Issue 18 (JUNE 2026)

UBSN
University Research Facility in Behavioral and Systems Neuroscience
神經科學中心實驗室

Newsletter

- **Dr. Fiona Xiangyan CHEN's research uses high-resolution vessel wall MRI to reveal how subtle changes in cerebral arteries affect cerebral small vessel disease.**
- **New at UBSN: Transcranial focused ultrasound stimulation system is now available.**
- **Upcoming event: UBSN Neuroscience Conference and Workshops 2026**

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Looking Beyond Arterial Narrowing: How Subtle Changes in Cerebral Arteries Affect Small Vessel Disease

Fiona Xiang-Yan Chen

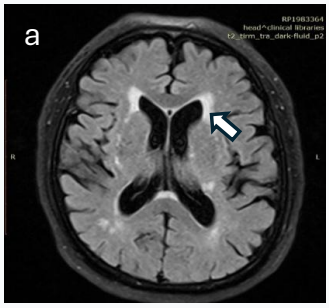
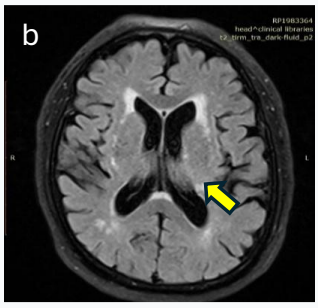
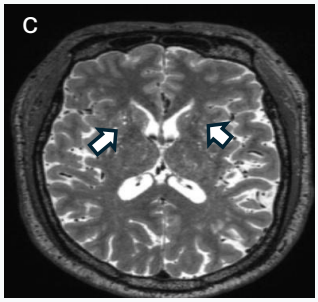
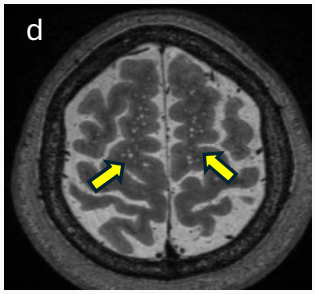
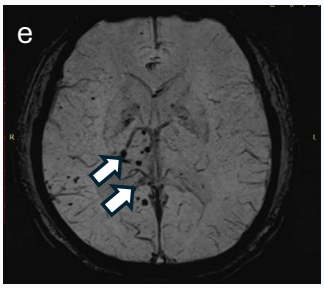
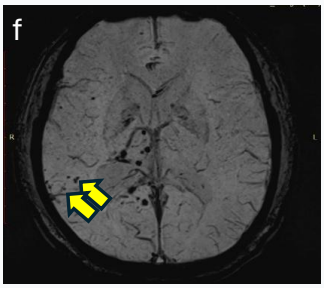
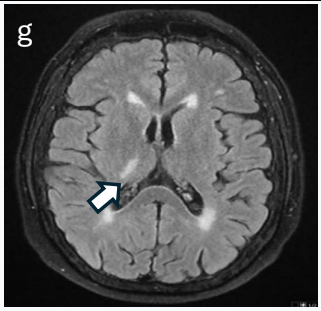
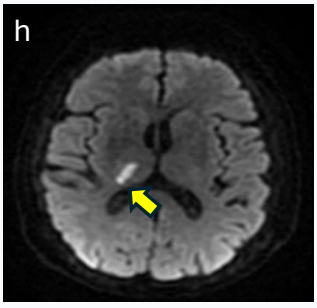
Stroke and cognitive decline remain major challenges in ageing societies, particularly in Asian populations. Two vascular conditions frequently implicated are intracranial atherosclerosis (ICAS)—disease of cerebral large arteries—and cerebral small vessel disease (CSVD), which affects the brain's microvasculature and is commonly seen on MRI as white matter hyperintensities, lacunes, microbleeds, and enlarged perivascular spaces. Although both conditions share common vascular risk factors, their exact relationship has long been debated.

In our recent community-based MRI study published in Annals of Clinical and Translational Neurology, we explored how subtle features of intracranial atherosclerosis, beyond simple arterial narrowing, are related to the burden of small vessel disease in stroke free adults.

We studied 225 middle aged and older adults from Hong Kong who had no history of stroke. Using high-resolution vessel wall MRI, a technique that allows detailed visualization of the artery wall rather than just the vessel lumen, we assessed multiple plaque characteristics including plaque load, remodeling patterns, eccentricity, and overall plaque severity. These were analyzed alongside standard MRI markers of CSVD.

Several important findings emerged. First, we found that ICAS was common even in apparently healthy community residents, with more than 17% showing evidence of ICAS. Most plaques were non stenotic and would likely have been missed using conventional

imaging approaches that focus only on luminal narrowing. At the same time, nearly half of the participants showed at least one clinically significant marker of CSVD.

		**Image a:** Periventricular WMH on FLAIR (white arrow). **Image b:** Deep subcortical WMH on FLAIR (yellow arrow).
		**Image c:** Basal ganglia EPVS on T2 (white arrows). **Image d:** Centrum semiovale EPVS on T2 (yellow arrows).
		**Image e:** Deep or alobar cerebral microbleeds on SWI (white arrows). **Image f:** Lobar cerebral microbleeds on SWI (yellow arrows).
		**Image g:** Acute infarct in right internal capsule on FLAIR (white arrow). **Image h:** Acute infarct in right internal capsule on DWI (yellow arrow).

Neuroimaging visual assessment of the phenotypes or biomarkers of CSVD.

More importantly, we observed a clear dose–response relationship between intracranial atherosclerotic burden and small vessel disease. Individuals with more severe plaque characteristics—particularly higher plaque load and adverse remodeling — had greater burdens of white matter hyperintensities, lacune infarcts, and enlarged perivascular spaces. These associations remained significant even after accounting for age and traditional vascular risk factors, suggesting that ICAS and CSVD are linked by more than shared risk profiles alone.

Our results highlight the value of high-resolution vessel wall MRI in uncovering early or subclinical intracranial atherosclerosis. By characterizing plaque morphology and arterial remodeling, this technique provides insights into how large artery disease may influence downstream microvascular injury in the brain. This has important implications for early detection, risk stratification, and potentially prevention of stroke and cognitive impairment.

In summary, our study shows that intracranial atherosclerosis and cerebral small vessel disease are closely interconnected in the ageing brain. Moving beyond traditional measures of arterial stenosis, advanced vessel wall imaging may help clinicians and researchers better understand — and ultimately intervene in — the vascular processes that underpin brain ageing and cerebrovascular disease.

Publication related to the article:

- Ackah, J.A., Du, H., Yang, W., Zeng, H., Chan, J.T.L., Lo, M.L.C. and Chen, X. (2025), The burden of intracranial atherosclerosis on cerebral small vessel disease: A community cohort study. Ann Clin Transl Neurol, 12: 1187-1200. https://doi.org/10.1002/acn3.70005

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Dr CHEN, Xiangyan Fiona

Division of Science, Engineering and Health Studies (SEHS), College of Professional and Continuing Education, The Hong Kong Polytechnic University

Research Institute for Smart Ageing (RISA), The Hong Kong Polytechnic University

Dr. Fiona Xiang-Yan Chen is a Senior Lecturer at College of Professional and Continuing Education (CPCE), the Hong Kong Polytechnic University, with a PhD in Anatomy and Cellular Pathology and clinical training in neurology. Her research focuses on cerebrovascular diseases, particularly stroke and vascular dementia. She has extensive expertise in advanced neuroimaging, with a strong emphasis on high-resolution MRI vessel wall imaging to characterize plaque morphology, composition, and disease progression. Her work integrates MRI with hemodynamic and clinical markers to improve precision diagnosis, risk prediction, and understanding of vascular cognitive impairment and stroke recurrence.

Q1: Many clinicians historically viewed Intracranial Atherosclerosis (ICAS) and Cerebral Small Vessel Disease (CSVD) as independent conditions that simply coexist because of shared risks like aging and hypertension. How does your study challenge this notion of "mere coexistence" ?

"Our findings demonstrate that ICAS and CSVD are not simply coexisting conditions driven by shared risk factors. Using high-resolution vessel wall MRI, we showed that specific atherosclerotic features—such as plaque load, remodeling, and morphology—are directly associated with the presence and severity of CSVD markers. Importantly, these associations remained significant even after adjusting for vascular risk factors, suggesting a more direct pathophysiological link rather than coincidental coexistence."

Q2: You mention a "dose-effect" relationship between ICAS and CVSD. Could you explain how an increase in plaque load specifically influences markers like white matter hyperintensities (WMH) or lacunes?

"We observed that increasing plaque load and greater ICAS severity are associated with progressively higher burdens of CSVD markers, including white matter hyperintensities and lacune infarcts. In other words, as the extent of intracranial atherosclerosis increases, the likelihood and severity of small vessel damage also rise. This graded relationship supports the idea that ICAS may actively contribute to microvascular injury, rather than just co-occur with it."

Q3: This research utilized specialized high-resolution vessel wall MRI sequences to look beyond simple vessel narrowing. What "subtle" plaque features—such as remodeling and eccentricity—were you able to detect that traditional imaging might have missed?

"High-resolution vessel wall MRI allowed us to go beyond luminal stenosis and identify subtle vessel wall characteristics, including positive or negative remodeling, plaque eccentricity, and non-stenotic plaque burden. Notably, features such as positive remodeling and eccentric plaques can remain "invisible" on conventional angiography, yet were shown to be strongly associated with disease severity. These imaging markers provide a more comprehensive understanding of plaque vulnerability and its downstream impact."

Q4: How do you anticipate accessing UBSN's equipment could help expand or enhance your future research in this area?

"Access to UBSN's advanced imaging platform will allow us to expand this work into a truly multimodal framework. By integrating multi-sequence MRI with non-invasive techniques such as ultrasound-based hemodynamic assessments, we aim to better characterize both structural and functional vascular changes. This approach has strong potential for community-based screening and early prevention strategies, ultimately supporting population-level improvements in cerebrovascular and cognitive health."

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Transcranial Focused Ultrasound Stimulation System

The Transcranial Focused Ultrasound Stimulation (tFUS) System is a state-of-the-art, non-invasive technology designed to precisely modulate brain activity by delivering focused ultrasound waves to targeted neural regions. With millimeter-level accuracy, tFUS supports both research and therapeutic interventions for neurological disorders, enabling deep brain stimulation without the need for surgical procedures. This MRI-compatible system operates at frequencies ranging from 250 kHz to 1000 kHz and achieves focal depths of 60 to 125 mm.

Specifications:

- Real-time targeting visualization with Brainsight neuronavigation
- GUI for planning and executing protocols; integrates with k-Plan
- MRI-compatible package; works with MRI environments
- Modality compatibility: TMS, EEG, NIRS

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Transcranial Focused Ultrasound Stimulation System

- Multi-planar targeting with two 4-channel transducers (CTX 250/CTX 500, DPX 500)
- Frequency 250 kHz to 1000 kHz; focal depths 60–125 mm
- Real-time per-channel power monitoring; automatic air-sonication shutdown
- Transducer health checks with hydrophone-based QA
- 100+ pre-loaded protocols; standardized reporting; history and auto-generated report

Applications:

- Neuromodulation for epilepsy
- Modulation of movement disorders (Parkinson's disease, dystonia, essential tremor)
- Psychiatry and mood disorders (depression, anxiety, PTSD)
- Chronic pain management
- Neurorehabilitation after stroke or traumatic brain injury
- Sleep and circadian research
- Basic neuroscience and brain mapping
- Closed-loop stimulation approaches
- Targeting and monitoring with imaging or recording (EEG, fMRI, etc.)
- Varied stimulation patterns to study plasticity and network dynamics

For enquiries, please contact Dr. Eliza SUN (Email: rui-eliza.sun@polyu.edu.hk)

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UBSN Research Seminars

Prof. Yang YANG

"How the Brain Learns to Read and Write – And Why Some Struggle"

Prof. Feng PAN

"Electrophysiology of Retinal Circuits and Beyond: Patch Clamp and Multielectrode Array Techniques in Neuroscience Research"

Prof. Derek YAU

"Non-invasive Brain Stimulation for Chronic Pain Conditions: Review and Potential Application"

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NIRSports 2 training session

On 14 May 2026, UBSN hosted a hands-on training session for the state-of-the-art NIRSports 2 fNIRS platform, providing researchers with practical experience in the NIRx system's hardware and software workflows.

Beyond standalone fNIRS recording, the workshop highlighted the system's integration capabilities. Attendees explored how the platform pairs with other modalities hosted at UBSN, such as EEG and tDCS, paving the way for comprehensive, multi-modal brain research projects at the university.

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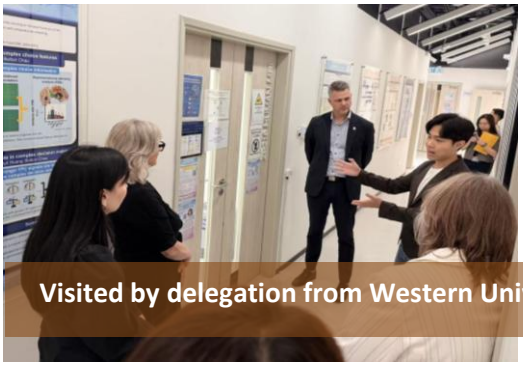
UBSN Welcomes Global Delegations and Academic Visitors

Visited by Prof. Jarugool Tretriluxana, Prof. Chutima Jalayondeja and Prof. Komsak Sinsurin from Mahidol University in Mar 2026

Visited by Prof. Paolo Bonato from Harvard Medical School and Prof. Dario Farina from Imperial College London in Mar 2026



Visited by delegation from Western University in Apr 2026

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Visited by students from Beijing Normal University in May 2026

Visited by delegation from Shanghai Science & Tech Commission in May 2026

In March 2026, UBSN kicked off a vibrant season of academic exchange by welcoming a delegation from Faculty of Physical Therapy of Mahidol University, alongside distinguished visits from by Prof. Paolo Bonato from Harvard Medical School and Prof. Dario Farina from Imperial College London. These engagements fostered meaningful dialogue and collaboration, while offering international researchers and experts an opportunity to experience UBSN's state-of-the-art research infrastructure firsthand.

The momentum continued into April 2026, with the visit of a distinguished delegation from Western University, further reinforcing UBSN's global research partnerships.

In May 2026, UBSN expanded its regional outreach by hosting a group of talented students from Beijing Normal University for an educational laboratory tour. UBSN also welcomed a professional delegation from the Science and Technology Commission of Shanghai Municipality to explore potential scientific synergies and collaborative opportunities.

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Events Ahead

MARK YOUR CALENDAR

UBSN Neuroscience Conference and Workshops 2026

27 June 2026, 9:30–18:30

DAY 1

Seminars

10:30 – 11:30	**Identifying Refined Neuropsychiatric Biomarkers Using TMS-EEG Co-Registration and Exploring Universal Clinical Epidemiological Insights Through Large-Scale TMS Registries** *Speaker: Prof. Yoshihiro NODA (Venue: Z209)*
12:00 – 13:00	**Feedback Processing and Attention in the Human Brain** *Speaker: Prof. Sheng HE (Venue: Z209)*
14:30 – 15:30	**Cognitive Neuroimaging Genetics: Research Practice and Progress** *Speaker: Prof. Bing ZHANG (Venue: Z209)*
17:00 – 17: 30	**Neuro-mechanisms of Antidepressant Effects of Acute and Chronic Physical Exercise** *Speaker: Prof. Sonata Suk-Yu YAU (Venue: Z209)* **Neural Mechanisms of Cantonese Lexical Tone: From Feature Representation to Cognitive Flexibility** *Speaker: Prof. Ran TAO (Venue: Z211)*

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Events Ahead

MARK YOUR CALENDAR

Poster Session

11:30 – 12:00 15:30 – 16:00	***Poster viewing*** *(Venue: Z208, Z210)*
16:00 – 17:00	***Poster presentation for the Best Poster Award*** *(Venue: Z210)*

Lab Tour

14:00 – 14:30 16:00 – 16:30	***Introducing various equipment, e.g. Human 3T MRI, Mock MR Scanner, Human and Animal Electrophysiological and Behavioral equipment*** *(Venue: Z216-218)*

Career Talk

16:00 – 17:00	***AI Innovation in Healthcare & Neuroscience*** *co-organized by IYOF (Venue: Z211)*

28 June 2026, 9:30–17:30

DAY 2

Workshops

10:00 – 13:00	**Advances in TMS–EEG: Technical Foundations, Artifact Management, and Emerging Biomarkers for Precision Psychiatry** *Speaker: Prof. Yoshihiro NODA (Venue: Z209)*
14:00 – 17:00	**Binocular Rivalry, Consciousness, and Mental Health** *Speaker: Prof. Sheng HE (Venue: Z209)*

University Research Facility in Behavioral and Systems Neuroscience

UBSN Neuroscience Conference and Workshops 2026

27 & 28 June 2026 (Sat & Sun)

9:30 - 18:30

Block Z,
The Hong Kong Polytechnic University

- 2/F Podium — Exhibits
- Room Z209, Z211 — Seminars
- ZB216-ZB218 — Lab Tour

Program Highlights

- Seminars from Keynote Presenters
- Seminars from Plenary Presenters
- Full-day Workshops with Certificate
- UBSN Poster Presentations
- UBSN Lab Tours introducing various equipment, e.g. Human 3T MRI, Mock MR, Human and Animal Electrophysiological and Behavioral equipment
- Career Talk
- Vendor Booths
- UBSN Best Paper Award, Best Poster Award
- UBSN Souvenirs (Fan, USB Drive, Travel Adaptor, etc)

Register Now

Keynote Speakers

Prof. Yoshihiro NODA

Department of Neuropsychiatry, Keio University School of Medicine, Shinjuku-ku, Tokyo, Japan

Key Interests:
Neuromodulation, Clinical Neurophysiology, TMS-EEG and rTMS Research for Psychiatric Disorders

Prof. Sheng HE

Principal Investigator (Adjunct), IBP Academic Deputy Director
State Key Laboratory of Cognitive Science and Mental Health, Institute of Biophysics, Chinese Academy of Sciences

Key Interests:
Cognitive Neuroscience (Visual Attention & Consciousness), Integrating Psychophysics, Neuroimaging, Noninvasive Brain Stimulation

Prof. Bing ZHANG

Professor, Vice President of Nanjing Drum Tower Hospital, the affiliated hospital of Nanjing University Medical School, the Director of the Medical Imaging Center and the Director of the Brain Science Research Institute at Nanjing University, China

Key Interests:
Molecular & AI Neuroimaging (Neurodegenerative Diseases, Brain Function, Cerebrovascular Conditions, Fetal Brain Development, Brain Tumor)

Plenary Speakers

Prof. Sonata Suk-Yu YAU

Associate Professor, Department of Rehabilitation Sciences,
The Hong Kong Polytechnic University,
Hong Kong, China

Prof. Ran TAO

Assistant Professor, Department of Language Science and Technology,
The Hong Kong Polytechnic University,
Hong Kong, China

For enquiries, please contact

Dr. Patrick YEUNG
patrick-kk.yeung@polyu.edu.hk | 2766 7773

or

UBSN Mailbox
ubsn.enquiry@polyu.edu.hk

Organisers: The Hong Kong Polytechnic University 香港理工大學 | UBSN University Research Facility in Behavioral and Systems Neuroscience

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KEEP IN TOUCH!

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ZB215-ZB222, LG2, Block Z, The Hong Kong Polytechnic University

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