ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27(Thu)-29(Sat), 2025
Paradise Hotel Busan, Korea

Abstract Book

Hosted by

Korean Stroke Society

Endorsed by

World Stroke Organization

ASIA PACIFIC STROKE ORGANISATION

ESO EUROPEAN STROKE ORGAN SAT ON

ICSU & ICAS 2025

Program at a Glance

Day 1: November 27(Thu)

Room	Room A (Grand Ballroom)	Room B (Capri)	Poster Room (Sydney)
8:00			[Poster Session 1]
9:00	[Symposium 1] Stroke prevention	[Scientific Session 1]	
10:00			
	Coffee Break (10:40-11:00)		
11:00	[Plenary Session 1]		
12:00	[Luncheon Symposium 1] DAEWOONG BIO INC.	[Luncheon Symposium 2] Chong Kun Dang Pharm	
13:00	[Satellite Symposium 1] Viatris korea	[Satellite Symposium 2] Organon	[Poster Session 2]
	Coffee Break (13:30-13:50)		
14:00	[Symposium 2] Acute stroke Management	[Scientific Session 2]	
15:00	Coffee Break (15:30-15:50)	MYUNG IN PHARM Coffee Break (15:30-15:50)	
16:00	[Focus session] Clinical Practice Guidelines	[Sponsored Scientific Session] MYUNG IN PHARM	
17:00		[Clinical Trial Session]	
	Break (17:30-17:50)		
18:00	[Sponsored Workshop Session 1] Hanmi Pharm (KOR)	[Sponsored Workshop Session 2] BORYUNG	

Day 2: November 28(Fri)

Room	Room A (Grand Ballroom)	Room B (Capri)	Room C & Poster Room (Sicily & Sydney)
8:00	[Sponsored Workshop Session 3] Mitsubishi Tanabe Pharma Korea	[Sponsored Workshop Session 3] Mitsubishi Tanabe Pharma Korea	
9:00	[Symposium 3] BTC	[Scientific Session 3]	
10:00			
	Coffee Break (10:40-11:00)		
11:00	[Plenary Session 2]		
12:00	[Luncheon Symposium 3] Sanofi-Aventis Korea	[Luncheon Symposium 4] Amgen Korea	
13:00	[Satellite Symposium 3] Korea Otsuka Pharm.	[Satellite Symposium 4] SAMJIN PHARM.	[Poster Session 3]
	Coffee Break (13:30-13:50)		
14:00	ICAS Symposium 1 Epidemiology and Stroke Mechanisms	[Scientific Session 4]	[Other Special Sessions] Remodeling of Acute Stroke Care System (Sicily) (KOR)
15:00			
	Coffee Break (15:30-15:50)		
16:00	ICAS Symposium 2 Vessel Assessment	[Other Special Sessions] Debate Session (KOR)	
17:00			
18:00			[Poster Session 4]
	Presidential Dinner (Invitation Only)		

ICSU & ICAS 2025

Day 3: November 29(Sat)

Room	Room A (Capri)	Room B (Sicily)	Room C (Sydney)
8:00	**[Symposium 4]** NeuroRehabilitation	**ICAS Symposium 3** Treatment	
9:00			
10:00	**[Plenary Session 3]**		
	Coffee Break (10:40-11:00)		
11:00	**[Symposium 5]** Anti-amyloid Therapy and Stroke (Joint Session of KSS and VasCog-Korea)	**ICAS Symposium 4** Other Intracranial Vascular Diseases	**Nursing Symposium** (KOR)
12:00			
13:00	**[Luncheon Symposium 5]** Daiichi-Sankyo, DAEWOONG	**[Luncheon Symposium 6]** SK chemicals	
		Break (13:40-14:00)	
14:00		**[한국뇌졸중유전체 연구회 심포지엄]** (14:00-15:55) (KOR)	
15:00			
		Coffee Break (15:55-16:15)	
16:00		**[GENESIS-K Symposium]** (16:15-18:00) (KOR)	
17:00			

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November 27 (Thu) 09:00-10:40 I Room A

Symposium 1.
Stroke Prevention [ENG]

CHAIRS

Sun U. Kwon (Asan Medical Center, Korea)
Lung Chan (Taipei Medical University, Taiwan)

Optimal Antithrombotic Strategy for Prevention of Atherosclerotic Stroke

Bum Joon Kim

Asan Medical Center, Seoul, Korea

Atherosclerotic stroke arises from plaque rupture or thromboembolism in either intracranial or extracranial arteries. In the acute stage, early dual antiplatelet therapy (DAPT) with aspirin and clopidogrel has been proven to reduce recurrent ischemic events, as shown in the CHANCE and POINT trials. Such an intensified short-term antiplatelet strategy is particularly critical during the unstable period of plaque activation.

Extracranial atherosclerotic stenosis (ECAS) is typically associated with artery-to-artery embolism, requiring potent antiplatelet regimens and, in selected cases, endovascular stenting. However, the optimal duration of DAPT after carotid or vertebral stenting remains uncertain. The ongoing CHET study in Korea is expected to clarify how long DAPT should be maintained following stent implantation to balance ischemic protection and bleeding risk. In contrast, intracranial atherosclerotic stenosis (ICAS) often involves in local branch occlusion, situ thrombosis and combination of mechanisms. The TOSS-2 trial demonstrated the benefit of early combination therapy with aspirin and cilostazol in reducing atherosclerosis burden in ICAS, while the CSPS.com study showed that cilostazol-based regimens lowered ischemic recurrence with fewer hemorrhagic complications. Given that revascularization procedures such as stenting are less commonly applied in ICAS, there is a growing need for antithrombotic strategies that effectively prevent thrombosis while concurrently suppressing atherosclerotic progression.

Ongoing research such as the CHANGE study aims to refine individualized antithrombotic strategies by integrating imaging, clinical, and biological markers to optimize stroke prevention in patients with atherosclerotic mechanisms.

New Era for Prevention of Cardioembolic Stroke

Young-Seo Kim

Hanyang University Hospital, Korea

Abstract

Cardioembolic stroke (CES) is one of the most devastating subtypes of ischemic stroke, accounting for approximately 14–30% of all cerebral infarctions. It is characterized by high early and late recurrence rates and the greatest associated morbidity and mortality. The pathophysiology involves blood stasis, thrombus formation within the left atrium or ventricle, valvular abnormalities, or paradoxical embolism through right-to-left shunts. As the global population ages, the incidence of cardioembolic stroke continues to rise, highlighting the urgent need for improved preventive strategies.

Warfarin has long been the cornerstone therapy for stroke prevention in atrial fibrillation (AF), reducing the risk of ischemic stroke by approximately 64%. However, its narrow therapeutic window, numerous food and drug interactions, genetic variability in metabolism, and need for continuous INR monitoring have limited its practicality. Time in Therapeutic Range (TTR) strongly correlates with clinical outcomes, but maintaining adequate TTR remains challenging, especially in elderly or polymedicated patients. Despite its efficacy, warfarin carries a significant risk of intracerebral hemorrhage (ICH), particularly in patients with hypertension, cerebral microbleeds, or amyloid angiopathy. The development of DOACs, including the direct thrombin inhibitor dabigatran and the factor Xa inhibitors rivaroxaban, apixaban, and edoxaban, has revolutionized cardioembolic stroke prevention. Large randomized controlled trials (RE-LY, ROCKET-AF, ARISTOTLE, ENGAGE AF) have demonstrated that DOACs are at least as efficacious as warfarin, with significantly reduced rates of ICH and comparable or improved safety. Their predictable pharmacokinetics and lack of need for routine monitoring make them more convenient for both patients and clinicians.

A promising development in anticoagulation is the inhibition of factor XI, which plays a key role in the intrinsic coagulation pathway. Epidemiologic observations indicate that congenital factor XI deficiency confers protection against thrombosis with minimal bleeding risk. Novel agents—small molecules such as milvexian and asundexian, monoclonal antibodies such as osocimab and abelacimab, and antisense oligonucleotides—are under investigation. Although early data suggest reduced bleeding complications, the OCEANIC-AF trial of asundexian was prematurely terminated due to excess ischemic events, indicating that efficacy remains to be conclusively proven. For patients at high bleeding risk or with contraindications to long-term anticoagulation, left atrial appendage occlusion (LAAO) has emerged as a viable alternative. Trials such as PROTECT AF, PREVAIL, and Amulet IDE demonstrated non-inferiority of LAAO devices compared with warfarin or other established therapies. In selected cases, catheter ablation may also reduce AF burden and potentially lower stroke risk, although definitive randomized evidence remains limited.

The prevention of cardioembolic stroke is entering a new era marked by safer and more individualized therapies. While DOACs have become the standard of care, ongoing research into factor XI inhibitors and interventional strategies offers further potential to minimize both thromboembolic and bleeding risks. Integrating these novel modalities into personalized treatment algorithms will be essential to improving long-term outcomes in this high-risk population.

Non-Statin Lipid-Lowering Therapy for Stroke Prevention

Cheng-Yang Hsieh, MD, PhD

Department of Neurology, Tainan Sin Lau Hospital, Tainan, Taiwan

Despite the proven efficacy of statins in reducing atherosclerotic cardiovascular disease (ASCVD) risk, a significant proportion of patients fail to achieve recommended low-density lipoprotein cholesterol (LDL-C) targets, particularly in secondary prevention after ischemic stroke. This residual risk may reflect statin intolerance, suboptimal response, or limitations of current treatment paradigms. Novel non-statin agents have emerged as powerful complementary or alternative strategies to further reduce LDL-C and improve cerebrovascular outcomes.

Bempedoic acid, a first-in-class oral adenosine triphosphate-citrate lyase (ACL) inhibitor, reduces cholesterol synthesis upstream of HMG-CoA reductase. Activated only in the liver, it is associated with minimal muscle-related adverse effects. In phase 3 trials, bempedoic acid achieved an additional 18–25% LDL-C reduction on top of maximally tolerated statin therapy and significantly lowered high-sensitivity C-reactive protein. The CLEAR Outcomes trial demonstrated that bempedoic acid reduces major cardiovascular events in statin-intolerant patients, with consistent benefit observed in subgroups with prior stroke or high cerebrovascular risk.

Inclisiran, the first small-interfering RNA (siRNA) therapy targeting hepatic PCSK9 synthesis, offers potent and sustained LDL-C lowering (~50%) with just twice-yearly subcutaneous dosing. Pooled analyses from the ORION-9, -10, and -11 trials confirmed durable efficacy and a favorable safety profile, regardless of background lipid-lowering therapy. Its novel mechanism and simplified dosing schedule may improve adherence and long-term risk reduction in secondary stroke prevention.

Together, bempedoic acid and inclisiran represent a paradigm shift toward individualized lipid management, enabling deeper and more sustained LDL-C lowering beyond statins. Integrating these agents into treatment algorithms holds promise for reducing recurrent stroke risk and addressing residual atherosclerotic burden across diverse patient populations.

Diabetic Control for the Secondary Stroke Prevention: what is the evidence and practical implication

Jeong-Min Kim

Seoul National University Hospital, Korea

Diabetes is a major risk factor for ischemic stroke, and stroke patient with diabetes is known to experience a higher incidence of neurological deterioration and stroke recurrence, and lower chance of successful recovery. Furthermore, the prevalence of diabetes is increasing worldwide due to an aging population and the growing prevalence of obesity among younger generations. Appropriate management of diabetes and comprehensive vascular risk factors is known to effectively prevent vascular event and improve functional outcome after stroke. Recently many antidiabetic drugs, including pioglitazone and glucagon-like peptide-1 receptor agonists, have shown promising effects in stroke prevention. This lecture discusses the diabetes management strategies for stroke survivors based on the latest guidelines and scientific evidence.

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November 27 (Thu) 09:00 - 10:40 I Room B

Scientific Session 1 [ENG]

CHAIRS

Kyungbok Lee (Soon Chun Hyang University Hospital Seoul)
Hae Woong Jeong (Inje University Busan Paik Hospital)

Stroke during pregnancy and the postpartum period: A nationwide population-based study in South Korea

Darda Chung[1], **Cindy W Yoon**[2]

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[2]*Neurology, Inha University School Of Medicine, Incheon, Korea, Republic of*

Purpose

Pregnancy-associated stroke (PAS) is an uncommon but important condition that can affect the health of both mother and infant. However, no nationwide data on PAS have been published in South Korea to date. This study aims to investigate the incidence, trends, and risk factors of PAS in South Korea.

Methods

Nationwide data from the Korean National Health Insurance Service (NHIS) were retrospectively analyzed to identify women of reproductive age (15–49 years) who delivered between 2014 and 2021, and PAS was defined as ischemic or hemorrhagic stroke occurring during pregnancy or within 6 weeks postpartum.

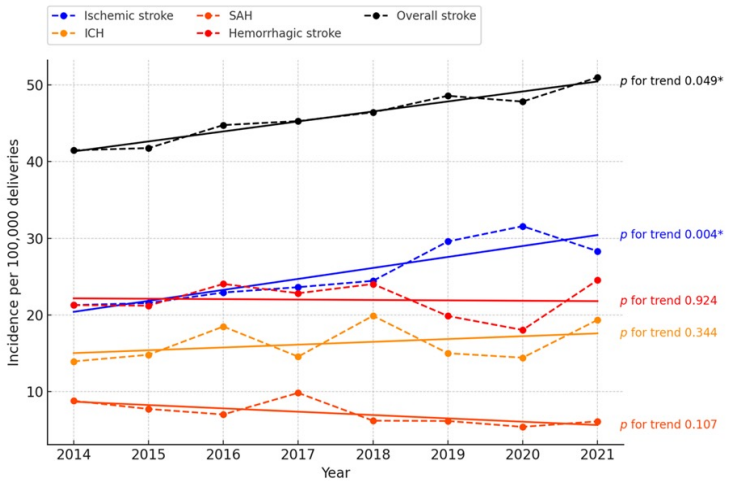
Results

Of 2,000,110 deliveries between 2014 and 2021, 909 first-ever strokes occurred during pregnancy or within six weeks postpartum, including 500 ischemic (55%) and 409 hemorrhagic (45%) strokes. The overall incidence of PAS was 45.6 per 100,000 deliveries (95% CI, 42.7–48.6) and increased from 41.5 in 2014 to 51.0 in 2021 (p = 0.049), mainly due to a rise in ischemic strokes. PAS was more frequent during the postpartum period (p <0.0001) and among older women (p for trend <0.0001). In multivariable analysis, advanced maternal age (OR per year, 1.02; 95% CI 1.01–1.05), hypertension (OR 2.04; 95% CI 1.37–3.04), migraine (OR 1.33; 95% CI 1.02–1.74), gestational hypertension (OR 1.49; 95% CI 1.04–2.12), preeclampsia/eclampsia (OR 5.00; 95% CI 3.59–6.96), and peripartum cardiomyopathy (OR 14.26; 95% CI 4.48–45.42) remained independent predictors of PAS.

Conclusions

The incidence of PAS is rising in South Korea, especially among older women and during the postpartum period, with maternal vascular and pregnancy-related complications serving as independent risk factors. These findings emphasize the clinical importance of increasing awareness of PAS and early identification and proactive management of high-risk women.

Contents



Vascular Risk-Factor Control in Recurrent Ischemic Stroke: Trends and Outcome Associations in the Korean Stroke Registry

Eung-Joon Lee[1,1], Matthew Chung[1,1], Han-Yeong Jeong[2,2], Keun-Hwa Jung[1,1], Jiyeon Ha[1]

[1]*Neurology, Seoul National University Hospital, Seoul, Korea, Republic of*

[2]*Neurology, Smg-Snu Boramae Medical Center, Seoul, Korea, Republic of*

Purpose

Recurrent ischemic stroke is associated with greater disability and mortality than first-ever stroke, yet contemporary evidence on vascular risk-factor control in this high-risk population is limited.

Methods

We analyzed Korean Stroke Registry admissions (2018–2023): 130,126 acute ischemic stroke encounters, including 24,183 recurrent events. Risk-factor control was defined as Hemoglobin A1c (HbA1c) ≤7.0%, low-density lipoprotein cholesterol (LDL-C) <70 mg/dL, non-current smoking, and normal weight (body mass index 18.5–24.9 kg/m^2). Age-standardized annual proportions were described; temporal trends and interactions by sex and age were estimated using population-averaged generalized estimating equations (GEE; logit, exchangeable) with hospitals as clusters, modeling calendar year per 1-year increment. Outcome models related the number of controlled factors (0–4) to discharge functional independence (modified Rankin scale [mRS] 0–2; premorbid mRS 0–1) and in-hospital mortality.

Results

In recurrent stroke, LDL-C control improved annually, more in women than men (per-year odds ratio [OR] 1.12 vs 1.06; P for interaction<0.001) and in older adults (50–64: OR 1.05; ≥65: OR 1.09) but not in 19–49 years (OR 0.95; P for interaction<0.001). HbA1c control was largely flat overall, with a borderline decline in 19–49 years (OR 0.91; P=0.058). Non-current smoking diverged by subgroup—improving in men (OR 1.07; P=0.011) but declining in women (OR 0.92; P=0.018; P for interaction<0.001) and decreasing in 19–49 years while increasing in ≥65 years (P for interaction<0.01). Normal weight declined in women (OR 0.97; P=0.012) and in 19–49 years (OR 0.87; P<0.001), consistent with rising obesity in younger adults. Each additional controlled factor (0–4) was independently associated with higher odds of discharge functional independence (adjusted OR 1.26; 95% confidence interval [CI] 1.21–1.30) and lower in-hospital mortality (adjusted OR 0.98; 95% CI 0.97–0.99).

Conclusions

In recurrent stroke, lipid management has improved, but gaps remain in glycemic, weight, and smoking control, particularly in younger adults and women. Comprehensive, age- and sex-tailored strategies are warranted.

Exploring the Relationship Between Air Pollution and Ischemic Stroke Rates: A Spatial and Temporal Study in Indonesia and Policy Recommendations

Jeddah Yanti[1,2], Dinil Qaiyimah[2], Novarina Sulsia Istain Ningtyas[2], Rizki Rachmad Saputra[3], Elvika Aulia Fitroningtyas[4]

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Purpose

Exposure to air pollution, particularly fine particulate matter (PM 2.5 and PM 10), is a known risk factor for ischemic stroke, as these particles can penetrate the bloodstream and reach the brain. This study aims to use advanced satellite technology to monitor pollution levels and evaluate their association with stroke prevalence in Indonesia. Early detection of environmental risk factors is crucial in preventive health strategies.

Methods

The study utilized Sentinel-5P (TROPOMI) satellite data from 2018 to 2025, which provided information on various atmospheric pollutants, including sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), and the Aerosol Absorption Index (PM 2.5 and PM 10). Data was processed and calibrated to estimate ground-level pollutant concentrations. These exposure data were then integrated with national stroke prevalence estimates and were further analyzed by classifying regions as urban or rural.

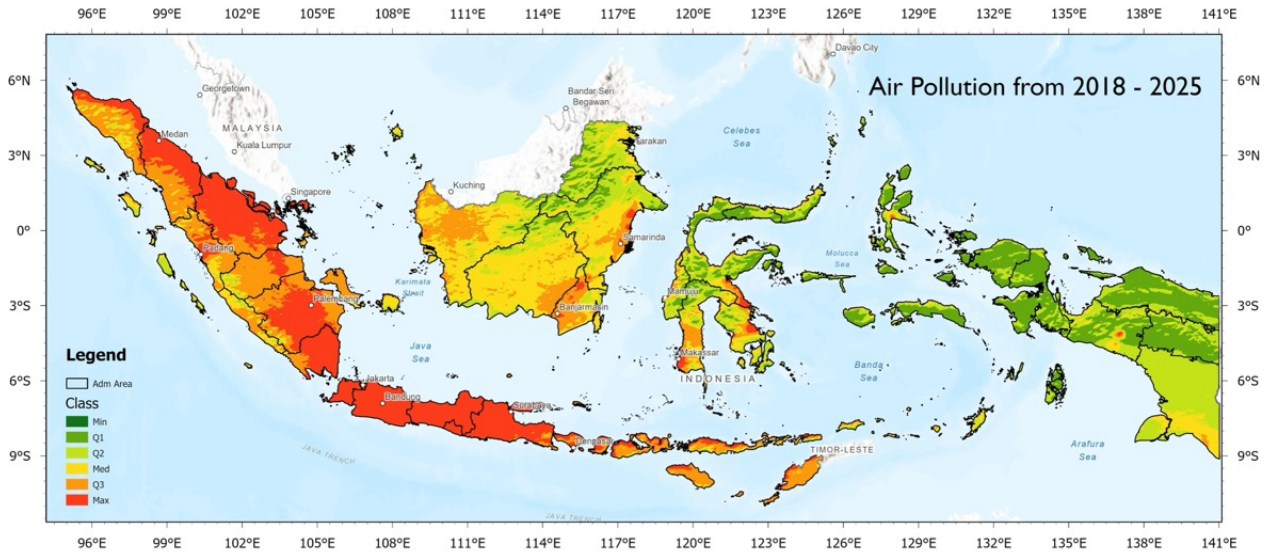
Results

Statistical analysis revealed an average atmospheric pollutant load of 0.25 mol m^{-2}. The specific pollutant loads identified included SO_2 (4.83×10^{-4} mol·m^{-2}), NO_2 (9.715×10^{-5} mol·m^{-2}), and CO (0.03743 mol·m^{-2}). The maximum pollution levels were evenly distributed across the island of Java, indicating a broad and consistent exposure to air pollutants.

Conclusions

Satellite remote sensing technology, such as the Sentinel-5P, has proven to be an effective tool for gathering high-resolution pollution exposure data. This study strengthens the understanding of the causal relationship between air pollution and ischemic stroke. The findings provide valuable evidence that can guide policy-making in environmental health, particularly in designing strategies for stroke prevention in pollution-prone regions.

Contents


Air Pollution from 2018 - 2025
Legend
Adm Area
Class
Min
Q1
Q2
Med
Q3
Max
MALAYSIA
INDONESIA
TIMOR-LESTE
Georgetown
Medan
Kuala Lumpur
Singapore
Kuching
Bandar Seri Begawan
Davao City
Pontianak
Palembang
Jakarta
Bandung
Surabaya
Banjarmasin
Samarinda
Tarakan
Makassar
Mamuju
Celebes Sea
Java Sea
Karimata Strait
Molucca Sea
Banda Sea
Arafura Sea
JAVA TRENCH
96°E
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102°E
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114°E
117°E
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Concomitant Large Artery Steno-occlusion and Risk of Recurrent Ischemic Stroke in Patients with Nonvalvular Atrial Fibrillation

Hyung Seok Guk[1], Do Yeon Kim[2], Ji Sung Lee[3], Keon-Joo Lee[4], Han-Gil Jeong[1], Jun Yup Kim[2], Jihoon Kang[2], Beom Joon Kim[2], Moon-Ku Han[2, 21], Hyunsoo Kim[5], Kang-Ho Choi[5], Joon-Tae Kim[5], Kyu Sun Yum[6], Dong-Ick Shin[6], Dong-Seok Gwak[7], Dong-Eog Kim[7], Jong-Moo Park[8], Kyusik Kang[9], Jae Guk Kim[10], Soo Joo Lee[10], Minwoo Lee[11], Mi-Sun Oh[11], Kyung-Ho Yu[11], Byung-Chul Lee[11], Hong-Kyun Park[12], Yong-Jin Cho[12], Keun-Sik Hong[12], Jay Chol Choi[13], Jeong-Ho Hong[14], Sung-Il Sohn[14], Tai Hwan Park[15], Kyungbok Lee[16], Wook-Joo Kim[17], Jee Hyun Kwon[17], Doo Hyuk Kwon[18], Jun Lee[18], Juneyoung Lee[19], Philip B. Gorelick[20], Hee-Joon Bae[2, 21], The Crcs-K-Nih And East-Af Investigators On Behalf Of[2]

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Purpose

Recurrent ischemic stroke remains common in patients with nonvalvular atrial fibrillation (NVAF) despite anticoagulation.

Concomitant large artery steno-occlusion (cLASO) is frequently observed, but the prognostic impact of its lesion characteristics in this population is not well established. In this study, we evaluated whether the presence and characteristics of cLASO in major cerebral arteries are associated with increased risk of recurrent ischemic stroke in patients with NVAF-related acute ischemic stroke (AIS).

Methods

This is a prospective cohort study of patients with NVAF-related AIS admitted to 14 tertiary stroke centers in South Korea between October 2017 and April 2020 who underwent brain magnetic resonance imaging and angiography. cLASO, defined as any degree of stenosis or occlusion of major cerebral arteries, was classified by anatomical severity (mild, moderate-to-severe, or occlusion) and clinical relevance (relevant vs. bystander), the latter based on concordance with infarct territory. The primary outcome was recurrent ischemic stroke within 3 years. Secondary outcomes included all-cause mortality and a composite of recurrent stroke, myocardial infarction, or death.

Results

Among 2,035 patients (mean age, 74.9 years; 54.8% male), 1,308 (64.3%) had cLASO, and 583 (28.6%) had clinically relevant cLASO. The 3-year cumulative incidence of recurrent ischemic stroke was 7.0%, with more than 40% of recurrence occurring within the first month. Recurrence rates increased significantly with cLASO presence (absence, 4.5% vs. presence, 8.1%), severity (mild, 5.7%; moderate-to-severe, 9.7%; occlusion, 9.1%) and clinical relevance (bystander, 3.8%; relevant, 13.9%) (all P's<0.05). In multivariable analysis, cLASO presence was associated with increased recurrence risk (adjusted hazard ratio [aHR], 1.97; 95% confidence interval [CI], 1.60-2.42). When severity and clinical relevance were modeled together, clinical relevance—but not severity—was independently associated with recurrence (aHR, 4.10; 95% CI, 2.57-6.54).

Conclusions

cLASO, especially when clinically relevant, is a strong and independent predictor of recurrent ischemic stroke in patients with NVAF-related AIS. These findings underscore the need for early, tailored secondary prevention strategies targeting coexisting atherosclerotic disease.

Association Between the NOTCH3 Pathogenic Variant and Age-Related Macular Degeneration: Evidence from the Taiwan Biobank and Taiwan CADASIL Registry

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Purpose

Age-related macular degeneration (AMD) is the main cause of central vision loss among the aged population and involves retinal microvascular dysfunction. CADASIL, a hereditary small vessel disease caused by NOTCH3 mutations, primarily affects the cerebral vasculature but may also involve the retinal microvasculature. This study investigated the association between the NOTCH3 pathogenic variant and AMD using data from the Taiwan Biobank, and sought to validate the findings in a hospital-based cohort.

Methods

Individuals from Taiwan Biobank carrying the NOTCH3 R544C variant were matched with noncarriers at a 1:10 ratio based on demographic and cardiovascular risk factors. The odds ratio (OR) for self-reported AMD and other eye diseases was calculated. To validate the findings, 64 individuals with NOTCH3 R544C variants and 84 age-matched controls from Taiwan-Associated Genetic and Non-genetic Small Vessel Disease (TAG-SVD) underwent ophthalmic evaluation for signs of AMD.

Results

In the Taiwan Biobank, individuals carrying the NOTCH3 R544C variant (n = 1,134) had a higher prevalence of stroke history (OR, 2.23; 95% CI, 1.30–3.84) and family history of stroke (OR, 2.05; 95% CI, 1.78–2.35) compared with matched controls (n = 11,340). They also had a higher prevalence of AMD (OR, 2.26; 95% CI, 1.38–3.71), but not of other eye diseases. Individuals with AMD were older, more likely to have diabetes mellitus, and had higher fasting glucose, HbA1c, total cholesterol, and low-density lipoprotein cholesterol levels. Multivariate analysis identified age (OR, 1.06; 95% CI, 1.01–1.11) and diabetes mellitus (OR, 5.51; 95% CI, 1.84–14.79) as independent factors associated with AMD. In the TAG-SVD cohort, AMD prevalence was higher in NOTCH3 R544C carriers (23.4%) than in age-matched controls (13.1%), although the difference did not reach statistical significance (p = 0.10).

Conclusions

Our findings establish a direct link between the NOTCH3 pathogenic variant and AMD, with evidence of earlier onset and a potential contribution of diabetes. Further studies are warranted to explore the disease modifiable effects of diabetes in subjects with NOTCH3 pathogenic variants.

Neutrophil extracellular traps in stroke thrombi retrieved by endovascular thrombectomy

Joonnyung Heo

Yonsei University College Of Medicine

Non-traditional Lipid Parameters as Robust Predictors of Intracranial Atherosclerosis: A Meta-Analysis

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[2]Medical Doctor Profession Program, Faculty Of Medicine, Syiah Kuala University, Aceh, Indonesia

[3]Epidemiology, Faculty Of Psychology, Islam Negeri Raden Fatah University, Palembang, Indonesia

Purpose

to systematically quantify the association between non-traditional lipid parameters and intracranial atherosclerosis (ICAS).

Methods

This Meta-analysis followed PRISMA guidelines. Literature was searched in PubMed, Web of Science, Scopus, Elsevier, and Google Scholar. Eligible studies included adults (≥18 years), assessed at least one non-traditional lipid biomarker, confirmed ICAS by imaging, and reported effect estimates with 95% CIs. Exclusion criteria were non-clinical and non–peer-reviewed studies.

Data were analyzed using RevMan 5.4, with risk of bias assessed by ROBINS-E. Pooled estimates were expressed as odds ratios (ORs) with 95% confidence intervals (CIs) for six non-traditional lipid parameters: remnant cholesterol, triglyceride–glucose (TyG) index, lipoprotein(a), apolipoprotein B/A-I ratio, total cholesterol/high-density lipoprotein cholesterol (TC/HDL-C) ratio, and low-density lipoprotein cholesterol/high-density lipoprotein cholesterol (LDL-C/HDL-C) ratio.

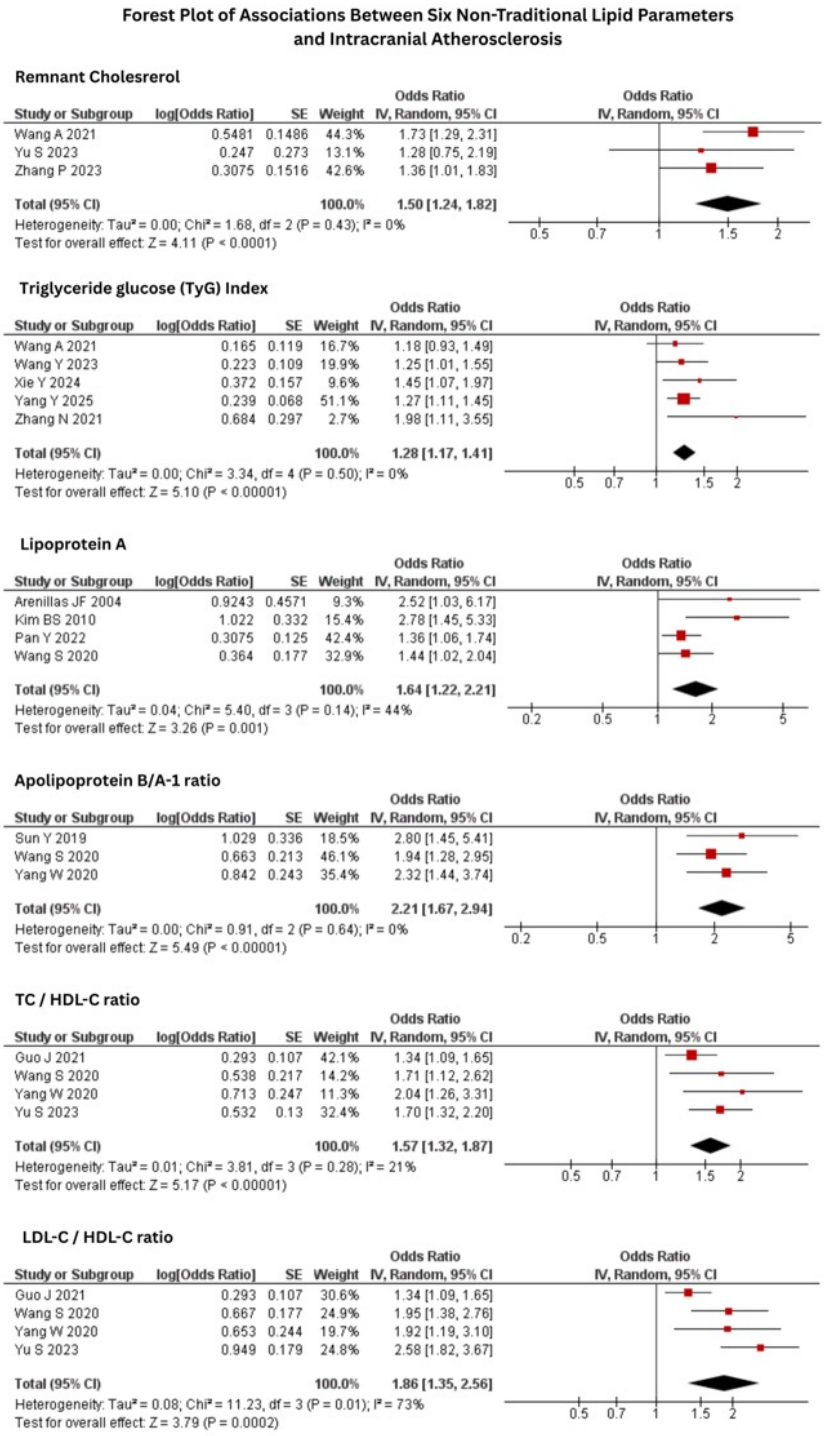
Results

The Pooled analysis of 15 clinical studies (2004-2025), comprising a total of 29,845 participants, revealed significant associations between several non-traditional lipid parameters and intracranial atherosclerosis. Remnant cholesterol (n=5,774) was related to a higher risk of ICAS (OR:1.50, CI:1.24–1.82; p<0.0001; I^2=0%), illustrating the role of triglyceride-rich lipoproteins in intracranial plaque formation and demonstrating its relevance for detecting residual risk beyond LDL-C. Similarly, the TyG index (n=10,697) exhibited a robust and uniform effect (OR:1.28, CI:1.17–1.41; p<0.00001; I^2=0%), indicating the contribution of insulin resistance to ICAS development and suggesting its practicality as an inexpensive, routinely accessible biomarker for early identification of high-risk patients. Elevated lipoprotein(a) (n=6,264) was related to ICAS (OR:1.64, CI:1.22–2.21; p=0.001; I^2=44%), reflecting its pro-atherogenic and pro-thrombotic properties; measurement of Lp(a) may therefore improve risk prediction, particularly among patients with unexplained or premature ICAS. The strongest and most consistent effect was observed for the ApoB/ApoA-I ratio (n=3,823), which was linked to over twice the odds of ICAS (OR:2.21, CI:1.67–2.94; p<0.00001; I^2=0%), highlighting the central importance of the balance between atherogenic and anti-atherogenic lipoproteins; this ratio may guide personalized lipid-lowering strategies. Moreover, both the TC/HDL-C ratio (n=8,544; OR:1.57, CI:1.32–1.87; p<0.00001; I^2=21%) and the LDL-C/HDL-C ratio (n=8,544; OR:1.86, CI:1.35–2.56; p=0.0002; I^2=73%) were positively correlated with ICAS, underscoring the value of these composite indices as integrated markers of lipid imbalance.

Conclusions

Non-traditional lipid parameters, particularly ApoB/ApoA-I ratio, remnant cholesterol, TyG index, and Lp(a), provide novel insights into the pathogenesis of ICAS and demonstrate predictive value beyond conventional lipid parameters. Their integration into clinical practice could enable earlier detection, more precise risk stratification, and the development of personalized prevention and therapeutic strategies for intracranial atherosclerosis.

Contents



Nocturnal Desaturation, Hemodynamic Variability and Outcome of Acute Ischemic Stroke

Hyunsun Oh[1], Jung Yoon Song[1], Keon Yeup Kim[1], Jeong Kyu Lee[1], Wook Jin Yang[1], Jun Young Jang[1], Dong-Wha Kang[1], Sun Uck Kwon[1], Bum Joon Kim[1]

[1]Neurology, Asan Medical Center, Seoul, Korea, Republic of

Purpose

Vital signs undergo dynamic changes and may influence outcomes in acute cerebral infarction. This study aimed to investigate whether physiologic alterations in vital signs—particularly nocturnal oxygen desaturation (NOD) and variability in blood pressure (BP) and heart rate (HR)—are associated with early neurological deterioration (END), and further to evaluate their association with long-term functional outcomes, assessed by the 3-month modified Rankin Scale (mRS), in patients with acute ischemic stroke (AIS).

Methods

We retrospectively reviewed AIS patients admitted to Asan Medical Center in 2022 who presented within 24 hours of symptom onset and underwent continuous vital sign monitoring. END was defined as a ≥2-point increase in the NIHSS within 7 days, and NOD as any SpO_2 ≤90% during nighttime. BP and HR variability were calculated using the standard deviation of 4-hour interval values. Univariate and multivariate logistic regression was used to identify factors associated with END and poor 3-month mRS outcome, defined as mRS 2–6. We conducted two mediation analyses. The first examined whether the effect of NOD on END was mediated through BP variability (BPV). The second assessed whether the effect of NOD on poor 3-month mRS was mediated through END.

Results

Among 298 patients, 79 (26.5%) experienced END. NOD (OR 3.73, p = 0.005) and higher BPV (OR 1.08, p = 0.018) were independently associated with END. Moderated regression analysis revealed a significant interaction effect, where BPV amplified the impact of NOD on END (p < 0.001). However, the mediation model did not support a significant indirect effect through BPV (ACME = 0.032, p = 0.07). Patients with NOD had worse 3-month mRS scores (mean 2.4 vs. 1.62, p = 0.025). The mediation analysis examining the effect of NOD on poor 3-month mRS showed that this association was significantly mediated by END (ACME = 0.154, p = 0.004). There was no significant direct effect of NOD after accounting for END, indicating that END fully explained the impact of NOD on 3-month outcome.

Conclusions

In AIS patients, both NOD and BPV were independently associated with END. BPV appeared to enhance the impact of NOD on END, suggesting a potential synergistic effect. Preventing END caused by NOD during the acute stage of stroke may help improve 3-month functional outcomes measured by the mRS.

Perivascular spaces and basilar artery remodelling in Fabry disease: a dual vascular pathology

Sungho Ahn[1], **Joo-Bong Kang**[1]

[1]*Neurology, Pusan National University Yangsan Hospital, Yangsan, Korea, Republic of*

Purpose

Fabry disease (FD) is a lysosomal storage disorder causing glycosphingolipid deposition in vascular endothelium. Early neurovascular involvement is difficult to detect because conventional MRI findings overlap with age-related small- and large-vessel changes. We hypothesized that integrating micro- and macrovascular MRI markers could improve detection of FD-related vasculopathy.

Methods

In a prospective case–control study, 26 genetically confirmed FD patients and 26 age- and sex-matched healthy controls underwent 3T MRI, including high-resolution vessel wall imaging. Macrovascular metrics included basilar artery (BA) diameter, BA tortuosity index (BATI), and a composite BA degeneration index (BADI). Microvascular markers comprised perivascular space (PVS) burden (Potter scale), white-matter lesion severity (modified Fazekas), and global cerebral atrophy. Associations with FD were assessed using multivariable logistic regression adjusting for age, sex, and vascular risk factors. Correlations between micro- and macrovascular markers and age-stratified analyses were performed.

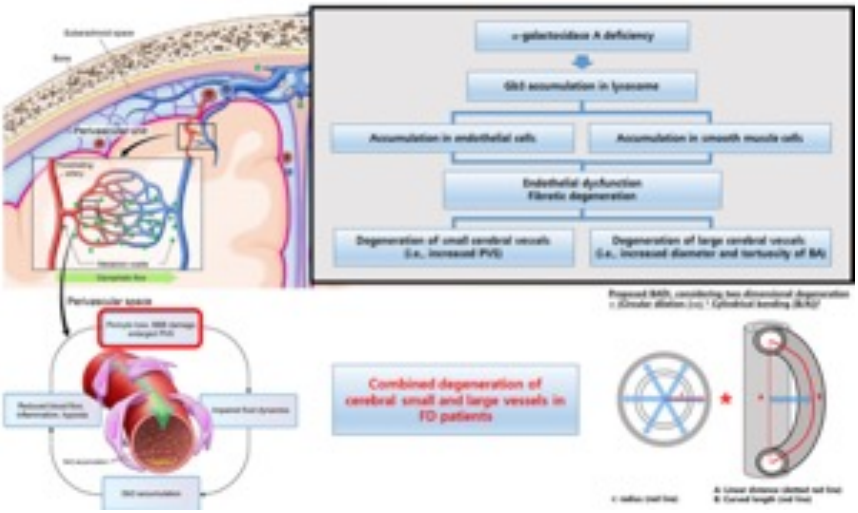
Results

FD patients exhibited larger BA diameter, higher PVS burden in basal ganglia and centrum semiovale, and greater cerebral atrophy compared with controls, while Fazekas scores were similar. Both PVS burden and BA diameter were independently associated with FD after adjustment; PVS remained significant after controlling for vascular risk factors. In FD—but not controls—PVS burden correlated positively with BADI, indicating coupled micro- and macrovascular remodeling. Age-stratified analyses revealed steeper increases in BA metrics and PVS burden with advancing age in FD, suggesting accelerated vascular degeneration.

Conclusions

Combining PVS burden with posterior-circulation remodeling indices (BA diameter/BADI) uncovers disease-specific coupling of micro- and macrovascular degeneration in FD. This quantitative MRI approach may enable earlier diagnosis, more precise risk stratification, and monitoring of therapeutic response in clinical practice.

Contents


α-galactosidase A deficiency
Gb3 accumulation in lysosome
Accumulation in endothelial cells
Accumulation in smooth muscle cells
Endothelial dysfunction
Fibrotic degeneration
Degeneration of small cerebral vessels
(i.e., increased PVS)
Degeneration of large cerebral vessels
(i.e., increased diameter and tortuosity of BA)
Perivascular space
Combined degeneration of
cerebral small and large vessels in
FD patients

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 11:00 - 12:00 I Room A+B

Plenary Session 1 [ENG]

CHAIRS

Sung-Hee Hwang (Kangnam Sacred Heart Hospital,
Hallym University)

Update on Embolic Strokes of Undetermined Source: Implications for Clinical Practice and Research

George Ntaios

Internal Medicine First Propedeutic Department of Internal Medicine, AHEPA Hospital, Aristotle University of Thessaloniki

The term embolic stroke of undetermined source (ESUS) was introduced in 2014 to describe patients with a nonlacunar ischemic stroke and no convincing etiology. The terms ESUS and cryptogenic stroke are not synonyms, as the latter also includes patients with multiple stroke etiologies or incomplete diagnostic work-up. ESUS involves approximately 17% of all ischemic stroke patients, and these patients are typically younger with mild strokes and an annual rate of stroke recurrence of 4% to 5%. It was hypothesized that oral anticoagulation may decrease the risk of stroke recurrence in ESUS, which was tested in 2 large randomized controlled trials. This session will discuss the trials of anticoagulation in patients with ESUS, suggest potential explanations for their neutral results, and highlight the rationale that supports ongoing and future research in this population aiming to reduce the associated risk for stroke recurrence.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 12:00 - 13:00 I Room A

Luncheon Symposium 1 [ENG]

CHAIRS

Kwang Ho Lee (Sungkyunkwan University School of Medicine)

The Role of Cerebrolysin in Ischemic Stroke Recovery

Da Eun Jeong
VHS Medical Center

Cerebrolysin has emerged as a promising multimodal agent that may enhance endogenous brain repair following ischemic stroke, particularly in addressing the persistent gap between vessel recanalization and meaningful functional recovery. Although intravenous thrombolysis and mechanical thrombectomy have substantially improved reperfusion rates, many patients continue to experience limited neurological restoration. This highlights the importance of targeting neuroplastic and neurovascular mechanisms that operate during the subacute and chronic recovery phases. Cerebrolysin, a peptide-based neurotrophic formulation, has been evaluated for its capacity to modulate multiple interconnected pathways relevant to post-stroke repair.

A structured review of (1) preclinical studies describing dendritic/axonal sprouting, neurogenesis, angiogenesis, oligodendrogenesis, mitochondrial resilience, and blood–brain barrier (BBB) protection; (2) randomized clinical trials including CASTA, CERE-LYSE-1, CARS-1/2, and the Korean Phase IV trial; (3) multicenter prospective data from the CEREHETIS study evaluating BBB integrity after reperfusion; and (4) real-world observations in moderate-to-severe stroke populations.

Preclinical findings consistently demonstrate that Cerebrolysin promotes dendritic remodeling, neurogenesis within the subventricular zone, angiogenesis, and white-matter repair, while attenuating inflammatory responses and stabilizing endothelial tight junctions. These mechanisms support a favorable environment for neurovascular unit (NVU) restoration. Clinical data provide complementary evidence: the CARS trial reported significant improvement in upper-limb motor outcomes with a 21-day course of Cerebrolysin combined with rehabilitation; Korean Phase IV imaging studies demonstrated increased fractional anisotropy and enhanced motor-network organization; and the CEREHETIS study showed reduced hemorrhagic transformation and improved BBB permeability in reperfusion-treated patients, with no adverse interaction with intravenous alteplase or endovascular thrombectomy.

Overall, current evidence suggests that Cerebrolysin may help bridge the transition from reperfusion to sustained neurological repair. By supporting NVU function and activating multiple endogenous restorative pathways, it has the potential to complement standard acute interventions and improve functional recovery trajectories. Further research is needed to refine optimal timing and integration with rehabilitation.

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Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 12:00 - 13:00 I Room B

Luncheon Symposium 2 [ENG]

CHAIRS

Kwang-Yeol Park (Chung-Ang University Hospital)

Luncheon Symposium 2

Balancing Efficacy and Safety in Stroke Prevention for Atrial Fibrillation: The Role of Apixaban

Doo Hyuk Kwon

Yeungnam University Medical Center

Abstract:

Stroke prevention is the cornerstone of atrial fibrillation (AF) management, particularly in elderly and frail patients where treatment decisions are often most challenging. Direct oral anticoagulants (DOACs) have replaced warfarin as the standard of care, but differences among agents remain in terms of efficacy, safety, and clinical applicability.

Apixaban has consistently demonstrated a favorable balance of efficacy and safety. In the ARISTOTLE trial, apixaban was superior to warfarin in reducing stroke, systemic embolism, major bleeding, and mortality. The AVERROES trial further confirmed its value in patients unsuitable for vitamin K antagonists, with reduced stroke risk and no significant increase in bleeding compared with aspirin. These results have been strongly supported by real-world evidence from diverse populations across the US, Europe, and Asia, including Korea.

Importantly, apixaban's advantages extend to high-risk subgroups such as the elderly, frail individuals, and those with renal impairment or prior gastrointestinal bleeding. Its twice-daily dosing regimen offers more stable plasma concentrations, reduced variability, and better adherence compared with once-daily agents.

Taken together, clinical trial data and real-world experience position apixaban as a reliable and practical choice for stroke prevention in AF, offering clinicians confidence in balancing efficacy and safety across a broad range of patients.

Optimal antiplatelet therapy after ischemic stroke

Hyuk Sung Kwon

Hanyang University Guri Hospital

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 13:00 - 13:30 I Room A

Satellite Symposium 1 [ENG]

CHAIRS

Dae-Il Chang (Gachon University Gil Medical Center)

Title: Evolving Strategies in LDL-C Management for Stroke Patients: Based on the 2025 ESC/EAS Guidelines

Jun young Chang

Asan Medical Center

Recent updates in the 2025 ESC/EAS Guidelines on dyslipidemia management have refined the approach to LDL-C lowering in patients with cerebrovascular disease. Risk assessment now relies on the SCORE2 and SCORE2-OP algorithms, which estimate 10-year fatal and nonfatal ASCVD risk in untreated individuals, integrating age, sex, smoking, blood pressure, and non-HDL-C. The definition of imaging-documented ASCVD has also been clarified, focusing on unequivocal evidence such as >50% carotid stenosis or significant atherosclerotic plaque. The new recommendations emphasize baseline (untreated) LDL-C levels and total cardiovascular risk to guide treatment intensity, rather than relying on fixed target values alone. A stepwise intensification strategy is advised, starting with statins, followed by ezetimibe or bempedoic acid, and proceeding to PCSK9 inhibitors (monoclonal antibodies or inclisiran) or evinacumab in familial hypercholesterolemia. Emerging evidence indicates that statin therapies do not increase hemorrhagic stroke risk, supporting their use even in patients with prior intracerebral hemorrhage under appropriate risk stratification. This presentation integrates these updates into practical LDL-C management strategies tailored for stroke prevention.

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Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 13:00 - 13:30 I Room B

Satellite Symposium 2 [ENG]

CHAIRS

Jaseong Koo (The Catholic University of Korea Seoul St. Mary's Hospital)

A Neurologist's Approach to Dyslipidemia: Why Ezetimibe Matters

Mi-Yeon Eun

Kyungpook National University Chilgok Hospital

Dyslipidemia is a key modifiable risk factor for atherosclerotic cerebrovascular disease, yet residual vascular risk remains despite statin therapy. While newer agents such as PCSK9 inhibitors have expanded therapeutic options, ezetimibe remains the most accessible adjunctive therapy in clinical practice. By inhibiting intestinal cholesterol absorption, ezetimibe provides complementary LDL-C reduction when combined with statins. Despite remarkable advances in lipid-lowering therapy, substantial residual cardiovascular and cerebrovascular risk persists in patients receiving statin treatment. This presentation examines the clinical trial evidence and practical benefits of ezetimibe in cerebrovascular disease from a neurologist's perspective.

Multiple landmark trials support ezetimibe's role in cerebrovascular disease prevention. The Treat Stroke to Target (TST) trial demonstrated that achieving LDL-C <70 mg/dL with statin-ezetimibe combination therapy in recent stroke or TIA patients significantly reduced major cardiovascular events. The ROSETTA-Stroke trial showed that moderate-intensity statin plus ezetimibe was superior to high-intensity statin monotherapy for LDL-C goal achievement in Korean stroke patients. The IMPROVE-IT trial demonstrated significant non-fatal stroke reduction with combination therapy, while RACING and HIJ-PROPER trials in Asian populations further confirmed efficacy and safety. Based on this robust evidence, recent guidelines increasingly recommend earlier and more proactive use of ezetimibe in combination with statins for secondary stroke prevention.

Ezetimibe is particularly valuable for patients with inadequate LDL-C control despite statin therapy, those with statin intolerance, and patients requiring aggressive lipid management after atherosclerotic stroke. With its established safety profile, proven efficacy, and ease of use, ezetimibe represents the most practical first-line adjunctive therapy to statins in routine neurological practice. Understanding when and how to incorporate ezetimibe into treatment algorithms is essential for optimal neurovascular risk management and prevention of recurrent stroke.

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Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 13:50 - 15:30 I Room A

Symposium 2:
Acute stroke Management [ENG]

CHAIRS

Eung-Gyu Kim (Inje University Busan Paik Hospital)
Byung Moon Kim (Severance Hospital)

Global Trends, Collaboration Networks, and Emerging Hotspots of Artificial Intelligence in Stroke Research

Nadyatul Husna

Dr. Reksodiwiryo Military Hospital

Comparative Effects of Aerobic Exercise and Virtual Reality Cognitive Training (VRCT) for Cognitive Function After Stroke: Potential Roles in Neuroplasticity – A Systematic Review and Meta-Analysis

Lilik Nurhasanah Purnomo Putri

Gadjah Mada University

Efficacy and Safety of Tenecteplase in Acute Ischemic Stroke

Tae Jung Kim

Department of Neurology and Critical Care Medicine , Seoul National University Hospital, Seoul, Republic of Korea

Tenecteplase, a genetically engineered variant of alteplase, has emerged as a promising thrombolytic agent for the treatment of acute ischemic stroke (AIS). With a prolonged half-life, higher fibrin specificity, and greater resistance to plasminogen activator inhibitor-1 compared with alteplase, tenecteplase allows single-bolus administration and may offer improved efficacy and safety. Early phase studies demonstrated acceptable safety at doses of 0.1–0.25 mg/kg, whereas higher doses were associated with increased risk of symptomatic intracranial hemorrhage. Subsequent randomized controlled trials across multiple regions, including Australia, Norway, Canada, China, and the United Kingdom, have consistently shown that tenecteplase at a dose of 0.25 mg/kg is noninferior to standard-dose alteplase in functional outcomes at 90 days, while maintaining comparable safety profiles. In real-world practice, observational studies have reported shorter door-to-needle times and lower rates of symptomatic intracranial hemorrhage with tenecteplase compared to alteplase, further supporting its practicality. Updated international guidelines now recommend tenecteplase 0.25 mg/kg as a safe and effective alternative to alteplase for patients with AIS presenting within 4.5 hours of onset and eligible for intravenous thrombolysis. Although tenecteplase has long been approved for the management of acute myocardial infarction, regulatory approval for stroke treatment is still under review in several countries, including Korea. Future clinical trials and real-world evidence will continue to refine its role in bridging therapy and extended time windows. Taken together, current evidence supports tenecteplase 0.25 mg/kg as a viable and convenient alternative to alteplase in AIS management.

Comparison of balloon guide catheters and conventional guide catheters for endovascular thrombectomy in acute ischemic stroke

Woosang Jung

Ajou University Hospital

Abstract

Endovascular thrombectomy (EVT) is standard care for large-vessel occlusion, yet opportunities remain to optimize reperfusion quality and functional recovery. This lecture synthesizes contemporary evidence comparing balloon guide catheters (BGC) with conventional guide catheters (CGC). Earlier stent-retriever–dominant observational studies and meta-analyses associated BGC use with higher first-pass effect and better clinical outcomes. In contrast, recent aspiration-first practice patterns have yielded heterogeneous results: PROTECT-MT reported longer procedure times and lower reperfusion quality with BGC in aspiration-based workflows, whereas PRoFATE suggested that proximal flow arrest (balloon inflation) can increase first-pass complete reperfusion without clear differences in final angiographic or clinical endpoints. Using principles from the second law of thermodynamics and Poiseuille's law, we argue that the effectiveness of aspiration hinges on maximizing the pressure gradient created by "systolic push + aspiration pull"; proximal flow arrest may diminish this gradient and reduce aspiration efficiency. We also review advantages of newer BGCs (larger lumens, improved compatibility, anchoring) and propose stepwise aspiration protocols (Engage–Withdraw & Wait–Remove) and context-specific BGC use. In summary, BGCs are advantageous in stent-first strategies, whereas selective use with minimal flow arrest appears reasonable in aspiration-first workflows.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 13:50 - 15:30 I Room B

Scientific Session 2 [ENG]

CHAIRS

Tai Hwan Park (Seoul Medical Center)
Keun-Hwa Jung (Seoul National University Hospital)

Global Trends, Collaboration Networks, and Emerging Hotspots of Artificial Intelligence in Stroke Research

Nadyatul Husna[1]

[1]*Medical Internship, Dr. Reksodiwiryo Military Hospital, Padang, Indonesia*

Purpose

Stroke is a leading cause of death and disability worldwide. In recent years, artificial intelligence (AI), including machine learning (ML) and deep learning (DL), has been increasingly applied to stroke imaging, diagnosis, rehabilitation, and outcome prediction. We conducted a bibliometric review of AI/ML/DL research spanning all stroke subtypes (ischemic, hemorrhagic, and others) to map publication trends, research hotspots, and collaboration networks.

Methods

A bibliometric study of publications indexed in PubMed, Scopus, and Web of Science from 2014 to 2025 was conducted. Data were analyzed using the R bibliometrix package, VOSviewer, and CiteSpace to identify publication dynamics, co-authorship and collaboration networks, keyword co-occurrence clusters, and citation bursts.

Results

AI-related stroke publications have grown steadily since 2014, with notable acceleration after 2018. The United States and China emerged as leading contributors, with strong international collaborations involving the United Kingdom, Italy, and other countries. Keyword co-occurrence analysis revealed major research themes in neuroimaging-based stroke diagnosis, acute management and prognostication, rehabilitation using AI-driven systems, and algorithm development. Citation burst analysis demonstrated a temporal shift: earlier focus on rehabilitation (e.g., upper limb therapy) has evolved toward machine learning, natural language processing, and cardiovascular risk prediction such as atrial fibrillation. Institutional collaboration networks highlighted research hubs in North America, Europe, and East Asia, with leading centers including the University of Calgary, Capital Medical University, Queen's University, and National Taiwan University.

Conclusions

This bibliometric mapping underscores the rapid integration of AI, ML, and DL in stroke research. Emerging directions include multi-modal predictive analytics combining imaging, genomics, and electronic health records, as well as AI-enhanced technologies for stroke rehabilitation. These trends indicate a shift toward data-driven risk stratification and clinical decision support, emphasizing the need for sustained international and interdisciplinary collaboration to translate AI advances into improved prevention, diagnosis, and management of stroke.

Comparative Effects of Aerobic Exercise and Virtual Reality Cognitive Training (VRCT) for Cognitive Function After Stroke: Potential Roles in Neuroplasticity – A Systematic Review and Meta-Analysis

Lilik Nurhasanah Purnomo Putri[1], Firly Hero Rubben Sembiring[2], Rifki Habibi Rahman[1], Rahmatu Syifa[1]

[1]*Master Of Biomedical Science, Gadjah Mada University, Yogyakarta, Indonesia*

[2]*School Of Biomedical Sciences, The University Of Melbourne, Victoria, Australia*

Purpose

Background : The latest global data in 2024 reported that approximately 12 million new stroke cases occur worldwide each year. One of the major sequelae of stroke is cognitive impairment, affecting up to 80% of survivors and significantly reducing independence, daily functioning, and long-term recovery. The high prevalence and profound consequences of this condition highlight the urgent need for effective rehabilitation strategies to improve cognitive outcomes. In this context, aerobic exercise and virtual reality cognitive training (VRCT) have emerged as promising interventions, both with potential roles in enhancing neuroplasticity. However, there is still no strong evidence directly comparing their effectiveness, while such information is crucial to provide evidence-based clinical guidance in managing post-stroke cognitive impairment.

Objective: To compare the effectiveness of aerobic exercise and virtual reality cognitive training (VRCT) in improving cognitive function among stroke survivors

Methods

A systematic review and meta-analysis was conducted on randomized controlled trials (RCTs) published between 2016 and 2025. Literature searches were performed in PubMed, Scopus, Google Scholar, and Cochrane following PRISMA guidelines, and study quality was assessed using the RoB-2 tool. Intervention groups received either aerobic exercise or VRCT, while control groups received standard rehabilitation. Cognitive outcomes analyzed included the Montreal Cognitive Assessment (MoCA), Trail Making Test A and B (TMT-A, TMT-B), and Forward and Backward Digit Span (FDS, BDS). Mean changes from pre- to post-intervention were extracted and compared

Results

A total of 1,457 participants from 22 studies were included, comprising 759 in the intervention group and 698 in the control group. Direct comparative analysis between interventions using the chi-square test (χ^2) showed that aerobic exercise was superior to VRCT in improving global cognitive function (MoCA) ($\chi^2 = 4.36$; $p = 0.04$; $I^2 = 77.1\%$), whereas VRCT was more effective in enhancing executive function (TMT-B) ($\chi^2 = 7.83$; $p = 0.005$; $I^2 = 87.2\%$). In contrast, no significant differences were observed between the two interventions in TMT-A, FDS, and BDS outcomes.

Conclusions

Both aerobic exercise and VR cognitive training improve cognition after stroke but with distinct roles. Aerobic exercise is more beneficial for global cognition, whereas VRCT is more effective in enhancing executive function. These findings suggest that post-stroke cognitive rehabilitation should be personalized and tailored to the specific goals of cognitive improvement, with both interventions potentially exerting their benefits through distinct pathways of neuroplasticity.

Acknowledgement

Lembaga Pengelola Dana Pendidikan (LPDP)

Impact of Auditory Comprehension Status on Functional Outcome Recovery in Post-Stroke Aphasia Patients

Kwanju Song[1], 3, Tanaka Tomotaka[2], Bum Joon Kim[1]

[1]Department Of Neurology, Asan Medical Center, Seoul, Korea, Republic of

[2]Department Of Neurology, National Cerebral And Cardiovascular Center, Osaka, Japan

[3]Medical Department, Sangun-Myeon Health Sub-Center, Bonghwa-Gun Public Health Center, Gyeongsangbuk-Do, Korea, Republic of

Purpose

While post-stroke aphasia (PSA) significantly impairs patient outcomes, the prognostic differentiation based on auditory comprehension capabilities remains inadequately defined. We investigated whether preserved auditory comprehension independently predicts superior functional outcomes in PSA patients.

Methods

We conducted a retrospective multicenter cohort study including PSA patients following acute ischemic stroke from tertiary centers in South Korea (2017-2023) and Japan (2011-2023). Patients were stratified by auditory comprehension abilities: comprehensive group (Broca's, transcortical motor, conduction, anomic aphasia) versus non-comprehensive group (global, mixed transcortical, Wernicke's, transcortical sensory aphasia). The outcomes included favorable functional status (modified Rankin Scale [mRS] 0-2) at 3 months, mRS improvement, worsening, and mortality at 3 months.

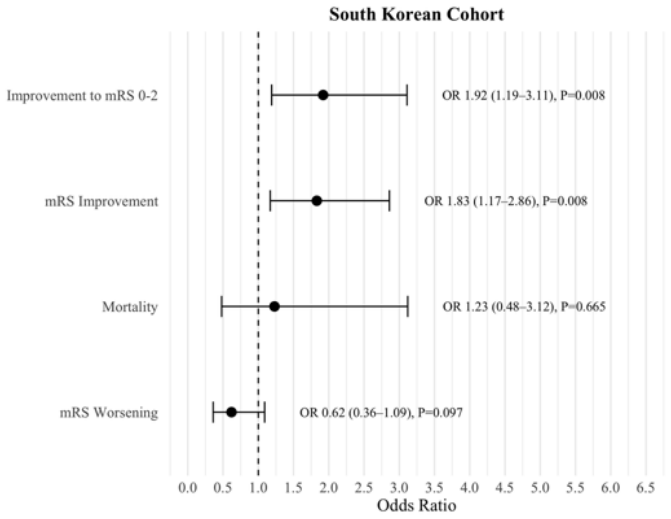
Results

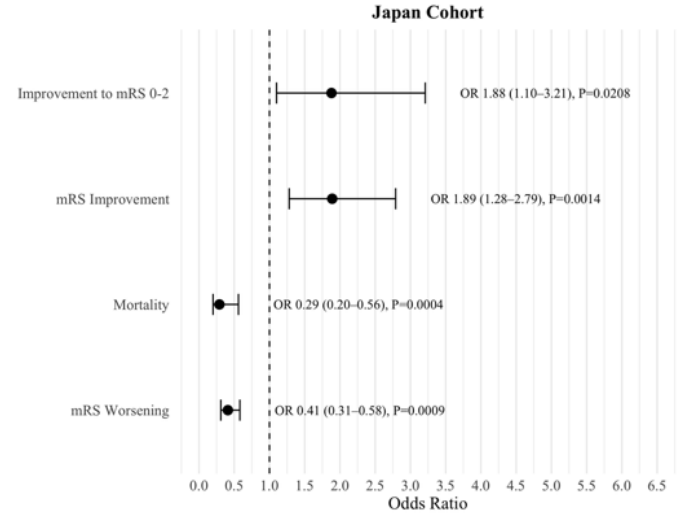
A total of 1,389 patients were included (Korea n=641; Japan n=748). Auditory comprehension deficits were identified in 80.3% of Korean and 59.0% of Japanese cohorts. Non-comprehensive patients presented with higher baseline stroke severity (Korea: NIHSS median 11 vs. 6, P<0.001; Japan: 23 vs. 12, P<0.001). At 3-month assessment, auditory comprehensive patients achieved superior rates of favorable functional status (Korea: 43.7% vs. 22.5%, P<0.001; Japan: 50.8% vs. 14.5%, P<0.001). 3-month mortality rates were significantly lower in comprehensive patients across both populations (Korea: 6.3% vs. 12.8%, P=0.042; Japan: 1.3% vs. 15.8%, P<0.001). Multivariable regression analysis confirmed preserved auditory comprehension as a significant predictor of the achievement of favorable functional outcome (Korea: OR 1.92, 95% CI 1.19-3.11, P=0.008; Japan: OR 1.88, 95% CI 1.10-3.21, P=0.021) and functional improvement (Korea: OR 1.83, 95% CI 1.17-2.86, P=0.008; Japan: OR 1.89, 95% CI 1.28-2.79, P=0.001). The Japanese cohort additionally demonstrated significant mortality reduction (OR 0.14, CI 0.05-0.41, P<0.001).

Conclusions

Preserved auditory comprehension significantly predicts functional recovery in PSA patients, with approximately two-fold increased odds of favorable outcomes. These findings support early aphasia assessment provides prognostic information relevant to rehabilitation. Recognition of auditory comprehension impairments supports individualized rehabilitation strategies for patients with PSA.

Contents


South Korean Cohort
Improvement to mRS 0-2
OR 1.92 (1.19–3.11), P=0.008
mRS Improvement
OR 1.83 (1.17–2.86), P=0.008
Mortality
OR 1.23 (0.48–3.12), P=0.665
mRS Worsening
OR 0.62 (0.36–1.09), P=0.097
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5
Odds Ratio


Japan Cohort
Improvement to mRS 0-2
OR 1.88 (1.10–3.21), P=0.0208
mRS Improvement
OR 1.89 (1.28–2.79), P=0.0014
Mortality
OR 0.29 (0.20–0.56), P=0.0004
mRS Worsening
OR 0.41 (0.31–0.58), P=0.0009
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5
Odds Ratio

Clinician Performance in Detecting Cerebral Aneurysms on MRA Is Improved by Deep Learning Assistance

Chan-Young Park[1], Gucheol Jung[3], Juyoung Lee[3], Hanna Kim[3], Sung-Min Gho[3], Dongwook Kang[1], Heejung Lim[1], Hae-Bong Jung[1], Young Taeck Oh[6], Hye Jun Lee[4], Jung-Bin Lee[2], Younghee Yim[2], Taek-Kyun Nam[5], Kwang-Yeol Park[1]

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Purpose

Reliable detection of intracranial aneurysms on MRA requires significant expertise, but diagnostic variability across physicians persists. As MRA usage continues to expand in clinical practice, the demand for reliable and consistent aneurysm detection is increasing. This study assessed interobserver variability in detection performance across physicians with different levels of experience and explored the potential role of artificial intelligence as an adjunct to clinical decision-making.

Methods

TOF-MRA studies with and without intracranial aneurysms were retrospectively collected. A physician without clinical experience and a resident with one year of neurology training independently reviewed the images and marked suspected aneurysms. Their findings were compared with reference annotations provided by two board-certified neuroradiologists. After a washout period, the same readers re-evaluated the MRAs with the assistance of deep learning–based software. Diagnostic accuracy and interpretation time were compared between readings performed with and without AI support.

Results

A total of 642 patients were evaluated, including 321 patients with 398 aneurysms (up to 5 per patient). Without AI assistance, the physician without clinical experience required an average of 85 seconds per case, achieving a sensitivity of 63.6% (253/398) and an accuracy of 74.5%. The resident with one year of experience required 33 seconds per case, with a sensitivity of 60.0% and an accuracy of 66.8%. With AI support, the inexperienced physician improved to 42 seconds per case, with a sensitivity of 83.4% and an accuracy of 80.2%. The resident improved to 29 seconds per case, with a sensitivity of 85.9% and an accuracy of 86.1%.

Conclusions

Deep learning–based AI support enhanced the sensitivity and accuracy of intracranial aneurysm detection on MRA while reducing interpretation time. AI assistance enabled less experienced physicians to achieve higher diagnostic performance with greater efficiency, highlighting its potential value as a clinical adjunct

Polar Metabolic Profiles in Ischemic Stroke Patients with Atrial Fibrillation

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Purpose

Ischemic stroke remains a major cause of death and long-term disability, with outcomes heavily influenced by its diverse etiologies. Accurately categorizing stroke subtypes is essential for improving diagnostic precision, tailoring therapeutic approaches, and implementing preventive strategies. Atrial fibrillation (AF) is a well-established, independent risk factor for ischemic stroke, emphasizing dedicated research into its associated biological markers.

In this study, we explored the polar metabolic profiles to associate with the presence atrial fibrillation in acute stroke patietns.

Methods

In this study, we analyzed plasma samples from 484 ischemic stroke patients, comprising 392 individuals without AF and 92 with AF, to identify metabolic alterations associated with AF-related stroke. We employed semi-targeted metabolomic analysis using ultrahigh-performance liquid chromatography coupled with a triple quadrupole mass spectrometer (UPLC-TQ-MS; Agilent 1290 Infinity LC and 6495 TQ-MS system).

Results

The metabolomic profiling revealed notable differences in various polar metabolites—including amino acids, purine derivatives, and acylcarnitines—between the two groups. Remarkably, ketone bodies (3-hydroxybutyrate and acetoacetate) and medium-chain acylcarnitines (hexanoylcarnitine, octanoylcarnitine, decanoylcarnitine, and lauroylcarnitine) were significantly elevated in patients with AF. After semi-targeted profiling, we conducted targeted analysis for 2 ketone bodies and 4 aclycarnitines using same instruments. Quantitatively, these 6 metabolites increased significantly compared to non-AF stroke patients. Ketone bodies showed strong positive correlations not only with fibrinogen and D-dimer but also with pro-BNP and Troponin T in AF stroke patients, suggesting that their increase is associated with both thrombosis and cardiac function. In contrast, acylcarnitines exhibited positive correlations only with pro-BNP and Troponin T, indicating that their increase is associated with cardiac function.

Conclusions

These findings suggest that ketone bodies and acylcarnitines may serve as potential metabolic biomarkers reflecting thromboembolic risk and impaired cardiac function in AF-related stroke, thereby providing new insights into the pathophysiological mechanisms linking metabolism, thrombosis, and cardiac dysfunction.

Acknowledgement

This research was partly supported by the Bio&Medical Technology Development Program of the National Research Foundation (NRF)

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Application for Real-Time Conversational Analysis of Multi-Modal Medical Data for Stroke Care Services

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Purpose

Artificial intelligence (AI) has been increasingly applied to prediction using clinical data and neuroimaging analysis. However, platforms that can comprehensively integrate diverse data types and provide them in a user-friendly manner remain limited. In this study, we developed a web-based application that analyzes multi-modal data, including clinical information, medical imaging, and physiological signals, and provide the results in real time through an intuitive interface. The objective was to support patients and caregivers in more easily understanding complex medical data.

Methods

The application utilized the OpenAI Realtime API for real-time speech recognition and conversational response, enabling the execution of appropriate browser tools according to user voice commands. For medical-related inquiries, the system executed the corresponding tool, converted the user query into text, and forwarded it to the Supervisor in LangGraph, which automatically invoked the appropriate AI Agent. The LangGraph framework incorporated Agents for (1) analysis of clinical data in stroke patients, (2) Fazekas scale prediction from FLAIR images, (3) vascular age prediction based on MRA-TOF images, and (4) lesion detection using ADC/DWI images. Supported input modalities included textual clinical records, medical images, physiologic data, and voices.

Results

The developed application performed automatic tool or agent routing of user voice queries and provided analytic results both visually and auditorily. Physiological signals were processed in real time, allowing intuitive monitoring of heart rate and oxygen saturation, while imaging results were visualized with overlays and interactive 3D renderings to enhance interpretability.

Conclusions

The proposed web-based application integrates real-time conversational interaction with multi-modal data analysis and visualization, demonstrating potential as a tool for patient-centered health management and clinical research support. Future work will involve validation in clinical environments, along with further enhancement of data security and system scalability.

Acknowledgement

This work was partly supported by the Institute of Information & Communications Technology Planning & Evaluation(IITP)-ICT Creative Consilience Program grant funded by the Korea government(MSIT)(IITP-2025-RS-2020-II201821, 50%) and Bio&Medical Technology Development Program of the National Research Foundation(NRF) grant funded by the Korea government(OOO)(RS-2023-00265393, 50%)

AI-guided Analysis of a Senescence–Exosome Gene Panel in Plasma Extracellular Vesicles for Stroke Prevention

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Purpose

Cellular senescence and extracellular vesicles (EVs) shape vascular aging and post-stroke inflammation. We asked whether an AI-enabled, interpretable gene-set approach applied to plasma EV RNA-seq could surface prevention-relevant signals.

Methods

We curated a senescence–exosome (SES) panel (690 genes) from published senescence resources and human exosome databases. Using a reproducible Colab workflow, we analyzed human plasma EV RNA-seq (GEO: GSE186844). Reads were mapped from Ensembl to HGNC symbols, transformed to log2(CPM+1), and low-expression genes were filtered (CPM>1 in ≥3 samples). We first ran a sanity check on the 11-sample subset, then tested the 21-sample cohort (Stroke n=9; Control n=12) with a batch term to account for re-used controls. Gene-wise effects were estimated by OLS linear modeling: expression ~ group(Stroke) + batch; false discovery was controlled with Benjamini–Hochberg.

Results

The global SES score (mean-z across intersecting genes) showed a small, non-significant shift in the 11-sample subset (Welch p=0.605). In the batch-adjusted 21-sample model, SYT7 emerged as significantly down-regulated in Stroke(coef −7.38; FDR=0.021). No additional SES genes met FDR<0.10.

Conclusions

An AI-guided, gene-set–based workflow applied to plasma EV RNA-seq identified SYT7 as a candidate prevention-oriented biomarker signal. This minimally invasive framework is suited for longitudinal screening in high-risk populations and will next be validated across external cohorts to assess predictive value for stroke prevention.

Patient-Tailored Neurovascular Repair Post-Stroke via Transplantation of Cranial Neural Crest-Derived Pericytes from Human Pluripotent Stem Cells: An Epigenetic Perspective

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Purpose

Blood brain barrier (BBB) is a highly selective interface composed of microvascular endothelial cells. Among the supporting cells, pericytes contribute to vascular remodelling, maturation, and stabilization. Human pluripotent stem cells (hPSCs), with their capacities for self-renewal and differentiation offer an ideal platform for deriving pericyte populations. This study aimed to investigate the gene expression profile of cranial neural crest-derived pericytes from hPSCs to better understand their role in BBB function and the potential use in stroke management.

Methods

The gene chip data GSE132857 was obtained from the GEO expression database. Proteomic analysis was performed on 9 samples from hPSC and control groups. Transcriptomic profiles were analyzed differentially expressed genes (DEGs). The key hub gene was further screened using machine learning-based approaches. At the same time, the protein-protein interaction (PPI) networks of these DEGs were established by STRING.

Results

Following transcriptomic data analysis, out of 19.270 items, CFLAR, IRAK4, ZNF595 were identified as significantly upregulated in neural crest stem cells (NSCSs) derived from stroke patient models. The Log2FC values of downregulated genes ranged from -9.38 to -0.87, while Log2FC values of upregulated genes ranged from 1.54 to 7.15. hPSC-derived pericytes significantly reduced infarct size and promoted neurological recovery. Machine learning-based gene prioritization showed strong predictive accuracy across gene clusters involved in blood reperfusion, neuronal apoptosis, and restoration of BBB integrity.

Conclusions

This study showed that pericyte-like cells derived from cranial neural crest cells can effectively improve neurological recovery and restore blood-brain barrier (BBB) function in a stroke model. These cells may offer a promising new approach for treating diseases related to BBB damage

Impact of Early Cognitive and Psychological Status on Return to Work After Acute Ischemic Stroke

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Purpose

As the incidence of young ischemic stroke (IS) continues to increase worldwide, helping IS survivors return to work (RTW) remains a key challenge, given the high socio-economic costs of unemployment. Post-stroke cognitive impairment (PSCI) and mood changes represent important hindrances to RTW, and such patients can benefit from early interventions. However, it remains uncertain whether early psycho-cognitive assessment during the acute admission can prognosticate RTW outcomes, helping care teams to prioritize high-risk patients for personalized rehabilitation regimens. Thus, we aimed to evaluate the relationship between early psycho-cognitive assessment and three-month RTW status in a cohort of working-age Asian IS survivors.

Methods

We prospectively included all consecutive IS patients previously in active employment admitted to a primary stroke center in Singapore from 1st January 2020 to 31st December 2022. Cognition and psychological status were assessed within 24-72 hours of IS admission using the Montreal Cognitive Assessment (MoCA) and Patient Health Questionnaire-9 (PHQ-9). RTW was assessed at three months post-stroke and classified using the International Classification of Occupations 2008 (ISCO-08). Associations between psycho-cognitive status and RTW were evaluated using univariable and multivariable logistic regression. Two sensitivity analyses were conducted excluding patients rehospitalized within 3 months and patients returned to a different job scope or occupation. We then performed post-hoc analyses to identify the optimal cut-off for dichotomizing MoCA score in predicting RTW, which would maximize Youden's index.

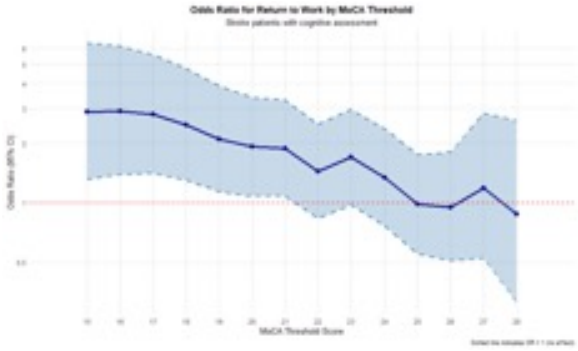
Results

Overall, 322 IS survivors were included, with 76 (23.6%) patients experiencing post-stroke depression and 214 (66.5%) patients experiencing PSCI; 212 (65.8%) patients successfully RTW at three months post-stroke. Higher PHQ-9 scores were significantly associated with non-RTW in univariable (OR 0.80, 95% CI 0.65-0.99, $p = 0.038$) but not multivariable analyses. Higher MoCA scores were significantly associated with RTW across univariable (OR 1.10, 95% CI 1.06-1.15, $p < 0.001$) and all multivariable analyses (OR 1.07, 95% CI 1.01-1.13, $p = 0.014$; Model C3). Lower occupational skill levels and increased stroke severity were also associated with lower odds of RTW. MoCA scores remained significantly associated with RTW across all levels of adjustment in both sensitivity analyses. Youden's index was maximal at MoCA >21 (OR 2.40, 95% CI 1.42 to 4.08, $p < 0.001$), indicating this was the optimal cut-off score.

Conclusions

Early MoCA scores at 24-72 hours post-stroke is significantly associated with RTW and may help prognosticate high-risk patients for early interventions. Longitudinal cohort studies are needed to better characterize longer-term cognitive and return-to-work trajectories in acute ischemic stroke.

Contents



Clinical Implementation of Pharmacogenomics Using Indream Medisupport: EMR-Integrated and Standalone Solutions

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Purpose

Integration of pharmacogenomic data into clinical practice remains challenging due to complexities in accessing genetic data and real-time clinical decision support. To address these limitations, Indream Healthcare has developed Indream Medisupport, an innovative platform designed for practical implementation of pharmacogenomics in routine clinical settings. This study highlights the capability of Indream Medisupport, emphasizing its interoperability with various Electronic Medical Record (EMR) systems and seamless integration with a patient-focused application, Indream MediChart.

Methods

We systematically reviewed and integrated pharmacogenomic guidelines from CPIC (Clinical Pharmacogenetics Implementation Consortium), encompassing CYP2C19, SLCO1B1, CYP2D6, and CYP2C9 genes. Utilizing Optical Character Recognition (OCR) technology, Indream Medisupport extracts relevant clinical data from various EMRs, irrespective of system compatibility. Concurrently, Indream MediChart collects de-identified patient genomic data, enabling immediate synchronization with Medisupport. This integration facilitates real-time pharmacogenomic alerts at the point of prescribing. To demonstrate the system's effectiveness, we created virtual dummy patient profiles representing CYP2C19, SLCO1B1, CYP2D6, and CYP2C9 poor-metabolizer haplotypes based on genetic variants identified among Jeju residents by the Jeju Precision Medicine Initiative (JPMI).

Results

Indream Medisupport effectively streamlined the integration of pharmacogenomic data into clinical workflows, enabling clinicians to receive real-time alerts about genetically influenced medication risks during prescribing. Unlike previous pharmacogenomic solutions, which often encountered implementation barriers due to EMR incompatibility or user-unfriendly interfaces, Medisupport's OCR technology offers versatile EMR integration.

Conclusions

While comprehensive pharmacogenomic guidelines exist, limitations remain regarding clinical recommendations for some enzyme-drug interactions due to insufficient empirical evidence. Nevertheless, known enzyme substrates suggest extensive pharmacogenomic implications for numerous medications. Indream Healthcare's pharmacogenomic database has cataloged hundreds of potential medication interactions, underscoring the broad applicability of genomic insights already achievable with existing patient genetic data. In conclusion, Indream Medisupport presents a scalable, practical model for routine clinical pharmacogenomics implementation, significantly addressing prior technological and logistical challenges.

Acknowledgement

Study Supported By InDream Healthcare Inc.

Dr. Ghang is the founder and CEO of InDream Healthcare Inc., a company that develops digital health solutions, including a clinical decision support system for polypharmacy management.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 15:50 - 16:50 I Room B

Sponsored Scientific Session [KOR]

CHAIRS

Woo-Keun Seo (Samsung Medical Center)

Sponsored Scientific Session

Acute Stroke Imaging in Clinical Practice and Research: Current Challenges and Multicenter Imaging Repository [KOR]

Beom Joon Kim (A)

Department of Neurology, Seoul National University Bundang Hospital

Background and Purpose: Acute stroke neuroimaging has evolved significantly, yet fundamental challenges persist in clinical decision-making. This talk overviews current imaging paradigms, identifies critical limitations, and proposes AI-driven solutions for transforming stroke care.

Acute stroke imaging in clinical practice: I will present the Four-P framework (Parenchyma, Pipes, Perfusion, Penumbra) as a foundational approach to hyperacute stroke imaging. Analysis of our institutional cohort reveals important dynamics: among 5,000 assessed admissions, 25% of initially DWI-negative suspected strokes converted to positive on follow-up imaging, with three-fold higher recurrent stroke risk. In 200 complete recanalization cases, 90% showed DWI lesion growth post-intervention. Our multicenter study of 1,500 EVT patients demonstrated that NCåCT-defined ischemic core showed stronger outcome associations than perfusion-defined core, while baseline hypodensity outperformed traditional scales for predicting hemorrhagic transformation.

AI Implementation and Challenges: Current AI applications in stroke imaging face critical obstacles including scanner heterogeneity, phenotypic diversity, and label noise. When strict criteria were applied to our 20,000-patient database, only 5% met lacunar infarction definitions, highlighting the need for massive datasets. To address these challenges, we established the CRCS-K Image Repository, achieving unprecedented scale in Asia with 20,422 consecutive patients (93% inclusion rate), comprising 35,000 NCCTs, 38,000 DWI sequences, and comprehensive clinical linkage. Our AISCAN platform enables web-based access and AI-driven analysis, while FASTRO real-time imaging sharing has reduced door-to-departure times by one hour.

Future Directions: Moving beyond image interpretation, we propose generative multimodal platforms incorporating digital twins for personalized simulations, generative AI cores for intervention modeling, and synthetic cohorts for in-silico trials. These approaches, supported by evolving regulatory frameworks, promise to transform stroke care from population-based rules to precision medicine.

Conclusion: While current AI tools remain narrow and brittle, integrating multimodal imaging with generative AI and international collaboration will enable truly personalized stroke treatment decisions.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 15:50 - 17:30 I Room A

Focus Session :
Clinical Practice Guidelines [ENG]

CHAIRS

Jay Chol Choi (Jeju National University Hospital)
Sung Chun Tang (National Taiwan University Hospital)

Recent Updated Guidelines for hypertension

Hye Seon Jeong

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Abstract

Background: Hypertension is one of the most significant modifiable risk factors for both primary and secondary prevention of stroke. Appropriate blood pressure (BP) control plays a crucial role not only in preventing the occurrence of stroke but also in improving clinical outcomes during the acute phase and recovery period.

Purpose: Since the publication of the 2009 Clinical Practice Guideline (CPG) by the Korean Stroke Society (KSS), major advances have been made in BP management, especially in patients with intracerebral hemorrhage and in those receiving endovascular reperfusion therapy for acute ischemic stroke. Reflecting these developments, the KSS CPG Committee has conducted a comprehensive update of the national guidelines for BP management in acute stroke.

Content: The updated KSS guideline provides 19 evidence-based recommendations covering BP management throughout the continuum of stroke care—from acute treatment to long-term secondary prevention. This lecture will also briefly review recent international updates, including the latest guidelines from the American Heart Association/American Stroke Association (AHA/ASA) and the European Society of Cardiology/European Society of Hypertension (ESC/ESH), focusing on new BP targets, individualized treatment approaches, and their clinical implications for stroke care.

Conclusion: These updated national and international recommendations offer clinicians an up-to-date, evidence-based framework for optimizing BP management in stroke patients.

Tenecteplase in Acute Ischemic Stroke: A Scientific Statement From the Korean Stroke Society

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Abstract

Tenecteplase (TNK) is a promising alternative thrombolytic agent for the treatment of acute ischemic stroke (AIS). However, its potential use is being impeded by the lack of regulatory approval and reimbursement policies for TNK in AIS in many countries, including South Korea. To address this therapeutic gap, the Korean Stroke Society developed scientific statement intended to inform policy changes and support the introduction of TNK in regions where it is not yet accessible, with the aim of enabling AIS patients to benefit from this advancement in thrombolytic therapy.

We reviewed randomized controlled trials (RCTs), meta-analyses, and systematic reviews published between January 2010 and November 2024 involving AIS patients treated with intravenous TNK. Meta-analyses were included if they exclusively evaluated RCTs and provided clinical evidence on the efficacy and safety of TNK. The statements were thoroughly reviewed and finalized by international expert panels after iterative revisions.

The statements suggest that TNK at 0.25 mg/kg can be considered as an alternative to alteplase for intravenous thrombolysis within 4.5 hours of the onset of AIS. The clinical out- comes in patients with large-vessel occlusion who are candidates for endovascular thrombec- tomy are better for TNK at 0.25 mg/kg than for alteplase.

These statements are intended to support the adoption of TNK in countries where it is not yet available, including South Korea, by providing up-to-date clinical evidence. Their im- plementation may broaden the therapeutic options for AIS patients and help align acute stroke care practices with international standards.

Moyamoya disease guidelines

Miki Fujimura, MD, PhD

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Moyamoya disease (MMD) is a chronic occlusive cerebrovascular disease with unknown etiology characterized by the progressive stenosis of internal carotid artery terminus and abnormal vascular network formation at the base of the brain. According to the latest guideline of the Japan Stroke Society, extracranial-intracranial bypass such as the superficial temporal artery (STA)-middle cerebral artery (MCA) anastomosis with or without indirect pial synangiosis is considered a reasonable management choice for symptomatic MMD patients, either with ischemic or hemorrhagic presentation. The STA-MCA anastomosis not only prevents cerebral ischemic attack by improving cerebral blood flow in ischemic MMD but also reduces the risk of re-bleeding in hemorrhagic MMD as indicated by Japan Adult Moyamoya Trial. Single antiplatelet therapy could be the option for ischemic MMD before and after revascularization surgery. Indication of the EC-IC bypass for asymptomatic MMD is still controversial. But the recent multicenter observational study of Asymptomatic Moyamoya Disease Registry (AMORE) suggests that hemisphere with an intrinsic periventricular anastomosis (so-called 'choroidal channel') has a substantial risk for de novo hemorrhage, which might be prevented by prophylactic EC-IC bypass to ameliorate this dangerous collateral. The on-going multicenter cohort study of MMD with choroidal anastomosis, the Moyamoya Periventricular Choroidal Collateral (P-ChoC) Registry may answer this important question.

Key words; Moyamoya disease, guidelines, surgical indication

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 16:50 - 17:50 I Room B

Clinical Trial Session [ENG]

CHAIRS

Hyung-Min Kwon (SMG–SNU Boramae Medical Centerl)
Jun Lee (Yeungnam University Medical Center)

Stroke Prevention With Apixaban and Clopidogrel in Atrial Fibrillation and Cerebral Atherosclerosis: The BEACON-AA Trial

Young Dae Kim, MD, PhD, JoonNyung Heo, MD, PhD, Hyungwoo Lee, MD,
Jae Wook Jung, MD, and Hyo Suk Nam, MD, PhD
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Abstract

Background

Patients with ischemic stroke who have both atrial fibrillation (AF) and large artery atherosclerosis (LAA) face a particularly high risk of recurrent events. Oral anticoagulation is standard for AF, while antiplatelet therapy is recommended for LAA. However, the optimal secondary prevention strategy when both mechanisms coexist remains uncertain, and current guidelines provide limited recommendations. Observational studies have yielded inconsistent results, and no randomized controlled trial (RCT) has directly addressed this question.

Aims

The BEACON-AA trial (BEnefits of Apixaban and Clopidogrel On stroke preventioN in patients with Atrial fibrillation and cerebral Atherosclerosis) is designed to determine whether short-term combination therapy with apixaban and clopidogrel is superior to apixaban monotherapy in reducing recurrent ischemic lesions in patients with acute ischemic stroke and concomitant AF and LAA.

Methods/Design

BEACON-AA is a multicenter, randomized, open-label, controlled trial with blinded endpoint adjudication (PROBE design). A total of 586 patients with acute ischemic stroke within 5 days, documented non-valvular AF, and ≥30% intracranial or extracranial stenosis (or clinically significant atherosclerotic disease) will be enrolled. Participants will be randomized 1:1 to receive apixaban monotherapy or apixaban plus clopidogrel for 30 days, followed by apixaban monotherapy.

The primary efficacy endpoint is the presence of recurrent ischemic lesions (symptomatic or asymptomatic) on brain MRI (DWI/FLAIR) at 30 days. Secondary endpoints include symptomatic ischemic stroke or transient ischemic attack (TIA), acute coronary syndrome, vascular revascularization, cardiovascular and all-cause mortality, major adverse cardiovascular events, and functional outcome at 90 days. Primary safety endpoints are major bleeding (ISTH criteria) within 90 days and new asymptomatic intracranial hemorrhage at 30 days.

Discussion

BEACON-AA will be the RCT to directly evaluate the efficacy and safety of short-term dual antithrombotic therapy in this high-risk subgroup of ischemic stroke patients. By incorporating sensitive MRI-based surrogate endpoints along with clinical outcomes, the trial is expected to provide critical evidence to guide secondary prevention strategies. The findings may inform future guideline recommendations and contribute to a more individualized approach in patients with AF and LAA.

Baseline Characteristics from the SOLO-ESUS Trial: Identifying High-Risk Atrial Cardiopathy in ESUS

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Purpose

Atrial fibrillation (AF) is a major occult cause of embolic stroke of undetermined source (ESUS), particularly among patients with left atrial enlargement (LAE). The SOLO-ESUS trial was designed to evaluate the diagnostic efficacy and safety of a 7-day patch-type cardiac monitor (PCM) compared with standard 12-lead electrocardiography (ECG) in detecting AF after ESUS with LAE. Here, we present the baseline characteristics of the enrolled population to highlight the clinical phenotype of this high-risk cohort.

Methods

SOLO-ESUS was a multicenter, randomized, open-label, blinded-endpoint trial conducted at 10 stroke centers in Korea between 2022 and 2024. Eligible patients had ESUS within 180 days and concomitant LAE confirmed by ECG or echocardiography. A total of 257 patients were randomized 1:1 to PCM or control.

Results

The mean age was 71 ± 11 years, and 55% were male. Hypertension (76%), diabetes (34%), and dyslipidemia (63%) were frequent comorbidities. Median [IQR] time from stroke onset to randomization was 8 [5–22] days. Most patients had a single ischemic lesion (74%) with cortical involvement (75%). Mean left atrial diameter was 41.8 ± 4.0 mm, and mean left atrial volume index 40.4 ± 14.0 mL/m^2. Twenty-four-hour Holter monitoring had been performed in 75%, detecting atrial tachycardia in 17%.

Conclusions

Patients with ESUS and LAE enrolled in SOLO-ESUS exhibited prominent atrial cardiopathy features and a high burden of vascular risk factors, defining a population at elevated risk for paroxysmal AF. These baseline data support targeted rhythm monitoring strategies—such as noninvasive PCM—as a practical approach for early AF detection and individualized secondary prevention in embolic stroke.

Clinical Trial Session

Dual antiplatelet Use for extended period taRgeted to AcuTe Ischemic stroke with presumed atherosclerotic OrigiN (DURATION): Preliminary baseline data for the DURATION randomized clinical trial.

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Purpose

The Clinical Research Collaboration for Stroke (CSCS)-K investigators are conducting a registry-based randomized clinical trial (DURATION) to evaluate the effectiveness of long-term dual antiplatelet therapy (DAPT) in patients with acute ischemic stroke attributed to large artery atherosclerosis (LAA).

Methods

This investigator-initiated, prospective, multicenter, open-label, and blinded endpoint trial began on July 7, 2020, leveraging the nationwide stroke registry. Patients with ischemic stroke, presumed to have LAA, who initiated DAPT within 7 days of onset were screened. Exclusion criteria included high bleeding risk and planned surgery. Eligible patients who provided informed consent within 7 days of hospitalization were immediately randomized to either DAPT or mono-antiplatelet therapy (MAPT). In the MAPT group, dual antiplatelet therapy was used for the first 3 months as a run-in period, after which monotherapy was continued for 1 year. The primary outcome was a composite of stroke, myocardial infarction, or vascular death. 2,374 patients per group were required to demonstrate DAPT superiority with 80% power under 5% significance level.

Results

As of September 8, 2025, a total of 4559 patients (19.4% of the 23518 registered patients) were enrolled. The mean age was 68.5 years (SD, 29.9), and 66.1% were male. Participants were allocated in a 1:1 ratio to DAPT (n=2301) and MAPT (n=2258). Of these, 4056 (88.2%) completed the 3-month run-in, and 3449 (75.0%) completed the 1-year intervention, with only 1% lost to follow-up. The 1-year cumulative rate of the primary outcome as of the current date was 9.6% (95% confidence interval, 8.7 - 10.4%). Patient enrollment is scheduled to close on September 19, 2025, upon reaching the expected number of outcome events (n=497).

Conclusions

The pragmatic, registry-based randomized trial has been successfully conducted. The forthcoming results are expected to provide critical evidence for guiding long-term antiplatelet strategies in patients with LAA stroke.

The STem cell-derived Extracellular Vesicle therapy In Acute ischemic stroke: STEVIA phase Ib trial

Jin-Soo Lee,[1] Tae-Jin Song,[2] Jong-Won Jung,[3] Woo Keun Seo,[3] Hyung Jun Kim,[3] Won Hyuk Chang,[4] Oh Young Bang[3,5,6]

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ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 17:50 - 18:40 I Room A

Sponsored Workshop Session 1 [KOR]

CHAIRS

Hee-Jung Song (Chungnam National University Sejong Hospital)

The RCT Journey: Insights and Practical Tips

Ki Hong Choi
Samsung Medical Center

A "New Standard" in Dyslipidemia Treatment

Wookjin Yang
Asan Medical Center

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 17:50 - 18:40 I Room B

Sponsored Workshop Session 2 [ENG]

CHAIRS

A-Hyun Cho (The Catholic University of Korea Yeouido St. Mary's Hospital)

The Emerging Role of Antidiabetic drugs in Stroke

Nam Hoon Kim

Korea University Anam Hospital

Optimal Approach for HMOD Management with Fimasartan Combination Therapy

Ki-Woong Nam

Department of Neurology, Seoul National University College of Medicine and Seoul Metropolitan Government-Seoul National University Boramae Medical Center

Abstract

Each year in Korea, approximately 10,500 new patients experience stroke, many of whom are left with varying degrees of neurological impairment. Among the numerous risk factors for stroke, hypertension stands out as the most common and powerful single contributor. Effective blood pressure control is therefore critical in both the acute and chronic management of stroke patients.

This presentation will review the latest clinical guidelines on blood pressure management in stroke, with a particular focus on the importance of early initiation of combination antihypertensive therapy. In addition, we will explore the clinical utility of fimasartan, an angiotensin II receptor blocker, in the management of blood pressure in post-stroke patients.

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Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 08:10 - 09:00 I Room A

Sponsored Workshop Session 3 [ENG]

CHAIRS

Mi Sun Oh (Hallym University Sacred Heart Hospital)

Emerging Role of Argatroban in Acute Ischemic Stroke Management

Soo Jeong

Department of Neurology, Hanyang University Medical Center, Seoul, Korea

Background

Historical use of anticoagulation in the acute phase of ischemic stroke—particularly with unfractionated heparin—failed to demonstrate meaningful improvements in functional outcomes and was associated with an increased risk of hemorrhagic complications. Consequently, current guidelines generally do not recommend routine anticoagulation in the hyperacute period. However, accumulating evidence has highlighted early neurological deterioration (END), often driven by in-situ thrombus propagation, as a clinically relevant and potentially modifiable target. In this context, argatroban, a direct thrombin inhibitor with predictable pharmacokinetics and a favorable safety profile, has re-emerged as a therapeutic option.

Recent Evidence

A recent randomized trial (JAMA Neurology, 2024) demonstrated that adding short-term argatroban infusion to standard medical therapy in patients with END significantly improved 90-day functional independence without increasing symptomatic intracranial hemorrhage. Complementary data from smaller prospective cohorts have suggested that early argatroban use may attenuate neurological worsening in branch atheromatous disease and large-artery atherosclerosis phenotypes, where thrombin activity appears to play a central pathophysiologic role. Although combination therapy with intravenous thrombolysis failed to show clear benefit in a large randomized trial, overall safety signals remained acceptable.

Significance

These findings collectively support the evolving concept that targeted, time-limited thrombin inhibition may offer clinical benefit in select acute ischemic stroke subgroups most prone to thrombus extension and END. Furthermore, argatroban's hepatic metabolism renders it attractive in patients with renal dysfunction compared with traditional anticoagulants.

Conclusion

While routine anticoagulation in acute ischemic stroke remains unjustified, emerging evidence positions argatroban as a promising adjunct for carefully selected patients experiencing, or at high risk for, END. Ongoing studies and real-world data will refine patient selection, optimal dosing strategies, and safety considerations. This presentation will summarize the current evidence base and discuss practical implications for acute stroke management.

Updated Clinical Evidence of Argatroban for END

Soo Jeong

Hanyang University Seoul Hospital

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 08:10 - 09:00 I Room B

Sponsored Workshop Session 4 [ENG]

CHAIRS

Tae-Jin Song (Ewha Womans University Seoul Hospital)

Stroke Prevention in Atrial fibrillation : Percutaneous Left Atrial Appendage Occlusion Update

Seung Yong Shin

Korea University Ansan Hospital

Stroke Prevention in Atrial fibrillation : Percutaneous Left Atrial Appendage Occlusion Update

Joonsang Yoo

Yongin Severance Hospital

This lecture focuses on the critical issue of secondary stroke prevention in patients with atrial fibrillation (AF), emphasizing the importance of effective anticoagulation therapy for patients who have already experienced a stroke. Atrial fibrillation significantly increases the risk of stroke due to the potential for blood clots to form in the heart and travel to the brain. As a result, secondary prevention strategies are vital in reducing the risk of recurrent strokes in these patients.

Direct oral anticoagulants (DOACs or NOACs) have become the preferred treatment for stroke prevention in AF patients, replacing traditional vitamin K antagonists such as warfarin. DOACs are favored due to their lower risk of major bleeding, fewer drug and food interactions, and the lack of a need for routine monitoring of anticoagulation levels. These advantages make DOACs, including apixaban, rivaroxaban, dabigatran, and edoxaban, more convenient and safer than warfarin, especially in the context of secondary stroke prevention, where maintaining a stable anticoagulant effect is essential. Large randomized clinical trials have shown that DOACs are at least as effective as warfarin in reducing the risk of stroke and systemic embolism, with apixaban, in particular, demonstrating superior efficacy and a lower risk of bleeding. This is especially important in stroke patients, where minimizing bleeding complications is a major concern. These trials have also shown that DOACs are more predictable in their pharmacokinetics compared to warfarin, making them easier to manage and reducing the frequency of adverse events.

Apixaban, a commonly used DOAC, has been shown to be particularly beneficial for patients with a history of stroke. Its safety profile, characterized by a lower incidence of major bleeding and superior efficacy in reducing stroke risk compared to warfarin, makes it a preferred option in secondary stroke prevention. The pharmacokinetic profile of apixaban allows for fixed dosing, which simplifies patient management and further contributes to its effectiveness. The lecture also addresses the complex issue of re-initiation of anticoagulation after a stroke. In patients who have suffered an ischemic stroke, anticoagulation therapy is generally restarted after a few days or weeks, depending on the patient's condition and the risk of bleeding. Recent studies suggest that initiating DOACs earlier is relatively safe and effective. In the case of hemorrhagic strokes, the decision to resume anticoagulation is more complex and requires a careful evaluation of the risks. DOACs, particularly apixaban, are favored for re-initiation due to their predictable effects and lower risk of bleeding compared to warfarin.

Finally, the presentation highlights the rising global prevalence of non-valvular atrial fibrillation, which is expected to increase as the population ages. This underscores the importance of optimizing anticoagulation therapy for stroke prevention, as the global burden of AF-related strokes is anticipated to grow. The lecture concludes by emphasizing the need for individualized treatment strategies in managing AF patients, considering factors such as stroke history, bleeding risk, and patient preferences, to optimize outcomes and minimize recurrence.

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Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 09:00 - 10:40 I Room A

Symposium 3 : BTC [ENG]

CHAIRS

Jae-Kwan Cha (Dong-A University Hospital)
Kyung-Ho Yu (Hallym University Sacred Heart Hospital)

AI and Stroke Neurology

Joonnyung Heo

Severance Hospital

AI and Neurology

Ramin Zand

Pennsylvania State University

Artificial intelligence (AI) and big data analytics are revolutionizing the field of neurology, providing new insights into complex diseases and enhancing patient outcomes. Neurological disorders such as stroke and dementia involve intricate interactions between genetic, vascular, metabolic, and environmental factors—yet current diagnostic and predictive tools capture only fragments of this complexity. By leveraging large-scale multimodal datasets that combine clinical records, neuroimaging, genomics, and social determinants of health, AI enables the discovery of patterns that were previously invisible to clinicians and researchers. This integration offers the potential to shift neurology from reactive disease management toward proactive prediction and prevention.

Our research group has developed and validated AI-driven frameworks that harness these data sources to enhance diagnosis, prognosis, and personalized care. We have developed models that utilize electronic health records (EHRs) and imaging data to identify stroke patients in emergency departments with greater speed and accuracy, as well as machine learning systems that combine clinical features and social determinants of health to predict post-stroke outcomes. Across studies, interpretable machine learning techniques and large multi-institutional validation efforts ensure that the models are not only accurate but also transparent and equitable.

Together, these advances illustrate a paradigm shift in neurology care: from isolated, symptom-based assessments to a data-driven, integrative science of brain health. As AI continues to evolve, its responsible deployment in clinical and research settings will redefine how we detect, prevent, and treat neurological disease—transforming both precision medicine and our understanding of the human brain.

Regional Artificial Intelligence for Intracerebral Hemorrhage Management

Jin Pyeong Jeon

Despite nationwide efforts to enhance the quality of treatment for acute brain conditions in Korea, regional disparities persist due to the lack of neurology specialists and infrastructure shortcomings in rural areas. We implemented two digital technologies, namely, artificial intelligence (AI)-based telemedicine and social media-based patient transfer platforms, from January 2024 to improve treatment quality for early-stage patients with various brain conditions in rural hospitals and facilitate links with regional hub hospitals. Today, I will share in detail my experience with the process I developed and their application.

Optimal task design for monitoring cognitive decline

Sang Wan Lee
KAIST

Cognitive decline, often manifested through impairments in learning and memory, is commonly associated with aging, addiction, and Alzheimer's disease. However, its gradual onset poses significant challenges for early diagnosis. We address this issue by framing it as a task optimization problem. Our proposed framework centers on human reward prediction, a core mechanism underlying learning and memory. Specifically, we introduce a novel approach that enhances the design of reward-based learning tasks by predicting the human prediction process itself, a concept we refer to as meta-prediction.

The meta-prediction with 82 subjects' data generated subject-independent tasks across four distinct scenarios. These tasks orchestrate foraging and uncertainty conditions, confirming our framework's task design ability. Moreover, their mechanistic interpretability provides an insight into human reward learning. An independent fMRI study with 49 individuals validated these tasks effectively modulated behavior and neural activities in prediction error encoding regions, including ventral striatum and lateral prefrontal cortex. Lastly, we demonstrated its compositional capacity to generate complex tasks uncovering intrinsic biases in high-level cognitive functions.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 09:00 - 10:40 I Room B

Scientific Session 3 [ENG]

CHAIRS

Beom Joon Kim (A) (Seoul National University Bundang Hospital)
Sang-il Suh (Korea University Guro Hospital)

Functional, Vascular, and Safety Outcomes of Intravenous Tenecteplase for Acute Ischemic Stroke Between 4.5 and 24 Hours of Symptom Onset: A Systematic Review and Meta-Analysis of Randomized Clinical Trials

Nabilah Puteri Larassaphira[1], Andi Muthiah Nur Inayah Rahman[1], Yusran Ady Fitrah[2]

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Purpose

Timely thrombolysis is critical in acute ischemic stroke (AIS), yet the safety and efficacy of tenecteplase beyond 4.5 hours remain largely unknown. This meta-analysis evaluated 0.25 mg/kg tenecteplase administered 4.5–24 hours after stroke onset in larger studies across functional and safety outcomes, and, for the first time, assessed vascular efficacy.

Methods

A comprehensive literature search was conducted in PubMed, ScienceDirect, and the Cochrane Library, following PRISMA guidelines. Risk of bias was assessed using the revised Cochrane risk-of-bias tool for randomized trials (RoB 2 Cochrane). Meta-analyses were performed using random- or fixed-effects models to calculate risk ratios (RRs) with 95% confidence intervals (CIs). Sensitivity analyses included leave-one-out and cumulative analyses. Statistical analyses were conducted using R (v4.2.3).

Results

Five randomized clinical trials met the inclusion criteria. Tenecteplase administration was associated with higher rates of excellent functional outcome (RR 1.20, 95% CI 1.02–1.41, p=0.03), functional independence (RR 1.12, 95% CI 1.00–1.25, p=0.04), and early neurological improvement (RR 2.19, 95% CI 1.06–4.50, p=0.03). For vascular efficacy outcomes, tenecteplase improved recanalization (RR 1.98, 95% CI 1.11–3.53, p=0.02) but not reperfusion. Safety outcomes, including any ICH, symptomatic ICH, 90-day mortality, parenchymal hematoma types 1 and 2, and systemic bleeding, were comparable to standard treatment. Heterogeneity was observed in several outcomes.

Conclusions

Intravenous tenecteplase administered beyond 4.5 hours significantly improves functional recovery and recanalization while maintaining a safety profile comparable to standard therapy. This is the first meta-analysis to evaluate vascular efficacy and systemic bleeding, strengthens evidence for its use beyond the conventional time frame. Further large-scale studies are warranted, particularly for outcomes with high heterogeneity.

Contents

No	Outcome	Risk Ratio (RR), 95% CI	p-value	Heterogeneity	No of Studies
1	Excellent functional outcome	1.20 (1.02, 1.41)	0.027	0	4
2	Functional independence	1.12 (1.00, 1.25)	0.042	45.1	5
3	Early neurological outcome	2.19 (1.06; 4.50)	0.034	74.3	4
4	Recanalization	1.98 (1.11, 3.53)	0.021	87.2	3
5	Reperfusion	1.54 (0.90, 2.64)	0.112	86.3	3
6	Any ICH	1.53 (0.94, 2.51)	0.088	50.3	2
7	Symptomatic ICH	1.78 (0.90, 3.51)	0.099	0	5
8	Death at 90 days	1.049 (0.78, 1.40)	0.749	0	3
9	Parenchymal Hematoma 1	2.82 (0.43, 18.34)	0.277	0	2
10	Parenchymal Hematoma 2	1.91 (0.89, 4.10)	0.098	0	3
11	Systemic bleeding	1.11 (0.44, 2.78)	0.825	27.8	4

Trans-Ancestry Assessment of European Statin Response Polygenic Risk Score in Young Korean Stroke Patients

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Purpose

Polygenic risk scores (PRSs) for statin-induced low-density lipoprotein cholesterol (LDL-C) response have been developed in European cohorts, but their utility in non-European populations remains uncertain. We investigated the transferability of a European-derived LDL-C PRS to Korean patients with early-onset ischemic stroke.

Methods

We analyzed 2,730 patients aged <55 years with acute ischemic stroke or transient ischemic attack (TIA) admitted within 7 days of onset to 17 academic or regional centers between 2017 and 2023 through the CRCS-K-NIH Registry. This cohort corresponds to the GENE_YAS (Genetic Analysis in Young Age Stroke Patients) study, a prospective sub-study of the CRCS-K-NIH designed to investigate genetic determinants of early-onset stroke. A PRS for on-statin LDL-C response was constructed using 35 single nucleotide polymorphisms identified in European cohorts. Follow-up LDL-C levels were measured 1–6 months post-stroke. Patients were stratified into PRS quartiles, and baseline characteristics, the absolute and percentage LDL-C reduction were compared. Multivariable logistic regression models estimated the association between PRS and treatment goals (LDL-C <70 mg/dL or ≥50% reduction), adjusting for age, sex, and atorvastatin-equivalent dose.

Results

Mean age was 47.0 years, 72.4% were male, and baseline LDL-C was 119.3±40.5 mg/dL. Follow-up LDL-C decreased progressively across PRS quartiles (Q1: 81.4 mg/dL; Q2: 79.3 mg/dL; Q3: 75.4 mg/dL; Q4: 70.2 mg/dL; p<0.001). Percentage reduction increased from 27.5% in Q1 to 32.8% in Q4 (p=0.018). Absolute reduction ranged from 44.9 mg/dL in Q1 to 50.7 mg/dL in Q4 (p=0.021). Patients in the highest PRS quartile (Q4) had more than twofold greater odds of achieving LDL-C <70 mg/dL or ≥50% reduction compared with Q1 (adjusted odds ratio 2.15, 95% confidence interval [CI] 1.73–2.67, p<0.001). Each 1-standard deviation increase in PRS corresponded to an additional 2.96 mg/dL LDL-C reduction (95% CI 1.37–4.55, p<0.001), independent of statin intensity.

Conclusions

A European-derived PRS for on-statin LDL-C response was significantly associated with both absolute and relative LDL-C reduction in young Korean stroke patients These findings support the cross-ancestry transferability of pharmacogenomic prediction tools and highlight their potential role in optimizing lipid-lowering strategies for secondary stroke prevention.

Contents

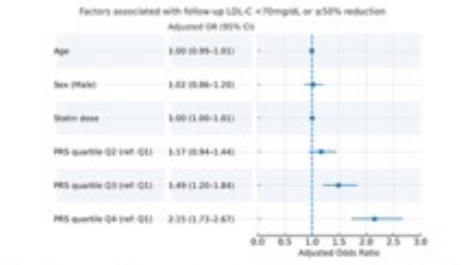

Figure. Forest plot showing factors associated with achieving follow-up LDL-C <70 mg/dL or ≥50% reduction. Adjusted odds ratios and 95% confidence intervals are displayed. Higher polygenic risk score (PRS) was significantly associated with target achievement, with the strongest association observed in the highest quartile (Q4) (aOR 2.15, 95% CI 1.73–2.67).

Abbreviations: LDL-C, low-density lipoprotein cholesterol; PRS, polygenic risk score; CI, confidence interval; aOR, adjusted odds ratio; Statin dose, atorvastatin-equivalent dose.

Intracranial Artery Tortuosity and the Effectiveness of Induced Hypertension in Acute Small Vessel Occlusion Stroke with Early Neurologic Deterioration

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Purpose

Induced hypertension (iHTN) remains unestablished, yet may benefit patients in small vessel occlusion (SVO) stroke with early neurologic deterioration (END), where treatment options are limited. We hypothesized that intracranial arterial tortuosity influences cerebral flow dynamics in SVO and modulates the effectiveness of iHTN, helping to identify patients most likely to benefit.

Methods

We included acute ischemic stroke patients with SVO who developed END (defined as a ≥2-point increase in the National Institutes of Health Stroke Scale (NIHSS) score or ≥1 point in the motor score). iHTN was delivered by intravenous phenylephrine infusion to raise systolic blood pressure by 10–20%. Effectiveness was defined as an improvement of ≥2 points in the overall NIHSS score or ≥1 point in the motor score. Group comparisons included demographics, symptomatic artery shape (straight, U-shape and S-shape), and the intracranial artery tortuosity index (ICATI), defined as the mean of tortuosity indices of the bilateral middle cerebral artery (MCA) and basilar artery (BA), where each tortuosity index was calculated as [(actual length / straight length−1) × 100]. Multivariable logistic regression analysis was performed to identify factors associated with the effectiveness of iHTN.

Results

A total of 149 patients with SVO and END who received iHTN therapy were analyzed. iHTN was effective in 72 patients (48.3%). There were no significant differences in baseline characteristics, including age, sex, and admission NIHSS between the two groups. Patients in the effective group had significantly lower ICATI values (mean 4.4 vs. 7.2, $p<0.001$). The distribution of arterial shape differed between groups ($p=0.012$) with straight configuration more frequent in the effective group (68.1% vs. 46.8%) and U-shape more common in the ineffective group (41.6% vs. 19.4%).

In multivariable logistic regression, lower ICATI (OR 0.89, 95% CI 0.82–0.96, $p=0.003$) and shorter time interval from END to iHTN initiation (OR 0.93, 95% CI 0.87–0.99, $p=0.028$) were independent predictors of iHTN effectiveness.

Conclusions

In acute SVO stroke patients with END, iHTN therapy was more effective in those with lower arterial tortuosity. These findings suggest that vascular tortuosity and related flow dynamics are associated with the effectiveness of iHTN therapy.

Comparative Risk of Dementia between Direct Oral Anticoagulants and Warfarin After Atrial Fibrillation Related Ischemic Stroke

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Purpose

Atrial fibrillation (AF) substantially increases the risks of ischemic stroke and dementia, and the global burden of both conditions is rising with population aging. While direct oral anticoagulants (DOACs) are now preferred over warfarin for stroke prevention in AF. Previous studies in AF patients without stroke suggested a protective role of DOACs against dementia, but whether such benefits extend to AF-related ischemic stroke survivors has not been clarified.

Methods

We used the Korean National Health Insurance Service database to identify patients with newly diagnosed ischemic stroke and concurrent AF from 2016 to 2019. Patients initiating either DOAC or warfarin therapy within one month after stroke discharge were included, and those with prior dementia or valvular disease were excluded. The primary outcome was all-cause dementia, and secondary outcomes were Alzheimer's dementia (AD) and vascular dementia (VaD), ascertained using ICD-10 codes plus dementia medication prescriptions. Multivariable Cox proportional hazards models with inverse probability of treatment weighting (IPTW) were applied to adjust for baseline differences.

Results

A total of 3,112 patients (mean age 70.6 ± 9.5 years; 66.6% male) were analyzed. Of these, 2,919 received DOACs and 193 received warfarin. Over a mean follow-up of 3.63 years, 673 patients developed dementia (538 AD, 168 VaD). Incidence rates of all-cause dementia were 60.3 per 1,000 person-years with DOACs and 48.6 with warfarin. After IPTW adjustment, DOAC use was associated with increased risks of all-cause dementia (HR 1.16, 95% CI 1.04–1.30) and AD (HR 1.85, 95% CI 1.62–2.13), but a reduced risk of VaD (HR 0.54, 95% CI 0.45–0.66).

Conclusions

In this large nationwide cohort of AF-related ischemic stroke survivors, DOAC therapy was associated with higher risks of all-cause and Alzheimer's dementia but a lower risk of vascular dementia compared with warfarin. These findings suggest that anticoagulant choice may differentially influence dementia subtypes after stroke. Clinicians should consider enhanced cognitive monitoring and individualized anticoagulant selection in this high-risk group. Further studies are needed to elucidate underlying mechanisms and guide optimal long-term management.

Acknowledgement

None

Venous outflow and outcomes after endovascular thrombectomy: Interaction with blood pressure variability

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Purpose

Despite previous studies suggesting an association between venous outflow (VO) and clinical outcomes, the relationship between VO status and comprehensive effectiveness and safety outcomes after endovascular thrombectomy (EVT), including the influence of systolic blood pressure variability (BPV), remains unclear.

Methods

We performed a secondary analysis of the OPTIMAL-BP trial. Patients were categorized into unfavorable VO (cortical vein opacification score (CVOS) <3) or favorable VO (CVOS ≥3). Effectiveness outcomes included modified Rankin Scale (mRS) scores of 0–2 and 0–3 at three months, excellent NIHSS recovery, and final infarction volume (FIV). Safety outcomes consisted of any intracerebral hemorrhage (ICH), symptomatic ICH, any parenchymal hemorrhage (PH), PH type 2, and subarachnoid hemorrhage (SAH). BPV parameters, including time rate (TR), standard deviation, coefficient of variation, and variation independent of mean, were calculated within the first 24 hours after randomization.

Results

Among 226 patients, unfavorable VO significantly correlated with lower odds of achieving mRS 0–2 (adjusted odds ratio [aOR], 0.44 [95% CI, 0.22–0.87]), mRS 0–3 (aOR, 0.39 [0.20–0.73]), excellent NIHSS recovery (aOR, 0.40 [0.15–0.95]), and increased FIV (adjusted coefficient, 37.18 [14.81–59.55]). It was also associated with increased odds of any ICH (aOR, 2.28 [1.20–4.39]), symptomatic ICH (aOR, 9.82 [3.12–39.40]), any PH (aOR, 6.08 [2.76–14.07]), PH type 2 (aOR, 174.59 [14.41–7276.24]), and SAH (aOR, 2.44 [1.13–5.29]). Only increased SBP TR correlated significantly with poorer effectiveness outcomes in unfavorable VO group. Sensitivity analysis using a Bayesian approach yielded results consistent with the primary analysis.

Conclusions

Unfavorable VO was associated with poorer clinical effectiveness and safety outcomes after successful recanalization following EVT. Increased post-EVT BPV further worsened clinical outcomes only in unfavorable VO group. These finding suggest that BPV modulation may improve prognosis in stroke patients with unfavorable VO.

Acknowledgement

None

Association Between Hyperacute Blood Pressure Lowering and Outcomes in Patients With Endovascular Thrombectomy

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Purpose

While blood pressure (BP) elevation is common in acute ischemic stroke and guidelines recommend reducing systolic BP to <185 mm Hg prior to reperfusion therapy, the safety and efficacy of active BP lowering in the hyperacute phase before endovascular thrombectomy (EVT) remain uncertain. This study aimed to investigate the clinical and radiological associations of early active BP lowering in the hyperacute phase prior to EVT.

Methods

We conducted a retrospective analysis of a prospective hospital-based registry including consecutive patients with anterior circulation large vessel occlusion who underwent EVT between 2016 and 2024. Patients were categorized into the active BP lowering in the emergency department (ED) group or the no BP lowering in the ED group based on whether they received intravenous antihypertensive treatment prior to EVT. The primary outcome was the distribution of the modified Rankin Scale (mRS) score at 3 months. Propensity score matching and multivariable regression analyses were used.

Results

Of the 492 included patients, the median age was 75 years (interquartile range [IQR] 63–83), 53.0% were men, and median National Institutes of Health Stroke Scale score was 14 (IQR 9–18). Of them, 53 (10.8%) received active BP lowering in the ED and median time from stroke onset to first BP lowering was 182.0 (IQR 103.0–400.0) minutes. After propensity score matching, patients who underwent active BP lowering showed a worse distribution of 3-month mRS scores (adjusted odds ratio [AOR] 0.38, 95% CI 0.18–0.80, p=0.013) and lower rates of functional independence (AOR 0.33, 95% CI 0.11–0.88, p=0.031). The active BP lowering group exhibited significantly greater infarct volume growth (mean difference between groups 32.7 mL, adjusted beta coefficient 33.4, 95% CI 18.2–48.7, p<0.001), whereas the incidence of symptomatic intracerebral hemorrhage did not differ between groups (AOR 1.14, 95% CI 0.31–4.34, p=0.844).

Conclusions

Active BP lowering in the ED prior to EVT was associated with worse functional outcomes and increased infarct growth, without a corresponding reduction in symptomatic intracerebral hemorrhage occurrence. These findings highlight the need for caution in initiating antihypertensive therapy before reperfusion and support further investigation through randomized clinical trials to define optimal pre-EVT BP management strategies.

Neutrophil extracellular traps in stroke thrombi retrieved by endovascular thrombectomy

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Purpose

To analyze the association between clinical variables and neutrophil extracellular traps (NETs) in thrombi retrieved by endovascular thrombectomy for acute ischemic stroke.

Methods

This was a retrospective study using the nationwide, prospective SMART-CLOT registry, which enrolls patients with stroke who underwent endovascular thrombectomy and had thrombi retrieved. Immunohistochemical staining was performed using the citrullinated histone H3 (HisH3) antibody, a marker of NETs. The HisH3-positive area was divided by the total thrombus area to calculate the HisH3 ratio. Patients enrolled between July 2017 and September 2023 from 11 centers were included. We investigated associations between the HisH3 ratio and clinical variables using multivariable linear regression with log-transformed HisH3 as the dependent variable and robust heteroskedasticity-consistent standard errors. Effect sizes were expressed as percentage change in HisH3 by each predictor, and partial R^2 values were reported to quantify the variance explained by individual variables.

Results

A total of 1,348 patients (mean 71.8 ± 12.3 years; 55.3% male) were included. In the overall cohort, longer onset-to-arrival time was independently associated with higher HisH3 proportion, corresponding to a 1.8% increase per 1-hour delay (95% confidence interval, CI, 0.8–2.9%; $P < 0.001$). Higher HisH3 proportion was associated with older age (11.4% increase per 10 years; 95% CI, 1.7–19.9%; $p = 0.021$), dyslipidemia (26.6% increase; 95% CI, 2.6–44.6%; $P = 0.028$), and higher angiographic reperfusion grade (overall partial $R^2 = 0.0223$). Conversely, atrial fibrillation (28.2% lower HisH3; 95% CI, –0.601 to –0.064; $P = 0.015$), higher erythrocyte sedimentation rate (8.5% lower per 10 mm/h; 95% CI, –14.5 to –3.2%; $P = 0.002$), and active cancer (37.4% lower; 95% CI, –93.7 to

–0.1%; P = 0.050) were associated with reduced HisH3 proportion. Among patients with atrial fibrillation (n = 688), persistent or permanent AF was strongly associated with higher HisH3 proportion (88.5% increase vs. paroxysmal AF; 95% CI, 35.0–91.7%; P < 0.001), and onset-to-arrival time still showed a significant association (2.7% increase per hour; 95% CI, 0.9–4.3%; P = 0.004). Among patients with a clear onset time (n = 651), onset-to-arrival was again associated with higher HisH3 proportion (2.4% increase per hour; 95% CI, 0.5–4.2%; P = 0.013).

Conclusions

In this large multi-center study, the extent of NETs was independently associated with delayed hospital arrival, atrial fibrillation subtype, systemic inflammatory markers, and active cancer. These findings may provide insight into the heterogeneity of thrombi and potential mechanism of immunothrombosis.

Inhibiting monocyte migration reduces arterial thrombosis and facilitates thrombolysis

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Purpose

Monocytes contribute to the initiation and propagation of venous thrombosis. Little is known about the roles monocytes play in arterial thrombosis, the cause of stroke and MI.

Methods

We investigated how chemokine receptor 2 (CCR2) knockout (-/-) affects platelet function, blood coagulation, thrombus volume, and thrombolytic susceptibility in 627 mice with FeCl3-mediated carotid arterial thrombosis: three CX3CR1-GFP mice, 326 C57BL/6 mice, and 288 CCR2-/- mice. We performed i) intravital microscopy imaging of leukocyte recruitment to carotid thrombus, ii) flow cytometry-based quantification of leukocytes in blood vs. thrombus and leukocyte-platelet aggregates in blood, iii) platelet aggregometry, iv) coagulation assays, v) micro-computed tomography (microCT)-based thrombus imaging using gold nanoparticles after tissue plasminogen activator (tPA) therapy with or without either a) CCR2 siRNA pretreatment (for 3 days) or post-treatment or b) clopidogrel pretreatment (for 7 days), and vi) histology including scanning electron microscopy.

Results

Intravital microscopy and flow cytometry showed that both neutrophils and monocytes were recruited to the acute arterial thrombus, as observed 30 minutes post-thrombosis. Platelet function tests demonstrated platelet aggregation to be lower in the whole blood of CCR2-/- mice (vs. C57BL/6 mice) but not in their leukocyte-free platelet rich plasma, suggesting this platelet dysfunction is cell-mediated. Flow cytometry experiments revealed lower numbers of monocyte – platelet aggregates (MPAs), a marker of platelet activity, in the blood of CCR2-/- mice, compared to C57BL/6 mice. Blood levels of FXIII and monocyte levels of FXIII-A were increased after carotid thrombosis in C57BL/6 mice but not CCR2-/- mice. Further, in vivo microCT and histology, respectively, showed that CCR2-/- mice had smaller and more porous thrombi with less fibrin cross-linking, compared with C57BL/6 mice. MicroCT also demonstrated that tPA-mediated thrombolysis was faster in CCR2-/- mice and CCR2 siRNA-treated

mice, compared to C57BL/6 mice. In addition, clopidogrel had a greater effect on inducing thrombus formation with smaller sizes after FeCl3 application, while CCR2-/- had a greater effect on dissolving thrombus faster after tPA administration.

Conclusions

CCR2 antagonism decreases platelet aggregation and reduces FXIII levels in blood and monocytes, thus driving arterial thrombosis towards the generation of a relatively small, porous, more lysable clot.

Oxidative stress-induced astrocytic collagen biosynthesis drives neuronal death in ischemic stroke

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Purpose

Astrocytes are emerging as key regulators of brain metabolism and homeostasis. However, how oxidative stress reshapes astrocytic metabolism to influence neuronal damage remains unclear.

Methods

We used a photothrombosis (PT)-induced ischemic stroke model in both rodents and non-human primates. GFAP- and Aldh1l1-Cre mice were employed for astrocyte-specific gene regulation, and pSico vectors packaged with the AAV-PHP.eB serotype were utilized. For transcriptomic analysis, primary cortical astrocytes were cultured and subjected to ATAC-seq and RNA-seq. To profile glycosylation, Tims-TOF MALDI imaging was performed.

Results

Here, we demonstrate that disruption of astrocytic metabolic process by H_2O_2 establishes a redox glycosylation coupling mechanism that drives astrocytic type I collagen (COL1) biosynthesis. Mechanistically, H2O2 suppresses miR-29 and enhances FUT8-mediated core fucosylation, thereby converging post-transcriptional and glycosylation-dependent post-translational regulations of COL1. This astrocyte-derived COL1, produced through redox-driven metabolic rewiring activates integrin signaling and promotes neuronal death. In a Photothrombosis (PT)-induced cortical stroke model, PT triggered H_2O_2-surge, astrogliosis, glycosylation remodeling, COL1 expression, fibrotic scarring, neuronal loss, and neurological deficits. Remarkably, these pathological cascades were prevented by astrocyte-specific silencing of COL1 or FUT8, or by treatment with KDS12025, a peroxidase enhancer that reduces intracellular H2O2 burden. The neuroprotective effects of KDS12025 were also recapitulated in a non-human primate stroke model.

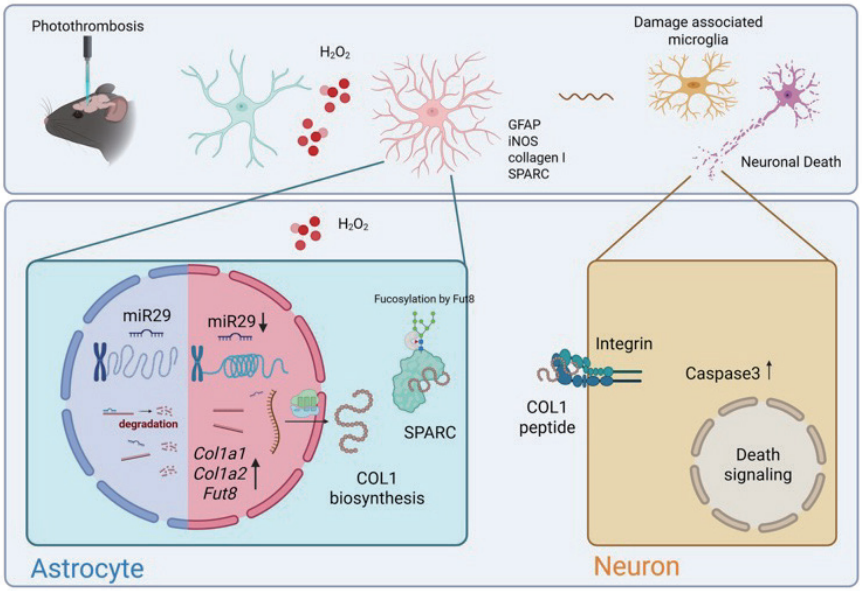
Conclusions

Together, these findings delineate a previously unrecognized astrocytic metabolic pathway in which oxidative stress reprograms glycosylation to induce COL1 production, promoting neuronal death, positioning H_2O_2 and astrocytic COL1 and FUT8 as promising therapeutic targets for functional recovery after stroke.

Acknowledgement

This study was supported by the Center for Cognition and Sociality (IBS-R001-D2) and through the YSF project (IBS-R001-Y2) under the Institute for Basic Science (IBS), Republic of Korea.

Contents



Serum Albumin as a Risk Factor for Contrast-Associated Acute Kidney Injury Following Mechanical Thrombectomy: Impact on Short-Term Outcomes

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Purpose

Contrast-associated acute kidney injury (CA-AKI) occurs in 2-9% of stroke patients undergoing mechanical thrombectomy (MT) and significantly impacts clinical outcomes. While serum albumin demonstrates protective effects against contrast nephrotoxicity in cardiac interventions, its role in neurointervention remains unexplored. We investigated the association between preprocedural serum albumin levels and CA-AKI development in large vessel occlusion patients undergoing MT.

Methods

We conducted a retrospective analysis of 592 patients with anterior circulation large vessel occlusion who underwent MT between January 2017 and December 2023. CA-AKI was defined as serum creatinine increase ≥25% or ≥0.5 mg/dL within 72 hours post-contrast administration. Serum albumin levels were categorized into tertiles. Primary outcomes included CA-AKI incidence and associations with short-term outcomes including early neurological deterioration, symptomatic intracerebral hemorrhage, in-hospital mortality, and 90-day modified Rankin Scale.

Results

CA-AKI occurred in 36 patients (6.1%). Incidence was significantly higher in low versus intermediate and high albumin groups (10.0% vs 7.0% vs 1.8%, p=0.015). Multivariate analysis identified diabetes mellitus (OR 4.06, 95% CI 1.91-8.60, p<0.001) and high serum albumin levels (OR 0.22, 95% CI 0.06-0.80, p=0.021) as independent CA-AKI predictors. CA-AKI was associated with early neurological deterioration (OR 3.44, 95% CI 1.55-7.63, p=0.002), symptomatic intracranial hemorrhage (OR 4.74, 95% CI 1.96-11.50, p=0.001), and in-hospital mortality (OR 5.44, 95% CI 1.74-16.96, p=0.004).

Conclusions

Preprocedural serum albumin levels represent a novel predictor of CA-AKI in stroke patients undergoing MT, with high levels providing independent protection and potential utility for risk stratification.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 11:00 - 12:00 I Room A+B

Plenary Session 2 [ENG]

CHAIRS

Jong S. Kim (Gangneung Asan Hospital)

Reperfusion Therapy

Liping Liu

Capital Medical University

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 12:00 - 13:00 I Room A

Luncheon Symposium 3 [ENG]

CHAIRS

Byung-Chul Lee (Hallym University Sacred Heart Hospital)

Optimizing Antiplatelet Strategies for Stroke Patients: Clopidogrel or Aspirin?

Dongwhane Lee

UIJEONGBU EULJI MEDICAL CENTER, EULJI UNIVERSITY

Clopidogrel Therapy in Special Populations for Stroke Secondary Prevention

Yo Han Jung

Gangnam Severance Hospital

Clopidogrel Therapy in Special Populations for Stroke Secondary Prevention

The prevailing clinical consensus for acute stroke secondary prevention dictates that clopidogrel therapy is favored for specific high-risk cohorts, particularly those diagnosed with poly-vascular disease (PVD). PVD is strictly defined as symptomatic atherosclerosis impacting multiple arterial beds, typically encompassing cerebrovascular disease, coronary artery disease, and/or peripheral artery disease. Post-mortem pathological studies consistently confirm the systemic manifestation of this underlying risk, demonstrating that coronary atherosclerosis and myocardial infarction (MI) are highly prevalent in stroke mortality cohorts, irrespective of the index stroke's initial etiology. The clinical effectiveness of clopidogrel, in contrast to acetylsalicylic acid (ASA), was notably amplified within the PVD patient subgroup, as substantiated by a dedicated sub-analysis of the CAPRIE trial. This analysis rigorously established that clopidogrel monotherapy yielded superior long-term efficacy in mitigating subsequent ischemic events. Specifically, when evaluating the composite endpoint of ischemic stroke (IS), MI, or vascular death, clopidogrel provided an absolute risk reduction of 1.4% at one year compared to ASA, corresponding to a relative risk reduction averaging 15% per year. Collectively, these data confirm that patients with demonstrable widespread vascular disease derive a distinct and significant therapeutic advantage from clopidogrel. Beyond the established PVD cohort, robust clinical evidence mandates the preferential deployment of clopidogrel over aspirin in several other specific high-risk demographics. A retrospective cohort investigation concentrating on advanced age cohorts (specifically 80 years) presenting with acute IS demonstrated that clopidogrel significantly mitigated the hazard of recurrent acute IS (HR 0.89), composite cardiovascular events (HR 0.88), and—critically—intracranial hemorrhage (HR 0.71) when benchmarked against ASA. Furthermore, for patients afflicted with Type 2 Diabetes Mellitus (T2DM), clopidogrel monotherapy consistently exhibits superior clinical outcomes, effectively reducing recurrence risk compared to ASA. Finally, in patients experiencing a "breakthrough" ischemic stroke while maintained on ASA therapy, initiating a therapeutic switch to clopidogrel has been shown to substantially reduce the risk of major adverse cardiovascular events. These cumulative findings underscore clopidogrel's dual capacity to simultaneously enhance efficacy in preventing subsequent ischemic events while also conferring a safety profile advantage, particularly pertaining to hemorrhagic risk, across these vulnerable patient strata. The totality of the presented research emphatically underscores that effective secondary stroke prevention necessitates precise, individualized risk stratification and tailored pharmacological selection. Management of established cardiovascular risk factors, including hypertension, diabetes, and rigorous smoking cessation, remains a foundational principle of care. Nevertheless, for patients definitively identified as high-risk due to the presence of PVD, advanced chronological age, or T2DM, the extant evidence compels a therapeutic shift beyond ASA, strongly advocating for the selection of clopidogrel as the single antiplatelet agent of choice for long-term maintenance treatment.

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Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 12:00 - 13:00 I Room B

Luncheon Symposium 4 [ENG]

CHAIRS

Ji Hoe Heo (Bundang CHA Hospital)

Start Early PCSK9 Inhibitor in Acute Phase of Atherosclerotic Stroke Patients

JungHwa Seo

Department of Neurology, Dong-A University Hospital, Busan, Korea

Background:

Patients with atherosclerotic ischemic stroke are at high risk of recurrence, particularly those with intracranial atherosclerotic stenosis (ICAS). Lowering LDL cholesterol quickly and effectively is one of the most important goals in secondary prevention. PCSK9 inhibitors (PCSK9i) are powerful agents that can reduce LDL levels faster and more deeply than other lipid-lowering drugs, especially when used together with high-intensity statins.

Rationale:

In recent years, strong evidence has shown that adding PCSK9 inhibitors to statins can reduce the risk of recurrent ischemic stroke by about 25% over two years. In patients with symptomatic ICAS, PCSK9i therapy significantly lowered LDL levels and also reduced early stroke recurrence. More recent clinical observations suggest that starting PCSK9i treatment during the acute stage of stroke leads to faster LDL reduction and fewer cases of early neurological worsening compared with standard therapy. These results indicate that achieving optimal lipid control early after stroke may play a key role in improving patient outcomes.

Conclusion:

Early initiation of PCSK9 inhibitors in combination with high-intensity statins may represent a promising treatment strategy for acute atherosclerotic ischemic stroke. Rapid LDL-C lowering could protect the brain, reduce early deterioration, and lower the risk of recurrence. Larger clinical trials are warranted to confirm these benefits and define the optimal timing of therapy initiation.

Keywords: PCSK9 inhibitor; ischemic stroke; LDL-C reduction; early neurological deterioration; secondary prevention

Stay Low Level of LDL-C to Reduce CV Risk of Atherosclerotic Stroke Patients

Minwoo Lee

Hallym University Sacred Heart Hospital

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 13:00 - 13:30 I Room A

Satellite Symposium 3 [ENG]

CHAIRS

Jun Hong Lee (NHIS ILSAN Hospital)

Re-thinking for Changing DAPT Practice in LAA Treatment

Sang Hee Ha

Gachon University Gil Medical Center

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 13:00 - 13:30 I Room B

Satellite Symposium 4 [ENG]

CHAIRS

Soo Joo Lee (Eulji University Daejeon Eulji Medical Center)

Optimal DAPT treatment strategies for preventing Stroke

Hye Seon Jeong

Department of Neurology, Chungnam National University Hospital, Daejeon, Republic of Korea

Abstract

Background: Dual antiplatelet therapy (DAPT) is a key strategy for preventing recurrent ischemic events after minor ischemic stroke or high-risk transient ischemic attack (TIA). Although short-term DAPT has proven effective in reducing early recurrence, defining the optimal duration that balances ischemic protection and bleeding risk remains a major clinical challenge.\

Purpose: This lecture reviews current evidence on the optimal duration of DAPT in stroke patients, focusing on pivotal randomized trials that have shaped contemporary practice—from short-term to extended treatment approaches.

Content: Landmark trials such as CHANCE, POINT, and THALES demonstrated that short-term DAPT (typically 21–30 days) significantly lowers early ischemic recurrence without a major increase in bleeding risk, forming the foundation of current guideline recommendations. In contrast, long-term DAPT studies including MATCH, SPS3, and CHARISMA showed limited additional benefit and higher rates of hemorrhage. Nevertheless, specific subgroups—such as patients with symptomatic large-artery atherosclerosis, intracranial or extracranial stenting, or recurrent events despite single antiplatelet therapy—may gain additional benefit from prolonged DAPT, as suggested by SAMMPRIS and other observational studies. These findings underscore the need for individualized treatment strategies based on stroke mechanism, vascular pathology, and bleeding risk profile.

Conclusion: Current evidence supports short-term DAPT (approximately 21–30 days) as the standard of care after minor ischemic stroke or high-risk TIA, followed by transition to monotherapy. However, in selected high-risk vascular subgroups, extended DAPT may be justified, highlighting the importance of personalized, mechanism-based decision-making in secondary stroke prevention.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 13:50 - 15:30 I Room A

ICAS Symposium 1 : Epidemiology and Stroke Mechanisms [ENG]

CHAIRS

Keun-Sik Hong (Inje University Ilsan Paik Hospital)
Byung-Woo Yoon (Eulji University Uijeongbu Eulji Medical Center)

ICAS History (Video or Zoom)

LR Caplan

Beth Israel Deaconess Medical Center

ICAS Vs ECAS: Ethnic Differences and Stroke Mechanisms

Jong S. Kim

Gangneung Asan Hospital

ICAS Epidemiology in Asians

Liping Liu

Capital Medical University

ICAS Epidemiology in Non-Asians

David Bonovich

Sutter Health Eden Medical Center

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 13:50 - 15:30 I Room B

Scientific Session 4 [ENG]

CHAIRS

Sung Hyuk Heo (Kyung Hee University Medical Center)
Manabu Inoue（National Cerebral and Cardiovascular Center)

Impact of Low-Density Lipoprotein Cholesterol Levels on Atherosclerotic Vascular Changes: Analysis of Korean Treat Stroke to Target (TST) Trial

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[2]Neurology, Gangneung Asan Hospital, Gangneung, Korea, Republic of

Purpose

Although the main Treat Stroke to Target (TST) trial showed that the low low-density lipoprotein cholesterol (LDL-C, <70 mg/dL) target (LT,) strategy significantly improved the primary outcome (cardiac and cerebrovascular) than the higher target (LDL-C, 90–110 mg/dL, HT) strategy, a subsequent analysis of Korean data showed that the LT strategy was relatively more effective in the reduction of stroke recurrence in patients with symptomatic external carotid artery stenosis (ECAS) than in those with intracranial artery atherosclerosis (ICAS). However, it remains unknown whether LT and HT strategies differently affect the progression or regression of ICAS and ECAS.

Methods

This study included 220 patients with ischemic stroke or TIA and evidence of atherosclerosis from 14 Korean TST centers. Participants were randomized into LT and HT groups and underwent follow-up magnetic resonance angiography (MRA) over median 2 years. The severity of arterial was graded at baseline and follow-up images, and the changes of stenosis degree were compared between ECAS and ICAS. Interaction analysis assessed the relationship between the location of symptomatic cerebral atherosclerosis and LDL-C target on stenosis change.

Results

Baseline characteristics did not differ significantly between the groups. Overall, there was no significant difference in the change of stenosis severity between LT and HT groups. However, in the symptomatic ECAS, the LT group demonstrated higher rate of regression (50 vs. 15%) and a lower rate of progression (3.8 vs. 10%) than the HT group.(p=0.044) Interaction analysis showed a non-significant (p=0.08), yet distinct trend that favorable vascular changes in the LT group are more often observed in the symptomatic ECAS as compared to the symptomatic ICAS.

Conclusions

In symptomatic ECAS, LT was associated with greater atherosclerotic regression, and lesser progression, which may help explain why more aggressive LDL-C lowering is needed in the ECAS than in ICAS patients.

Impact of failed back surgery syndrome on stroke and all-cause mortality: A nationwide cohort study

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Purpose

Failed Back Surgery Syndrome (FBSS) refers to persistent or recurrent symptoms following lumbar spinal surgery, including chronic back or leg pain. Although FBSS is commonly recognized as a cause of pain, functional impairment, and reduced quality of life, its long-term impact on major neurological diseases and mortality should be thoroughly considered. This study aimed to evaluate the association between FBSS and subsequent stroke and all-cause mortality.

Methods

We conducted a retrospective cohort study using data from the Korean National Health Insurance Service from 2002 to 2023. After applying a wash-out period, we identified patients who underwent lumbar spine surgery between 2009 and 2023. FBSS was defined using two criteria: (1) assignment of International Classification of Diseases[ICD]-10 code M96.1 (post-laminectomy syndrome) and (2) reoperation for lumbar spine surgery after the index procedure. The primary outcome was incident stroke (new onset ICD-10 codes of I60–I64); the secondary outcome was all-cause mortality.

Results

Among 603,272 patients included in the final analysis, those with FBSS had a significantly increased risk of stroke (adjusted hazard ratio [aHR] 1.15; 95% confidence interval [CI], 1.12–1.19; p <0.001), consistent across both FBSS sub-definitions: post-laminectomy syndrome (aHR 1.17; 95% CI, 1.10–1.25; p <0.001) and reoperation (aHR 1.25; 95% CI, 1.17–1.32; p <0.001). FBSS was also associated with increased all-cause mortality (aHR 1.10; 95% CI, 1.07–1.12; p <0.001).

Conclusions

FBSS is associated with significantly increased risks of both stroke and all-cause mortality. As the population continues to age and the prevalence of degenerative spine diseases rises, FBSS should no longer be considered merely a chronic pain syndrome. Instead, it must be recognized and managed as a critical risk factor for stroke and other serious long-term outcomes, warranting proactive, interdisciplinary strategies for prevention and long-term care.

Association between FIB-4 and Post-stroke Cognitive Impairment outcomes

Dong Gyun Ko[1,2], Jekuk Yu[1,2], Sangwon Choi[1,2], Kyung-Ho Yu[1,2], Byung-Chul Lee[1,2], Minwoo Lee[1,2], Mi Sun Oh[1,2]

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Purpose

Metabolic status is a known determinant of post-stroke outcomes. Particularly, liver dysfunction is associated with poor vascular health and the accumulation of neurotoxic agents. However, further studies are needed to clarify the role of specific metabolic indicators in the cognitive prognosis of stroke patients. This study aimed to investigate the association between the Fibrosis-4 (FIB-4) index—a marker of liver fibrosis and Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD)—and post-stroke cognitive impairment (PSCI).

Methods

A total of 904 patients within inclusion criteria were analyzed from a prospective stroke registry. Cognitive function was assessed 3 to 6 months after stroke, and PSCI was defined as a z-score below –2 standard deviations in at least one cognitive domain. The FIB-4 index was calculated using the formula:

FIB-4 = [Age (years) × AST (U/L)] / [Platelet count (10^9/L) × √ALT (U/L)].

Multiple logistic regression analyses were conducted, adjusting for age, sex, years of education, history of hypertension, diabetes, prior stroke, hyperlipidemia, atrial fibrillation, stroke volume, initial NIHSS score, premorbid modified Rankin Score(mRS), TOAST classification, cerebral microbleeds (CMB), modified Fazekas score, medial temporal lobe atrophy (MTLA), HbA1c level, LDL, creatinine, hemoglobin, and D-dimer levels.

Results

The PSCI group showed a significantly higher mean FIB-4 score (1.9 ± 1.1) than NCI group (1.7 ± 0.9, p = 0.003). After adjusting for covariates, a higher FIB-4 index remained an independent predictor of PSCI (adjusted OR: 1.28; 95% CI: 1.04–1.59; p = 0.021). Using cutoffs of 1.30 and 2.67, patients in the high FIB-4 group (n = 112) exhibited significantly lower z-scores in the language (mean z-score: 0.1 ± 1.1 in low, -0.1 ± 1.1 in intermediate, -0.4 ± 1.3 in high FIB-4 group; p = 0.018) and memory domains (mean z-score: -0.7 ± 1.0, -0.7 ± 1.0, -0.9 ± 1.0 respectively; p = 0.035), even after adjusting for age, sex, years of education, and initial NIHSS score.

Subgroup analyses revealed no significant interaction effects with TOAST classification or underlying conditions, suggesting that the predictive power of FIB-4 for PSCI is not modified by stroke subtype or comorbidities. However, a trend toward increasing odds ratios in patients with diabetes, atrial fibrillation, and cardioembolic stroke subtypes may indicate that liver fibrosis influences impaired glucose metabolism and autonomic function through systemic inflammation.

Conclusions

The FIB-4 index is an independent predictor of PSCI. Liver fibrosis may play a role in post-stroke cognitive outcomes via metabolic and inflammatory pathways, warranting further investigation.

Clinical Implications of an Imaging-Based Classification for Detecting New Atrial Fibrillation after Ischemic Stroke : A 10-Year Study of Two Comprehensive Stroke Centers

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Purpose

Several trials have shown that clinically relevant atrial fibrillation (AF) frequently remains undetected within the first year after ischemic stroke. Most established screening models for new AF detection after ischemic stroke depend on detailed clinical information and echocardiographic parameters, presupposing extensive work-ups. We therefore developed and validated a scoring system using only age and the cardioembolic (CE) probability from a pre-validated DWI-based TOAST classification model to predict new AF.

Methods

We analyzed two independent acute ischemic stroke cohorts (development n=853; external validation n=693) with prospective AF ascertainment during hospitalization and follow-up, up to 10 years. We extracted the CE class probability (0–1) derived from DWI. Candidate logistic models were fit in the development cohort. The most practical specification, 0.66×age + 13.8 points for CE probability ≥0.480, was selected as the final score, with an operating cutoff of 54.42. In validation, accuracy, operating characteristics, and number needed to screen (NNS) were evaluated and compared against four established clinical information-based scores. Kaplan–Meier analyses with log-rank tests were examined for overall and within subgroups of detections before- and after-discharge.

Results

The new score achieved an AUC of 0.745 (95% CI, 0.694–0.797) overall, 0.751 (0.683–0.818) for detections before discharge, and 0.673 (0.579–0.767) for detections after discharge, and performance was comparable to most clinical scores. At the prespecified cutoff (54.42), accuracy was 0.731 overall; corresponding NNS were 6.7 overall, 6.1 before discharge, and 10.4 after discharge. Kaplan–Meier curves demonstrated robust risk separation between high- and low-risk groups overall and within both subgroups (all log-rank $p<0.001$; Figure 1).

Conclusions

This study demonstrated that a streamlined imaging-based score, incorporating only age and a DWI-derived lesion pattern probability, stratifies risk of AF detection after ischemic stroke. The tool provides a practical and reproducible approach for early bedside risk assessment that could support sustained AF surveillance.

Silent Sentinel Infarcts on Noncontrast CT: A High-Risk Clinical Syndrome Predicting Stroke Etiology and Outcome with a Deep Learning-Based Solution for Detection

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Purpose

Non-lacunar silent cerebral infarction (SCI) is identified incidentally on noncontrast CT (NCCT) in clinical practice, and its clinical significance is often overlooked, with suboptimal clinical management. In this study, we aim to investigate the clinical implication of non-lacunar SCI lesion in acute stroke patients, and to develop automated software based on NCCT.

Methods

In this retrospective, multicenter cohort study, 628 patients with first-ever symptomatic stroke were included between 2021 and 2024 in South Korea. Risk factors and prognostic value of non-lacunar SCI lesion was based on findings from neuroimage assessment with paired NCCT and fluid-attenuated inversion recovery (FLAIR) MR data. Proportion of concordance of probable old stroke etiology (based on relevant vascular stenosis) with first-ever symptomatic stroke etiology was assessed. Prognosis was evaluated by favorable outcomes (mRS <3) at 3-month modified Rankin Scale (mRS) and utility-weighted (UW)-mRS using linear mixed models. 2D U-net model was trained using paired image data from separate cohort (n=758) and external validation was performed without any overlap with the training cohort (n=1680).

Results

Non-lacunar SCIs were identified in 13.5% of 628 patients with first-ever symptomatic stroke. These patients were older (median age: 73.4 vs 69.2, P<0.001), exhibited larger acute infarction (median: 3.2 vs 1.0 mL, P<0.001), and had higher rates of arterial fibrillation (34.1 vs 17.5%, P<0.001). Severe vascular stenosis and occlusion were also more frequent (severe stenosis: 14.6% vs 7.8%, P=0.015; occlusion: 14.6% vs 7.0%, P=0.004). Among patients with non-lacunar SCI, 46.9% of those with relevant vascular stenosis were classified as large-artery atherosclerosis, while 45.3% of those without stenosis were classified as cardioembolic stroke at the time of first-symptomatic stroke onset (P=0.032 and P=0.041, respectively). At 3-month follow-up, patients with non-lacunar SCI had less frequent favorable outcomes (mRS <3: 51.8% vs. 73.1%; adjusted P=0.002), and a significant time × group interaction further indicated a worse UW-mRS trajectory in patients with non-lacunar SCI compared to those without (P<0.001 in both the random intercept and random intercept & slope models). The deep learning model demonstrated per-case sensitivity (0.722–0.755), specificity (0.797–0.932), PPV (0.493–0.712), and NPV (0.921–0.945).

Conclusions

Non-lacunar SCI lesions are associated with atrial fibrillation and severe vascular stenosis, and may share common etiological pathways with future symptomatic stroke. Given their link to poor outcomes when first-symptomatic stroke occurs, early identification and appropriate management through proper evaluation of patients with non-lacunar SCI may help reduce the burden of stroke. Furthermore, an automated NCCT-based lesion detection model demonstrated reliable performance, supporting clinicians in timely identification and evaluation of non-lacunar SCI lesions, thereby facilitating informed management decisions in practice.

Machine Learning Analysis of Nocturnal Food Availability and Night-Time Light Exposure as Circadian-Metabolic Determinants of Stroke Burden in Nationwide Spatial Epidemiology

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[2]*Computational Science Research Laboratory, Science, Society, Technology Commons, Jakarta, Indonesia*

Purpose

Circadian disruption is an emerging determinant linking obesity, diabetes, and stroke. Community-level nocturnal exposures, such as late-night food availability and light-at-night, have not been systematically investigated in relation to stroke burden. We aimed to develop a "Nocturnal Foodscape × Night Lights" index and examine its association with metabolic risk factors and stroke outcomes.

Methods

We constructed a Nocturnal Food Availability Index (NFAI) using OpenStreetMap points of interest tagged as fast-food outlets, convenience stores, and restaurants with opening_hours extending beyond 22:00, normalized per 10,000 residents at county and tract levels. Night-time light intensity was obtained from NASA VIIRS Black Marble VNP46A4 annual composites (2019–2021) and averaged across residential areas. Outcomes included prevalence of stroke, obesity, diabetes, and short sleep from the CDC PLACES 2024 dataset, and stroke mortality and hospitalization rates from the CDC Heart Disease and Stroke Atlas (2019–2021). Covariates were PM2.5 concentrations (EPA AQS), hourly nocturnal heat and humidity from NLDAS-2, and the CDC Social Vulnerability Index (SVI). Associations were estimated using hierarchical Bayesian spatial models and graph neural networks, incorporating adjacency matrices for spatial correlation. Mediation analysis quantified indirect pathways through obesity, diabetes, and short sleep.

Results

The analysis covered 3,142 counties and about 72,000 census tracts. Counties in the highest quintile of combined NFAI and night-time light exposure had a 1.31-fold higher prevalence of obesity (95% CI 1.18–1.46, absolute difference +6.4%) and a 1.26-fold higher prevalence of diabetes (95% CI 1.11–1.41, +2.9%) compared with the lowest quintile. Stroke prevalence was 3.2% (95% CI 2.9–3.4) versus 2.5% (95% CI 2.3–2.6), a relative increase of 28%. Stroke mortality rates were 62.1 per 100,000 (95% CI 58.7–65.5) in the top quintile versus 47.3 (95% CI 44.5–50.0) in the bottom quintile, a 31% excess. Each interquartile range increase in NFAI was associated with a 2.8% rise in stroke prevalence ($\beta = 0.028$, SE 0.009, $p < 0.001$) and a 3.4% rise in stroke mortality ($\beta = 0.034$, SE 0.012, $p = 0.002$). Mediation analysis indicated that obesity contributed 24.5%, diabetes 17.3%, and short sleep 8.9% to the excess stroke prevalence, jointly explaining 41.8%. Graph neural networks achieved AUROC 0.81 (95% CI 0.78–0.84) and AUPRC 0.73 (95% CI 0.70–0.76), outperforming regression models (AUROC 0.72, AUPRC 0.62).

Conclusions

This integrative study indicates that nocturnal food availability and light-at-night increase stroke burden through metabolic and circadian pathways. The "Nocturnal Foodscape × Night Lights" framework, combined with machine learning, provides a novel prevention approach to identify high-risk communities and guide urban policy interventions.

Gut microbiome targeted therapy for hemorrhagic stroke caused by cerebral cavernous malformation

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[1]*Department Of Pharmacology, School Of Biomedical Sciences, University Of New South Wales, Sydney, Australia*

Purpose

Cerebral cavernous malformation (CCM) is a cluster of abnormal blood vessels in the brain that lead to neurological deficits, seizures and fatal hemorrhagic stroke. CCM affects 1 in 200 people and yet there is no available drug treatment. Neurosurgery is the only treatment, but most CCM lesions are surgically inaccessible and hence are left untreated.

We identified gut microbiome dysbiosis and its inflammation as the critical stimulus in CCM, demonstrating the importance of the gut-brain axis in CCM. Importantly, CCM patients also manifest gut microbiome dysbiosis and gut barrier health can impact CCM disease course. Hence, our aim is to develop a novel CCM therapy by targeting the gut-brain axis.

Methods

Unsaturated fat has many beneficial effects including brain health and reduced inflammation. Hence, we tested the role of an unsaturated "healthy" high fat (HF) using diet and fecal matter transplantation (FMT) in mouse models that recapitulates human CCM disease. Brains were harvested to measure CCM disease burden using micro-CT imaging. Gut samples were collected to measure gut integrity using histology. Blood was collected to measure circulating lipopolysaccharide (LPS). Fecal samples were collected for shotgun metagenomics and metabolomics (including lipidomics) to determine the changes in the gut profile after the diet intervention.

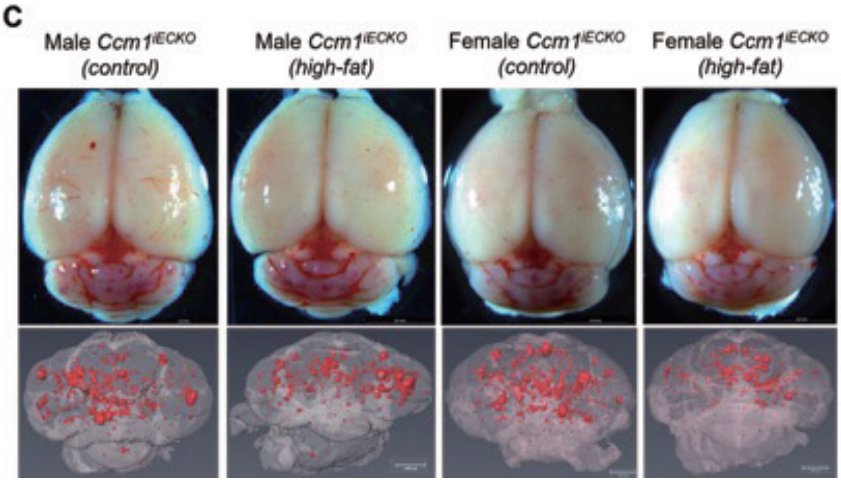
Results

Micro-CT revealed a 6-week HF diet and HF FMT significantly reduced CCM lesion burden in mice compared to littermate controls. Circulating LPS levels and gut integrity were not changed by HF. Shotgun metagenomics and metabolomics identified key gut microbiome changes including bacterial strains (e.g. Akkermansia muciniphila) and metabolites (Vitamin B, Sphingolipids) respectively.

Conclusions

The unsaturated HF diet mediated protection against CCM disease is likely due to the change in the gut microbiome because the HF FMT recipients were also protected, without changes in LPS and gut barrier integrity. Identified bacterial strains and sphingolipids could serve as a potential therapeutic target for CCM disease. This warrants further studies on CCM patients to correlate and validate our preclinical findings. Hence, we are in search for clinician researchers for collaboration to further explore the role of gut microbiome and its therapeutic potential for CCM patients.

Contents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The Hidden Role of Environmental Exposures in Shaping Ischemic Stroke Burden Across Southeast Asia: A Population-Based Study

Zavia Putri Salsabila[1]

[1]*Public Health, Universitas Islam Indonesia, Yogyakarta, Indonesia*

Purpose

Stroke is a serious medical event that occurs when blood flow to part of the brain is blocked or there is sudden bleeding in the brain. Stroke has become the second leading cause of mortality and the third leading cause of disability globally. Globally, there are over 101 million people living with the effect of stroke, with over 12 million new incident strokes occurring each year. Stroke is strongly correlated with metabolic risk factors such as high consumption of lipids, hypertension, and cardiovascular disease. Recently, some research shows that environmental risk factors also contributed to the mortality of stroke. This research seeks to better understand the environmental determinants in shaping the burden of ischemic stroke across Southeast Asian populations.

Methods

This study performed a secondary analysis using the Global Burden of Disease database. The analysis focused on individuals diagnosed with ischemic stroke who were between the ages of 20 and 54 and resided in Southeast Asia. The epidemiologic data examined included mortality rates and Daily Adjusted Life Years (DALYs). DALYs serve as a crucial metric in global health, measuring the total burden of disease by combining both years of life lost due to premature death (YLL) and years lived with illness or disability (YLD).

Results

The analysis identified five environmental factors that significantly contributed to the burden of ischemic stroke in Southeast Asia. Ambient particulate matter was the leading determinant, linked to 42,812 deaths and accounting for 833,515 DALYs, highlighting its dual impact on both mortality and long-term disability. Household air pollution from solid fuels showed a nearly equivalent burden, responsible for 42,757 deaths and 800,771 DALYs, underscoring the persistent public health threat posed by indoor air quality in the region. Lead exposure emerged as another important contributor, with 20,233 deaths and 402,192 DALYS, suggesting that chronic toxic exposure continues to shape stroke outcomes. Temperature-related risks, while comparatively smaller in magnitude, were not negligible. High temperature has 3,890 deaths and 63,825 DALYS, whereas low temperature contributed 2,221 deaths and 36,631 DALYS. These findings point out the need for targeted interventions to improve indoor air quality and reduce lead exposure, as well as strategies to mitigate temperature extremes.

Conclusions

The results indicate that ambient and household air pollution is the most significant environmental risk factor for ischemic stroke. Air pollution is more important than temperature extremes and lead exposure, making it necessary to implement regionally targeted interventions to address modifiable environmental determinants.

Machine Learning and Causal Inference Analysis of Elevator Outages as Natural Experiments: Forced Stair Use and Short-Term Stroke Emergency Risk in Metropolitan High-Rise Residential Districts

Elfiany Syafruddin[1]

[1]*Computational Science Research Laboratory, Science, Society, Technology Commons, Jakarta, Indonesia*

Purpose

Acute physical strain can act as a short-term trigger for cerebrovascular events in individuals with cardiometabolic risk. However, quantifying real-world community-level triggers has remained challenging. We proposed that unplanned elevator outages in high-rise residential buildings force sudden stair use and may transiently increase emergency medical service (EMS) activations for suspected stroke.

Methods

We conducted a natural experiment using linked New York City Open Data from 2018–2023. Elevator outages were identified from the 311 Service Requests dataset, selecting complaints coded "ELEVATOR OUT" with verified timestamps and geocoded to building addresses. Building characteristics, including number of floors and residential occupancy, were obtained from the PLUTO database. Outcomes were daily counts of EMS Incident Dispatch data classified as "stroke/cerebrovascular accident" within 500 meters of affected buildings. Covariates included hourly temperature and humidity from NLDAS-2, ambient PM2.5 from EPA AQS, and neighborhood indicators from the NYC Community Health Profiles. We applied difference-in-differences (DiD) models with event-time specification (−7 to +7 days around outages), adjusting for day-of-week, seasonality, weather, and secular trends. Analyses were stratified by building height, borough, and neighborhood diabetes and obesity prevalence. Causal forests were used to estimate heterogeneous treatment effects.

Results

The analysis included tens of thousands of elevator outage events linked to thousands of high-rise residential buildings across New York City. Within 48 hours of outage onset, EMS stroke calls increased by 8.6% (95% CI 5.2–12.1, $p < 0.001$) compared with matched control days. The relative increase peaked at 24 hours (11.3%, 95% CI 7.4–15.2) and subsided by day 3. Effects were stronger in buildings ≥10 floors (RR 1.15, 95% CI 1.08–1.23) compared with <10 floors (RR 1.05, 95% CI 0.99–1.11, interaction $p = 0.02$). Borough-level analyses showed the largest increases in the Bronx (+13.9%, 95% CI 8.1–19.7) and Brooklyn (+10.4%, 95% CI 6.0–14.9). Causal forest analysis revealed stronger associations in neighborhoods with diabetes prevalence ≥15% and obesity prevalence ≥25%, where average treatment effects reached +16.7% (95% CI 10.3–23.1). Placebo outage windows showed no association.

Conclusions

Elevator outages provide a natural experiment where forced stair use was linked to short-term increases in EMS stroke calls, especially in high-rise, high-risk neighborhoods. These findings stress the role of urban infrastructure in stroke prevention.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 13:50 - 15:30 I Room C

Remodeling of Acute Stroke Care System [KOR]

CHAIRS

Kyungbok Lee (Soon Chun Hyang University Hospital Seoul)
Jae-Kwan Cha (Dong-A University Hospital)

Stroke Center Certification in Korea

Jinkwon Kim

Yongin Severance Hospital

Present and Future of Regional cardio-cerebrovascular Center in Korea

Keun-Hwa Jung

Seoul National University Hospital

Application of Person-/Regional Stroke Center Based Network System

Dae-Hyun Kim, MD.PhD

Department of Neurology, Busan Regional Cardiocerebrovascular Center, Dong-A University Hospital

Abstract

Stroke is a time-sensitive medical emergency that requires prompt treatment to reduce mortality and prevent long-term disability. In Korea, the current emergency stroke care system faces several challenges, including a shortage of stroke-specialized hospitals, regional disparities in medical infrastructure, a lack of a coordinated emergency transfer system and management framework for stroke patients.

To overcome these limitations, the Korean government has launched a pilot project to establishe an emergency network for acute stroke (person-/regional stroke center based network system). This national stroke network aims to strengthen coordination among 119 emergency medical services, general hospitals, and stroke centers, facilitating the rapid transfer of stroke patients to hospitals capable of providing timely and appropriate treatment. This system is designed to support faster diagnosis and intervention, ensuring that patients across all regions have timely access to acute stroke care.

Stroke specialists play a pivotal role in this network. Their responsibilities have recently expanded to include prehospital care initiatives, operation of stroke alert system in emergency room and participation in quality improvement programs. To sustain the quality of stroke care and promote active patient acceptance in emergency room, it may be now essential to implement additional measures—such as establishing a system of dedicated neurologists in emergency departments and strengthening multidisciplinary collaboration.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 15:50 - 17:30 I Room B

Debate Session 1 :
Optimal LDL-C Targets in Ischemic Stroke Prevention: Should We Aim for <70 mg/dL or Push Lower? [KOR]

CHAIRS

Hyo Suk Nam (Yonsei University College of Medicine)
Yong-Seok Lee (SMG-SNU Boramae Medical Center)

Targeting LDL-C <70 Mg/Dl is Enough and Safe

Tae-Jin Song

Ewha Womans University Seoul Hospital

Low-density lipoprotein cholesterol (LDL-C) lowering with statins is a cornerstone of secondary prevention after ischemic stroke, but the optimal LDL-C target and the safety of intensive lipid lowering remain debated, particularly across different stroke subtypes and comorbid conditions. Current guidelines generally recommend a target LDL-C <70 mg/dL, or at least a 50% reduction from baseline, for patients with atherosclerotic ischemic stroke or transient ischemic attack (TIA), often with high-intensity statins and add-on ezetimibe in very high-risk individuals. However, ischemic stroke is etiologically heterogeneous, and emerging data suggest that "the lower, the better" may not uniformly apply to small-vessel disease, cardioembolic stroke, or patients with high hemorrhagic risk.

Randomized trials such as SPARCL established the benefit of high-dose atorvastatin in reducing recurrent ischemic events, but also raised concern about increased intracerebral hemorrhage (ICH), particularly in patients with a prior hemorrhagic stroke or small-vessel disease phenotype. More recently, the Treat Stroke to Target trial showed that an LDL-C target <70 mg/dL reduced major cardiovascular events by about 22% compared with a higher target, confirming the efficacy of more intensive LDL-C lowering in patients with atherosclerotic stroke. Yet, in Korean cohorts with symptomatic cerebral atherosclerosis, a similarly low target yielded neutral overall results, and the benefit appeared attenuated in small-vessel occlusion and intracranial, as opposed to extracranial, atherosclerosis. These findings underscore the importance of vascular bed, ethnicity, and underlying stroke mechanism when extrapolating trial data to clinical practice.

Safety considerations extend beyond classic hemorrhagic events. Observational imaging studies in patients with numerous cerebral microbleeds suggest that driving LDL-C below ~55 mg/dL may be associated with the development of new microbleeds, potentially increasing future ICH risk in a "fragile" small-vessel brain, although causal mechanisms remain speculative. Mendelian randomization analyses further indicate that genetically proxied statin-induced LDL lowering and high-intensity statin exposure may be causally related to higher ICH risk, even as overall vascular benefits remain substantial. In the general population, very low LDL-C has also been linked to atrial fibrillation and appears to follow a U-shaped relationship with cardiovascular outcomes, highlighting the possibility of harm at both extremes.

Taken together, current evidence supports an LDL-C target <70 mg/dL as an effective and generally safe goal for most patients with ischemic stroke, especially those with large-artery atherosclerosis, while acknowledging that more aggressive intensification (e.g., <55 mg/dL, <40mg/dL, or the lower is the better with high-intensity statin plus ezetimibe or PCSK9 inhibition) should be reserved for carefully selected very high or extreme risk patients. In individuals with a history of lobar ICH, multiple cerebral microbleeds, presumed small-vessel disease, pure cardioembolic stroke without concomitant atherosclerosis, or advanced CKD/ESRD, the balance between ischemic benefit and hemorrhagic or systemic risk becomes less clear, and a more conservative strategy targeting LDL-C around 70 mg/dL appears acceptable. Ultimately, LDL-C targets after stroke should be individualized, integrating stroke subtype, hemorrhagic markers, comorbidities, and ethnic differences in statin response, rather than applying a uniform "the lower, the better" paradigm to all patients.

"The Lower, the Better": Ultra-Low Targets with PCSK9 Inhibitors Are Superior

Hee Kwon Park

Department of Neurology, Inha University Hospital

Acute stroke including cerebral infarction, is a major global medical emergency, leading to substantial disability and is the second leading cause of death worldwide. Since 2015, mechanical thrombectomy has been established as the standard of care for patients with AIS due to emergent large vessel occlusion (ELVO), regardless of individual patient characteristics or geographical location. During acute stroke period, some patients experience early neurological deterioration (END) or recurrent stroke, both of which are strongly associated with unfavorable 90-day outcomes, despite technically successful EVT. To reduce the END during admission, we tried aggressive medication like dual antiplatelet agents in this periods.

Hyperlipidemia is a primary therapeutic target in the secondary prevention of ischemic stroke, with high-intensity statin therapy to lower the low-density lipoprotein cholesterol (LDL-C) level recommended as first-line treatment. Recent guidelines recommend that for patients with ischemic stroke who are at very high risk, if LDL-C level remains above 70 mg/dL despite maximal tolerated statin therapy, the addition of ezetimibe—and, if necessary, a proprotein convertase subtilisin–kexin type 9 inhibitor(PCSK9i)—may be considered to further reduce the risk of recurrent ischemic stroke. Additionally, the efficacy of lipid-lowering therapy should be evaluated within 4 to 12 weeks of initiating statins, with follow-up monitoring every 3 to 12 months based on the patient's clinical needs. However, this method is contrary to the effective and rapid lowering of LDL levels in patients during acute stroke periods. Many reports suggest that ezetimibe and PCSK9i are also good options to improve the outcome of the patients with cardio-cerebral vascular diseases.

Regarding the timing of ezetimibe and PCSK9 inhibitor treatment, previous reports have suggested that early initiation of ezetimibe or PCSK9 inhibitors may be beneficial in patients with acute ischemic stroke or acute coronary syndrome. Here, we review recent and ongoing studies demonstrating the beneficial effects of early administration of ezetimibe or PCSK9i in these patients and discuss their potential clinical application.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 15:50 - 17:30 I Room B

Debate Session 2 :
Adult Moyamoya Disease Treatment: Surgery vs. Medical Management
[KOR]

CHAIRS

Hyo Suk Nam (Yonsei University College of Medicine)
Yong-Seok Lee (SMG-SNU Boramae Medical Center)

Direct Bypass as The Gold Standard: Why Surgery Outperforms Medical Therapy

Tae Keun Jee

Samsung Medical Center

Medical Therapy First: Balancing Risks and Realities in Adult Moyamoya Care

Mi-Yeon Eun

Kyungpook National University Chilgok Hospital

Abstract

The optimal management of adult moyamoya disease (MMD) continues to evolve alongside advances in our understanding of its pathophysiology. While revascularization surgery has demonstrated benefits as a treatment option, a thorough consideration of medical therapy's role is important for comprehensive, patient-centered clinical decision-making.

Adult MMD patients demonstrate considerable heterogeneity in clinical presentation, symptom severity, and individual risk profiles. An important consideration in treatment planning is recognizing that certain patient populations may face substantial surgical risks. These include elderly patients with multiple comorbidities, those with severe cardiopulmonary disease and individuals with unfavorable vascular anatomy for bypass surgery. Additionally, asymptomatic or minimally symptomatic patients may benefit from careful observation, as the natural history of adult MMD shows considerable variation across different patient subgroups. Although surgical revascularization can be beneficial in appropriately selected candidates, it carries notable perioperative risks, including ischemic or hemorrhagic complications, hyperperfusion syndrome, seizures, wound issues, and anesthesia-related events. Careful assessment of the individual risk–benefit ratio is therefore essential, especially for patients with mild or stable disease.

This presentation will review current evidence supporting medical management in adult MMD, highlighting our recent meta-analysis on antiplatelet therapy. The analysis provides insights into stroke prevention, functional outcomes, and mortality under medical therapy, while also addressing safety concerns such as hemorrhagic risk.

A thoughtful, individualized strategy that integrates medical therapy, whether as primary treatment for surgical contraindications, as interim management during evaluation, or as adjunctive therapy to enhance surgical outcomes, offers a balanced and pragmatic framework for the care of adults with MMD.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 15:50-17:30 I Room A

ICAS Symposium 2 : Vessel Assessment [ENG]

CHAIRS

Dong-Eog Kim (Dongguk University Ilsan Hospital)
Xu Weihai (Chinese Academy of Medical Science)

Understanding Vascular Tortuosity and Hemodynamics

Bum Joon Kim (B)

Asan Medical Center, Seoul, Korea

Intracranial atherosclerotic stenosis (ICAS) represents one of the most prevalent causes of ischemic stroke, particularly in Asian populations. Beyond luminal narrowing, vascular geometry, especially tortuosity, plays a crucial role in modulating local hemodynamics and influencing disease progression. Tortuous intracranial arteries alter wall shear stress (WSS), oscillatory shear index (OSI), and pressure distribution, leading to endothelial injury and plaque instability.

Emerging evidence suggests that increased vascular tortuosity is closely associated with the development and progression of atherosclerosis. Regions of high curvature tend to exhibit low and oscillatory WSS, which promotes endothelial dysfunction, lipid deposition, and inflammatory activation. Notably, several imaging and population-based studies have shown that intracranial arteries in Asian populations are more tortuous than in Western counterparts, potentially contributing to their higher susceptibility to ICAS and recurrent stroke. These geometric differences may partly explain ethnic disparities in stroke mechanisms and treatment response.

ICAS can lead to ischemic stroke through multiple mechanisms, including in situ thrombosis, local branch occlusion, hypoperfusion, and artery-to-artery embolism. Hemodynamic stress and disturbed flow patterns contribute to the formation of vulnerable plaques characterized by enhancement, thin fibrous caps, and intraplaque hemorrhage. These unstable plaques may rupture under altered shear forces, serving as a nidus for distal embolization. Increasing evidence also indicates that patients with marked vascular tortuosity experience higher rates of early neurological deterioration (END), possibly due to impaired collateral flow and persistent hemodynamic instability. Moreover, excessive tortuosity can complicate endovascular navigation, reduce device deliverability, and worsen procedural outcomes in ICAS-related interventions.

Thus, hemodynamic and geometric factors are integral to both the natural history and treatment response of ICAS. Understanding tortuosity-induced hemodynamic heterogeneity provides new insight into ICAS pathophysiology beyond the traditional concept of fixed stenosis severity. Ongoing multidisciplinary research seeks to integrate geometric and flow-related biomarkers into clinical assessment to refine risk stratification and guide individualized therapy in ICAS.

AI-Powered Techniques for Measuring Arterial Morphology

Woo-Keun Seo, MD, PhD, FAHA

Department of Neurology and Stroke center, Samsung Medical Center, Sungkyunkwan university School of Medicine, Seoul, Korea.

Accurate and quantitative assessment of cerebrovascular morphology is essential for understanding the wide inter-individual diversity and complexity of the cerebral vasculature, and for fundamentally improving early diagnosis and prognosis in cerebrovascular diseases. Establishing standardized templates of healthy cerebral vessels and modeling age-related structural changes enable objective estimation of disease risk and vascular aging, forming the basis for precision prevention and personalized therapeutics.

This session addresses how morphometric indicators—such as global arterial tortuosity, recurrent stroke risk metrics, and RNF213 mutation-associated vascular features—offer new prognostic and predictive insights by quantifying arterial cross-sectional area, circularity, and tortuosity. The lecture further explores cutting-edge AI-based systems for disease detection and the generation of advanced cerebrovascular imaging, emphasizing their transformative potential despite current technical limitations.

This emerging paradigm not only enhances early detection and individualized disease management but also lays the groundwork for a data-driven, predictive approach in clinical cerebrovascular science, representing a key advance in both research and patient care.

Vessel Wall MRI in The Evaluation Of Intracranial Diseases

Jong S. Kim

Gangneung Asan Hospital

Management of ICAS based on vessel wall MR findings

Xu Weihai

Chinese Academy of Medical Science

Abstract

Intracranial atherosclerotic stenosis (ICAS) remains a major cause of ischemic stroke, and optimal management strategies are still evolving. Vessel wall magnetic resonance imaging (VW-MRI) enables direct visualization of the arterial wall, providing insights beyond luminal stenosis. It allows detailed assessment of plaque characteristics such as plaque morphology features, remodeling patterns and plaque components. Recent studies have demonstrated the clinical utility of VW-MRI in the management of ICAS. First, it helps differentiate atherosclerotic from non-atherosclerotic lesions, preventing delayed or inappropriate treatment. Second, it enables the identification of high-risk patients who are prone to recurrence and may potentially benefit from aggressive therapy. Third, it facilitates the monitoring of therapeutic response, providing valuable information for treatment adjustment. With its growing clinical relevance, VW-MRI is gradually being integrated into routine clinical decision-making for patients with ICAS.

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Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 29 (Sat) 08:00 - 09:40 I Room A

Symposium 4 : NeuroRehabilitation [ENG]

CHAIRS

Yong-Il Shin (Pusan National University Yangsan Hospital)
Seung Don Yoo (Kangdong Kyung Hee University Hospital)

Smart Monitoring System for Stroke Rehabilitation

Na Young Kim

Yonsei University College of Medicine

Stroke rehabilitation is challenged by heterogeneous and nonlinear recovery trajectories. Conventional assessments are episodic, subjective, and often fail to capture real-world function. Smart monitoring systems address these limitations by providing continuous, sensor-based, and adaptive tracking. They enhance precision and personalization in post-stroke care.

Digital biomarkers capture multi-domain aspects of recovery. Motor function includes gait speed, stride variability, and symmetry. Balance and posture are quantified by center-of-pressure trajectories and sway variability. Upper limb recovery is tracked via kinematic analysis. Cognitive and emotional performance is monitored through smartphone-based metrics. Physiological states such as heart rate variability, stress, and fatigue are also captured. These biomarkers provide continuous, objective, and sensitive measures to track rehabilitation progress.

Smart monitoring system for clinicians to leverage data from multiple sensors should incorporate various functional features. Data generated by devices supplied from different vendors should be stored in a standardized format and linkable to patient information. Sensor data undergo acquisition, preprocessing, feature extraction, and integration with hospital information systems or electronic medical records. Clinician dashboards and automated reports deliver actionable feedback for both providers and patients.

Clinical integration shows promise but also practical challenges. Linking digital data to EMR alongside conventional assessments is feasible but complicated by data fragmentation, manual entry, network issues, patient adherence, and regulatory constraints. At Yongin Severance Hospital, we set up a system to integrate signals recorded from new wearable sensors and existing monitoring devices into the EMR. During this process, we encountered numerous challenges including the allocation of human and material resources. Policy limitations and cost-effectiveness considerations present additional obstacles.

Overall, smart monitoring systems and digital biomarkers offer an objective foundation for therapy adjustment, early detection of recovery plateaus, and data-driven discharge planning in stroke rehabilitation. Addressing practical integration challenges will be key to translating their potential into routine clinical practice.

BCI-based rehabilitation in stroke patients

Joon-Ho Shin

National rehabilitation center

Stroke remains a leading cause of long-term disability, with motor dysfunction posing a critical challenge for recovery. Brain–computer interface (BCI)–based rehabilitation has emerged as a promising strategy to restore motor function by decoding neural signals associated with motor intention and delivering real-time contingent feedback to facilitate neuroplasticity.

Recent systematic reviews and meta-analyses have demonstrated that BCI-based therapy yields clinically meaningful improvements in upper limb motor recovery, particularly when combined with functional electrical stimulation (FES) or robotic assistance. A multicenter RCT (Wang et al., 2024) involving 296 ischemic stroke patients confirmed that one month of BCI training enhanced upper limb Fugl–Meyer scores by 3.35 points over conventional therapy. Advances in adaptive algorithms, multimodal feedback, and virtual reality integration have further improved engagement and learning efficiency in both subacute and chronic stroke populations.

Our recent double-blinded RCT provided new evidence for the causal role of feedback contingency in driving motor recovery. In chronic stroke patients with severe wrist extensor weakness, motor imagery–contingent BCI training induced greater improvements in wrist extensor strength (ΔMRC = 0.52, $p = 0.036$) and range of motion ($p = 0.019$) compared to MI-independent BCI. Resting-state EEG analysis revealed enhanced functional connectivity within the ipsilesional premotor network and between hemispheres, and these neuroplastic changes correlated with clinical gains. These findings highlight that closed-loop contingency between motor intention and feedback—rather than mere stimulation exposure—is a critical determinant of BCI efficacy in chronic stroke rehabilitation.

Emerging directions, including contralesional control strategies for patients with extensive lesions, endovascular or implantable BCIs for severe paralysis, and standardized clinical protocols for EEG-based intervention design, further expand the clinical and translational potential of this technology.

Overall, converging evidence supports that BCI therapy enhances motor recovery through targeted modulation of sensorimotor networks, with the greatest benefits achieved when feedback is contingent, multimodal, and personalized. Future research should focus on integrating AI-driven adaptivity, neuroimaging-guided biomarkers, and cross-stage longitudinal designs to optimize BCI applications across the stroke continuum.

Gait Rehabilitation with The Exoskeletal Wearable Robots in Stroke Patients

Fazah Akhtar Hanapiah

Faculty of Medicine, Universiti Teknologi MARA

Machine Learning in Stroke Rehabilitation

Soyoung Kwak

College of Medicine, Yeungnam University

Stroke remains a leading cause of long-term disability worldwide. Stroke rehabilitation, which relies on neuroplasticity to restore brain function, is a multidisciplinary approach to help the people with stroke restore, improve, or maintain their physical, cognitive, emotional, and social functioning. Effective rehabilitation is essential for restoring motor, cognitive, and functional abilities, however, traditional stroke rehabilitation has some limitations such as high clinical demand, a hospital-centered provision of stroke rehabilitation, and limited adaptability to the patients' needs and circumstances.

Machine learning, one of the artificial intelligence techniques, enables computer system to learn patterns and rules from provided data without explicit programming. Because it is particularly useful when analyzing big data and images, stroke rehabilitation, which usually involves an enormous amount of clinical and image data per patient, is a field where machine learning can be especially well utilized. Several domains, including high-precision assessments, outcome prediction, personalizing therapy (dose and modalities), remote monitoring, and adaptive technology (e.g., brain-computer interface, robotics, etc.), have been suggested to incorporate this technology.

In this presentation, we will examine specific cases where machine learning can be applied to stroke rehabilitation and explore its limitations and future development directions.

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November 29 (Sat) 08:00 - 09:40 I Room B

ICAS Symposium 3 : Treatment [ENG]

CHAIRS

Kyung-Yul Lee (Gangnam Severance Hospital)
Joung-Ho Rha (Inha University Hospital)

Antithrombotics for ICAS

Kazunori Toyoda

National Cerebral and Cardiovascular Center, Japan

In ICAS patients with recent stroke or TIA, addition of clopidogrel or ticagrelor to aspirin for up to 90 days 30 days, respectively, is reasonable to reduce recurrent stroke risk by the AHA/ASA guideline. The same guideline recommends long-term use of aspirin alone and addition of cilostazol to aspirin or clopidogrel for symptomatic ICAS patients. Existing oral anticoagulants are not recommended for ICAS patients; however, the recent ATIS-NVAF trial showed that the addition of an antiplatelet agent to anticoagulant therapy did not result in a significant difference in net clinical benefit compared with anticoagulant monotherapy in patients with ischemic stroke or TIA and concurrent nonvalvular atrial fibrillation and atherosclerotic cardiovascular disease. Thus, oral anticoagulant alone may be a reasonable option for ICAS patients having nonvalvular atrial fibrillation. Novel inhibitors of activated factor XI, milvexian and asundaxian, new oral anticoagulants, in addition to antiplatelets, may be protective against recurrent stroke in ICAS patients.

LDLc Target in The Management of ICAS

Jong S. Kim

Gangneung Asan Hospital

Acute Thrombectomy: Differences between ICAS and Other Conditions

Jin Soo Lee, MD, PhD

Professor, Department of Neurology, Ajou University School of Medicine, Ajou University Hospital, Suwon, Republic of Korea

Abstract:

Intracranial atherosclerosis-related large vessel occlusion (ICAS-LVO) represents a significant and distinct subgroup of LVO stroke (LVOS), posing challenges compared to pure embolic occlusions in endovascular treatment (EVT). This lecture will first address the critical need for a specific classification system for LVOS including ICAS-LVO besides TOAST classification. Operational diagnostic criteria designed to accurately identify and categorize ICAS-LVO, enabling subsequent retrospective analyses, will be presented.

Next, the efficacy of several EVT methods in this specific cohort will be critically evaluated. Analysis of retrospective clinical studies confirms that while EVT, using devices like stent retrievers and contact aspiration, can achieve initial recanalization, the outcomes are often complicated by high rates of underlying, remnant stenosis and a significant tendency for acute reocclusion. These findings underscore that simple thrombus removal is often insufficient for ICAS-LVO, as the underlying atherosclerotic plaque remains problematic.

Building on these characteristics, a multi-modal treatment strategy will be introduced. This includes the primary EVT approaches (stent retriever and contact aspiration) followed by necessary "rescue" therapies. The evidence for local antiplatelet infusion (e.g., tirofiban), and rescue balloon angioplasty and stenting, which are often required to establish durable vessel patency by addressing the fixed focal atherosclerotic lesion, will be discussed.

Finally, the importance of pre-EVT prediction of ICAS-LVO will be explored. Identifying reliable imaging or clinical predictors is crucial for effective treatment planning, allowing interventional teams to anticipate the need for rescue therapies and have appropriate equipment (balloons, stents, antiplatelets) readily available. Furthermore, accurate pre-procedural prediction is a prerequisite for designing robust, prospective studies aimed at definitively establishing the optimal EVT and adjuvant strategies for ICAS-LVO patients.

Stenting/Angioplasty of ICAS: Past and Future

Liping Liu

Capital Medical University

ICSU & ICAS 2025

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and International Conference on Intracranial Atherosclerosis

November 29 (Sat) 09:40-10:40 I Room A+B

Plenary Session 3 [ENG]

CHAIRS

Gyeong-Moon Kim (Samsung Medical Center)

Advancements in IV thrombolysis: Transitioning from tPA to TNK

Carlos A. Molina

Vall d'Hebron Hospital

Abstract

Over the past decade, tenecteplase (TNK) has rapidly emerged as a leading alternative to alteplase (tPA) for intravenous thrombolysis in acute ischemic stroke (AIS). TNK, a genetically modified variant of tPA with greater fibrin specificity and a longer plasma half-life, enables single-bolus administration and more efficient delivery. These pharmacological properties provide substantial logistical advantages over tPA's 60-minute infusion—streamlining workflows, reducing door-to-needle times, and facilitating inter-hospital transfers, especially in thrombectomy-capable networks. Evidence from randomized controlled trials (RCTs) supports TNK as an effective and safe thrombolytic. The EXTEND-IA TNK and ATTEST trials demonstrated superior early reperfusion and similar or improved 90-day functional outcomes compared with alteplase in patients eligible for thrombectomy. The pragmatic AcT trial (Canada, >1,500 patients) and TRACE-2 (China) validated equivalent efficacy and safety in real-world clinical settings. Meta-analyses of pooled RCT data consistently show comparable or lower rates of symptomatic intracerebral hemorrhage and a modest superiority in excellent functional outcome (mRS 0–1) with TNK 0.25 mg/kg versus tPA 0.9 mg/kg, establishing this dose as the preferred regimen. Globally, the transition from tPA to TNK is accelerating. In Australia, New Zealand, and parts of Canada, TNK has become the routine standard for intravenous thrombolysis. Across Europe, adoption is expanding rapidly, with national guideline endorsements or pilot implementation in the UK, Ireland, Spain, and the Netherlands, and inclusion in updated ESO and AHA/ASA recommendations as a viable alternative to alteplase. Real-world registries and implementation studies report increased use in both primary and comprehensive stroke centers, driven by workflow efficiency, cost-effectiveness, and ease of administration. In the United States and China, large-scale pragmatic trials (e.g., TASTE-A, TRACE-2) have further accelerated acceptance, with TNK increasingly replacing tPA in emergency stroke protocols. Overall, converging pharmacological, clinical, and operational evidence strongly supports tenecteplase (0.25 mg/kg single bolus) as the emerging global standard of care for intravenous thrombolysis in acute ischemic stroke, offering improved efficiency without compromising safety or efficacy.

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November 29 (Sat) 11:00 - 12:40 I Room A

Symposium 5 : Anti-amyloid Therapy and Stroke (Joint Session of KSS and VasCog-Korea) [ENG]

CHAIRS

Sung Il Sohn (Keimyung University Dongsan Hospital)
Seong-Ho Koh (Hanyang University Hospital)

Antiamyloid Immunotherapy for Alzheimer's disease

Sung Hoon Kang

Korea University Guro Hospital

CAA-ri and ARIA: Diagnosis and treatment

Young Hee Jung

Department of Neurology, Hallym University Sacred Heart Hospital, College of Medicine, Hallym University

Abstract

Cerebral amyloid angiopathy–related inflammation (CAA-RI) and amyloid-related imaging abnormalities (ARIA) share a common pathophysiologic substrate of vascular amyloid and immune activation. With the increasing clinical use of anti-amyloid monoclonal antibodies for Alzheimer's disease, differentiating spontaneous CAA-RI from treatment-induced ARIA has become crucial for neurologists. CAA-RI represents a spontaneous autoimmune vasculitis-like response to vascular amyloid, characterized by anti-Aβ autoantibody–mediated perivascular inflammation and asymmetric vasogenic edema, typically showing a marked response to corticosteroid therapy. ARIA, in contrast, is an iatrogenic phenomenon associated with antibody-mediated amyloid clearance, resulting in transient blood–brain barrier disruption, vasogenic edema (ARIA-E), or microhemorrhage (ARIA-H). On MRI, CAA-RI usually presents with asymmetric T2/FLAIR hyperintensity accompanied by contralateral microbleeds or cortical superficial siderosis, whereas ARIA tends to show symmetric, dose- and time-dependent lesions that generally resolve spontaneously within months. Diagnosis relies on clinical context, MRI pattern recognition, and occasionally cerebrospinal fluid findings such as decreased Aβ42 or elevated anti-Aβ antibodies. CAA-RI is treated with high-dose corticosteroids followed by tapering, and immunosuppressants may be considered for relapse, while ARIA management is primarily supportive, involving temporary suspension of therapy and follow-up imaging. Recent evidence suggests that ARIA may represent an iatrogenic counterpart of CAA-RI, forming a spectrum of amyloid-related immune response. Risk factors such as APOE ε4 carrier status, baseline cortical superficial siderosis, and white matter hyperintensity burden may predict susceptibility. Recognizing the shared mechanisms and applying evidence-based monitoring allow safe continuation of anti-amyloid therapy and improved patient outcomes.

The Impact of Anti-Amyloid Immunotherapies on Stroke Care

Tomotaka Tanaka

Department of Neurology, National Cerebral and Cardiovascular Center, Osaka, Japan

Amyloid-β accumulation is an early step in the pathophysiology of Alzheimer's disease, and randomized trials of anti-amyloid monoclonal antibodies have enabled the clinical use of lecanemab and donanemab. In Japan, this therapy is delivered not only by neurologists but also by psychiatrists and geriatricians; however, expertise in stroke neurology is critical for safe implementation. Based on more than a year of experience with over 70 patients of anti-amyloid antibody therapy at our institution, this presentation synthesizes the cerebrovascular knowledge necessary for patient selection, treatment monitoring, and complication management, emphasizing the clinicoradiologic overlap between amyloid-related imaging abnormalities (ARIA) and cerebral amyloid angiopathy–related inflammation (CAA-RI). A practical framework translates stroke practice into anti-amyloid therapy, including intracerebral hemorrhage risk assessment, blood pressure optimization, and evidence-based strategies for recognizing and treating CAA-RI. On this basis, approaches to optimizing anti-amyloid antibody therapy are discussed.

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November 29 (Sat) 11:00 - 12:40 I Room B

ICAS Symposium 4 : Other Intracranial Vascular Diseases [ENG]

CHAIRS

Man Seok Park (Man Seok Park)
Chul-Ho Sohn (Seoul National University Hospital)

RNF213-related vasculopathy

Masafumi Ihara, MD

Department of Neurology, National Cerebral and Cardiovascular Center

The p.R4810K variant in the RNF213 gene was identified as the founder variant in East Asian moyamoya disease. The association of this variant with non-moyamoya intracranial arterial stenosis was also demonstrated, and the disease concept of RNF213-related vasculopathy was proposed, suggesting a continuous spectrum with moyamoya disease. In addition, moyamoya disease is occasionally accompanied by polyvascular disease involving not only intracranial vessels but also neck vessels, coronary arteries (especially vasospastic angina), pulmonary arteries, aorta, abdominal visceral arteries and peripheral arteries, which have been found to be associated with RNF213 variants, mainly p.R4810K, carried by approximately 1.5% of the Japanese population. The severity of vascular disease caused by the RNF213 variant is not uniform, and some environmental and genetic factors are thought to jointly define the phenotype. The RNF213 variants confer the greatest risk for cardiovascular diseases in East Asia, and successful targeting of these variants is essential for the control of cardiovascular diseases, including stroke, in East Asian countries.

Non-surgical management of adult Moyamoya disease: Conventional & Emerging

Oh Young Bang

Samsung Medical Center

Abstract

Moyamoya disease (MMD) is a rare, progressive cerebrovascular disorder characterized by stenosis or occlusion of the internal carotid arteries, leading to the development of fragile collateral vessels at the base of the brain. Surgical revascularization remains the mainstay of treatment to prevent ischemic and hemorrhagic events. However, the role of medical management has gained increasing recognition, particularly for asymptomatic patients or those at high risk for surgical complications. In this presentation, I discussed current guidelines and evidence supporting various medical management strategies for MMD, including rigorous control of risk factors and judicious use of antithrombotic therapy. Given the considerable heterogeneity in patient presentation—such as age of onset, clinical symptoms, and comorbid conditions—tailored therapeutic approaches are essential to address individual patient needs. Although the current literature on medical management remains limited, individualized strategies may help reduce the risk of ischemic events and improve overall outcomes. The fundamental etiology of MMD has yet to be elucidated, and the disease involves complex pathophysiological interactions among multiple vascular cell types. Consequently, no disease-modifying pharmacologic agent has been developed to date. Finally, I introduced recent research efforts aimed at overcoming these challenges and establishing novel therapeutic approaches for MMD.

Intracranial Artery Dissection

Byung Moon Kim, MD, PhD.

Interventional Neuroradiology, Severance stroke center, Severance Hospital, Yonsei University College of Medicine

Objective

The objectives of this presentation are to briefly review the natural course of intracranial artery dissection (IAD), and how to diagnose and manage it.

Brief historical review

IAD can present ruptured or unruptured form. In the past, most IAD was thought to be ruptured at presentation. However, owing to rapid evolution of neuroimaging technique, unruptured IAD has been increasingly diagnosed as a cause of ischemic stroke and nowadays seems to be one of the major causes of stroke in young and middle aged patients. Unruptured IAD reveals broad spectrum in presenting symptoms and appears to differ in natural course depending on location and findings on advanced neuroimaging. Therefore, management strategy may be optimized depending on presentation symptom, location and findings on advanced neuroimaging.

Recent developments

In the past decade, there has been important knowledge reported about acute unruptured ICD. In the natural clinical course, most unruptured IAD follows benign clinical course with a low rupture risk especially after 2 weeks after symptom onset. Natural course seems to differ on morphology at presentation. Morphology of IAD based on luminal imaging (catheter, CT, or MR angiogram) can be divided into 3 types; steno-occlusive, pearl-and-string (PS), and aneurysmal dilatation. In addition, two typical sign can be detected on cross-sectional imaging (MR, CT, and flat panel CT); intimal flap/dual lumen sign and intramural hematoma. PS with intramural hematoma shows aggravation most frequently on follow-up imaging, while steno-occlusive type shows improvement most frequently. In fact, persistent steno-occlusive on follow-up imaging has an extremely low risk of rupture. In contrast, rupture risk cannot be excluded in IAD with newly formed or enlarge aneurysmal dilatation on follow-up imaging.

Considering its benign natural course, neurointerventional or surgical treatment should be preserved for the selected IAD cases. However, neurointerventional treatment should be considered in following conditions; (1) acute stroke due to intracranial large vessel occlusion by IAD, (2) aggravation or recurrent neurological symptom due to stenosis related to IAD despite adequate antithrombotic treatment, and (3) IAD with a newly developed or enlarging dissecting aneurysm. When determining if one does neurointerventional treatment, it should be keep in mind to balance treatment risk and benefit, in other words, treatment feasibility and risk when IAD is left without treatment.

Owing to evolution of advanced neuroimaging technique, nowadays unruptured IAD has been increasingly diagnosed as a cause of ischemic stroke. Using vessel wall MRI, unruptured IAD is second most common cause of acute stroke due to intracranial stenosis after atherosclerotic one, especially in the middle aged in East Asia. When considering therapeutic and prognostic approaches differ between IAD and atherosclerotic stenosis, vessel wall MRI is a useful tool in the East Asian population.

Conclusion

Natural course of most unruptured IAD follows benign and may differ depending on radiological findings. Therefore, conservative management should be first considered. However, neurointerventional treatment should be considered for the selected IAD cases. Vessel wall MRI is helpful to differentiate IAD and atherosclerotic intracranial stenosis. When considering therapeutic and prognostic approaches differ between IAD and atherosclerotic stenosis, vessel wall MRI may be useful in the East Asian population. Most importantly, close follow-up with vascular imaging is mandatory, especially the first in 2-4 weeks after initial symptomatic presentation and in 3-6 months for incidental presentation, if conservative management is chosen.

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Infectious Intracranial Artery Diseaes

Nijasri C. Suwanwela,M.D.

Chulalongkorn University, Bangkok, Thailand

Abstract

Evidence supports classifying infection-related intracranial stenosis into three overlapping categories: (1) chronic systemic infection–associated atherosclerosis, (2) acute infection–triggered vascular inflammation, and (3) direct infectious vasculopathy or invasion. Understanding these pathways highlights infection as an important dimension in the complex pathobiology of intracranial arterial disease.

In chronic systemic infection, persistent viral or bacterial exposure may promote endothelial dysfunction and vascular inflammation. The Northern Manhattan Study (NOMAS) showed that prior HSV-2 and CMV infections were independently associated with greater intracranial large artery stenosis, while data from the ARIC and Dental ARIC cohorts linked periodontal disease and severe tooth loss to intracranial atherosclerotic stenosis. These findings suggest that chronic viral and oral infections contribute to intracranial vascular injury through inflammatory and immune-mediated mechanisms.

Acute systemic infections, including respiratory viruses such as influenza, adenovirus, cytomegalovirus, and SARS-CoV-2, have also been implicated as transient triggers for stroke. A recent meta-analysis involving 48 studies confirmed that respiratory viral infections are temporally associated with increased risks of acute myocardial infarction and stroke, mediated by endothelial activation and cytokine surges.

Finally, direct infectious vasculopathy occurs when pathogens invade or inflame cerebral arteries locally. Tuberculous meningitis, bacterial and viral meningitides, varicella-zoster vasculopathy, and fungal sinus infections (e.g., Aspergillus invasion) can all lead to focal intracranial arterial stenosis and ischemic complications.

These converging lines of evidence emphasize that infection, whether systemic or localized, represents a crucial and potentially modifiable contributor to intracranial arterial pathology.

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November 29 (Sat) 11:00-12:40 I Room C

Nursing Symposium [KOR]

CHAIRS

Sam Yeol Ha (Chung-Ang University Hospital)
Jinkwon Kim (Yongin Severance Hospital)

Basic Assessment of Stroke (Neurological Examination)

Jeonghoon Bae

Chung-Ang University Gwangmyeong Hospital

Early and accurate neurological assessment is essential for the timely recognition and management of acute stroke. Nurses are often the first healthcare professionals to encounter stroke patients in emergency and ward settings. A systematic and standardized neurological examination allows nurses to identify subtle changes, communicate effectively with physicians, and contribute to rapid decision-making in acute stroke care.

The lecture will cover the essential components of neurological assessment relevant to stroke care, including level of consciousness, cranial nerve function, motor and sensory testing, coordination, speech and language evaluation, and vital signs associated with neurovascular status. Key assessment tools such as the Glasgow Coma Scale and the NIH Stroke Scale (NIHSS) will be introduced with simplified interpretation tips suitable for nursing practice. Case-based examples will demonstrate how to distinguish common stroke syndromes and detect early neurological deterioration. Emphasis will also be placed on consistent documentation, team communication, and the role of nursing assessment in continuous stroke monitoring and secondary prevention.

A thorough and consistent neurological examination by nurses is a cornerstone of high-quality stroke care. By understanding the principles and key elements of stroke assessment, nurses can play an active role in improving patient outcomes and ensuring seamless multidisciplinary collaboration across the stroke care continuum.

Etiologic Classification of Stroke (Why Do We Perform These Studies?) (ICSU Nov. 29 Saturday)

Do Yeon Kim, MD

Department of Neurology, Seoul National University Bundang Hospital

Understanding the etiology of ischemic stroke is fundamental to both acute management and secondary prevention. Although stroke often presents with similar clinical symptoms, its underlying mechanisms are diverse, requiring distinct diagnostic and therapeutic strategies. This lecture introduces the etiologic classification of ischemic stroke—large artery atherosclerosis (LAA), cardioembolism (CE), small vessel occlusion (SVO), other determined (OD), and undetermined (UD)—and explains why identifying the exact cause is clinically crucial.

The session will review the principles of the Trial of Org 10172 in Acute Stroke Treatment (TOAST) and MRI-based MAGIC classification algorithm, which systematically differentiates stroke subtypes through neuroimaging and cardiovascular evaluation. Practical diagnostic tools such as vessel wall MRI, multi-detector CT, echocardiography, Holter monitoring, and transcranial Doppler will be discussed in relation to their role in identifying vascular lesions, embolic sources, and perfusion deficits.

By linking pathophysiologic concepts with real-world diagnostic pathways, this lecture aims to help nurses understand how etiologic classification guides appropriate antithrombotic therapy, risk-factor control, and patient education. Recognizing the mechanism of stroke is not only a matter of academic classification—it is the foundation of personalized and evidence-based nursing care for stroke patients.

Secondary Prevention for Stroke (How to Guide The Patients for Better Outcome)

Seong Ho Park

Hanyang University College of Medicine

Nursing Symposium

Procedures for Stroke Patients (TFCA, Stent, Thrombectomy, CEA, Craniotomy) (How to Explain These Procedures to The Patients)

Jeong Yoon Lee

Soon Chun Hyang University Hospital Seoul

Risk Factors & Management of END (How to Look Closely and How to Manage These Patients)

Minwoo Lee

Hallym University Sacred Heart Hospital

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November 29 (Sat) 12:40 - 13:40 I Room A

Luncheon Symposium 5:
Managing Anticoagulation in Stroke Patients : Tailored Strategies with Edoxaban
[ENG]

CHAIRS

Oh Young Bang (Samsung Medical Center)

Real-World Anticoagulation for Secondary Stroke Prevention

Yerim Kim, MD, PhD

Department of Neurology, Kangdong Sacred Heart Hospital, Hallym University College of Medicine

Background

Atrial fibrillation (AF) accounts for about 20% of ischemic strokes and is linked to greater severity and mortality. Despite strong evidence supporting oral anticoagulation (OAC), real-world data show underuse and suboptimal control, especially in Asians. NOACs have emerged as safer and more effective alternatives to warfarin.

Guidelines and Timing

Current ESC, EHRA, KHRS, and AHA/ASA guidelines recommend NOACs as first-line agents for stroke prevention in AF. Anticoagulation should begin according to stroke severity (the "1–3–6–12 day rule"), while reinitiation after ICH is advised after 4–8 weeks.

Clinical Evidence

The TIMING (2022) and ELAN (2023) trials demonstrated that early NOAC initiation after acute ischemic stroke is non-inferior to delayed treatment, with no excess bleeding risk. These findings support early secondary prevention when bleeding risk is low.

Conclusion

NOACs offer a safe and effective strategy for secondary stroke prevention in AF patients. Early initiation guided by clinical and imaging criteria enhances outcomes, emphasizing the need for individualized, guideline-based management in real-world practice.

Tailored Anticoagulation with Edoxaban in Complex Stroke Patients

Jaeseob Yun

Keimyung University Dongsan Hospital

Abstract

Managing Anticoagulation in Stroke Patients: Tailored Strategies with Edoxaban

Stroke remains one of the leading causes of death and disability worldwide, and atrial fibrillation (AF) is among the most important risk factors contributing to cardioembolic stroke. Oral anticoagulation is the cornerstone of secondary stroke prevention in patients with AF, but its optimal use in clinical practice remains challenging. Balancing the risks of recurrent ischemic events against those of major bleeding requires individualized treatment strategies that account for patient age, comorbidities, renal function, and concomitant medications.

In recent years, direct oral anticoagulants (DOACs) have largely replaced warfarin as the preferred agents for stroke prevention in AF, supported by strong evidence of efficacy, safety, and ease of use. Among them, edoxaban, a selective factor Xa inhibitor, has demonstrated noninferior efficacy and superior safety in reducing hemorrhagic stroke and major bleeding compared with warfarin in pivotal trials such as ENGAGE AF-TIMI 48. Importantly, edoxaban provides advantages in elderly and frail patients—populations at particularly high risk of both stroke and bleeding—where simplified dosing and favorable pharmacokinetics support its clinical utility.

However, the management of anticoagulation in stroke patients extends beyond AF alone. Real-world clinical practice increasingly encounters diverse and complex situations: patients with cryptogenic or embolic stroke of undetermined source (ESUS), those with concurrent coronary artery disease requiring antiplatelet therapy, patients with cancer-associated stroke, and individuals undergoing acute interventions such as endovascular thrombectomy. Each of these scenarios requires nuanced consideration of when to initiate or resume anticoagulation, how to select the appropriate agent, and how to balance combined therapies to optimize safety and efficacy.

This lecture will provide a practical, case-based approach to tailoring anticoagulation strategies in stroke patients. Key topics will include:

1.Risk stratification in AF-related stroke – incorporating CHA_2DS_2-VASc and HAS-BLED scores, as well as imaging biomarkers and frailty assessment, into clinical decision-making.

2.Timing of anticoagulation initiation after acute ischemic stroke – reviewing recent evidence on early versus delayed initiation, including trials such as ELAN, TIMING, and START.

3.Anticoagulation in special populations – elderly, renal impairment, patients with high bleeding risk, and those with concurrent indications for antiplatelet therapy.

4.Integrating edoxaban into practice – exploring its unique clinical profile, safety data, and practical dosing strategies, with a focus on real-world applications in Asian patients.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 29 (Sat) 12:40 - 13:10 I Room B

Luncheon Symposium 6 [ENG]

CHAIRS

Hee-Joon Bae (Seoul National University Bundang Hospital)

Next neuroprotective agent : Ginkgo biloba ext.

Chi Kyung Kim

Korea University Guro Hospital

Treatment of Anti-Platelet in Stroke patients & Solution of poly-pharmacy

Sung-Ho Ahn

Department of Neurology, Pusan National University School of Medicine, and Research Institute for Convergence of Biomedical Science and Technology, Pusan National University Yangsan Hospital, Korea

Abstract

Antiplatelet therapy is foundational for secondary prevention after non-cardioembolic ischemic stroke and high-risk transient ischemic attack (TIA). In East Asian populations, however, two concurrent features complicate a one-size-fits-all approach: (i) a high burden of intracranial atherosclerosis (ICAS), which elevates early recurrence risk, and (ii) a high prevalence of cerebral small-vessel disease (SVD)—including white-matter hyperintensities (WMH), lacunes, and cerebral microbleeds (CMBs)—which increases intracranial hemorrhage (ICH) risk. These opposing hazards mandate phenotype-guided selection and duration of antiplatelet therapy, alongside rigorous control of medication complexity to prevent bleeding from drug–drug interactions and therapeutic redundancy.

We outline a pragmatic, evidence-aligned framework for East Asian stroke patients that (1) stratifies ischemic and hemorrhagic risks using clinical and imaging markers, (2) specifies timing and agent choice across acute, subacute, and maintenance phases, and (3) embeds a structured solution to poly-pharmacy that reduces adverse events without compromising efficacy. Accordingly, personalized cerebrovascular care should adopt a tiered pathway anchored to three axes: (A) ischemic risk drivers (symptomatic ICAS, multifocal large-artery stenoses, active plaque features, early recurrent events); (B) hemorrhagic risk drivers (high SVD burden, lobar vs deep CMB pattern, prior ICH, uncontrolled hypertension, concurrent anticoagulants/NSAIDs); and (C) pharmacogenomic/pharmacokinetic context (CYP2C19 loss-of-function alleles common in East Asians, acid-suppression strategy, renal function, frailty).

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 29 (Sat) 14:00 - 15:55 I Room B

한국뇌졸중유전체연구회 심포지엄 [KOR]

CHAIRS

Jay Chol Choi (Jeju National University Hospital)

Updates and Recent Trends of the ACMG Guidelines

Boram Kim

Department of Laboratory Medicine, Korea University Guro Hospital, Seoul, Korea

The introduction of next-generation sequencing (NGS) into clinical practice has led to an explosive increase in the demand for genetic variant interpretation. In this context, the standards and guidelines for the interpretation of sequence variants were published in 2015 by Sue Richards and the American College of Medical Genetics and Genomics Laboratory Quality Assurance Committee (ACMG guidelines). These guidelines have served as the gold standard for laboratory and clinical genetic diagnostics, providing a robust, evidence-based framework for classifying genetic variants into five well-defined categories.

However, the guidelines have several limitations. Their broad approach can result in ambiguity when interpreting variants for specific genes or diseases. In addition, subjectivity in evidence weighting and differences in how individual laboratories apply the criteria often lead to inconsistent variant interpretations, with the same variant sometimes classified differently by different labs. Furthermore, there is a frequent classification of variants as "variants of uncertain significance (VUS)," leaving many findings clinically unresolved and limiting clear clinical decision-making. The original guidelines lack detailed recommendations for interpreting complex or rare variant types, as well as contain insufficiently defined thresholds for population frequency data.

In recent years, the ACMG has implemented key updates and refinements to streamline variant classification, including the introduction of disease- and gene-specific specifications to address ambiguities and improve interpretive consistency among laboratories. Noteworthy trends include increased adoption of quantitative, point-based frameworks and Bayesian models to harmonize evidence weighting and facilitate precise variant interpretation. Furthermore, collaborations with ClinGen and other organizations have facilitated regular updates of actionable gene lists, notably expanding secondary findings and leveraging new digital resources such as ClinGen's web-based tools for laboratories.

Ongoing updates continue to emphasize consensus-driven, evidence-based recommendations and transparency in guideline development, with a focus on maintaining clinical utility amid evolving technologies such as NGS and expanding genomic data. These continuous improvements aim to enhance the reliability, specificity, and relevance of variant interpretation, ultimately benefitting patient care and clinical genomics worldwide.

Multiomics 분석기술의 소개 및 이해

Soo Ji Lee

Seoul National University Graduate School of Public Health

This session provides an accessible overview of multiomics approaches, ranging from genotyping and genome sequencing to transcriptomic and other omics analyses, that are transforming our understanding of human diseases, including stroke. Participants will gain a foundational understanding of how these technologies generate and integrate omics data to uncover biological mechanisms and guide translational research. The presentation also highlights essential considerations for data quality, harmonization, and biobank infrastructure that underpin reliable multiomics investigations in clinical and research settings.

Introduction to the Korea National Genome Project

Ji Hwan Park, Ph.D.

Department of Biological Science, Ajou University, Suwon, Korea

A new wave of precision medicine has become an inevitable consequence of a drastic improvement in related technologies, including high-throughput sequencing and data analysis and sharing. Here, we briefly introduce the National Genome Project (NGP), recently rebranded as BioBigData-Korea (BIKO), which provides genome and clinical information from up to 25,000 participants during a pilot phase: rare disease, cancer, and autism spectrum disorder patients and healthy participants. The NGP has been designed to encourage the scientific community to perform integrative analyses with the large-scale genome and clinical data, while protecting the participants' privacy and securing data confidentiality. Our consortium generated whole genome sequencing (WGS) data from the collected blood or saliva samples. Furthermore, we have established the processing and quality control pipelines for the WGS data to call germline or somatic variants with consistency and confidence. All these processed WGS data and clinical information have been stored in the Research Environment Platform and provided to the scientific community, enabling the researchers to conduct a multitude of integrative data analyses in the secured workspace.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 29 (Sat) 16:15 - 18:00 I Room B

Genesis-K [KOR]

CHAIRS

Juneyoung Lee (Department of Medical Statistics, Korea University College of Medicine)
Soo Ji Lee (Seoul National University Graduate School of Public Health)

Update of study progress of GENESIS-K

Jonguk Kim

Seoul National University Bundang Hospital

The GENESIS-K study is the first large-scale, multicenter genomic cohort project in Korea aimed at identifying genetic factors influencing drug response and adverse effects in stroke patients, and implementing precision medicine in clinical practice. While pharmacogenomics-based targeted therapy has already become standard care in oncology, it has not yet been effectively applied in stroke medicine to guide individualized drug selection or predict treatment-related risks. To bridge this gap, GENESIS-K established a nationwide collaborative network of more than 30 major stroke centers since 2023, integrating clinical, imaging, and genomic data within a unified platform. Through the web-based registry system (www.strokedb.or.kr), patient enrollment, data entry, and specimen tracking are performed in near real time. All specimens are processed in a central laboratory for DNA extraction, aliquoting, long-term storage, and genomic analysis. By the end of 2025, more than 4,000 patients have been enrolled, fulfilling the first-phase target, and weekly newsletters provide each site with updates on recruitment status and consent rates. In addition, the Korean Stroke Genomics Research Network was launched to strengthen clinical and research capacity through regular workshops, symposia, and training programs. Hosting the International Stroke Genomics Consortium (ISGC) workshop in Seoul further established a foundation for global collaboration.

During the early phase, discrepancies between the Illumina Asian chip and the KoGES Korean chip resulted in a genomic inflation factor (λ) of 1.45, but iterative quality control and imputation reduced it to 1.05, ensuring analytical reliability. This improvement positioned the GENESIS cohort as a potential national reference for future genomic research. To enhance clinical utility, an automated reporting system was developed based on the Clinical Pharmacogenetics Implementation Consortium (CPIC) guidelines. The system provides both a simplified clinical summary and a detailed report describing the functional implications of each genotype. Fourteen key genes—including CYP2C19, SLCO1B1, APOE, and RNF213—were prioritized, and ongoing analyses compare the allele frequency distributions in Korean patients with those in the UK Biobank.

In parallel, the study is conducting polygenic risk score (PRS) analyses to predict drug efficacy at a multigenic level. In the first example focusing on statin response, a European-derived PRS significantly predicted LDL-C reduction among Korean stroke patients: each standard deviation increase in PRS was associated with a 1.3-fold higher likelihood of achieving LDL-C <70 mg/dL, and patients in the top PRS quartile had more than double the success rate compared with those in the lowest quartile. These findings demonstrate the cross-ancestry transferability of pharmacogenomic PRS and pave the way for future predictive models for various drug classes, including antiplatelets and anticoagulants.

Furthermore, the GENESIS cohort is being linked with data from the National Health Insurance Service and Health Insurance Review and Assessment Service to obtain longitudinal information on medication adherence, adverse events, and long-term outcomes such as stroke recurrence and cognitive decline. This integration enables comprehensive analyses of pharmacogenomic effects across the post-stroke continuum and provides a foundation for AI-driven predictive modeling of drug response. Currently, GENESIS is actively collaborating with major international genomic cohorts, including DISCOVERY and ERICH-GENE in the United States, STROMICS in China, and Biobank Japan, to elucidate genetic determinants of stroke recurrence, cognitive impairment, and drug responsiveness across populations. Ultimately, GENESIS aims to develop clinically actionable prediction tools combining polygenic and clinical data, establishing a precision medicine platform that supports individualized drug therapy and adverse event prevention for stroke patients.

Early-onset stroke GWAS

Jeeeun Kim

Seoul National University Graduate School of Public Health

Abstract:

Given its substantial burden and evidence for a stronger genetic contribution than in late-onset stroke, early-onset stroke (EOS) is a priority for mechanistic discovery and prevention. This session introduces the application of genome-wide association studies (GWAS) to EOS. As a genome-wide discovery approach, GWAS is well suited to mapping genetic susceptibility across diverse populations and to translating findings through LD-informed fine-mapping and functional annotation. Applied to EOS, GWAS may identify susceptibility loci and generate hypotheses about disease-relevant pathways. The presentation outlines key elements for study design, analysis, and clinical translation, and aims to provide practical insights for EOS research.

Functional recovery GWAS

Jeong Yoon Lee

Soon Chun Hyang University Hospital

Stroke recurrence GWAS

Do Yeon Kim, MD

Seoul National University Bundang Hospital

Polygenic risk scores (PGS) have emerged as promising tools for genetic risk stratification in complex diseases, including ischemic stroke (IS). The GIGASTROKE project established an integrative polygenic score (iPGS) that combines ancestry-specific stroke GWAS data with genetic determinants of vascular risk factors, demonstrating predictive utility across populations. However, most validation cohorts have consisted of older adults. Because genetic predisposition plays a larger role in early-onset stroke, we aimed to assess the performance and clinical relevance of the GIGASTROKE iPGS in young Korean patients with IS.

(1) Part I investigates whether the GIGASTROKE iPGS discriminates young-age stroke cases (GENE-YAS cohort, ≤55 years) from population controls (KoGES cohort) and whether this association is mediated by conventional vascular risk factors.

(2) Part II examines whether the iPGS predicts stroke recurrence among GENE-YAS patients and compares its predictive performance with a Japan-derived metaGRS.

GENE-YAS includes over 4,000 acute stroke patients from 15 Korean centers (2018–2023) genotyped with the Illumina Asian array, harmonized with 72,298 KoGES controls genotyped with the KoreanChip. Rigorous quality control, phasing, and imputation will be performed, leveraging 839 overlapping samples for cross-platform calibration. The East Asian iPGS for IS from GIGASTROKE and the metaGRS from BioBank Japan will be computed.

In Part I, iPGS distributions between cases and controls will be compared and discriminative performance for stroke occurrence will be quantified by AUC, and mediation analyses will estimate the proportion of genetic effects explained through vascular risk burden.

In Part II, recurrence data will be obtained by linkage with national claims using the Recurrence-Stroke Identification Algorithm. Cox models will estimate hazard ratios for recurrence per iPGS quantile, with subgroup analyses by age, vascular risk, and stroke subtype. Comparative analyses will assess whether iPGS or metaGRS provides superior prognostic discrimination.

We hypothesize that the iPGS will effectively distinguish young-age stroke from population controls and that a higher iPGS will correlate with increased recurrence risk, particularly in subgroups with low environmental risk. Partial mediation by vascular factors would suggest additive genetic-environmental contributions, while persistent direct effects would indicate independent genetic pathways.

This study will provide the first evaluation of the GIGASTROKE iPGS in young-onset stroke within an East Asian population. Demonstrating its ability to predict both stroke occurrence and recurrence will clarify the role of polygenic risk in early cerebrovascular disease and inform precision prevention strategies tailored to genetically susceptible individuals.

PGS study for statin effect

Eung-Joon Lee

Seoul National University Hospital

Genesis-K

Variant reclassification in targeted gene panel

Keon-Joo Lee

Korea University Guro Hospital

Systematic reclassification of variants of uncertain significance (VUS) or novel variants in established monogenic stroke-associated genes can refine genetic diagnosis. Large early-onset stroke cohorts with next-generation sequencing (NGS) data enable such reassessment using updated ACMG/AMP guidelines and population-specific resources. We conducted a systematic reclassification of uncertain or novel variants in these genes using targeted sequencing data from a large early-onset ischemic stroke cohort. Variants were reassessed with updated ACMG/AMP criteria, incorporating population-specific allele frequencies, in silico prediction tools, and variant-level functional considerations. The findings of this analysis will be presented.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 08:00-08:50 I Poster Room (Sydney)

Poster Session 1

CHAIRS

Hahn Young Kim (Konkuk University Medical Center, Korea)
Jinkwon Kim (Yongin Severance Hospital, Korea)

Device Selection and Outcomes in Mechanical Thrombectomy for Large Vessel Occlusion: A Subanalysis of the K-NET Registry

Yuichiro Kushiro[1], Toshihiro Ueda[2], Masataka Takeuchi[3], Masafumi Morimoto[4], Ryo Yamamoto[5], Yoshifumi Tsuboi[6], Satoshi Takaishi[2], Kentaro Tatsuno[2], Noriko Usuki[2], Hidemichi Ito[2], Hidetoshi Murata[1]

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Purpose

Mechanical thrombectomy (MT) is the established standard of care for large vessel occlusion (LVO); however, the optimal device strategy remains uncertain. This study evaluated baseline characteristics and clinical outcomes according to thrombectomy devices, using data from the Kanagawa Intravenous and Endovascular Treatment of Acute Ischemic Stroke (K-NET) registry, a multicenter prospective study across 40 institutions in Kanagawa Prefecture, Japan.

Methods

Between 2018 and 2021, 3,187 patients undergoing MT were registered. Patients were categorized into three groups: stent retriever (SR, n=464), aspiration catheter (Asp, n=592), and combined technique (Combined, n=2,008). Device selection was determined by each institution. The primary endpoint was a favorable outcome, defined as a modified Rankin Scale (mRS) score of 0–2 at 90 days. Secondary endpoints were successful reperfusion, symptomatic intracranial hemorrhage (sICH), and mortality. Functional outcomes were compared after adjustment for baseline factors using propensity score analysis stratified by occlusion site.

Results

Patients in the Combined group were older, had higher baseline NIHSS scores, and more frequently presented with ICA occlusions (30%). This group showed the longest puncture-to-reperfusion (PTR) time (median 54 min), the lowest reperfusion rate (88%), and the lowest rate of favorable outcomes (37.3%). The Asp group, which included more BA/VA occlusions (14.9%), achieved the shortest PTR time (median 32 min) and the highest proportion of favorable outcomes (49.2%), with fewer sICH and SAH events. The SR group more often had MCA occlusions (68.5%), achieved the highest reperfusion rate (92%), but also had the highest SAH rate (15.3%). By occlusion site, the Asp group showed the best outcomes for ICA (43.2%) and M1 (52.6%) occlusions, while the SR group had the best outcomes for M2/M3. For BA/VA occlusions, the Asp group had numerically favorable outcomes, though not statistically significant. In propensity score–matched analysis, the Asp group demonstrated significantly better outcomes for ICA, M1, and BA/VA occlusions compared with other groups, whereas no significant differences were observed for M2/M3.

Conclusions

In this K-NET subanalysis, the Asp group achieved the shortest PTR times and most favorable functional outcomes, particularly for ICA, M1, and BA/VA occlusions. The Combined group, often used in severe ICA cases, showed less favorable results. These findings suggest that device selection should be tailored according to occlusion site to optimize outcomes.

Predicting Functional Outcome After Mechanical Thrombectomy in Acute Ischemic Stroke: A Structural Equation Model of Age Mediated by Brain Frailty on Pre-Thrombectomy MRI

Yoonkyung Lee[1,2], Junho Sung[1], Dae-Hyun Kim[1,2], Jung Hwa Seo[1,2], Jin-Heon Jeong[1,2], Seungho Lee[3], Jae-Kwan Cha[1,2]

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Purpose

In patients undergoing mechanical thrombectomy (MT) for anterior circulation large vessel occlusion (LVO) in acute ischemic stroke (AIS), the role of brain frailty assessed via pre-treatment MRI remains unclear. Brain frailty assessed by pre-treatment MRI to evaluate its impact on 3month functional outcomes in anterior circulation AIS patients undergoing MT.

Methods

We retrospectively analyzed 264 patients with acute anterior circulation large vessel occlusion who underwent mechanical thrombectomy. Brain frailty was defined using global cortical atrophy, white matter hyperintensity (Fazekas score), and the presence of old cortical infarctions and lacunes. Structural equation modeling was applied to assess the direct and indirect effects of age on 3-month functional outcome (mRS), mediated by brain frailty.

Results

Brain frailty was directly associated with poor 3-month outcome ($\beta = 0.36$, $p = 0.003$). Age was positively associated with brain frailty ($\beta = 0.17$, $p < 0.001$) and showed a significant indirect effect on poor outcome through brain frailty ($\beta = 0.054$, 95% CI 0.028–0.080, $p < 0.001$). The direct effect of age on outcome was not significant, supporting a full mediation model. Additional analyses showed that higher NIHSS, severe hypoperfusion intensity ratio, and failed reperfusion were independently related to poor outcome. Logistic regression confirmed that brain frailty was significantly associated with poor functional outcome (OR = 2.53, 95% CI 1.14–5.63, $p = 0.023$).

Conclusions

Brain frailty on pre-treatment MRI independently predicted poor 3-month outcome after mechanical thrombectomy for anterior circulation AIS, providing prognostic value beyond reperfusion status and age. Considering brain frailty may improve outcome prediction in clinical practice.

Comparative Clinical Outcomes After Endovascular Thrombectomy in Acute Stroke Patients With and Without Cancer: A Korea–Taiwan Registry Analysis

Cheng-Yang Hsieh[1], Meng-Tsang Hsieh[2, 3], Yong Soo Kim[4], Chih-Hao Chen[5], Yi-Chen Hsieh[6], Jong-Moo Park[7], Chun-Jen Lin[8], Kyusik Kang[9], Yu-Wei Chen[10], Soo Joo Lee[11], Meng Lee[12], Jae-Kwan Cha[13], Kuan-Hung Lin[2], Tai Hwan Park[14], Chih-Wei Tang[15], Kyungbok Lee[16], Jun Lee[17], Keun-Sik Hong[18], Te-Yuan Chen[19], Kyung-Ho Yu[20], Cheng-Yu Wei[21], Dong-Eog Kim[22], Hsu-Ling Yeh[23], Joon-Tae Kim[24], Po-Lin Chen[25], Jay Chol Choi[26], Jee Hyun Kwon[27], Dong-Ick Shin[28], Sung-Il Sohn[29], Hung-Yi Chiou[30], Chulho Kim[31], Kwang-Yeol Park[32], Chi Kyung Kim[33], Li-Ming Lien[23], Sung Hyuk Heo[34], Jiunn-Tay Lee[35], Lung Chen[36], Sheng-Feng Sung[37], Sung-Chun Tang[5], Beom Joon Kim[4]

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Purpose

Endovascular thrombectomy (EVT) is a mainstay of treatment for large vessel occlusion stroke, but its role in patients with active or historical malignancy remains poorly defined. Few studies have examined temporal changes in EVT usage and outcomes among this vulnerable population. We aim to evaluate trends in EVT treatment patterns and outcomes among stroke patients with cancer and to compare procedural and clinical results with non-cancer patients across time.

Methods

Using prospectively collected data from a binational registry (Korea and Taiwan), we analyzed consecutive patients with acute ischemic stroke who underwent EVT between 2011 and 2023. Patients with cancer were identified, and propensity score matching (1:2) was used to create balanced cancer and non-cancer cohorts. Outcomes included reperfusion success, symptomatic intracranial hemorrhage (SICH), early neurological deterioration (END), in-hospital mortality, 90-day mortality, and functional independence. We also explored temporal trends in EVT practice and outcomes among cancer patients.

Results

Among 6,526 patients treated with EVT, 473 (7.2%) had a cancer history. Technical success and hemorrhagic complications were comparable between groups, but cancer patients had higher END (17.0% vs 10.4%), in-hospital death (19.0% vs 8.6%), and lower odds of functional independence at 90 days. Over time, the proportion of cancer patients receiving EVT increased, while SICH rates declined and reperfusion rates improved. However, long-term functional outcomes did not show a corresponding improvement, possibly due to broader inclusion of patients with advanced cancer or reduced physiological reserve.

Conclusions

While EVT remains technically safe in stroke patients with cancer, their clinical outcomes lag behind. Our data suggest increasing physician confidence in treating this population, alongside procedural refinement. However, tailored strategies are needed to optimize long-term recovery in cancer-associated stroke.

Acknowledgement

The Taiwan Stroke Society funds the Taiwan Registry of Endovascular Thrombectomy for Acute Ischemic Stroke. This work was partly supported by the Tainan Sin Lau Hospital Research Program under grant SLH-114-05. The sponsors had no role in the design and conduct of the study, the interpretation of the data, or the decision to submit the study for publication.

Impact Of Age On Clinical Outcomes After Endovascular Thrombectomy In Patients With Large Ischemic Stroke

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Purpose

Limited high-quality data are available to demonstrate the impact of age on recanalization rates and clinical outcomes in patients with large ischemic strokes undergoing endovascular thrombectomy (EVT). This study aimed to evaluate the association between age and clinical outcomes after EVT in patients with large-core infarcts in a real-world setting.

Methods

We retrospectively analyzed data from a prospective, multicenter cohort study of patients with large ischemic strokes due to anterior circulation large vessel occlusion within 24 hours (August 2023-September 2024). Patients were stratified into four age groups: <60, 60-69, 70-79, and ≥80 years. Large infarcts were defined as ASPECTS 0-5 on non-contrast CT or MRI. Primary outcomes were favorable outcome (modified Rankin Scale score of 0-3) and mortality at 90 days. Secondary outcomes included procedure times and rates of successful recanalization (mTICI 2b-3).

Results

A total of 403 patients with large infarcts were included (36.2% women; median [IQR] age, 64 [54-71] years). Older age groups had higher rates of atrial fibrillation and baseline glucose levels (P<.001 and P=.006, respectively). No significant differences were observed across age groups in procedure times (P=.154) or rates of successful recanalization (P=.295). The proportion of patients achieving favorable outcome decreased with age, from 68.2% in those <60 years (101 of 148 patients) to 24.3% in those ≥80 years (9 of 37 patients) (P<.001), while mortality increased from 12.4% (17 patients) to 32.3% (10 patients) (P<.001). Older age independently predicted both poor functional outcomes (OR=1.07; P<.001) and higher mortality (OR=1.09; P<.001).

Conclusions

Age was a significant predictor of functional outcomes after EVT in patients with large ischemic stroke, despite having no significant impact on procedural performance or recanalization success. These findings underscore the need for tailored post-EVT management strategies in elderly populations.

Acknowledgement

We would like to express our gratitude to all the clinicians, neurologists, interventionists, imaging and laboratory technicians and statisticians for their contributions to the data collection and analysis for this study

Impact of pre-stroke Angiotensin-Converting Enzyme inhibitors (ACEi) on pneumonia during acute stroke: An Asian perspective

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Purpose

Stroke-associated pneumonia is a major contributor to morbidity and mortality in acute stroke care. Previous studies have shown that angiotensin-converting enzyme inhibitors (ACEi) may reduce the risk of post-stroke pneumonia. However, the impact of pre-stroke ACEi use on the occurrence of pneumonia during acute stroke remains unclear, prompting the need for this study.

Methods

This prospective observational study involved reviewing 11,398 patients admitted to 15 Malaysian public hospitals with acute stroke. Data on demography, WHO stroke classification, clinical assessment and Glasgow Coma Scale (GCS) at presentation, stroke recurrence, stroke-related pneumonia and outcomes were extracted from the Malaysian National Neurology Registry. Descriptive analyses and multivariable logistic regressions were performed to evaluate the pre-stroke ACEi effect on stroke-related pneumonia and clinical outcomes.

Results

More than half (56%) of patients were male, with an average age of 62.5±12.47 years. About 78.5% had first-ever stroke and nearly 80% were ischaemic stroke. Up to 14.6% had stroke-related pneumonia during hospitalization, with one-fifth of total mortality being attributable to stroke-related pneumonia. About 15.9% were prescribed on ACEi before their first-ever stroke, compared to 27.1% with recurrent event. Adjusting for demographics, GCS at presentation, stroke recurrence and classifications, diabetes and smoking status, patients on ACEi prior to acute stroke had lower risk of developing pneumonia (OR=0.74, 95%CI 0.63, 0.86; p<0.001) and lower risk of succumbing to stroke-related pneumonia (OR=0.66, 95%CI 0.45, 0.96; p=0.032), compared to their counterparts without ACEi. Subgroup analyses observed similar effects on reduction in occurrence of pneumonia (OR=0.687, 95%CI 0.56, 0.84; p<0.001) and pneumonia-related mortality (OR=0.60, 95%CI 0.37, 0.99; p=0.045) among patients with first-ever stroke, but not in those with recurrent stroke (p=0.317 and p=0.309, respectively). Besides, pre-stroke ACEi also observed a reduction in all-cause mortality during acute stroke (OR=0.65, 95%CI 0.51, 0.83; p<0.001).

Conclusions

This study demonstrated that ACEi prior to first-ever stroke may confer protective effect against stroke-related pneumonia and associated mortality during acute stroke event. It may be worth for a prospective trial to confirm its potential beneficial effect among patients with high risk for stroke.

Acknowledgement

The authors would like to express gratitude to the Malaysian National Stroke Registry Group and the Director-General of Health, Malaysia for his approval to present this study.

Evaluation of Nutritional Management During the Vasospasm Period in Clazosentan Treatment After Subarachnoid Hemorrhage

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Purpose

Clazosentan (CLZ), an endothelin receptor antagonist, has gained attention in Japan for preventing cerebral vasospasm following subarachnoid hemorrhage (SAH). However, fluid retention remains a major adverse effect. Previous studies have suggested an association between CLZ discontinuation and hypoalbuminemia. This study investigated nutritional management strategies to ensure safe and effective CLZ treatment.

Methods

We retrospectively analyzed patients who received CLZ after SAH surgery between August 2022 and August 2025. Patients were divided into two groups: those who completed CLZ treatment (C group) and those who discontinued it due to adverse effects (D group). Intergroup comparisons were performed using the Mann–Whitney U test, with significance set at $p<0.05$.

Results

Among 51 patients treated with CLZ, 38 (74.5%) completed treatment and 13 (25.5%) discontinued it. Baseline characteristics, including sex, BMI, pre-admission mRS, WFNS grade, aneurysm location, and treatment modality, were comparable between groups. However, significant differences emerged in nutritional and fluid parameters. At 5 and 10 days post-admission, the D group showed markedly higher fluid balance (–21.5 vs. 981 mL, p=0.0763; –255 vs. 559 mL, p=0.0053) and lower oral intake ratios (44.7% vs. 7.7%, p=0.0013; 60.5% vs. 15.4%, p=0.0072). Albumin levels were significantly lower in the D group at admission (4.2 vs. 3.8 g/dL, p=0.0112) and day 5 (3.2 vs. 2.6 g/dL, p=0.007), with only partial recovery at discharge (3.6 vs. 3.2 g/dL, p=0.0370). Pleural effusion occurred more frequently in the D group (39.5% vs. 92.3%, p=0.0010). Clinical outcomes were also worse: delayed cerebral ischemia occurred in 38.5% vs. 10.5% (p=0.0226), and favorable outcome at discharge (mRS 0–2) was achieved in 38.5% vs. 68.4% (p=0.0275).

Conclusions

Patients who discontinued CLZ exhibited hypoalbuminemia, positive fluid balance, and delayed initiation of oral intake, which were associated with poorer clinical outcomes. These findings suggest that albumin-preserving nutrition, early and adequate oral intake, and careful fluid management are essential to minimize adverse effects and maximize the therapeutic benefit of CLZ during the vasospasm period after SAH.

Diagnostic and Prognostic Utility of Inflammatory Hematologic Ratios in Acute Ischemic Stroke: A Receiver Operating Characteristic Curve Analysis

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Purpose

Acute ischemic stroke (AIS) remains a major cause of disability and mortality. Inflammatory hematologic ratios and infarct volume have been explored as prognostic markers, but their clinical utility requires validation through robust statistical approaches. Receiver Operating Characteristic (ROC) curve analysis provides a direct assessment of their diagnostic and prognostic performance. This study aimed to evaluate the predictive accuracy of the neutrophil–lymphocyte ratio (NLR), platelet–lymphocyte ratio (PLR), lymphocyte–monocyte ratio (LMR), mean platelet volume (MPV), Hounsfield unit (HU), and infarct volume in patients with AIS using ROC analysis.

Methods

We retrospectively analysed 126 AIS patients admitted to Dr. Wahidin Sudirohusodo General Hospital, Makassar, Indonesia, between January 2023 and December 2024. Hematological parameters and CT-based HU values and infarct volumes were assessed at admission. Functional outcome was determined at discharge using the modified Rankin Scale (mRS). ROC analysis was applied to establish cut-off values, sensitivity, specificity, and area under the curve (AUC) for each parameter.

Results

ROC analysis identified significant discriminatory cut-offs for NLR (2.84; AUC 0.89; OR 24.48; p<0.001), PLR (152.54; AUC 0.75; OR 7.00; p<0.001), LMR (2.74; AUC 0.81; OR 19.91; p<0.001), and infarct volume (2.33 cm^3; AUC 0.91; OR 45.02; p<0.001). MPV (cut-off 10.1; AUC 0.54; p=0.163) and HU (cut-off 18; AUC 0.54; p=0.130) showed no predictive value. Infarct volume achieved the highest discriminatory accuracy, followed closely by NLR.

Conclusions

ROC curve analysis demonstrates that NLR, PLR, LMR, and infarct volume are reliable predictors of short-term outcomes in AIS, with infarct volume providing the greatest prognostic accuracy. MPV and HU lacked discriminatory capacity. These findings highlight the value of ROC-derived thresholds for integrating inflammatory markers and imaging variables into prognostic assessment in AIS.

Collateral Perfusion Score as a Surrogate of Infarct Growth Rate and Predictor of Futile Endovascular Thrombectomy in Acute Anterior Circulation Ischemic Stroke

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Purpose

Infarct growth rate (IGR) in anterior circulation ischemic stroke determines the therapeutic window and clinical outcomes. Rapid assessment of IGR is critical for personalized endovascular thrombectomy (EVT) decision-making. This study examined whether collateral perfusion score (CPS) can serve as a surrogate marker for IGR and predict futile EVT.

Methods

This secondary analysis of a prospective observational study included patients with acute ischemic stroke caused by steno-occlusion of the unilateral internal carotid artery and/or middle cerebral artery (M1 and M2) within 6 hours of symptom onset. IGR was calculated as baseline diffusion-weighted imaging lesion volume divided by the onset-to-imaging time (ml/min). CPSs were categorized as 5 (excellent), 4 (good), 3 (intermediate-to-good), 2 (intermediate-to-poor), 1 (poor), and 0 (very poor). IGR and CPS were compared using pairwise two-sided multiple comparison analyses. Multiple logistic regression analyses were conducted to assess their predictive value for futile EVT, defined as a modified Rankin Scale score ≥3 at 90 days despite successful recanalization (TICI 2b-3).

Results

A total of 467 participants (mean age ± standard deviation, 72 ± 12; 270 men) were included. CPS showed a significant inverse correlation with IGR (p<0.001). In multivariable analysis of 255 participants, older age (odds ratio [OR], 2.05; 95% confidence interval [CI], 1.49-2.82; p<0.001), higher baseline National Institutes of Health Stroke Scale scores (OR, 1.09; 95% CI, 1.03-1.16; p=0.007), very poor CPS (OR, 11.16; 95% CI, 2.11-58.90; p=0.005), and longer onset-to-recanalization time (OR, 1.10; 95% CI, 1.03-1.19; p=0.006) were independently associated with EVT.

Conclusions

CPS was inversely associated with IGR and independently predicted futile EVT, along with age, baseline stroke severity, and onset-to-recanalization time. These findings support CPS as a practical surrogate for infarct growth dynamics and a useful tool for identifying patients at high risk of futile EVT in clinical practice.

Case Report: Artery of Percheron Infarction Diagnosis By Mri 3 Tesla And Low-Dose Intravenous Thrombolysis Treatment

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Purpose

Background and Objectives: Occlusion of the Percheron artery (AOP) causes bilateral thalamic infarction, often leading to a decline in consciousness. This nonspecific presentation complicates diagnosis, and identifying the presence of AOP infarction is crucial in the treatment with rtPA, low-dose Alteplase, and in late time treatment windows, which can still result in very good recovery outcomes

Methods

Case Presentation A 77-year-old male patient was admitted to the hospital 11 hours ago. The family discovered that the patient was drowsy, unresponsive, and did not answer when callede. The patient was brought to a local hospital by family, where a brain CT scan was performed, but the diagnosis was unclear, and no treatment was administered. On admission, he was anesthetized with a GCS of 7 (E1M5V1), BP 120/80 mmHg, sPO2 98%, painful stimulus response appropriate, pupils 2 mm, with light reflex, and NIHSS score of 35. Medical history: Hypertension, treated intermittently with 5mg Amlodipine. After that about thirty minutes the patient had a magnetic resonance imaging of the head. The MRI showed increased DWI signal within the periventricular white matter consistent with paramedian thalamic nuclei and midbrain involvement (Figures 1), however reduce the signal on the ADC pulse (Figures 2) and acute bilateral ischemic infarction consistent with the AOP occlusion was diagnosed. Treatment:The patient was treated with rtPA (Alteplase) 0.6mg/kg.

Results

After 24 hours of fibrinolytic treatment, the patient could not open his eyes but responded appropriately to pain. After 5 days, the patient was awake, communicated well, and had no weakness. One week later, the patient was alert, occasionally confused, with no weakness, and an NIHSS score of 0

Conclusions

Artery of Percheron obstruction is a rare form of ischemic stroke, but recognition of the possible presence of an AOP obstruction both clinically and in imaging is essential to the administration of time-sensitive treatments, such as mechanical removal of the obstruction or tPAs. This shows that brain MRI to diagnose stroke is very necessary, especially in cases of cerebral infarction in the posterior circulation.

Recurrent Ischemic Stroke in a CYP2C19 Poor Intermadiate Metabolizer A case for Genotype Guided Antiplatelet Therapy

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Purpose

Clopidogrel is commonly used for the secondary prevention of ischemic stroke. However, it is a prodrug that requires hepatic bioactivation via cytochrome P450 enzymes (particularly CYP2C19). The effectiveness of clopidogrel is reduced in individuals carrying loss-of-function CYP2C19 alleles, which are present in approximately 25% of Caucasians and up to 60% of Asians

Methods

We report the case of a 60-year-old Vietnamese male with a history of ischemic stroke approximately 10 years prior, resulting in left-sided weakness and a modified Rankin Scale (mRS) score of 2. The patient had been on secondary stroke prevention therapy with clopidogrel 75 mg/day and atorvastatin 20 mg/day. However, he presented with acute onset of slurred speech, worsening left-sided weakness, and unsteady gait, with mRS increasing to 3. Brain MRI using a 3.0 Tesla scanner revealed new hyperintense lesions in the corona radiata and right centrum semiovale. Time-of-flight (TOF) 3D MRA demonstrated loss of flow signal in the right M1 segment of the middle cerebral artery (MCA) and markedly reduced flow in the left posterior cerebral artery (PCA) (Figure 1). Genetic testing showed CYP2C19 *2 mutant and *3 wild type, consistent with a poor metabolizer phenotype. The patient was switched to a new secondary prevention regimen including cilostazol 100 mg twice daily, aspirin 81 mg/day, and rosuvastatin 20 mg/day. Follow-up MRI at 8 months showed improved flow in the right M1 segment of the MCA and the left PCA (Figure 2). Clinically, the patient demonstrated significant motor recovery with mRS improving to 1

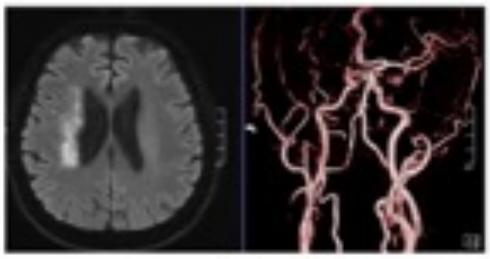
Results

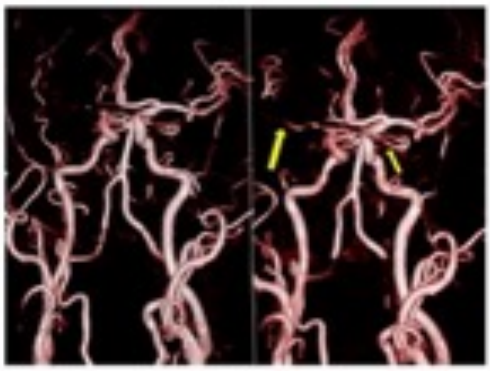
This case highlights the clinical significance of CYP2C19 polymorphisms in guiding antiplatelet therapy. Genotype-guided treatment with cilostazol may improve outcomes in patients with clopidogrel resistance due to CYP2C19 loss-of-function alleles. Long-term dual antiplatelet therapy with cilostazol and aspirin was not associated with an increased risk of bleeding in this patient.

Conclusions

For patients with recurrent ischemic stroke and severe intracranial atherosclerosis, especially in Asian populations with a high prevalence of CYP2C19 polymorphisms, secondary prevention strategies should be guided by pharmacogenetic testing to optimize antiplatelet therapy.

Contents





Prognostic Factors and Timing of Endovascular Therapy in Patients With Active Cancer and Large Vessel Occlusion

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Purpose

Active cancer is a major risk factor for ischemic stroke, often driven by cancer-associated hypercoagulability. While endovascular thrombectomy (EVT) is standard care for large vessel occlusion (LVO), patients with active cancer were underrepresented in pivotal EVT trials. This study aimed to evaluate the impact of treatment timing and identify predictors of outcomes in LVO with active cancer.

Methods

We performed a retrospective, multicenter cohort study of 125 patients with active cancer who underwent EVT for anterior circulation LVO between 2017 and 2024. Patients were categorized as early EVT (<6 hours from last known normal to puncture; n = 71) or delayed EVT (6–24 hours; n = 54). The primary outcome was favorable functional status at 3 months (modified Rankin Scale [mRS] 0–2). Secondary outcomes included discharge mRS, recanalization rates, hemorrhagic transformation, and mortality. Multivariable regression was used to identify predictors of outcome. Subgroup analyses were conducted for cancer-related stroke, defined as cryptogenic embolism with hypercoagulability (D-dimer ≥3 μg/mL).

Results

Recanalization rates were similar across groups (70.3% vs. 64.7%, p > 0.99). Patients treated within 6 hours had better early outcomes, with lower discharge mRS (3 [1, 4] vs. 4 [3, 5], p = 0.003) and a trend toward higher 3-month functional independence (37.5% vs. 21.6%, p=0.162). Independent predictors of favorable outcomes included lower baseline NIHSS, absence of diabetes and systemic metastasis, lower D-dimer levels, and first-pass reperfusion. In the delayed subgroup, larger perfusion–diffusion mismatch volumes were associated with better outcomes (OR 1.072, p = 0.051). Cancer-related stroke patients had particularly poor long-term outcomes, especially those with systemic metastasis (OR 0.169; 95% CI, 0.029–0.978; p = 0.047) or treated beyond 6 hours (OR 0.178, 95% CI 0.018–1.180, p = 0.058), with only 1 of 21 achieving functional independence at 3 months.

Conclusions

Early EVT is associated with improved functional recovery in LVO with active cancer. Although advanced imaging and biomarker-based selection may optimize treatment strategies, EVT performed beyond 6 hours shows limited outcomes in patients with cancer-related stroke or systemic metastasis.

A Statistical Perspective on The Relationship Between High Blood Pressure, High Cholesterol, and Vegetable Consumption and Stroke

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Purpose

Stroke affects millions of individuals annually and is a major worldwide health concern. It happens when a portion of the brain's blood supply is interrupted, leading to the death of brain cells. An important contributing factor to both ischemic and hemorrhagic strokes is high blood pressure. Controlling blood pressure is crucial for lowering the risk of stroke and preserving cardiovascular health in general. Another aspect is that high cholesterol raises the risk of stroke considerably, mainly because it causes atherosclerosis. Plaque, or fatty deposits, accumulate in the arteries with this illness. Therefore, the purpose of this study is to investigate the relationship between high blood pressure, high cholesterol, and vegetable consumption and stroke.

Methods

This study is quantitative in nature and uses secondary binary data from individuals who consume vegetables at least once a day, have high blood pressure, high cholesterol, or have had a stroke. UCI Machine Learning is the source of the data. Binary regression analysis was used to process the data in order to address the study's goals.

Results

High blood pressure, high cholesterol, and vegetable consumption all significantly affect the risk of stroke (chi-square 5326.077, Sig 0.000), according to the Omnibus Tests of Model Coefficients, a statistical test used to assess a model's overall fit. Individually, high blood pressure patients had a considerably higher chance of having a stroke (S.E. 0.024, sig 0.000), and high cholesterol patients had a significantly beneficial effect on stroke risk (S.E. 0.022, sig 0.000). Furthermore, individuals who ate vegetables at least once a day had a lower risk of stroke (S.E. 0.024, sig 0.023). Overall, 7.2% of the variation in stroke incidence can be explained by the predictor variables (Nagelkerke R Square 0.072).

Conclusions

Patients who have high blood pressure and excessive cholesterol may be more susceptible to stroke. Additionally, the risk of stroke might be decreased by eating vegetables at least once a day. Stroke prevention initiatives should concentrate on controlling high

The Impact of Cerebral Microbleeds on Hemorrhagic Transformation and Functional Outcome following Reperfusion Therapy.

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Purpose

In patients presenting with acute ischemic stroke (AIS), we are now more frequently detecting cerebral microbleeds (CMBs) on their pre-treatment Magnetic Resonance Imaging (MRI). This study aimed to investigate the impact of cerebral microbleeds on both hemorrhagic transformation rates and 3-month functional outcomes in AIS patients undergoing reperfusion treatment.

Methods

We conducted a retrospective cross-sectional study of consecutive AIS patients who underwent reperfusion therapy (intravenous thrombolysis and/or endovascular thrombectomy) at our institution between January 2021 and March 2025 in Vietnam. The presence, burden (1-4, 5-9, ≥ 10 CMBs), and location (lobar, deep or both) of CMBs were assessed on pre-treatment T2*-weighted MRI by a consensus of an experienced neurologist and a neuroradiologist. The primary outcomes were any intracerebral hemorrhage (ICH), symptomatic intracerebral hemorrhage (sICH) according to European Cooperative Acute Stroke Study (ECASS) III and the Safe Implementation of Thrombolysis in Stroke-Monitoring Study (SITS-MOST) criteria. The secondary outcome was poor functional outcome (modified Rankin Scale [mRS] score of 4-6) at 3 months.

Results

Among 357 patients included, 332 (93.0%) underwent endovascular therapy alone, 22 (6.2%) received bridging therapy, and 3 (0.8%) underwent intravenous thrombolysis only. CMBs were detected in 68 patients (19.0%), with a maximum count of 22 CMBs in a single patient, 56 (82%) had 1-4 CMBs, 8 (12%) had 5-9 CMBs, 4 (6%) had ≥ 10 CMBs. In the majority of cases, CMBs were observed in the lobar regions of 39 (57%) patients. In comparison with patients with no CMBs, age was higher in patients with CMBs. Any asymptomatic ICH occurred in 156 patients (43.7%), sICH was observed in 25 patients (7.0%) by ECASS III and in 14 patients (3.9%) by SITS-MOST criteria. Poor functional outcome at 3 months was seen in 134 patients (37.5%). The presence of CMBs was associated with higher odds of any ICH on univariable analysis (odds ratio [OR] 2.13; 95% confidence interval [CI] 1.25–3.65; p = 0.01). However, no statistically significant associations were found between CMBs and sICH, or between CMBs and poor functional outcome at 3 months. Neither the burden nor the location of CMBs showed a significant correlation with outcomes.

Conclusions

Pre-treatment CMBs may be useful for predicting the risk of any ICH following reperfusion therapy in AIS. CMBs should not be considered a contraindication to reperfusion therapy in these patients.

Acknowledgement

I would like to express my sincere gratitude to Organizing Committee of ICSU&ICAS 2025. I would like to thank Associate Professor – Doctor Thang Nguyen Huy for his dedicated guidance, and our institution, all colleagues that contribute the successful completion of this study.

Clinical Impact of Post-Recanalization Hemorrhagic Transformation and Its Prediction Using Baseline Non-Contrast CT: Results From a Nationwide Prospective Multicenter Imaging Repository

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Purpose

Hemorrhagic transformation (HT) after recanalization therapy remains a critical concern in acute ischemic stroke management. While severe hemorrhages clearly worsen outcomes, the prognostic impact of mild hemorrhagic transformation and its optimal prediction methods remain uncertain. In this study, we aimed to evaluate clinical significance of all HT subtypes and develop automated HT prediction models based on non-contrast computed tomography (NCCT) image.

Methods

We analyzed 2211 patients receiving intravenous thrombolysis and/or endovascular thrombectomy from the multicenter Clinical Research Collaboration for Stroke in Korea Imaging repository (2022-2024). HT was classified on follow-up imaging of MR or CT. Baseline ischemic lesion volume and Alberta Stroke Program Early CT Score-based net water uptake (ASPECTS-NWU) were quantified on baseline NCCT. Multivariable regression was used to assess the association of HT and 90-day modified Rankin Scale scores. The performance of HT prediction models were compared, the automated imaging model vs. established scores (HAT and SEDAN), using area under the curve (AUC).

Results

HT occurred in 41.2% of patients (HI1: 13.7%, HI2: 16.8%, PH1: 6.5%, PH2: 4.1%). All HT subtypes independently predicted worse functional recoveries with stepwise increasing odds ratios: HI1 (1.77, 95% CI 1.40-2.22), HI2 (2.83, 2.27-3.53), PH1 (4.65, 3.41-6.36), and PH2 (14.76, 9.61-22.90). This association persisted across treatment modalities and vascular territories. For parenchymal hemorrhage prediction, the automated imaging model (NCCT imaging markers combined with clinical variables) achieved superior performance (AUC 0.77; 0.73 – 0.80) than HAT (0.71; 0.68 – 0.75) and SEDAN (0.72; 0.69 – 0.76) scores (both P<0.01 for AUC comparison).

Conclusions

Even mild HI was independently associated with poor functional outcomes after reperfusion therapy. Automated NCCT-derived biomarkers provide superior HT risk prediction compared to conventional scores, offering a practical tool for individualized stroke management in the reperfusion era.

RAPID CTA versus JLK LVO for Large Vessel Occlusion Detection: A Pragmatic Comparison of Performance and Common Pitfalls

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Purpose

Rapid detection of large vessel occlusion (LVO) is crucial for improving outcomes of acute ischemic stroke. This study provides a real-world, head-to-head comparison of two commercial AI tools for automated LVO detection—RAPID CTA (vessel density-based) and JLK LVO (deep learning-based)—in a Korean stroke center.

Methods

We retrospectively analyzed 176 consecutive patients with suspected stroke who underwent both CT angiography and CT perfusion. The performance of RAPID CTA and JLK LVO was compared against expert neuroradiologist consensus using the area under the receiver operating characteristic curve (AUROC). Misclassified cases (false positives [FPs] and false negatives [FNs]) were reviewed to determine their underlying causes.

Results

LVO was confirmed in 53 of 176 patients (30.1%). Both tools demonstrated high and comparable overall performance (AUROC 0.93 for both, p=0.64). The causes for misclassifications were also consistent across both platforms. The most common cause of FPs was high-grade intracranial stenosis mimicking occlusion. The primary cause for FNs was the presence of well-developed collateral flow in distal occlusions, which masks the vessel cut-off. However, a matched-sensitivity analysis revealed different performance trade-offs; at a predefined threshold yielding 83% sensitivity, JLK LVO demonstrated higher specificity than RAPID CTA (0.96 vs. 0.89).

Conclusions

Both RAPID CTA and JLK LVO are effective tools, but they exhibit distinct performance trade-offs. A clear understanding of each tool's common pitfalls and performance trade-offs is crucial for clinicians to effectively integrate these AI results for optimal patient care.

Anatomical variations of the torcular Herophili connecting cerebral venous sinuses on magnetic resonance venography

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Purpose

The torcular Herophili has been known as one of the main structures connecting intracranial venous sinuses. However, anatomical variations of the torcular Herophili to connect the intracranial venous sinuses were frequently observed, and, have not well-understood the types and frequencies of the variations, yet. We evaluated the types and frequencies of anatomical variations of the torcular Herophili regions connecting intracranial venous sinuses using magnetic resonance venography (MRV) findings.

Methods

We retrospectively reviewed MRV of 98 ischemic stroke patients who had no or <1cm of acute ischemic lesions on arterial territory as well as no venous territory lesion on magnetic resonance imaging (MRI). MRV (TR/TE, 37.0/4.5; flip angle, 60°; FOV, 24mm, slice thickness, 1.6mm; matrix, 256x160 matrix, Signa EXCITE 1.5 T imaging unit, GE Healthcare, Milwaukee, Wisconsin) were performed to evaluate intracranial venous system at the same time with MRI and magnetic resonance angiogram for individual patients. We evaluated the anatomical variations and frequencies of the torcular Herophili area by the classifications of the connecting patterns of straight sinus (SS), superior sagittal sinus (SSS) and bilateral lateral sines.

Results

The connecting patterns to the torcular Herophili could be classified into 6 types: Type 1 (9 patients, 9%) showing symmetric connection of both SS and SSS into confluence and symmetric drainage into both lateral sinuses; Type 2 (31 patients, 31%) showing SSS drainage into right lateral sinus, instead, SS drainage into left lateral sinus; Type 3 (4 patients, 4%) SSS drainage into left lateral sinus, instead, SS drainage into right lateral sinus; Type 4 (26 patients, 26%) showing unilateral right lateral sinus drainage of both SSS and SS; Type 5 (5 patients, 5%) showing unilateral left lateral sinus drainage of both SSS and SS; Type 6 (25 patients, 25%) showing variable converging patterns of the both lateral and SS and SSS without the confluence.

Conclusions

The present study observed anatomical variations connecting SS, SSS and lateral venous sinuses to the torcular Herophili area. These findings could provide information to understand variable intracranial venous hemodynamics differently developed in individual patients

Clinical Usefulness of Silent MRA in Follow-up after Coil Embolization for Cavernous Sinus Fistulas

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Purpose

The standard treatment for carotid-cavernous fistula (CCF) is fistula occlusion using detachable coils. However, follow-up imaging is often hampered by metallic artifacts on MRI/MRA, and digital subtraction angiography (DSA) remains the gold standard despite its invasiveness. Recently, Silent MRI with a zero echo time (0TE) sequence has been reported to reduce metal artifacts and enable reliable visualization of vascular structures. We report two CCF cases that silent MRA was useful after coil embolization.

Methods

Case 1: A man in his 60s underwent transarterial embolization for traumatic carotid-cavernous fistula (CCF). Digital subtraction angiography (DSA) immediately after treatment demonstrated residual flow into the inferior petrosal sinus (IPS). Silent MRA performed the following day confirmed persistent IPS flow. However, the flow had disappeared by one week, and DSA at the same time also demonstrated complete occlusion. The findings of the two modalities were consistent.

Case 2: A woman in her 70s underwent transarterial and transvenous embolization for traumatic CCF. Post-procedural DSA demonstrated minimal residual filling of the cavernous sinus without venous reflux. Silent MRA obtained at the same time showed consistent findings, and follow-up at 6 months also confirmed concordant results between DSA and Silent MRA.

Results

In both cases, silent MRA findings were in excellent agreement with DSA, suggesting its value as a noninvasive and repeatable follow-up modality. Previous studies have also shown that Silent MRA offers superior visualization of venous drainage and stented segments compared with conventional TOF-MRA, even in the presence of metallic implants.

Conclusions

Silent MRI demonstrated diagnostic performance comparable to DSA in post embolization follow-up of CCF, providing a promising, low-invasive alternative for repeated surveillance.

Artificial Intelligence and Detection of Anterior Circulation Large Vessel Occlusion on Noncontrast CT: A Multinational Validation and Pivotal Reader Study Demonstrating Improved Clinician Accuracy

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Purpose

Artificial intelligence (AI) algorithms for detecting anterior circulation large vessel occlusion (LVO) on noncontrast CT (NCCT) show promise, but concerns about generalizability across diverse populations and a lack of evidence for improved clinician performance have limited their adoption. We aimed to validate an LVO detection AI algorithm on a multinational, multiethnic cohort and determine its impact on diagnostic accuracy in a pivotal reader study.

Methods

This retrospective study evaluated an AI algorithm on two cohorts: a Korean cohort of 723 subjects (127 with LVO) and a US cohort of 240 subjects (120 with LVO). We assessed AI's standalone performance (AUC-ROC) and compared it to radiologists' interpretations. Subsequently, a multi-reader, multi-case crossover study was conducted with eight physicians on the Korean dataset to measure the change in diagnostic accuracy (AUC, sensitivity, specificity) with AI assistance versus unassisted reading. We also simulated the AI's clinical impact using Net Reclassification Improvement (NRI), Number Needed to Screen (NNS), and Benefit-Harm Ratio (BHR).

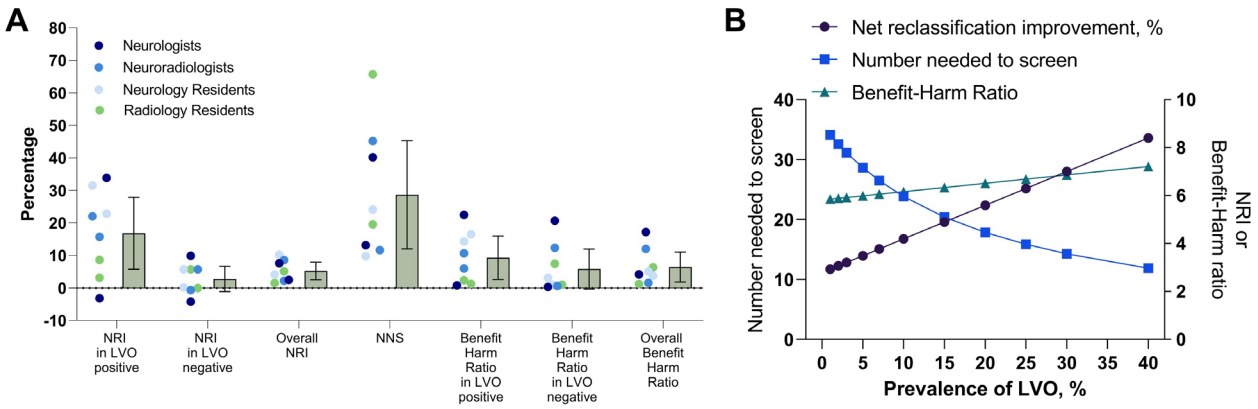
Results

The AI algorithm showed high standalone performance in both the US (AUC 0.899) and Korean (AUC 0.963) cohorts, significantly outperforming radiologists in the US dataset ($p<0.001$). In the reader study, AI assistance significantly improved the mean diagnostic AUC of all physicians from 0.718 to 0.852 ($p<0.001$). This was driven by a substantial increase in sensitivity from 0.513 to 0.685 ($p=0.003$). Neurology residents saw the largest benefit, with their AUC increasing from 0.695 to 0.880. The clinical impact simulation revealed a positive NRI of 5.2%, an NNS of 28.7, and a favorable BHR of 6.4.

Conclusions

In this multinational validation, the AI algorithm was highly accurate, generalizable, and significantly improved the diagnostic performance of clinicians. By enhancing accuracy and acting as a reliable safety net, this tool has the potential to accelerate stroke workflows and standardize care globally.

Contents


A
Neurologists
Neuroradiologists
Neurology Residents
Radiology Residents
Percentage
80
70
60
50
40
30
20
10
0
-10
NRI in LVO positive
NRI in LVO negative
Overall NRI
NNS
Benefit Harm Ratio in LVO positive
Benefit Harm Ratio in LVO negative
Overall Benefit Harm Ratio
B
Net reclassification improvement, %
Number needed to screen
Benefit-Harm Ratio
Number needed to screen
NRI or Benefit-Harm ratio
Prevalence of LVO, %
0
5
10
15
20
25
30
35
40
2
4
6
8

Quantitative Assessment of Intracranial Aneurysms: Comparison of Deep Learning Image Reconstruction and Hybrid Iterative Reconstruction

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Purpose

Precise quantification of intracranial aneurysm dimensions is essential for therapeutic planning and device selection. Although digital subtraction angiography remains the reference standard, advances in CT angiography (CTA) now permit image quality comparable to conventional angiography. We aimed to compare morphometric assessment of intracranial aneurysms and noise characteristics between deep learning image reconstruction (DLIR) and hybrid iterative reconstruction (hybrid-IR).

Methods

A dedicated head phantom containing simulated intracranial aneurysms of known dimensions was scanned with CTA. Image datasets were reconstructed using both hybrid-IR and DLIR. Quantitative analyses included image quality, CT attenuation profiles, edge response distance (ERD), and edge-rise slope (ERS) were analyzed. Aneurysm dimensions—including height, width, and neck diameter—were measured, and mean differences were compared with true aneurysm size. Reconstructions were performed using hybrid-IR and DLIR.

Results

Background and intraluminal noise were significantly reduced with DLIR relative to hybrid-IR (23.9% and 9% reduction, respectively; $p<0.012$). Mean ERS and ERD were consistently shorter with DLIR ($p<0.012$, $p=0.005$, $p=0.004$). Average aneurysm height, width, and neck diameter were 10.97±0.17 mm, 11.39±0.19 mm, and 5.84±0.15 mm with hybrid-IR, and 10.64±0.21 mm, 11.04±0.22 mm, and 5.64±0.14 mm with DLIR. Both techniques slightly overestimated aneurysm size; however, DLIR demonstrated significantly smaller measurement errors than hybrid-IR.

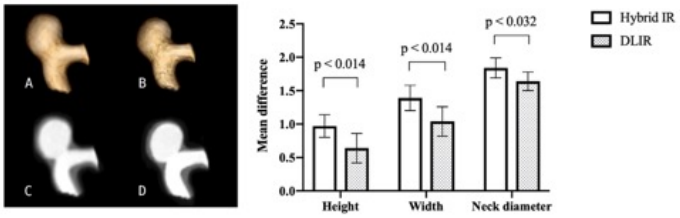
Conclusions

Although CTA tends to overestimate aneurysm dimensions, DLIR provides improved accuracy and reduced noise compared with hybrid-IR. These findings suggest DLIR may enhance aneurysm quantification, with important implications for clinical decision-making, device sizing, and longitudinal monitoring.

Acknowledgement

None

Contents



Association Between Cerebral Oxyhemoglobin Coherence and Perfusion Defects in Acute Ischemic Stroke: A Preliminary Study

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Purpose

Insufficient cerebral perfusion is a well-established risk factor for cerebral ischemia in patients with large artery steno-occlusion. The maintenance of cerebral blood flow depends on autoregulatory mechanisms mediated by myogenic, neurogenic, and endothelial pathways. This study aimed to investigate the relationship between wavelet coherence of cerebral oxyhemoglobin (HbO_2) signals across multiple channels and perfusion abnormalities in acute ischemic stroke, using high-density multi-channel near-infrared spectroscopy (NIRS).

Methods

Thirteen patients diagnosed with acute ischemic stroke were enrolled. Prefrontal HbO_2 data were collected within 24 hours of hospital admission over 30 minutes using a high-density multi-channel NIRS device (NIRSIT-X). Wavelet phase coherence (WPCO) analysis was performed to evaluate the coherence of prefrontal HbO_2 oscillations across five distinct frequency bands: interval I (cardiac activity, 0.6–2 Hz), interval II (respiratory activity, 0.15–0.6 Hz), interval III (myogenic activity, 0.05–0.15 Hz), interval IV (neurogenic activity, 0.02–0.05 Hz), and interval V (endothelial metabolic activity, 0.0095–0.02 Hz). Ipsilateral WPCO was defined as the coherence among channels within the hemisphere containing the ischemic lesion, while contralateral WPCO referred to coherence between the lesion-affected hemisphere and the contralateral side. Based on perfusion imaging, patients were divided into two groups: those with perfusion defects (n=5) and those without (n=8).

Results

Patients with perfusion defects showed significantly lower WPCO values in interval V compared to those without perfusion abnormalities. This reduction was observed in both ipsilateral WPCO (0.463 ± 0.108 in perfusion defect group vs. 0.662 ± 0.083 in without perfusion defect group; P = 0.003) and contralateral WPCO (0.404 ± 0.097 in perfusion defect group vs. 0.561 ± 0.101 in without perfusion defect group; P = 0.019), indicating impaired endothelial metabolic oscillations associated with perfusion deficits.

Conclusions

A decrease in wavelet coherence of cerebral HbO_2 signals within the endothelial metabolic activity frequency is linked to perfusion deficits and ischemic lesions in patients with acute ischemic stroke. These findings suggest that frequency-specific metrics derived from NIRS, especially within interval V, could serve as non-invasive biomarkers for detecting cerebral perfusion impairments in ischemic stroke. However, further studies with larger cohorts are needed to validate these results.

Acknowledgement

None

Development of a Generative Model for Predicting Future Cerebrovascular Changes Using MRA (NOSTRADAMUS study)

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Purpose

Assessing cerebrovascular structure encompasses not only the mechanisms of brain vascular disease but also the prediction of future risk of cerebrovascular diseases. Recent advances in artificial intelligence have enabled us to imagine structural changes in the cerebral artery using generative models. Here, we developed a generative model to predict future changes in cerebrovascular trees and investigate their clinical implications. The NOSTRADAMUS study (Neurovascular Outcome Simulation via Time-series Radiologic Analysis and Deep generative models Applying MRA for Upcoming States) aimed to develop TOF-MRA image specified generation model to imagine brain vessel changes in stroke patients.

Methods

A total of 121 patients were included in this study. Eligibility for inclusion required acute stroke within 7 days among patients enrolled in the Samsung Stroke Registry between January 2017 and December 2020. We utilized several deep learning algorithms to generate future TOF-MRA images. TOF-MRA, clinical, vessel coordinate, and duration data were used to develop TOF-MRA generation models. The attention 3D U-Net model with time2vec embedding and the 3D GAN (generative adversarial network) model were applied to build the future cerebrovascular trees. The comparison of the generated images was conducted using cerebrovascular morphometric analysis.

Results

Across patients, the mean Pearson correlation coefficient between the original after images and the generated images was 0.76 ± 0.01 ($p < 0.001$). The attention 3D U-Net based model showed better generation quality than 3D GAN based model. Cerebrovascular morphometric features in the generated images reflected aspects of both baseline and after images. The generation performance was varied depending on the features and the topological location of the arteries. In the generated images, pial arterial luminal areas were closer to the after images, whereas larger vessels were closer to the before images. In contrast, the min-max diameter ratio was more similar to the after images in larger vessels and to the before images in smaller vessels. Curvature was consistently closer to the after images, regardless of vessel size.

Conclusions

In conclusion, applying deep learning model specialized in effectively learning temporal information, we achieved better future image predictions than the conventional 3D GAN models in medical image processing. Thus, we could intuitively demonstrate the

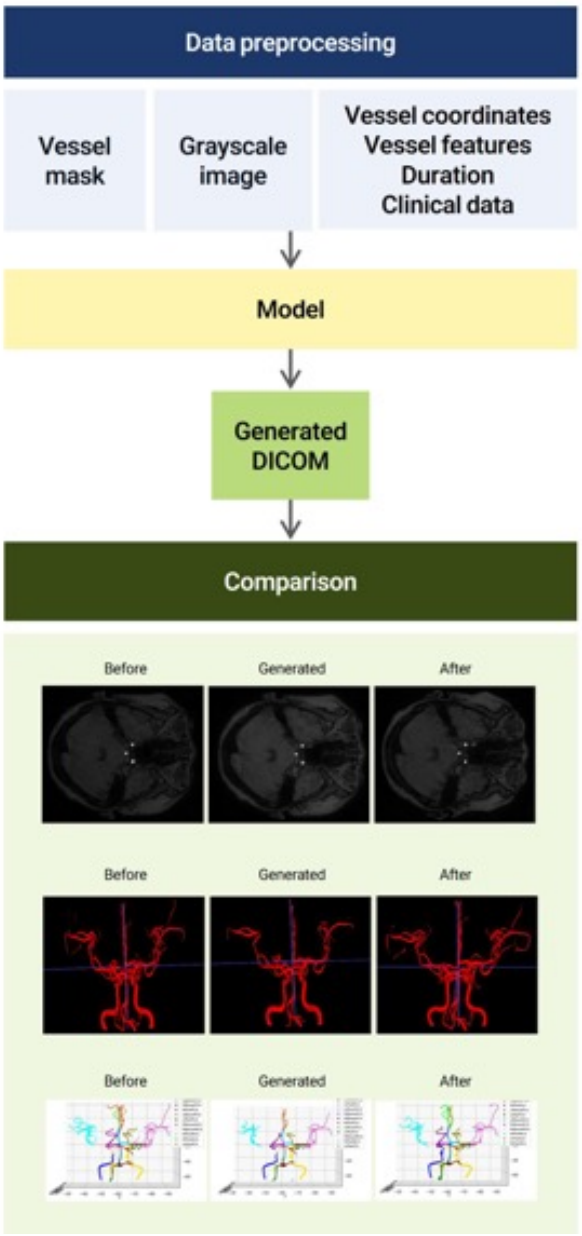
anticipated prognosis when specific interventions or treatments are properly implemented by generating and visually presenting results under different conditions of key clinical indicators—such as LDL cholesterol levels—that influence cerebrovascular diseases. This visual feedback is expected to encourage patients' active participation in their own therapy.

Acknowledgement

This work was partly supported by the Institute of Information & Communications Technology Planning & Evaluation(IITP)-ICT Creative Consilience Program grant funded by the Korea government(MSIT)(IITP-2025-RS-2020-II201821, 50%) and Bio&Medical Technology Development Program of the National Research Foundation(NRF) grant funded by the Korea government(MSIT)(RS-2023-00265393, 50%).

Contents

Figure 1. Overall process of NOSTRADAMUS study.



The value of arterial spin-labeling MRI in the assessment of collaterals of patients with carotid occlusive disease

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Purpose

We evaluated the value of arterial spin-labeling (ASL) magnetic resonance imaging (MRI) in the assessment of collaterals of patients with carotid occlusive disease and the correlation between cerebrovascular reserve (CVR) on acetazolamide (ACZ) -stress single photon emission computed tomography (SPECT) brain scans and collaterals on ASL MRI in internal carotid artery (ICA) stenosis.

Methods

86 patients with ICA stenosis (>70%) were enrolled in this study. Including pulsed ASL, MRI was acquired on a 3 tesla system. On ASL, late-arriving flow appears as serpiginous high ASL signal within cortical vessels, which has been termed arterial transit artifact (ATA). Images were interpreted for the presence of ATA. 82/86 ICA stenosis patients underwent SPECT imagings with Tc-99m-ECD in the resting and after ACZ challenge. We observed the presence of intracranial collaterals, which are manifested by ATA, on ASL brain perfusion scan. CVR based on rest-SPECT and ACZ-stress SPECT was calculated. With ACZ-stress SPECT, the 82 patients were grouped as either showing or not showing evidence of decreased CVR. We assessed the relationship between reduced CVR and intracranial collaterals shown as ATA on ASL brain perfusion.

Results

In 61/86 (70%) of the ICA stenosis patients, ASL showed ATA in ipsilateral to the stenosis. With acetazolamide stress SPECT, the 27/82 (32%) patients showed evidence of decreased CVR. In 45/55 (81%) of the normal CVR group and 16/27 (59%) of the reduced CVR from the SPECT results, pulsed ASL showed ATA in ipsilateral to the stenosis. Significant positive relationship was observed between normal CVR group and ATA showing group in ICA stenosis patients on ASL brain perfusion (p=0.035, chi-square test).

Conclusions

The ATA with ASL imaging as a noninvasive and no contrast demanding technique, can depict slow flow in excellent collateral vessels and has clinical utility in detecting CVR in patients with ICA stenosis.

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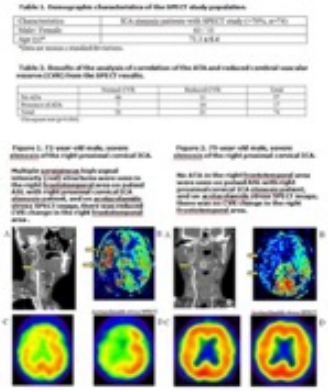

Comparison of a new craniometric guidance for the Sylvian vein versus Taylor-Haughton line

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Purpose

Objectives: The Sylvian vein (SV) is the primary anatomical landmark on the lateral surface of the brain. For the neurosurgical approach, recognizing the SV is essential information. With the trend toward minimally invasive surgery, precise anatomical localization becomes increasingly important. Moreover, a craniometric guidance for the SV will reliably enhance neurosurgical planning and intraoperative approach. Anatomical guidance for the SV was previously proposed, and it utilized a linear bar type. However, its representation was complex and unclear. Thus, we aimed to develop a new guidance for the SV.

Methods

Materials and methods: The SV of thirty-seven patients was illustrated on venous phase angiographic images. Scanned images were manually fused using Adobe Photoshop CS5. The outlines of the lateral skulls were realigned to fit together, after which venous structures were overlaid. Coronal sutures and posterior clinoid processes served as references during this realignment process. Half the length of the line connecting the external ear canal (EAC) and glabella was used to draw a circle (Sylvian circle). The Sylvian circle (SC) and the actual course of the SVs were then compared. The SV and SC distributions were measured using ImageJ (NIH).

Results

Results: Twenty-nine (79%) of the thirty-seven patients exhibited SV located within 5 mm of the SC. Five SVs were positioned above the SC, and two were placed below it. There was a total of seven cases in which the trajectory was within 5 mm of the SC and accounted for less than 80% of the path.

Conclusions

Conclusion: The SC represents the contour of the SV more accurately than a straight line. The SC can be drawn promptly and is instinctively applicable in pre- and intra-operative neurosurgical practice.

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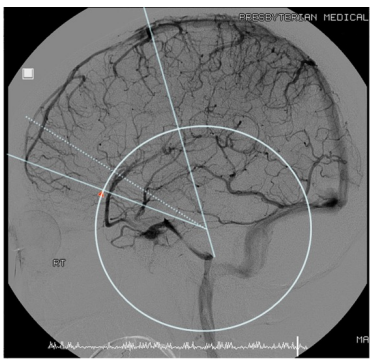

Assessing the risk of overt or covert brain infarct by lesion mapping

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[15]Department Of Neurology, Yeungnam University Hospital, Daegu, Korea, Republic of

Purpose

Statistical and brain mapping analyses of covert brain infarcts (CBIs) may help (i) to understand why CBIs are asymptomatic or only subtly symptomatic and (ii) to identify clinical factors associated with CBIs. We aimed to localize the brain regions where ischemic lesions are associated with a higher likelihood of covert (versus) overt infarction.

Methods

We included 5,295 consecutive patients with acute first-ever ischemic stroke from the Korean image-based stroke database project, which is a subproject of the Clinical Research Collaboration for Stroke–Korea (CRCS-K), a nationwide stroke registry. An acute infarct was defined as a focal lesion showing diffusion-weighted MRI (DWI) hyperintensity. Overt brain infarct (OBI) was defined as an acute infarct observed in acute ischemic stroke patients but without any chronic infarcts. A chronic infarct was defined as a focal lesion with hyperintensity on T2-weighted MRI (T2WI), indicative of tissue destruction or cavitation, with no corresponding DWI hyperintensity. CBI was defined as a chronic infarct observed in patients with no history of stroke or TIA. Patients were categorized into two groups: those without CBI (OBI group) and those with CBI (CBI group). OBI frequency was evaluated in the OBI group, and CBI frequency in the CBI group. We compared voxel-based lesion frequency between OBI and CBI groups using Firth's penalized logistic regression. This comparison aimed to assess the relative prevalence of clinically CBI versus OBI.

Results

Overall, 59% were male (mean age 67.1±13.0); patients with CBIs on admission T2WI were older, carried more hypertension/diabetes/coronary disease, used antiplatelet/statins more often, had higher prestroke mRS>2, and presented with higher admission NIHSS scores than OBI-only patients. Voxelwise frequency maps showed OBIs (DWI) concentrated in MCA territories (deep white matter, basal ganglia, perirolandic, temporal) and PICA-territory cerebellum, whereas CBIs (T2WI) were more focused in the internal capsule, corona radiata, basal ganglia, right temporo-occipital regions, and the PICA-territory cerebellum.

The OBI–CBI odds ratio (OR) map was right-skewed (33rd/67th percentiles 6.3/13.4); 95% of voxels had FDR-significant OR>1, indicating that overt-prone loci predominate. Lowest-tertile OR voxels clustered in dorsomedial prefrontal, inferior occipital, right temporo-occipital, basal ganglia/internal capsule/corona radiata, and PICA; highest-tertile voxels localized to MCA regions (inferior/middle frontal, left-predominant operculum/insula, pre-/postcentral, middle temporal) and SCA-territory cerebellum. Regionally, the left hemisphere, gray matter, and MCA territory were enriched for high-OR voxels. NIHSS analyses linked the lowest tertile to visual field deficits and left weakness, the middle to left weakness/neglect, and the highest to consciousness, gaze, right weakness, sensory, language, and dysarthria.

Conclusions

This study provides novel CBI–OBI OR maps along with comprehensive interpretations relevant to clinical practice and research, which may inform health service planning by highlighting the need for neurological assessments that more effectively target visual field defects, left-sided weakness, and neglect to facilitate timely recognition of less obvious presentations of stroke. We suggest that, in addition to FAST (Face, Arm, Speech, Time)—an acronym widely used for early recognition and response to acute stroke—public awareness campaigns should also address these less obvious symptoms.

Acknowledgement

The study authors appreciate contributions from all CRCS-K members. This study was supported by grants from the National Priority Research Center Program (NRF-2021R1A6A1A03038865), and Bioimaging Data Curation Center Program (NRF-2022M3H9A2096198 RS-2022-NR068424), and the Basic Science Research Program (RS-2025-00514203) of the National Research Foundation funded by the Korean government.

Stroke Mimics: Artifact-Induced Pseudolesions in Stroke Imaging

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Purpose

Rapid and accurate diagnosis of stroke is critical to manage stroke, however imaging artifact can complicate diagnosis by mimicking stroke-related lesions. Stroke-mimicking pseudolesions represent diagnostic pitfalls that may confuse even experienced clinicians and early-career radiologists. Such confusion can delay critical interventions or prompt unnecessary therapies. Therefore, the aim of this poster to raise awareness of common pseudolesions produced by artifacts in stroke imaging.

Methods

We highlight frequent artifacts on stroke images, including diffusion-weighted imaging (DWI), time-of-flight magnetic resonance angiography (TOF MRA), and fluid-attenuated inversion recovery (FLAIR), that can be mistaken for true stroke lesions and review the physical principles behind these imaging techniques.

Results

Through illustrative examples, we demonstrate how artifacts may appear as hyperintense or hypointense signals, potentially leading to overestimation, underestimation, or mistyping of stroke extent or etiology. Recognizing these pseudolesions requires systematic review of adjacent slices and corresponding images from different sequences and modalities. A basic understanding of image acquisition physics further aids in distinguishing between true pathology and artifacts.

Conclusions

By improving familiarity with imaging artifacts and their manifestations, clinicians and radiologists can enhance diagnostic confidence and accuracy in acute stroke cases, reducing the risk of misdiagnosis and optimizing patient outcomes.

Analysis of Ischemic Stroke Research Articles: A Synthesis of Therapeutic and Pathological Findings

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Purpose

Ischemic stroke remains a leading cause of disability and mortality worldwide. This analysis synthesizes findings from 19 key research articles to provide a comprehensive overview of the current research landscape, with a focus on inflammatory pathways, novel biomarkers, and emerging therapeutic strategies. The goal is to highlight current trends and identify key areas for future investigation.

Methods

Synthesis of information from 19 research articles on ischemic stroke. The analysis focused on the study objectives, methodologies, key findings, and clinical implications of each article. We identified and integrated key themes, including the role of inflammation (e.g., IL-1 family cytokines), the identification of biomarkers (e.g., CRP, IL-6, miR-210), and therapeutic interventions (e.g., cell therapy, traditional medicine, immunomodulators).

Results

Synthesis revealed several key insights. Inflammation, particularly involving the IL-1 family, is a central mechanism in stroke pathogenesis and recovery. Studies identified significant differences in inflammatory markers between stroke subtypes, suggesting a need for personalized diagnostic and therapeutic approaches. Promising biomarkers such as FDP, IL-6, and miR-210 have shown high sensitivity in predicting stroke outcomes. Furthermore, several novel therapies, including cell-based delivery of IL-1Ra, traditional herbal medicines (Kyung-ok-ko), and immunomodulators (Boswellic acids), have demonstrated neuroprotective effects in preclinical models or early-phase trials.

Conclusions

The reviewed research highlights the critical role of inflammation in ischemic stroke and underscores the potential of various biomarkers for diagnosis and prognosis. The findings support a shift toward personalized medicine, with a focus on subtype-specific treatments. While numerous therapeutic strategies show promise in preclinical studies, further research particularly in human clinical trials is essential to validate their long-term efficacy and safety. This ongoing research is vital for developing effective, evidence-based treatments to improve outcomes for stroke patients.

Acknowledgement

This abstract is based on a synthesis of research from scopus articles.

Investigating Novel Therapeutic and Diagnostic Strategies for Ischemic Stroke

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Purpose

Ischemic stroke is a leading cause of global disability. This abstract synthesizes the objectives of recent research to provide a comprehensive overview of the current research landscape, focusing on uncovering the intricate molecular mechanisms of stroke. The goal is to highlight the specific roles of various inflammatory and neurorepair pathways, as well as the development of biomarkers for improved diagnosis and prognosis.

Methods

This abstract synthesizes study objectives from 19 research articles published between 2010 and 2025. These objectives were categorized into three main areas: investigating specific molecular pathways (e.g., IL-1 family, P2Y6 receptor), developing novel diagnostic and prognostic tools (e.g., blood biomarkers, genetic polymorphisms), and examining the effects of therapeutic agents (e.g., Boswellic acids, cell therapy).

Results

The synthesized objectives show a strong focus on the inflammatory cascade. Studies aimed to investigate the role of microglial IL-1α in stroke recovery, the neuroprotective effects of drugs like Dexmedetomidine, and the anti-inflammatory mechanisms of compounds like Dauricine. In diagnostics, research objectives included determining the association between inflammatory markers and stroke subtypes, and developing a cocktail of blood biomarkers to predict stroke outcomes. Therapeutic objectives covered a broad range, from investigating the neuroprotective role of PR-957 to examining IL-1Ra cell therapy and the effects of traditional medicines like Kyung-ok-ko.

Conclusions

The collective objectives of these studies highlight a research landscape committed to tackling ischemic stroke from multiple angles. Key areas of focus include a deeper understanding of inflammation and neurorepair, the development of precise biomarkers for personalized medicine, and the discovery of novel therapeutic agents. This concerted research effort is vital for advancing from basic scientific discoveries to effective clinical treatments for stroke patients.

Acknowledgement

Based on a synthesis of research from scopus articles.

Translating Preclinical Findings to Clinical Practice: The Challenge of Ischemic Stroke Therapies

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Purpose

The development of effective ischemic stroke therapies is hindered by a significant gap in clinical translation. While numerous neuroprotective and anti-inflammatory strategies show promise in preclinical models, a lack of large-scale human clinical trials prevents their validation. This abstract aims to synthesize the implications of this gap, emphasizing the critical need for human data to move research from the laboratory to patient care.

Methods

Synthesizes the implications of the clinical translation gap by analyzing a selection of studies 11 articles. We focused on studies that identified promising interventions such as genetic manipulations to microglial pathways, anti-inflammatory drugs like Dauricine, and cell therapies such as hADSC-NCs, but relied solely on non-human models for their conclusions.

Results

The studies consistently demonstrated that interventions could reduce brain injury, mitigate inflammation, and promote functional recovery in experimental models. For example, Dexmedetomidine showed broad neuroprotective effects in mice, and IL-1α administration appeared to be an effective therapy in murine models. However, these findings are largely confined to preclinical settings. The absence of corresponding human clinical data means that the therapeutic potential, optimal dosage, and safety profile of these interventions for humans are still unknown, preventing their progression to clinical use.

Conclusions

A critical gap in clinical translation is the primary bottleneck in ischemic stroke research. To overcome this, future efforts must prioritize well designed clinical trials. These trials are essential for rigorously testing the efficacy and safety of promising preclinical interventions, optimizing their application for humans, and ultimately delivering new, effective therapies to patients.

Acknowledgement

Based on a synthesis of research from scopus articles.

Circulating Biomarkers for Predicting Inflammatory and Immune-Mediated Outcomes in Acute Ischemic Stroke Patients

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Purpose

The post-stroke inflammatory response is a critical determinant of recovery, but the prognostic value of circulating biomarkers for predicting specific immune-mediated complications requires rigorous synthesis to guide clinical utility.

Methods

We conducted a systematic review and meta-analysis of studies investigating the association between circulating biomarkers measured within 72h of acute ischemic stroke onset and predefined outcomes: post-stroke infection (PSI), hemorrhagic transformation (HT), and poor functional outcome (mRS 3-6 at 90 days). Pooled adjusted odds ratios (aOR) with 95% confidence (CI) and prediction intervals (PI) were calculated using random-effects models. Subgroup analysis evaluated effect modification by revascularization therapy.

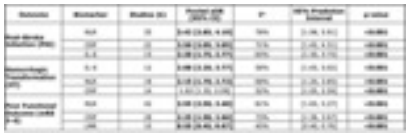
Results

Neutrophil-to-lymphocyte ratio (NLR) was the strongest predictor for PSI (pooled aOR=3.42, 95% CI: 2.85-4.10; 95% PI: 1.98-5.91) and poor functional outcome (aOR=2.95, 95% CI: 2.50-3.48). IL-6 was the superior predictor for HT (aOR=2.88, 95% CI: 2.20-3.77). Revascularization therapy significantly modified NLR's association with PSI, strengthening its predictive effect in treated patients (aOR=4.51) versus untreated (aOR=2.90; p-interaction<0.01). Wide prediction intervals indicated substantial heterogeneity across clinical settings. Lymphocyte-to-monocyte ratio (LMR) was protective for functional outcome (aOR=0.55).

Conclusions

NLR and IL-6 are robust, early prognostic biomarkers for immune-mediated complications, with predictive utility enhanced by revascularization therapy. These findings support their integration into stratified management protocols to identify high-risk patients for targeted interventions. Standardization of biomarker measurement and reporting is essential for clinical translation.

Contents



The Effects of Hypertension, Body Mass Index, and Smoking on Stroke: A Statistical Binary Regression Approach

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Purpose

Strokes carry a significant risk of death. Survivors may become paralyzed, disoriented, and lose their ability to see and speak. Around the world, 15 million people suffer a stroke every year. Families and communities were strained as a result of the 5 million deaths and an additional 5 million permanent disabilities. The main reason is high blood pressure. The two most important modifiable risks are tobacco smoking and high blood pressure (WHO, 2024). This study examines the relationship between stroke and smoking, body mass index, and hypertension.

Methods

Secondary data from the Kaggle database about 249 stroke patients and 4861 stroke-free people. Additionally, the anticipated variables—hypertension, body mass index, and smoking—were gathered via Kaggle. An individual unit of analysis is used in this study. Following data collection, SPSS software was used to analyze the data using binary logistic regression.

Results

According to the Omnibus Tests of Model Coefficients, the risk of stroke is significantly influenced by smoking status, body mass index, and hypertension (chi-square 70.836, Sig 0.000). In addition, individuals who smoke have a substantial positive influence on the incidence of stroke (S.E. 0.064, sig 0.004), and those with hypertension have a significant positive influence on the incidence of stroke (S.E. 0.156, sig 0.000). However, the incidence of stroke is unaffected by body mass index. In the meantime, predictor variables affect the incidence of stroke by 4.3% (Nagelkerke R Square 0.043). This concept's model passed the test with a chi-squared value of 1919.536 < -2 Log probability.

Conclusions

Patients who smoke and have a history of high blood pressure are at risk for stroke. According to this study, a person's risk of stroke will rise in proportion to their smoking habit and history of hypertension.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 13:00 - 13:50 I Poster Room (Sydney)

Poster Session 2

CHAIRS

Jeong-Min Kim (Seoul National University Hospital, Korea)
Minwoo Lee (Hallym University Sacred Heart Hospital, Korea)

α7nAChR activation protects against neuroinflammation in cerebral ischaemic reperfusion injury via miR-21/TNF-α/NFκB signalling pathway.

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Purpose

Neuroinflammation plays a critical role in cerebral ischemia-reperfusion injury (CIRI). While α7-Nicotinic Acetylcholine Receptor (α7nAChR) activation demonstrates anti-inflammatory benefits in various diseases, its role in CIRI remains underexplored. This study evaluates α7nAChR activation's neuroprotective effects using BV2 microglia, focusing on inflammatory modulation via the miR-21-mediated pathway.

Methods

BV2 cells underwent oxygen-glucose deprivation/reoxygenation (OGDR) to simulate CIRI, with α7nAChR agonist PNU282987 administered to assess inflammatory markers (TNF-α, IL-6, IL-1β, IL-10) and NFκB pathways. Antagomir was used to determine mir-21 functional role in the α7nAChR anti-inflammatory pathway. Nanostring analysis of the inflammation panel was employed to examine other associated inflammation-related genes.

Results

OGDR elevated proinflammatory markers (TNF-α, IL-6, IL-1β), while PNU282987 reduced these markers and upregulated anti-inflammatory IL-10. NFκB expression linked to proinflammatory responses decreased at both gene and protein levels. Mir-21 antagomir reversed this effect. NanoString analysis revealed that miR-21 inhibition significantly affected inflammation-related genes, including AL1RAP, TLR9, FLT1, PTGIR, NFκB, TREM2, TNF, SMAD7, FOS, CCL5, IFIT1, CFB, CXCL10, IFI44, DDIT3, IRF7, OASL1, IL1A, IFIT2, C3, CD40, STAT2, IFIT3, IL1RN, OAS1A, CSF1, CCL4, CCL2, CCL3, BCL2L1, and ITGB2. Enrichment analysis of upregulated genes identified Gene Ontology Biological Processes related to cytokine responses and TNF-associated pathways.

Conclusions

This study highlights α7nAChR activation as a key regulator of anti-inflammatory responses in BV2 microglia under OGDR conditions, with miR-21 identified as a crucial mediator of receptor-driven neuroprotection via the TNF-α/NFκB signalling pathway.

Acknowledgement

This work received a Fundamental Research Grant Scheme (FRGS) grant from the Ministry of Higher Education, Malaysia [FRGS/1/2020/STG02/UKM/02/6] and Geran Universiti Penyelidikan (GUP) from the Universiti Kebangsaan Malaysia [GUP-2021–006].

Mast Cell–Targeted Inhibitors Disrupting the Dura-Brain Neuroimmune Axis: Pharmacoinformatic Insights into MRGPRX2 Modulation for Post-Stroke Inflammation Control

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Purpose

Emerging evidence implicates mast cells, particularly those residing at the dura-brain interface, in amplifying post-stroke neuroinflammation. These cells rapidly respond to ischemic injury by releasing histamine, tryptase, and cytokines that exacerbate blood–brain barrier (BBB) disruption, brain edema, and cerebrospinal fluid (CSF) dysregulation. Activation of the Mas-related G protein-coupled receptor X2 (MRGPRX2) is a key trigger of mast cell degranulation in this context. While its role in allergic reactions is well documented, its contribution to neuroimmune signaling after stroke remains underexplored. This study aimed to identify small-molecule MRGPRX2 inhibitors that may modulate dura-based mast cell activation and suppress secondary inflammation post-stroke.

Methods

Five ternary thiazole–coumarin–azomethine derivatives were docked against MRGPRX2 (PDB ID: 7VV5) using AutoDock Vina, with C48/80 as a reference. ADMET properties were evaluated using the pkCSM server. β-Cyclodextrin inclusion modeling was performed to assess bioavailability enhancement.

Results

All three thiazole–coumarin–azomethine derivatives (6i, 6f, 6k) demonstrated favorable binding to MRGPRX2, with compound 6i exhibiting the strongest affinity (–8.5 kcal/mol). Compound 6i also showed optimal pharmacokinetic properties, including 100% predicted intestinal absorption, no CYP1A2 inhibition, and moderate BBB permeability (log BB = –1.078), consistent with CNS-targeted delivery. In contrast, compound 6f showed lower binding affinity (–8.1 kcal/mol), slightly poorer BBB permeability (–0.925), while compound 6k exhibited the highest lipophilicity (LogP = 6.81) and lowest predicted clearance, potentially raising concerns for in vivo persistence. To address solubility limitations (log S = –3.336), β-cyclodextrin inclusion modeling was performed for compound 6i, yielding a binding energy of –7.1 kcal/mol with three hydrogen bonds and full cavity accommodation, indicating improved aqueous compatibility and formulation feasibility for intranasal or oral CNS-targeted delivery.

Conclusions

These findings highlight compound 6i as a promising MRGPRX2-targeted inhibitor with favorable ADMET and formulation profiles. Its potential to regulate mast cell activation at the dura–brain axis supports further development as a novel strategy for controlling post-stroke neuroinflammation.

Dual Downregulation of NQO2 and NLRP3: A Pharmacoinformatic Strategy Targeting Oxidative–Inflammatory Cascades in Stroke and Intracranial Atherosclerosis

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Purpose

Ischemic stroke and intracranial atherosclerosis (ICAS) share convergent mechanisms of oxidative stress and chronic neuroinflammation. Quinone oxidoreductase II (NQO2) amplifies reactive oxygen species generation, while the NLRP3 inflammasome drives sterile inflammation and plaque destabilization. Together, these processes contribute not only to acute ischemic injury but also to long-term complications including recurrent stroke, cognitive decline, and ICAS-related disability. Dual targeting of these pathways may offer synergistic neurovascular protection. This study aimed to identify small-molecule scaffolds capable of modulating both NQO2 and NLRP3 through pharmacoinformatic approaches.

Methods

Five Thiazole-Coumarin-Azomethine derivatives were docked against NQO2 (PDB: 1QR2) and the NLRP3 NACHT domain (PDB: 7ALV) using AutoDock Vina. ADMET properties were predicted via SwissADME and pkCSM, including BBB permeability, oral bioavailability, and toxicity. β-cyclodextrin inclusion modeling was applied to assess solubility enhancement.

Results

Compounds 6h, 6i, and 6k demonstrated dual inhibition potential. Compound 6k showed the strongest binding affinity toward NLRP3 (–11.1 kcal/mol), followed by 6i (–10.7 kcal/mol) and 6h (–9.7 kcal/mol). For NQO2, 6i (–8.6 kcal/mol) and 6k (–8.4 kcal/mol) outperformed 6h (–8.5 kcal/mol). All three derivatives exhibited favorable pharmacokinetics, with high intestinal absorption (≥90%), non-inhibition of CYP1A2, and acceptable clearance. BBB permeability was moderate (log BB ≈ –1.0 to –1.2), suggesting partial CNS penetration. Solubility was modest (log S –3.3 to –4.7), but drug-likeness assessments indicated consistent bioavailability scores (0.55) with minimal Lipinski violations (≤1). Toxicity predictions revealed safe margins, with oral rat LD_{50} values of 2.5–3.2 mol/kg. Overall, 6i and 6k emerged as the most promising candidates.

Conclusions

Dual NQO2–NLRP3 downregulation represents a novel multitarget strategy to mitigate oxidative–inflammatory injury in ischemic stroke and stabilize atherosclerotic plaques in ICAS. These findings highlight 6i and 6k as lead scaffolds warranting further validation in ischemic stroke, ICAS, and post-stroke dementia models.

Contents

GENERAL PROPERTIES			
Molecules/Pubchem ID	**6h**	**6i**	**6k**
MW	562.445	521.554	600.45
Binding Affinity			
NQO2 (kcal/mol)	-8.5	-8.6	-8.4
NLRP3 (kcal/mol)	-9.7	-10.7	-11.1
LIPOPHILICITY			
Consensus Log P	6.7126	6.0479	6.8304
WATER SOLUBILITY			
Log solubility (log mol/L)	-6.705	-8.336	-8.466
PHARMACOKINETICS			
BBB Permeability (log BB)	-1.102	-1.078	-1.225
CYP1A2 inhibitor	No	No	No
Intestinal Absorption (Human) (% Absorbed)	90.629	100	100
Total Clearance (log ml/min/kg)	0.132	0.08	-0.122
DRUGLIKENESS			
Lipinski #violations	1	1	0
Bioavailability Score	0.55	0.55	0.55
MEDICINAL CHEMISTRY			
Leadlikeness #violations	3	2	2
Synthetic Accessibility	4.26	4.2	4.39
TOXICITY			
Oral Rat Acute Toxicity (LD50) (mol/kg)	2.564	3.205	3.214

Comparative Analysis of Hippocampal Neuron Survival Across Subfields in MCAO Rats Treated with NevG.

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Purpose

Ischaemic stroke leads to significant neuronal loss, particularly in the hippocampus, and current treatments are limited by side effects. This study evaluated the neuroprotective and safety profile of NevG, a nutraceutical blend of Lignosus rhinocerotis, Hericium erinaceus, and Ganoderma lucidum, in a rat model of middle cerebral artery occlusion (MCAO).

Methods

Fifty-five male Sprague Dawley rats were divided into normal, MCAO, and NevG-treated groups (250, 500, and 1000 mg/kg). MCAO was induced surgically, and NevG was administered orally for 28 days. Body weight, behavior, and histopathology of liver and kidney were assessed for toxicity. Neuronal viability in hippocampal subfields (CA1, CA2, CA3, DG) was evaluated using cresyl violet staining, and ultrastructural changes were examined by TEM. Serum biochemical parameters were measured to assess systemic effects.

Results

NevG was well tolerated at all doses, with no significant changes in body weight, behavior, or organ histology. Biochemical markers of liver and kidney function remained within normal ranges. MCAO caused marked neuronal loss in all hippocampal subfields, especially CA1 (54.84% reduction). NevG treatment produced dose-dependent neuroprotection, with the 1000 mg/kg group restoring CA1 neuronal viability to 85.71% of normal, and similar improvements observed in CA2, CA3, and DG. TEM confirmed preservation of neuronal ultrastructure in treated groups.

Conclusions

This study demonstrates that NevG blend of Lignosus rhinocerus, Hericium erinaceus, and Ganoderma lucidum exhibits protective and therapeutic effects in a middle cerebral artery occlusion (MCAO) rat model of ischemic stroke. Comprehensive evaluations, including toxicity, neurological, histological, and biochemical assessments, revealed dose-dependent efficacy with no signs of toxicity at 250, 500, and 1000 mg/kg. The highest dose (1000 mg/kg) produced the most pronounced benefits, such as reduced infarct size, preservation of hippocampal neurons, and improvements in cognitive and motor functions. These effects are likely mediated by the antioxidant and anti-inflammatory properties of NevG, as evidenced by decreased levels of TNF-α, IL-1β, IL-6, and NF-κB. Overall, the findings suggest that NevG may serve as a promising natural adjunct for post-stroke therapy.

Acknowledgement

I would like to express my sincere gratitude to Management and Science University (MSU), Malaysia, for the continuous support

provided throughout this project. Special thanks are also extended to Athirah Azlan, a master's student, for her dedication and hard work, which were instrumental in the successful completion of this work. Additionally, I would like to acknowledge the use of ChatGPT-4.0, an AI language model developed by OpenAI (San Francisco, CA, USA), for assistance in refining certain sections of the writing, particularly in language editing.

Relationship between Agricultural Vulnerability to Organic Fungicides and Herbicides and Stroke Incidence in a Rural Population of Northern India.

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Purpose

Stroke has emerged as a growing health concern among rural populations in India, where agricultural workers are frequently exposed to pesticides. Chronic exposure to fungicides and herbicides has been linked to neurotoxicity, oxidative stress, and vascular dysfunction—mechanisms that may predispose individuals to cerebrovascular disease. However, limited evidence exists on the specific role of pesticide exposure in stroke development. This study investigates the association between exposure to commonly used organic fungicides and herbicides and incident stroke in an Indian agricultural cohort.

Methods

We analyzed data from 10,542 pesticide applicators enrolled between 2019 and 2024. Incident stroke cases were identified through linkage with local stroke registries and confirmed by physician diagnosis. Exposures were assessed through detailed questionnaires on pesticide use, including duration, frequency, and specific crop applications, covering 23 organic and thiocarbamate herbicides and 28 carbamate-based fungicides registered in India. Cox proportional hazards models were used to estimate covariate-adjusted hazard ratios (HR) and 95% confidence intervals (CI). Subgroup analyses were performed based on protective practices (e.g., glove use) and prior head injury.

Results

Over a median follow-up of 4 years, 908 incident stroke cases were identified, including 604 ischemic strokes, 101 transient ischemic attacks (TIAs), and 203 hemorrhagic strokes. Overall exposure to organic fungicides was associated with a significantly increased stroke risk (HR = 2.67, 95% CI: 2.21–3.43). A moderate but elevated risk was also observed for herbicides (HR = 2.24, 95% CI: 0.97–2.82). Strong associations were noted with specific fungicides such as copper compounds, maneb, jojoba, and metiram, as well as herbicides including diallate, propham, and chlorpropham. Risks were highest among applicators with prior head injury or those who reported not using protective gloves, suggesting possible vulnerability modifiers.

Conclusions

This study demonstrates a significant association between exposure to certain organic fungicides and herbicides and increased stroke risk in rural agricultural workers. Findings highlight the urgent need for stricter pesticide regulations, improved protective measures, and longitudinal studies to better understand neurovascular risks posed by pesticide exposure in vulnerable farming communities.

Association of Neurofilament Light Chain, Glycated Hemoglobin, Homocysteine, Folic Acid, and Vitamin B12 in Serum of Stroke Patients with Type 2 Diabetes

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Purpose

This study aimed to explore the relationship between serum NfL, Hcy, folic acid, vitamin B12, and glycated hemoglobin (HbA1c) in elderly stroke patients with T2DM, and to assess their associations with motor and non-motor symptoms.

Methods

A cross-sectional study was conducted among 124 patients aged 60–80 years diagnosed with both stroke and T2DM. Patients with illness duration >14 days or prior use of steroids, vitamin B12, or folic acid supplementation were excluded. Serum concentrations of Hcy, HbA1c, NfL, folic acid, and vitamin B12 were measured using electrochemiluminescence immunoassay and single-molecule array technology. Stroke severity was assessed using the Unified Stroke Rating Scale and the Global Stroke Rating Scale. Statistical correlations were examined using Spearman's rank correlation coefficient.

Results

Stroke patients demonstrated significantly higher serum Hcy and NfL levels compared with age-matched controls ($p = 0.005$), correlating with greater motor symptom severity. Polytherapy patients had higher Hcy and HbA1c levels and lower folic acid concentrations than those on monotherapy. No significant differences were observed between risperidone- and tiapride-treated groups. Disease duration positively correlated with serum Hcy, NfL, and HbA1c, while folic acid showed a negative correlation. Cognitive impairment was the most prevalent non-motor symptom (64.5%), whereas rigidity was notably absent. Elevated Hcy and HbA1c were linked not only to motor dysfunction but also to non-motor features, including cognitive decline.

Conclusions

Higher levels of Hcy, NfL, and HbA1c, combined with folic acid and vitamin B12 deficiencies, were strongly associated with greater stroke severity and symptom burden in patients with T2DM. These findings highlight the importance of metabolic and nutritional monitoring in stroke care and suggest that targeted supplementation strategies may hold therapeutic promise in reducing disease progression and improving neurological outcomes.

Optimization of a zebrafish embryo model to investigate cerebral hypoxia-reoxygenation sulfite-mediated chemical hypoxia

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Purpose

Stroke reperfusion injury (SRI) remains a critical complication of ischemic stroke therapy, characterised by reactive oxygen species (ROS) overproduction and mitochondrial dysfunction that amplify neuronal damage. Zebrafish embryos provide a versatile vertebrate model for live imaging and high-throughput analysis of cerebral injury, enabling rapid screening of hypoxia-reoxygenation parameters.

This study aims to establish and optimize a zebrafish embryo model of cerebral hypoxia-reoxygenation injury using sodium sulfite–induced chemical hypoxia. Specifically, it aimed to evaluate whether chorion status (chorionated vs. dechorionated) and the duration of hypoxia exposure influence the severity of apoptotic brain injury, thereby identifying reproducible experimental conditions for future mechanistic investigations.

Methods

Zebrafish embryos at 24 hours post-fertilisation (hpf) were allocated into eight groups based on chorion status (chorionated vs. dechorionated) and hypoxia exposure times (control, 30, 60, and 90 min). Hypoxia was induced using sodium sulfite, followed by 2 hours of reoxygenation in normoxic E3 media. Embryos were subsequently stained with 10 µg/mL acridine orange, incubated for 45 minutes in the dark, and washed twice before anaesthesia with tricaine (0.2 mg/mL). Fluorescence imaging of the brain region was performed to visualize apoptotic cells as markers of cerebral injury.

Results

All embryos survived across experimental conditions. Dechorionated embryos exhibited more pronounced apoptotic cell fluorescence compared to chorionated embryos, and apoptotic intensity increased progressively with longer hypoxia durations. A 30-minute hypoxia exposure followed by 2 hours of reoxygenation was sufficient to induce consistent cerebral apoptosis, providing a practical condition for subsequent model applications.

Conclusions

The optimised hypoxia-reoxygenation protocol establishes a reproducible zebrafish embryo model of cerebral injury, with sensitivity influenced by chorion status and exposure duration. This model offers a robust foundation for mechanistic studies, in understanding the pathophysiology and drug screening for stroke reperfusion injury.

Cytoprotective alternation interventions in acute ischemic stroke: mapping three decades global research dynamics 1995-2025

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Purpose

While stroke is a leading cause of mortality and long-term disability worldwide, cytoprotection research reminds fluctuate dynamically. The aim of this study is to advance intellectual trajectory research hotspot on cytoprotective agents in stroke especially ischemic brain over the past three decades, emphasis on the acceleration of shifting academic focus across research themes and publication years. Through this approach highlight emerging domains and underexplored areas.

Methods

This study incorporated bibliometric analysis using 7124 articles extracted from PubMed and 184 articles from Scopus database for data collection. Data are analysed using VOSviewer software version 1.6.19 for overlay visualization to display array of research dynamics. Network structures capture research dynamics accross the period 1995-2025. The variation in dot size and line thickness in the overlay map is indicative of significant meaning. Larger dots are indicative of keywords with greater impact on publications and higher frequency of mention across related studies. Conversely, thicker lines represent stronger relationships between different keywords.

Results

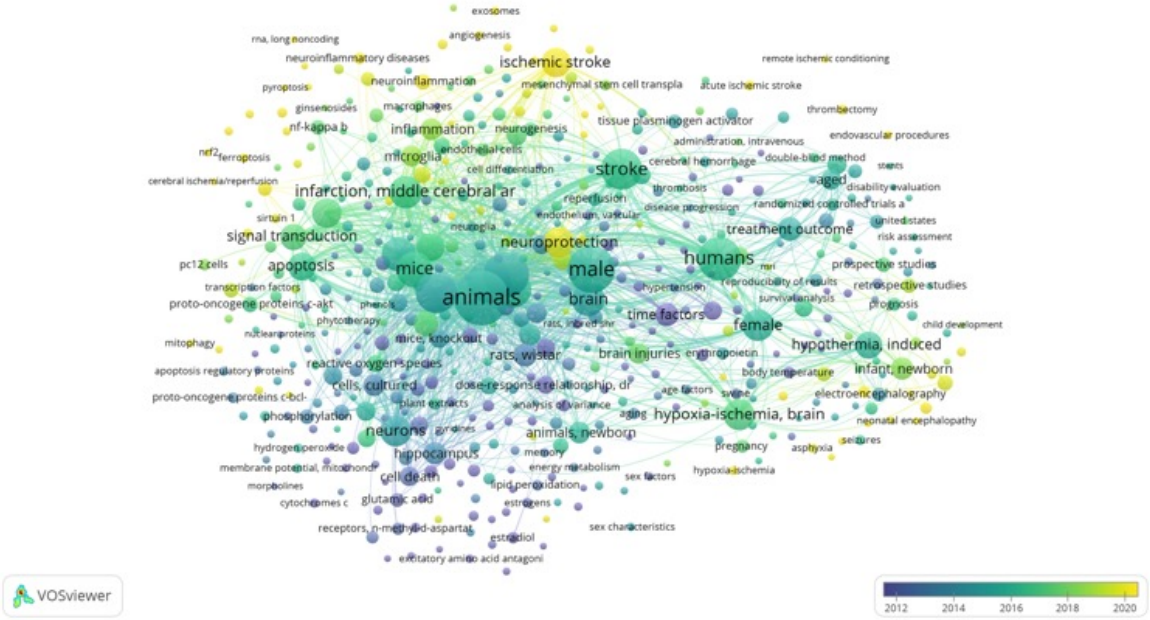
The overlay visualization from two database extracted highlights the predominance of animal-based models and male-focused studies in cytoprotective research for acute ischemic stroke. The apparent resurgence of cytoprotection throughout 2019-2020 period shows shift toward integrative strategies combination reperfusion with molecular or cellular rather than revival of single agent approaches. Green-yellow Pubmed clusters around apoptosis, ROS, and inflammation reaffirm centrality classical mechanisms. Yellow-green Scopus clusters (neuroprotective agent, pathophysiology, brain ischemia) indicate that the emphasis during this time was shifting toward therapeutic agents and pathophysiological frameworks, but still anchored in experimental models. Recent research hotspot majority shift into stem cell, exosomes and neuroimmune modulation. Trajectory from basic neuroscience to translational therapy is evident, critical gaps in clinical field transferability and precision medicine remain challenges. In PubMed, the most significant increase was observed in 2024, with a total of 528 published articles, whereas in Scopus, the peak occurred in 2009 with 30 publications. This discrepancy highlights differences in publication trends between the two databases.

Conclusions

This study provides a comprehensive highlight of global research trends on cytoprotective interventions agent in ischemic brain. The evolution from classical mechanisms overviewed toward integrative approaches including translation therapy for

neuroimmune modulation. These findings emphasize persistent gaps in clinical translation and the need for precision based strategies.

Contents



Epigenetic Regulation of Neuroinflammation in Experimental Stroke: Insights from Primary Cell Culture and Rat Middle Cerebral Artery Occlusion Model

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Purpose

Ischemic stroke triggers profound neuroinflammation, which amplifies neuronal injury and hinders recovery. However, the molecular mechanisms linking epigenetic regulation to inflammatory responses remain poorly defined. This study aimed to delineate how epigenetic remodeling contributes to post-stroke neuroinflammation and to evaluate whether targeted modulation of histone acetylation could attenuate neuronal loss in pre-clinical stroke models.

Methods

Primary cortical neurons, astrocytes, and microglia from neonatal rats were subjected to oxygen–glucose deprivation (OGD) to mimic ischemic stress. Cell viability, inflammatory cytokine release (TNF-α, IL-1β, IL-6), and histone acetylation (H3K9ac, H4K16ac) were quantified using MTT assays, ELISA, and Western blotting. In vivo, adult male Sprague-Dawley rats underwent transient middle cerebral artery occlusion (MCAO) for 90 minutes, followed by reperfusion. Neurological deficits were scored, and infarct volumes were determined using TTC staining. Brain tissue was examined for neuronal injury, glial activation, and epigenetic markers. To probe therapeutic potential, animals received the histone deacetylase (HDAC) inhibitor sodium butyrate (300 mg/kg, i.p.) or vehicle at reperfusion onset.

Results

OGD induced robust neuronal death in culture, accompanied by significant increases in TNF-α and IL-1β release from astrocytes and microglia. This inflammatory response correlated with global reductions in histone acetylation, suggesting an epigenetic brake on neuroprotective gene expression. In the MCAO model, ischemic brains exhibited widespread neuronal apoptosis, glial hypertrophy, and elevated pro-inflammatory cytokines, paralleled by hypoacetylation of histones H3 and H4. Treatment with sodium butyrate restored histone acetylation levels, suppressed microglial activation, and reduced cytokine release. Importantly, sodium butyrate–treated rats demonstrated smaller infarct volumes and improved neurological scores compared to vehicle controls.

Conclusions

These findings highlight epigenetic dysregulation as a key driver of post-stroke neuroinflammation and neuronal vulnerability. Pharmacological restoration of histone acetylation attenuates inflammatory cascades and improves outcomes in pre-clinical stroke models. Targeting epigenetic regulators represents a promising therapeutic avenue for ischemic stroke, bridging molecular neuroscience with translational potential.

NEUROPROTECTIVE POTENTIAL OF GENISTEIN AND 17B-ESTRADIOL IN AMYLOID BETA-INDUCEDNEUROTOXICITY: IMPLICATIONS FOR STROKE

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Purpose

This study investigates the effects of genistein in mitigating amyloid beta (Aβ 25-35)-induced neurotoxicity inaging female rats, particularly in the presence or absence of 17β-estradiol (E2), to assess its therapeuticrelevance in neurodegeneration-related stroke impairments.

Methods

Female Sprague-Dawley rats aged 12 and 24 months were divided into control and treatment groups. Theexperimental groups received subcutaneous 17β-estradiol (0.1 µg/g body weight) for 30 days. Synaptosomesisolated from the hippocampus were treated in vitro with genistein (5 nM), Aβ (25-35), or both at varyingconcentrations (0.1, 1, and 5 µM) for 60 minutes. Behavioral tests, including the Morris water maze, rotarodtest, and grip strength assessment, were conducted. Behavioral tests, including the Morris water maze, rotarodtest, and grip strength assessment, were conducted. The expression of glucose transporter-4 (GLUT4),peroxisome proliferator-activated receptor gamma (PPARγ), and inflammatory cytokines (TNF-α, IL-1β, IL-6)were analyzed Western blot techniques.

Results

Genistein administration significantly improved antioxidant defense mechanisms, reduced lipid peroxidation,and enhanced motor coordination and cognitive function in aging rats. Aβ-induced behavioral deficits werealleviated, as evidenced by improved performance in movement-based and memory tasks, reduced AChEactivity, and lower pro-inflammatory cytokine levels. In vitro, genistein counteracted Aβ toxicity by increasingPPARγ and GLUT4 expression, restoring neurotransmitter balance, and reducing oxidative stress

Conclusions

Genistein exhibits strong neuroprotective effects against Aβ-induced toxicity, particularly in estrogen-deficientaging brains. Its ability to improve cognitive and motor functions highlights its potential as a therapeutic agentfor neurodegenerative movement disorders. Further research is required to explore its clinical applicability inage-related neurological diseases.

Magnetic stimulation for the targeted delivery of atorvastatin-loaded liposomes in stroke treatment

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Purpose

Focused magnetic stimulation (MagStim) can temporarily and safely open the blood-brain barrier (BBB) for target delivery. We investigated whether opening the BBB with MagStim and delivering atorvastatin-loaded PEGylated liposomes (LipoStatin) would work synergistically for subacute post-stroke treatment.

Methods

Two weeks after middle cerebral artery occlusion (MCAO), an injection of 15 mg/ml magnetic nanoparticles (MNPs) was performed, followed by 30 minutes of MagStim, in subacute stroke models. The procedure was conducted over a week, during which MagStim and MNPs were administered three times at two-day intervals, and LipoStatin (10 mg/kg) was injected immediately after each MagStim treatment. We investigated the motor function, BBB integrity, neuroinflammation, and neurogenesis three weeks after stroke (Sham vs. Control vs. LipoStatin vs. MagStim+LipoStatin).

Results

The MagStim+LipoStatin group showed improved motor function compared to the Control ($p = 0.007$) group. The MagStim+LipoStatin group significantly reduced infarct volume and improved BBB integrity compared to the control and LipoStatin groups. In the MagStim+LipoStatin group, the expression of TNF-α was reduced ($p = 0.020$) compared to the LipoStatin group, and eNOS was enhanced ($p = 0.037$) compared to the Control group. Markers for neurogenesis were also considerably increased in the MagStim+LipoStatin group compared to the Control and LipoStatin groups ($p < 0.0001$).

Conclusions

Our study demonstrates the beneficial synergistic effects of MagStim and the target delivery of LipoStatin in subacute ischemic stroke. These findings underscore the need for future advancements in promising novel non-invasive MagStim methods and nanotherapeutic hybrid approaches for target drug delivery and treatment in post-stroke recovery.

Association of protein C activity with cardioembolic stroke: Mediation by atrial fibrillation

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Purpose

Cardioembolic stroke (CE) is a major subtype of ischemic stroke, associated with high morbidity and mortality. Atrial fibrillation (AF) — the leading cause of CE—is often undiagnosed before stroke onset. Although reduced protein C activity has been observed in various clinical conditions, its role in CE pathophysiology remains unclear. Whether it contributes to CE risk by promoting AF remains unknown

Methods

We analyzed 991 patients with acute ischemic stroke enrolled in a prospective stroke registry between June 2016 and May 2021. Protein C activity was measured within 24 h of admission, and stroke subtypes were classified based on the TOAST classification. Associations between protein C activity, AF, and CE were assessed using multivariable logistic regression. Mediation analysis was conducted to quantify the indirect effect of protein C on CE via AF.

Results

Protein C activity was significantly lower in patients with CE than in the non-CE group (92.3 ± 25.6 vs. 106.5 ± 27.8 IU/dL, $p < 0.001$). In univariate analysis, lower protein C activity was inversely related to CE (odd ratio [OR] = 0.98; 95% confidence interval [CI]: 0.97–0.99; $p < 0.001$), which attenuated after adjustment for AF. Mediation analysis revealed a statistically significant indirect protein C effect on CE via AF (OR = 0.922; 95% CI: 0.900–0.943; $p < 0.001$), consistent with full mediation.

Conclusions

Reduced protein C activity increases CE risk primarily through its relationship with AF. Protein C may serve as an upstream biomarker of AF-related thromboembolism and support its incorporation into stroke prevention risk stratification frameworks.

Synergistic Regeneration: Polydeoxyribonucleotide and Shock Wave Sequencing in Immobilized Skeletal Muscle Recovery

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Purpose

Stroke-related sarcopenia can promote the occurrence and development of sarcopenia through a variety of pathogenesis, such as immobilization, impaired feeding, sympathetic activation, inflammation and denervation.

The main purpose of the study is to investigate the combined effects of polydeoxyribonucleotide (PDRN) and extracorporeal shock wave therapy (ESWT) sequences on the regenerative processes in immobilized atrophied rabbit calf muscles.

Methods

Thirty male New Zealand rabbits, aged 12 weeks, were divided into five groups: normal saline, PDRN, ESWT, PDRN injection before ESWT, and PDRN injection after ESWT. Following 2 weeks of cast immobilization, the respective treatments were administered to the atrophied calf muscles (Figure 1). Radial ESWT was performed twice weekly. The evaluation included measurements of calf circumference, tibial nerve compound muscle action potential (CMAP), and gastrocnemius (GCM) muscle thickness after 2 weeks of treatment. Histological and immunohistochemical staining, as well as Western blot analysis, were conducted 2 weeks post-treatment. Staining intensity and extent were assessed using semi-quantitative scores.

Results

Groups 4 and 5 demonstrated significantly greater calf muscle circumference, GCM muscle thickness, tibial nerve CMAP, and GCM muscle fiber cross-sectional area (types I, II, and total) than in the remaining three groups ($p < 0.05$, Figure 2), while they did not differ significantly in these parameters. Groups 2 and 3 showed the higher values for all the observations compared to group 1 ($p < 0.05$, Figure 2). Group 4 had the greatest ratio of vascular endothelial growth factor (VEGF) to platelet endothelial cell adhesion molecule-1 (PECAM-1) in the gastrocnemius muscle fibers than in the other four groups ($p < 0.05$, Figure 3). Western blot analysis revealed significantly higher expression of angiogenesis cytokines in groups 4 and 5 than in the remaining ($p < 0.05$, Figure 3).

Conclusions

The combination of ESWT and PDRN injection demonstrated superior regenerative efficacy for atrophied calf muscle tissue in rabbit models than these techniques alone or saline. Sequential Polydeoxyribonucleotide Injection and Extracorporeal Shock Wave Therapy Promote Angiogenesis and Superior Regenerative Recovery of Immobilization-Induced Calf Muscle Atrophy in Rabbit Models, Providing Translational Implications for Stroke Rehabilitation.

Contents

Dynamic Reorganization of Neural Circuits Underlying Early Recovery After Stroke

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Purpose

Stroke is one of the leading causes of death worldwide, and it is a severe condition that causes permanent loss of function in the damaged area, leaving people with disabilities. Although rapid neurological recovery is commonly observed within the first month after stroke, the underlying mechanisms at the microcircuit level remain poorly understood. Moreover, most studies have focused on the chronic phase of recovery, with relatively few addressing the neural dynamics during the acute phase. In this study, we aim to observe neuronal activity changes during the acute and chronic phases of stroke recovery using Neuropixels probes.

Methods

We used a photothrombotic stroke model induced by injecting Rose Bengal dye (30 mg/kg) via retro-orbital sinus. A 532 nm green laser (45 mW) was applied for 10 minutes over the skull region corresponding to the primary motor cortex (M1), resulting in a localized cortical infarction of approximately 4 mm2. Spike data were obtained during a virtual reality (VR) task from the ipsilateral striatum and motor cortex adjacent to the right primary motor cortex (M1), as well as from the contralateral M1.

Results

Behavioral observations showed that mice developed a bias, preferentially turning toward the ipsilateral side after stroke induction. We analyzed how neuronal activity in the acute phase changes by comparing pre-stroke and post-stroke states. In particular, we investigated alterations such as firing rates in the penumbral region and possible compensatory changes in the contralateral M1. Our investigations further revealed an elevation in firing rates in the contralateral hemisphere post-stroke, indicating a potential compensatory hyperexcitability. Single-unit analyses were conducted to characterize potential shifts in cue-evoked selectivity. We observed a pronounced increase in choice-selectivity, reflected by an elevated projection along the coding direction for movements, suggesting altered motor preference or compensation following stroke.

Conclusions

The significance of this research lies in its potential to elucidate the mechanisms underlying stroke recovery at the neural circuit level. We plan to present chronic longitudinal recordings during the acute recovery phase to track the progression of neural circuit reorganization and neuroplasticity over time. By understanding these processes, we may identify novel therapeutic targets for neural repair, and the insights gained could also be applied to the development of artificial neural networks inspired by biological recovery mechanisms.

Acknowledgement

This research was supported by multiple grants, including the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (grant numbers: RS-2024-00440705 and RS-2024-00512879); the National Research Foundation of Korea(NRF) grant funded by the Korea government(MSIT) (RS-2023-00265883); the MSIT(Ministry of Science and ICT), Korea, under the ICAN(ICT Challenge and Advanced Network of HRD) support program(IITP-2025-RS-2024-00437359) supervised by the IITP(Institute for Information & Communications Technology Planning & Evaluation).

Poster Session 2

Identifying and Ranking Stroke Risk Factors Through Python-Based Machine Learning Techniques for Enhanced Prevention Strategies

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Purpose

Stroke is a leading cause of death and disability worldwide. Effective prevention relies heavily on the ability to identify and prioritise risk factors. Conventional approaches are often limited in analysing complex patterns among risk factors. With technological advances, Python-based machine learning analysis enables more accurate and data-driven risk factor identification.

Methods

This study used a public dataset containing 70,000 stroke risk factor entries, including demographic, clinical, and symptom-related variables. The data was analysed in Python using the Random Forest Classifier algorithm to predict stroke risk (At Risk vs. Not At Risk). All features were analysed to determine their importance in influencing stroke risk. Visualisations included risk factor ranking graphs and model performance metrics.

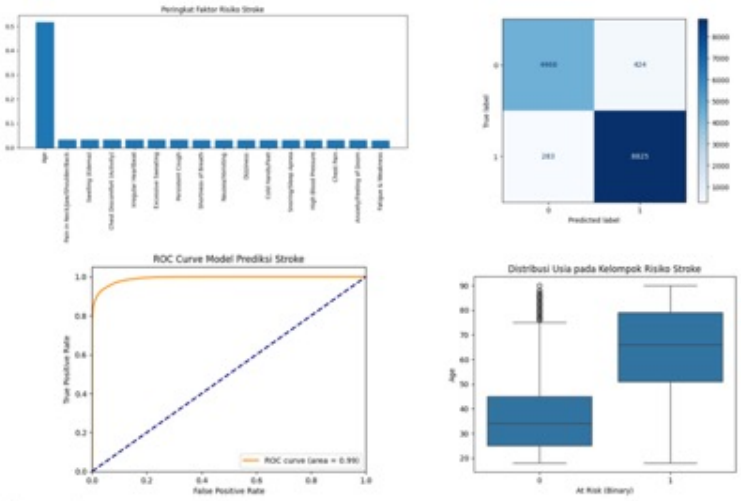
Results

The developed machine learning model demonstrated good classification performance. Age was the most dominant risk factor, followed by high blood pressure, heart rhythm disturbances, and other cardiovascular symptoms. The risk factor ranking graph shows that age contributes more than 50% to stroke risk prediction. This analysis provides an overview of the priority risk factors that can be targeted in prevention efforts.

Conclusions

A Python-based machine learning approach effectively identifies and ranks stroke risk factors. These findings have the potential to improve more targeted, evidence-based stroke prevention strategies, particularly in high-risk populations.

Contents



Epidemiology and Risk Prediction of Stroke: A Python-Based Analysis of Population-Level Determinants and Prognostic Modeling

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Purpose

Stroke is a leading cause of death globally, and epidemiological studies indicate that demographic, clinical, and behavioural factors play a significant role in increasing its risk. This study uses Python as a data analysis tool to identify key determinants and develop a population-level stroke risk prediction model.

Methods

This study used a population health dataset that included demographic variables (age, gender, marital status, type of employment, place of residence), clinical variables (hypertension, heart disease, body mass index, average glucose level), and behavioural variables (smoking status). The analysis was conducted in Python through epidemiological exploration and predictive modelling using Random Forest. The model was validated using a train-test split (80:20) and evaluated using classification metrics and ROC-AUC.

Results

Epidemiological analysis shows that stroke risk increases sharply in older people. Age, average glucose levels, and BMI emerged as the most influential determinants of stroke incidence, while other factors such as hypertension, heart disease, and smoking status played a lesser role. The Random Forest prediction model achieved good performance with an AUC of 0.81 and balanced precision and recall results, demonstrating its potential application in population-level risk assessment.

Conclusions

This study emphasises the importance of demographic and clinical factors in stroke epidemiology and demonstrates that Python-based analysis can provide a reliable prognostic prediction model. This approach could form the basis for strategies for stroke prevention, early detection, and risk control in the broader population.

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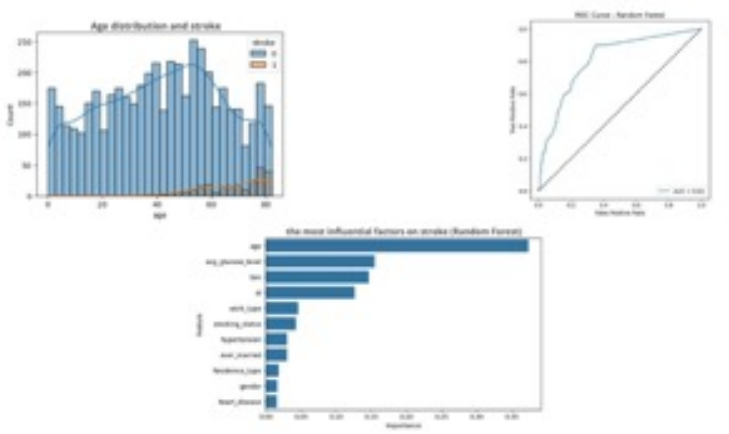

Navigating Challenges: Transcarotid Artery Revascularization in a Patient with Heparin-Induced Thrombocytopenia – A Unique Case

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Purpose

Transcarotid Artery Revascularization (TCAR) is a widely accepted intervention for carotid artery stenosis (CAS). This case presents a challenging scenario of a patient with a history of Heparin-Induced Thrombocytopenia (HIT) undergoing TCAR for symptomatic left carotid stenosis.

Methods

N/A

Results

Due to the contraindication of heparin use, the intraoperative management involved the administration of argatroban, an alternative anticoagulant. Additionally, the challenge extended to the use of saline mixed with argatroban, highlighting the unique considerations and successful navigation of obstacles in this complex clinical case. Heparin-induced thrombocytopenia (HIT) is a rare immune-mediated reaction to heparin that can lead to both arterial and venous thrombosis. Argatroban, a synthetic selective direct thrombin inhibitor, has emerged as a viable alternative to heparin in such situations, with growing evidence supporting its use in TCAR procedures.

The patient is an 86-year-old woman who presented with a subacute left-sided stroke symptoms with mild aphasia, right upper extremity weakness, and confusion, and was found to have severe left CAS. . Left common carotid angiography revealed severe stenosis at the bifurcation. We performed our transcarotid artery revascularization procedure. We connected the reversal flow in the filtration device from the carotid sheath to the venous sheath and confirmed flow. We advanced a 5mm balloon over an 014 wire across the stenosis and inflated this to nominal pressure. An 8 mm x 40 mm stent was placed across the stenosis. Total reversal time was 11 minutes. For irrigation, lines, and drips, we added 15,000 mcg of argatrobran for every 500 cc of saline.

Following the surgery, the patient's recovery was uneventful. There were no observed new neurological impairments, and effective hemostasis was maintained throughout her hospital stay, eliminating the need for blood transfusions.

Conclusions

In patients with a history of Heparin-Induced Thrombocytopenia undergoing TCAR, the successful utilization of argatroban as an anticoagulant, coupled with saline mixed with argatroban, can provide a safe and effective alternative. This case underscores the significance of individualized approaches in complex clinical scenarios, ensuring optimal patient outcomes.

Acknowledgement

N/A

Contents

Reducing Reading Time Using AI-Based Intracranial Hemorrhage Detection Software

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Purpose

Automated intracranial hemorrhage (ICH) detection algorithms have shown promising results in experimental settings. This study investigates the impact of implementing JLK-ICH triage on reducing radiology reading times for head non-contrast computed tomography (NCCT) scans, specifically in detecting ICH.

Methods

Data were collected from NCCT scans performed before (December 2023 to February 2024) and after (March 2024 to July 2024) the implementation of AI in the emergency room at Kyung Hee University Gangdong Hospital. Key variables included patient demographics, clinical diagnosis, scan time, and time to final radiology report. The study also assessed the impact of the disengagement of radiology residents on reading times. The JLK-ICH triage system automatically prioritized suspected ICH cases for faster review, and results were compared across both periods.

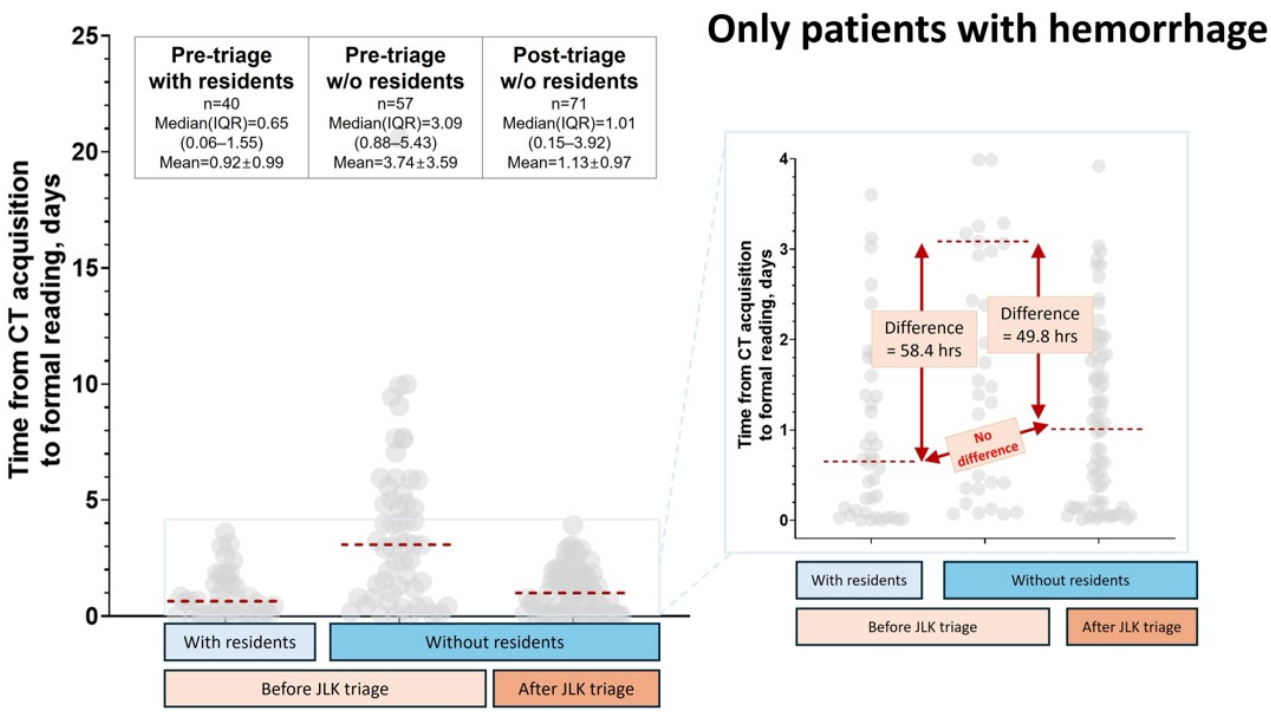
Results

Before AI implementation, the average time from CT scan to formal reading was 2.83 days (n = 1,394; SD 2.70). After JLK-ICH triage was introduced, the average time decreased to 1.61 days (n = 1,285; SD 1.47), reducing the process by approximately 20.5 hours. Among patients diagnosed with ICH (57 before and 71 after implementation), the time to formal reading significantly decreased from an average of 3.74 days (SD 3.59) to 1.13 days (SD 0.97), representing a reduction of approximately 49.8 hours. When comparing the periods before and after resident disengagement, the average NCCT reading time increased dramatically from 0.91 days (SD 1.18) to 2.83 days (SD 2.70; $p < 0.01$). However, following JLK-ICH triage implementation, reading time was reduced by approximately 20 hours (1.61 ± 1.47 days). For ICH patients, the time to official reading increased by over 58 hours after resident departure. Nonetheless, the use of JLK-ICH triage helped reduce the delay by approximately 50 hours, restoring reading times to levels comparable to those before resident disengagement ($p = 0.61$).

Conclusions

The JLK-ICH triage system effectively mitigated delays in official reading times caused by resident departure, particularly for NCCT scans in ICH cases. It restored reading times to levels similar to those before resident disengagement, demonstrating its utility in maintaining timely diagnosis and care for patients with suspected ICH.

Contents


Only patients with hemorrhage
Pre-triage with residents
n=40
Median(IQR)=0.65
(0.06–1.55)
Mean=0.92±0.99
Pre-triage w/o residents
n=57
Median(IQR)=3.09
(0.88–5.43)
Mean=3.74±3.59
Post-triage w/o residents
n=71
Median(IQR)=1.01
(0.15–3.92)
Mean=1.13±0.97
Time from CT acquisition to formal reading, days
25
20
15
10
5
0
With residents
Without residents
Before JLK triage
After JLK triage
Time from CT acquisition to formal reading, days
4
3
2
1
0
Difference = 58.4 hrs
Difference = 49.8 hrs
No difference
With residents
Without residents
Before JLK triage
After JLK triage

AI-Integrated Biosensor Wearables for Real-Time Monitoring and Personalized Education in Aged Patients with Stroke and Dementia

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Purpose

Stroke in aged patients with dementia represents a dual clinical burden, accelerating neuronal decline and increasing the risk of cardiovascular complications. Traditional rehabilitation approaches often overlook the need for continuous monitoring and individualized education to maintain brain health and prevent further deterioration. Artificial intelligence (AI)-enabled biosensor wearables offer a novel solution by combining real-time physiological monitoring with adaptive educational support, enabling proactive interventions in this vulnerable population.

This study evaluates the feasibility and effectiveness of AI-integrated biosensor wearables for continuous health monitoring and delivery of personalized educational prompts aimed at supporting stroke rehabilitation and cognitive preservation in elderly patients with dementia.

Methods

A 30-day observational study was conducted on 260 elderly patients with confirmed stroke and dementia in Gurugram, India. Participants used biosensor-enabled wearable devices equipped with photoplethysmography (PPG), electrodermal activity (EDA) sensors, accelerometers, and skin temperature monitors. The devices continuously recorded health parameters such as blood pressure, heart rate variability (HRV), sleep quality, physical activity, and fluid retention markers. AI algorithms analyzed data trends, flagged early warning signs (e.g., persistent hypertension, reduced HRV, poor sleep quality), and generated real-time alerts. Personalized educational prompts targeted lifestyle adjustments, including sodium reduction, hydration, and adherence to medications. Alerts were also triggered for body mass index (BMI) fluctuations exceeding 5%.

Results

The AI-driven system effectively detected early indicators of physiological stress, including elevated systolic/diastolic blood pressure and reduced nocturnal HRV. Patients with higher adherence to activity and sleep recommendations demonstrated improved blood pressure control and better estimated glomerular filtration rate (eGFR) values ($p < 0.05$). Real-time feedback improved compliance with neuroprotective behaviors, particularly dietary modifications and hydration awareness. Psychological well-being was positively impacted, as fatigue, anxiety, and sleep disturbances were promptly addressed through tailored educational prompts.

Conclusions

AI-integrated biosensor wearables present a transformative approach to stroke rehabilitation in elderly patients with dementia. By combining continuous physiological monitoring with personalized education, these devices enable early intervention, support cognitive preservation, and enhance patient engagement in long-term care. Future research should examine long-term neuronal and functional outcomes, as well as the integration of AI-driven wearables into comprehensive stroke and dementia care models.

A Descriptive Review of the Challenges and Opportunities in the Adoption of AI and Machine Learning for Stroke Care

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Purpose

Artificial Intelligence (AI)-based clinical decision support systems offer insights beyond conventional medical devices, aiming to improve diagnostic and prognostic accuracy through the utilization of granular data. This enables personalized care for a wider population. Machine Learning (ML) methods are increasingly facilitating the detection of large vessel occlusions and salvageable tissue, optimizing treatment duration and cost-effectiveness. ML has also shown promising results in predicting post-stroke functional outcomes.

Methods

This study used descriptive analysis to review 10 relevant studies from 2014–2024, focusing on recent studies on AI and ML in stroke care.

Results

This preliminary study points out the advantages of ML in leveraging real-world data to predict clinical outcomes. However, a reproducibility crisis hinders progress, with only a small proportion of published ML studies in the field of stroke disclosing the source code or providing external validation. Key barriers include institutional and national data sharing restrictions, inconsistent reporting standards, and limited source code availability. Federated platforms can partially address data privacy concerns, enabling algorithm training without direct data exchange. Furthermore, standardized data curation and annotation, as well as clear algorithmic reporting, are crucial for the development and validation of reliable ML models. Lack of data/code transparency hinders reviewers' ability to detect and mitigate bias, increasing the risk of overfitting and poor generalization.

Conclusions

Widespread adoption of AI in stroke care requires addressing reproducibility, transparency, and ethical issues through robust technical and editorial measuresCollaboration among authors, reviewers, and editors is essential to ensuring reliable, understandable, and impactful AI solutions that earn the trust of clinicians and patients.

Diagnostic and Prognostic Accuracy of Artificial Intelligence Systems in Stroke Care

Ni Made Ratih Kusuma Dewi[1], Rosinta Purba[1], Asriati Asriati[2, 1], Silmi Rahmani[4], Lintong Simbolon[1], Hepri Ardianson[1], Igna Abdul[1], Yesika Simbolon[3, 1], Hanna Rosanti[3]

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[2]Public Health, Cendrawasih University, Papua, Indonesia

[3]Accounting, Atmajaya University, Yogyakarta, Indonesia

[4]Biotechnology, The Pranala Institute, Yogyakarta, Indonesia

Purpose

Artificial intelligence (AI) systems show transformative potential for accelerating stroke diagnosis and prognosis, but their comparative accuracy against clinical standards and real-world readiness require rigorous quantitative synthesis.

Methods

We conducted a systematic review and meta-analysis following PRISMA-DTA guidelines, including studies comparing AI-driven systems to expert clinicians or standard protocols for stroke imaging tasks. Primary outcomes were sensitivity/specificity for large vessel occlusion (LVO) and intracranial hemorrhage (ICH) detection, and correlation (r) for 90-day functional outcome (mRS) prediction. Bivariate random-effects models pooled accuracy metrics. Subgroup analyses evaluated algorithm architecture (CNN vs. non-CNN) and study design (prospective vs. retrospective).

Results

For LVO detection, AI demonstrated superior sensitivity versus human experts (0.92, 95% CI: 0.89-0.94 vs. 0.85, p<0.01) with comparable specificity (0.88). For ICH detection, convolutional neural networks (CNNs) significantly outperformed other architectures (DOR=4.21 vs. 2.85, p=0.02). Prognostic prediction showed strong correlation between AI-predicted and actual mRS (r=0.78, 95% CI: 0.72-0.83). Critically, prospective studies showed a 15% reduction in diagnostic odds ratio (DOR) compared to retrospective analyses (p<0.01), indicating significant performance degradation in real-world settings.

Conclusions

AI systems achieve superior diagnostic sensitivity for LVO detection compared to clinicians but exhibit a consistent "prospective penalty" in real-world validation. CNNs demonstrate particular strength for image-based tasks. Successful implementation requires hybrid human-AI workflows and rigorous prospective testing rather than autonomous replacement of clinical expertise.

Contents

Advancing Neuroimaging Analysis through Deep Learning: A Study on Open-Source MRI Datasets

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Purpose

The objective of this study is to evaluate the effectiveness of artificial intelligence (AI) techniques, particularly deep learning models, in enhancing the detection and classification of neurological disorders using magnetic resonance imaging (MRI). By leveraging open-source neuroimaging datasets, we aim to establish reproducible benchmarks and assess the generalizability of AI-driven models in clinical research contexts.

Methods

We conducted experiments using the Alzheimer's Disease Neuroimaging Initiative (ADNI) and the Open Access Series of Imaging Studies (OASIS) datasets, which provide high-quality structural MRI scans with corresponding diagnostic labels. Preprocessing steps included skull stripping, intensity normalization, and spatial alignment. A 3D convolutional neural network (CNN) was developed to classify subjects into cognitively normal, mild cognitive impairment, and Alzheimer's disease groups. Model training was performed using a stratified 80:10:10 split for training, validation, and testing. Data augmentation techniques, including random rotations and elastic deformations, were employed to mitigate overfitting. Performance was compared with baseline machine learning models such as support vector machines (SVMs) and random forests using handcrafted features.

Results

The proposed 3D CNN achieved an accuracy of 85.4%, outperforming traditional methods (SVM: 82.7%, random forest: 80.3%). The model demonstrated robustness across both ADNI and OASIS datasets, indicating strong cross-dataset generalizability. Gradient-weighted Class Activation Mapping (Grad-CAM) revealed that the network consistently focused on hippocampal and cortical regions known to be biomarkers for Alzheimer's disease progression.

Conclusions

This study highlights the potential of deep learning models to enhance neuroimaging-based diagnosis of neurodegenerative disorders. By utilizing openly available datasets, we provide a reproducible framework that can be extended to other neurological conditions. The findings suggest that AI-driven neuroimaging pipelines may accelerate early detection and personalized treatment planning in clinical practice.

Early Prediction of Post-Stroke Cognitive Decline Using a Multimodal Deep Learning Framework

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[1]*College Of Nursing, Keimyung University, Daegu, Korea, Republic of*

Purpose

Cognitive impairment is a common sequela of stroke, affecting long-term recovery and quality of life. However, current clinical tools for predicting post-stroke cognitive decline remain limited in accuracy and often lack individualized precision. In this study, we developed a multimodal deep learning model to predict cognitive decline at 6 months post-stroke using routinely collected data.

Methods

The model integrates brain MRI (structural and diffusion), clinical variables (age, NIHSS, education level, vascular risk factors), and behavioral metrics (activity levels, sleep quality from wearable devices) obtained within 2 weeks post-stroke. A hybrid architecture was constructed using a CNN encoder for imaging, feedforward layers for tabular data, and an attention-based fusion module to jointly learn cross-modal interactions. The model was trained and validated using a prospective stroke registry (n=410), with cognitive outcomes defined by Montreal Cognitive Assessment (MoCA) scores.

Results

Results demonstrated a predictive AUC of 0.88 (95% CI: 0.85–0.91) for significant cognitive decline (MoCA < 20 at 6 months). SHAP analysis revealed that white matter integrity, baseline sleep fragmentation, and age were the most informative features. The proposed model outperformed traditional logistic regression and random forest models by a margin of 12–15% in accuracy.

Conclusions

This work highlights the utility of integrating multimodal post-stroke data using deep learning to forecast cognitive trajectories. Such tools may enable clinicians to identify high-risk patients early and personalize cognitive rehabilitation strategies accordingly.

Artificial Intelligence-Based Real-Time Detection of Stroke Events Using Wearable Biosignals and Spontaneous Speech

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Purpose

Timely identification of acute stroke is critical to optimize clinical outcomes, yet prehospital delays remain a significant barrier, especially among individuals living alone. This study introduces a real-time stroke detection system leveraging wearable biosignals and natural speech processing, aimed at enhancing early recognition outside hospital settings.

Methods

Participants with a prior history of ischemic stroke (n=275) were monitored over 12 months using a wearable device capable of capturing heart rate variability (HRV), electrodermal activity (EDA), and peripheral oxygen saturation. Concurrently, voice data were intermittently recorded through a smartphone app during daily check-ins. The system employed an ensemble model: a temporal convolutional network for physiological signals and a transformer-based NLP module to detect abrupt changes in articulation, fluency, and syntax.

Results

The model was trained using labeled events from medical records and caregiver reports, with "pre-stroke onset" windows defined for supervised learning. It achieved a sensitivity of 91.4% and specificity of 87.8% in detecting suspected acute stroke events within 10-minute resolution. Key predictive features included sudden HRV reduction, speech rate drop, and sentence-incompletion patterns.

Conclusions

This AI-powered approach provides a foundation for real-time, home-based stroke monitoring. By integrating physiological and speech changes, the system may facilitate earlier medical attention and reduce treatment delays in high-risk populations.

Video-Based Detection of Post-Stroke Motor Impairment Using Deep Pose Estimation and Movement Analysis

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Purpose

Objective evaluation of motor recovery in stroke patients is often limited by the need for specialized personnel and equipment. This study presents a vision-based artificial intelligence system that automatically detects and quantifies upper limb motor impairments using 2D video recordings during rehabilitation exercises.

Methods

A total of 198 stroke patients undergoing standard physical therapy were recruited and recorded weekly while performing standardized motor tasks (e.g., shoulder flexion, reaching). Using a lightweight camera setup, videos were processed using OpenPose to extract joint coordinates, followed by time-series feature extraction (e.g., range of motion, movement smoothness, asymmetry index). A deep CNN-LSTM architecture was trained to classify impairment severity based on the Fugl-Meyer Assessment (FMA) as reference.

Results

The system achieved a classification accuracy of 85.7% (macro F1-score 0.83) across mild, moderate, and severe impairment levels. Model predictions correlated strongly with clinical FMA scores ($r = 0.87$, $p < 0.001$). Notably, the model demonstrated robustness across different lighting and clothing conditions, supporting its use in outpatient or home-based settings.

Conclusions

This study demonstrates the feasibility of AI-driven, contactless motor assessment using video data alone. Such tools may enable scalable, remote monitoring of functional recovery and reduce the burden on clinical personnel in stroke rehabilitation programs.

Feasibility Study of AI-enabled Soft-Tissue-Enhanced CT Image to Detect Acute Ischemic Stroke

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Purpose

Accurate and timely detection of ischemic stroke is essential for clinical decision-making. While magnetic resonance imaging (MRI), particularly diffusion-weighted imaging and apparent diffusion coefficient (ADC) maps, provides superior sensitivity for ischemic lesions, its availability in acute emergency settings is limited. In contrast, computed tomography (CT) is widely accessible but offers limited soft-tissue contrast. This study aimed to evaluate whether AI-generated soft-tissue-enhanced CT (STECT), synthesized by translating CT into MRI-like images, can improve the detection of acute ischemic stroke compared with conventional CT.

Methods

We trained and evaluated two types of deep learning models for image translation and lesion detection. The image translation model was trained to generate MRI-like images from non-contrasted CT (NECT) scans, producing the STECT modality. The lesion detection model was trained using NECT, MRI (ADC), or the combination of NECT and STECT to predict lesion masks. Experiments were conducted on the ISLES 2024 dataset, which provides paired CT, ADC, and lesion annotations. Lesion detection performance was assessed using standard segmentation metrics, including Dice coefficient and recall, to enable direct comparison across modalities.

Results

Lesion detection performance across modalities is summarized in Table 1. As expected, ADC-based detection achieved the highest performance (Dice: 0.468 ±0.286, Recall: 0.414 ±0.295), confirming its superiority in ischemic lesion detection. NECT-based detection showed considerably lower accuracy (Dice: 0.134 ±0.150, Recall: 0.138 ±0.170), reflecting the limited sensitivity of CT. Notably, combining NECT with STECT improved performance compared with NECT alone (Dice: 0.152 ±0.194, Recall: 0.200 ±0.259).

A subgroup analysis revealed a clinically meaningful observation. In cases where NECT-based detection completely failed (recall = 0), the inclusion of STECT increased lesion recall up to 0.472. This complementary effect suggests that AI-generated STECT may provide additional lesion cues, enabling detection of otherwise missed cases in emergency settings where only CT scans are available.

Conclusions

This feasibility study demonstrates that while ADC remains the most reliable modality for ischemic stroke detection, the combination of NECT and AI-generated STECT achieved improved performance compared with NECT alone. Moreover, the complementary effect observed in the NECT failure subgroup indicates that the combination of NECT and STECT may provide added clinical value by enhancing lesion detectability in cases that would otherwise be missed. These findings emphasize the

importance of subgroup-level evaluation and highlight the potential of synthetic imaging as an auxiliary modality. Future work should focus on task-aware translation strategies, multimodal integration, and validation on larger multi-center datasets to comprehensibely access the clinical utility of synthetic imaging for acute stroke triage.

Contents

Table 1. Comparison of lesion detection performance across imaging modalities. Values are reported as mean (SD).

Modality	Dice ↑	IoU ↑	Precision ↑	Recall ↑	HD95 ↓	ASSD ↓
ADC	0.468 (0.286)	0.350 (0.247)	0.652 (0.251)	0.414 (0.295)	31.180 (29.846)	12.957 (21.226)
NECT	0.134 (0.150)	0.080 (0.098)	0.229 (0.246)	0.138 (0.170)	50.976 (23.932)	25.489 (21.297)
NECT+STECT	0.152 (0.194)	0.096 (0.134)	0.176 (0.225)	0.200 (0.259)	42.616 (25.426)	22.539 (22.423)

A Rare Case of Large-Vessel Giant Cell Arteritis Involving the Internal Carotid and Vertebral Arteries with Subsequent Stroke

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Purpose

Giant cell arteritis (GCA) is a systemic vasculitis typically affecting the extracranial branches of the carotid artery. However, large-vessel variants involving the internal carotid or vertebral arteries are extremely rare.

Methods

A 79-year-old man was referred with suspected vasculitis. Vascular imaging revealed wall thickening and stenosis involving the distal ICA and bilateral vertebral arteries, consistent with large-vessel GCA. High-dose intravenous methylprednisolone (40 mg/day for 7 days) was initiated, followed by tapering and adjunctive tocilizumab. Despite immunosuppressive therapy, the patient developed ischemic stroke during follow-up, requiring secondary prevention with aspirin and combination lipid-lowering therapy (atorvastatin and ezetimibe).

Results

This case illustrates a rare presentation of large-vessel GCA with both intracranial and extracranial arterial involvement leading to stroke. Early recognition and comprehensive management are crucial to reduce morbidity.

Conclusions

Although extracranial branches are the most commonly affected in GCA, recent reports have described a large-vessel variant involving the aorta and proximal great vessels. Intracranial artery involvement, particularly distal ICA or vertebral arteries, remains exceptional. Our case demonstrates that ischemic stroke can occur even under aggressive immunosuppression, suggesting that vascular inflammation may persist or accelerate atherosclerotic changes. This highlights the importance of close cerebrovascular monitoring and multidisciplinary management, including immunomodulation and vascular risk reduction strategies. Reporting such cases expands the understanding of the diverse clinical spectrum of GCA and underscores the need for individualized treatment strategies.

Acknowledgement

The authors thank the Department of Rheumatology for their collaboration in patient management. No specific funding was received for this work.

A Case of Distal ICA Severe Stenosis in Overlap Between RNF213 Vasculopathy and APS Vasculopathy

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Purpose

Mutations in the RNF213 gene are among the most well-recognized genetic variants causing cerebrovascular diseases, including moyamoya disease and atherosclerosis. Antiphospholipid syndrome (APS) is well established as a major cause of coagulopathy; however, accumulating evidence suggests that APS can also manifest as proliferative vasculopathy. Here, we report a patient with distal internal carotid artery (ICA) steno-occlusion carrying an RNF213 mutation and concomitantly diagnosed with APS.

Methods

Results

A 49-year-old woman with no prior medical history except hypertension presented with transient numbness of the left hand. Imaging revealed severe stenosis of the right distal ICA and bilateral M1 stenosis, whereas MR angiography performed four years earlier at another hospital had been normal. To investigate the etiology of the cerebral vasculopathy, genetic testing was performed, confirming an RNF213 mutation. Although typical moyamoya vessels were not evident, the patient was followed under suspicion of RNF213-related vasculopathy. Laboratory testing repeatedly demonstrated high-titer anticardiolipin antibody positivity, as well as dsDNA and Sm antibody positivity, accompanied by clinical signs such as malar rash. Rheumatology assessed the patient as highly suggestive of systemic lupus erythematosus and initiated hydroxychloroquine.

Follow-up MRA after six months revealed progression of right ACA stenosis. Considering vasculitis, steroid pulse therapy was administered; however, paradoxically, MCA stenosis worsened and ischemic lesions gradually increased. Consequently, STA–MCA bypass surgery was performed without complications.

Conclusions

Bypass surgery is a critical treatment option in moyamoya disease, whereas immunotherapy is generally prioritized in APS-related vasculopathy. This case, presumed to represent overlap between RNF213 vasculopathy and APS vasculopathy rather than definite moyamoya disease, was refractory to steroids but managed successfully with bypass surgery. Although the observation period is short, this case highlights the potential therapeutic role of bypass surgery in overlap syndromes of RNF213-related vasculopathy and APS.

LOW-DOSE INTRAVENOUS THROMBOLYSIS IN THE EXTENDED TIME WINDOW BEYOND 4.5 HOURS IN PATIENTS WITH ACUTE ISCHEMIC STROKE A CASE SERIES FROM CAN THO S.I.S GENERAL HOSPITAL

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Purpose

Background: Low-dose intravenous thrombolysis (0.6 mg/kg) administered between 4.5 and 9 hours after acute ischemic stroke onset has demonstrated comparable efficacy to the standard dose, with a reduced risk of hemorrhagic complications.Objective: This case series, conducted at S.I.S Can Tho International General Hospital from November 2024 to July 2025, aimed to evaluate the clinical outcomes and safety of low-dose intravenous thrombolysis.

Methods

Forty patients with acute ischemic stroke without large vessel occlusion, who underwent standard 3T MRI perfusion imaging, were treated with low-dose alteplase.

Results

The mean age of patients was 59.4 ± 17.9 years. At 90 days, 62.5% achieved excellent functional outcomes mRS 0–1), and 87.5% achieved functional independence (mRS 0–2), indicating significant neurological improvement. No symptomatic intracerebral hemorrhage or death was recorded. One patient (2.5%) had asymptomatic intracerebral hemorrhage within 24 hours.

Conclusions

The mean age of patients was 59.4 ± 17.9 years. At 90 days, 62.5% achieved excellent functional outcomes mRS 0–1), and 87.5% achieved functional independence (mRS 0–2), indicating significant neurological improvement. No symptomatic intracerebral hemorrhage or death was recorded. One patient (2.5%) had asymptomatic intracerebral hemorrhage within 24 hours.

Acknowledgement

Low-dose intravenous thrombolysis may be a safe and effective option for selected patients with acute ischemic stroke, when guided by advanced imaging and administered within the extended 4.5 to 9-hour time window.

Anterior Communicating Artery Location as a Risk Factor for Rupture in Small Intracranial Aneurysms Less Than 5 mm: A Retrospective Analysis

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Purpose

Despite intracranial aneurysms smaller than 5 mm are generally considered to have a low risk of rupture, management of those located at the anterior communicating artery (ACoA) remains a significant clinical challenge. This study evaluated whether ACoA location constitutes a risk factor for rupture in aneurysms less than 5 mm in diameter.

Methods

We retrospectively reviewed patients diagnosed with intracranial aneurysms at our institution from January 2015 to September 2022. After excluding unruptured aneurysms, re-ruptures at previous surgical sites, and aneurysms with fusiform, dissecting, or blood blister morphology, 381 cases were analyzed. Clinical and radiological data were collected, with subgroup comparisons based on aneurysm size (<5 mm vs. ≥5 mm). Logistic regression was used to identify factors associated with rupture in small aneurysms.

Results

Aneurysms at the ACoA exhibited a significantly higher incidence of rupture in the <5 mm subgroup compared to other locations ($P < 0.05$). Subgroup analysis confirmed that ACoA location was associated with a disproportionately elevated rupture rate among smaller aneurysms ($P < 0.05$). Logistic regression identified ACoA site as an independent predictor of rupture in aneurysms smaller than 5 mm ($P < 0.05$).

Conclusions

The ACoA location is associated with an increased incidence of ruptured aneurysms compared to other intracranial sites, particularly among smaller aneurysms. Our findings highlight the need to consider ACoA location as a potential risk factor for rupture in small aneurysms.

Association of Clopidogrel Genetic Polymorphism with Efficacy and Safety for Ischemic Stroke or Transient Ischemic Attack: A Systematic Review and Updated Meta-Analysis

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Purpose

Research suggests that CYP2C19 loss-of-function (LoF) alleles impede the metabolism of clopidogrel. However, there is limited research on the relationship between these alleles and the risk of stroke or transient ischemic attack (TIA) recurrence in patients taking clopidogrel. This updated meta-analysis aims to evaluate the relationship between CYP2C19 LoF alleles and the risk of stroke or TIA recurrence among patients receiving clopidogrel.

Methods

Relevant literature was obtained from searches of PubMed, Scopus, Cochrane Central Register Controlled Trials (CENTRAL), and Embase. The outcome measures of included studies were stroke or TIA, composite vascular events as an efficacy, and bleeding as a safety outcome. This meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (PROSPERO ID: CRD42024564771).

Results

An analysis of 28 studies encompassing 11,401 patients treated with clopidogrel following stroke or TIA revealed that carriers of CYP2C19 LoF alleles had significantly higher risk of stroke recurrence compared to non-carriers (risk ratio [RR], 1.89; 95% confidence interval [CI]: 1.55-2.32). Composite vascular events were also significantly more frequent in carriers of the CYP2C19 LoF allele than in non-carriers (RR, 1.54; 95% CI: 1.16-2.04). Both observational studies (RR, 2.20; 95% CI: 1.74–2.79) and post-hoc analyses of randomized controlled trials (RR, 1.44; 95% CI: 1.04–1.99) demonstrated significantly increased recurrence risk among carriers of these alleles. This risk was especially pronounced in Asian populations (RR, 1.97; 95% CI: 1.60–2.43). There was insufficient data specific to other ethnic groups for definite conclusions. The incidence of bleeding events was similar between groups.

Conclusions

Carriers of CYP2C19 LoF alleles treated with clopidogrel had a higher risk of stroke or TIA recurrence than non-carriers. This risk was higher in Asian populations.

Acknowledgement

None

Temporal Dynamics of Atrial Fibrillation Detection Across Clinical Subtypes in Relation to Cardiovascular Events

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Purpose

Atrial fibrillation (AF) is a possible etiological factor in embolic stroke of undetermined source (ESUS) and recurrent syncope, necessitating its prompt identification to mitigate cardiovascular morbidity. This study evaluates the temporal distribution of AF detection across distinct clinical phenotypes, including acute ESUS, chronic ESUS, and syncope to inform tailored monitoring strategies.

Methods

A retrospective cohort of 60 patients monitored between 2019 and 2023 was stratified into three clinical subgroups: acute ESUS (n=24), chronic ESUS (n=26), and syncope (n=10). Temporal trends in AF detection were analyzed to identify subgroup-specific variations in detection timing, with particular attention to cumulative incidence and detection peaks.

Results

Of the 60 patients enrolled, 41.7% were female (n=25), with a median age of 74.8 years (±11.4 years). In the acute ESUS cohort, AF detection was significantly clustered within the initial 100 days of monitoring, with over 60% of cases identified during this period, reflecting an accelerated detection timeline. Conversely, the chronic ESUS cohort exhibited a biphasic distribution of AF detection, underscoring the need for sustained longitudinal surveillance. In the syncope cohort, AF detection was evenly distributed throughout the study period without distinct temporal pattern compared to ESUS.

Conclusions

The temporal dynamics of AF detection varied across clinical phenotypes. Acute ESUS necessitates early monitoring strategies, while chronic ESUS benefits from prolonged surveillance. Syncope cases needed targeted diagnostic approaches. These findings highlight the need for individualized monitoring protocols to optimize AF detection and improve secondary prevention outcomes.

Effects of Smoking Status on the Age of Onset of First-ever Ischemic Stroke by Subtypes: Korean Stroke Registry

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Purpose

While the causal relationship between smoking and increased stroke risk is well-established, the impact of smoking status and cessation duration on age at first-ever ischemic stroke onset by subtypes remains inadequately characterized. This study aimed to evaluate the association between smoking status and age at first-ever ischemic stroke onset using comprehensive data from the Korean Stroke Registry (KSR).

Methods

We conducted a retrospective analysis of prospectively collected data from the KSR between 2014 and 2023. Patients with first-ever ischemic stroke were stratified into four cohorts based on smoking status: current smokers, recent former smokers (cessation within 5 years), long-term former smokers (cessation >5 years), and never-smokers. Primary outcome was age at first-ever ischemic stroke onset. Subgroup analyses were performed according to sex and stroke etiology based on Trial of Org 10172 in Acute Stroke Treatment classification.

Results

The analysis included 135,251 patients with first-ever ischemic stroke. Mean age (±SD) at stroke onset showed a significant gradient across smoking categories: current smokers (61.0±11.4 years), recent former smokers (66.0±11.6 years), long-term former smokers (70.2±10.9 years), and never-smokers (71.3±12.4 years) ($p<0.001$). This pattern persisted across all major stroke subtypes after adjustment: large artery atherosclerosis (63.4, 67.7, 71.7, and 70.9 years, respectively; $p<0.001$), small vessel occlusion (61.1, 65.9, 69.4, and 68.6 years, respectively; $p<0.001$), and cardioembolism (67.1, 69.9, 73.7 and 73.7 years, respectively; $p<0.001$).

Conclusions

Smoking status was significantly associated with earlier age of onset of first-ever ischemic stroke. A dose-response relationship was observed between smoking cessation duration and delayed stroke onset, suggesting potential benefits of smoking cessation programs in stroke prevention strategies.

Machine Learning-Based Analysis of Endovascular Treatment Patterns in Intracranial Aneurysms: An Interventional Neuroradiology Perspective

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Purpose

Intracranial aneurysms are vascular abnormalities with a high risk of causing subarachnoid hemorrhage, which carries a significant mortality rate. Advances in interventional neuroradiology have enabled endovascular therapies such as stent-assisted coiling, flow diverters, and microcatheter embolization, which are considered more effective than open surgery. However, selecting the optimal treatment remains challenging due to the complexities of clinical and radiological factors. With the increasing availability of clinical data, machine learning offers a potential approach to identifying clinical patterns and predicting treatment preferences in aneurysm patients.

Methods

This study used a dataset of intracranial aneurysm patients analyzed using Python. Data exploration was conducted to describe age distribution and correlations between clinical variables and to evaluate a predictive model for treatment patterns. Two algorithms were applied: Random Forest and Logistic Regression. The analysis included distribution visualization, correlation heatmaps, feature importance, and evaluation of model performance metrics (accuracy, precision, recall, and f1-score).

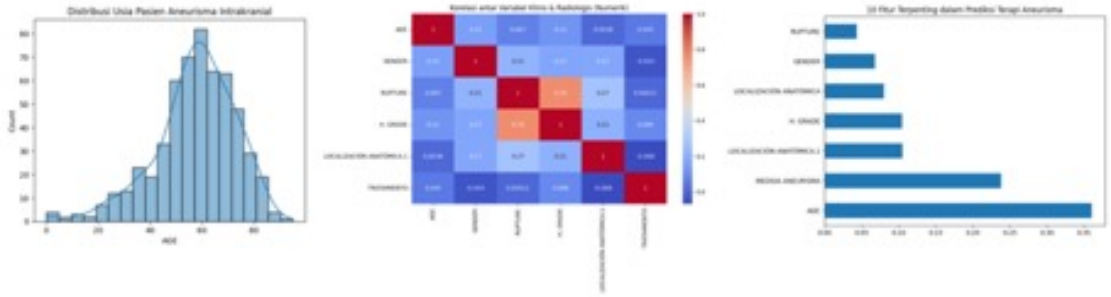
Results

Age distribution indicates that aneurysms most frequently occur between 50 and 70 years, with a peak incidence in the sixth decade of life. Variable correlations demonstrated a strong association between rupture status and Hunt-Hess grade (r=0.76), indicating clinical significance for therapeutic decisions. Feature importance analysis using Random Forest confirmed that age, aneurysm size, and anatomical location were the main predictors. However, the model's predictive performance was still low, with a Random Forest accuracy of 32% and a Logistic Regression accuracy of 29.9%. Precision, recall, and F1-score values also showed limitations, resulting in suboptimal prediction accuracy.

Conclusions

The application of machine learning to predict endovascular therapy patterns for intracranial aneurysms shows potential in identifying relevant clinical factors. Although model performance remains low, this study provides an initial foundation for developing more accurate prediction models with larger data sets, feature engineering, and alternative algorithms. The integration of clinical data and machine learning has the potential to support decision-making in Interventional Neuroradiology.

Contents



ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 27 (Thu) 13:00 - 13:50 I Poster Room (Sydney)

Poster Session 3

CHAIRS

Jang-Hyun Baek (Kangbuk Samsung Hospital, Korea)
Kang Ho Choi (Chonnam National University Hospital, Korea)

Evaluating the Beneficial Effects of an Iyengar Yoga Program Combined with Tinospora cordifolia (Giloy) Juice in Stroke Rehabilitation

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Purpose

Stroke remains a major public health challenge worldwide, contributing significantly to long-term disability, reduced quality of life, and socioeconomic burden. Rehabilitation following stroke extends beyond motor recovery, as many patients also experience gastrointestinal (GI) disturbances, metabolic dysregulation, inflammatory changes, and neurocognitive decline. Non-pharmacological interventions are increasingly explored for their potential to complement conventional therapies. Iyengar Yoga (IY), with its emphasis on precision, alignment, and supportive props, has demonstrated benefits for balance, flexibility, and stress reduction. Meanwhile, Tinospora cordifolia (TC; Giloy), a medicinal plant with antioxidant and immunomodulatory properties, may improve metabolic stability and support neuronal recovery.

To evaluate the effects of a structured Iyengar Yoga program combined with daily TC juice intake on stroke symptoms, metabolic markers, inflammatory and neuronal biomarkers, and quality of life in post-stroke rehabilitation patients residing in the Delhi metropolitan region.

Methods

A cross-sectional study included 260 participants in the intervention group and 150 controls from a cohort of 410 post-stroke rehabilitation patients. Baseline variables included age, family history, waist circumference, fasting glucose, HbA1c, C-reactive protein, caspase-3, chimerin, and secretagogin levels, as well as MRI and CT findings. The intervention group undertook a daily one-hour IY session (06:00–07:00 AM) followed by 100 ml of TC juice for one month. Glycemic control was assessed through fasting, postprandial, and 120-minute glucose levels. Stroke-related symptoms were evaluated using a modified Rome III questionnaire, while mood and quality of life were self-reported.

Results

After one month, significant improvements were observed in the intervention group compared to controls. Glycemic indices (fasting glucose, postprandial glucose, HbA1c), insulin sensitivity, and blood pressure showed marked improvement ($p < 0.001$). Inflammatory and neuronal biomarkers—including C-reactive protein, caspase-3, chimerin, and secretagogin—demonstrated normalization trends, supported by MRI and CT findings. GI disturbances such as abdominal pain, nausea, belching, and early satiety were reduced. Participants also reported higher energy, improved stool quality, reduced vomiting, and enhanced emotional well-being. Global health scores and quality of life indices were significantly higher in the intervention group.

Conclusions

A daily regimen of Iyengar Yoga combined with Tinospora cordifolia juice is a safe, low-cost, and effective complementary therapy for stroke rehabilitation. This integrative approach alleviates neuronal and metabolic disturbances, reduces inflammation, and improves psychological health. Findings suggest potential for delaying aging-related decline and guiding the development of novel adjunctive therapies for stroke and related disorders.

Rehabilitation Effects of Mechanoacoustic Vibration Therapy on Mobility, Bone Strength, and Sleep Quality in Elderly Women with Post-Stroke Complications

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Purpose

This study aimed to evaluate the effects of mechanoacoustic vibration therapy on mobility, bone mineral density, muscle strength, balance, pain, and sleep quality in elderly women experiencing post-stroke complications.

Methods

Eighty-two women aged 65–75 years with documented post-stroke disability were enrolled. The intervention group (n = 42) received mechanoacoustic vibration therapy three times weekly for six months (30 minutes per session, 300 Hz) in addition to standard pharmacological and exercise-based rehabilitation. The control group (n = 40) underwent only conventional drug treatment. Outcome measures included the Unified Stroke Rating Scale (URLSS), Berg Balance Scale, Falls Efficacy Scale, Verbal Numerical Rating Scale for pain, dual-energy X-ray absorptiometry (DXA), isokinetic muscle testing, Tinetti Scale, ECOS-16 quality-of-life questionnaire, and the Pittsburgh Sleep Quality Index.

Results

Significant benefits were observed in the intervention group compared with controls. Vibration therapy led to marked improvements in bone mineral density at the lumbar spine and femoral neck ($p < 0.01$), gait stability and balance scores ($p < 0.001$), and muscle strength ($p < 0.01$). Pain levels decreased notably ($p < 0.01$), while walking distance and functional mobility improved ($p < 0.05$). Sleep quality showed meaningful enhancement, with better duration ($p = 0.001$) and subjective sleep satisfaction ($p = 0.05$). Although a reduction in medication use was noted, statistical significance was limited.

Conclusions

Integrating mechanoacoustic vibration therapy into stroke rehabilitation offers a safe and effective approach to improving mobility, bone strength, and sleep quality in elderly women. By addressing both neurological and systemic complications, this therapy may enhance independence, reduce long-term disability, and promote holistic recovery in post-stroke populations.

A Global Macroeconomic Evaluation of the Cost-Effectiveness of Primary and Secondary Stroke Prevention Strategies

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Purpose

Stroke imposes a massive and growing global economic burden, yet a comprehensive macroeconomic comparison of prevention and treatment strategies across different income settings is lacking, hindering optimal resource allocation by policymakers and health systems.

Methods

We conducted a systematic review and meta-regression analysis of cost-effectiveness studies for stroke interventions. Data from 287 studies (12,543 ICER estimates across 94 countries) were integrated with World Bank and UNDP macro-economic indicators. The primary outcome was the probability of an intervention being cost-effective at a country-specific willingness-to-pay threshold (50% GDP per capita). Hierarchical logistic regression modeled the odds of cost-effectiveness, controlling for intervention type, GDP per capita, government health expenditure, and out-of-pocket spending.

Results

Primary prevention strategies demonstrated superior cost-effectiveness: polypill therapy showed 92% probability overall, ranging from 96% in LMICs to 89% in HICs. Hypertension treatment followed at 88% probability. Advanced interventions showed significant income-based disparity: thrombectomy was cost-effective in 78% of HIC evaluations but only 42% in LMICs. Meta-regression identified government health expenditure as the strongest moderator: a 10% increase raised thrombectomy's cost-effectiveness probability by 15% (aOR=1.15, p<0.001) and thrombolysis by 12% (aOR=1.12, p=0.003). Each 1% increase in out-of-pocket spending reduced the probability of cost-effectiveness across all interventions by 3% (aOR=0.97, p=0.02). The model explained 68% of variance in cost-effectiveness outcomes.

Conclusions

Macroeconomic factors fundamentally determine stroke intervention value. LMICs should prioritize primary prevention while strengthening health financing systems to enable future adoption of advanced therapies. HICs should maintain investment in comprehensive stroke systems. Reducing financial barriers is critical for realizing the full value of evidence-based interventions across all economic contexts.

Contents

Table 1. Proportion of Cost-Effective Evaluations by Intervention and Country Income Level

(At a WTP threshold of 50% of GDP per capita)

Intervention	Global	HIC	UMIC	LMIC/LIC
Primary Prevention				
Polypill Therapy	92%	89%	95%	96%
Hypertension Treatment	88%	85%	92%	94%
Anticoagulation for AFib	85%	90%	80%	65%
Acute Management				
Mechanical Thrombectomy	68%	78%	55%	42%
Stroke Unit Care	82%	95%	70%	58%
Intravenous Thrombolysis	75%	88%	68%	45%
Secondary Prevention				
Antiplatelet Therapy	90%	92%	88%	85%

Table 2. Hierarchical Logistic Meta-Regression for Probability of Cost-Effectiveness

(Dependent Variable: Odds of an ICER being below the 50% GDP/capita threshold)

Predictor	Adjusted Odds Ratio (aOR)	95% CI	p-value
Intervention (Ref: Polypill)			
Thrombectomy	0.21	[0.15, 0.29]	**<0.001**
Thrombolysis	0.38	[0.28, 0.52]	**<0.001**
Anticoagulation	0.65	[0.48, 0.88]	**0.006**
Macro-Economic Moderators			
Log(Gov. Health Exp. per capita)	1.15	[1.08, 1.22]	**<0.001**
Out-of-Pocket Exp. (% of CHE)	0.97	[0.95, 0.99]	**0.02**
Subgroup: Thrombectomy in LMICs			
Log(Gov. Health Exp. per capita)	1.32	[1.15, 1.51]	**<0.001**

Examining the Impact of New and Improved Biologic Therapies on Outcomes for Patients with Moderate to Severe Stroke

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Purpose

From around 12.2 million incident cases of stroke worldwide, 143 million DALYs lost, and 6.6 million deaths globally (Lancet, 2019). While conventional treatments often provide limited benefit, biologic molecular therapies (inflammation , oxidative stress, and neuroprotection) have emerged as promising alternatives. This study evaluates the effectiveness of biologic therapies compared to conventional treatment in improving outcomes among patients with moderate to severe stroke.

Methods

A systematic review and meta-analysis of RCTs (2010 and 2023) was performed using PubMed, MEDLINE, and the Cochrane Library. Eligible studies assessed biologic therapies in stroke patients and reported mortality, functional independence, or quality of life with. Logistic and linear meta-regression models were applied to quantify treatment effects while controlling for age, gender, baseline severity, and comorbidities.

Results

The mean age was 65.4 years, 48% were female, and baseline stroke severity averaged NIHSS 15.2. At 12-month follow-up, mortality was 28% and 42% achieved functional independence. Biologic therapy significantly improved outcomes (β=0.322, $p<0.001$), reducing mortality and increasing the likelihood of functional recovery. Age negatively influenced outcomes (β=-0.145, $p=0.001$), indicating each additional year modestly reduced recovery potential. Higher baseline severity also strongly predicted poorer outcomes (β=-0.261, $p<0.001$), while comorbidities were similarly detrimental (β=-0.181, $p=0.004$). Gender was not significant ($p=0.558$). Subgroup analyses revealed that biologic therapies were most effective when initiated within 24 hours of stroke onset and demonstrated consistent benefits across different drug classes. Funnel plot inspection suggested minimal publication bias.

Conclusions

Biologic therapies significantly improve clinical outcomes in moderate to severe stroke, reducing mortality and enhancing functional independence beyond conventional care. Benefits remain robust after adjusting for age, baseline severity, and comorbidities. These findings highlight the transformative potential of biologic agents in stroke management and support their integration into future treatment guidelines, though longer-term trials are warranted to confirm durability and cost-effectiveness.

Contents

Meta-Regression Results for Predictors of Functional Outcomes

Predictor Variable	Coefficient (β)	Standard Error (SE)	p-value
Age	-0.145	0.041	**0.001**
Gender (female)	0.029	0.054	0.558
Baseline Stroke Severity	-0.261	0.073	**<0.001**
Comorbidities	-0.181	0.062	**0.004**
Biologic Therapy	0.322	0.051	**<0.001**

Transforming Elderly Stroke Care: The Impact of Digital Aging, Social Capital, and Economic Factors in Indonesia

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Purpose

The rising global burden of post-stroke depression demands innovative care models beyond clinical settings. Digital aging and social capital represent promising community-based resources for mitigating psychological sequelae, yet their comparative impact alongside economic factors remains unestablished in resource-limited populations.

Methods

We analyzed data from elderly stroke survivors (≥60 years) in the Indonesia Family Life Survey (Wave 5, 2014-2015). The primary outcome was geriatric depression measured by the 10-item Geriatric Depression Scale (GDS-10). Key exposures included digital technology use (mobile/internet access), social capital (composite index: community participation, trust, reciprocity), and wealth quintiles. Multivariate linear regression adjusted for sociodemographic and health covariates, with subgroup analysis by rehabilitative care access and causal mediation analysis.

Results

Higher social capital (β = -1.92, $p<0.001$) and top wealth quintile (β = -1.05, $p=0.003$) were independently associated with significantly lower GDS-10 scores, while digital technology use showed a non-significant trend (β = -0.58, $p=0.08$). Subgroup analysis revealed the protective effect of social capital was substantially stronger among patients without rehabilitative care access (β = -2.25, $p<0.001$) versus those with access (β = -1.15, $p=0.04$; p-interaction=0.02). Mediation analysis demonstrated that 35% of wealth's protective effect on depression was mediated through enhanced social capital (ACME = -0.37, $p<0.001$).

Conclusions

Social capital outperforms digital connectivity as a protective factor against post-stroke depression and serves as a critical compensatory resource where clinical care is absent. Economic advantage partially exerts its benefit by fostering social connectedness. Integrated stroke care models must prioritize community-based social interventions and economic support to effectively address the mental health epidemic among survivors in resource-limited settings.

Identifying the Feasibility of Hybrid Therapeutic Education for Stroke Patients: A Systematic Literature Review

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Purpose

Therapeutic education is crucial in stroke rehabilitation. Hybrid models were created due to limited access to face-to-face services. These models combine digital or telehealth education with hands-on therapy or rehabilitation devices. This method is effective across a range of clinical and psychosocial aspects, according to emerging evidence. The aim of this study was to examine recent research (2018–2025) examining the effectiveness of hybrid therapeutic education in stroke patients, with a focus on quantitative outcomes.

Methods

Twelve studies were identified using literature review from reputation Journal in website, these included five RCTs, three pilot/feasibility studies, and four qualitative/implementation studies. Design, population, intervention, duration, and primary and secondary outcomes were all elements of the extracted data.

Results

Conclusions

Therefore, hybrid therapeutic education significantly improves patients' quality of life. However, further analysis of this, particularly clinical trials, is needed.

Association Between Insomnia and Quality of Life in Patients Undergoing Post-Stroke Rehabilitation

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Purpose

Objectives This study investigated the prevalence of insomnia and its impact on motor recovery, cognitive performance, and emotional well-being in individuals undergoing rehabilitation following stroke.

Background Stroke remains one of the leading causes of long-term disability worldwide, with survivors often experiencing a range of complications beyond motor impairment. Among these, insomnia and other sleep disturbances are highly prevalent yet underrecognized. Poor sleep quality in post-stroke patients can worsen fatigue, mood disorders, and cognitive dysfunction, thereby limiting rehabilitation outcomes and lowering overall quality of life. Understanding the relationship between insomnia and clinical outcomes is therefore essential to optimize post-stroke care.

Methods

A total of 130 patients with a confirmed diagnosis of stroke were included in this cross-sectional study. The sample consisted of 70 men and 40 women, with a mean age of 65.3 ± 0.7 years. Average disease duration was 6.5 ± 3.4 years, and the mean severity stage was 2.2 ± 0.5. Participants were assessed using standardized tools to measure sleep disturbances, motor function, mood, and cognition. These included the Stroke Sleep Scale (RLSSS), Epworth Sleepiness Scale (ESS), Beck Depression Inventory, Spielberger Anxiety Scale, and validated quality of life measures. Data were analyzed to determine the prevalence of insomnia and its association with clinical and demographic variables.

Results

Insomnia was reported in 39% of patients, while fragmented sleep and frequent nighttime awakenings were noted in nearly 87%. Early morning awakenings occurred in 45% of cases. Women reported higher rates of sleep disturbances, including distressing dreams and frequent arousals, compared to men. Insomnia severity was strongly associated with longer disease duration and greater functional impairment. Patients who developed sleep problems in the early recovery phase exhibited significantly poorer sleep quality and more nocturnal awakenings than those with later onset disturbances ($p < 0.001$). Sleep fragmentation correlated with increased morning fatigue, reduced concentration, and inconsistent daily performance ($p < 0.05$).

Conclusions

Insomnia is a common and clinically significant issue in stroke survivors, influenced by age, disease severity, and neuropsychiatric comorbidities. Targeted interventions addressing both emotional and physical factors are essential to improve sleep quality, rehabilitation outcomes, and overall quality of life in post-stroke patients.

Analysis of the Impact of Murattal Al-Quran on Stroke Patients in Indonesia: A Systematic Literature Review

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Purpose

Stroke is a leading cause of disability in Indonesia, causing physical and psychological impairments. Non-pharmacological therapies such as music are increasingly being researched as additional interventions to accelerate recovery. This study identified and analyzed the impact of music listening on stroke patients in Indonesia based on evidence from the scientific publications.

Methods

The method used was a literature review of research conducted in Indonesia from 2010 to 2024, including nursing journals, university theses, proceedings, and case reports. The data reviewed included study design, sample size, music type, and outcomes.

Results

The results showed that the types of music used included instrumental music (3 studies), Mozart's classical music (1 study), nature sounds (3 studies), traditional kolintang music (2 studies), and movement music (1 study). The research designs included six quasi-experimental/pre-posttest studies, one case study, one narrative review study, and two pilot intervention studies. Sample sizes ranged from 3 to 30 patients, totaling approximately 191 stroke patients across all studies. Psychological effects were evident in five studies, reporting significant reductions in anxiety (average anxiety scores decreased by 20–40%), and two studies reported reductions in depression. Quality-of-life effects were evident in one case study in Jakarta (2019), showing an improvement in subjective quality of life in three patients who listened to music regularly. Physiological/functional effects were evident in two studies (2020–2021) that found improvements in physical mobility and muscle strength, and one study (2020) found an average increase in consciousness (GCS) of 1–2 points after nature sound music intervention. Traditional music from a study using kolintang in Manado (2018–2019) demonstrated positive effects on the psychological and social aspects of stroke patients.

Conclusions

Music therapy in Indonesia has been shown to be beneficial for stroke patients, particularly on psychological aspects (anxiety, depression, and mood) and quality of life, with additional evidence on physical function (mobility, muscle strength, and GCS). Although the results are promising, most studies are still limited to quasi-experimental designs with small sample sizes, necessitating further testing with larger samples.

The impact of aromatherapy on stroke patients in overcoming anxiety, lack of sleep, and fatigue levels: literature review

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Purpose

Stroke is a global health problem with a high incidence and disability rate. In addition to motor impairments such as limb weakness and difficulty speaking, stroke patients often experience non-motor symptoms, including anxiety, sleep disturbances, and fatigue. These conditions not only complicate the physical recovery process but also significantly reduce the patient's quality of life. In recent decades, complementary therapies have begun to be developed as an adjunct to conventional medical treatment. One form of complementary therapy that has been widely researched is aromatherapy. The purpose of this study was to determine the impact of aromatherapy on stroke patients in reducing anxiety, improving sleep quality, and alleviating fatigue.

Methods

The method used in this research is a systematic meta-analysis of literature review sources used from national and internationally reputable journals such as pudmed, frontiers and mdpi.

Results

Aromatherapy is a complementary therapy that supports medical therapy and can reduce anxiety, hallucinations, stress, delusions, and sleep disorders. Various aromatherapy treatments include lavender aromatherapy, rose aromatherapy, and lemongrass extract aromatherapy. Lavender aromatherapy reduces anxiety levels from severe to mild by 77.8% and can also improve patient sleep quality by 2-3 hours. Rose aromatherapy can also reduce pain levels from point 6 to point 4. Lemongrass extract aromatherapy can improve patient sleep quality. Aromatherapy can be administered through inhalation, aromatherapeutic baths, reflexology, and saunas.

Conclusions

Aromatherapy can be used for stroke patients to improve sleep quality, reduce anxiety and fatigue levels.

Impact of Statin-Ezetimibe combination therapy on small dense LDL and serum amyloid beta in stroke patients

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Purpose

Post-stroke mixed dementia is influenced by both recurrent stroke and cognitive decline, often associated with hyperlipidemia. This study aimed to compare the effects of statin monotherapy (SM) versus statin-ezetimibe combination therapy (SE) on serum small dense LDL (sdLDL), amyloid beta oligomers, and cognitive function in post-stroke patients.

Methods

A total of 283 ischemic stroke patients aged ≥65 years were enrolled within six months of onset between January 2020 and December 2022. Patients received either SM or SE to achieve LDL <70 mg/dL and were followed for two years. Cognitive function was assessed using the SNSB-D, MMSE, and CDR-SB. Serum sdLDL subfractions were measured by polyacrylamide gel electrophoresis (EONE Laboratory), and amyloid beta oligomers using the Spiking and Incubation Multimer Detection System (PeopleBio). Statistical analyses were performed with SPSS.

Results

Sixty-two patients completed the study (SE: 36, SM: 28). Total cholesterol, triglycerides, HDL, and LDL levels showed no significant differences. However, the SE group showed significantly lower sdLDL (p=0.041) and amyloid beta oligomer levels (p=0.047). Cognitive scores on the SNSB-D were significantly higher in the SE group after two years (p=0.022).

Conclusions

Statin-ezetimibe combination therapy may be more effective than statin monotherapy in reducing sdLDL and amyloid beta levels, and in preserving cognitive function in post-stroke patients. These findings suggest a potential role for SE in the prevention of post-stroke cognitive decline, though further studies are needed for validation.

The Impact of Cerebral Small Vessel Disease on Functional Recovery after Intracerebral Hemorrhage: Stratified Analysis by Age

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Purpose

Background

Cerebral small vessel disease (cSVD) is a well-established contributor to intracerebral hemorrhage (ICH). Its presence carries significant implications for stroke prevention, acute management, post-stroke recovery, recurrence, and socioeconomic burden. Despite its clinical significance, the impact of cSVD on functional outcomes after ICH, particularly concerning aging, remains uncertain.

Purpose

This study aimed to evaluate the impact of cSVD on functional recovery after ICH by comprehensively assessing multiple functional domains and stratifying patients by age (<65 and ≥65 years) to account for age-related confounding effects.

Methods

We retrospectively analyzed data from 356 patients with primary spontaneous ICH. Functional status was evaluated at baseline and at 3 months post-ICH across multiple domains, including global disability, activities of daily living, gait, upper extremity function, and swallowing ability, using validated assessment tools. Patients were categorized based on age and the presence or absence of cSVD.

Results

Patients without cSVD consistently exhibited better functional status than those with cSVD at both baseline and 3-month evaluations, across both age groups. Although all groups—regardless of age or cSVD status—showed statistically significant functional improvement over time, the degree of improvement was significantly lower in patients with cSVD, particularly among those aged 65 years or older. Multivariable logistic regression analysis confirmed that cSVD was a strong and independent predictor of poor functional outcomes at 3 months after ICH, even after adjusting for other variables.

Conclusions

Our findings emphasize that cSVD is not merely a passive comorbidity but an active and independent determinant of poor prognosis and limited recovery following ICH. The clinical importance of early detection of cSVD and support the need for more intensive, individualized rehabilitation strategies in ICH survivors. These insights may guide future research and clinical practices aimed at improving outcomes for ICH survivors with cSVD.

Acknowledgement

None

Direct Oral Anticoagulants in Pediatric Congenital and Acquired Heart Disease: Implications for Stroke Prevention – A Systematic Review and Meta-analysis

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Purpose

To evaluate the efficacy and safety of direct oral anticoagulants (DOACs) in preventing thromboembolic events, including stroke, in children with congenital and acquired heart disease (CAHD), compared to standard-of-care anticoagulants.

Methods

A systematic review and meta-analysis of randomized controlled trials (RCTs) was conducted. Databases were searched through July 1, 2025, for RCTs comparing DOACs (dabigatran, rivaroxaban, apixaban, edoxaban) to vitamin K antagonists, low-molecular-weight heparin, or aspirin in patients under 18 with CAHD. Relative risks (RRs) with 95% confidence intervals (CIs) were pooled using random-effects models. Subgroup analyses focused on CHD.

Results

Four RCTs comprising 732 pediatric patients were included. DOACs significantly reduced overall thromboembolic events (RR = 0.42, 95% CI: 0.18–0.97; p = 0.04). Stroke was rare but occurred only in control groups, with a pooled RR favoring DOACs (RR = 0.15, 95% CI: 0.01–3.63). In the CHD subgroup, DOACs showed a non-significant trend toward fewer thromboembolic events (RR = 0.29, 95% CI: 0.06–1.29). Major bleeding and clinically relevant non-major bleeding were not significantly different between DOAC and control arms in both overall and CHD-specific populations.

Conclusions

DOACs appear to offer a safe and effective strategy for thromboembolic prophylaxis, including stroke prevention, in pediatric patients with CAHD. These findings support the integration of DOACs into pediatric stroke prevention strategies, particularly in high-risk cardiac populations where adherence and long-term management are critical.

Cerebral embolic protection devices and transcatheter aortic valve implantation. Could stroke be avoided? A Meta-analysis of RCTs

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Purpose

Debris embolization during transcatheter aortic valve implantation (TAVI) can lead to stroke after the procedure, devastating the survival and quality of life (QoL) of patients. Cerebral embolic protection devices (CEPDs) were developed to protect against embolization from the valve or vasculature during or post-surgery. However, it remains controversial whether CEPDs can mitigate the risk of stroke. Aim: To assess the effect of CEPDs used in TAVI procedures and the risk of stroke starting from day two following TAVI, as well as neurocognitive outcomes.

Methods

We included randomized controlled trials (RCTs) comparing TAVR with and without CEPD. Four electronic databases were searched from inception through April 2025. Primary endpoints included all-cause mortality, major adverse cardiovascular and cerebrovascular events (MACCE), stroke, and disabling stroke. Risk ratios (RR) with 95% confidence intervals (CI) were pooled. TSA was performed to estimate the required information size and adjust for random errors, with thresholds set at 5% type I error and 80% power.

Results

Nine RCTs (n = 11,876; CEPD = 6,140; control = 5,736) were analyzed. The results showed a significant risk of disabling stroke following 2-5 days postoperatively without CEPDs (RR = 0.455, 95% CI: [0.214, 0.967]; P = 0.041) but no significant associated risk following 30 days postoperatively (RR = 1.295; 95 CI: [0.373, 4.493]; P = 0.684). There was no significant risk of non-disabling stroke with 2-5 days or 30 days postoperative follow-up between both the cerebral protection group and controls (RR = 1.196; 95% CI: [0.738, 1.938]; P = 0.467) and (RR = 0.939; 95% CI: [0.528, 1.671]; P = 0.831), respectively. There was no significant difference regarding the overall stroke incidence, major adverse cardiac and cerebrovascular events, mortality rate, acute kidney injuries, and major vascular complications. No significant heterogeneity was found between the pooled studies. CEPD use showed no significant difference in mortality (RR = 1.04; 95% CI [0.68–1.58]) or MACCE (RR = 1.13; 95% CI [0.69–1.86]).

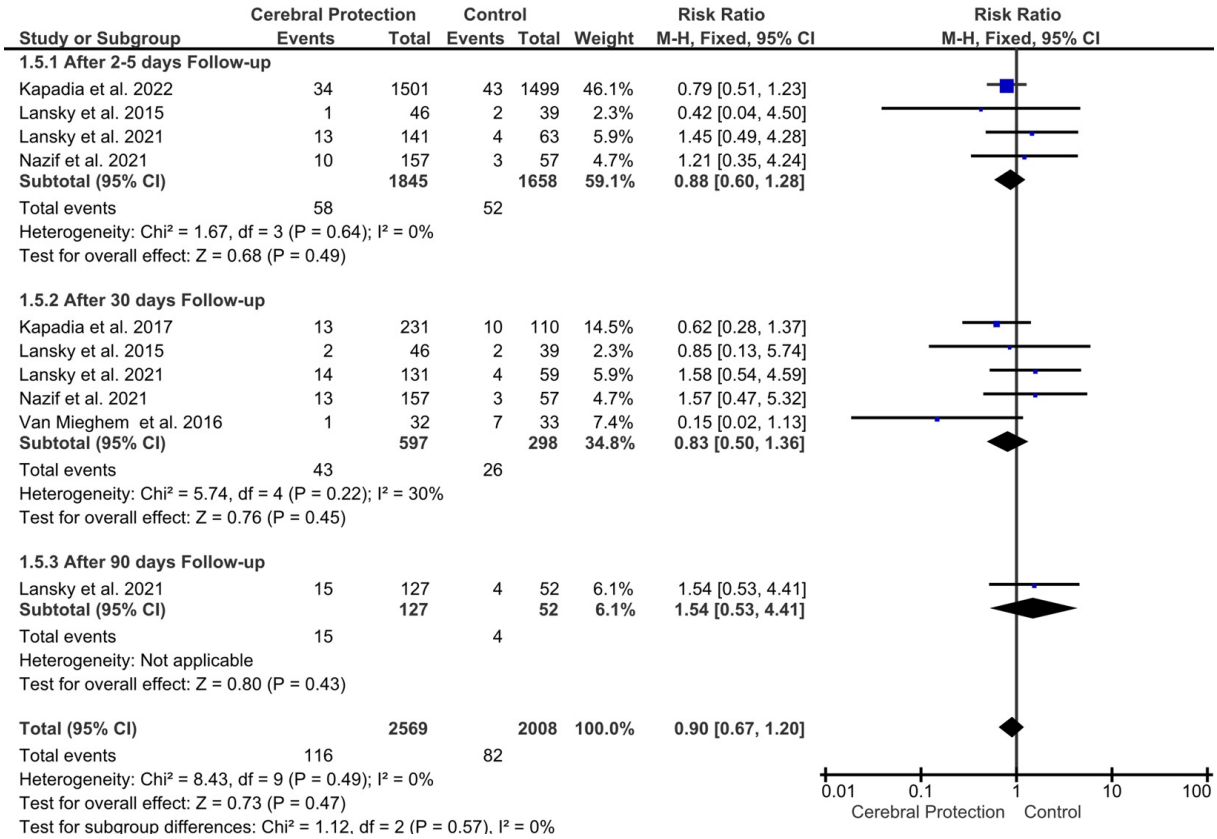
Conclusions

Using the CEPDs in TAVI procedures can be effective in reducing the disabling stroke in the initial phase postoperatively. CEPDs also have a protective effect against mild cognitive impairment after TAVI on the MoCA scale.

Acknowledgement

None

Contents


Cerebral Protection
Control
Risk Ratio
Risk Ratio
Study or Subgroup Events Total Events Total Weight M-H, Fixed, 95% CI
M-H, Fixed, 95% CI
1.5.1 After 2-5 days Follow-up
Kapadia et al. 2022 34 1501 43 1499 46.1% 0.79 [0.51, 1.23]
Lansky et al. 2015 1 46 2 39 2.3% 0.42 [0.04, 4.50]
Lansky et al. 2021 13 141 4 63 5.9% 1.45 [0.49, 4.28]
Nazif et al. 2021 10 157 3 57 4.7% 1.21 [0.35, 4.24]
Subtotal (95% CI) 1845 1658 59.1% 0.88 [0.60, 1.28]
Total events 58 52
Heterogeneity: Chi² = 1.67, df = 3 (P = 0.64); I² = 0%
Test for overall effect: Z = 0.68 (P = 0.49)
1.5.2 After 30 days Follow-up
Kapadia et al. 2017 13 231 10 110 14.5% 0.62 [0.28, 1.37]
Lansky et al. 2015 2 46 2 39 2.3% 0.85 [0.13, 5.74]
Lansky et al. 2021 14 131 4 59 5.9% 1.58 [0.54, 4.59]
Nazif et al. 2021 13 157 3 57 4.7% 1.57 [0.47, 5.32]
Van Mieghem et al. 2016 1 32 7 33 7.4% 0.15 [0.02, 1.13]
Subtotal (95% CI) 597 298 34.8% 0.83 [0.50, 1.36]
Total events 43 26
Heterogeneity: Chi² = 5.74, df = 4 (P = 0.22); I² = 30%
Test for overall effect: Z = 0.76 (P = 0.45)
1.5.3 After 90 days Follow-up
Lansky et al. 2021 15 127 4 52 6.1% 1.54 [0.53, 4.41]
Subtotal (95% CI) 127 52 6.1% 1.54 [0.53, 4.41]
Total events 15 4
Heterogeneity: Not applicable
Test for overall effect: Z = 0.80 (P = 0.43)
Total (95% CI) 2569 2008 100.0% 0.90 [0.67, 1.20]
Total events 116 82
Heterogeneity: Chi² = 8.43, df = 9 (P = 0.49); I² = 0%
Test for overall effect: Z = 0.73 (P = 0.47)
Test for subgroup differences: Chi² = 1.12, df = 2 (P = 0.57), I² = 0%
0.01 0.1 1 10 100
Cerebral Protection Control

The Relationship between Stroke Prevalence and Comorbidities, Happiness, Smoking Habits, and National Health Insurance Coverage in Indonesia: Spearman Correlation Analysis Using Open Government Data

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Purpose

Stroke is a leading cause of death and disability. According to 2023 data from the Indonesian Ministry of Health, its prevalence was 8.3 per 1,000 population. This study aims to identify the relationship between stroke prevalence and comorbidities, happiness, socioeconomic status, and lifestyle in Indonesia.

Methods

The method used was Spearman correlation analysis. This analysis identified the relationship between stroke prevalence (per population in %), ischemic heart disease (per population in %), hypertension (per population in %), happiness (per population in), per capita income (US$, converted to US), JKN coverage (%) and smoking (%). Data sources were World Health Statistics, IHME, and the Indonesian Central Statistics Agency (BPS), with secondary data from 2000 to 2021. The year 2021 was used due to data transparency through 2021.

Results

The results show that comorbid ischemic heart disease has a moderate and positive association with stroke, as the coefficient value is greater than 0.5 (ρ=0.5498). The higher the probability of ischemic heart disease, the higher the prevalence of stroke. Hypertension has a negative and small association (ρ=0.3014), happiness has a positive and moderate association (ρ=-0.5889), universal health coverage has a negative and small association (ρ=-0.2025), smoking has a positive and small association (ρ=0.1962), and per capita income has a positive and small association (ρ=0.989). Happiness and universal health coverage are seen as the primary factors reducing stroke prevalence. Happiness, in fact, appears to be the primary factor reducing stroke, as it has the highest ρ value. The primary contributing factor is ischemic heart disease.

Conclusions

Therefore, efforts are needed to ensure that Indonesians maintain their mental health and remain happy to reduce the incidence of stroke. Maintaining health includes ischemic heart disease and hypertension, as well as changing lifestyles that increase the risk of stroke, such as smoking and working too hard.

Contents

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. spearman strokeprevelance ishemicheartdisease_disability hypertension happinness universal_heath_coverage smoking incom
> e_percapita
(obs=33)
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	stroke~e	ishemi~y	hypert~n	happin~s	univer~e	smoking	income~a
strokeprev~e	1.0000						
ishemichea~y	0.5498	1.0000					
hypertension	0.3014	0.6188	1.0000				
happinness	-0.5889	-0.1574	0.0973	1.0000			
universal_~e	-0.2025	0.1096	0.0446	0.0859	1.0000		
smoking	0.1962	-0.0070	-0.1725	-0.1472	-0.5114	1.0000	
income_per~a	0.0989	0.2246	0.1768	0.2724	0.0381	-0.4265	1.0000

Evaluating Bleeding Risk Prediction Tools for Stroke Prevention in Atrial Fibrillation on Apixaban and Rivaroxaban: Do They Pass the Test?

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Purpose

Methods

Results

Of 1,868 patients screened, 313 with NVAF receiving apixaban (n=164) or rivaroxaban (n=149) were included. Over a median follow-up of 2.89 years, 12.5% experienced bleeding events. Among rivaroxaban-treated patients, bleeding risk assessment tools demonstrated sufficient diagnostic ability, with ORBIT showing the highest AUROC (0.68), followed by HEMORR2HAGES (0.66) and HAS-BLED (0.63). In contrast, bleeding risk assessment tools performed poorly in apixaban-treated patients, with ORBIT achieving an AUROC of only 0.58. Subgroup analyses revealed improved discrimination in patients aged 75 years and older, where HAS-BLED reached an AUROC of 0.74 in the rivaroxaban group. However, no bleeding risk assessment tool consistently achieved good predictive accuracy (AUROC ≥0.7) across treatment groups, suggesting limited reliability of these tools in NVAF patients on rivaroxaban or apixaban.

Conclusions

Bleeding risk assessment tools showed limited diagnostic accuracy in NVAF patients receiving apixaban or rivaroxaban. Even the simplified ABH tool, designed for direct oral anticoagulant (DOAC)-treated populations, did not demonstrate reliable discrimination. While ORBIT and HAS-BLED performed sufficiently in certain subgroups, no tool consistently achieved good diagnostic accuracy. These findings emphasizes the need for better bleeding risk prediction models tailored to DOAC use in NVAF stroke prevention.

Acknowledgement

Microsurgical treatment of ethmoidal dural arteriovenous fistula

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Purpose

A 78-year-old male presented with an episode of confusion. CTA revealed an abnormal collection of vessels in the basal frontal region, and diagnostic cerebral angiogram revealed an ethmoidal dural arteriovenous fistula (dAVF). The patient underwent microsurgical treatment for dAVF disconnection.

Methods

N/A

Results

Key surgical steps of this procedure include opening a three-quarter bicoronal incision, harvesting pericranium, bringing the scalp forward to the orbital rim, identifying the nasofrontal suture, performing our craniotomy with a Burr hole at the keyhole, and then opening a small amount of bone over the venous frontal sinus in order to maintain control, and then fashioning our frontal craniotomy flap. This patient's frontal sinus was quite big, and the frontal sinus was necessarily opened, so we had to perform exenteration and cranialization at the end of the case. Once our craniotomy was performed, we prepared our Greenberg retractor, brought in the operative microscope, and then we opened the dura in a curvilinear fashion and sewed it forward, performed an extensive subarachnoid dissection utilizing neuronavigation to direct these efforts. We worked our way under the gyrus rectus until the main draining vein of the fistula was encountered, and then we identified fistulous arteries within the dura along the floor of the anterior fossa. We performed a baseline ICG angiogram to reveal the main draining vein and location of the fistula. We then coagulated the feeders within the dura, placed an 8mm straight mini titanium clip across the main draining vein. We observed the behavior of the vessels as well as neuromonitoring. We then performed a follow-up ICG angiogram. Finally, we coagulate the main draining vein and disconnected it. Subsequently, we performed a diagnostic cerebral angiogram to confirm obliteration. The patient made an excellent recovery, and his confusion resolved.

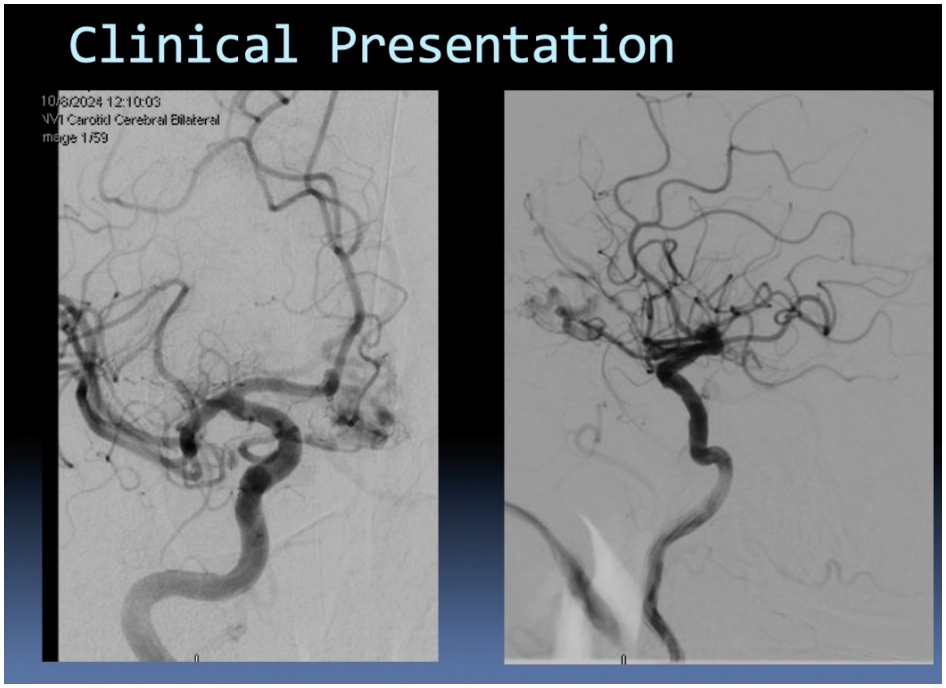
Conclusions

In conclusion, ethmoidal dural arteriovenous fistulas are aggressive and require treatment to prevent rupture and subsequent hemorrhagic stroke. Endovascular treatment is possible, but disadvantages include risk of blindness and recurrence. Surgical treatment, on the other hand, can result in obliteration of the dural AV fistula and is curative in the long term.

Acknowledgement

N/A

Contents



Pathophysiology and Predictors of Stroke Recovery: Insights from a Meta-Analysis

Lintong Hottua Simbolon[1], Asriati Asriati[2, 1], Gracce Sinaga[3, 1], Rosinta Purba[1], Igna Abdul Lukmana[1], Yesika Simbolon[3, 1], Hepri Ardianson[1]

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Purpose

The complex pathophysiology of stroke involves neuronal injury, excitotoxicity, inflammation, and vascular dysfunction, with outcomes heavily influenced by clinical, demographic, and therapeutic variables. Elucidating these mechanisms and the factors that modulate recovery is critical for guiding evidence-based prevention and treatment strategies. Understanding the differential impacts of age, baseline stroke severity, comorbidities, and intervention modalities, including thrombolytic therapy and advanced imaging techniques, can inform clinical decision-making and improve prognostic accuracy.

Methods

This meta-analysis synthesized data from multiple open-access databases, including the NIH National Institute of Neurological Disorders and Stroke (NINDS), European Stroke Organisation, and WHO repositories, covering studies published between 2010 and 2022. Eligible studies included clearly defined patient populations, standardized stroke outcome measures, and follow-up durations sufficient for assessing recovery trajectories. Key control variables included socioeconomic status, geographic region, and pre-existing health conditions.

Results

The mean patient age was 66.1 years, 46% were female, and baseline stroke severity measured by NIHSS averaged 14.8, indicating predominantly moderate to severe strokes. Average follow-up was 15 months, during which the overall mortality rate was 30.5% and functional independence was achieved in 40.3% of patients. Meta-regression revealed that age ($\beta = -0.152$, SE = 0.034, $p = 0.0008$) and baseline stroke severity ($\beta = -0.287$, SE = 0.061, $p < 0.0001$) were negatively associated with recovery outcomes, whereas advanced imaging techniques ($\beta = 0.318$, SE = 0.039, $p < 0.0001$) and thrombolytic therapy ($\beta = 0.294$, SE = 0.045, $p < 0.0001$) positively influenced functional recovery and survival. Gender demonstrated a nonsignificant effect ($\beta = 0.075$, SE = 0.048, $p = 0.12$), while comorbidities were significantly detrimental ($\beta = -0.167$, SE = 0.057, $p = 0.003$). Visualization of these relationships confirmed that advanced clinical interventions were the strongest positive predictors of outcomes, whereas older age and higher initial stroke severity were the primary negative determinants.

Conclusions

This meta-analysis underscores the critical role of early, advanced therapeutic interventions in mitigating stroke-related morbidity and mortality. Thrombolytic therapy and the application of advanced imaging techniques significantly enhance the likelihood of functional recovery, whereas advanced age and severe baseline strokes predict poorer outcomes. These findings highlight the necessity of integrating rapid diagnostic and interventional strategies tailored to patient-specific risk factors to optimize

recovery trajectories. The results also suggest that controlling for comorbidities and demographic variables is essential for accurate prognostication and effective clinical management.

Contents

Meta-Regression Results

Predictor Variable	Coefficient (β)	Standard Error (SE)	p-value
Age	-0.152	0.034	0.0008
Gender (female)	0.075	0.048	0.120
Baseline Stroke Severity	-0.287	0.061	<0.0001
Comorbidities	-0.167	0.057	0.003
Advanced Imaging Techniques	0.318	0.039	<0.0001
Thrombolytic Therapy	0.294	0.045	<0.0001

NAD^+ supplementation protects blood-brain barrier integrity in endothelial cells after inducing hemorrhagic stroke via enhancement of mitochondrial respiration

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Purpose

Endothelial cells (ECs) in the brain are enriched with mitochondria and tight junctional proteins that are essential for maintaining blood-brain barrier (BBB) integrity as a first line of barrier by restricting toxic substances. Maintenance of BBB is critical to protecting the brain from the pathogen infiltration and acute brain injury by oxidative stress. Currently, treatments such as anticoagulants and thrombolytics are administered after the onset of stroke and Effective strategies to maintain BBB integrity or prevent BBB disruption still need to be developed.

Methods

We established a mouse model of hemorrhagic stroke by stereotaxic injection of collagenase into the striatal region of the brain. Behavioral assessment was performed using the cylinder test, in which forelimb use was evaluated by quantifying the number of wall contacts during rearing. To assess blood–brain barrier (BBB) integrity, we conducted immunofluorescence staining. Additionally, our laboratory has developed a specialized technique for the isolation of brain microvessels. Using this approach, we performed RNA sequencing and immunoblotting to characterize BBB-specific alterations.

Results

Our previous work demonstrated that mitochondrial oxidative phosphorylation (Oxphos) in cerebral ECs is crucial for BBB maintenance. RNA sequencing of isolated cerebral vessels from EC-specific Crif1 knockout mice (TEKCRIF1 KO mice) revealed alterations in multiple signaling pathways, including previously identified alterations in Notch1 signaling. In this study, we focused on the downregulation of the NAD^+ signaling pathway and explored its therapeutic potential. We found that NAD^+ supplementation protects cerebral ECs from mitochondrial dysfunction under oxygen-glucose deprivation (OGD), an in vitro model of ischemia. Pretreatment with NAD^+ preserved mitochondrial respiration and sustained the expression of junctional proteins. Furthermore, systemic administration of NAD^+ in a mouse model of intracerebral hemorrhage (ICH) significantly reduced neurological symptoms and BBB disruption.

Conclusions

These findings suggest that enhancing mitochondrial function through NAD^+ supplementation may serve as an effective strategy for preventing BBB breakdown. Targeting mitochondrial metabolism in cerebral endothelial cells represents a promising therapeutic avenue for the treatment of neurovascular disorders

Acknowledgement

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (RS-2023-00237665, 2022R1A2C2002756, RS-2024-00406568, RS-2024-00463129) and by a grant of the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare (KH130308)

The Association between Whole Blood Viscosity and Small vessel disease markers

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Purpose

Whole blood viscosity (WBV) plays a pivotal role in regulating microcirculatory dynamics and vascular shear forces. Nevertheless, its association with small vessel disease (SVD) markers correlates of chronic cerebrovascular pathology has not been fully elucidated. The present investigation sought to clarify the link between WBV and SVD markers including white matter hyperintensities (WMH), cerebral microbleeds, lacunar infarctions, enlarged perivascular spaces, and chronic infarcts.

Methods

This single-center prospective observational study enrolled patients who visited the cerebrovascular clinic from March 2023 to August 2025. Participants provided written consent, underwent brain MRI, and had WBV measured with an oscillatory plate viscometer (Advanced Rheology Solutions, Ltd.) at 5 Hz and 10 Hz. Demographic data and vascular risk factors (hypertension, diabetes, dyslipidemia, smoking, prior stroke, and coronary heart disease) were collected. The presence of SVD markers were defined as moderate-to-severe WMH (Fazekas), ≥1 CMB, ≥1 lacune, any enlarged PVS, or any chronic infarct. WBV values were compared using the Mann–Whitney U test, and logistic regression was applied for markers significant in univariate analysis ($p<0.05$), adjusting for age, sex, and hypertension.

Results

A total of 75 patients were analyzed, with a median age of 67 years (IQR 61–75) and 41.3% were male. The median WBV was 27.4 (IQR 19.7–35.1) at 5 Hz and 16.9 (IQR 14.2–21.7) at 10 Hz. Among SVD markers, WMH were observed in 62.7% of patients, enlarged perivascular spaces in 37.3%, lacunes in 24.0%, chronic infarcts in 22.7%, and cerebral microbleeds in 14.7%. Comparisons of WBV across SVD markers demonstrated higher in those with enlarged perivascular spaces in 5 Hz WBV (30.6 vs. 25.6). At 10 Hz, higher WBV values were observed in patients with cerebral microbleeds (18.4 vs. 16.6) and enlarged perivascular spaces (19.5 vs. 16.3). In multivariable logistic regression, WBV at 10 Hz was significantly associated with the presence of enlarged perivascular spaces (OR 1.098, 95% CI 1.011–1.192, $p=0.027$), independent of age, sex, and hypertension.

Conclusions

This study suggests an association between WBV and the presence of enlarged perivascular spaces. Further research quantitative and topographic image analysis is warranted to validate these observations and elucidate underlying mechanisms.

Acknowledgement

This study was supported by the National Research Foundation of Korea (no. RS-2023-00249098).

Development of a Hemorrhage Severity Detection Algorithm in SAH Patients Using Frontal EEG

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Purpose

Subarachnoid hemorrhage is a life-threatening condition that requires early and accurate detection. Electroencephalography has been explored as a non-invasive tool for identifying neural abnormalities associated with SAH. Subarachnoid hemorrhage is a life-threatening condition that requires early and accurate detection. Electroencephalography has been explored as a non-invasive tool for identifying neural abnormalities associated with SAH.

Methods

Frontal EEG data were collected from SAH patients and analyzed using Fast Fourier Transform (FFT). Power spectral density differences were examined across six frequency bands: Delta (0-4 Hz), Theta (4-8 Hz), Alpha (8-12 Hz), Low Beta (12-25 Hz), High Beta (25-30 Hz), and Gamma (30-48 Hz). A t-test was conducted to determine statistically significant differences between 6 ruptured and 15 unruptured groups.

Results

Significant differences in EEG were observed between the ruptured and unruptured aneurysm groups across all frequency bands. The t-test indicated that the Low Beta band exhibited the largest mean difference (0.3403) with the highest t-value (249.36), making it the most distinguishing feature for classification. This was followed by the Gamma band (mean difference: 0.3192, t-value: 162.05) and the High Beta band (mean difference: 0.1763, t-value: 127.86). The Delta band exhibited the smallest mean difference (0.3078) and the lowest t-value (37.523), indicating a relatively lower classification impact.

Conclusions

This study demonstrates that frontal EEG can effectively differentiate between ruptured and unruptured aneurysm. The significant differences in power spectral density, particularly in Low Beta, Gamma, and High Beta bands, suggest their potential for SAH classification. The developed algorithm may aid in rapid, non-invasive SAH detection for enhanced predictive accuracy.

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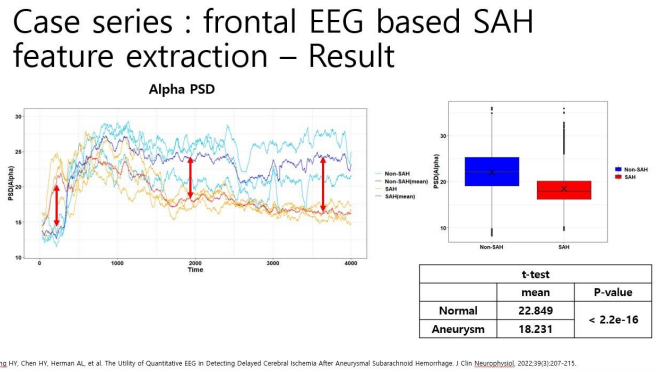

*Baang HY, Chen HY, Herman AL, et al. The Utility of Quantitative EEG in Detecting Delayed Cerebral Ischemia After Aneurysmal Subarachnoid Hemorrhage. J Clin Neurophysiol. 2022;39(3):207-215.

Lipoprotein(a) and Its Relationship with Atherosclerotic Burden and Long-Term Vascular Outcome in East Asian Stroke Patients: A prospective Cohort Study

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Purpose

Lipoprotein(a) [Lp(a)] has emerged as a key biomarker for atherosclerotic cardiovascular disease and stroke recurrence. While individual studies have demonstrated associations between Lp(a) and specific atherosclerotic markers, the relationship between Lp(a) levels and overall atherosclerotic burden, as well as long-term vascular outcomes in East Asian stroke patients, remains incompletely characterized. We investigated whether elevated Lp(a) represents a source of residual vascular risk despite guideline-adherent secondary prevention strategies.

Methods

This prospective cohort study included 787 consecutive East Asian patients with acute ischemic stroke. Patients were categorized by Lp(a) levels (<75 vs ≥75 nmol/L). Intracranial atherosclerotic stenosis (ICAS) burden was systematically assessed using a semi-quantitative method as the total number of affected intracranial arteries demonstrating ≥50% stenosis. Primary and secondary endpoints were time to recurrent ischemic stroke and major adverse cardiovascular events (MACE), respectively. Cox proportional hazards models and propensity score matching were employed.

Results

Among 787 patients, 142 (18.0%) had elevated Lp(a) ≥75 nmol/L, with right-skewed distribution (median 26 nmol/L). ICAS burden distribution was similar between low and high Lp(a) groups (P=0.886). The median follow-up duration was 31 months for ischemic stroke and 29 months for the composite vascular outcome. During follow-up, recurrent ischemic stroke occurred in 73 patients (6.8%) and MACE in 182 patients (16.8%). Elevated Lp(a) levels showed no significant association with recurrent stroke (HR 1.20, 95% CI 0.62-2.32, P=0.583) or MACE (HR 1.15, 95% CI 0.64-2.05, P=0.646).

Results remained consistent across multiple Lp(a) thresholds (75, 112, and 175 nmol/L) and after propensity score matching.

Conclusions

In East Asian stroke patients with characteristically low median Lp(a) levels, elevated lipoprotein(a) was not significantly associated with increased atherosclerotic burden or stroke recurrence under optimal medical management. These findings have important implications for ethnicity-specific implementation of emerging Lp(a)-targeted therapies.

Prospective Multicenter Validation of a Deep Learning Model for Ischemic Stroke Subtype Classification

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Purpose

Accurate subtyping of ischemic stroke (AIS) is crucial for secondary prevention but is frequently delayed by multi-day diagnostic evaluation and subject to interobserver variability. We aimed to prospectively validate a deep learning algorithm developed to provide immediate, objective AIS subtype classification in clinical practice.

Methods

In this prospective, multicenter, observational study at nine stroke centers in Korea, we enrolled consecutive AIS patients. The AI algorithm integrated diffusion-weighted imaging (DWI) and atrial fibrillation (AF) status to classify AIS subtypes (large-artery atherosclerosis [LAA], small-vessel occlusion [SVO], cardioembolism [CE], or undetermined). We compared the AI's classification, available immediately after MRI, with the final diagnosis determined by treating neurologists following a complete clinical workup. The primary endpoint was the diagnostic agreement, measured by Cohen's Kappa.

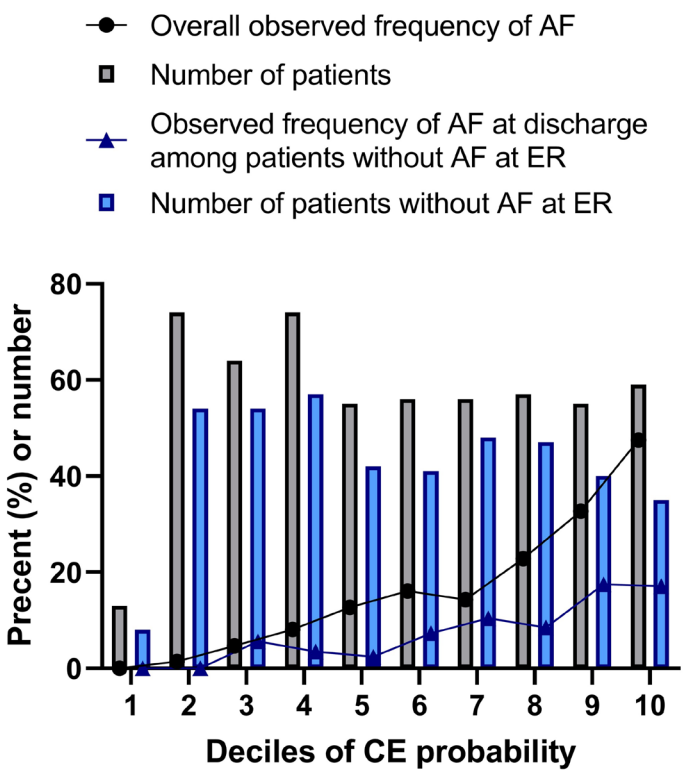
Results

The final analysis included 617 patients (mean age 68.9 years, SD 12.5). The AI algorithm demonstrated substantial concordance with neurologists, achieving 75.7% overall agreement and a Cohen's Kappa of 0.643 (95% CI, 0.594-0.692), thereby meeting the primary endpoint. The algorithm showed high sensitivity and specificity for SVO (0.91 and 0.94, respectively) and CE (0.95 and 0.89, respectively). A DWI-only model effectively stratified CE risk, with 47.5% of patients in the highest-risk decile having confirmed CE. In a sub-study, a non-expert reader assisted by the AI achieved substantial agreement with expert adjudication (Kappa=0.61).

Conclusions

In a real-world, multicenter setting, this deep learning algorithm demonstrated accurate and reliable classification of AIS subtypes, with performance comparable to that of human experts. The tool has the potential to streamline diagnostic workflows, reduce diagnostic uncertainty, and support timely clinical decision-making for secondary stroke prevention.

Contents



Declies	Range of CE probability
1	0%
2	≤1%
3	2–3%
4	4–9%
5	10–16%
6	17–32%
7	33–54%
8	55–75%
9	76–86%
10	87–95%

Concussion and Subsequent Stroke Risk: A Multi-National Real-World Evidence Study Using the TriNetX Network

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Purpose

To our knowledge, this is the first study to employ the TtiNext database to examine the association between concussion and subsequent risk of stroke.

Methods

Data were obtained from the US Collaborative Network of TriNetX on August 26, 2025, which provides patient-level information including demographics, diagnoses (based on the Internal Classification of Disease, Tenth Revision, Clinical Modification, ICD-10-CM codes), and labs (body mass index, BMI, from TNX Curated). The network crosses 72 health care organizations (HCOs) totally and collects more than a hundred million patients, including a variety of races and ethnicities.

This is a population-based retrospective cohort study. The control group was matched to the concussion group using propensity score matching (PSM) in a 1:1 ratio based on age at index, sex, ethnicity, race, body mass index (BMI), adverse social economic status, and comorbidities. In total, 605,658 individuals were enrolled in each of the concussion group and control group.

Results

Our findings suggest that concussion may act as an independent risk factor for both ischemic and hemorrhagic stroke. Concussion may confer a particularly elevated risk of stroke among younger individuals, females, Asians, whereas BMI may not play a significant modifying role.

A concussion results in axonal strain and neuroinflammation. However, damage to blood vessels in the brain, potentially leads to weakened vessel walls and impaired blood flow. The hyperglycoglytic state and disproportionate impairment of blood flow may exacerbate secondary injury and prolong neuroinflammation.

Activation of the hypothalamic-pituitary-adrenal (HPA) axis following concussion leads increased cortisol release, which may prolong neuroinflammation and elevated risks of stroke. Younger individuals appear to be more sensitive to HPA axis dysregulation compared with older individuals, and females more so than male. White individuals exhibit a more robust HPA axis response than Blacks.

The comparable HRs across BMI subgroups may imply that concussion confers a stroke risk through a distinct pathophysiological pathway.

Conclusions

Concussion increases the risk of both ischemic and hemorrhagic stroke independently, with the highest risk observed in the short term, followed by a sustained long-term risk. Younger individuals, female, and/or White with a history of concussion may be at greater risk of stroke compared with older individuals, males, and/or Black or African American with concussion. Whether concussion confers a greater increase in stroke risk among Asian individuals and those with higher body mass index remains unclear and warrants further investigation.

Bioinformatics-Driven Arteriolar Regulatory Genomics-Informed Polygenic Risk Modeling for Stratification and Prevention in Intracranial Atherosclerotic Stroke

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Purpose

Intracranial atherosclerotic stenosis (ICAS) is a leading cause of ischemic stroke, but recurrent events are not fully explained by luminal narrowing or conventional risk factors. Existing polygenic scores capture systemic vascular risk but rarely incorporate the unique regulatory architecture of intracranial arterioles. We aimed to develop a bioinformatics-driven Arteriolar Polygenic Regulatory Risk Score (APRRS-ICAS) by integrating chromatin architecture with genetic risk variants, enabling improved stratification and prevention strategies tailored to ICAS patients.

Methods

We analyzed human cerebral arteriole datasets from Micro-C, promoter capture Hi-C, ATAC-seq, and RNA-seq available in the Gene Expression Omnibus (GEO) (GSE288690–694) to define enhancer–promoter interactions and tissue-specific expression. Genetic variants associated with atrial fibrillation and blood pressure were obtained from a large meta-analysis available in GEO (GSE225293). SNP–gene regulatory assignments required overlap with accessible chromatin and linkage to expressed promoters through Micro-C contacts. Variants were weighted by GWAS effect size and a regulatory impact factor integrating contact strength, accessibility, and expression specificity. APRRS-ICAS was calculated as the weighted allele sum across prioritized variants. Performance was assessed by 5-fold cross-validation, calibration, and decision curve analysis. Biological plausibility was evaluated by pathway enrichment and overlap with transcriptomic signatures from ruptured versus asymptomatic plaques available in GEO (GSE198600).

Results

APRRS-ICAS retained 437 regulatory variant–gene pairs across 152 arteriolar-expressed genes. Stratification by quartiles showed odds ratio 2.1 (95% CI: 1.7–2.6) for ICAS stroke risk in the top versus bottom quartile. Discrimination achieved AUC 0.79 (95% CI: 0.74–0.83) with Brier score 0.18, outperforming a conventional polygenic score (AUC 0.66). Calibration slope ranged 0.91–1.06, and net reclassification index improved by 0.17. Enriched pathways included endothelial junction integrity (NOTCH4, JAG1), extracellular matrix stability (COL4A1/2), vascular tone (EDNRA, KCNJ2), and macrophage inflammatory signaling (PLCE1, TREM1). Cross-validation confirmed that 68% of APRRS-ICAS genes overlapped with rupture-associated programs, reinforcing mechanistic relevance. A reduced 20-gene panel preserved discrimination (AUC 0.77) and is feasible for PCR-based implementation. Clinically, APRRS-ICAS improved correct classification of high-risk ICAS patients by 15% compared with standard models, with sensitivity 78% (95% CI: 69–86) and specificity 71% (95% CI: 61–81), supporting individualized prevention strategies.

Conclusions

This bioinformatics-driven risk model integrates arteriolar regulatory genomics with vascular risk variants to improve ICAS stroke prediction beyond conventional scores. APRRS-ICAS may support precision prevention, enable earlier identification of high-risk patients, and reveal novel molecular targets for therapeutic intervention.

Emotional Distress as a Risk Factor for Inadequate Recovery and Recurrent Stroke: A Psychosocial Perspective

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Purpose

Stroke ranks among the diseases with the highest mortality rates globally. Stroke not only results in a high mortality rate but also serves as a major contributor to disability, thereby impacting those affected. In addition to factors such as vascular and metabolic factors that are the leading causes of stroke, psychosocial factors, such as emotional stress experienced by stroke patients, can hinder the rehabilitation process of stroke sufferers and increase the recurrence of stroke events. This narrative literature aims to examine the existing evidence concerning the influence of emotional distress as a risk factor for inadequate recovery in stroke patients and the recurrence of stroke.

Methods

For this narrative review, an international literature search was conducted through PubMed, Scopus, and Google Scholar with publication years between 2020 and 2025. The literature search used several keywords, namely "post-stroke depression," "emotional distress," "recovery," "recurrence," and "psychosocial factors." Studies that assessed depression, anxiety, emotional distress, and their relationship to rehabilitation outcomes and recurrent stroke were analyzed using narrative synthesis.

Results

Several lines of evidence suggest that emotional distress is a significant determinant of stroke patient outcomes. Emotional distress experienced by stroke patients, such as feeling like a burden on caregivers, depression, and anxiety, is associated with delayed neurological recovery, severe disability, and increased mortality. Moreover, emotional distress may be associated with an increased risk of recurrent stroke. Factors suspected to cause this include poor adherence to treatment and maladaptive coping strategies. Furthermore, neurological findings demonstrate a correlation between depression severity and decreased activity in the medial prefrontal cortex, dorsolateral prefrontal cortex, and temporal lobe, providing objective evidence supporting that emotional distress contributes to impaired recovery through dysfunctional emotion regulation and neuroplasticity. From a lifestyle perspective, emotional distress can foster sedentary behavior, disrupt sleep, and encourage unhealthy habits, which may exacerbate distress and elevate vascular risk, contributing to poor recovery and stroke recurrence. From a psychosocial perspective, distress diminishes motivation, undermines adherence to rehabilitation, and escalates caregiver burden, ultimately worsening patient outcomes.

Conclusions

Emotional distress is a multidimensional risk factor that plays a significant role in worsening recovery and increasing the risk of stroke recurrence. Therefore, psychosocial support in rehabilitation programs is needed to improve long-term outcomes. However, more research is needed, particularly longitudinal and interventional studies, that further examine the relationship between emotional distress and stroke recovery and recurrence.

Acknowledgement

The authors acknowledge the contribution of previously published studies that formed the basis of this narrative review. No external funding was received for this work.

Correlation of Dietary Habit Among Hypertension Patient in Asia with Stroke Incident

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Purpose

The influence of a person's dietary habits is a contributing factor to various diseases, such as hypertension. The relationship between hypertension and dietary habits, particularly in Asian countries, is closely linked, influenced by various factors such as traditional foods, socioeconomic status, and lifestyle changes. Hypertension is recognized as a risk factor for stroke, as evidenced by high blood pressure substantially increasing the risk of ischemic and hemorrhagic strokes. The disease, with its increasing prevalence across continents, poses a significant health burden. In urban areas, this increase can be particularly rapid due to changing dietary habits.

Methods

The method used in this study was a search for articles from the past 10 years related to hypertension as a risk factor for stroke. Articles were collected by researchers over the past 10 years, from 2016 to 2025, using the keywords "hypertension, stroke, dietary habits, lifestyle." The articles were searched using bibliometric analysis using open access articles. The keyword search yielded 439 articles and 22 research categories related to hypertension as a risk factor for stroke, with the majority of findings in the biological and clinical sciences. This study included 105 items discussing hypertension and dietary habits as risk factors for stroke.

Results

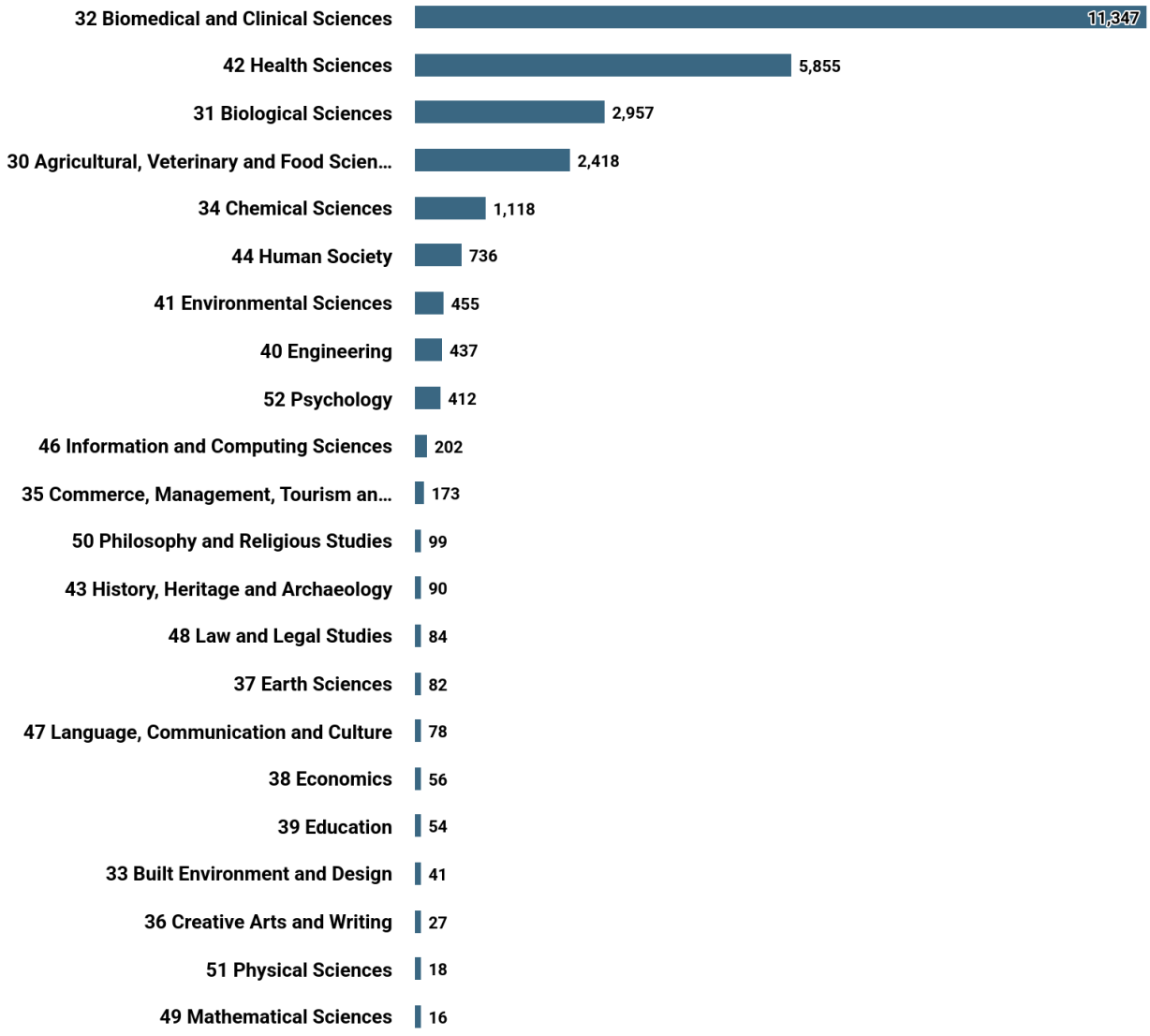
Hypertension is a complex health problem and is a major risk factor for developing complications, such as stroke. The articles reviewed indicate that dietary habits and lifestyle are the primary factors influencing hypertension rates among Asian populations. The increasing trend of Western lifestyles, coupled with high salt intake and obesity, can exacerbate hypertension. Dietary habits also contribute to the worsening of hypertension, leading to complications such as stroke. Traditional food cultures, high in sodium, contribute to the prevalence of hypertension.

Conclusions

The mix of traditional and fast food often makes it difficult for individuals on a sodium-rich diet to adhere to hypertension management.

Contents

number of publications in each research category. (Criteria: see below)



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Criteria: 'Hypertension and food culture in asia' in full data; Publication Year is 2016 or 2017 or 2018 or 2021 or 2019 or 2020 or 2022 or 2026 or 2025 or 2024 or 2023; Publication Type is Article; Open Access is All OA.

Utilizing Open Government Data for GIS Mapping of Stroke Disease Vulnerability in Indonesia's 34 Provinces

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Purpose

As a disease that contributes significantly to mortality and disability, stroke remains a major health problem in Indonesia. This study identified the threat of stroke in 34 Indonesian provinces using GIS analysis.

Methods

Spatial and geographic data were transformed into useful information through data processing techniques in the Geographic Information System study. Descriptive regional analysis was used for the analysis, which focused on 34 Indonesian provinces. Among the data found were sufficient stroke disease mortality, prevalence, and disability-adjusted life years (DALYs), as reported by the Institute for Health Metrics and Evaluation (IHME).

Results

The results show that the highest prevalence of stroke occurred in all provinces on the island of Java, marked by the number of prevalence in the fourth quarter (the highest). Beside that, on other islands, such as Sumatra, the highest occurred in North Sumatra, Bangka Belitung, and Lampung; on Sulawesi Island, the highest was in South Sulawesi Province, while other provinces were mostly in the second and third quarters. Interestingly, Papua Province and Maluku Island had the lowest prevalence rate (first quarter). The provinces with the highest DALYs face the same prevalence. Likewise, the mortality rate in provinces on the island of Java is also the highest. However, the island of Bangka Belitung province showed deaths in the third quarter and is not at the highest risk of prevalence. The eastern region of Indonesia showed low mortality. When compared to happiness, the relationship between happiness and stroke is negative. Western Indonesia shows a similar pattern: the higher the happiness level, the lower the risk of stroke. Meanwhile, the high number of people who smoke shows a negative relationship.

Conclusions

Therefore, the government needs special attention, especially in Western Indonesia, including all provinces on Java and those with the highest vulnerability. Possible measures include increasing incomes, increasing happiness levels, and a smoking policy.

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9318 - 27392
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83487 - 587644


Smoking in Indonesia
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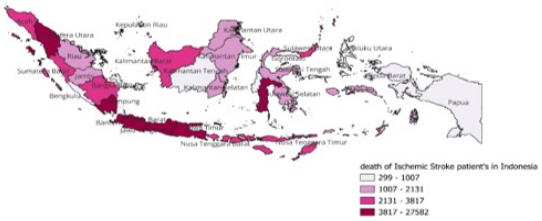
28 - 29,7
29,7 - 33,8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71,3 - 72,4
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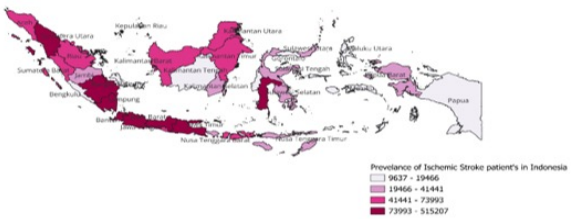
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Colchicine for Secondary Stroke Prevention in Asian Countries: A Systematic Review

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Purpose

There is increased recognition that inflammation plays a vital role in atherothrombosis. Colchicine is a well-tolerated anti-inflammatory drug and has raised new interest regarding its potential role in secondary prevention of cardiovascular events, including stroke and transient ischemic attacks. The present systematic review has investigated the effectiveness of Colchicine in secondary stroke prevention among Asian populations, where the incidence of this condition is still relatively high.

Methods

A literature search including English-language journals was conducted from 2015 through 2024. The searches were conducted through PubMed, Cochrane, EBSCO, and Science Direct and yielded 292 articles screened to include seven studies.

Results

Colchicine may reduce the rate of recurrent stroke or TIA. This appears especially promising in patients with elevated inflammatory markers, as reflected by decreases in high-sensitivity C-reactive protein. However, studies to date have been plagued by inconclusive data resulting from small sample sizes and significant methodological differences that make generalization of findings difficult.

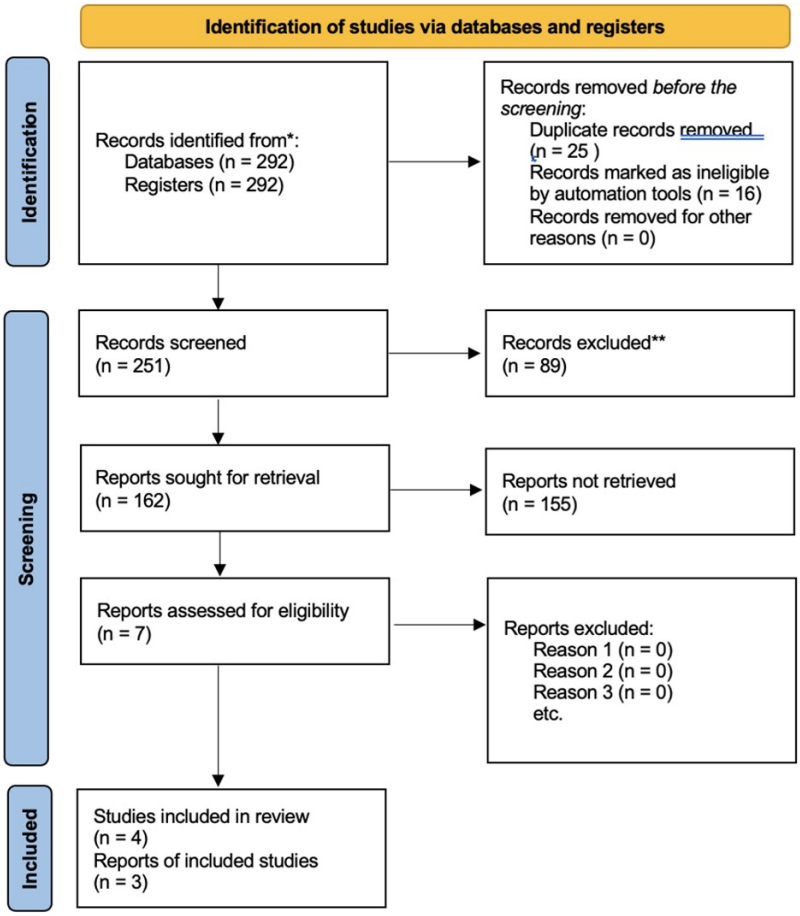
Conclusions

Colchicine is a promising adjunctive therapy in secondary stroke prevention, especially for those patients with a higher inflammatory burden. Confirmation of efficacy and safety assessment in diverse populations by further large-scale trials, and more so on the cost-effectiveness of stroke prevention strategies, especially within resource-limited settings, are called for.

Acknowledgement

None

Contents


Identification of studies via databases and registers
Identification
Records identified from*:
Databases (n = 292)
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Records removed *before the screening*:
Duplicate records removed (n = 25)
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Records screened
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(n = 89)
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Reports not retrieved
(n = 155)
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(n = 7)
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Reason 1 (n = 0)
Reason 2 (n = 0)
Reason 3 (n = 0)
etc.
Included
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(n = 4)
Reports of included studies
(n = 3)

Multiple Regression Model to Analyze the Impact of Environmental Factors, Health Allocation, and Business Field on the Risk of Death from Ischemic Stroke in Indonesia

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Purpose

Ischemic stroke is a disease with high mortality, including in Indonesia. This study aims to identify factors influencing ischemic stroke mortality in Indonesia based on environmental factors, workplace factors, and healthcare expenditure.

Methods

The method used was multiple linear regression analysis using the ordinary least squares model. Secondary data sources were from the World Bank, the Global Burden of Disease, and the Central Statistics Agency (BPS), which measured the percentage of deaths from ischemic stroke per population. The independent variable was environmental factors subtracted from the country's total carbon dioxide emissions ($MtCO_2$). Healthcare expenditure was divided into three categories: Domestic general government health expenditure (GGHE-D), External health expenditure (EXT) per capita in US$, and out-of-pocket expenditure. The employment sector was the percentage of the population working in the industrial and agricultural sectors.

Results

The results showed that carbon emissions significantly increased ischemic stroke mortality, as the p-value was less than 5% alpha (p=0.026, 95% CI=0.026). GGHE-D significantly and negatively reduced ischemic stroke mortality by 0.157% (p-value = 0.007). EXT did not significantly decrease by 0.0017% (p-value = 0.750), and out-of-pocket expenditure significantly and negatively decreased by 0.0023% (p-value = 0.027). Based on employment sector, both employee in agricultural and industrial had a negative but insignificant effect on ischemic stroke in Indonesia (p-value = 0.155 and 0.689). High CO_2 levels were the highest contributor to the risk of ischemic stroke mortality, followed by government spending.

Conclusions

Therefore, to reduce ischemic stroke mortality in Indonesia from an environmental and socioeconomic perspective, efforts are needed to address air pollution, increase government spending on health, and increase public income to allow for out-of-pocket funds for treatment. However, a clinical analysis of prevention is crucial, as the effects of these factors are very small compared to the clinical risks faced by patients.

Contents

Source	SS	df	MS		
				Number of obs	= 22
				F(6, 15)	= 5.25
Model	.003619641	6	.000603274	Prob > F	= 0.0043
Residual	.001724445	15	.000114963	R-squared	= 0.6773
				Adj R-squared	= 0.5482
Total	.005344086	21	.00025448	Root MSE	= .01072

stroke	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
lnco2	.0822663	.0332718	2.47	0.026	.011349	.1531835
outofpocket	-.0022932	.0009326	-2.46	0.027	-.0042811	-.0003054
externalexpenditure	-.0016748	.0051582	-0.32	0.750	-.0126694	.0093197
governmentexpenditure	-.015653	.00499	-3.14	0.007	-.026289	-.005017
employee_in_industry	-.0075908	.0050746	-1.50	0.155	-.0184071	.0032256
employee_in_agriculture	-.0010887	.0026706	-0.41	0.689	-.0067811	.0046036
_cons	.1614444	.3055691	0.53	0.605	-.4898607	.8127495

Medicinal Plants as Neuroprotective Agents: Exploring Phytochemical Pathways for Stroke Prevention

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Purpose

To explore the potential of medicinal plants and their bioactive compounds as neuroprotective agents, aiming to prevent stroke by targeting oxidative stress, inflammation, and vascular dysfunction.

Methods

A literature-based analysis was conducted focusing on medicinal plants known for neuroprotective properties. Phytochemicals such as flavonoids, alkaloids, polyphenols, and phenolic compounds were evaluated for antioxidant, anti-inflammatory, and vasodilatory effects. Advanced in silico approaches, including molecular docking and AI-assisted pattern recognition, were integrated to predict the interaction of plant-derived compounds with stroke-related molecular targets. Additionally, ethnobotanical knowledge and clinical evidence from human and animal studies were reviewed to validate therapeutic potential.

Results

Extracts from Ginkgo biloba and Curcuma longa demonstrated improved cerebral blood flow, reduced oxidative stress, and modulation of inflammatory pathways. Phenolic-rich compounds from Camellia sinensis and resveratrol-containing plants exhibited neuroprotection by mitigating ischemic injury and enhancing vascular resilience. AI-driven compound screening identified several phytochemicals with high predicted affinity for stroke-related biomarkers, highlighting candidates for further experimental validation. Community-level use of medicinal herbs was found to be feasible, particularly in regions with limited access to conventional stroke prevention therapies.

Conclusions

Medicinal plants offer a sustainable, culturally inclusive, and biologically grounded strategy for stroke prevention. Integrating traditional botanical knowledge with modern scientific tools, including AI and molecular modeling can accelerate the identification of neuroprotective compounds. Such an approach holds potential for developing affordable and accessible interventions that complement conventional pharmacological strategies, ultimately contributing to reduced stroke incidence worldwide.

The impact of SGLT2 inhibitor treatment on thrombus composition and functional outcome after endovascular thrombectomy

Matthew Chung[1], Jeong-Min Kim[1], Eung-Joon Lee[1], Keun-Hwa Jung[1], Seung-Hoon Lee[1], Kwang-Yeol Park[2], Ho-Geol Woo[3], Minwoo Lee[4]

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Purpose

Sodium-Glucose Cotransporter 2 (SGLT2) inhibitors have shown promising results regarding functional outcome in acute ischemic stroke patients. We aimed to evaluate the relationship of SGLT2 inhibitor treatment on thrombus composition and functional outcome in ischemic stroke patients that received endovascular thrombectomy (EVT).

Methods

Between May 2020 and November 2024, consecutive patients that received EVT for acute ischemic stroke at one of four tertiary medical centers were reviewed for eligibility. Patients with clot retrieval that had histological analysis performed were included. Baseline clinical characteristics, thrombectomy outcomes, clot parameters, and functional outcomes were compared between 3 groups (no diabetes mellitus [DM], DM without prior SGLT2 inhibitor use, DM with prior SGLT2 inhibitor use). Successful recanalization was defined as modified Thrombolysis in Cerebral Infarction 2b to 3 and excellent recovery was defined as a modified Rankin Scale score of 0 to 1 at 3 months after index stroke.

Results

174 patients were included in the final analysis. Prior SGLT2 inhibitor use was not associated with a difference in nucleated cell count in clot or initial stroke severity. Patients who received SGLT2 inhibitors upon discharge experienced a greater decrease in the National Institute of Health Stroke Scale [NIHSS] scores during their hospital stay than patients without DM or DM patients not taking SGLT2 inhibitors (11.7± 7.1 vs 4.4±9.2 vs 0.5±11.2, p=0.047). In multivariate logistic regression analysis, age, cardioembolic stroke, initial NIHSS, and early neurological deterioration were significantly associated with excellent recovery.

Conclusions

Pre-treatment with SGLT2 inhibitors was not related to clot composition or initial stroke severity. Post treatment with SGLT2 inhibitors, although not significantly associated with excellent functional outcome, showed a tendency of facilitated neurological recovery in the early period.

Intra-Arterial tPA as a Rescue Therapy for Refractory Large Vessel Occlusion: a case report

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Purpose

Endovascular thrombectomy(EVT) has markedly improved outcomes in patients with acute ischemic stroke and large vessel occlusion(LVO). However, some patients remain refractory despite angioplasty, stenting, and IA tirofiban. In such cases, IA alteplase (tPA) has been proposed, though not established as standard therapy.

Methods

We reviewed IA tPA dosing strategies. Early protocols used 20–40 mg depending on prior IVT. More recent RCTs employed lower regimens: SYNTHESIS (0.9 mg/kg), THRACE (≤0.3 mg/kg), and CHOICE (0.225 mg/kg, max 22.5 mg). Our institutional protocol followed CHOICE, applying 0.225 mg/kg (max 20 mg, truncated), with 10% infused initially and further dosing guided by angiographic findings.

Results

An 86-year-old woman presented with acute left MCA infarction (NIHSS 12). Angiography revealed distal ICA to proximal MCA occlusion. Suction thrombectomy failed, and a stent retriever revealed severe proximal M1 stenosis consistent with ICAS. Rescue angioplasty was performed with a balloon angioplasty twice, followed by Wingspan 4×20 mm stent deployment and post-dilation with a 2.0×9 mm balloon. IA tirofiban (0.75 mg total) was administered, but follow-up angiography demonstrated persistent MCA occlusion suspicious for in-stent thrombosis. Additional tirofiban (0.25 mg) was ineffective. Rescue IA alteplase 1.8 mg achieved recanalization and restored flow, with a final angiographic result of TICI 2a. No hemorrhagic complications were observed. NIHSS at discharge was 14.

Conclusions

Low-dose IA tPA may provide a rescue option for refractory cases unresponsive to EVT, stenting, and IA tirofiban. While optimal dosing is yet to be defined, recent evidence and our case support low-dose, titrated IA tPA as feasible and safe. Further randomized studies are warranted to establish its role in clinical practice.

Comparison of Automated MRI Perfusion Analysis Software: Agreement in Ischemic Penumbra Estimation and Decision-Making for Endovascular Thrombectomy

Jonguk Kim[1], Jong-Hyeok Park[2], Dongmin Kim[2], Myungjae Lee[2], Joon-Tae Kim[3], Leonard Sunwoo[4], Cheolkyu Jung[4], Wi-Sun Ryu[2], Beom Joon Kim[1]

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Purpose

While computed tomography perfusion is widely used in acute stroke imaging, magnetic resonance perfusion-weighted imaging (PWI) offers superior spatial resolution and tissue specificity, particularly when combined with diffusion-weighted imaging (DWI). However, no prior study has systematically compared automated PWI analysis platforms.

This study aims to evaluate the performance of a newly developed software (JLK PWI) against the established RAPID platform in terms of volumetric agreement and clinical decision concordance.

Methods

This retrospective multicenter study included 299 patients with acute ischemic stroke who underwent PWI within 24 hours of symptom onset. Volumetric agreement between RAPID and JLK PWI was assessed using concordance correlation coefficients (CCC), Bland–Altman plots, and Pearson correlations. Agreement in endovascular therapy (EVT) eligibility was evaluated using Cohen's kappa based on DAWN and DEFUSE-3 criteria.

Results

The mean age was 70.9 years, 55.9% were male, and the median NIHSS score was 11 (IQR 5–17). The median time from the last known well to PWI was 6.0 hours. JLK PWI showed excellent agreement with RAPID for ischemic core (CCC=0.87; $p<0.001$) and hypoperfused volume (CCC = 0.88; $p<0.001$). EVT eligibility classifications based on DAWN criteria showed very high concordance across subgroups (κ=0.85–0.91), and substantial agreement was observed using DEFUSE-3 criteria (κ=0.71).

Conclusions

JLK PWI demonstrates high technical and clinical concordance with RAPID, supporting its use as a reliable alternative for MRI-based perfusion analysis in acute stroke care.

ICSU & ICAS 2025

Joint Conference of 2025 International Conference Stroke Update
and International Conference on Intracranial Atherosclerosis

November 28 (Fri) 17:40 - 19:00 I Poster Room (Sydney)

Poster Session 4 [ENG]

CHAIRS

Kyusik Kang (Nowon Eulji Medical Center, Korea)
Sang-jun Ahn (Catholic Kwandong University Medical Center, Korea)
Mi-Yeon Eun (Kyungpook National University Chilgok Hospital, Korea)
Young Dae Kim (Severance Hospital, Korea)

Real-World Use of Evolocumab in Acute Large Artery Atherosclerotic Stroke: A Nationwide Registry Study

Do Yeon Kim[1,2], Hannah Jung[3], Beom Joon Kim[1], Moon-Ku Han[1], Keon-Joo Lee[4], Kyungmi Oh[4], Chi Kyung Kim[4], Kang-Ho Choi[5], Joon-Tae Kim[5], Hyunsoo Kim[5], Kyu Sun Yum[6], Dong-Ick Shin[6], Dong-Seok Gwak[7], Dong-Eog Kim[7], Jong-Moo Park[8], Kyusik Kang[9], Jae Guk Kim[10], Soo Joo Lee[10], Mi Sun Oh[11], Kyung-Ho Yu[11], Yong-Jin Cho[12], Keun-Sik Hong[12], Joong-Goo Kim[13], Jay Chol Choi[13], Jeong-Ho Hong[14], Sung-Il Sohn[14], Tai Hwan Park[15], Kyungbok Lee[16], Wook-Joo Kim[17], Jee-Hyun Kwon[17], Doo Hyuk Kwon[18], Jun Lee[18], Jae-Kwan Cha[19], Dae-Hyun Kim[19], Sang-Hwa Lee[20], Chulho Kim[20], Hae-Bong Jeong[21], Kwang-Yeol Park[21], Juneyoung Lee[3], Hee-Joon Bae[1]

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Purpose

Evolocumab, a proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitor, is an effective lipid-lowering therapy for secondary prevention after cardiovascular disease. However, evidence regarding its real-world use in large artery atherosclerotic (LAA) stroke remains limited. We investigated evolocumab's usage patterns, determinants for initiation, and lipid-lowering efficacy in patients treated within 1 month of acute ischemic stroke.

Purpose

Evolocumab, a proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitor, is an effective lipid-lowering therapy for secondary prevention after cardiovascular disease. However, evidence regarding its real-world use in large artery atherosclerotic (LAA) stroke remains limited. We investigated evolocumab's usage patterns, determinants for initiation, and lipid-lowering efficacy in patients treated within 1 month of acute ischemic stroke.

Methods

This retrospective study utilized a nationwide multicenter stroke registry (CRCS-K-NIH). We identified patients with acute ischemic stroke due to LAA admitted to 19 centers between August 2018 and September 2023 who received evolocumab within 1 month of onset. We analyzed treatment timing, injection frequency, concomitant therapy, and LDL-C goal achievement (<70 mg/dL and ≥50% reduction) at last injection. LDL-C target attainment (<70 or <55 mg/dL) and percentage reduction at 1 and 3 months were also assessed. Baseline characteristics were compared between evolocumab users and non-users.

Results

Of 15,864 LAA stroke patients, 296 (1.9%) were treated with evolocumab within 1 month. The median initial NIHSS score was 4 (IQR 2-7), and 13.9% received endovascular treatment. Most received only one injection (90.9%). The median interval from arrival to first injection was 1 day (IQR 0-1), with 95.6% of patients treated within 7 days. Concomitant use with high-intensity statins (91.9%) and ezetimibe (55.4%) was frequent. At the last evolocumab injection, 78.7% achieved their primary LDL-C goal. At 1 month, the mean LDL-C reduction was 66.8% (SD 15.9), with 87.7% and 75.4% achieving LDL-C <70 mg/dL and <55 mg/dL, respectively. At 3 months, mean reduction was 50.8% (SD 22.3), and 70.0% and 40.9% achieved LDL-C <70 mg/dL and <55 mg/dL, respectively. Compared to non-users, evolocumab users were more likely to have undergone endovascular treatment, have symptomatic steno-occlusion, and have higher baseline LDL-C and total cholesterol.

Conclusions

In this nationwide cohort of LAA stroke patients, evolocumab was predominantly prescribed for those with endovascular treatment, symptomatic steno-occlusion, or elevated baseline lipid levels. Most received a single, early dose within the first week. Concomitant high-intensity statin and ezetimibe use was frequent, and over three-quarters achieved LDL-C goals. These findings suggest evolocumab is mainly administered in the acute phase for high-risk patients, highlighting its clinical utility in this population.

Acknowledgement

The authors would like to acknowledge the contributions of the CRCS-K-NIH registry investigators who participated in this study. This work was supported by Amgen. The sponsor had no role in the design, conduct, data collection, analysis, interpretation, or writing of the manuscript.

Impact of a Mobile Image-Sharing Application on Inter-Hospital Transfer Times for Acute Stroke Patients

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Purpose

Reducing door-in-door-out (DIDO) time is a critical component of acute stroke care, yet it remains a significant challenge. Delays in inter-hospital transfer can restrict patient access to time-sensitive treatments like mechanical thrombectomy. We hypothesized that the implementation of a dedicated mobile image-sharing application (FASTRO, JLK Inc. Seoul, Korea) could streamline communication and expedite the transfer process for acute stroke patients. This study aimed to evaluate the impact of this application on DIDO time and identify specific patient subgroups that benefit most from this intervention.

Methods

We conducted a retrospective analysis of stroke patients transferred from Gyeonggi Provincial Medical Center Icheon Hospital to Seoul National University Bundang Hospital between April 2022 and August 2025. Following the implementation of the FASTRO application in November 2024, 231 patients were stratified into a pre-implementation cohort (n=173) and a post-implementation cohort (n=58). The primary endpoint was the median DIDO time. We performed a subgroup analysis based on the last normal time (LNT)-to-door interval, using the 4.5-hour as a cutoff, to assess the application's efficacy in different clinical scenarios.

Results

Baseline demographic characteristics were comparable between the two groups; the pre-implementation group had a mean age of 71.8 years (±12.8) and was 58.4% male, while the post-implementation group had a mean age of 69.4 years (±12.7) and was 55.2% male. The introduction of the FASTRO application led to a statistically significant reduction in the overall median DIDO time from 2.20 hours to 1.95 hours ($p<0.001$). More importantly, the application demonstrated a profound effect on process stability by mitigating extreme delays. The subgroup analysis revealed a more nuanced impact. For patients arriving within the 4.5-hour, the median DIDO time was comparable between two groups. However, for patients arriving after 4.5 hours, the use of FASTRO resulted in a clinically meaningful reduction in median DIDO time, from 2.63 hours to 2.13 hours—a 30-minute improvement ($p < 0.001$).

Conclusions

The implementation of a mobile image-sharing application significantly enhances the efficiency and reliability of the inter-hospital transfer process for acute stroke patients. While its effect on patients arriving within 4.5 hours is minimal, the application proves to be a highly effective tool for expediting transfers in patients who present late. This suggests its primary value lies in standardizing care and reducing process delays for patients who may not be on the highest-priority pathway, thereby improving the overall stroke system of care.

Frequency Of Early Onset Seizures In Acute Stroke Patients

Acute stroke is defined as the acute onset of focal neurological findings in a vascular territory as a result of underlying cerebrovascular disease. According to the TOAST classification, there are five main types of ischemic strokes. These are large vessel atherosclerosis, small vessel diseases (lacunar infarcts), cardioembolic strokes, stroke of other determined causes and stroke of undetremined causes. Each of these has different causes and pathophysiology. Regardless of the type of stroke, it is important to know that with each minute of large vessel ischemic stroke untreated, close to two million neurons die. This is the most important "time is brain" concept in understanding acute stroke and its treatment.

Although, there are different timing-based definitions of stroke-associated early onset seizures, most authors identify early seizures as those occurring within 7–14 days after acute stroke onset. Seizures occurring after this time window are defined as late seizures.

This distinction underlies possible differences concerning the pathophysiology of and risk factors for early and late seizures.

Previous studies have reported wide range of percentages is probably explained by the analysis of retrospective studies, different window for defining Early Seizures (range 1–30 days). Therefore further evidence is needed to get local evidence in this subject by determining the frequency of early onset seizures in acute stroke patients.

Results of my study will pave the way for better decision recommendations for guiding clinicians in early identification, prevention, diagnosis, and treatment.

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Purpose

To determine the frequency of early onset seizures in acute stroke patients.

Methods

Study design: Cross Sectional Study. Setting: Department of Neurology, Fauji Foundation Hospital, Rawalpindi. Duration of study: This study was conducted from 10th January 2022 to 10th July 2022. Sample size: 300 sample size was calculated with WHO sample size software, 95% confidence level, 2.5% margin of error and expected frequency of early onset seizures by 5% in acute stroke patients. Sampling technique: Non-probability consecutive sampling

Results

Age range in this study was from 30 to 70 years with mean age of 54.693±6.41 years and mean duration of stroke was 12.223±4.63 hours as shown in Table-I. Male patients were 73.3% and females were 26.7% as shown in Table-II. Ischemic stroke was 77.3% and hemorrhagic stroke was 22.7% as shown in Table-III. Early onset of seizures was observed in 6% patients as shown in Table IV. Stratification of early onset of seizures with respect to age, gender, type of stroke and duration of stroke are shown in Tables-V, VI, VII and VIII respectively.

Conclusions

The early onset of seizures after stroke were common in females and hemorrhagic stroke patients. Higher stroke severity and presentation with confusion were independent risk factors for early onset of seizures after stroke. A negative association was observed between focal weakness at presentation and early onset of seizures after stroke. The early onset of seizures after stroke was associated with higher in-hospital complications, longer ICU stay, and worse outcomes at discharge. In the future, with the use of the identified predictive factors, patients at higher risk of early onset of seizures may serve as candidates for randomized intervention trials for early onset of seizures prevention.

Acknowledgement

My greatest and foremost appreciation goes to the Almighty Allah who has made it possible for me to accomplish this research. I am extremely grateful to Associate Professor Dr. Husnain Hashim for his continued encouragement, support and advice during my time in research.

Retrospective Clinical Audit of Post-Thrombolysis Intracranial Haemorrhage in Acute Ischaemic Stroke: Experience from Tertiary Centre in Kelantan, Malaysia (Jan 2024–Jun 2025)

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Purpose

Intravenous thrombolysis with recombinant tissue plasminogen activator (rt-PA) is the gold standard treatment for acute ischaemic stroke within the therapeutic window, yet intracranial haemorrhage (ICH) remains its most feared complication. ICH significantly worsens morbidity and mortality. Auditing post-thrombolysis ICH allows evaluation of patient selection, identification of risk factors, and comparison with international benchmarks and local guidelines.

Methods

A retrospective clinical audit was conducted at Hospital Raja Perempuan Zainab II (HRPZ II), Kelantan, Malaysia from January 2024 to June 2025. During this period, 79 patients underwent intravenous thrombolysis for acute ischaemic stroke. Patients complicated by ICH were compared with those without ICH. Demographics, vascular risk factors, atrial fibrillation (AF), baseline National Institutes of Health Stroke Scale (NIHSS), and outcomes were analysed in relation to AHA/ASA (2019) and Malaysian Clinical Practice Guidelines (2020).

Results

Seven patients (8.9%) developed ICH post-thrombolysis. Compared with the 72 without ICH, these patients were significantly older (median 73 vs 63 years, p=0.04) and had higher baseline NIHSS (median 15 vs 11, p=0.02). Hypertension was present in all ICH cases (100% vs 74%, p=0.18). Other comorbidities, including diabetes (29% vs 38%, p=0.68), hyperlipidaemia (71% vs 63%, p=0.72), and AF (29% vs 18%, p=0.45), showed no significant differences. Six ICH patients were managed conservatively, while one required decompressive craniectomy. Functional outcomes were poor in the ICH group, with most discharged severely disabled (mRS 4–5), whereas the majority without ICH achieved favourable recovery (mRS 0–3).

Conclusions

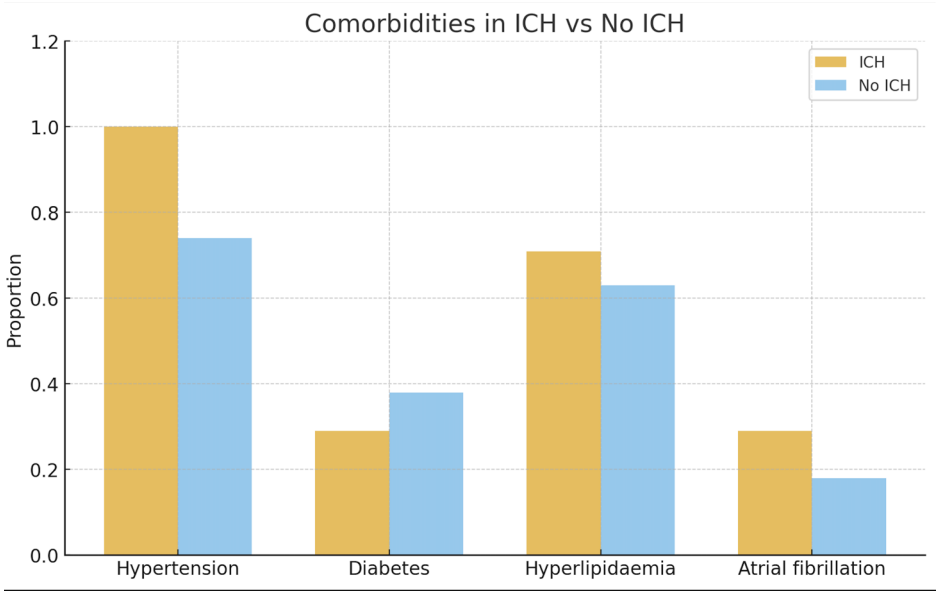
The ICH rate (8.9%) exceeded international benchmarks (≈2–7%). Age ≥70 and NIHSS ≥15 were statistically significant predictors of ICH, highlighting the importance of risk stratification. Hypertension was near-universal in ICH cases, supporting guideline emphasis on rigorous blood pressure control. Although sample size limited statistical power, these findings underline the need for vigilant patient selection, strict peri-thrombolysis monitoring, and optimization of vascular risk factors.

At HRPZ II, post-thrombolysis ICH occurred in a notable minority and was associated with poor outcomes. Patients without ICH were younger, had lower NIHSS, and better functional recovery. This audit reinforces guideline recommendations for cautious thrombolysis, aggressive vascular risk optimisation, and intensive post-treatment care.

Acknowledgement

We would like to thank the Department of Internal Medicine, HRPZ II, and the stroke team for their support and assistance in this audit.

Contents



Bridging versus Direct Thrombectomy in Acute Ischemic Stroke Patients with Low ASPECTS

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Purpose

Bridging thrombectomy (BT) is currently considered standard practice in acute ischemic stroke (AIS) due to large vessel occlusion (LVO). However, its clinical benefit over direct thrombectomy (DT) alone remains uncertain in patients with large ischemic cores, typically represented by low Alberta Stroke Program Early CT Scores (ASPECTS). This study aims to evaluate and compare the efficacy and safety of BT versus DT in AIS patients with low ASPECTS.

Methods

This study analyzed data from a prospective, nationwide registry of AIS patients who underwent endovascular thrombectomy (EVT). Eligible patients included those with anterior circulation LVO and an ASPECTS ≤ 5 who received EVT with or without prior intravenous thrombolysis (IVT). The primary outcome was a modified Rankin Scale (mRS) score of 0–3 at 90 days. Secondary outcomes included mRS 0–2 at 90 days, successful reperfusion, symptomatic intracranial hemorrhage (sICH), and mortality.

Results

A total of 254 patients were enrolled, with 119 receiving BT and 135 undergoing DT. Baseline demographics, past medical history, blood pressure, NIHSS scores (19 [14-23] vs. 19 [16-24], p = 0.113), ASPECTS (4 [3-5] vs. 4 [3-5], p = 0.440), and onset to puncture time did not differ between groups. However, a significantly higher proportion of patients in the DT group were on anticoagulants (25.9% vs. 5.9%, p < 0.001), while the BT group demonstrate a shorter onset-to-recanalization time (315 min vs. 330 min, p = 0.044). After adjusting for age, sex, NIHSS, onset-to-puncture and onset-to-recanalization times, and anticoagulants use, no significant differences were observed between the groups in primary or secondary outcomes.

Conclusions

Among AIS patients with low ASPECTS, BT did not demonstrate a significant clinical advantage over DT, nor was it associated with an increased risk of sICH or mortality.

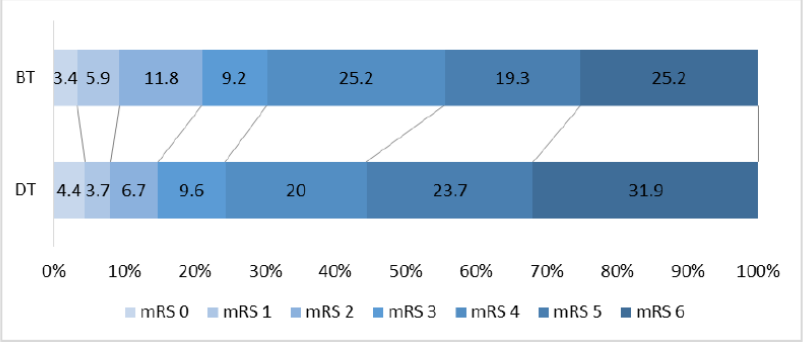
Contents

A. Comparative Outcomes in Bridging and Direct Thrombectomy Group.

Outcome	Bridging thrombectomy	Direct thrombectomy	Crude OR (95% CI)	Adjusted OR* (95% CI)
90-day mRS 0-3	36 (30.3%)	33 (24.4%)	1.34 (0.77 – 2.33)	1.13 (0.59 – 2.17)
90-day mRS 0-2	25 (21.0%)	20 (14.8%)	1.53 (0.80 – 2.92)	1.28 (0.60 – 2.72)
Successful reperfusion	100 (84.0%)	107 (79.3%)	1.38 (0.72 – 2.62)	1.33 (0.63 – 2.79)
sICH	18 (15.1%)	16 (11.9%)	1.33 (0.64 – 2.73)	1.41 (0.64 – 3.12)
Mortality	30 (25.2%)	43 (31.9%)	0.72 (0.42 – 1.25)	0.80 (0.43 – 1.49)

*** Adjust age, sex, NIHSS, onset to puncture and onset to recanalization time, anticoagulants use.**

B. Distribution of 90-day mRS Score between Bridging and Direct Thrombectomy Group.



Incident of Stroke Among Young Population in Asia: Trend of research in the past decade

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Purpose

An unhealthy and irregular lifestyle can significantly affect a person's health and may even increase the risk of diseases being passed on to future generations. Conditions once considered diseases of adulthood, such as urological disorders, cardiovascular disease, brain disorders, and stroke, are now increasingly seen in younger populations. Stroke in particular has become a serious concern, as it is no longer confined to the elderly but also affects young adults. Beyond genetic factors, stroke in younger individuals can arise from blood vessel abnormalities, congenital heart disease, and clotting disorders. The incidence of stroke among young populations in Asia has shown marked variation over the past decade, reflecting both epidemiological patterns and evolving risk factors. While traditionally associated with older adults, recent studies highlight that 15–30% of strokes in regions like India occur in individuals aged 15–49, with some reports as low as 8.8%.

Methods

This study employed bibliometric analysis of publications from 2016–2025 using the keywords "incident, stroke, youth, population, asia" A total of 500 open-access articles were analyzed, grouped into 22 research categories, with the majority focusing on biological and clinical sciences. Of these, 159 articles discussed stroke in young adults.

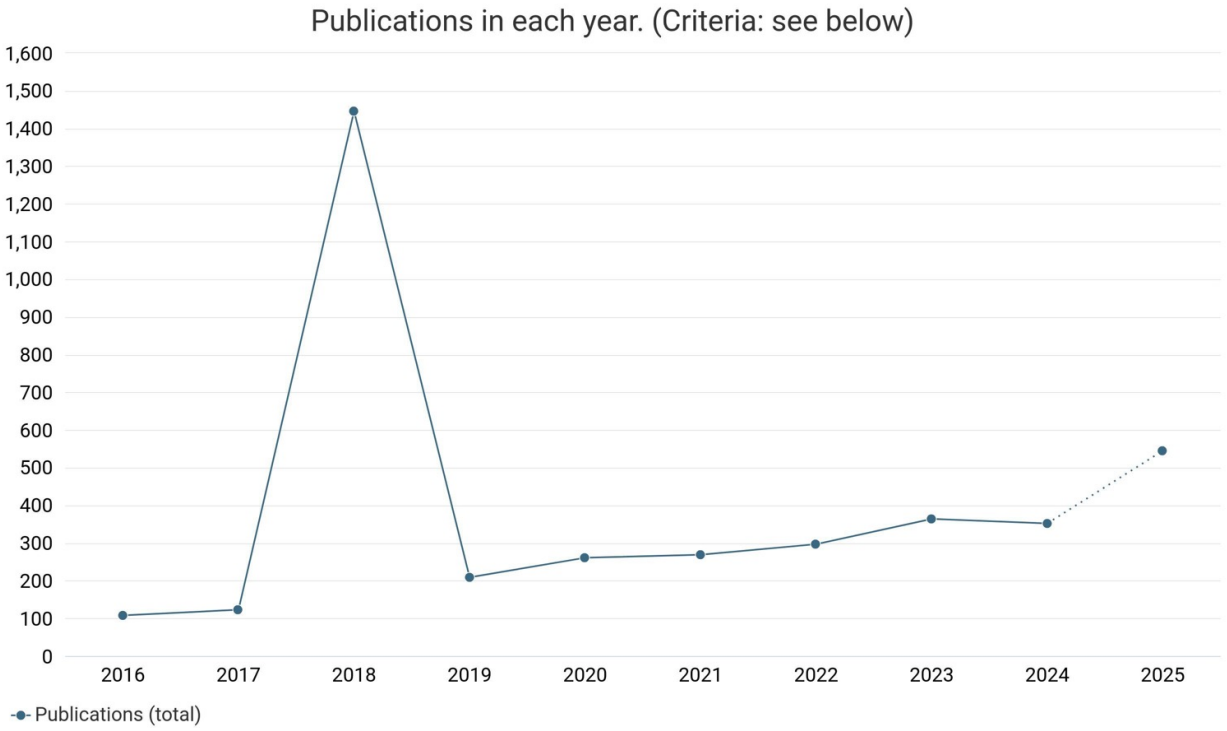
Results

Findings reveal that congenital heart disease and sickle cell disease are among the leading causes of stroke in young individuals. In Indonesia, lifestyle-related factors play a major role, including smoking, early-onset hypertension, obesity, and alcohol consumption. Additionally, infections such as focal cerebral arteriopathy and physical injuries like clavicle trauma increase risk.

Conclusions

Stroke in young people is a complex problem with profound effects on growth, development, and quality of life. Greater awareness of risk factors, early detection, and preventive strategies are crucial to reduce the burden of this condition.

Contents



Source: https://app.dimensions.ai
Exported: September 19, 2025
Criteria: 'Incident of stroke at Young Population in Indonesia' in full data; Publication Year is 2025 or 2024 or 2023 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2016; Publication Type is Article; Open Access is All OA.

The Post-Stroke Triad: Disparities in Care Satisfaction, Psychological Sequelae, and Nutritional Risk Among Indonesian Elderly

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Purpose

Stroke survivors face long-term deficits extending beyond physical disability to encompass care dissatisfaction, psychological morbidity, and nutritional decline. In resource-limited settings like Indonesia, the role of rehabilitative care in addressing this triad of outcomes remains unestablished.

Methods

We analyzed a propensity score-matched cohort from the Indonesia Family Life Survey (Wave 5), including 812 elderly adults (≥60 years) with self-reported stroke and 2,436 matched controls. Outcomes were care satisfaction (0-10 scale), psychological distress (CES-D-10), and body mass index (BMI). Subgroup analysis compared stroke patients with and without access to rehabilitative care (usual care source + rehabilitative service use). Advanced analyses included multivariate regression, heterogeneity testing, and causal mediation.

Results

Post-stroke patients reported significantly lower care satisfaction (β=-0.89, $p<0.001$), higher psychological distress (β=2.95, $p<0.001$), and lower BMI (β=-0.92, $p<0.001$) than matched controls. Subgroup analysis revealed access to rehabilitative care was associated with substantially higher satisfaction (β=1.15, $p<0.001$) and reduced distress (β=-1.68, $p=0.007$), but not improved BMI (β=0.21, $p=0.58$). A significant interaction demonstrated the psychological benefit of rehabilitation was stronger for women (p-interaction=0.03). Causal mediation analysis indicated 41% of stroke's effect on distress was mediated through functional disability (ADL limitations) (ACME=1.21, $p<0.001$).

Conclusions

Access to rehabilitative care substantially improves patient-reported experiences and mental health in post-stroke elderly, particularly for women, but fails to address nutritional risks. The strong mediation effect of functional disability underscores rehabilitation's critical role in mitigating psychological sequelae. Integrated post-stroke care models must combine rehabilitation with nutritional interventions to comprehensively address this triple burden.

Contents

Table 1. Baseline Characteristics After Propensity Score Matching

(Weighted Proportions/Means)

Characteristic	Control (n=2,436)	Stroke (n=812)	Standardized Mean Difference
Age, mean (SD)	70.1 (7.8)	70.3 (7.9)	0.03
Female, %	55.2%	54.9%	0.01
Wealth Q1 (Lowest), %	24.1%	25.3%	0.03
≥2 Comorbidities, %	58.7%	72.5%	0.29
ADL Difficulty, mean (SD)	0.9 (1.5)	2.1 (2.0)	0.68

Table 2. Adjusted Analysis of Outcomes: Stroke vs. Matched Controls

(Models adjusted for wealth, education, and comorbidities)

Outcome	Control Group (Adj. Mean)	Stroke Group (Adj. Mean)	Effect Size (β)	95% CI	p-value
Satisfaction (0–10)	7.4	6.5	-0.89	[-1.25, -0.53]	**<0.001**
CES-D-10 Score (0–30)	8.1	11.1	2.95	[2.30, 3.60]	**<0.001**
BMI (kg/m^2)	23.1	22.2	-0.92	[-1.28, -0.56]	**<0.001**

Table 3. Correlates of Outcomes among Stroke Patients (n=812)

(Multivariate models within the stroke cohort, adjusted for age, wealth, comorbidities, and ADL score)

Predictor	Satisfaction (β)	CES-D-10 Score (β)	BMI (β)
Rehabilitative Care (Ref: No)	**1.15 (0.65 to 1.65); p<0.001**	**-1.68 (-2.89 to -0.47); p=0.007**	0.21 (-0.53 to 0.95); p=0.58
Female (Ref: Male)	-0.18 (-0.68 to 0.32); p=0.48	0.92 (-0.15 to 1.99); p=0.09	-0.45 (-1.15 to 0.25); p=0.21
Care × Female Interaction	0.31 (-0.35 to 0.97); p=0.36	**-1.55 (-2.95 to -0.15); p=0.03**	0.38 (-0.62 to 1.38); p=0.46

Malnutrition in Geriatric Stroke Disease: An Investigation of Critical Risks of Nutritional Status

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Purpose

Stroke in the geriatric population initiates a cascade of physiological and social events that often culminate in malnutrition, a condition which severely compromises recovery, increases mortality, and heightens the risk of secondary complications. Malnutrition is a potent yet modifiable predictor of poor post-stroke outcomes, but its multi-factorial risks in resource-limited geriatric populations are poorly quantified, obscuring targeted intervention strategies.

Methods

We analyzed 844 geriatric (≥60 years) stroke survivors from the Indonesia Family Life Survey (Wave 5). Malnutrition was defined as BMI <18.5 kg/m^2 or MUAC <23 cm. Key predictors included dysphagia symptoms, functional disability (ADL score), wealth quintile, and rehabilitative care access. We employed multivariate logistic regression, causal mediation analysis, and latent class analysis (LCA) to identify risk pathways and patient subtypes.

Results

Malnutrition prevalence was 31.4%. Dysphagia (aOR=3.12, p<0.001), severe ADL limitations (aOR=2.58, p<0.001), and lowest wealth quintile (aOR=2.95, p<0.001) were independent predictors. Rehabilitative care halved the odds of malnutrition (aOR=0.60, p=0.04). Mediation analysis revealed 45% of stroke's effect on nutrition was mediated through functional disability (ACME=0.37, p<0.001). LCA identified three phenotypic classes: "Functional-Dependent Malnourished" (22%; high dysphagia/ADL disability), "Socioeconomically-Deprived Malnourished" (41%; extreme poverty, rural residence), and "Well-Nourished" (37%; urban, affluent). The functional-dependent class had the highest mortality risk at 2-year follow-up.

Conclusions

Geriatric post-stroke malnutrition manifests through two distinct phenotypes requiring tailored interventions: functional support and dysphagia management for the first, and socioeconomic assistance for the second. Integrating multimodal nutritional screening and targeted care pathways into stroke rehabilitation is essential to mitigate risk and improve survival.

Contents

Adjusted Odds Ratios for Predictors of Malnutrition

(Multivariate Logistic Regression, n=844)

Predictor	aOR	95% Confidence Interval	p-value
Dysphagia Symptoms (Ref: No)	3.12	[2.05, 4.75]	**<0.001**
ADL Limitations (Ref: None)			
- Mild (1-2)	1.45	[0.95, 2.21]	0.08
- Severe (≥3)	2.58	[1.72, 3.87]	**<0.001**
Wealth Quintile (Ref: Q5 Highest)			
- Q4	1.45	[0.82, 2.56]	0.20
- Q3	1.88	[1.05, 3.38]	**0.03**
- Q2	2.15	[1.21, 3.82]	**0.009**
- Q1 (Lowest)	2.95	[1.68, 5.18]	**<0.001**
Access to Rehabilitative Care (Ref: No)	0.60	[0.37, 0.97]	**0.04**

Caregiver Perception, Knowledge, and Attitude Toward Postoperative Recovery Among Patients With Stroke Disease

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Purpose

The critical role of caregivers in postoperative stroke recovery is well-recognized yet poorly quantified, particularly in resource-limited settings. Understanding how caregiver type influences knowledge, burden, and attitudes—and how these factors ultimately affect patient outcomes—is essential for developing targeted support systems.

Methods

We analyzed 655 caregiver-patient dyads from the Indonesia Family Life Survey (Wave 5) where patients had a history of stroke and surgery. Caregiver type was categorized as spouse, other family, certified (nurses/paramedics), or informal. Outcomes included caregiver knowledge (composite score of care practices), perceived burden (proxy Zarit score), health-seeking attitude, and patient functional status (ADL score). Multivariate linear regression adjusted for patient and caregiver characteristics.

Results

Certified caregivers demonstrated superior knowledge scores (β=2.15, $p<0.001$) and more positive health-seeking attitudes (β=1.08, $p=0.01$) compared to spouses, but reported 32% higher burden scores (β=1.92, $p=0.02$). Spouses showed the highest burden among non-certified caregivers. While higher knowledge predicted better patient ADL outcomes (β=-0.35, $p=0.04$), a significant knowledge-attitude interaction revealed this benefit was conditional: patients of knowledgeable caregivers with positive attitudes showed markedly better recovery (ADL score: 1.8 vs 3.4, $p<0.01$) than those with knowledgeable but passive caregivers. Structural equation modeling confirmed attitude mediates 41% of knowledge's effect on recovery outcomes. Wealthier households utilized more certified care but showed no significant outcome differences after controlling for caregiver factors.

Conclusions

Caregiver knowledge alone is insufficient without positive health-seeking attitudes. Interventions must simultaneously enhance training while fostering proactive care attitudes, particularly for family caregivers. Certified caregivers require structural support to mitigate their high burnout risk. Integrating attitude-building into caregiver training is essential for optimizing stroke recovery outcomes.

Contents

Table 1. Characteristics of Caregiver–Patient Dyads by Caregiver Type

Characteristic	Spouse (n=250)	Other Family (n=297)	Certified (n=64)	Informal (n=44)	p-value
Caregiver Age, mean	65.1	48.3	41.5	45.2	<0.001
Caregiver Education > Primary, %	15.2%	35.1%	100%	22.7%	<0.001
Patient ADL Score, mean	2.8	2.5	3.5	2.7	0.02
Patient Wealth Q1 (Lowest), %	30.4%	25.6%	45.3%	38.6%	0.04

Table 2. Adjusted Caregiver Outcomes by Type (Reference = Spouse)

Outcome	Other Family (β)	Certified Caregiver (β)	Informal Caregiver (β)
Knowledge Score (0–5)	0.45 (p=0.08)	**2.15 (p<0.001)**	0.22 (p=0.52)
Perceived Burden Score	-0.88 (p=0.06)	**1.92 (p=0.02)**	-0.35 (p=0.61)
Health-Seeking Attitude	0.31 (p=0.21)	**1.08 (p=0.01)**	0.15 (p=0.72)

Table 3. Multivariate Linear Regression of Patient ADL Score on Caregiver Factors

Predictor	β Coefficient	95% Confidence Interval	p-value
Main Effects			
Caregiver Knowledge (per 1-point increase)	-0.35	[-0.68, -0.02]	**0.04**
Health-Seeking Attitude (per 1-point increase)	-0.21	[-0.49, 0.07]	0.14
Caregiver Type (Ref: Spouse)			
Other Family	-0.18	[-0.72, 0.36]	0.51
Certified Caregiver	0.52	[-0.15, 1.19]	0.13
Informal Caregiver	-0.10	[-0.81, 0.61]	0.78
Interaction Term			
Knowledge × Attitude	-0.28	[-0.53, -0.03]	**0.03**
Model Fit			
R^2		0.31	
Adjusted R^2		0.28	
F-statistic		9.85	**<0.001**

Impact of Hyperglycemia and Glycemic Variability During Acute Period on Stroke Associated Pneumonia

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Purpose

Stroke-associated pneumonia (SAP) is the most common infectious complication in patients with acute ischemic stroke (AIS). During the acute phase, blood glucose (BG) levels in stroke patients are elevated and fluctuate due to stress hyperglycemia. In this study, we evaluated the association between SAP and various parameters related to BG levels and variability in AIS patients.

Methods

We evaluated consecutive patients with AIS, who measured BG more than four times per day during the first 5 days between 2017 and 2018. SAP was defined based on modified Centers for Disease Control and Prevention criteria. Glycemic parameters included mean, standard deviation, coefficient of variation of BG, hyperglycemia ratio (based on BG >180 mg/dL), and mean amplitude of glycemic excursion (MAGE).

Results

A total of 297 patients with AIS were evaluated. In multivariable analysis, the mean BG remained significant after adjusting for confounders (adjusted odds [aOR] = 1.02; 95% confidence interval [CI]: 1.01-1.04). Age, dysphagia, initial NIHSS score, white blood cell counts, and albumin level were also significantly associated with SAP, being independent of mean BG. Among various glycemic parameters, the standard deviation of BG (aOR = 1.03; 95% CI: 1.01-1.05), hyperglycemia ratio (aOR = 1.03, 95% CI: 1.01-1.05), and MAGE (aOR = 1.02, 95% CI: 1.00-1.03) also showed statistically close correlations with SAP after adjusting for confounders.

Conclusions

We demonstrate that not only high BG level but also high BG variability is associated with SAP in AIS patients, suggesting the need for tight glucose monitoring and intensive management during the acute phase.

Acknowledgement

not applicable

Small Vessel Disease Burden and Futile Reperfusion After Successful Recanalization: Mediation by Infarct Growth Rate

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Purpose

Futile reperfusion (FR) after technically successful endovascular thrombectomy (EVT) is common and may reflect microcirculatory failure. We posited infarct growth rate (IGR) as a proximal, time-ordered readout of microcirculatory sufficiency and hypothesized that greater MRI-defined total small vessel disease (SVD) burden independently predicts FR, with a component mediated by IGR.

Methods

In a multicenter cohort, total SVD score was derived from white matter hyperintensities, lacunes, cerebral microbleeds, and enlarged perivascular spaces on MRI. Determinants of IGR were modeled using OLS on log(IGR+0.1) with HC3 robust errors. Multivariable logistic regressions estimated adjusted odds ratios (aORs) for FR. Causal mediation quantified the natural direct (NDE), indirect (NIE), and total effects (TE) of total SVD score ≥3 on futile reperfusion, with IGR specified as the mediator.

Results

Higher SVD was associated with faster IGR (β=0.593; 95% CI, 0.409–0.777; p<0.001) with significant nonlinearity (p<0.001). In the FR model, SVD (aOR 3.98; 95% CI, 2.32–6.84; p<0.001) and log(IGR+0.1) (aOR 1.44; 95% CI, 1.10–1.89; p=0.009) were independent predictors; SVD×collateral was not significant. SVD related to progression (aOR 3.27; 95% CI, 2.00–5.33) and SHT (aOR 1.92; 95% CI, 1.20–3.08). Mediation showed NIE 1.40 (95% CI, 1.12–1.86), NDE 4.18 (95% CI, 2.19–7.86), and TE 5.86 (95% CI, 3.03–11.60), with ~19% mediated (log-odds).

Conclusions

Greater SVD burden is linked to accelerated early infarct growth and higher odds of FR, partly via IGR, supporting cSVD-driven microcirculatory failure as a mechanistic contributor and highlighting tissue-level progression as a therapeutic target.

Effectiveness of a Regional Hotline System in Optimizing Inter-Hospital Stroke Transfers and Treatments

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Purpose

The Korean government launched the Pilot Project for the Emergency Stroke and Cardiovascular Disease Care Network in March 2024 to improve regional acute stroke care and optimize inter-hospital transfer efficiency. This study evaluated the impact of the project by comparing patient characteristics, transfer times, and treatment strategies before and after its implementation within the Geoje–Dong-A University stroke transfer network.

Methods

This study was conducted in collaboration with a single hospital in the Geoje region, where definitive stroke treatment is unavailable due to limited medical infrastructure. Consequently, inter-hospital transfer to a comprehensive stroke center is essential for patients with cerebrovascular disease. We retrospectively analyzed 244 consecutive stroke patients transferred from the collaborating hospital in Geoje to the Dong-A University Regional Comprehensive Stroke Center between May 2021 and July 2025. Patients were categorized as transferred before implementation (May 2021 to February 2024, n = 145) or after implementation (March 2024 to July 2025, n = 99). Baseline characteristics, transfer intervals, and treatment strategies were compared, with subgroup analyses for ischemic and hemorrhagic strokes.

Results

After implementation, pre-transfer hotline consultations increased markedly. Among patients with ischemic stroke, transfer intervals were significantly shortened, including both door-in to door-out and door-in to final hospital door-in times. Furthermore, the use of endovascular therapy (EVT) and bridging therapy combining intravenous thrombolysis and intra-arterial thrombectomy increased after implementation. These findings indicate that the pilot project facilitated faster transfers and expanded access to reperfusion therapies for ischemic stroke patients.

In contrast, among patients with hemorrhagic stroke, there were no significant differences in transfer times or treatment strategies between the periods before and after implementation, likely due to the small sample size.

Conclusions

In conclusion, the implementation of a regional hotline-based transfer system within the Geoje–Dong-A University network was associated with improved transfer efficiency and greater utilization of reperfusion therapy for acute ischemic stroke. A structured emergency care network may optimize stroke workflows, particularly in regions lacking local interventional capability.

Injectable Ultrathin and Biodegradable Sensor for Large-Area Monitoring of Cerebral Cortex Blood Flow

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Purpose

This study aims to develop a minimally invasive approach for large-area monitoring of cerebral blood flow. By inserting a large-area electrode through a small cranial opening, we establish a sensor that resides on the cortical surface and enables real-time, wide-field measurement of cerebral hemodynamics. Owing to its ultrahigh sensitivity, the sensor not only captures subtle variations in cortical blood flow but also allows precise diagnosis of systemic cardiac expansion dynamics.

Methods

The system leverages a shape-memory polymer engineered with a unique structural design that allows an ultrathin electronic device to be delivered through a small cranial opening without damage. Once inserted, the device restores its original geometry and expands to cover a large cortical surface. The integrated platform incorporates strain sensors based on metallic microcracks for highly sensitive detection of surface strain, along with electrodes capable of real-time monitoring of temperature, pressure, pH, and electrocorticography (ECoG). Importantly, the entire device is biodegradable, ensuring safe long-term operation and eventual resorption within the body.

Results

We successfully demonstrated that an electronic device with a lateral dimension nearly ten times larger than the syringe inner diameter could be injected and deployed without damage. The expanded device enabled real-time measurement of multiple physiological parameters, including cortical strain, temperature, pressure, pH, and ECoG signals. Moreover, the ultrahigh sensitivity of the system allowed precise monitoring of cerebral blood flow dynamics as well as accurate tracking of cardiac cycles and hemodynamic variations.

Conclusions

This work establishes a new paradigm for minimally invasive, large-area brain monitoring by combining injectability, biodegradability, and multifunctionality in a single platform. The technology enables simultaneous assessment of neural and cardiovascular physiology, offering transformative potential for clinical diagnosis, postoperative monitoring, and fundamental neuroscience studies.

The benefit and safety of minimal-dose intravenous heparin injection during mechanical thrombectomy : a single center retrospective study

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Purpose

We assessed the clinical effect of minimal-dose intravenous heparin for mechanical thrombectomy.

Methods

Patients with hyperacute ischemic stroke who presented to a single university hospital were enrolled in this study. We compared clinical and laboratory findings between patients who received heparin during mechanical thrombectomy and those who did not, using final TICI score, modified Rankin scale (mRS) at 3 months and hemorrhagic transformation during admission. The univariate or multivariate associations between poor outcomes and other clinical findings were investigated with two-tailed Fisher's exact test and P values<0.05 were considered significant.

Results

From January 2016 to October 2024, 492 patients (69.3 ± 12.4 years, 280 men) were included, and 78(11.6%) subjects received intravenous heparin, dose 500-2000 IU bolus, followed by 500-1000 IU/h. There were no differences in the prevalence of hypertension, diabetes mellitus and atrial fibrillation, initial NIHSS or stroke etiology. However, intravenous thrombolysis was more frequent in control group. The risk of hemorrhagic conversion on image was significantly higher in heparin group than non-user group, but there was no difference in symptomatic hemorrhage. However, there was no difference in mRS at 90 days, early neurological deficit and stroke recurrence between the two groups.

Conclusions

Even minimal dose of intravenous heparin injection before and during mechanical thrombectomy was associated with an increased risk of hemorrhagic conversion without significant change in functional outcome or recanalization status.

Machine Learning-Based Prediction of Unfavorable Outcomes in Embolic Stroke of Undetermined Source

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Purpose

Evidence on functional outcomes and their predictors in patients with embolic stroke of undetermined source (ESUS) remains limited. This study aimed to develop machine learning (ML) models to predict unfavorable outcomes at 3 months and 1 year after stroke, and to identify relevant features in ESUS patients.

Methods

A retrospective analysis was conducted using data from the Real World Study of Embolic Stroke of Undetermined Sources (ROS-ESUS), a multicenter prospective study encompassing 19 tertiary medical centers in South Korea from 2014 to 2019. Patients with ESUS were included, with demographic, clinical, laboratory variables, electrocardiographic, Holter monitoring, and transthoracic echocardiographic parameters as predictors. A baseline logistic regression model and two ML models—tree-based gradient boosting model (LightGBM) and Multi-Layer Perceptron (MLP)—were developed. Unfavorable outcomes were defined as a modified Rankin Scale score ≥3 at 3 months and 1-year. The primary metric for model performance was the area under the receiver operating characteristic curve (AUROC).

Results

Among 5,712 patients analyzed for 3-month outcomes, 1,450 (25.4%) had unfavorable outcomes, while 4,599 were included for 1-year predictions, with 1,133 (24.6%) experiencing poor outcomes. For a 3-month prediction, both ML models outperformed logistic regression (AUROCs: 0.854 [95% CI, 0.837–0.872] for LightGBM and 0.854 [95% CI, 0.836–0.871] for MLP vs. 0.821 [95% CI, 0.802–0.840]; P<0.001). For a 1-year prediction, LightGBM demonstrated the highest predictive performance (AUROC: 0.835 [95% CI, 0.814–0.856]), significantly surpassing logistic regression (AUROC: 0.812 [95% CI, 0.789–0.835]; P=0.012), while MLP showed no significant difference. Key predictors across both timepoints included initial National Institutes of Health Stroke Scale score, age, and D-dimer levels. For a 3-month prediction, mitral E/e' ratio and minimum heart rate on Holter monitoring played a critical role, while for a 1-year prediction, mitral A-wave velocity and hemoglobin became more influential.

Conclusions

ML approaches demonstrate their capability to capture the complex interplay of clinical variables and prognosis unique to ESUS. The findings highlight the significance of incorporating advanced data-driven methodologies in the management of ESUS, a condition characterized by its diverse etiologies and complex clinical presentation.

Diagnostic Performance of Post-Contrast FLAIR Versus Post-Contrast T1-Weighted Imaging MRI for the Detection of Meningitis: A Systematic Review and Meta-Analysis

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Purpose

Meningitis remains one of the most serious central nervous system infections, associated with considerable morbidity and mortality. Accurate and timely diagnosis is crucial to reduce complications and improve patient outcomes. While cerebrospinal fluid (CSF) analysis continues to be the diagnostic gold standard, it is invasive and not without risks. Magnetic resonance imaging (MRI) provides an important non-invasive alternative. Conventional post-contrast T1-weighted imaging (CE-T1WI) is widely used to assess leptomeningeal enhancement, but its diagnostic value is limited by difficulty in differentiating vascular from meningeal enhancement. Post-contrast fluid-attenuated inversion recovery (CE-FLAIR), which suppresses CSF signal, offers superior delineation of meningeal inflammation. This systematic review and meta-analysis aimed to evaluate and compare the diagnostic accuracy of CE-FLAIR and CE-T1WI in detecting infectious meningitis.

Methods

This study followed the PRISMA guidelines. A comprehensive literature search was conducted in PubMed, Scopus, Embase, and Web of Science to identify relevant studies published between 2010 and 2025. Eligible studies were prospective or retrospective diagnostic accuracy investigations directly comparing CE-FLAIR and CE-T1WI, using CSF analysis as the reference standard. Narrative reviews, case series, and studies without quantitative data were excluded. The Newcastle–Ottawa Quality Assessment Scale (NOS) was applied to assess methodological quality. Data extraction focused on sensitivity, specificity, and diagnostic accuracy. Meta-analysis was performed using MetaBayesDTA version 1.5.2, generating pooled estimates and summary receiver operating characteristic (SROC) curves with 95% confidence and prediction regions.

Results

Four studies were included. Pooled analysis showed that contrast-enhanced FLAIR (CE-FLAIR) outperformed contrast-enhanced T1-weighted imaging (CE-T1WI) in detecting infectious meningitis. CE-FLAIR achieved a pooled sensitivity of 0.90 (95% CI: 0.84–0.95) and specificity of 0.85 (95% CI: 0.77–0.91), compared with 0.74 (95% CI: 0.63–0.83) and 0.73 (95% CI: 0.62–0.82) for CE-T1WI. Forest plots showed CE-FLAIR consistently reached sensitivities up to 0.97, while CE-T1WI dropped to 0.60. CE-FLAIR specificity generally exceeded 0.80, whereas CE-T1WI often fell below. sROC curves confirmed these findings: CE-FLAIR clustered in the upper-left quadrant, indicating high accuracy and low heterogeneity, while CE-T1WI showed a wider spread and greater variability.

Conclusions

CE-FLAIR demonstrates superior diagnostic accuracy over CE-T1WI for infectious meningitis. Its higher sensitivity, specificity, and consistency make it the preferred MRI sequence for early, reliable detection of leptomeningeal enhancement. These findings support incorporating CE-FLAIR as a primary sequence to improve diagnostic confidence and clinical care.

Integrating Nutrition and Lifestyle Interventions for Stroke Prevention and Survivorship in Indonesia : A Population-Based Perspective

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Purpose

Stroke is a leading cause of mortality and disability worldwide, with nutritional and lifestyle factors recognized as key determinants of both incidence and recovery. Evidence from low- and middle-income countries, including Indonesia, remains limited. This study utilized data from the Indonesian Family Life Survey (IFLS5, 2014–2015) to examine associations between dietary and lifestyle factors with stroke occurrence and survivorship outcomes.

Methods

Stroke occurrence was binary outcome, while recovery was assessed using a continuous stroke recovery score. Independent variables included fruit and vegetable intake, physical activity, and smoking, with age, gender, income, education, and medical history as controls. Logistic regression estimated associations with stroke risk, and multiple linear regression assessed predictors of recovery among survivors.

Results

The prevalence of stroke was 3.5% in the cohort with mean age 50.3 years, of whom 47.8% were male. Logistic regression showed that high fruit intake (odds ratio [OR] 0.57, p=0.015) and regular physical activity (OR 0.70, p=0.032) reduced stroke risk, whereas smoking increased risk (OR 1.68, p=0.021). Age was a significant predictor of higher risk (OR 1.09, p=0.001), while gender, education, and income were not statistically significant. Among survivors, linear regression demonstrated that high fruit intake (β=2.34, p=0.008), physical activity (β=1.92, p = 0.011), higher education (β=1.21, p=0.022), and higher income (β=0.96, p=0.029) improved recovery scores, whereas older age (β=−0.15, p=0.003) and smoking (β=−1.98, p=0.041) impaired recovery.

Conclusions

Nutritional and lifestyle factors exert significant effects on both stroke incidence and recovery outcomes in Indonesia. Regular fruit consumption and physical activity are protective, while smoking substantially increases risk and worsens recovery. These findings emphasize the need for public health interventions targeting dietary

Contents

Table 1. Descriptive Statistics of Key Variables

Variable	Mean (SD) / Percentage
Age (years)	50.3 (10.5)
Gender (Male)	47.8%
Income (IDR/month)	3,540,000 (1,200,000)
Education (years)	9.8 (4.5)
High Fruit Intake	32.4%
Regular Physical Activity	45.1%
Stroke Occurrence	3.5%

Table 2. Logistic Regression Results: Predictors of Stroke Occurrence

Variable	Coefficient	Odds Ratio	P-value
High Fruit Intake	-0.568	0.57	0.015
Regular Physical Activity	-0.355	0.70	0.032
Age	0.087	1.09	0.001
Male Gender	0.233	1.26	0.159
High Income	-0.125	0.88	0.112
High Education	-0.168	0.84	0.064
Smoking Status (Smoker)	0.522	1.68	0.021

Table 3. Multiple Linear Regression Results: Predictors of Stroke Recovery Score

Variable	Coefficient	Std. Error	P-value
High Fruit Intake	2.34	0.87	0.008
Regular Physical Activity	1.92	0.73	0.011
Age	-0.15	0.05	0.003
Male Gender	-1.02	0.95	0.276
High Income	0.96	0.44	0.029
High Education	1.21	0.56	0.022
Smoking Status (Smoker)	-1.98	0.82	0.041

Health and Economic Costs of Stroke in Southeast Asia: An Analysis of Productivity Lost

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Purpose

Stroke imposes a significant economic burden that extends beyond direct medical expenditures to include productivity losses and reduced quality of life. In Southeast Asia, where healthcare resources vary widely, understanding the economic impact of stroke is crucial for guiding policy and optimizing resource allocation. This study estimates the economic burden of stroke across selected Southeast Asian countries, identifies key cost drivers, and analyzes the demographic and socioeconomic factors influencing these costs.

Methods

Data were retrieved from peer-reviewed literature, PubMed, and open sources including the World Health Organization and World Bank databases. Extracted variables encompassed direct and indirect costs related to hospitalization, rehabilitation, medication, and productivity loss. Covariates included age, gender, income, education, smoking, physical activity, and healthcare expenditure. A random-effects meta-analysis was used to pool cost data, while multiple linear regression and meta-regression explored the influence of control variables on economic outcomes. Descriptive statistics were calculated to summarize demographic and economic patterns.

Results

Per capita healthcare spending across the region averaged USD 500, with most countries ranging between USD 350 and 650. Regression analyses demonstrated that each additional year of age was associated with a USD 32 increase in stroke-related costs ($p = 0.015$), while higher income levels were linked to greater expenditure, with each dollar of income corresponding to a USD 0.14 increase in costs ($p = 0.04$). Smoking was a major driver, adding USD 250 per patient compared to non-smokers ($p = 0.001$). In contrast, physical activity was protective, with each additional day of activity per week reducing the economic burden by USD 105 ($p = 0.03$). Crucially, higher national healthcare spending demonstrated a strong mitigating effect, with each additional dollar of per capita expenditure reducing stroke burden by USD 2.75 ($p < 0.001$). Gender and education showed no statistically significant effects.

Conclusions

The economic burden of stroke in Southeast Asia is shaped by demographic, behavioral, and system-level factors. Older age, higher income, and smoking increase costs, whereas physical activity and greater healthcare investment significantly reduce the financial impact. These findings highlight the potential of targeted public health interventions alongside strategic healthcare investment, to mitigate stroke-related economic losses and improve health system sustainability across the region.

National Trends in Stroke Burden in Taiwan from 2006–2021: Incidence, Mortality, and Disability-Adjusted Life Years

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Purpose

Despite advancements in acute stroke care, stroke is still one of the leading causes of death and disability in Taiwan. This study aimed to evaluate the burden of stroke, including ischemic stroke (IS), intracerebral hemorrhage (ICH), and subarachnoid hemorrhage (SAH), in Taiwan from 2006 to 2021, providing estimates of incidence, prevalence, mortality, and disability-adjusted life years (DALYs).

Methods

Using data from the National Health Insurance Database and Taiwan Stroke Registry, we estimated the burden of stroke subtypes for the years 2006–2021, including incidence, prevalence, death, and disability-adjusted life-year (DALY) counts and age-standardised rates per 100 000 people. Stroke subtypes were defined by ICD-10 codes.

Results

In 2021, the age-standardised incidence of IS was 163.7 per 100,000 (men 187.9, women 142.6), a 13.8% decline since 2006. Prevalence rose to 994.8 per 100,000 (+16.9%), consistently higher in men. Mortality decreased overall by 25.5% (men 15.8, women 11.5 per 100,000). DALY rates declined by 10.6%, with a persistently greater burden in men. For ICH, incidence increased by 22.9% to 63.3 per 100,000 (men 74.1, women 53.2), prevalence rose by 64.8%, while mortality and DALY rates declined by 49.1% and 41.5%, respectively. Men bore a markedly higher ICH burden. SAH showed apparent rises in incidence (+1010.5%), prevalence (+1034.1%), and DALYs (+60.8%); however, this mainly reflects ICD-10 recoding in 2016 and should be interpreted with caution. Total DALYs for all stroke increased in absolute terms from 1,258.91 (2006) to 1,467.89 (2021) (+16.6%), while the age-standardised DALY rate fell from 1,211.62 to 944.33 (–22.1%). In 2021, years lived with disability (YLD) accounted for 60.4% of DALYs in IS, whereas years of life lost (YLL) contributed to 78.4% of DALYs in ICH.

Conclusions

From 2006–2021, Taiwan saw declines in IS and ICH burdens and a fall in the all-stroke age-standardised DALY rate despite rising absolute DALYs, consistent with population ageing; SAH trends remain uncertain due to coding changes. Persistent sex disparities underscore the need for targeted prevention and optimised acute care.

Global Disparities in Ischemic Stroke Prevalence Among Working-Age Adults: Patterns Across Socio-Demographic Index Countries in 2021

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Purpose

Ischemic stroke is a major global health burden, with its prevalence varying across different socio-economic regions. Socio-Demographic Index (SDI), a composite measure of social and economic development, provides a useful framework to assess disparities in disease burden. This study aims to compare the prevalence of ischemic stroke in low, middle, and high SDI countries in 2021 among working-age adults.

Methods

This study analyzed ischemic stroke prevalence among individuals aged 20–54 years across low, middle, and high Socio-Demographic Index (SDI) countries. SDI, a composite measure of social and economic development, includes lagged income per capita, average education level (≥15 years), and total fertility rate. Countries were categorized into SDI groups, and prevalence data were examined to identify patterns and disparities. Data were sourced from the Global Burden of Disease (GBD) 2021 database.

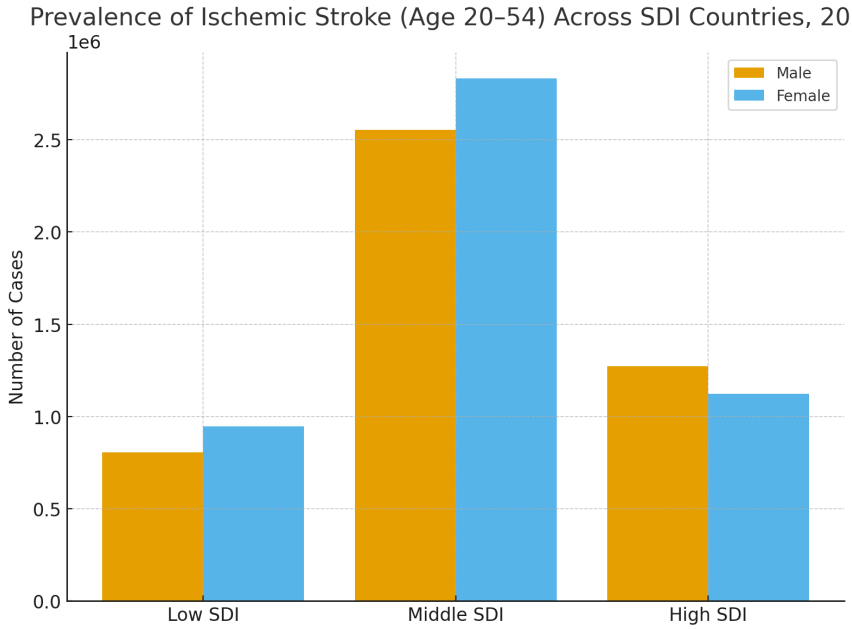
Results

The findings indicate that middle SDI countries had the highest prevalence of ischemic stroke, with a total of 5,387,072 cases, including 2,554,873 cases in males and 2,832,199 cases in females. High SDI countries recorded a total prevalence of 2,395,955 cases, with a higher proportion in males (1,273,322 cases) than in females (1,122,633 cases). Meanwhile, low SDI countries reported a total prevalence of 1,752,085 cases, consisting of 804,844 cases in males and 947,242 cases in females. Notably, in both middle and low SDI countries, ischemic stroke prevalence was higher in females than in males, whereas in high SDI countries, the prevalence was higher in males than in females.

Conclusions

Middle SDI countries bear the highest burden of ischemic stroke among working-age adults, with prevalence predominantly higher in females. These findings highlight the need for targeted prevention and control strategies in middle SDI regions to reduce the stroke burden in this population.

Contents


Prevalence of Ischemic Stroke (Age 20–54) Across SDI Countries, 2021
1e6
Male
Female
Number of Cases
0.0
0.5
1.0
1.5
2.0
2.5
Low SDI
Middle SDI
High SDI

Epidemiological Patterns of Ischemic Stroke across Socio-Demographic Index Levels: A Comparative Analysis between High and Low SDI Population

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Purpose

Ischemic stroke is the most prevalent type of stroke, resulting from thrombotic or embolic occlusion that diminishes blood flow to the brain. In 2021, there were 69.9 million existing cases of ischemic stroke globally, along with 7.8 million new cases. However, notable disparities exist among countries with varying sociodemographic index (SDI) levels. This study seeks to compare the epidemiological data on ischemic stroke across sociodemographic index levels.

Methods

This study utilized secondary data obtained from the Global Burden of Disease database. We included these criteria: aged more than 55 years and diagnosed with ischemic stroke. The analyzed data included prevalence, mortality, and years lived with disability (YLDs) in both high SDI and low SDI regions. YLDs quantify the non-fatal component of disease burden, calculated as the prevalence of a condition multiplied by a disability weight that reflects the severity of health loss.

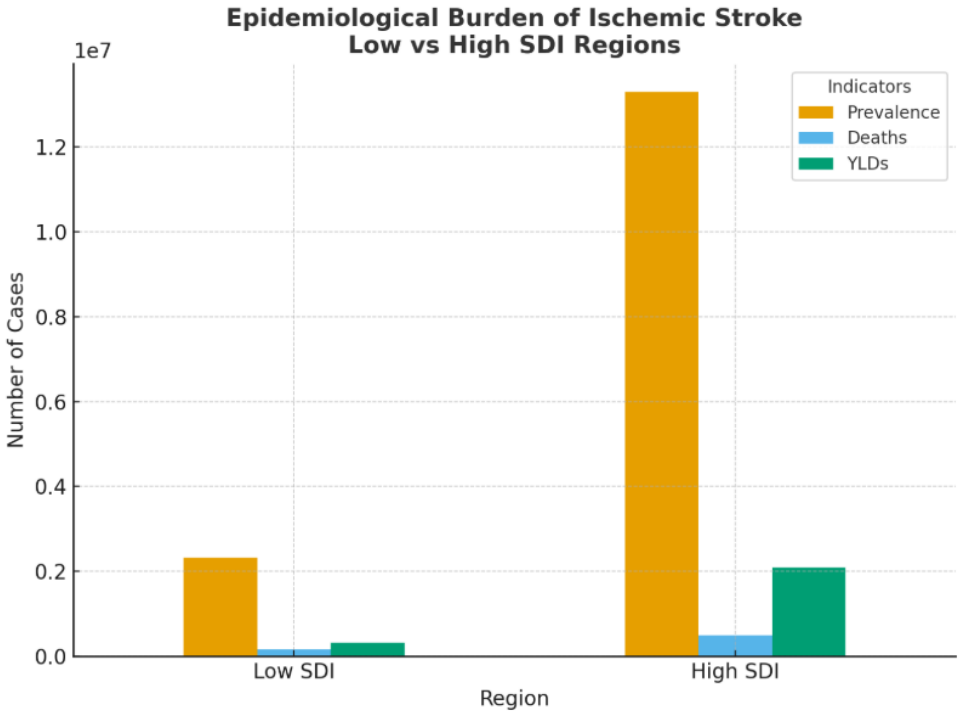
Results

The analysis showed marked differences in the epidemiological burden of ischemic stroke between low and high SDI populations. Low SDI regions showed that the prevalence was 2.32 million cases, with 163,841 deaths and 324,718 YLDs. In contrast, high SDI regions showed much larger prevalence with 13.3 million cases and a substantially higher non-fatal burden (2,096,622 YLDs) accompanied by 501,620 deaths. Sex-stratified analysis revealed distinct patterns across SDI levels. In low SDI, male and female mortality was similar (84,195 vs 79,646 cases), while prevalence was slightly higher among females (1.22 million vs 1.09 million). In high SDI, however, female deaths exceeded those of males (287,032 vs 214,588 cases), despite males contributing a larger share of prevalent cases (7.06 million vs 6.23 million).

Conclusions

Low-SDI populations are disproportionately affected by stroke mortality, while high-SDI populations have a much higher disability burden (YLDs), reflecting improved survival but longer years lived with disability.

Contents


Epidemiological Burden of Ischemic Stroke
Low vs High SDI Regions
1e7
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Number of Cases
Indicators
Prevalence
Deaths
YLDs
Low SDI
High SDI
Region

Association of weekend catch-up sleep with the atherosclerotic cardiovascular disease risk score: a hypothesis-generating study from US and Korean National Health and Nutrition Examination Surveys

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Purpose

A proportion of the populations sleeps longer on the weekends. We investigated a possible association between weekend catch up sleep (WCUS) and a known index of later development of atherosclerotic cardiovascular disease (ASCVD). We tested for an association of WCUS and ASCVD risk scores in 2 existing datasets.

Methods

We analyzed national data from the 2019–2021 KNHANES (n = 11,502) and the 2017–2020 NHANES (n = 2,135). WCUS duration from self-reported questionnaires was categorized as ≤0 hours, >0–1 hours, 1–2 hours, and >2 hours. The ASCVD risk score estimating a 10-year risk of ASCVD events was categorized into low (<7.5%), intermediate (7.5%–20%), and high (≥20%) groups.

Results

WCUS (>2 hours) was inversely associated with the high ASCVD risk group in the KNHANES (adjusted odds ratio [aOR] = 0.19, 95% confidence interval [CI]: 0.08–0.45), but not in the NHANES. The inverse association of WCUS (>2 hours) with the high ASCVD risk group was shown only in the KNHANES, independent of weekday sleep duration (aOR = 0.20, 95% CI: 0.07–0.51 for <6 hours; aOR = 0.17, 95% CI: 0.07–0.39 for ≥6–8 hours; aOR = 0.13, 95% CI: 0.03–0.63 for ≥8 hours). However, WCUS (>2 hours) showed no significant association with the high ASCVD risk group in weekday sleep duration subgroups.

Conclusions

The apparent association between WCUS and ASCVD in an existing dataset underscore the need to investigate WCUS in prospective studies.

Acknowledgement

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KNOWLEDGE AND PERSONALITY AMONG NURSING STUDENTS RELATED WITH PATIENT SAFETY IMPLEMENTATION

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Purpose

Patient safety incidents are a major challenge in healthcare, particularly in low- to middle-income countries. A low patient safety culture can be caused by a lack of knowledge and awareness among healthcare students, negatively impacting patient care. To achieve a safe patient safety culture in healthcare, various factors can influence it, such as the knowledge and personality of nursing students.

Methods

This article employed a descriptive-analytical research design with a cross-sectional approach. The sampling technique used was a total sampling, where the total sample size equals the total population studied. The population of this article was nursing students who had previously practiced experience.

Results

Patient safety incidents among students are a serious problem because students who practice can contribute to patient safety incidents. This can be caused by an individual's knowledge and personality. The research results indicate a positive relationship between knowledge and personality and patient safety compliance. The correlation coefficient between knowledge and compliance was 0.266, indicating a weak positive relationship. This means that the higher a student's knowledge, the higher their compliance, although not a strong one. The correlation coefficient between personality and compliance was 0.503, indicating a moderate and positive relationship. From the results of the correlation coefficient, personality is more strongly related than knowledge, in terms of its relationship with a student's compliance. Several studies have shown that personality plays a role in patient safety compliance. Although introverts are often seen, they possess several strengths, such as a calm nature, empathy, and mature thinking, which can improve the quality of nursing care.

Conclusions

Therefore, it can be concluded that both knowledge and personality contribute to supporting a culture of patient safety, and both need to be developed to improve the quality of nursing care, ensuring a safer and more effective quality.

Bridging Gaps in Pediatric Dystonia Care: Perspectives of Primary Health Care Providers in Rural India

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Purpose

Pediatric dystonia remains an underdiagnosed and undertreated movement disorder, particularly in resource-limited settings. A lack of awareness and inadequate training among primary health care providers (PCPs) contribute to delays in diagnosis and suboptimal management. In the Narsan district of Haridwar, India, many children with dystonia may remain undiagnosed due to misconceptions and limited access to specialized neurological care. Understanding the knowledge, attitudes, and perceptions of PCPs is crucial for improving early identification, treatment, and overall patient outcomes.

Objectives:

This study aims to assess the knowledge, attitudes, and perceptions of PCPs regarding pediatric dystonia. It also seeks to identify barriers and facilitators influencing the implementation of developmental screening programs and surveillance in pediatric care settings.

Methods

A cross-sectional, mixed-methods study was conducted among 678 health care professionals from various primary care facilities. A structured questionnaire covering dystonia diagnosis, management, and disease progression was administered, along with qualitative interviews involving 540 participants. Descriptive statistics and independent t-tests were used to analyze quantitative data, while thematic analysis was applied to qualitative responses.

Results

Findings revealed a significant gap in knowledge, particularly regarding dystonia diagnosis (36.4%) and management (66.4%). Medical officers demonstrated significantly higher awareness compared to nursing staff ($p = 0.01$). Nearly 27% of PCPs misinterpreted dystonia symptoms as stroke or psychiatric disorders, leading to hesitancy in managing affected patients. The mean scores for overall knowledge, diagnostic ability, treatment options, and disease understanding were 14.65 ± 4.08, 7.72 ± 1.32, 4.64 ± 1.12, and 4.11 ± 1.62, respectively. Despite a generally favorable attitude toward developmental screening, actual implementation remained limited due to resource constraints and institutional barriers.

Conclusions

The study highlights critical knowledge gaps among PCPs regarding pediatric dystonia. Comprehensive training programs and structured screening initiatives are essential for improving early detection and management. Strengthening educational resources and integrating standardized screening protocols into routine pediatric care could enhance outcomes for children with dystonia.

Blood Pressure Status and Risk of Cardiovascular Disease in Older Adults Aged 75+ Without Prior Cardiovascular Events: A Nationwide Cohort Study

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Purpose

The association between hypertension status and cardiovascular disease (CVD) risk in individuals aged ≥75 years without prior CVD events remains unclear. We examine the relationship between hypertension status and CVD risk in this population.

Methods

We conducted a nationwide cohort study using the Korean National Health Insurance Service database, including 869,781 adults aged ≥75 years who underwent standardized health check-ups from 2012 to 2015 and had no prior history of stroke or myocardial infarction (MI). Participants were classified into five mutually exclusive BP categories: normotension, pre-hypertension, controlled hypertension, uncontrolled hypertension, and new-onset hypertension. The primary endpoint was a composite of stroke and MI, with death considered as a competing risk. Subdistribution hazard ratios (HRs) were estimated using Fine–Gray models adjusted for demographic, socioeconomic, lifestyle, and clinical covariates. Penalized spline analyses assessed continuous, nonlinear associations of systolic (SBP) and diastolic BP (DBP) with outcomes.

Results

During a mean follow-up of 6.7 years, 120,353 participants (13.8%) experienced incident CVD, including 74,001 strokes and 55,117 MIs. Compared with normotension, all elevated BP categories were associated with significantly increased CVD risk (pre-hypertension: HR 1.13, 95% CI 1.11–1.16; new-onset hypertension: HR 1.29, 95% CI 1.26–1.33; controlled hypertension: HR 1.21, 95% CI 1.18–1.23; uncontrolled hypertension: HR 1.33, 95% CI 1.30–1.36). Stroke risk rose more steeply with BP elevation than MI risk. Spline models demonstrated a progressive linear increase in stroke risk with higher SBP, whereas MI exhibited a U-shaped relationship with both SBP and DBP.

Conclusions

All elevated BP categories were associated with increased risks of stroke, MI, and the composite outcome, with the highest risk in uncontrolled hypertension. Risk of stroke appeared more sensitive to BP elevation than MI. Additional spline analyses indicated a progressive increase in CVD risk with higher SBP and a U-shaped relationship with DBP. These findings support individualized BP management in the older population.

Acknowledgement

None

Burden of Stroke in the United States of America, 1990–2021: A systematic analysis for the US Burden of Disease Study 2021

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Purpose

Accurate and updated stroke burden estimates are essential to inform public health interventions and resource allocation in the United States (US). We aimed to evaluate the burden of ischemic and hemorrhagic stroke in the US in 2021 and analyze trends from 1990 to 2021 by age, sex, and geographic location.

Methods

This was a comprehensive analysis based on the 2021 Global Burden of Disease (GBD) study encompassing ischemic stroke, intracerebral hemorrhage (ICH), and subarachnoid hemorrhage (SAH). The stroke incidence, prevalence, mortality, and disability-adjusted life-years (DALYs), including absolute numbers and age-standardized rates per 100,000 population, were stratified by stroke subtype, sex, age, and geographic region.

Results

In 2021, there were 0.41 million incident strokes (95% uncertainty interval (UI), 0.36–0.47 million), predominantly ischemic (0.31 million, 75.6%). The prevalence was 6.3 million, with ischemic stroke accounting for 78% (3.07 million, 48.7% men). Hemorrhagic strokes included 0.75 million ICH and 0.45 million SAH. Stroke deaths totaled 0.19 million, with DALYs of 3.91 million. From 1990 to 2021, the crude stroke prevalence markedly increased for ischemic stroke (65.7%), ICH (78.3%), and SAH (70.6%). Although age-standardized incidence and mortality rates generally decreased over this period, the incidence of SAH has increased recently, and hemorrhagic stroke mortality peaked around 2000. Younger populations (aged 15–49 years) experienced an increasing stroke burden, especially in Alaska and Arkansas, highlighting demographic and regional disparities.

Conclusions

Despite improvements in age-standardized stroke incidence, mortality, and DALYs, the overall burden of stroke continues to increase owing to demographic shifts and the increasing prevalence of risk factors. There is a critical need for tailored and targeted interventions to address the evolving demographic and regional disparities and effectively reduce the US stroke burden.

Saving Young Brains: Adolescent Stroke Reversed with Thrombolysis

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Purpose

Acute stroke in adolescent is rarely seen and can be debilitating if neurological recovery is not achieved. However, with increasing number of stroke incidence, there is an increase of cases on young adults. We present a case of acute ischaemic stroke in a 17 year old boy at our centre.

Methods

A 17 year old Malay male presented to Emergency Department (ED) with sudden onset left sided limb weakness and numbness at 1230H while gardening with his father in school compound. He was last seen well at 1200H. He had no underlying illness, not on any medication, denies illicit substance abuse and non-smoker. Upon arrival, his GCS was E4V5M6, BP 135/71mmHg, HR 83bpm, SPO2 100% under room air and capillary blood sugar (CBS) 4.6. Neurological examination revealed power over his left upper limb and left lower limb were 3/5 with reduced upper limb sensation over C5-C6, C8-T1 level. Cranial nerve examination was unremarkable. The initial NIH Stroke Scale (NIHSS) was 5. Acute stroke protocol was activated and a plain CT brain done showed no obvious hypodensity or intracranial bleed. He was started on thrombolysis once consented by his father with IV Alteplase at 1620H and completed after 1 hour. He had no significant complication during and after thrombolysis and made full neurological recovery within 24 hours. His NIHSS was 0 prior to discharge.

Results

Acute stroke is usually seen in adult patients with risk factors of developing atherosclerosis and ischaemia. However, there is an increase in incidence of younger patients developing acute stroke, including adolescent age group. Data for thrombolysis in paediatric and adolescent age group may be scarce, but there are case reports of successful thrombolysis in these age groups. In our case, full neurological recovery was made post thrombolysis indicating a good benefit versus risk of treatment. Obesity and young hypertension are important modifiable risk factors to be considered while managing our youth community to avoid development of stroke.

Conclusions

Early recognition of acute stroke is essential and thrombolysis therapy should be considered for adolescent presenting with acute stroke ensuring their bright future.

Case report : Persisent hypoglossal artery with ipsilateral carotid stenosis and pontine infarction.

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Purpose

Persistent hypoglossal artery (PHA) is a rare congenital vascular anomaly and one of the persistent carotid–vertebrobasilar anastomoses (PCVBA). Normally, these embryonic vessels regress when the embryo period, being replaced by the posterior communicating and vertebrobasilar arteries. Failure of regression may result in the posterior circulation through the internal carotid artery (ICA), which can predispose to ischemic events due to carotid stenosis or cardioembolic source.

Methods

A 68-year-old woman with hypertension and diabetes mellitus presented with a history of ischemic stroke one month earlier. She had been hospitalized elsewhere with left-sided weakness, and MRI revealed a right pontine infarction. CTA and MRA at the outside hospital and our institution demonstrated a PHA originating from the right proximal ICA and joining the basilar artery. Additional findings included chronic bilateral corona radiata and left cerebellar infarctions, multiple microbleeds, and stenoses in the right proximal ICA, right PCA (P2), and left MCA (M1). Both vertebral arteries were hypoplastic, the right posterior communicating artery was absent, and a left fetal-type PCA was present. Carotid ultrasound showed about 46% diameter reduction of the right ICA without hemodynamically significant flow. Echocardiography revealed no evidence of a definite cardioembolic source. Laboratory findings were unremarkable. The patient was resistant to aspirin and clopidogrel and was maintained on cilostazol and statin therapy.

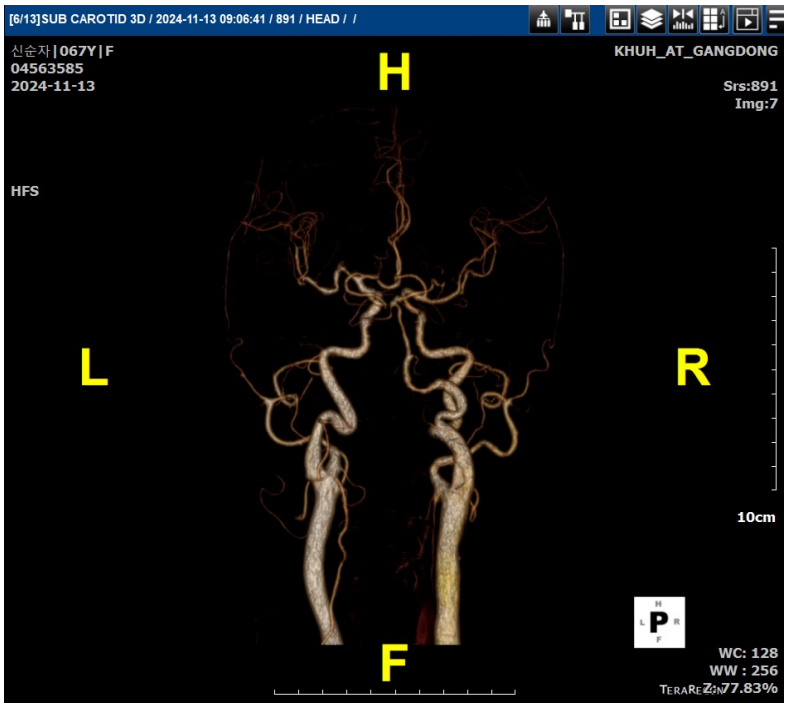
Results

PHA is a rare congenital anomaly and one of the persistent carotid–vertebrobasilar anastomoses (PCVBA), with a reported prevalence of 0.02–0.1%, second only to the persistent trigeminal artery. PCVBA includes four embryonic vessels— the persistent trigeminal artery (PTA), persistent hypoglossal artery (PHA), proatlantal intersegmental artery (PIA), and primitive otic artery (POA), which normally regress at 7–12 mm of embryonic development and are replaced by the posterior communicating and vertebrobasilar arteries. Failure of regression results in the posterior circulation supplied via the internal carotid artery. PHA typically arises from the upper cervical ICA, passes through the hypoglossal canal, and joins the basilar artery. Such anastomoses may predispose to ischemic stroke due to carotid stenosis or cardioembolic sources and require carefulness during carotid endarterectomy or stenting.

Conclusions

This case illustrates a rare presentation of PHA associated with multiple vascular abnormalities and ischemic stroke. Recognition of persistent carotid–vertebrobasilar anastomoses is important because they may be predisposing factors for anterior and posterior circulation infarction and increase the risk of vascular injury during carotid endarteriectomy or stenting.

Contents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Alice in Wonderland Syndrome as a Manifestation of Posterior Cerebral Artery Infarction: A Case Report

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Purpose

Alice in Wonderland syndrome (AIWS) is a neurological condition characterized by transient perceptual distortions like micropsia, macropsia, or altered spatial perception. While commonly associated with migraine, infections, or epilepsy, its occurrence due to a vascular etiology, particularly posterior cerebral artery (PCA) infarction, is exceptionally rare. We present a case of a patient with PCA stroke presenting with AIWS along with visual field defect, highlighting the need for prompt recognition in the acute setting.

Methods

We describe the clinical course, neuroimaging, and neuropsychological assessment of an 81-year-old male who presented with AIWS as the manifestation of PCA infarction. We also review existing literature to contextualize this unusual presentation and its diagnostic implications.

Results

The patient presented with sudden left visual field loss accompanied by visual distortions. He reported macropsia, describing television subtitles and small objects as vertically elongated and blurred, akin to ink spreading in water. Symptoms were more pronounced in peripheral and distant vision, aggravated when tracking moving objects. Neurological examination revealed left homonymous inferior quadrantanopia. Neuropsychological testing showed that while he could identify individual elements of a complex scene, he failed to grasp its overall meaning. Brain magnetic resonance imaging (MRI) revealed an acute infarct in the right occipital cortex, consistent with his symptoms. Magnetic resonance angiography (MRA) showed no large vessel occlusion, and an electrocardiogram (ECG) confirmed atrial fibrillation. The perceptual distortions resolved within 48 hours with anticoagulation, leaving only the residual visual field defect.

Conclusions

This case report underscores that AIWS, although rare, can be a presenting symptom of an acute ischemic stroke, specifically involving the PCA territory. While AIWS is classically linked to non-vascular causes, clinicians must consider ischemic stroke, particularly occipital or occipito-temporal infarction, as an underlying etiology. This case reinforces that AIWS can occur simultaneously with a visual field defect, and its transient nature may be a significant clinical feature. Therefore, prompt neurovascular evaluation is required when AIWS is encountered, even in the presence of more typical stroke signs.

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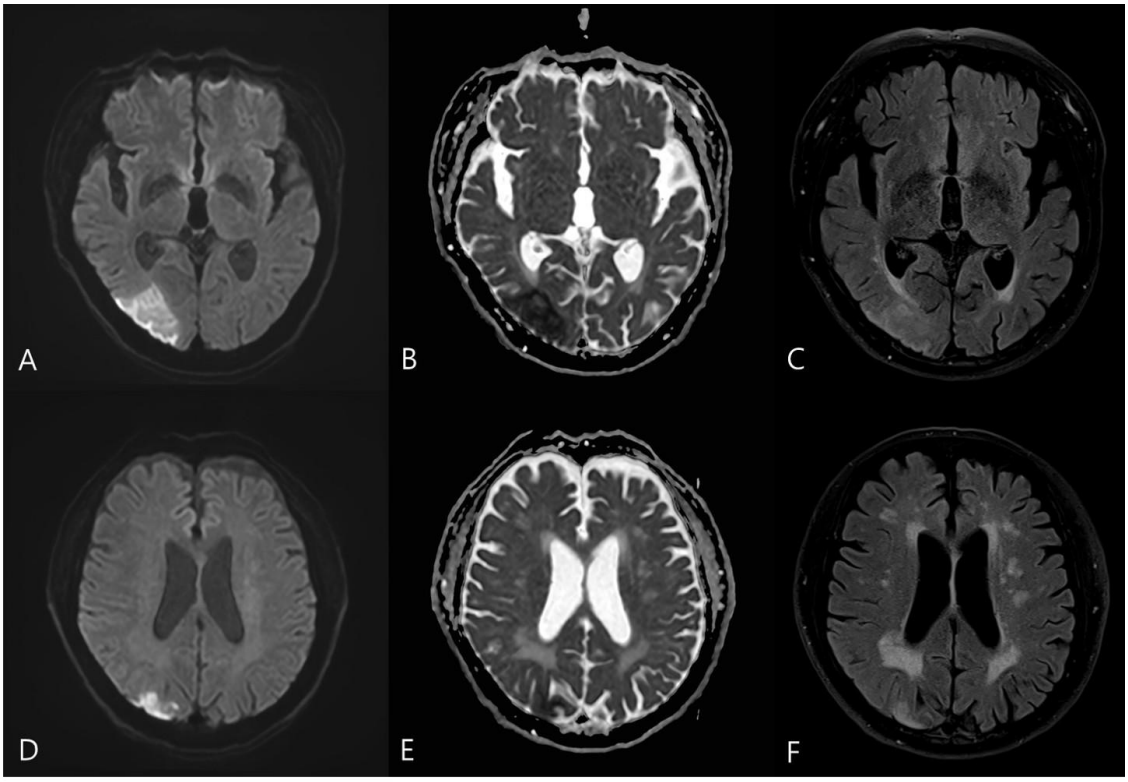

Patent Foramen Ovale Closure in an Elderly Patient with Recurrent Cerebral Infarction and Platypnea–Orthodeoxia Syndrome

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Purpose

Patent foramen ovale (PFO) may cause cerebral infarction and platypnea–orthodeoxia syndrome (POS). POS is a rare condition characterized by dyspnea and arterial desaturation in the upright position due to right-to-left shunting of deoxygenated blood through the PFO. PFO can also lead to stroke via paradoxical embolism, and closure is indicated in relatively young patients without other identifiable causes.

Methods

Case

Results

A 78-year-old woman was admitted with dysarthria that had developed 4 hours earlier. Her history included hypertension, hyperlipidemia, and an old right subcortical infarction. Brain MRI showed acute infarction in the left frontal white matter and inferior frontal gyrus. Stroke unit monitoring demonstrated intermittent oxygen desaturation below 90% when sitting. She was usually asymptomatic but developed dyspnea when saturation dropped below 85%. Intermittent oxygen supplementation improved desaturation, and oxygen levels remained above 97% when lying supine without symptoms. Pulmonary CT angiography excluded thromboembolism. Transesophageal echocardiography identified a PFO with atrial septal aneurysm, grade >3. Given the likelihood of PFO contributing to both recurrent stroke and POS, PFO closure was performed without complications. No further desaturation was observed afterward.

Conclusions

Monitoring in the stroke unit may assist in diagnosing POS. In appropriately selected elderly patients, PFO closure can be a safe and effective therapeutic option.

Fabrication of a Monorail-type Diagnostic Catheter for Rescue Retrieval Technique of a Distal Embolic Protection Device

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Purpose

We introduce a novel rescue retrieval technique for embolic protection devices (EPD), utilizing a fabricated monorail-type HN5 diagnostic catheter.

Methods

An 8 French VISTA BRITE TIP IG guiding catheter was placed in the left common carotid artery (CCA). The proximal internal carotid artery (ICA) was seen to have a posterolateral trajectory for approximately 1 cm, followed by a pronounced upward curve. The stenotic area was identified from the arterial bend extending roughly 1 cm superiorly. A 7.2 mm Emboshield NAV6 embolic protection system was deployed, and A 4 mm x 40 mm AVIATOR Plus RX balloon catheter was situated at the stenotic segment via the wire of the EPD for pre-stenting angioplasty. A 7 mm x 40 mm RX Acculink carotid stent was deployed in the proximal ICA. During the procedure, meticulous care was taken to position the distal end of the stent at the initial segment of the stenotic ICA, considering the acute angle of the ICA-CCA junction and the diameter inconsistency between proximal ICA and distal CCA. Following stent deployment, a spatial separation was observed between the proximal end of the stent and the arterial wall, attributed to the ICA's inherent curvature

Results

Upon attempting retrieval of the EPD, the catheter's progression was hindered at the proximal end of stent, entrapped by the protruding strut. The challenging dual curves preceding the stent created a barrier, hindering straightforward navigation of the retrieval catheter. After several trials, we configured the retrieval catheter to an acute angle by steaming; however, its advancement remained impossible. Ultimately, the need for an alternative catheter with a sharper angle for overcoming the protruding stent became apparent, and the HN 5 diagnostic catheter was selected for this task. Subsequently, the posterior aspect of the HN 5 diagnostic catheter was punctured with an 18-gauge needle to repurpose it as a monorail-type device (Figure). The needle was affixed to the EPD wire and later removed from the HN 5 catheter. Prior to catheter advancement into the stent, gentle compression was applied beneath the left mandible, aligning with the stent's location, to minimize the ICA-CCA angle. The catheter successfully navigated through the stent with no resistance, and the EPD was effectively retrieved

Conclusions

We confirmed the location of the stent, vessel patency, and the widened internal diameter of proximal ICA in the final angiogram

Repeated Endovascular Thrombectomy in Acute Ischemic Stroke with Large Vessel Occlusion: Recurrence patterns, Contributing Factors, and Clinical Outcomes

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Purpose

Since Endovascular thrombectomy (EVT) became the standard treatment for acute ischemic stroke with large vessel occlusion (LVO), repeated EVT cases have increased. However, data remain limited regarding the characteristics of patients with recurrent strokes requiring repeated EVT. This study aimed to investigate the outcomes and contributing factors for recurrence in patients undergoing repeated EVT.

Methods

We retrospectively reviewed consecutive patients who received repeated EVT for LVO stroke at out center between March 2016 and February 2025. Patients characteristics, clinical and procedural outcomes, and factors contributing to repeated EVT were analyzed.

Results

Of 1,430 patients who underwent EVT, 34 patients (2.4%) received repeated EVT, including 3 (0.2%) with three sessions. Early recurrence (≤ 7 days) occurred in 6 cases, while late recurrence was observed in 31 cases (median interval 976 days; range 8-1964 days). Cardioembolism was the most common etiology (n=21, 56.8%). Leading causes of recurrence included poor medication adherence (n=9, 24.3%), misprescription due to misinterpretation of stroke etiology (n=7, 18.9%), and anticoagulant underdosing (n=6, 16.2%). Physician-related factors accounted for the majority (56.8%), exceeding patient-related (24.3%) and disease-related factors (18.9%). Functional outcomes were significantly worse after repeated EVT compared to initial EVT (p=0.001).

Conclusions

Although rare, repeated EVT was associated with poor outcomes and was more often attributable to physician-related factors than patient- or disease-related causes, underscoring the need for improved clinical decision-making and physician practices.

Mislocalization of the Culprit lesion by CT perfusion scan in patients with hyperacute stroke and large vessel occlusion

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Purpose

For hyperacute ischemic stroke due to large vessel occlusion(LVO), mechanical thrombectomy is the treatment option of choice. Usually, CT perfusion scans with angiography reveal the causative lesion of LVO, which is the target of recanalization therapy. Sometimes, for various reasons, CT perfusion scans can mislead the location of the target for treatment. Here we described two cases demonstrating mislocalization on CT scans.

Methods

Case 1; An 83 year old woman presented with altered mental status and Lt hemiparesis. The neurologic examination showed Rt gaze perferance, neglect and Lt visual field cut. The initial CT angio-perfusion scans demonstrated the hypoperfusion in Rt PCA territory due to Rt PCA occlusion. Although Rt ICA occlusion was also observed, the perfusion status of this area was not poor. Diffusion weighted images and Gradient echo images suggested Rt PCA infarct and large thrombus in Rt distal ICA. We tried mechanical thrombectomy. The initial conventional angiography revealed that the Rt PCA was supplied by fetal circulation via Rt P-com and the occlusion of Rt distal ICA caused the hypoperfusion of this area.The clot did not affect the collateral flow from A-com to Rt MCA territory, thus preserving perfusion in Rt MCA area. We recanalized Rt distal ICA, resulting in the reperfusion of Rt PCA and Rt MCA areas.

Results

Case 2: The 65 aged man demonstrates the Lt hemiparesis with hypesthesia. The initial CT scans suggested Rt MCA occlusion with hypoperfusion. On initial conventional angiography, Rt MCA occlusion was consistent with a chronic lesion. The MR scans indicated acute Rt pontine infarction with chronic Rt MCA occlusion.

Conclusions

CT angiography with perfusion imaging provides the data on localiation of culprit lesion and the target of recanalization. However, CT scans cannot distinguish whether a lesion is acute or chronic, or whether it is causative or not. The possibility of misinterpretation by CT scans should be considered, and MR scans or neurological examinations may be helpful in making the decision.

Acknowledgement

none

A Case Report on Manual Aspiration for a Carotid Thrombus During Carotid Angioplasty and Stenting

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Purpose

Carotid angioplasty and stenting (CAS) is a common alternative to carotid endarterectomy for preventing stroke from carotid artery plaque. However, a significant risk of CAS is the formation of a periprocedural thrombus. While intravenous (IV) tirofiban is a standard treatment for such clots, it may not be sufficient for large thrombi or occlusions, often requiring a more aggressive approach.

Methods

We report a case where a thrombus formed during CAS and was successfully removed by manual aspiration.

Results

A 54-year-old male was admitted to the emergency room with left-sided hemiparesis that had started 4 hours and 50 minutes prior to arrival. He had been diagnosed with hypertension three months earlier and was taking medication, but was otherwise healthy. At home, he was unable to lift his left arm and had no sensation, but his arm weakness had improved by the time he arrived at the emergency room. His initial NIHSS score was 3 (arm weakness 1, sensation 2). A CT angiogram in the emergency room revealed severe stenosis in the right carotid artery.

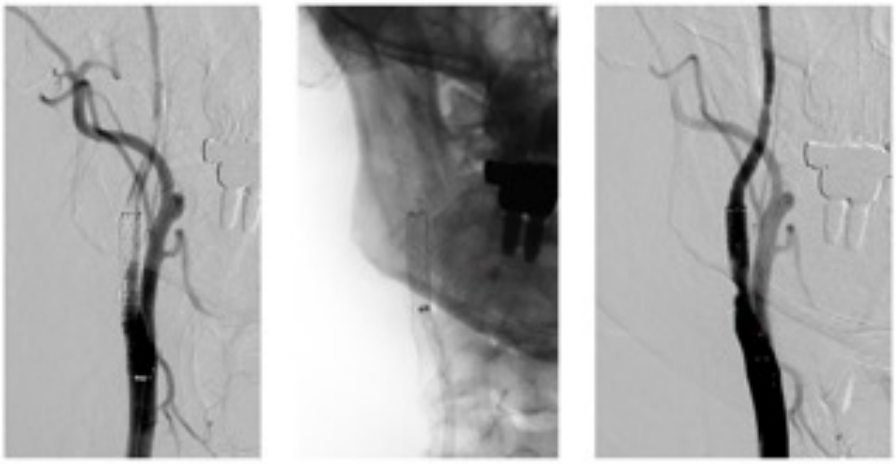
The patient's neurological symptoms resolved the following day, and a brain MRI showed no acute lesions. A 4-vessel angiogram performed on the third day of hospitalization revealed 86% stenosis (NASCET) in the right carotid artery.

During CAS on the fourth day, after the stent was placed, blood flow was blocked distal to the stenotic site. Subsequent balloon angioplasty restored blood flow, but a mural thrombus was observed at the site of the stenosis. Two attempts at catheter injection with 1 mg of tirofiban were made, but the size of the thrombus did not change. Manual aspiration was then performed with an intermediate catheter positioned against the thrombus. This successfully removed the thrombus, and subsequent angiography 15 minutes later showed no remaining thrombus. The patient did not develop any new neurological symptoms. A brain MRI the next day showed only a few subtle, small cortical lesions. At a 3-month follow-up, the patient had no new neurological symptoms.

Conclusions

This case highlights that while thrombus formation during CAS is a known complication, it can be safely and effectively managed. When pharmacological treatments prove insufficient, prompt and aggressive mechanical intervention, such as manual aspiration, can serve as a vital rescue therapy to minimize the risk of serious procedural complications.

Contents



Endovascular trajectory after downstream occlusion: Angiographic and clinical implications

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Purpose

Downstream occlusion during mechanical thrombectomy presents a procedural challenge with unclear therapeutic thresholds and prognostic implications. This study aimed to investigate the angiographic and clinical outcomes associated with downstream occlusion, focusing on treatment decisions and the efficacy of subsequent endovascular interventions.

Methods

We retrospectively reviewed 100 patients who developed downstream occlusion during thrombectomy for large vessel occlusion. The variables analyzed included downstream occlusion location, frequency of further thrombectomy, degree of recanalization improvement, and functional independence rates.

Results

Among the cohort, 61.0% achieved immediate mTICI 2b reperfusion despite the presence of downstream occlusion. Further thrombectomy was performed in 62.0% of cases, most frequently when occlusions were located in the proximal arterial segments (M1, M2, A3, P1, and P2), with intervention rates exceeding 95%. In contrast, treatment was typically withheld for more distal occlusions (M3, M4, P3), with an 89.5% non-intervention rate for these occlusions. Among those who underwent further thrombectomy, 72.0% demonstrated angiographic improvement in mTICI grade, and 91.9% achieved successful recanalization. Functional independence rates varied significantly according to the occlusion site. M1 segment occlusions were associated with the poorest outcomes (9.5%), whereas distal occlusions (M2–M4) had markedly higher rates of favorable outcome (55–60%). Within M4 occlusions, involvement of critical cortical branches (precentral, central, angular) was associated with lower functional independence (42.9%) than non-critical branches (frontal, temporal; 69.2%), although this difference was not statistically significant.

Conclusions

Downstream occlusion is a common event during thrombectomy and frequently warrants additional intervention, particularly for proximal vessel involvement. Although further thrombectomy can enhance reperfusion, clinical outcomes are highly dependent on the affected vascular territory. These findings support a segment-specific approach to downstream occlusion management during acute stroke intervention.

Recurrent Ischemic Stroke in a CYP2C19 Intermediate Metabolizer A Case for Genotype-Guided Antiplatelet Therapy

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Purpose

Clopidogrel is widely used for secondary prevention of ischemic stroke; however, its efficacy may be reduced in individuals with CYP2C19 loss-of-function alleles, particularly in Southeast Asian populations.

Methods

We report the case of an 80-year-old Cambodian male admitted in January 2024 with slurred speech, facial asymmetry, and right-sided weakness (muscle strength 3/5). Brain MRI revealed mild stenosis of the left middle cerebral artery (M1 segment). He was treated with aspirin, clopidogrel, rosuvastatin, and losartan, showing gradual clinical improvement (mRS score 1). However, in May 2024, he suffered a recurrent ischemic stroke with similar symptoms. Genetic testing identified him as a CYP2C19 intermediate metabolizer (*1/*2), indicating reduced clopidogrel efficacy. Repeat MRI showed left MCA occlusion and hemispheric infarction. Clopidogrel was replaced with ticagrelor, and statin therapy was intensified. After 8 months, follow-up MRI showed revascularization with mild residual stenosis. The patient achieved full motor recovery with only mild dysarthria and maintained an mRS score of 1.

Results

This case highlights the clinical relevance of CYP2C19 polymorphism in guiding antiplatelet therapy. Genotype-guided treatment with ticagrelor may improve outcomes in patients with clopidogrel resistance due to CYP2C19 variants.

Conclusions

Personalized antiplatelet therapy based on CYP2C19 genotype can enhance secondary stroke prevention and should be considered in high-risk patients, especially in East Asian populations.

Inflammatory Biomarkers and Imaging Density as Determinants of Stroke Severity in Intracranial Atherosclerosis

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Purpose

Systemic inflammation has been increasingly implicated as a central process in in intracranial atherosclerosis (ICAS) development and its association with severity of ischemic stroke. The purpose of this study was to explore the association of inflammatory hematological indices, including the neutrophil to lymphocyte ratio (NLR), platelet to lymphocyte ratio (PLR) and monocyte to lymphocyte ratio (MLR), as well as mean platelet volume (MPV) and Hounsfield Unit (HU) values, with stroke severity in ICAS patients.

Methods

One hundred patients with ICAS who were hospitalized in Dr. Wahidin Sudirohusodo General Hospital, Makassar were enrolled in a cross-sectional study. Baseline, cohort demographic attributes, vascular risk factors, and hematology values were captured. Severity of stroke was assessed by the National Institutes of Health Stroke Scale (NIHSS). Statistical analysis included the Kruskal–Wallis test, Spearman's correlation, and one-way ANOVA, applied according to the distribution of the data.

Results

Higher levels of NLR, PLR, and MLR were found to be associated with increased stroke severity. There were positive correlations between NIHSS scores and NLR ($r = 0.476$; $p = 0.001$), PLR ($r = 0.376$; $p < 0.001$), and MLR ($r = 0.514$; $p < 0.001$). HU values also had a weak but statistically significant correlation ($r = 0.225$; p-value = 0.024) and MPV showed no correlation ($r = 0.099$; p-value = 0.328).

Conclusions

NLR, PLR, and MLR, as convenient and inexpensive inflammation markers, could be used for estimating the severity of stroke in patients with ICAS, which may have implications for risk stratification and decision-making in clinical practice. HU values offer limited extra information, and MPV seems less relevant in this regard.

Blood-Derived Extracellular Vesicle and Neutrophil microRNA Machine Learning Approach for Intracranial Atherosclerotic Stroke Classification and Hemorrhagic Transformation Risk Prediction

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Purpose

Accurate recognition of intracranial atherosclerotic stenosis (ICAS) and prediction of hemorrhagic transformation (HT) remain critical gaps in acute ischemic stroke management. Neuroimaging alone cannot fully identify ICAS etiology or anticipate bleeding risk after reperfusion. We aimed to develop a microRNA-based machine learning approach integrating extracellular vesicle (EV) and neutrophil transcriptomic profiles to jointly classify ICAS-related stroke and predict HT after intravenous thrombolysis (IVT) or endovascular therapy (EVT).

Methods

Three independent datasets were analyzed. L1CAM-positive extracellular vesicles were isolated from plasma of acute ischemic stroke patients and controls without cerebrovascular risk factors (GSE269195, n=28). Small RNAs were sequenced to capture neuronal EV signatures, and an unsupervised encoder was pre-trained. Plasma EV transcriptomes from stroke patients undergoing mechanical thrombectomy with adjudicated etiologies (atherothrombotic n=6, cardioembolic n=10, ESUS n=5; GSE255087, n=21) provided supervised labels for ICAS versus non-ICAS classification. Neutrophil RNA-seq profiles from acute stroke patients exposed ex vivo to PBS, rt-PA, or rt-PA with histidine-rich glycoprotein (HRG) (GSE247434, n=15) informed modeling of HT risk, given the role of HRG-mediated immune modulation in post-thrombolysis bleeding. Reads were quality-controlled, microRNAs and tRNA fragments quantified, and batch effects harmonized using ComBat-seq and mutual nearest neighbors. A masked k-mer encoder was pre-trained on neuronal EV data and then fine-tuned in a multi-task learning setting that combined etiology classification and HT risk regression calibrated against HRG-responsive neutrophil expression. Domain-adversarial training enhanced cross-cohort generalizability. Model performance was evaluated through nested cross-validation and leave-one-dataset-out testing. Post-hoc calibration and SHAP analysis ensured interpretability.

Results

The framework achieved moderate but consistent performance across external folds. ICAS classification reached an AUC of 0.77 (95% CI: 0.68–0.84) with Brier score 0.19, while HT prediction achieved an AUC of 0.75 (95% CI: 0.65–0.83). Calibration slopes ranged from 0.90–1.05, indicating probability reliability. Compared with baseline models (NIHSS + ASPECTS for etiology; clinical scores for HT), the approach improved net reclassification index by 0.13 and provided modest net benefit in decision curve analysis. Informative features included miR-21-5p, miR-92a-3p, and tRF-GlyGCC from EVs, together with HRG-responsive neutrophil transcripts linked to HT. A reduced 12-feature panel maintained comparable accuracy and remains feasible for qPCR-based

translation. Performance was stable across folds without severe overfitting, variance explained by the model exceeded 18%, and identified features overlapped with endothelial activation and neutrophil degranulation signatures validated in independent stroke-related transcriptomic studies.

Conclusions

This proof-of-concept shows that integrating EV and neutrophil microRNAs can aid ICAS classification and hemorrhagic transformation prediction, while providing the basis for multicenter validation toward a clinically practical blood test in acute stroke care.

Interpretable AI-Driven Framework for Predicting Intracranial Atherosclerosis Using Multi-Omics Data

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Purpose

Intracranial atherosclerosis (ICAS) is a major contributor to ischemic stroke globally, yet early identification remains limited by its multifactorial and heterogeneous nature. This study examined interpretable AI-driven framework that integrates multi-omics data to enhance the prediction of ICAS and uncover key molecular determinants.

Methods

Multi-omics datasets were compiled from 1,280 individuals, including ICAS patients and matched controls. These included genomic variants, transcriptomic expression profiles from single-cell RNA sequencing and targeted metabolomic data. Clinical metadata were harmonized across cohorts. A hybrid machine learning pipeline was constructed using XGBoost, random forest, and deep learning models. SHAP values were used to ensure model interpretability and identify influential biological features. Dimensionality reduction and unsupervised clustering were applied to detect molecular subgroups, while pathway enrichment analyses were conducted to explore disease-associated mechanisms.

Results

The XGBoost model demonstrated superior predictive performance, achieving an area under the receiver operating characteristic curve of 0.91, with a precision of 0.84 and recall of 0.83. External validation yielded a comparable AUC of 0.87, confirming the model's generalizability. Key predictive features identified through SHAP included elevated expression of IL6 ($p<0.01$) and TNF ($p<0.01$) associated with inflammatory activation, endothelial adhesion molecules including ICAM1 ($p<0.01$)and VCAM1 ($p<0.01$), and matrix-degrading enzymes including MMP9 ($p<0.01$) linked to plaque destabilization. The integration of multi-omics data improved prediction accuracy by over 20 percent compared to models based solely on clinical variables. Enrichment analysis revealed consistent activation of inflammatory signaling, leukocyte adhesion, and extracellular matrix remodeling in high-risk individuals.

Conclusions

This study presents a robust and interpretable AI framework for predicting intracranial atherosclerosis using multi-layered biological data. The approach not only enhances risk stratification but also provides mechanistic insights into the molecular drivers of ICAS, offering new avenues for precision cerebrovascular medicine.

Malignant MCA Infarction with Dilated Cardiomyopathy and Atrial Fibrillation: Multidisciplinary Challenges in Stroke Reperfusion and Heart Failure Management

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Purpose

Dilated cardiomyopathy (DCM) with atrial fibrillation (AF) is a major risk factor for cardioembolic stroke. Malignant middle cerebral artery (MCA) infarction is uncommon in young adults but carries high mortality. Management becomes particularly challenging when advanced cardiac dysfunction coexists, as it limits reperfusion and surgical options.

Methods

We present a 42-year-old Malay woman with underlying chronic AF, non-ischemic DCM with LVEF 18%, post-implantable cardioverter-defibrillator, and subclinical hypothyroidism treated with levothyroxine. She presented with sudden-onset left hemiplegia and dysarthria (NIHSS 13). CT brain confirmed a right MCA infarction; CT angiography revealed severe right internal carotid stenosis with M2 occlusion. Intravenous thrombolysis was administered within the therapeutic window, resulting in partial neurological improvement (NIHSS 7). On day 3, she became drowsy with gaze deviation. Repeat CT brain showed progression to malignant MCA infarction without hemorrhagic transformation.

Results

Neurosurgical input advised conservative management due to her poor cardiac reserve. Echocardiography revealed global LV hypokinesia, spontaneous echo contrast,but no intracardiac thrombus. She was managed with guideline-directed heart failure therapy, including a beta-blocker, diuretics, digoxin, spironolactone, empagliflozin, and sacubitril/valsartan as tolerated. Dabigatran was initiated for secondary stroke prevention. At discharge, she remained functionally dependent (mRS 4) with residual hemiparesis but improved to mRs 3 by day 90. She tolerated anticoagulation with minor menorrhagia.

Conclusions

This scenario highlights several clinical dilemmas, such as the risks of thrombolysis in severe DCM and the choice not to perform decompressive hemicraniectomy in malignant MCA infarction because of significant cardiac risk factors. Her cardiovascular instability may have been worsened by subclinical hypothyroidism. Despite constraints, a multidisciplinary strategy enabled effective stabilization and recovery. Cardioembolic stroke in young individuals with DCM and AF is linked to significant morbidity. Meticulous choice for reperfusion, tailored anticoagulation approaches, and teamwork across disciplines are crucial for enhancing results. Cardioembolic stroke in young patients with DCM and AF is associated with high morbidity. Careful patient selection for reperfusion, tailored anticoagulation strategies, and close multidisciplinary collaboration are essential to optimize outcomes.

Acknowledgement

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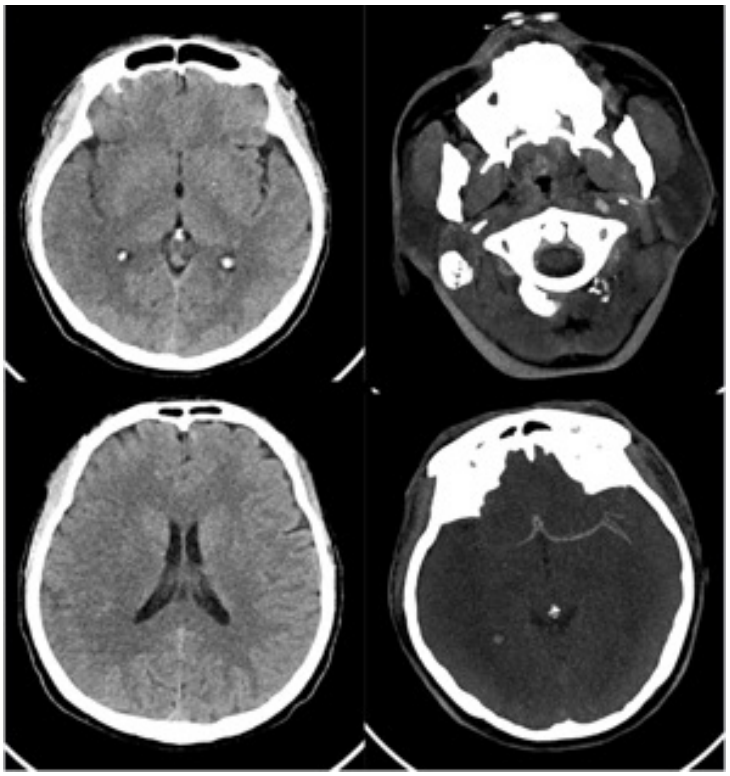

Impact of the RNF213 p.R4810K Variant on Clinical Characteristics and Treatment Outcomes in Patients with Intracranial Artery Stenosis With and Without Endovascular Treatment

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Purpose

The RNF213 p.R4810K variant is prevalent in East Asians and is a recognized genetic risk factor for intracranial artery stenosis (ICAS). Although endovascular treatment (EVT) has shown potential benefits, its role in RNF213 carriers remains unclear. The objective is to evaluate the clinical characteristics and treatment outcomes of symptomatic ICAS in carriers versus non-carriers of the RNF213 p.R4810K variant among patients with and without EVT.

Methods

We retrospectively analyzed 72 patients with symptomatic ICAS (ICA, MCA, or ACA) who underwent genetic testing between April 2020 and July 2025. EVT was performed in 29 patients. ICAS was defined as ≥50% luminal narrowing according to the WASID criteria on MRA, CTA, or angiography. Demographics, vascular morphology, treatment modality (EVT or medical therapy), complications, and outcomes were compared between carriers and non-carriers.

Results

Thirteen patients (18.1%) carried the variant. Carriers were more often female (54% vs. 37%) and younger (median age, 62 vs. 71 years). Stenosis severity was similar (71% vs. 73%), but lesion length was greater in carriers (8.0 vs. 5.9 mm). Complex lesions (Mori type ≥ C) were observed in 7 of 13 carriers (53.8%) compared with 15 of 59 non-carriers (34.4%). None of these differences reached statistical significance. Balloon angioplasty and/or stenting was performed in 5 carriers (38.5%) and 24 non-carriers (40.7%), with technical success achieved in all cases. Retreatment for restenosis was required in 2 carriers (40.0%) and 7 non-carriers (29.2%). All patients who underwent EVT achieved good functional outcomes (mRS 0–2) at 3 months. Among those treated medically, the proportion of patients with good outcomes was 100% in carriers (n=8) and 68.8% in non-carriers (n=35), with significant difference (p=0.022).

Conclusions

Carriers of the RNF213 p.R4810K variant in symptomatic ICAS patients were typically younger women with longer and more complex lesions. Functional outcomes after EVT were favorable in both carriers and non-carriers, although retreatment tended to be slightly more frequent in carriers. Conversely, in the medically treated group, outcomes appeared to be better in carriers. Further prospective studies are needed to validate these findings and optimize treatment strategies.

Mathematical Modeling of Disturbed Intracranial Shear Stress, Endothelial PKN1-Mediated H3.3S31 Epigenomic Activation, and Macrophage-Driven Matrix Degradation for Predicting Fibrous Cap Failure Risk in Intracranial Atherosclerosis

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Purpose

Intracranial atherosclerotic stenosis (ICAS) often leads to stroke through plaque rupture without severe luminal narrowing. Current imaging-based assessments cannot capture this hidden vulnerability. We aimed to develop a mathematical modeling framework integrating disturbed shear stress, endothelial epigenomic activation, and plaque biomechanics to estimate fibrous cap failure risk in ICAS, thereby informing patient-specific risk stratification beyond stenosis degree.

Methods

Endothelial RNA-seq and ATAC-seq under disturbed flow with PKN1-dependent H3.3S31 phosphorylation (GSE261753–755) were used to parameterize an epigenomic response module. Recently ruptured versus asymptomatic carotid plaques (GSE198600, n=11) provided vulnerability signatures for validation. Macrophage priors were derived from single-cell plaque data (GSE224273). The model comprised three layers: computational fluid dynamics of intracranial arterial segments to quantify wall shear stress and oscillatory shear index; an ordinary differential equation system linking shear to PKN1/H3.3S31 activation, NF-κB, and NOTCH signaling; and an agent-based plaque layer simulating macrophage-driven matrix degradation, smooth muscle cell collagen turnover, and cap fatigue. Failure was defined as cap thickness falling below a critical stress threshold. Calibration was performed using endothelial fold-changes and plaque transcriptomic programs, with predictions validated against rupture profiles.

Results

The model achieved an AUC of 0.813 (95% CI: 0.72–0.88) with Brier score 0.17 in distinguishing ruptured from asymptomatic plaque signatures. Calibration slope ranged from 0.92–1.04, and decision curve analysis indicated net benefit across moderate-to-high thresholds. Sensitivity analysis identified oscillatory shear amplitude and PKN1 signaling gain as dominant contributors, explaining 27% of variance in rupture probability. Simulated interventions predicted that PKN1 inhibition or NOTCH-JAG1/DLL4 rebalancing reduced rupture probability by 22–28% under identical disturbed flow conditions. Predicted outputs overlapped with endothelial activation and macrophage MMP signatures from independent stroke datasets, supporting biological plausibility. Clinically, the model achieved 79% sensitivity (95% CI: 68–87) and 72% specificity (95% CI: 61–83) for rupture prediction, with a positive predictive value of 74% and negative predictive value of 77%. Net benefit analysis indicated an absolute risk reclassification improvement of 14% compared with luminal stenosis degree alone, indicating its translational relevance for ICAS patients.

Conclusions

Mathematical modeling integrating intracranial shear, endothelial epigenomics, and plaque dynamics predicts fibrous cap failure in ICAS and may guide molecular targeting and decision support beyond imaging, ultimately improving precision risk stratification in acute stroke care.

Automated Intracranial Atherosclerosis Detection and Prognosis: Toward Reproducible Stroke Risk Prediction.

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Purpose

Intracranial atherosclerosis (ICAS) is a major cause of ischemic stroke, especially in Asian populations. However, large-scale open data for ICAS quantification remain limited. Automated vessel segmentation from Time-of-Flight Magnetic Resonance Angiography (TOF-MRA) provides a scalable alternative to manual interpretation, enabling reproducible assessment of cerebrovascular burden.

Methods

We conducted a systematic review and meta-analysis of studies reporting on ICAS prevalence, risk, and prognosis (2000–2023). For technical validation, we utilized the open-source COSTA TOF-MRA dataset, which provides expert-annotated vessel segmentations. A 3D U-Net architecture was applied for vessel extraction, and stenosis was approximated using lumen diameter ratios. Performance was measured using Dice similarity and area under the curve (AUC) against expert masks. Meta-analysis outcomes included recurrent stroke risk associated with ICAS, stratified by Asian vs. non-Asian populations.

Results

Automated vessel segmentation achieved high accuracy on the COSTA dataset (mean Dice=0.86, 95% CI: 0.84–0.88). However, open datasets currently lack outcome follow-up, preventing direct prognostic modeling. From the systematic review (34 studies, >12,000 patients), ICAS was associated with a 2.1-fold increased risk of recurrent stroke (pooled HR=2.12, 95% CI: 1.85–2.44; I^2=27%). Subgroup analyses indicated stronger associations in Asian populations (HR=2.45) compared with Western cohorts (HR=1.71). Evidence on statin modification of ICAS outcomes was inconsistent and limited to clinical trial data, not open datasets.

Conclusions

Open-source TOF-MRA resources (e.g., COSTA) enable reproducible vessel segmentation and stenosis detection but currently lack prognostic follow-up. Systematic review confirms ICAS as a major predictor of recurrent stroke, with ethnic disparities. Future research should prioritize linking imaging-based ICAS burden from open datasets with harmonized clinical outcomes to enable prognostic modeling and treatment-effect modification studies.

Unhealthy Lifestyle and Cardiovascular Disease Risk in Older Adults Aged 75+ Without Prior Cardiovascular Events: A Nationwide Cohort Study

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Purpose

Cardiovascular disease (CVD) remains the leading cause of morbidity and mortality worldwide, with its burden rising sharply in aging societies. While lifestyle modification is well established as a preventive strategy in midlife, the impact of unhealthy behaviors on CVD risk among very old adults is less clear. We aimed to evaluate whether clusters of unhealthy lifestyle behaviors continue to predict cardiovascular risk in this understudied age group without prior CVD.

Methods

We analyzed data from the Korean National Health Insurance Service (KNHIS) for adults aged 75 and older without prior CVD who underwent health check-ups between 2012 and 2015. The Unhealthy Lifestyle Behavior Score (ULBS) was used to quantify risk, assigning one point for current smoking, heavy drinking, and a sedentary lifestyle. The primary outcome was CVD incidence. Fine and Gray's subdistribution hazards model estimated subdistribution hazard ratios (HRs), considering death as a competing risk.

Results

A total of 869,781 participants (mean age: 78.49 ± 3.48 years, 41.7% male) were included. During a mean follow-up of 6.7 years, 120,353 participants experienced incident CVD, including 74,001 strokes and 55,117 MIs. The ULBS distribution was 0 in 13.9%, 1 in 77.6%, 2 in 7.7%, and 3 in 0.7% of participants. A clear dose-response relationship was observed: compared with ULBS 0, adjusted HRs for CVD were 1.17 (95% CI 1.15–1.19) for score 1, 1.48 (1.45–1.52) for score 2, and 1.53 (1.44–1.63) for score 3. Similar trends were noted for stroke and MI, with smoking showing the strongest association across outcomes. Heavy drinking was linked to higher CVD and stroke risk but not significantly to MI, whereas sedentary lifestyle consistently but moderately increased risk.

Conclusions

In this nationwide cohort of adults aged ≥75 years without prior cardiovascular events, unhealthy lifestyle behaviors significantly increased the risk of CVD, with clear evidence of a cumulative burden as behaviors clustered. Even a single factor such as smoking, heavy drinking, or sedentary lifestyle conferred excess risk, and multiple behaviors together produced markedly higher hazards. Stroke risk was particularly sensitive to lifestyle factors, suggesting that cerebrovascular health in the very elderly is especially vulnerable. These findings emphasize that lifestyle modification remains clinically relevant well beyond midlife. Preventive strategies tailored to older adults may meaningfully reduce the growing burden of cardiovascular disease in aging societies.

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None

Denosumab on Bone Mineral Density in Patients with Cerebral Infarction and Osteoporosis

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Purpose

This study aims to compare the BMD response to denosumab between the patients with cerebral infarction and control subjects with osteoporosis.

Methods

Ninety-six patients with osteoporosis consisted of 24 patients with cerebral infarction and control subjects. Osteoporosis was diagnosed in all patients using dual-energy x-ray absorptiometry (DXA). After osteoporosis diagnosis, denosumab was injected subcutaneously twice six months interval along with daily oral vitamin D supplementation. Follow-up DXA examination was performed, and areal BMD was obtained at 12 months after the first denosumab injection.

Results

There were no significant intergroup difference in clinical characteristics and areal BMD before injection except higher proportion of women in the control

subjects. At 12 months after denosumab injections, areal BMD in lumbar spine, femoral neck, and total hip increased significantly in both groups compared with baseline ($p<.001$). The changes of femoral neck and total hip areal BMD in control subjects (6.1±10.1%/4.5±7.8%) after injections were significantly higher than those (0.3±12.5%/0.3±8.3%) in the control subjects ($p=.025$). However, there was no significant differences of areal BMD change in the lumbar spine and one-third radius between the two groups (Figure 1).

Conclusions

Denosumab therapy significantly increased areal BMD in the lumbar spine and hip in the control subjects and in the lumbar spine in stroke patients.

Considering the high risk of hip fractures in the stroke patients with osteoporosis, other osteoporosis treatments are needed to increase areal BMD in the hip.

Quantitative Ischemic Core Volume on Multimodal Imaging Outperforms ASPECTS for Outcome Prediction in Large Core Stroke after Thrombectomy

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Purpose

Endovascular thrombectomy (EVT) is beneficial for patients with large core stroke, but patient selection remains challenging. The Alberta Stroke Program Early CT Score (ASPECTS) is widely used but suffers from limited inter-rater reliability and may not accurately reflect the true ischemic core. We aimed to compare the prognostic performance of quantitative ischemic core volumes derived from non-contrast CT (NCCT), CT perfusion (CTP), and diffusion-weighted imaging (DWI) against the conventional NCCT-ASPECTS for predicting 3-month functional outcomes in large core stroke patients undergoing EVT.

Methods

We collected consecutive patients with anterior circulation large vessel occlusion from 18 comprehensive stroke centers (June 2022–August 2024; n=1,201). After propensity score matching, final 249 per group for EVT and best medical treatment (BMT) remained. Outcomes at 3-months included modified Rankin Scale (mRS) shift analysis, good (0–2), fair (0–3), poor (5–6), and death (6), compared between EVT and BMT under the same inclusion of 6 RCTs. Core estimation was derived with automated pipelines for DWI, CTP and NCCT ischemic core volumes with NCCT-ASPECTS. Large-core definitions followed prior literature: NCCT-ASPECTS <6; DWI core ≥50 mL; CTP core ≥70 mL; NCCT core ≥50 mL. In EVT-treated patients, 3-month mRS of poor (5–6), severe disability or death (4–6) and mortality (6) were compared between each core volume with NCCT-ASPECTS.

Results

Matched EVT versus BMT analyses reproduced RCT benefits. Shift analyses favored EVT across all 6 trial criteria (OR 2.21–3.08), and poor outcome was reduced (OR 0.23–0.38), with additional signals for functional independence and mortality in selected trials. In EVT-treated patients, a DWI ≥50 mL independently predicted poor outcome (aOR 6.12, 95% CI 2.77–14.23), severe disability or death (aOR 3.97, 1.99–8.13), and mortality (aOR 2.68, 1.06–6.93), with higher discrimination than ASPECTS (AUC for poor outcome 0.75 vs 0.61, p<0.001). A CTP ≥70 mL demonstrated better discrimination for mortality (AUC 0.72 vs 0.57, p=0.015), while NCCT ≥50 mL showed better prediction for poor outcome (AUC 0.69 vs 0.60, p<0.001) and mortality (AUC 0.68 vs 0.45, p=0.004). Notably, patients classified as large core by volumetric criteria alone had significantly worse outcomes than those defined by ASPECTS alone, whose outcomes were similar to patients without a large core.

Conclusions

Quantitative ischemic core volumes of NCCT, DWI, and CTP were more informative than NCCT-ASPECTS. Incorporating core volumetry into decision making may improve patient selection, and trials with standardized volumetric thresholds are needed.

Impact of Anticoagulation Timing on Early Neurological Deterioration in Patients with Acute Large Vessel Occlusion and Atrial Fibrillation Undergoing Mechanical Thrombectomy

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Purpose

Determining the optimal timing of direct oral anticoagulant (DOAC) initiation in patients with acute ischemic stroke (AIS) due to large vessel occlusion (LVO) and atrial fibrillation (AF) undergoing mechanical thrombectomy (MT) is challenging. It remains unclear whether early DOAC initiation can prevent early neurological deterioration (END). This study aimed to evaluate the association between anticoagulation timing and clinical outcomes in this population.

Methods

We conducted a retrospective study at a single stroke center between 2017 and 2024. The study included patients with acute anterior circulation large vessel occlusion who underwent MT, had AF requiring DOACs and received pre-procedural diffusion-weighted imaging (DWI). Infarct severity was categorized by Alberta Stroke Program Early CT Score (ASPECTS) measured on diffusion-weighted imaging (DWI) as mild (8–10), moderate (5–7), or severe (0–4). Early anticoagulation was defined as DOAC initiation within 2 days for mild-to-moderate infarcts and within 7 days for severe infarcts, while late anticoagulation was defined as initiation beyond these windows but restricted to within 3 weeks. Multivariable logistic regression analyzed predictors of anticoagulation timing, END, and 90-day functional outcomes.

Results

A total of 243 patients were included in the study, of whom 106 received early anticoagulation and 137 received late anticoagulation. Late anticoagulation was associated with intravenous thrombolysis ($p = 0.02$), poor reperfusion after MT ($p = 0.03$), and post-MT intracranial hemorrhage ($p < 0.01$). END was associated with late anticoagulation ($p = 0.02$), severe initial neurological deficit ($p = 0.04$), absence of intravenous thrombolysis ($p = 0.01$), and poor reperfusion after MT ($p < 0.01$). Anticoagulation timing was not associated with infarct recurrence, hemorrhage after DOAC administration, and 90-day functional outcomes.

Conclusions

In this study, intravenous thrombolysis, poor reperfusion after MT, and post-MT intracranial hemorrhage were independent predictors of late DOAC initiation, which in turn was associated with a higher risk of END. These findings suggest that early DOAC initiation may help prevent early neurological worsening in this population.

The Importance of Atypical Etiologies: A Case Study of a Patient Unresponsive to Reperfusion Therapy

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Purpose

Traditionally, prognosis of ischemic stroke is significantly influenced by the "golden hour," referring to the administration of tPA within one hour of symptom onset. Additionally, mechanical thrombectomy is known to have a better prognosis when performed within six hours of onset. However, even under those golden conditions, recanalization may not occur. This case study details a young patient with hyperacute cerebral infarction. Despite timely treatment, recovery of patient was limited.

Methods

A 30-year-old male, with no medical history, presented to the emergency room with left-sided weakness. Neurological examination revealed the NIHSS score of 14, consistent with right MCA territory infarction. tPA was administered 58 minutes after symptom onset, followed by CT, MR imaging, suggesting a total occlusion of the right MCA M1 segment. A mechanical thrombectomy was performed 3 hours after onset. Despite the removal of thrombi, recanalization was not achieved. After MCA stenting, TFCA (transfemoral cerebral angiography) showed a modified TICI grade 2a. After admission, the patient was given aspirin and clopidogrel to promote recanalization. On hospital day 3, rivaroxaban was added. On hospital day 10, the patient transferred to the department or rehabilitation with NIHSS score 12. A neurological exam conducted after 35 days of symptom onset showed left-sided motor weakness graded G5/G1 in the upper extremity and G5/G4 in the lower extremity. The R4810K variant was identified in the RNF213 gene, leading to a diagnosis of Moyamoya disease.

Results

According to a Korean cohort study from 2008-2020 (J Korean Med Sci. 2024 Sep 2;39(34):e27), based on the TOAST classification, the proportions of stroke etiologies known to respond to tPA—Large Artery Atherosclerosis (LAA), Small Vessel Occlusion (SVO), and Cardioembolism (CE)—accounted for 35.2%, 18.2%, and 21.2% of all cases, respectively. However, in a young age cohort (ages 15-45) from 2014 to 2018 (J Clin Neurol 2020;16(4):605-611), these proportions were different, at 15.6%, 17.8%, and 12.6%, respectively. Of particular note, the rates of dissection (14.1%) and Moyamoya Disease (MMD) (3.7%) were remarkably high in this younger group. Therefore, even if a young patient presents with a presumed diagnosis of LAA, the underlying etiology may be different. In such cases, aggressive treatments like tPA or intra-arterial thrombectomy (IAt) may not lead to clinical improvement.

Conclusions

As illustrated by the case study, if neurological improvement do not achieve after appropriate procedures, it's crucial to consider the possibility of an underlying etiologies other than LAA, SVO, CE.

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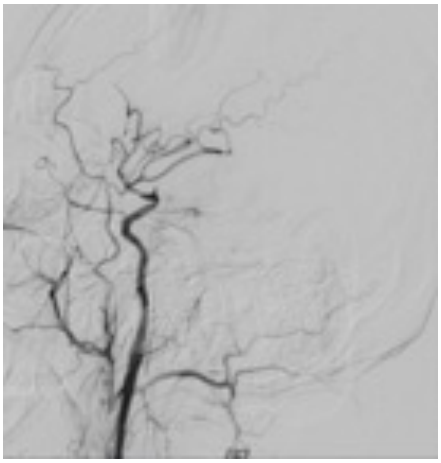

Post-Thrombolysis Lipoprotein(a) Levels and Hemorrhagic Transformation in Acute Ischemic Stroke

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Purpose

Lipoprotein(a) [Lp(a)] is a well-established proatherogenic and prothrombotic biomarker. However, its relationship with hemorrhagic transformation (HT) following intravenous thrombolysis using recombinant tissue plasminogen activator (IV tPA) in acute ischemic stroke (AIS) remains unclear. This study aimed to investigate the relationship between post-tPA serum Lp(a) levels and the development of HT in AIS patients.

Methods

This retrospective single-center study included 304 consecutive AIS patients treated with IV tPA between 2020 and 2024, with serum Lp(a) measured within 12 hours after thrombolysis. The primary outcome was symptomatic HT, confirmed on follow-up computed tomography (CT) or magnetic resonance imaging (MRI). Lp(a) levels were analyzed as a continuous variable and by tertiles. Logistic regression models were sequentially adjusted: Model 1 (unadjusted), Model 2 (adjusted for age, sex, baseline NIHSS, blood glucose, white blood cell count, systolic blood pressure, and onset-to-needle time), and Model 3 (further adjusted for hs-CRP and fibrinogen).

Results

Among 304 patients (mean age: 70.2 ± 12.5 years; 59.8% male), 55 (18.2%) developed symptomatic HT. Higher Lp(a) levels were independently associated with increased risk of symptomatic HT in all models. In continuous analysis, the adjusted odds ratio (OR) per unit increase in Lp(a) was 1.98 (95% CI: 1.90–2.01; $p = 0.03$) in Model 3. In tertile analysis, patients in the highest Lp(a) tertile had significantly higher odds of HT compared to the lowest tertile (adjusted OR: 2.45; 95% CI: 1.21–1.95; $p = 0.04$). A significant dose-response trend was observed (p for trend < 0.05).

Conclusions

Elevated serum Lp(a) levels after thrombolysis were independently associated with an increased risk of symptomatic hemorrhagic transformation in acute ischemic stroke. Lp(a) may serve as a clinically useful biomarker for identifying patients at increased risk of bleeding complications following IV thrombolysis.

Adjunctive Intraarterial Thrombolysis after Thrombectomy in Large Vessel Occlusion Stroke: A Meta-Analysis of RCTs

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Purpose

Adjunctive intraarterial (IA) thrombolysis after endovascular thrombectomy may improve clinical outcomes in patients with large vessel occlusion (LVO) stroke possibly due to improvement in microvascular reperfusion.

Methods

We conducted a meta-analysis of randomized controlled trials (RCTs) evaluating IA thrombolysis with tenecteplase, alteplase or urokinase in anterior or posterior circulation LVO stroke after successful reperfusion (modified Thrombolysis in Cerebral Infarction 2b–3). Efficacy outcomes were excellent functional outcome (modified Rankin Scale [mRS] 0–1), functional independence (mRS 0–2) and recovery without any disability (mRS 0) at 90 days. Safety outcomes included symptomatic intracerebral hemorrhage (ICH), any ICH and death. Odds ratios (OR) and 95% confidence intervals (CI) were pooled using random-effects models.

Results

Seven RCTs (n = 2,130; 2022–2025) were included. IA thrombolytic drugs used were alteplase, tenecteplase and urokinase with doses ranging from 10 % to 50% of recommended IV dosage. IA thrombolysis significantly improved excellent functional outcome (mRS 0–1: OR 1.45, 95% CI 1.19–1.76) and recovery without any disability (mRS 0: OR 1.34, 95% CI 1.09–1.64), without safety risks (symptomatic ICH: 5.05% with IA thrombolytics vs. 4.49% in standard). Paradoxically, there was no difference in functional independence (mRS 0–2) (OR 1.09, 95% CI 0.99–1.20). Additionally, tenecteplase or alteplase at doses equivalent to 25% or 50% of recommended IV dosage significantly improved excellent functional outcome.

Conclusions

IA thrombolysis offered immediately following EVT with successful reperfusion improved excellent functional outcome and recovery without disability at 90 days with an acceptable safety profile.

Acknowledgement

Non

Effect of In-Hospital Anticoagulation on Outcomes in Infective Endocarditis Complicated by Acute Ischemic Stroke

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Purpose

Infective endocarditis (IE) is a life-threatening disease with high mortality, often complicated by ischemic stroke as well as intracranial hemorrhage. The necessity and efficacy of antithrombotic therapy remain controversial due to the delicate balance between thromboembolic prevention and bleeding risk, particularly in patients with ischemic stroke complicating IE.

Methods

We conducted a single-center retrospective cohort study including patients diagnosed with IE complicated by ischemic stroke between 2012 and 2024. The cohort was stratified into two groups based on whether patients received anticoagulation therapy during hospitalization following IE diagnosis. Anticoagulation was administered predominantly with warfarin, while a minority of patients received direct oral anticoagulants (DOACs). The primary outcome was all-cause mortality within 3 months. Factors associated with 3-month mortality were investigated.

Results

Among 170 patients, 154 patients with available data on 3-month mortality were finally included. Among them, 26 patients (16.9%) had died by that time point and 82 (53.2%) received anticoagulation therapy during hospitalization. All-cause 3-month mortality was significantly lower in patients who received anticoagulation compared to those who did not (7.3% vs. 27.8%, $p < 0.001$). Intracranial hemorrhage was observed in 42.5% (37 of 87 patients) of those who received anticoagulation therapy, and in 48.2% (40 of 83 patients) of those who did not receive anticoagulation ($p = 0.557$). In multivariable logistic regression, age (OR, 1.077; 95% CI, 1.020–1.155; $p = 0.005$), male sex (OR, 0.214; 95% CI, 0.048–0.782; $p = 0.019$), ejection fraction (OR, 0.891; 95% CI, 0.819–0.954; $p < 0.001$), intracranial hemorrhage (OR, 4.618; 95% CI, 1.247–20.361; $p = 0.021$), and anticoagulation therapy (OR, 0.206; 95% CI, 0.032–0.966; $p = 0.045$) were independently associated with 3-month all-cause mortality.

Conclusions

Despite the high risk of intracranial hemorrhage in patients with infective endocarditis, anticoagulation therapy during hospitalization is associated with reduced all-cause mortality within 3 months, irrespective of concomitant intracranial hemorrhage.

Prognostic Differences in Acute Ischemic Stroke Patients with Concomitant Heart Failure: Between HFrEF and HFmrEF

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Purpose

Although it is well established that acute ischemic stroke (AIS) patients with heart failure (HF) have poorer outcomes, there is limited evidence on how heart failure with mid-range ejection fraction (HFmrEF) affects the prognosis of AIS patients.

Methods

A single-center retrospective cohort study was conducted on patients diagnosed with AIS. Among these patients, those who underwent transthoracic echocardiography (TTE) within one year before or after AIS were categorized into three groups based on ejection fraction (EF) : normal, HFmrEF, and HFrEF. The 3-month modified Rankin Scale (mRS) score and early neurological deterioration (END) were compared among the groups. Patients with an mRS score of 3 or higher were defined as having a 'poor functional outcome'.

Results

Among 1,100 patients with AIS who underwent TTE within one year, 38 patients (3.5%) were classified as having HFrEF, and 50 (4.5%) were classified as having HFmrEF. 21 of 38 (56.8%) in the HFrEF group and 20 of 50 (40.0%) in the HFmrEF group had poor functional outcomes at 3 months after discharge. Although the proportion was higher in the HFrEF group, the difference was not statistically significant (56.8% vs. 40.0%, $p = 0.183$). In the normal EF group, 370 of 1,013 patients (37.0%) had poor functional outcomes at 3 months. Compared to this group, the HFrEF patient group showed a statistically significant association with poor functional outcome (56.8% vs. 37%, $p = 0.024$), whereas the HFmrEF group did not demonstrate a significant difference. In multivariable logistic regression, the HFrEF group was independently associated with poor 3-month functional outcome (OR, 5.594; 95% CI, 2.021–15.072; $p < 0.001$), whereas the HFmrEF group was not (OR, 2.331; 95% CI, 0.257–23.582; $p = 0.454$). There was no statistically significant difference in END between the two groups.

Conclusions

Patients in the HFrEF group clearly exhibited poorer 3-month functional outcomes, whereas the HFmrEF group did not show a statistically significant difference compared to the HFrEF group.

Association between Pleural effusion and Clinical Prognosis in Patients with Acute Ischemic Stroke

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Purpose

Ischemic stroke is a common cause of death worldwide. In clinical practice, it is observed that many patients who have experienced an ischemic stroke also suffer from simultaneous comorbidities such as pleural effusions, which could be directly associated with a worse clinical prognosis. Therefore, this study analyzed outcomes in terms of the severity of the event, mortality, duration of hospital stay, and in-hospital recurrence of the episode, in order to determine the implications resulting from the presentation of both pathologies.

Methods

All patients who underwent acute ischemic stroke between 2018 and 2022 at a tertiary care university hospital were included in this observational, retrospective-cohort, hospital-based analysis. Propensity score matching was used to control for background variables such as patient demographics.

Results

178 (15.6%) patients had pleural effusion was accompanied by initial ischemic stroke events. After propensity matching, the mortality of patients with pleural effusion was 7.3% higher than those with no pleural effusion ($p < 0.001$). Neurointensive care unit (NICU) stay was longer for those with pleural effusions (8 [IQR 6–11] days, 3 [IQR 2–7] days for those without pleural effusion, $p < 0.001$). Patients with pleural effusions had a higher incidence of early neurological deterioration (END, 21 [11.8%] with pleural effusions, 66 [6.8%] without pleural effusions). Patients with pleural effusion were more likely to be associated with congestive heart failure and atrial fibrillation (22.1% vs. 5.7% and 34.6% vs. 17.5%).

Conclusions

Patients with pleural effusion who suffer from an acute ischemic stroke show worse clinical outcomes in terms of mortality, event severity, and duration of hospital stay.

Brain Lesion Pattern and Hemorrhagic Transformation in Patients with Acute Ischemic Stroke and Infective Endocarditis: Comparisons by Microorganisms

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Purpose

Infective endocarditis (IE) constitutes an important cause of embolic stroke with distinct pathophysiological mechanisms from other stroke subtypes. While patients with IE demonstrate pathogen-specific variations in clinical outcomes and disease characteristics, current understanding of the differences in IE-related stroke according to causative microorganisms remains limited. This investigation aimed to evaluate and compare clinical, neuroimaging characteristics and outcomes in patients with IE-related acute ischemic stroke stratified by causative pathogens.

Methods

This retrospective observational study analyzed patients diagnosed with definite IE presenting with acute ischemic stroke. Clinical characteristics and outcomes were compared among three predominant pathogen groups: Staphylococci, Streptococci, and Enterococci. Multivariable logistic regression analysis was performed to investigate potential predictors of hemorrhagic transformation (HT) and mortality across the entire cohort.

Results

The analysis encompassed 170 patients with IE-related stroke. Among these, 140 patients were categorized into three predominant pathogen groups: Staphylococci (n=73), Streptococci (n=51), and Enterococci (n=16), while the remaining 30 patients comprised other microorganisms (n=18) and cases with unidentified pathogens (n=12). Staphylococcal infections exhibited the most severe neurological phenotype, characterized by extensive multiple embolic lesions (≥10 lesions: 57.5% vs. 29.4% Streptococcal vs. 37.5% Enterococcal, p=0.028), substantially elevated hemorrhagic transformation rates (58.9% vs. 29.4% vs. 12.5%, p<0.001), and increased three-month mortality (24.6% vs. 8.5% vs. 6.7%, p=0.042). Multivariable logistic regression analysis of the entire cohort (n=170) identified three independent predictors of hemorrhagic transformation: male sex (OR 2.581, 95% CI 1.136-5.864, p=0.024), Staphylococcal etiology (OR 3.853, 95% CI 1.469-10.106, p=0.006), and lesion diameter ≥15mm (OR 8.042, 95% CI 3.516-18.397, p<0.001). Unidentified pathogen status was independently associated with increased mortality (OR 23.764, 95% CI 2.511-224.939, p=0.006).

Conclusions

Staphylococcal IE-related stroke demonstrates distinct neuroimaging patterns with extensive embolic burden, elevated hemorrhagic transformation risk, and increased mortality compared to Streptococcal and Enterococcal infections. These pathogen-specific differences support tailored therapeutic strategies for managing IE-related stroke.

Vessel Wall MRI Enhancement Patterns and Infarction Risk in RNF213-Positive Moyamoya Patients

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Purpose

High-resolution vessel wall MRI (VW-MRI) provides unique insights into vessel wall pathology in Moyamoya disease, and vessel wall enhancement (VWE) has been proposed as a marker of disease activity. We investigated whether VWE presence and its enhancement patterns are associated with cerebral infarction in a large, genetically homogeneous cohort of RNF213-positive patients.

Methods

We retrospectively analyzed 201 consecutive RNF213-positive Moyamoya patients who underwent VW-MRI. Patients were classified according to the presence of VWE (absent vs present), and, among those with VWE, by enhancement pattern (eccentric vs pure concentric). Cerebral infarction was determined based on clinical and MRI findings. Clinical risk factors and lipid profiles (hypertension, diabetes mellitus [DM], smoking, total cholesterol, triglycerides [TG], HDL, and LDL) were included. Group comparisons used chi-square or Fisher's exact tests, and multivariable logistic regression was performed adjusting for DM and TG.

Results

Infarction occurred in 48 patients (23.9%). Patients with VWE had a significantly higher frequency of infarction compared with those without enhancement (28.4% vs 13.8%; OR 2.45, 95% CI 1.05–5.72, p=0.030). Among VWE-positive patients, pure concentric enhancement was strongly associated with infarction compared with eccentric enhancement (39.1% vs 18.4%, p=0.012). This relationship remained robust in multivariable analysis (OR 3.74, 95% CI 1.60–8.75, p=0.002). DM independently predicted infarction (OR 3.7, 95% CI 1.29–10.8, p=0.015), while TG showed a borderline association. In contrast, hypertension, LDL cholesterol, and smoking were not significantly related to infarction.

Conclusions

In this large RNF213-positive cohort, the presence of VWE and, more specifically, pure concentric enhancement were significantly associated with cerebral infarction, independent of metabolic risk factors.

Utility of Vessel Wall MRI in Diagnosing Rotational Vertebral Artery Occlusion

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Purpose

Vessel wall magnetic resonance imaging (VWMRI) allows evaluation of intracranial arterial wall pathologies beyond the lumen. Although digital subtraction angiography (DSA) remains the gold standard for diagnosing rotational vertebral artery occlusion (RVAO), VWMRI may serve as a useful non-invasive tool. Here, we report a case of RVAO in which vessel wall imaging (VWI) contributed to the diagnosis.

Methods

A 42-year-old female presented with dizziness exacerbated by head movement, accompanied by nausea, vomiting, and gait disturbance. She had a history of hepatitis B infection and cervical herniated nucleus pulposus (HNP). Neurological examination revealed left-beating spontaneous nystagmus without other deficits or headache.

Initial CT angiography demonstrated marked stenosis or occlusion of the left vertebral artery (V1–2 segment) with hypoplasia, and diffusion-weighted imaging revealed a left cerebellar infarction.

Because the patient had a stroke at a young age, further evaluation was performed. Laboratory tests showed elevated rheumatoid factor (116.9 IU/mL) and a positive ANA, with no other abnormal autoantibodies; rheumatoid factor can sometimes be falsely elevated in hepatitis B.

Vessel wall imaging, including evaluation of the cervical spine, was performed to assess the vertebral artery and surrounding structures. It revealed C5–6 disc degeneration with disc space narrowing and osteophyte formation, providing anatomical context for potential external compression of the left vertebral artery.

Results

Vertebral angiography demonstrated retrograde flow from the right to left vertebral artery, with focal severe stenosis at the left V2 segment (C5–6 level). Dynamic angiography showed no change in stenosis when the head was turned to the right in the supine position, although distal flow was improved. In contrast, head turning to the left resulted in complete occlusion of the left V2 segment, with retrograde flow from the right VA supplying the distal left VA.

Conclusions

Unlike MR or CT angiography that show only the vessel lumen, VWI can evaluate both the lumen and vessel wall, including inflammation, hematoma, and thickening. In rotational vertebral artery occlusion, which is caused by external compression rather than internal narrowing, VWI can show wall changes and intimal injury, helping to distinguish it from dissection. Although DSA is still the gold standard for diagnosing RVAO, VWI is a useful non-invasive method that complements routine vascular imaging.

Endovascular Thrombectomy in Infective Endocarditis: A Case Highlighting Clinical Equipoise and Infectious Complications

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Purpose

Endovascular thrombectomy (EVT) is the standard treatment for large vessel occlusion. However, in rare instances of stroke caused by infective endocarditis, EVT may present unique challenges. We report a case illustrating how intracranial stenting, performed under the impression of intracranial atherosclerosis, resulted in severe infectious complications, thereby underscoring the clinical equipoise faced in emergency decision- making.

Methods

A 53-year-old woman with hypertension and diabetes mellitus presented with acute left hemiparesis eight hours after onset. On admission, her National Institutes of Health Stroke Scale (NIHSS) score was 5. She had a recent history of fever, leukocytosis, and elevated inflammatory markers. Computed tomography angiography (CTA) revealed right M1 segment truncal-type occlusion without branch occlusion sign. Given the imaging appearance suggestive of intracranial atherosclerosis, EVT was performed. After an initial unsuccessful attempt, balloon angioplasty and stent deployment were undertaken, achieving reperfusion with Thrombolysis in Cerebral Infarction (TICI) grade 2b.

Results

On day 7, the patient developed peri-stent intracranial hemorrhage (ICH), subarachnoid hemorrhage (SAH), edema, and contrast enhancement indicating brain abscess. Digital subtraction angiography (DSA) at day 47 demonstrated restenosis with pseudoaneurysm. Transthoracic echocardiography (TTE) revealed severe mitral regurgitation with vegetation, leading to mitral valve replacement (MVR) on day 8. The patient received prolonged antibiotic therapy. By day 120, follow-up magnetic resonance imaging (MRI) and DSA showed resolution of infection, reocclusion of stent insertion site and preserved perfusion via collateral circulation. She was discharged without neurological deficits (Modified Rankin Scale [mRS] 0).

Conclusions

This case highlights the diagnostic and therapeutic dilemma in EVT for stroke patients with potential infective endocarditis. Despite subtle clinical clues such as fever, the truncal-type occlusion pattern without branch occlusion sign suggested intracranial atherosclerosis, prompting stent use. However, the stent acted as a nidus for bacterial colonization, leading to severe complications. Clinicians should remain vigilant for infective endocarditis in young patients with fever and elevated inflammatory markers and carefully weigh EVT strategies, especially intracranial stenting, in such contexts.

A case of Thromboembolic Stroke caused by arterial Thoracic Outlet Syndrome

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Purpose

Arterial thoracic outlet syndrome (aTOS) is a rare condition in which subclavian artery compression leads to thrombus or aneurysm formation, occasionally causing cerebral embolism. In particular, thrombi originating from the left subclavian artery may migrate through the left vertebral artery into the posterior circulation. We present the first domestic case of posterior circulation stroke caused by left-sided aTOS, highlighting its diagnostic and therapeutic implications.

Methods

A 58-year-old woman presented 19 hours after onset of dizziness and tinnitus. On admission, blood pressure was unmeasurable in the left arm, accompanied by cyanosis. Neurological examination revealed mild cerebellar ataxia (NIHSS score 2). Brain diffusion-weighted MRI demonstrated multiple embolic infarcts in the right cerebellum and left occipital lobe. CT angiography revealed occlusion of the left subclavian artery with compression by a cervical rib and clavicle. Cardiac and laboratory work-up excluded other embolic sources. The patient was initially treated with enoxaparin and subsequently underwent thromboembolectomy of the left subclavian artery.(Fig B)

Results

Following the procedure, cyanosis and paresthesia of the left arm improved, blood pressure equalized with the right arm, and no new cerebral infarcts developed. She was discharged on apixaban, later switched to aspirin. At three-month follow-up, vascular angiography confirmed complete resolution of the thrombus but demonstrated persistent subclavian artery compression and distal aneurysmal change. (Fig A,C,D) Surgical correction with cervical rib resection and angioplasty was recommended, but the patient declined and remains on medical therapy.

Conclusions

A thrombus originating from the left subclavian artery can enter the basilar artery via the left vertebral artery, leading to posterior circulation infarction. This case underscores that aTOS should be considered when stroke occurs in the presence of upper-limb symptoms. Importantly, unlike conventional ischemic stroke, surgical correction of the underlying anatomical abnormality such as rib resection and vascular reconstruction is crucial to prevent recurrence. Early recognition and appropriate intervention are essential for favorable outcomes in this rare but surgically treatable cause of stroke.

Hyperperfusion Seizure During Treatment for Vasospasm after Carotid Artery Stenting: A Case Report

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Purpose

Cerebral hyperperfusion syndrome (CHS) after carotid artery stenting (CAS) is a well-known complication, but the occurrence of vasospasm followed by hyperperfusion after CAS is rare and has seldom been reported. We report a patient with hyperperfusion seizure after vasospasm who received carotid artery stenting.

Methods

A 62-year-old male patient was admitted for intermittent, recurrent right-sided vision loss, left motor weakness, and sensory deficit that began one month prior. A brain MRI performed about 2 years ago had already shown progressed severe stenosis of the right proximal internal carotid artery (ICA). A recent brain MRI showed progression to tight stenosis of the right proximal ICA, along with decreased CBF in the right MCA territory.

He was started on cilostazol and clopidogrel. On the day of the CAS, the medication was changed to a combination of aspirin and clopidogrel.

A TFCA performed after admission confirmed right proximal ICA stenosis corresponding to 77% by NASCET criteria, and CAS was performed. However, left-sided weakness, left hemineglect, and mental change newly developed on the day of the procedure. A brain CT confirmed occlusion of the superior and inferior divisions of the right M2, and decreased perfusion in the right MCA territory. TFCA was performed, which confirmed moderate vasospasm of the right distal MCA. Consequently, cilostazol and nimodipine were added. After the start of treatment, the patient's neurologic deficit showed improvement.

Three days after the TFCA, the patient experienced a generalized tonic–clonic seizure lasting about 2 minutes. The seizure subsided after administration of Ativan and Keppra. A brain CT performed at the time showed hyperperfusion in the right cerebral hemisphere.

Results

It was determined that nimodipine and cilostazol likely caused the seizure through their vasodilatory effects, and they were discontinued. A subsequent EEG showed no specific findings, and the patient was discharged after his symptoms improved.

Conclusions

This case report is significant in that it highlights the potential risks that can arise even after the successful treatment of severe carotid artery stenosis and vasospasm, and it emphasizes the importance of multifaceted and meticulous monitoring in patient management.

Herpes simplex virus encephalitis, negative cerebrospinal fluid analysis, as an underrecognized etiology of cerebral infarction

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Purpose

Herpes simplex virus encephalitis (HSE) may present with clinical manifestations that mimic acute cerebrovascular events. Moreover, HSE is known to induce direct cerebrovascular complications, such as vasculitis, which may precipitate ischemic or hemorrhagic strokes. We report a case of HSE initially misdiagnosed as an acute ischemic cerebral infarction in the emergency department.

Methods

None

Results

An 85-year-old male was admitted to the emergency department with altered mental status accompanied by fever. Brain MRI revealed marked diffusion restriction in the right corona radiata and precentral cortex, with mild diffusion restriction observed in the right medial temporal lobe. CT angiography demonstrated severe bilateral stenosis of the middle cerebral arteries. Initial cerebrospinal fluid (CSF) analysis was unremarkable. Despite empirical antibiotic therapy and antithrombotic treatment, the patient's clinical condition did not improve. A follow-up MRI revealed new edematous diffusion restriction in the left medial temporal lobe. Subsequent CSF polymerase chain reaction (PCR) testing was positive for herpes simplex virus (HSV). The patient responded favorably to intravenous acyclovir therapy, showing significant clinical improvement.

Conclusions

HSE, resulting from HSV infection, is a potentially life-threatening neurological condition that can closely mimic ischemic stroke and may lead to significant morbidity if not promptly diagnosed and treated. A negative initial CSF analysis does not exclude the diagnosis of HSE. Clinicians must maintain a high index of suspicion in atypical cases, as early initiation of acyclovir therapy is critical for favorable neurological outcomes.

Rapid Development of a Posterior Communicating Artery Aneurysm Presenting with Painful Oculomotor Palsy: A Case Report

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Purpose

To report a rare case of rapidly developing posterior communicating artery (PCom) aneurysm presenting with painful oculomotor nerve palsy, and to emphasize the critical role of prompt neurovascular imaging.

Methods

Case) A 77-year-old male with a history of hypertension, hyperlipidemia, aortic valve replacement, and chronic warfarin use presented with sudden-onset headache and left periorbital pain, followed by ptosis and ophthalmoplegia. Neurological examination revealed complete left third nerve palsy with anisocoria. An MRA performed 13 months earlier had shown no aneurysms. Although Tolosa–Hunt syndrome was initially suspected, pupillary involvement suggested compressive pathology. Orbit MRI and repeat MRA were performed.

Results

Neuroimaging revealed a newly developed 3 mm left PCom aneurysm. Transfemoral cerebral angiography (TFCA) confirmed the aneurysm with morphological features concerning for impending rupture. Prompt coil embolization was performed, leading to rapid relief of periorbital pain and gradual improvement in oculomotor function.

Conclusions

This case highlights the possibility of de novo aneurysm formation and rapid growth within a relatively short period. Painful oculomotor palsy with pupillary involvement is highly suggestive of a posterior communicating artery aneurysm and requires prompt neurovascular imaging. Hemodynamic stress, vascular fragility due to long-standing hypertension, and anticoagulation may contribute to rapid aneurysm development. In addition, there is a possibility of the presence of previously undetectable microaneurysms. Early recognition and timely endovascular intervention are essential to prevent aneurysmal rupture and promote neurological recovery.

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