world organisation of neurosonology

WON 2026

28th Conference of the World Organisation of Neurosonology



6 – 8 November 2026

Eugenides Foundation
Athens
Greece

FINAL PROGRAM AND BOOK OF ABSTRACTS

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World Organisation of Neurosonology (WON) (ESNCH)

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Welcome LETTER

Dear colleagues and friends,

It is our great pleasure to welcoming you to Athens, Greece, from November 6th to 8th 2026, for the 28th Conference of the World Organisation of Neurosonology (WON). Neurosonology has undergone remarkable development over the past decades, transforming into a versatile discipline with applications across multiple areas of clinical neurology. What once focused mainly on vascular ultrasound has now expanded into a wide spectrum of techniques, from the detection of microembolic signals and orbital sonography to brain tissue imaging, point-of-care ultrasound, and detailed examination of peripheral nerves and muscles. This rapid evolution not only broadens the diagnostic and clinical possibilities but also creates the necessity for structured training and internationally recognized certification. Ensuring that specialists acquire both the theoretical background and practical skills through standardized education is essential for maintaining high-quality practice and for advancing the field worldwide.

The 28th WON Conference in Athens will provide a unique opportunity to explore the latest advances in neurosonology, share experiences with world-leading experts, and enhance both theoretical knowledge and practical skills. The program will include state-of-the-art lectures, interactive workshops, and ample opportunities for networking with colleagues from around the globe. Beyond the scientific program, Athens -one of the world's most historic capitals- offers an unforgettable backdrop. Known as the cradle of democracy and philosophy, the city harmoniously combines ancient heritage with vibrant modern life. With the iconic Acropolis, world-class museums, and lively cultural scene, Athens will make your conference experience not only scientifically enriching but also personally inspiring.

We warmly welcoming you in Athens for this special event which takes place at Eugenides Foundation, a prestigious educational and cultural institution in Athens. We are confident that you will leave with new insights, new skills, and new friendships, carrying the spirit of neurosonology forward for the benefit of your patients and the advancement of our field.

Welcome to the 28th Conference of the World Organisation of Neurosonology in Athens!



Georgios Tsivgoulis, MD, PhD
Professor & Chairman of Second Department of Neurology, School of Medicine, National & Kapodistrian University of Athens, "Attikon" University Hospital, Athens, Greece
Conference Chair



João Sargento Freitas, MD, PhD
Head of Stroke Unit and Neurosonology Laboratory at Coimbra
Integrated Healthcare System & University of Coimbra,
Coimbra, Portugal WON/ESNCH President

COMMITTEES

LOCAL ORGANIZING COMMITTEE

ORGANIZING COMMITTEE

Chair

Grigoris Stratakos

Members

Eleni Bakola
Lina Palaiodimou
Odysseas Kargiotis
Klearchos Psychogios
Apostolos Safouris
Theodoros Karapanayiotides
Ioanna Koutroulou
Antonios Kerasnoudis
Konstantinos Vadikolias
Panagiotis Mitsias
Argiro Tountopoulou
Sotirios Giannopoulos
Maria Chondrogianni
Aikaterini Theodorou

SCIENTIFIC COMMITTEE

Diana Aguiar de Sousa | *Portugal*
Andrei V. Alexandrov | *United States of America*
Anne Alexandrov | *United States of America*
Elsa Azevedo | *Portugal*
Claudio Baracchini | *Italy*
Eleni Bakola | *Greece*
Eva Bartels | *Germany*
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Zsolt Garami | *United States of America*
Alexander Grimm | *Germany*
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Antonis Kerasnoudis | *Greece - Germany*
Martin Köhrmann | *Germany*
Ioanna Koutroulou | *Greece*
Christos Krogias | *Germany*
Caterina Kulyk | *Italy*
Radim Licenik | *United Kingdom*
Piergiorgio Lochner | *Germany*
Arijana Lovrencic-Huzjan | *Croatia*
Dimosthenis Lykouras | *Greece*
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László Oláh | *Hungary*
Lina Palaiodimou | *Greece*
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Janja Pretnar-Oblak | *Slovenia*
Klearchos Psychogios | *Greece*
Daniel Richter | *Germany*
Bernd Ringelstein | *Germany*
David Rodriguez-Luna | *Spain*
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Mark Rubin | *United States of America*
Simona Sacco | *Italy*
João Sargento-Freitas | *Portugal*
Aarti Sarwal | *United States of America*
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Georgios Tsivgoulis | *Greece*
Jurgita Valaikene | *Lithuania*
Jose Manuel Valdueza | *Germany*
Dimitra Veltsista | *Greece*
Paul Von Weitzel-Mudersbach | *Denmark*
Milan R. Vosko | *Austria*
Uwe Walter | *Germany*
Alastair Webb | *United Kingdom*
Joanna Wojczal | *Poland*

Friday 06 November

07:00-19:00 **REGISTRATION**

Ground Floor Hall 08:00-10:00

Neuro-Orbital Ultrasound: Point-of-Care Ultrasound in Neuro-Ophthalmology

Chairs: **Dr. Maria Ioanna Stefanou, Dr. Piergiorgio Lochner**

Point-of-Care Ocular Ultrasound (POCUS) Application in Neurocritical Care
Dr. Joanna Wojczal | Medical University of Lublin, Poland

Non-Invasive Methods to Depict Intracranial Pressure
Dr. Bernhard Rosengarten | Department of Neurology, Chemnitz Medical Centre

How to Perform an Ultrasound Examination of the Pupil
Prof. Erwin Stolz | Justus Liebig University

Discussion
All

Conference Hall 08:00-10:00

Functional Ultrasound

Chairs: **Prof. Elsa Azevedo, Prof. Nezvat Uzuner**

Testing for cerebral autoregulation
Prof. Pedro Castro | Department of Neurology and Stroke Unit, Uls São João, Porto

Tips and Pitfalls of apnoea testing
Dr. Nathalie Nasr | Poitiers University Hospital

Vasoreactivity in cerebrovascular diseases
Dr. Laszlo Olah | University of Debrecen

Discussion
All

Friday 06 November

Reception Hall 08:00-10:00

Detection of Atherosclerosis in Acute Cerebral Ischemia

Chairs: **Dr. David Skoloudik, Dr. Caterina Kulyk**

Atherosclerosis in cervical vessels
Prof. Marina Diomedi | Department of Systems Medicine, University of Rome Tor Vergata

Intracranial atherosclerosis with ultrasound
Dr. Lina Palaiodimou | NKUA

Cardiac and aortic atherosclerosis
Dr. Radim Liceink | North West Anglia NHS Foundation, United Kingdom

Focused cardiac ultrasound in Stroke Units
Dr. Jorge Pagola | Vall Hebron Hospital

Discussion
All

10:00-10:30 COFFEE BREAK

Ground Floor Hall 10:30-12:30

Hands-on I

Station #1: Optic nerve sheath diameter
Dr. Piergiorgio Lochner | Saarland University

Station #2: POCUS-TCD in ICU
Dr. Bernhard Rosengarten | Department of Neurology, Chemnitz Medical Centre

Station #3: Pupil assessment
Dr. Filippo Maria Farina | University of Padua School of Medicine

Station #4: Midline assessment
Prof. Erwin Stolz | Justus Liebig University

Friday 06 November

Conference Hall 10:30-12:30

Hands-on II

Station #1: Cerebral autoregulation
Prof. Pedro Castro | Department of Neurology and Stroke Unit, Uls São João, Porto

Station #2: Breath Holding Index
Dr. Nathalie Nasr | Poitiers University Hospital

Station #3: Neurovascular coupling with visual stimuli
Prof. Elsa Azevedo | São João University Hospital

Station #4: Examination of Cerebral Vasoreactivity
Dr. Laszlo Olah | University of Debrecen

Conference Hall 10:30-12:30

Hands-on III

Station #1: Assessment of atherosclerosis in carotid arteries
Dr. Paul Von Weitzel-Mudersbach | Aalborg University Hospital

Station #2: Assessment of circle of Willis
Dr. Caterina Kulyk | WON

Station #3: Focused cardiac ultrasound
Dr. Jorge Pagola | Vall Hebron Hospital

Station #4: Aortic and pulmonary ultrasound
Dr. Radim Liceink | North West Anglia NHS Foundation

12:30-13:00	LUNCH BREAK

Meeting Hall 12:30-13:00

EC Meeting

Friday 06 November

Ground Floor Hall 13:30-15:30

Applications of Neuromuscular Ultrasound in the Differential Diagnosis of Neuromuscular Disorders

Chairs: **Dr. Kalliopi Pitarokoili, Dr. Antonis Kerasnoudis**

Entrapment neuropathies
Dr. Christos Moschovos | Second Department of Neurology, "Attikon" Hospital, School of Medicine, National and Kapodistrian University of Athens

Myopathies
Prof. Dimitra Veltsista | University of Patras

Autoimmune neuropathies
Prof. Alexander Grimm | University Hospital Tuebingen Department of Neurology

Diaphragm ultrasound
Dr. Dimosthenis Lykouras | University of Patras

Discussion
All

Conference Hall 13:30-15:30

TCD Monitoring during Cardiothoracic Surgery, Vascular Procedures and Right-to-left Shunt Diagnosis

Chairs: **Prof. Claudio Baracchini, Dr. Patricia Martinez-Sanchez**

Carotid Artery Stenting and Endarterectomy
Prof. Stephan Schreiber | Oberhavel Klinik Hennigsdorf

Aortic arch and aortic valve procedures
Dr. Zsolt Garami | Houston Methodist DeBakey Heart & Vascular Center

Microemboli detection
Prof. Werner Mess | MUMC+

Right-to-left shunt detection
Dr. Ioanna Koutroulou | Aristotle University of Thessaloniki

Friday 06 November

Reception Hall 13:30-15:30

Fundamentals of a Top-class Neurosonological Study

Chairs: **Dr. Susanna Horner, Prof. Hee-Jung Song**

Detailed assessment of carotid stenosis
Dr. Aikaterini Theodorou | 2nd Department of Neurology, NKUA Athens

Non-atherosclerotic pathologies (dissection and vasculitis)
Mr. Milan R. Vosko | LK Amstetten

Basal ganglia ultrasound
Prof. Uwe Walter | Rostock University Medical Center

Venous assessment
Prof. Jose Manuel Valdueza | Neurological Doctor's Office Bad Segeberg

15:30-16:00 COFFEE BREAK

Ground Floor Hall 16:00-18:00

Hands-on IV

Station #1: Median nerve
Dr. Christos Moschovos | Second Department of Neurology, "Attikon" Hospital, School of Medicine, National and Kapodistrian University of Athens

Station #2: Lower limb neuropathies
Prof. Alexander Grimm | University Hospital- Tuebingen Department of Neurology

Station #3: Myopathies
Prof. Dimitra Veltsista | University of Patras

Station #4: Diaphragm ultrasound
Dr. Dimitrios Toumpanakis | National and Kapodistrian University of Athens

Conference Hall 16:00-18:00

Hands-on V

Station #1: Setting up TCD monitoring
Dr. Joaquin Carneado-Ruiz | Hospital Universitario Puerta De Hierro, Unidad De Ictus, Servicio De Neurologia

Station #2: Microemboli detection
Prof. Werner Mess | MUMC+

Station #3: Clinical vignette
Prof. Stephan Schreiber | Oberhavel Klinik Hennigsdorf

Station #4: Right-left shunt detection
Dr. Zsolt Garami | Houston Methodist DeBakey Heart & Vascular Center

Friday 06 November

Reception Hall 16:00-18:00

Hands-on VI

Station #1: Carotid arteries
Dr. Milan Vosko

Station #2: Intracranial sinuses and veins
Prof. Jose Manuel Valdueza | Neurological Doctor's Office Bad Segeberg

Station #3: Basal ganglia
Prof. Uwe Walter | Rostock University Medical Center

Station #4: Large vessel vasculitis
Prof. Aleksandra Pavlovic | University of Belgrade, Faculty of Special Education and Rehabilitation

Auditorium – Main Hall 18:00-19:00

Satellite Symposium (see page 21)

Auditorium – Main Hall 19:00-20:00

Opening Ceremony

Chairs: **Dr. Georgios Tsivgoulis, Dr. João Sargento-Freitas, Prof. Uwe Walter**

Introduction
Dr. Georgios Tsivgoulis | Attikon University Hospital Greece

Welcome to the WON/ESNCH Main Event
Dr. João Sargento-Freitas | Uls De Coimbra

Keynote Lecture: Perfusion transcranial ultrasound in stroke management
Prof. Christos Krogias | Evk Herne, Academic Teaching Hospital Ruhr University Bochum

Saturday 07 November

07:00-20:00 **REGISTRATIONS**

Auditorium – Main Hall 08:00-09:00

Scientific Communications I

Chairs: **Dr. Kurt Niederkorn, Dr. Aikaterini Theodorou**

OP01 Taking Advantage of Pterional Approach to perform Transcranial Doppler: The "Trieste window"

ILARIO SCALI[1,2], PAOLA CARUSO[1], ANASTASIA GALLETTI[2], ANTONIO MEOLA[2], SASHA OLIVO[3], EMANUELE VINCIS[1], FEDERICO SATURNO SPURIO[2], MAGDA QUAGLIOTTO[1], SARA BALDO[2], ALFONSO LA RUSSA[2], HADI BADREDDINE[2], ANDREA BRUNO[2], VITTORIA MARIA SARRA[1], NICOLA CARRARO[1], LEONELLO TACCONI[2], PAOLO MANGANOTTI[1]

[1]Clinical Unit of Neurology, University Hospital and Health Services of Trieste, Italy, [2]Department of Neurosurgery, University Hospital and Health Services of Trieste, Italy, [3]Department of Neurology, Hospital of Gorizia, Italy

OP02 A new Transcranial Doppler Frequency Modulation Scale for Micro-embolic signals based on the Normalized Velocity Variability

RUUD KEUNEN[1], GEERT JAN ROMERS[2]

[1]Haga Hospital, The Hague Netherlands, [2]IT Department Keunen Medical, Wassenaar, The Netherlands

OP03 Safety of ultrasound contrast during transcranial Doppler within 24h after mechanical thrombectomy for acute ischemic stroke

BRUNO MIGUEL SANTOS CARVALHO[1,2], TIAGO PEDRO[3], GUILHERME GAMA[4,5], GORETI MOREIRA[4,5], ANA AIRES SILVA[1,2,5], CARMEN FERREIRA[2], LUÍSA FONSECA[4,5,7], ELSA AZEVEDO[2,6], PEDRO CASTRO[2,5,6]

1Department of Clinical Neurosciences and Mental Health, Faculty of Medicine, University of Porto, Porto, Portugal, [2]Department of Neurology, São João University Hospital, Porto, Portugal, [3]Department of Neuroradiology, São João University Hospital, Porto, Portugal, [4]Department of Internal Medicine, São João University Hospital, Porto, Portugal, [5]Stroke Unit, São João University Hospital, Porto, Portugal, [6]RISE-Health, Department of Clinical Neurosciences and Mental Health, Faculty of Medicine, University of Porto, Porto, Portugal, [7]Department of Medicine, Faculty of Medicine, University of Porto, Porto, Portugal

OP04 Doppler-Assisted Early Mobilization After Acute Ischemic Stroke: interim analysis of study population

MARIANA COELHO[1], LEANDRA FAGUNDES[1], FERNANDO SILVA[1], ANA CATARINA FONSECA[2], EMANUEL MARTINS[1], ANTÓNIO CONCEIÇÃO[3], MARCELO QUEIROZ[1], ANDRÉ ALVES[1], CATARINA FERNANDES[1], MARIA JOÃO LEITÃO[1], MATILDE JÓIA[1], EDUARDO FREITAS[1], NUNO PALRICAS[1], PEDRO CASTRO[4], CRISTINA DUQUE[5], CATARINA GERALDES[2], DIANA AGUIAR SOUSA[6], PAOLA CARUSO[7], JANJA PRETNAR[8], DAVID BONIFACIC[9], GABRIJELA DEDIC[10], KATARINA RADOS[11], BRANKO MALOJCIC[11], JOÃO SARGENTO FREITAS[1]

[1]Unidade Local De Saúde De Coimbra, Coimbra, Portugal, [2]Unidade Local de Saúde de Santa Maria, Lisbon, Portugal, [3]Portugal AVC – União de Sobreviventes, Familiares e Amigos, Portugal, [4]Unidade Local de Saúde de São João, Porto, Portugal, [5]Unidade Local de Saúde de Matosinhos, Matosinhos, Portugal, [6]Unidade Local de Saúde de São José, Lisbon, Portugal, [7]University Hospital and Health Services of Trieste, Trieste, Italy, [8]Ljubljana University Medical Centre, Ljubljana, Slovenia, [9]University Hospital of Rijeka, Rijeka, Croatia, [10]Varaždin General Hospital, Varaždin, Croatia, [11]University Hospital Centre Zagreb, Zagreb, Croatia

OP05 Bedside 3D contrast-enhanced ultrasound enables morphological imaging and spatial characterization of cerebral vasospasm in neuro-intensive care

GEORGES CHABOUH[1], VIVIEN SZABO[2,3], QUENTIN MESNILDREY[2], CHIARA MARTINEZ[2], AITANA WAELBROAECK[1], TOKY RAKOTOMANGA[2], FRÉDÉRIC GRECO[2], PIERRE-FRANÇOIS PERRIGAULT[2], KÉVIN CHALARD[2,3], VINCENT HINGOT[1]

[1]Resolve Stroke, France, [2]Department of Critical Care Medicine and Anesthesiology, Gui de Chauliac University Hospital of Montpellier, Montpellier, France, [3]IGF, Univ. Montpellier, CNRS, Inserm, Montpellier, France

OP06 Velocity Curvature Index for Early Prediction of Delayed Cerebral Ischemia Following Aneurysmal Subarachnoid Haemorrhage: A Comparison with Conventional Transcranial Doppler Biomarkers

HANNA SCHENCK[1], ERIK GOMMER[1], CELINE VAN CRAENENBROECK[1], RICK VAN LANEN[1], MARCEL ARIES[1], MICHAEL VELDEMAN[2], ONNO TEERNSTRA[1], JIM DINGS[1], INGER DE RIDDER[1], YASIN TEMEL[1], WERNER MESS[1], ROEL HAEREN[1]

[1]Maastricht University Medical Center, Netherlands, [2]Aachen University Hospital, Germany

Saturday 07 November

Reception Hall 08:00-10:00

WON Certification in Neurosonology – Theoretical Exam

Auditorium – Main Hall 09:00-10:15

TCD is the Superior Test for Right to Left Shunt Detection: a WON/ESNCH Workgroup Consensus Statement

Chairs: **Dr. Natan Bornstein, Dr. Laszlo Csiba**

Shunt Detection for Stroke Prevention
Dr. Aristeidis Katsanos | McMaster University

TCD is the Superior Test for Right to Left Shunt Detection
Dr. Zsolt Garami | Houston Methodist DeBakey Heart & Vascular Center

Technique and Performance of TCD for Right to Left Shunt Diagnosis: a WON/ESNCH Workgroup Consensus Statement
Dr. Mark Rubin | Sound Vascular Neurology

Discussion
All

10:15-10:45 COFFEE BREAK

Auditorium – Main Hall 10:45-12:00

Stroke Emergency Ultrasound: From Prehospital to Reperfusion (Joint session with ESO)

Chairs: **Dr. Georgios Tsivgoulis, Prof. David Rodriguez-Luna**

Ultrasound diagnostics prior to reperfusion therapies
Dr. Andrei V. Alexandrov | Department of Neurology, University of Arizona College of Medicine – Phoenix

Hemodynamic management after endovascular thrombectomy
Prof. Pedro Castro | Department of Neurology and Stroke Unit, Uls São João, Porto

Early venous predictors of outcome after large vessel occlusion
Dr. Francesco Favruzzo | Comprehensive Stroke Center, Ospedale Dell'angelo, Mestre

Discussion
All

12:00-13:30 LUNCH BREAK AND POSTER VIEWING (see page 22-23)

Chairs: **Prof. Rita Leite Fernandes, Prof. Alexandra Frogoudaki, Prof. Emily Ho, Prof. Dipraj Limbu, Prof. Milija Mijajovic, Prof. Methil Pradeep, Prof. Camilo Rodriguez**

Saturday 07 November

Meeting Room 12:00-13:30

Council of Nations

Reception Hall 13:00-18:00

WON Certification in Neurosonology – Practical Exams

Auditorium – Main Hall 13:30-14:45

Neurocritical and Intensive Care Sonography

Chairs: **Dr. Jurgita Valaikiene, Dr. Panayiotis Mitsias**

Cardiac arrest and cerebral perfusion monitoring with ultrasound
Prof. Christos Krogias | Evk Herne, Academic Teaching Hospital Ruhr University Bochum

Sonography in the neurointensive care unit: applications and case insights
Dr. Eleni Bakola | Attikon University Hospital Greece

Optic nerve sheath diameter in the ICU: assessing intracranial pressure non-invasively
Prof. Michael Ertl | District Hospital Günzburg

Discussion
All

Auditorium – Main Hall 14:45-16:00

Ultrasound in Rare and Unusual Stroke Etiologies

Chairs: **Dr. Alastair Webb, Prof. Martin Köhrmann**

Ultrasound in angiitis: primary and secondary forms
Dr. Odysseas Kargiotis | University Hospital of Patras

Reversible cerebral vasoconstriction syndrome and hemodynamic patterns
Prof. Diana Aguiar de Sousa | Uls De São José and Faculdade De Medicina, Universidade De Lisboa

Carotid web and other non-atherosclerotic causes of stroke: diagnostic insights from ultrasound
Prof. Arijana Lovrencic-Huzjan | UHC Sestre Milosrdnice

Discussion
All

16:00-16:30 COFFEE BREAK

Saturday 07 November

Auditorium – Main Hall 16:30-17:30

Satellite Symposium: (see page 21)

Auditorium – Main Hall 17:30-18:45

Stroke Diagnostics: Emerging Frontiers in Neurosonology

Stroke Diagnostics**: Emerging Frontiers in Neurosonology**

Robotic-assisted transcranial Doppler: the future of continuous monitoring
Dr. Caterina Kulyk | WON

Microembolic signals and their role in ischemic stroke classification
Dr. Eleni Bakola | Attikon University Hospital

Peripheral nerve ultrasound: expanding the neurosonology spectrum
Dr. Antonis Kerasnoudis | St. Luke's Hospital Thessaloniki

Discussion
All

Auditorium – Main Hall 19:00-20:00

General Assembly

Sunday 08 November

07:30-14:00 **REGISTRATIONS**

Auditorium – Main Hall 08:00-09:00

Scientific Communications II

Chairs: **Prof. Viviane Zetola, Dr. Joanna Wojczal**

OP07

Clinical, neurosonological findings and risk factors for late recurrence of craniocervical artery dissection

ARIJANA LOVRENCIC-HUZJAN[1], IVONA JERKOVIC[1], LUKA MILICEVIC[1], VERICA HITREC[1], IVANA SIMAC[1], TIMON CVJETICANIN[1], IVAN ANZULOVIC[1], IVANA KOBASIC-GALIC[1], MARINA ROJE-BEDEKOVIC[1]
[1]UHC Sestre Milosrdnice, Croatia

OP08

Sonographic findings of cervicocranial arteries in a family harboring heterozygot variant of TGFB2 gene

ARIJANA LOVRENCIC-HUZJAN[1], IVANA SIMSC[1], IVANA KOBASIC-GALIC[1], IVONA JERKOVIC[1], SIME ANZULOVIC[2], SANDA HULJEV-FRKOVIC[2]
[1]UHC Sestre Milosrdnice, Croatia, [2]UHC Zagreb, Croatia

OP09

Clinical Loop: Development and Preliminary Evaluation of a Web-Based Educational Platform for Ultrasound Training

JORGE PAGOLA[1], JESUS JUEGA[2], JUAN ALVAREZ-CIENFUEGOS[3], GIULIO FIORE[1], CLAUDIA MEZA[1], NOELIA RODRIGUEZ[1], ADRIANO BONURA[1], RADIM LICENIK[4]
[1]Vall Hebron Hospital, Barcelona, Spain, [2]Germans Trias i Pujol Hospital, Badalona, Spain, [3]Trueta Hospital, Girona, Spain, [4]North West Anglia Foundation NHS Trust, Cambridgeshire, United Kingdom

OP10

Ethnic Variation in Carotid Bulb Morphology and Vascular Geometry: Insights from Ultrasound Assessment

HOSSAM ABDELMAGEED[1], LAMIA MBAREK[2], XUEWEI XIE[2,3], YONGJUN WANG[2,3], HUI LI[2,3,4], YANG LIU[5], HUAGUANG ZHENG[2,3,5], ROBERT FLEISCHMANN[1], JENS P DREIER[6,7], JOSE MANUEL VALDUEZA[8]
[1]University of Greifswald, Germany, [2]China National Clinical Research Center for Neurological Diseases, Beijing, China, [3]Department of Neurology, Beijing Tiantan Hospital, Capital Medical University, Beijing, China, [4]Department of Clinical Epidemiology and Clinical Trial, Capital Medical University, Beijing, China, [5]Health Management Center, Beijing Tiantan Hospital, Capital Medical University, Beijing, China, [6]Center for Stroke Research Berlin, Charité-Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin, Humboldt-Universität zu Berlin, Berlin Institute of Health, Berlin, Germany, [7]Experimental Neurology, Charité-Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin, Humboldt-Universität zu Berlin, Berlin Institute of Health, Berlin, Germany, [8]Neurological Center, Segeberger Kliniken, Bad Segeberg, Germany

OP11

Left ventricular thrombus detected by neurologist-performed focus after acute ischemic stroke: A four-year multidisciplinary follow-up

NATHALIA BARROS FERREIRA[1], ANA INÊS MARTINS[1], FERNANDO SILVA[1], EMANUEL MARTINS[1], JOÃO ANDRÉ SOUSA[1]
[1]Unidade Local de Saúde de Coimbra, Condeixa-a-Nova, Portugal

OP12

Transcanial doppler ultrasound for hemodynamic flow pattern characterization in cerebral arteriovenous malformation: A clinical case

RAFAEL GUERRERO LOZOYA[1]
[1]Hospital CIMA de Hermosillo, Hermosillo, Sonora, México, 2Instituto Mexicano del Seguro Social, Hermosillo, Sonora, México

Sunday 08 November

Auditorium – Main Hall 09:00-10:15

Ultrasound Based Treatments and Decision Making in Stroke Medicine (Joint Session with WSO)

Chairs: **Dr. Branko Malojcic, Prof. Peter Schellinger**

Sonothrombolysis: where do we stand in 2026?
Dr. Andrei V. Alexandrov | Department of Neurology, University of Arizona College of Medicine - Phoenix

Low intensity focused ultrasound stimulation in stroke: A Paradigm shift in stroke ultrasound
Dr. Wayne Feng | Duke University School of Medicine

Asymptomatic carotid stenosis ultrasonography, a new look after CREST-2
Dr. Felix Schlachetzki | University of Regensburg

Discussion
All

10:15-10:45 COFFEE BREAK

Auditorium – Main Hall 10:45-12:00

Ultrasound Beyond Ischemic Stroke (Joint Session with EFSUMB)

Chairs: **Prof. Janja Pretnar-Oblak, Prof. Eva Bartels**

Transcranial Sonography in Psychiatric Disorders
Dr. Daniel Richter | Evangelisches Krankenhaus Herne

Contrast-enhanced ultrasonography in vascular diseases
Dr. Luke Dixon | Imperial College NHS Trust London

Improving Vascular Assessment with Advanced Ultrasound: Evidence, Limitations and Future Directions
Prof. Chris de Korte | Radboudumc

Discussion
All

Sunday 08 November

Meeting Hall 10:45-12:00

Parallel WON/ESNCH Working Groups Meeting

Auditorium – Main Hall 12:00-13:15

Ultrasound Applications in Diagnostic Work-up of Headache (Joint Session with EAN)

Chair: **Dr. Dimos Mitsikostas**

US in the evaluation of intracranial hypertension and hypotension
Dr. Piergiorgio Lochner | Saarland University Medical Center, Homburg

US in the evaluation of FMD & dissection
Dr. Klearchos Psychogios | Stroke Unit Metropolitan Hospital

Ultrasound applications in giant cell arteritis
Dr. Argyro Tountopoulou | National and Kapodistrian University of Athens

Discussion
All

Auditorium – Main Hall 13:15-14:15

Closing Ceremony

WON/ESNCH Awards for best poster and oral communications
Dr. João Sargento Freitas, Dr. Uwe Walter

Handover of WON Certificates in Neurosonology
Dr. Eva Bartels, Dr. Branko Malojcic, Dr. Claudio Baracchini

Invitation to WON International Training Course in 2027
Dr. João Sargento Freitas, Dr. Janja Pretnar Oblak

Final words
Dr. Georgios Tsivgoulis

SATELLITE SYMPOSIUMS

Friday 06 November

18:00-19:00

Medtronic
Engineering the extraordinary

Satellite Symposium: Recent Advances of Prolonged Cardiac Monitoring in Cryptogenic Stroke

Clinical Insights
Dr. Georgios Tsivgoulis | Attikon University Hospital Greece

Technical Insights
Prof. Polychronis Dilaveris | Assistant Professor of Cardiology, National & Kapodistrian University of Athens, Medical School; 3rd Department of Cardiology, Sotiria Chest Diseases Hospital

Saturday 07 November

16:30-17:30

Canon

Satellite Symposium:

ePOSTERS

PP01

Inflammatory biomarkers, oral health, and subclinical vascular remodeling assessed by carotid ultrasound in a pediatric population: a cross-sectional study

RITA NUNES RATO[1,2], SUSANA SOARES[3], CARMEN FERREIRA[1], PAULO MELO[4,5], ELSA AZEVEDO[1,2,6]

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PP02

Ocular sonography revealing Optic Disc Drusen mimicking optic disc edema leading to Intracranial Hypertension misdiagnosis

ELENI BAKOLA[1], MARIA CHONDROGIANNI[1], EVANGELIA-MAKRINA DIMITRIADOU[1], AIKATERINI FOSKA[1], CHRISTOS MOSCHOVOS[1], AIKATERINI THEODOROU[1], LINA PALAIODIMOU[1], VAIA LAMBADIARI[2], IRINI CHATZIRALLI[3], GEORGIOS TSIVGOULIS[1,4]

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PP03

Sonographic Assessment of Substantia Nigra and Electrophysiological Evaluation of the Masseter Inhibitory Reflex in Patients with Amyotrophic Lateral Sclerosis (ALS)

ELENI BAKOLA[1], MARIANNA PAPADOPOULOU[1], STELLA FANOURAKI[1], ANGELIKI STERPI[1], CHRISTOS MOSCHOVOS[1], MARIA-IOANNA STEFANOU[1], AIKATERINI THEODOROU[1], GEORGIA PAPAGIANNOPOULOU[1], MARIA CHONDROGIANNI[1], LINA PALAIODIMOU[1], GEORGIOS TSIVGOULIS[1]

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PP04

Use of point-of-care and interventional ultrasound modules developed for hybrid mobile stroke units

RADIM LICENIK[1,2,3], DAVID PAKIZER[1], MARTIN HUNCOVSKY[1], DORIAN PFEIFER[3]

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PP05

WON multimodule point-of-care ultrasound in neurology and stroke medicine

RADIM LICENIK[1,2], JORGE PAGOLA[3], PIERGIORGIO LOCHNER[4], DILRAJ LIMBU[1,8], FELIPE MONTELLANO[5], VLATKA LUKSIC RESKOVIC[6], OSIAN LLWYD[7], WON FOCUS POCUS WORKING GROUP[9]

[1]Acute Stroke Centre, North West Anglia NHS Foundation Trust, United Kingdom, [2]Prehospital Emergency Care Research Group, Faculty of Medicine, Ostrava University, Czechia, [3]Department of Neuorology, Vall d'Hebron Universitary Hospital, Barcelona, Spain, [4]Department of Neuorology, Saarland University Hospital, Homburg, Germany, [5]Department of Neuorology, University Hospital Würzburg, Würzburg, Germany, [6]Department of Cardiovascular Diseases, University Hospital Centre, Zagreb, Croatia, [7]University of Oxford, Oxford, United Kingdom, [8]Faculty of Medicine, Masaryk University, Brno, Czechia, [9]World Organisation of Neurosonology

PP06

Ultrasound-assisted lumbar puncture in neurological practice: First-pass success and procedural outcomes from a prospective observational study

DIPRAJ LIMBU[1], RADIM LICENIK[1], AMRIT GURUNG[1]

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PP07

Clinical, neurosonological findings and risk factors for late recurrence of craniocervical artery dissection

ARIJANA LOVRENCIC-HUZJAN[1], IVONA JERKOVIC[1], LUKA MILICEVIC[1], VERICA HITREC[1], IVANA SIMAC[1], TIMON CVJETICANIN[1], IVAN ANZULOVIC[1], IVANA KOBASIC-GALIC[1], MARINA ROJE-BEDEKOVIC[1]

[1]UHC Sestre Milosrdnice, Croatia

PP08

Sonographic findings of cervicocranial arteries in a family harboring heterozygot variant of TGFB2 gene

ARIJANA LOVRENCIC-HUZJAN[1], IVANA SIMSC[1], IVANA KOBASIC-GALIC[1], IVONA JERKOVIC[1], SIME ANZULOVIC[2], SANDA HULJEV-FRKOVIC[2]

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PP09

Clinical Loop: Development and Preliminary Evaluation of a Web-Based Educational Platform for Ultrasound Training

JORGE PAGOLA[1], JESUS JUEGA[2], JUAN ALVAREZ-CIENFUEGOS[3], GIULIO FIORE[1], CLAUDIA MEZA[1], NOELIA RODRIGUEZ[1], ADRIANO BONURA[1], RADIM LICENIK[4]

[1]Vall Hebron Hospital, Barcelona, Spain, [2]Germans Trias i Pujol Hospital, Badalona, Spain, [3]Trueta Hospital, Girona, Spain, [4]North West Anglia Foundation NHS Trust, Cambridgeshire, United Kingdom

ePOSTERS

PP10

Ethnic Variation in Carotid Bulb Morphology and Vascular Geometry: Insights from Ultrasound Assessment

HOSSAM ABDELMAGEED[1], LAMIA MBAREK[2], XUEWEI XIE[2,3], YONGJUN WANG[2,3], HUI LI[2,3,4], YANG LIU[5], HUAGUANG ZHENG[2,3,5], ROBERT FLEISCHMANN[1], JENS P DREIER[6,7], JOSE MANUEL VALDUEZA[8]

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PP11

Left ventricular thrombus detected by neurologist-performed focus after acute ischemic stroke: A four-year multidisciplinary follow-up

NATHALIA BARROS FERREIRA[1], ANA INÊS MARTINS[1], FERNANDO SILVA[1], EMANUEL MARTINS[1], JOÃO ANDRÉ SOUSA[1]

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PP12

Transcanial doppler ultrasound for hemodynamic flow pattern characterization in cerebral arteriovenous malformation: A clinical case

RAFAEL GUERRERO LOZOYA[1]

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PP13

Longitudinal TCD-BHI monitoring during donanemab therapy in early Alzheimer's disease: A proof-of-concept case report

MARIA BAGNATO[1], MARTINA GAIA DI DONNA[1], CHIARA GIUSEPPINA BONOMI[2], CATERINA MOTTA[2], ALESSANDRO MARTORANA[2], MARINA DIOMEDI[2]

[1]University of Tor Vergata Rome, Hospital F. Spaziani Frosinone, Italy, [2]University of Tor Vergata Rome, Italy

PP14

Quantifying Variability in Transcranial Doppler Microembolic Signals: From Frequency Modulation Index to Intra-Event Velocity Variability

RUUD KEUNEN[1], GEERT JAN ROMERS[2]

[1]Haga Hospital, The Hague, Netherlands, [2]IT Department Keunen Medical Software, Wassenaar, The Netherlands

PP15

S2 Phase–Locked Turbulence Signals Mimicking Microemboli in Transcranial Doppler: A Distal, Reflection-Driven Haemodynamic Phenomenon

JUNG JINMAN[1], RUUD KEUNEN[2], GEERT JAN ROMERS[3]

[1]Korea University Asan Hospital, Seoul, Korea, [2]Haga Hospital, The Hague, The Netherlands, [3]IT Department Keunen Medical, Wassenaar, The Netherlands

PP16

Characterization of carotid and vertebral artery flow spectra in cerebral circulatory arrest: A combined transcranial and extracranial doppler case series of 12 ICU patients with brain death

KRYSTIAN SPORYSZ-JANIEC[1]

[1]Medical University of Warsaw, Warszawa, Poland

PP17

Transcranial color-coded Doppler monitoring in acute liver failure due to paracetamol intoxication: A case report of cerebral hemodynamic recovery following liver transplantation

KRYSTIAN SPORYSZ-JANIEC[1]

[1]Medical University of Warsaw, Warszawa, Poland

PP18

The transcranial Doppler pulsatility index as a marker of increased intracranial pressure in the ICU: A critical review of an oversimplified threshold with illustrative cases

KRYSTIAN SPORYSZ-JANIEC[1]

[1]Medical University of Warsaw, Warszawa, Poland

PP19

Epileptic seizure as the first symptom of Subarachnoid hemorrhage

KLEMENTJAN MIRAKA[1], ERMIR ROCI[1]

[1]UHC Mother Teresa, Albania

PP20

A simplified formula to estimate ICP based on the pulsatility index

MARC VANHOOF[1]

[1]AZ Turnhout, Belgium

PP21

Point-of-care multimodal testing with BIS and TCCD to document supratentorial injury in the determination of death by neurological criteria after primary infratentorial brain lesions

MARC VANHOOF[1], KRISTIEN CLERINX[1], FILIEP SOETENS[1], EVA BOONEN[1]

[1]AZ Turnhout, Belgium

PP22

Point-of-care ultrasound in neurological outpatient practice: A tool for early diagnosis

SASHA OLIVO[1], ILARIO SCALI[2], PAOLA CARUSO[2], VITTORIA MARIA SARRA[2], RICCARDO GARBO[1], MICHELE RANA[1], NICOLA CARRARO[2]

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PP23

Bilateral optic neuritis as initial presentation of MOGAD during pregnancy: Diagnostic value of transorbital ultrasound

MARÍA PAYÁ MONTES[1], ÓSCAR AYO MARTÍN[1], MARÍA PALAO[1], BLANCA SERRANO SERRANO[1], TOMÁS SEGURA[1]

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ePOSTERS

PP24

Discovering pathophysiology in brain tumor angiogenesis: A Doppler study

ILARIO SCALI[1,2], PAOLA CARUSO[1], EDOARDO RICCI[1], ANTONIO MEOLA[2], ANASTASIA GALLETTI[2], SASHA OLIVO[3], EMANUELE VINCIS[1], FEDERICO SATURNO SPURIO[2], MAGDA QUAGLIOTTO[1], SARA BALDO[2], ALFONSO LA RUSSA[2], HADI BADREDDINE[2], ANDREA BRUNO[2], VITTORIA MARIA SARRA[1], NICOLA CARRARO[1], MARCELLO NACCARATO[1], LEONELLO TACCONI[2], PAOLO MANGANOTTI[1]

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PP25

The Triple Pathology of PFO, Stroke, and Thrombophilia: Long-Term Outcomes and Multimodal Right-to-Left Shunt Assessment

CATARINA TELES[1], MARCO ALMEIDA[1], ANA INÊS MARTINS[1,2], CAROLINA FERNANDES[1], ANA BRÁS[1], LUCIANO ALMENDRA[1], CARLA CECÍLIA NUNES[1], CRISTINA MACHADO[1], BRUNO RODRIGUES[1], LUIS PAIVA[3], MANUEL SANTOS[3], ANA BOTELHO[3], GUSTAVO SANTO[1], FERNANDO SILVA[1], MARCO COSTA[3], JOÃO SARGENTO-FREITAS[1,2]

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PP26

High resolution ultrasonography in the diagnosis of ischemic neuropathy post-arteriovenous fistula surgery: A case report

ROBERTO PEREIRA SANTOS[1], MARCO ANTÔNIO SALES DANTAS DE LIMA[1], CAROLINA ROUANET CAVALCANTI DE ALBUQUERQUE[1], GUSTAVO LOPES DE FREITAS HONÓRIO[1], CELMIR OLIVEIRA VILAÇA[1,2], RITA DE CÁSSIA LEITE FERNANDES

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PP27

Isoechoic substantia nigra on transcranial sonography in an unusual presentation of Segawa's disease with clubfoot deformity

CELMIR OLIVEIRA VILAÇA[1,2], ROBERTO SANTOS PEREIRA[1], RITA DE CÁSSIA LEITE FERNANDES

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PP28

Transcranial Ultrasonography Findings in a Case of Cerebral Hemiatrophy in Rasmussen Encephalitis

RITA DE CÁSSIA LEITE FERNANDES, JULIA FERNANDES ALVES DE OLIVEIRA[1], INGRID PEREIRA MARQUES[1], BEATRIZ SARNO[2], GUSTAVO LOPES DE FREITAS HONÓRIO[1]

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PP29

Transcranial Doppler cerebrovascular reactivity monitoring in patients with Alzheimer's disease receiving anti-amyloid therapy

MARTINA GAIA DI DONNA[1,2], MARIA ROSARIA BAGNATO[1,3], CHIARA GIUSEPPINA BONOMI[2], CATERINA MOTTA[2], ALESSANDRO MARTORANA[2], MARINA DIOMEDI[3]

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PP30

Transcranial Doppler reveals dual-circulation hemodynamic failure in persistent trigeminal artery anatomy

MARTINA GAIA DI DONNA[1,2], FRANCESCA BERNOCCHI[1,2], GIOVANNI DI MAURO[1], MARIO FERRANTE[1], MARIA RITA DI RUZZA[1], GIADA VALENTE[4], CARLO EMANUELE SAGGESE[1], MARIA ROSARIA BAGNATO[1,3]

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PP31

Survey about practice of neurosonology in Belgium

PASQUALE SCOPPETTUOLO[1], SYLVIE DE RAEDT[2]

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PP32

Neuro-POCUS Advantages in Acute Ischemic Stroke Patients Treated with Endovascular Thrombectomy

SAULIUS TAROZA[1], MARIUS KURMINAS[2], DALIUS JATUŽIS[1], JURGITA VALAIKIENĖ[1]

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PP33

Neuro-POCUS in acute ischemic stroke patient with medium-sized brain artery occlusion treated by endovascular thrombectomy: Towards prompt diagnosis of infective endocarditis

JURGITA VALAIKIENĖ[1], SAULIUS TAROZA1

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PP34

Prevalence of carotid web in patients with carotid atherosclerosis and 10-year risk of stroke: post-hoc analysis of ANTIQUE study

ISTVÁN SZEGEDI[1], DAVID ŠKOLOUDÍK[2], DAVID PAKIZER[3]

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PP35

Comparative analysis of blood flow waveforms in the internal carotid and middle cerebral arteries in patients with carotid stenosis: Implications for ischemic stroke

KOEN VAN DER WAAIJ[1], INGER DE RIDDER[1], ERIK GOMMER[1], WERNER MESS[1]

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ePOSTERS

PP36

CAD: Recanalization matters? Predictive factors and outcomes from a retrospective study

PAOLA CARUSO[1], EMANUELE VINCIS[1], SASHA OLIVO[2], ILARIO SCALI[1], VITTORIA MARIA SARRA[1], NICOLA CARRARO[1], MAGDA QUAGLIOTTO[1], GIANPIERO FARINA[1], GIOVANNI FURLANIS[1], MARCELLO NACCARATO[1], PAOLO MANGANOTTI[1]

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PP37

Pivotal study on ultrasound-based sarcopenia assessment in acute stroke patients

PAOLA CARUSO[1], LAURA MAZZARI[1], EDOARDO RICCI[1], GIOVANNI FURLANIS[1], CINZIA LEVEC[1], TATIANA LEVEC[1], SARA MILANI[2], VALENTINA PESAVENTO[2], MARCELLO NACCARATO[1], PAOLO MANGANOTTI[1]

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PP38

Patients with ischemic cryptogenic stroke have higher grades of carotid intraplaque microvascular flow assessed by Superb microvascular imaging than patients with known stroke etiology

ANA CATARINA FONSECA[1], MARTIM BEATO BAPTISTA[1], TÂNIA RAFAEL[1], SUSANA BLANCO SANTOS[1], MARIA INÊS LOPES[1], FÁTIMA SOARES[1]

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PP39

Bilateral striopallidodentate calcinosis as seen through transcranial brain sonography

VASILIKI MAVRI[1], SILVA VASILI[1], IRFAN TROSHANI[1], DANIEL RICHTER[1], MICHALIS MICHAIL[1], CHRISTOS KROGIAS[1]

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PP40

Subclavian Steal: cephalo-brachial steal or haemodynamic cerebral shunting syndrome?

LUCIA PASCAZIO[1], FABIO AMATI[2], GIORGIO LIACI[3]

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PP41

Serial carotid duplex examinations in resolving carotid web uncertainty

KATARINA RADOŠ[1], KLARA GELO[1], ANTONELA BAZINA MARTINOVIC[1], BRANKO MALOJCIC[1]

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PP42

Clinical utility of bedside neuro-POCUS in acute central nervous system infections, mimicking ischemic stroke

GRAŽINA MATULAITYTE[1], ERIKA VAITKUTE[2], JURGITA VALAIKIENE[1]

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PP43

Unusual cause of unilateral headache in young adult

EVGUENIA VASSILEVA[1,2], NAIRA MURADIAN[2], PLAMEN GECOV[1,2], ROXANA RUSCHEVA[1]

[1]Medical University - Sofia, Bulgaria, [2] University Hospital "Tsaritsa Yoanna - ISUL", Bulgaria

PP44

Bilateral Internal Carotid Artery Stenosis Managed with Sequential Bilateral Carotid Endarterectomy: Case Report

IOANA GEORGESCU[1], ANDREEA BADEA[1,2], ANDREEA ELENA IACOB[1], FLORENTINA CRISTINA PLEŞA PLEŞA[1,2], CARMEN ADELLA SÎRBU[1,2,3]

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PP45

A multicenter study to optimize microembolic signal classification based on double-blind multiparametric assessment by human experts using an universal graphical and audible interface [MESOMEGA]

PEDRO CASTRO[1], EMILY HO[2], MARK RUBIN[3], ZSOLT GARAMI[4], INES FORTUNA[2], FLORIAN ROESSLER[5], DAVID SKOLOUDIK[6], MANFRED KAPS[5], RUNE AASLID[7], WERNER MESS[8]

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PP46

Transcranial Color-Coded Duplex (TCCD) revealing Reversible Cerebral Vasoconstriction Syndrome (RCVS) as a case of persistent headache

ARUSCHAN WARTUMJAN[1]

[1]Segeberger Kliniken, Germany

PP47

Intracranial stenosis and metabolic risk factors

HORIA NICOLAE[1,2], TEODOR TRINCA[1,2]

[1]Emergency University Hospital Elias, Romania, [2]University of Medicine and Pharmacy Carol Davila Bucharest, Romania

PP48

Optic Nerve Ultrasound in the Neuro-POCUS Era: Technical Challenges and Emerging Solutions

NICOLA CARRARO[1], VITTORIA MARIA SARRA[1], GIADA RIZZO[2], FRANCESCO BRUN[2]

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PP49

Repurposing transcranial Doppler ultrasonography as a teaching tool in undergraduate medical education

KESAVA MANDALANENI[1], LAUREN WALKON[1], EARLAN CHARLES[3], PRIYANKA VENKATAPATHAPPA[2]

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ePOSTERS

PP50

Transcranial Sonography for Bedside Assessment of the Thalamic Lesion After HIFU: A Pilot Concordance Study with MRI

EMILIO RODRÍGUEZ-CASTRO[1], JOSÉ LUIS TABOADA-ARCOS[2], GUSTAVO FERNÁNDEZ-PAJARÍN[3], BRAIS RODRÍGUEZ-BOTANA[4], PAULA ROMÁN-PENA[4], BEGOÑA ARES[3], MIGUEL BLANCO-ULLA[2], ANTONIO JESÚS MOSQUEIRA-MARTÍNEZ[2], ÁNGEL SESAR[3]

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PP51

Extracranial Internal Carotid Artery Vasospasm Causing Recurrent TIA/ Migraine-Like Attacks: Diagnostic Value of Acute Vascular Doppler Ultrasound

MARIA JOÃO LIMA[1], MARIANA SECO[1], SANDRA MOREIRA[1], CRISTINA DUQUE[1]

[1]Unidade Local De Saúde De Matosinhos, Portugal

PP52

CT perfusion imaging as prognostic factor for stroke outcome

STEFAN MAUSBACH[1], MELANIA DOMINKO[1], YOSEF BAHOUS[1], ELIEL BEN-DAVID[1], VLADIMIR BORODETSKY[1], NATAN M. BORNSTEIN[1], RONI EICHEL[1]

[1]Shaare Zedek Medical Center, Israel

PP53

Early effects of Intensity-Modulated Radiotherapy in head and neck cancer: A Longitudinal Advanced Neurosonology Study

JORGE RODRÍGUEZ-PARDO[1], LUIS GLARIA[2], EDUARDO MARIÑO[1], CARLOS HERVÁS[1], ELISABET GONZÁLEZ DEL PORTILLO[2], ROSA MARÍA MORERA[2], JUAN JOSÉ GONÇALVES[3], SARA ESCOBAR[1], PAULA ALDAZ[3], JOSE LUIS CEBRIÁN[4], BLANCA FUENTES[1], JORGE NOGUERA[4], RICARDO RIGUAL[1], ANE ESCRIBANO[2], GERARDO RUIZ[1], DARÍO SÁNCHEZ-CABRERO[5], MARÍA ALONSO DE LECIÑANA[1]

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Endovascular treatment and TCD monitoring of SAH related vasospasm

MISLAV BUDISIC[1], VLADIMIR KALOUSEK[1], ARIJANA LOVRENČIĆ-HUZJAN[1], MARIJANA BOSNAR PURETIĆ[1], LIDIJA DEŽMALJ GRBELJA[1], SARA DRNASIN[1], JOSIP SEKOVANIĆ[1], BRANIMIR ČULO[1], IVANA KOBASIĆ[1], MARINA ROJE-BEDEKOVIĆ[1]

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Arterial–Venous Neurovascular Coupling Indices Are Associated with Migraine Severity: A Transcranial Doppler and Color-Coded Duplex Study

STEFANO CAPRONI[1], GRETA CHIAPPALUPI[2], ELEONORA TERENZI[1], ELISA VALENTE PIETROSANTO[2], SARA ARCANGELI[2], ANTONIO IOVINELLA[1], DANIELE GRAZIANI[1], ANTONIO TUFO[1], MATILDE MASSARELLI[3], SIMONE BELLAVIA[4], MASSIMILIANO DI FILIPPO[2]

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Ultrasound-detected carotid atherosclerotic plaque width and plaque progression as markers of mortality risk: 10-year follow-up results from the antique study

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Recurrent Vascular Events and Death in Patients at High Vascular Risk in Relation to Carotid Plaque Characteristics, Including Greyscale Median Echogenicity

MARTA MARIA MARTINEZ MARTINEZ[1], FERNÁNDEZ TRAVIESO JORGE[1], MIGUEL ÁNGEL VÁZQUEZ RONDA[2], GEMA NAVARRO JIMÉNEZ[2], ELENA DE LA CRUZ BERLANGA[3]

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CARLOTA VILLAR RODRÍGUEZ[1,2], DIEGO VILLAGRÁN SANCHO[1,2], LOURDES MÁRQUEZ OLMEDO[1], LORETO MARTIN ORTIZ[1], FERNANDO SOTO BENITEZ[1], MANUEL MEDINA RODRIGUEZ[1,2], ANDRES HERMOSIN GOMEZ[1,2], JUAN ANTONIO CABEZAS RODRIGUEZ[1,2], MARTA AGUILAR PEREZ[2,3], ELENA ZAPATA ARRIAZA[2,3], ISABEL GUTIERREZ JARRIN[2,3], ASIER DE ALBONIGA-CHINDURZA[2,3], CHRISTIAN NORAMBUENA[2,3], FRANCISCO MONICHE[1,2], ALEJANDRO GONZALEZ[2,3]

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A Case of Symptomatic Carotid Web with an Underlying Mobile Thrombus Revealed by Cervical Duplex Ultrasound

MANVEL AGHASARYAN[1], EMNA JARRAR[1], LEONARD SMADJA[1], GARY OUANOUNOU[1], NICOLAS CHAUSSON[1], DIDIER SMADJA[1]

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ePOSTERS

PP60

Diagnostic performance of echo-doppler in the detection of carotid web using a standardized ultrasound scoring system

MANVEL AGHASARYAN[1], EMNA JARRAR[1], LEONARD SMADJA[1], GARY OUANOUNOU[1], NOCOLAS CHAUSSON[1], DIDIER SMADJA[1]

[1]Sud Francilien Hospital Center, Paris, France

PP61

Right to left shunt testing with transcranial Doppler Ultrasound: A Scoping Review and Statement by the Microembolic Study Workgroup of the World Organisation of Neurosonology

MARK RUBIN[1], JOÃO ANDRÉ SOUSA[2], JOÃO SARGENTO FREITAS[2], ARISTEIDIS KATSANOS[3], CHRYSI BOGIATZI[4]

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The role of ultrasonography of the brachial plexus in differentiating between Parsonage-Turner syndrome and neuroborreliosis. A pictorial review

PAWEŁ WALKOWIAK[1], GRZEGORZ KOZERA[2,3]

[1]Department of Neurology with Stroke Subdivision, John Paul II Regional Hospital in Belchatow, Poland, [2]Medical Simulation Centre, Medical University of Gdansk, Poland, [3]Copernicus Hospital in Gdansk, Poland

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PAULINA JURCZAK-KOBUS[2], ALEKSANDRA KULS-OSZMANIEC[3], JACEK SOBOCKI[2], MARTA LENSKA-MIECIEK[1]

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Renal function and glucose regulation are strongly associated with carotid disease severity in diabetic patients

VESNA ĐERMANOVIĆ DOBROTA[1]

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Beyond Flow Velocity: Critical Closing Pressure Identifies Subclinical Hemodynamic Compromise in Internal Carotid Artery Stenosis

ALA BASHIR[1], GAL IFERGANE[1], ASAF HONIG[1]

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Direct Evidence of In Situ Thrombus Formation Over a Carotid Web in Acute Ischemic Stroke

JOANA CANCELA[1], ANA RITA SACRAMENTO[1], JOÃO SOUSA[1], EMANUEL MARTINS[1], FERNANDO SILVA[1]

[1]ULS Coimbra, Portugal

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Unilateral Recurrent Primary Central Nervous System Vasculitis presenting as ipsilateral embolic ischemic strokes: A case report with the role of Transcranial Color- Coded Duplex Sonography

KLARA GELO[1], KATARINA RADOŠ[1], BRANKO MALOJČIĆ[1]

[1]UHC Zagreb, Croatia, Croatia

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When microembolic signals tell the story!

MARIANA PEREIRA[1,2,3], RITA SÁ[4], MIGUEL SCHÖN[4,5], CAROLINA PINHEIRO[6], DIANA AGUIAR DE SOUSA[4,5], ANA PAIVA NUNES[4,5]

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Ultrasound Assessment of Vulnerable Carotid Plaque in Ischemic Stroke Patients with Non-Severe Carotid Stenosis: A Systematic Review

DARIO RAMIS[1], LAURA AMAYA PASCASIO[2], INES BARTOLOME ARENAS[1]

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Friend or foe? Post-thrombectomy cerebral hyperperfusion on transcranial Doppler predicts early neurological improvement in an age-dependent manner in anterior large-vessel-occlusion stroke

MATTEO PAOLUCCI[1], GIACOMO URBINATI[1], LUDOVICA MIGLIACCIO[1], MAURO GENTILE[1], GIORGIA ARNONE[1], LUANA GENTILE[1], FEDERICA NALDI[1], STEFANO FORLIVESI[1], ANDREA ZINI[1]

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PP71

Ultrasound examination in diagnostics of cerebral arteritis: benefits and pitfalls

GRZEGORZ KOZERA[1,2,3], PAWEŁ WALKOWIAK[4], JACEK ANTECKI[3,5], JOANNA WOJCZAL[6], LESZEK BIENIASZEWSKI[1]

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GENERAL INFORMATION A-Z

A

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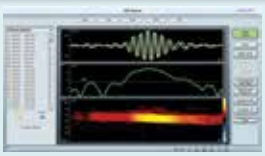
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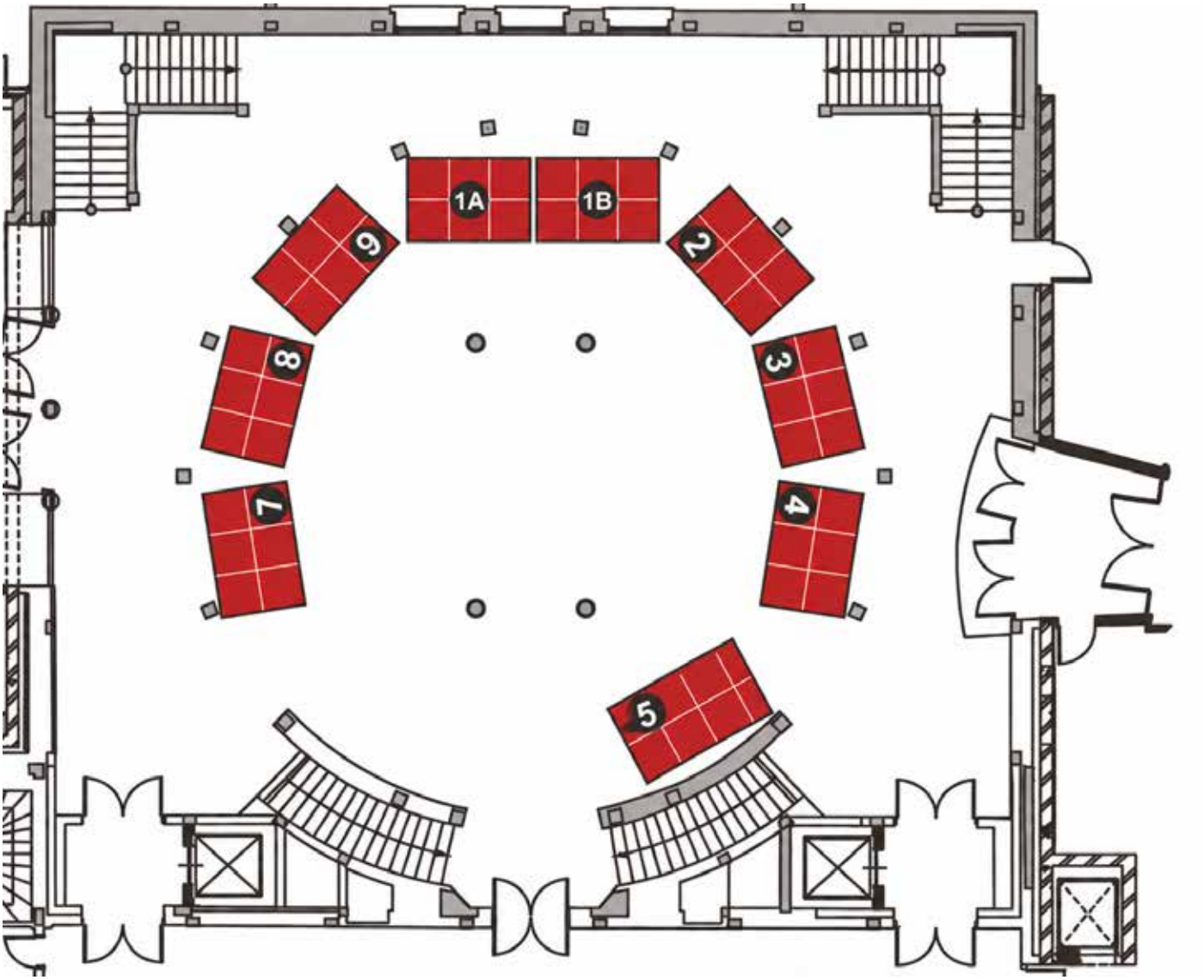
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ABSTRACT

OP01 - OP12

Scientific Communications I-II

Scientific Communications I

Auditorium – Main Hall 08:00-09:00

Saturday 07 November

OP01

Taking Advantage of Pterional Approach to perform Transcranial Doppler: The "Trieste window"

ILARIO SCALI[1,2], PAOLA CARUSO[1], ANASTASIA GALLETTI[2], ANTONIO MEOLA[2], SASHA OLIVO[3], EMANUELE VINCIS[1], FEDERICO SATURNO SPURIO[2], MAGDA QUAGLIOTTO[1], SARA BALDO[2], ALFONSO LA RUSSA[2], HADI BADREDDINE[2], ANDREA BRUNO[2], VITTORIA MARIA SARRA[1], NICOLA CARRARO[1], LEONELLO TACCONI[2], PAOLO MANGANOTTI[1]

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Background: Pterional craniotomy is premium approach in brain aneurysms surgery: it implies drilling of greater sphenoid wing lateral part that creates post-operative bone gap. In patients with ruptured intracranial aneurysms who undergo clipping, post-operative wound sutures, inflammatory process and descending oedema could make it difficult to perform Trans-Cranial-Doppler (TCD) to detect vasospasm, impeding conventional transtemporal approach. Our aim was to investigate if bone breach that follows pterional approach could be used to obtain better transcranial insonation, defining new acoustic window to monitor post-operative patients with aneurysm rupture.

Methods: We retrospectively collected patients affected by aneurysmal rupture admitted to Trieste Neurosurgery (1.1.2025-12.31.2025) who undergo clipping by pterional approach and provided with acceptable transtemporal window. After intervention, we performed TCD exams during vasospasm risk interval, using both transtemporal and transsphenoidal window (renamed "Trieste window"); we evaluated potential flow differences among major cerebral vessels insonated by one or the other approach. We used t-test or Wilcoxon signed-rank test as appropriate (statistically significance when $p<0.05$).

Results: 18 exams were performed. Using "Trieste window", flow signal was detected 5mm deeper than usual for anterior and 10mm for posterior circulation. Compared to transtemporal approach, insonating by post-operative bone breach middle cerebral artery hemodynamic values were slightly increased, both proximally (PSV 121.6±38.0vs116.3±35.6 cm/s, p=0.277; EDV 47.4±20.4vs43.1±16.9 cm/s, p=0.099; MFV 75.9±28.2vs70.4±24.4 cm/s, p=0.096; median PI 1.04vs1.06, p=0.051; median RI 0.63vs0.64, p=0.116) and distally (PSV 119.4±29.8vs107.2±32.3 cm/s, p=0.016; EDV 48.4±18.3vs43.0±17.5 cm/s, p=0.044; MFV 75.7±23.1vs66.0±20.7 cm/s, p=0.006; median PI 1.03vs0.98, p=0.075; median RI 0.60vs0.59, p=0.392). Similar results were found analysing anterior cerebral artery, while flow values in posterior cerebral artery were slightly decreased. Rosenthal basal vein was detected in both approaches. Lindegaard index was comparable.

Conclusions: To monitor patients who undergo clipping after aneurysmal subarachnoid hemorrhage, "Trieste window" allows higher-quality, safer-for-patient and more-time-sparing TCD exams compared to conventional transtemporal approach.

Scientific Communications I

Saturday 07 November

Auditorium – Main Hall 08:00-09:00

OP02

A new Transcranial Doppler Frequency Modulation Scale for Micro-embolic signals based on the Normalized Velocity Variability

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Background: Frequency modulation (FM) of Doppler signals is a recognized characteristic of micro-embolic signals (MES) detected with transcranial Doppler (TCD). FM has been described as particularly helpful in distinguishing gaseous from solid emboli. However, despite its importance, there is currently no simple FM quantitative parameter nor FM scale that clinicians can easily use in routine TCD analysis of micro embolic signals.

Objective: Based on the NVV analysis of a complete HITs spectrum consisting of presumed gaseous emboli (n=30), solid emboli (n=20), speckle (n=20) movement artefacts (n=10) and speech artefacts (n=10)we introduced a frequency modulation scale for micro-embolic signals.

Methods: The Normalized Velocity Variability (NVV) was used as a simple quantitative parameter for measuring frequency modulation of Doppler embolic signals. TCD Doppler audio signals were analyzed using zero-crossing detection within a ±20 ms window around candidate events. Instantaneous Doppler frequency was derived from consecutive zero-crossing intervals and converted to velocity. NVV was defined as the ratio of the standard deviation of instantaneous velocity to the mean velocity within the event window. NVV values were compared between presumed gaseous emboli, solid emboli, systolic speckle, diastolic speckle, movement artefacts and speech artefacts.

Results: Presumed gaseous emboli demonstrated significantly higher NVV values than solid emboli ($p < 0.001$). Speckle signals and artefacts showed intermediate but more variable NVV distributions. NVV therefore reflects the degree of Doppler frequency modulation.For clinical interpretability, NVV values were categorized into five frequency modulation (FM) levels.

Conclusion: NVV values corresponded to increasing levels of frequency modulation. Solid emboli were predominantly associated with low FM levels (FM1–FM2), whereas gaseous emboli were associated with high FM levels (FM4–FM5). Intermediate values (FM3) were observed in embolic showers and curtain signals.

OP03

Safety of ultrasound contrast during transcranial Doppler within 24h after mechanical thrombectomy for acute ischemic stroke

BRUNO MIGUEL SANTOS CARVALHO[1,2], TIAGO PEDRO[3], GUILHERME GAMA[4,5], GORETI MOREIRA[4,5], ANA AIRES SILVA[1,2,5], CARMEN FERREIRA[2], LUÍSA FONSECA[4,5,7], ELSA AZEVEDO[2,6], PEDRO CASTRO[2,5,6]

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Background: Transcranial Doppler (TCD) is increasingly used for neurovascular monitoring after mechanical thrombectomy (MT) in acute ischemic stroke. In patients with poor temporal bone windows, ultrasound contrast may improve insonation. However, the early post-MT period is characterized by blood-brain barrier disruption, endothelial injury and reperfusion-related hemorrhagic risk. We assessed whether contrast-enhanced TCD within 24 hours after MT was associated with worse functional outcome or increased hemorrhagic complications.

Methods: We performed a single-center retrospective cohort study of consecutive ischemic stroke patients treated with MT between 2023 and 2025 who underwent TCD within 24 hours after procedure end. Patients undergoing contrast-enhanced TCD were compared with those examined without contrast. The primary outcome was favorable functional outcome at 3 months, defined as modified Rankin Scale (mRS) 0–2. Secondary outcomes included mortality, hemorrhagic transformation, parenchymal hematoma, subarachnoid hemorrhage, and immediate contrast-related events. Confounding was addressed using multivariable logistic regression adjusted for age, pre-stroke mRS and baseline NIHSS.

Results: Among 233 patients, 84 underwent contrast-enhanced TCD and 149 without contrast. Contrast-enhanced TCD patients were older, more often female, and had worse pre-stroke functional status. In non-adjusted analyses, favorable outcome was less frequent with contrast-enhanced TCD (mRS 0–2: 34.5% vs 49.0%), but this association disappeared after adjustment (adjusted OR 0.85, 95% CI 0.44–1.66). Mortality was comparable. Hemorrhagic transformation was similar between groups (20.2% vs 20.8%; adjusted OR 0.78, 95% CI 0.38–1.58), as were parenchymal hematoma (adjusted OR 1.65, 95% CI 0.49–5.54) and subarachnoid hemorrhage (6.0% vs 9.4%; adjusted OR 0.62, 95% CI 0.21–1.85). No immediate serious contrast-related reactions were recorded.

Conclusions: Contrast-enhanced TCD within 24 hours after MT was not associated with worse adjusted functional outcome or increased hemorrhagic risk. These findings support the use of ultrasound contrast when needed to obtain adequate insonation in early post-thrombectomy neurovascular monitoring.

Auditorium – Main Hall 08:00-09:00

Saturday 07 November

OP04

Doppler-Assisted Early Mobilization After Acute Ischemic Stroke: interim analysis of study population

MARIANA COELHO[1], LEANDRA FAGUNDES[1], FERNANDO SILVA[1], ANA CATARINA FONSECA[2], EMANUEL MARTINS[1], ANTÓNIO CONCEIÇÃO[3], MARCELO QUEIROZ[1], ANDRÉ ALVES[1], CATARINA FERNANDES[1], MARIA JOÃO LEITÃO[1], MATILDE JÓIA[1], EDUARDO FREITAS[1], NUNO PALRICAS[1], PEDRO CASTRO[4], CRISTINA DUQUE[5], CATARINA GERALDES[2], DIANA AGUIAR SOUSA[6], PAOLA CARUSO[7], JANJA PRETNAR[8], DAVID BONIFACIC[9], GABRIJELA DEDIC[10], KATARINA RADOS[11], BRANKO MALOJCIC[11], JOÃO SARGENTO FREITAS[1]

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Background: Patient's mobilization after ischemic stroke remains a daily clinical challenge, with significant potential impact on functional outcomes. Although early mobilization may reduce systemic complications and facilitate rehabilitation, concerns remain regarding neurological deterioration and recurrence of events. The DOP-MOBILIZE trial aims to determine whether early mobilization guided by cerebral hemodynamic assessment using extracranial and transcranial ultrasound improves outcomes compared with usual clinical practice. In this study, we present baseline data on the first patients included in the trial.

Methods: This is a randomized, investigator-initiated, multicentre, phase III clinical trial with blinded outcome assessment. The trial plans to include 1300 adults with acute ischemic stroke within 48 hours of symptom onset. In the intervention group, mobilization is guided by extracranial and transcranial Doppler ultrasound findings, with immediate mobilization (< 48 hours) performed in patients without hemodynamically significant abnormalities. In the control group, mobilization follows clinical practice of the attending physician. The primary outcome is functional status at 3 months.

Results: The trial is currently active in three centres. This preliminary analysis presents the first 80 enrolled patients (55.2% male), with a mean age of 75.44 ± 11.81 years and mean NIHSS score at randomization of 5.70 ± 4.74. In the acute phase, 31.0% underwent fibrinolysis and 63.8% thrombectomy. The most prevalent vascular risk factor was hypertension, present in 81.0% of patients. Forty patients (50.0%) were randomized to the intervention group and both groups are adequately balanced in baseline features. All patients randomised for the intervention group fulfilled the planned protocol.

Conclusions: DOP-MOBILIZE proposes a personalized approach to early post-stroke mobilization based on cerebral hemodynamics status. Its results may impact future clinical recommendations, leading to safer, more individualized and more effective care in the acute phase of ischemic stroke.

OP05

Bedside 3D contrast-enhanced ultrasound enables morphological imaging and spatial characterization of cerebral vasospasm in neuro-intensive care

GEORGES CHABOUH[1], VIVIEN SZABO[2,3], QUENTIN MESNILDREY[2], CHIARA MARTINEZ[2], AITANA WAELBROAECK[1], TOKY RAKOTOMANGA[2], FRÉDÉRIC GRECO[2], PIERRE-FRANÇOIS PERRIGAULT[2], KÉVIN CHALARD[2,3], VINCENT HINGOT[1]

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Background & Purpose: In comatose, sedated patients, cerebral vasospasm (CVS) and delayed cerebral infarction after aneurysmal subarachnoid hemorrhage are monitored using transcranial Doppler (TCD) and CT angiography/perfusion (CTA/CTP). TCD provides only ad hoc velocities; CTA/CTP requires patient transport, X-ray exposure, and iodinated contrast. Contrast-enhanced ultrasound (CEUS) with microbubbles enables irradiation-free, repeatable, bedside imaging. The SCULPT study evaluates a 3D CEUS device dedicated to cerebral exploration. We report (i) anatomical concordance between 3D CEUS microvascular imaging (MVI) and CTA, and (ii) ability of CEUS to detect spatially confined flow accelerations associated with CVS.

Methods: Single-arm, monocentric, prospective study including adult neuro-ICU patients with a clinical indication for CTP. Exclusions: pregnancy, contraindication to microbubble contrast, cardiac shunt, hemodynamic or respiratory instability. At each routine CTP, patients underwent routine TCD plus bilateral 3D CEUS via transtemporal window with bolus microbubble infusion. The device produced 3D MVI reconstructions and color-coded Doppler maps allowing spectral extraction (PSV, MFV, EDV, PI, RI) at any voxel. MVI was normalized on CTA post-hoc. Descriptive statistics were used for feasibility and detection rates.

Results: Twenty five patients underwent 151 CEUS acquisitions. Bilateral contrast enhancement succeeded in 84% (127/151); 13% showed suboptimal probe positioning, 3% failed due to poor acoustic window. Mean exam duration was 11 min (vs 28 min CTA/CTP, 5 min TCD). With optimal positioning (n=11), detection was 100% for MCA M1, M2, and basilar artery; 89% for anterior and posterior cerebral arteries; 22% for the anterior communicating artery. In severe right-MCA CVS, 3D Doppler localized focal M1 acceleration with spectral quantification along the vessel (peak PSV 132 cm/s vs 91 and 86 cm/s up- and downstream). No serious adverse events occurred.

Conclusion: Bedside 3D CEUS is feasible in the neuro-ICU and provides spatial characterization of velocity variations along single cerebral arteries, complementing standard TCD.

Saturday 07 November

Auditorium – Main Hall 08:00-09:00

OP06

Velocity Curvature Index for Early Prediction of Delayed Cerebral Ischemia Following Aneurysmal Subarachnoid Haemorrhage: A Comparison with Conventional Transcranial Doppler Biomarkers

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Background and objective: Delayed cerebral ischaemia (DCI) is a major cause of morbidity after aneurysmal subarachnoid haemorrhage (aSAH) and results from microvascular dysfunction. Predictive biomarkers for DCI are lacking. The objective of this prospective study was to determine whether the velocity curvature index (VCI), a novel metric quantifying the morphology of cerebral blood flow velocity (CBFV) waveform measured with transcranial Doppler (TCD) predicts DCI. The VCI was compared to traditional TCD biomarkers: the resistance index (RI), pulsatility index (PI) and elevated CBFV values indicating vasospasm.

Methods: Repeated TCD examinations were performed in aSAH patients during the first two weeks after ictus. Bilateral middle cerebral artery (MCA) CBFV was measured at three depths for 30 seconds of artefact free signal. Individual beat waveforms were automatically extracted and averaged to generate a representative waveform, from which VCI as well as RI and PI were calculated. Mixed-effects models were used to identify factors associated with these parameters. Receiver operating characteristic analysis (AUC) evaluated prediction of DCI.

Results: Thirty patients were included; seven developed DCI. In linear mixed-effects analysis, MCA VCI was lower with increasing age (β = –0.038 per year, p = 0.01), on the side ipsilateral to the ruptured aneurysm (β = -0.33, p = 0.002), and tended to be lower in distal segments of the MCA. Distal MCA VCI measured within 72 hours after ictus (baseline) and age predicted DCI with high accuracy (AUC 0.88, 95% bootstrap percentile CI 0.72–0.96) and performed better than elevated CBFV, PI and RI (AUC 0.76, 0.78 and 0.76 resp.).

Conclusion: Baseline distal MCA VCI and age accurately predicted DCI and outperformed traditional TCD biomarkers. It may serve as a non-invasive, bedside biomarker for early DCI prediction in aSAH patients. Future studies with a larger sample size are needed to validate these findings.

Auditorium – Main Hall 08:00-09:00

Sunday 08 November

OP07

Clinical, neurosonological findings and risk factors for late recurrence of craniocervical artery dissection

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Background: Diagnosis of giant cell arteritis (GCA) is currently based on ultrasound evaluation of the temporal arteries which has replaced biopsy. Typical ultrasound findings are the dark halo sign and vessel incompressibility. Although complications of GCA are commonly the result of vasculitis of the head and neck arteries, evaluation of these arteries is not considered part of the systematic evaluation. The aim of our study was to evaluate changes in precerebral and cerebral arteries and follow their dynamics after corticosteroid therapy.

Methods: Patients with GCA diagnosed by an experienced rheumatologist at a single UMC were included from 2022 to 2024. They received corticosteroid therapy at diagnosis. Precerebral doppler ultrasound and transcranial color doppler ultrasound were aimed to be performed within 7 days after treatment. Clinical follow up was performed with additional ultrasound investigations after one month and one year.

Results: 47 patients (75,7 years, 81% female) with GCA were included. The first neurosonological investigation was performed on average 2,7 days from diagnosis (0-9 days). Atherosclerotic changes were found in 41 patients (87%). Pathological changes were evaluated as inflammatory if they clearly differed from atherosclerotic changes, had elements of the dark halo sign or vessel incompressibility and/or had a clear dynamic after corticosteroid therapy. Such changes were detected in 10 patients (21%), six had diffuse vessel wall thickening that was reversable after treatment in two. Two had stenosis of the vertebral artery that improved after therapy in one. Two more had heamodynamic changes in the ophtalmic artery. Six other patients (12%) had ≥70% atherosclerotic stenosis of precerebral vessels.

Conclusions: Our study confirmed that inflammatory changes of precerebral arteries and the ophthalmic artery, especially before or immediately after the start of corticosteroid therapy. It is also possible to follow the dynamic of these changes and assess the efficacy of the corticosteroid therapy.

OP08

Sonographic findings of cervicocranial arteries in a family harboring heterozygot variant of TGFB2 gene

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Background: Severe carotid stenosis is a clinically important vascular disorder associated with increased ischemic stroke risk, highlighting the need for accurate and accessible detection. We previously showed that neck acoustic recordings capture stenosis-induced hemodynamic turbulences and thereby support non-invasive carotid assessment. However, the reported physics-based approach may not have fully leveraged the diagnostic information in these signals, hence, we investigated the added value of machine learning in the acoustic detection of severe carotid stenosis.

Methods: Neck acoustic recordings were obtained with a digital stethoscope from patients undergoing ultrasound for suspected carotid stenosis. Carotid arteries were classified as severe stenosis (≥70%) or non-severe stenosis (<70%). Three models were evaluated for stenosis detection, including 1) the original 10-feature weighted logistic model, 2) a ridge logistic regression model with feature selection from the same 10 features (selection model), and 3) a ridge logistic regression model with feature selection from the same 10 features plus 276, Matlab Toolbox-based, additional features (expansion model). Feature selection followed an add-and-replace strategy with three-fold cross-validation during feature selection, followed by 10-fold cross-validation for model training and evaluation. Areas under the receiver-operating curve (AUCs) for training and testing sets were calculated from in-fold training and out-of-fold validation performance, respectively.

Results: Among 114 recordings, 28 represented severe stenosis. The original model achieved a training AUC of 0.87 and a test AUC of 0.79. The selection model retained one acoustic feature and yielded a test AUC of 0.81. The expansion model retained five features and achieved the best performance with an AUC of 0.90 in the training set and an AUC of 0.88 in the testing set.

Conclusions: Feature-selected machine learning improved acoustic detection of severe carotid stenosis. The expansion model achieved the best performance, supporting machine learning-assisted acoustic analysis as a promising non-invasive detection approach.

Scientific Communications II

Sunday 08 November

Auditorium – Main Hall 08:00-09:00

OP09

Clinical Loop: Development and Preliminary Evaluation of a Web-Based Educational Platform for Ultrasound Training

JORGE PAGOLA[1], JESUS JUEGA[2], JUAN ALVAREZ-CIENFUEGOS[3], GIULIO FIORE[1], CLAUDIA MEZA[1], NOELIA RODRIGUEZ[1], ADRIANO BONURA[1], RADIM LICENIK[4]

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Background: Carotid stenoses represent a frequent cause of ischemic strokes. Diagnosis relies heavily on ultrasound. Manual stethoscope auscultation is discouraged due to low sensitivity (~50%) and specificity (~80%). A new mobile device ("BodyTune") digitally records neck artery flow murmurs.

Aim of this study is to compare sonographic findings with auscultatory findings obtained using a new handheld device with AI-driven signal processing.

Methods: This monocentric, prospective feasibility study includes 30 patients with unilateral, proximal internal carotid artery stenosis (≥ 50% per NASCET). All participants undergo standardized clinical and ultrasound examinations. Both sides of the neck are auscultated using the BodyTune handheld device. The primary endpoint evaluates significant audio profile differences between stenotic and non-stenotic carotids. Secondary endpoints evaluate differences based on stenosis severity (≥ 70%), symptom status, and 12-month progression.

Results: As a pilot study, data analysis remains primarily descriptive. First results will be presented at the WON/ESNCH Congress.

Conclusion: This study represents the first clinical feasibility test for automated carotid auscultation. Identifying characteristic audio profile differences could validate further research. In the long term, this technology may offer a non-invasive, AI-supported screening tool to complement ultrasound diagnostics

OP10

Ethnic Variation in Carotid Bulb Morphology and Vascular Geometry: Insights from Ultrasound Assessment

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Background: Postmortem examination of the carotids of patients carrying cerebral aneurysms has shown arterial wall structural changes, especially increased stiffness, that might be associated with an elevated risk of rupture. Previous use of ultrasound and tonometry have been used but considered as not very accurate. We used a new ultrasound technology to assess over the cardiac cycle carotid arterial diastolic/systolic stiffening.

Methods: We performed in vivo ultrafast ultrasound of the common carotid arteries in a population of patients suffering from ruptured, unruptured cerebral aneurysms and without cerebral aneurysms. Patients were accordingly divided in 3 groups and matched for vascular risk factors. Patients known for carotid arterial or arterial elastic diseases were excluded. Carotid diameter, IMT pulse wave velocity, were measured in all patients using a 6.4 MHz linear transducer and statistically compared.

Results: 90 patients (30 with unruptured, 30 with ruptured cerebral aneurysms and 30 healthy) were retained. Overall average age of the patients was 56±12years. Average IMT was 0.57±0.12mm, average carotid artery diameter 0.59±0.08cm, average blood pressure (131.6±19.51;72.72±10.72mmHg), average heart rate 71.66±11.67/min. Early systole and end diastole pulse wave velocities along with increased IMT of the common carotid artery were significantly decreased (p-value< 0.001) in the cerebral aneurysm ruptured group as compared with the unruptured and healthy patients groups.

Conclusions: Our study shows that ultrafast ultrasound might be a novel rapid, non-invasive screening and monitoring tool in the evaluation of the risk of cerebral aneurysm rupture. This unexpected behavior of common carotid arterial elastic properties in the cerebral aneurysm ruptured group suggests a pressure independent underlying arteriopathy.

Auditorium – Main Hall 08:00-09:00

Sunday 08 November

OP11

Left ventricular thrombus detected by neurologist-performed focus after acute ischemic stroke: A four-year multidisciplinary follow-up

NATHALIA BARROS FERREIRA[1], ANA INÊS MARTINS[1], FERNANDO SILVA[1], EMANUEL MARTINS[1], JOÃO ANDRÉ SOUSA[1]
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Background: Neurovascular coupling (NVC) reflects the integrity of the neurovascular unit and may be impaired across the multiple sclerosis (MS) disease continuum. Whether cognitive performance influences the relationship between NVC and structural white matter (WM) damage in MS remains unexplored.

Methods: Seventy-six patients with MS underwent NVC assessment using transcranial Doppler (TCD) ultrasound in the middle cerebral artery (MCA) and posterior cerebral artery (PCA) territories, using N-Back and visual flickering-checkerboard paradigms, respectively. Cognitive function was evaluated with a comprehensive neuropsychological battery, yielding four composite domains: attention, executive function, memory, and global cognition. Brain MRI quantified white matter hyperintensity (WMH) and both grey matter (GM) and WM volumes. Multivariate linear regression was adjusted for age, sex, race, disease duration, EDSS, and vascular risk factors.

Results: Most participants had relapsing-remitting MS (93%), median disease duration of 8 years, median EDSS of 2, and 66% had at least one vascular risk factor. NVC MCA showed no significant correlation with WMH burden or with any cognitive measure. In patients with higher executive function scores, higher PCA NVC was significantly associated with lower WMH burden (β=–0.104, 95% CI [–0.176, –0.033], p=0.007). In patients with higher global cognitive scores, higher PCA NVC was associated with both lower WMH burden (β=–0.116, 95% CI [–0.222, –0.009], p=0.035) and lower WM volume (β=–0.001, 95% CI [–0.002, –0.000], p=0.022). No association was found between PCA NVC and GM volume across any cognitive stratum.

Conclusions: Preserved PCA neurovascular function is associated with lower WM lesion burden, specifically in MS patients with better executive and global cognitive performance, while MCA NVC showed no relationship. These findings suggest that cognition may define a subgroup of MS patients in whom PCA NVC efficiency confers relative structural resilience, supporting its potential role as a non-invasive biomarker for risk stratification.

OP12

Transcanial doppler ultrasound for hemodynamic flow pattern characterization in cerebral arteriovenous malformation: A clinical case

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Background: The contribution of the autonomic nervous system (ANS) to cerebral haemodynamics under resting conditions remains debated. We hypothesised that sympathetic and parasympathetic influences are detectable even at rest, independent of blood pressure and carbon dioxide.

Methods: Ninety-nine healthy subjects (44 women; median age 42 years, IQR 30–59) were studied supine at rest. Cerebral blood flow velocity (CBFV) was assessed bilaterally by transcranial Doppler; blood pressure (BP) by finger photoplethysmography; end-tidal CO_2 ($EtCO_2$) by capnography. ANS indices — RRISD, low-frequency (LF) and high-frequency (HF) power spectral density (PSD) components with LF/HF ratios from inter-heartbeat-interval (RRI) and systolic BP (sysBP) time series, and baroreflex sensitivity (BRS) — were related to cerebrovascular resistance (CVR), dynamic cerebral autoregulation (dCA) gain and phase via transfer function analysis (TFA), and CBFV. MeanBP, sysBP, and $EtCO_2$ served as covariates. Univariate predictors ($p \leq 0.05$) entered a multiple linear regression (MLR); effect sizes were estimated by Cohen's f^2.

Results: MLR identified independent ANS contributions across all cerebral haemodynamic variables. CBFV was positively associated with sympathetic indices (LF/HF ratios of RRI and sysBP PSDs) and RRISD, alongside age (left: adjusted R^2=0.421; right: 0.350). CVR was driven by meanBP and age, with an additional sympathetic contribution (LF/HF RRIdem PSD) on the right. dCA gain in the autoregulatory LF range depended on age and meanBP variability bilaterally; HF gain was modulated by RRISD and $EtCO_2$SD. dCA phase was associated with BP variability and $EtCO_2$ in the LF range; HF phase with RRI, sysBP, and $EtCO_2$. Consistent left-to-right hemispheric asymmetries were observed across multiple relationships.

Conclusions: This study provides quantitative evidence that ANS tone shapes cerebral haemodynamics even under undisturbed resting conditions. Sympathetic activity augments CBFV and CVR, while parasympathetic indices attenuate CVR; dCA is modulated by BP variability as a sympathetically driven intermediate. The observed hemispheric asymmetries warrant dedicated follow-up studies.

ABSTRACT

PP01 - PP71

e-Poster Viewing

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP01

Inflammatory biomarkers, oral health, and subclinical vascular remodeling assessed by carotid ultrasound in a pediatric population: a cross-sectional study

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Background: Although clinical manifestations of atherosclerosis predominantly emerge in adulthood, cardiovascular risk factors and behaviors originate in childhood. The interplay between adiposity, systemic inflammation, insulin resistance, and subclinical vascular remodeling in prepubertal children remains incompletely characterized.

Methods: Cross-sectional study of 117 children aged 6–10 years, categorized as normal weight (BMI z-score ≤1; n=58), overweight (1<z≤2; n=29), or obese (z>2; n=30). Bilateral mean carotid intima-media thickness (cIMT) was calculated as the average of left and right carotid IMT measurements. Fasting lipid profile, glucose, insulin, HOMA-IR, high-sensitivity CRP (hs-CRP), TNF-α, and adiponectin were assessed. Body fat percentage (BF%) was determined by bioelectrical impedance. Oral health was evaluated using the decayed, missing, and filled teeth index (DMFT). Statistical analyses included Mann-Whitney, Kruskal-Wallis, Spearman correlations, ROC analysis with bootstrapped 95% confidence intervals, and multivariate regression.

Results: Obese children exhibited significantly higher insulin (5.20 vs. 2.95 µUI/mL), HOMA-IR (1.020 vs. 0.559), hs-CRP (0.110 vs. 0.045 mg/dL), triglycerides (p=0.034), and systolic blood pressure (p=0.028). Mean bilateral cIMT was significantly greater in obese vs. normal-weight children (0.484 vs. 0.453 mm; p=0.046). BF% was independently associated with bilateral cIMT in both bivariate (Spearman ρ=0.233; p=0.038) and multivariate analyses (OLS p=0.026). Higher DMFT scores were weakly but significantly associated with greater BF% (ρ=0.288; p=0.006), insulin (ρ=0.233; p=0.033), and HOMA-IR (ρ=0.224; p=0.041), with no detectable association with bilateral cIMT or circulating inflammatory biomarkers.

Conclusions: Obesity in school-age children is associated with measurable subclinical arterial remodeling detectable by carotid ultrasound as early as 6–10 years of age. BF% by bioimpedance was independently associated with vascular remodeling. The weak yet significant association between dental caries burden and insulin resistance suggests shared cardiometabolic determinants rather than a direct vascular pathway. These findings may support carotid ultrasound as a complementary tool for subclinical cardiovascular risk investigation in pediatric obesity.

PP02

Ocular sonography revealing Optic Disc Drusen mimicking optic disc edema leading to Intracranial Hypertension misdiagnosis

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Background: Idiopathic intracranial hypertension (IIH) commonly presents with papilledema, making optic disc edema (ODE) on fundoscopy a critical diagnostic sign. However, pseudoedema from optic disc drusen (ODD) may mimic papilledema, leading to misdiagnosis and unnecessary invasive testing.

Case presentation: We describe a 27-year-old overweight man with type 1 diabetes mellitus who was referred for suspected IIH after "papilledema" was reported on routine fundoscopy. Brain MRI and MRV were normal, and the patient was asymptomatic with preserved visual acuity. As part of our standard protocol before lumbar puncture, ocular ultrasound was performed. It revealed normal optic nerve sheath diameter but confirmed ODE with bilateral hyperechoic, highly reflective structures at the optic nerve heads, consistent with calcified ODD.

Conclusion: This case highlights the role of ocular ultrasound not only in evaluating raised intracranial pressure but also in detecting alternative causes of optic nerve head elevation. Routine incorporation of ocular ultrasound before lumbar puncture in young patients with suspected IIH may prevent misdiagnosis, reduce unnecessary invasive procedures, and optimize patient management.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP03

Sonographic Assessment of Substantia Nigra and Electrophysiological Evaluation of the Masseter Inhibitory Reflex in Patients with Amyotrophic Lateral Sclerosis (ALS)

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Background: Amyotrophic Lateral Sclerosis (ALS) is increasingly recognized as a multisystem neurodegenerative disorder extending beyond upper and lower motor neuron degeneration. Previous studies have reported substantia nigra (SN) hyperechogenicity in ALS, suggesting involvement of extrapyramidal and subcortical structures.

Objective: To investigate structural and functional abnormalities of the brainstem and subcortical pathways in patients with ALS using transcranial sonography of the substantia nigra and the Masseter Inhibitory Reflex (MIR).

Methods: This single-center prospective study was conducted at the Second Department of Neurology, in Attikon University Hospital, between March 2024 and March 2026. Twenty-five newly diagnosed patients with ALS and 25 age- and sex-matched healthy controls were included. All patients underwent neurological examination, electrophysiological assessment, ALS Functional Rating Scale-Revised (ALSFRS-R) evaluation, MIR testing, and transcranial sonography of the substantia nigra.

Results: The mean age of patients was 57 years; 16 were male and 9 female. Nine patients had bulbar involvement. The mean ALSFRS-R score was 38 ± 4. Brisk jaw jerk was observed in 7/9 patients with bulbar symptoms compared with 2/16 patients without bulbar involvement. SN hyperechogenicity was detected in 33% (3/9) of patients with bulbar involvement and in 16% (2/16) of those without bulbar symptoms. The mean hyperechogenic area was larger in patients with bulbar involvement than in healthy controls (0.23 cm^2 vs. 0.13 cm^2). Regarding MIR, no inhibitory response was recorded in 36% (9/25) of patients, while 24% (6/25) exhibited a single silent period with normal latency and duration. In 36% (9/25) of patients, SP1 was normal; however, one-third of these patients (3/9) showed prolonged latency and increased duration of SP2.

Conclusions: Patients with ALS exhibit both structural abnormalities of the substantia nigra and functional impairment of inhibitory brainstem circuits. These findings support the concept that ALS is a multisystem neurodegenerative disease involving not only motor neurons but also subcortical and brainstem networks.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP04

Use of point-of-care and interventional ultrasound modules developed for hybrid mobile stroke units

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Background: Hybrid mobile stroke units (h-MSU) are specialised ambulances despatched to patients with conditions extended beyond stroke including other neurological emergencies. They are equipped with a mobile CT scanner as well as with ultrasounds, x-ray, ECG, EEG, complex point-of-care laboratory equipment and can provide advanced neurointensive care including intravenous thrombolysis in pre-hospital settings. Czech MSU team and World Organisation of Neurosonology POCUS FoCUS (point-of-care and focused cardiac ultrasound) working group developed multimodule POCUS programme that can be used in many healthcare settings. One of the modules is MSU-POCUS that combines cardiac, medical, neuro, vascular and interventional modalities.

Methods: Five POCUS modules were combined:
Focused cardiac ultrasound
Medical: lungs, abdominal, urinary tract, DVT
Neuro: transcranial and transorbital sonography
Vascular: transcranial Doppler, carotid, vertebral and temporal arteries, aorta
Interventional: ultrasound guided peripheral and central access

The MSU-POCUS was used during the "Challenging geographical condition: How Hybrid-Mobile Stroke Units can contribute to appropriate treatment times" trial in Czechia in the Zlin-Valmez region from October to December 2023.

Results: H-MSU was dispatched to a total of 54 calls, treated 46, six of them received intravenous thrombolysis (with median arrival to needle time of 30 minutes, 17 – 36 minutes) and one patient was transferred to the CSC following CTA detected LVO. MSU-POCUS was performed in nine patients: FoCUS (2), lungs (2), urinary tract (1), carotid (5), peripheral line (4).

Conclusions: MSU-POCUS used in h-MSU's in pre-hospital emergency care settings is a feasible, safe, rapid and efficient tool adding multiple useful modalities to standard care.

PP05

WON multimodule point-of-care ultrasound in neurology and stroke medicine

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Background: Point-of-care ultrasound (POCUS) has been expanding across numerous medical disciplines, including neurology, cardiology, and internal medicine, providing rapid bedside answers to specific clinical questions. Its versatility enables application across diverse healthcare settings, from pre-hospital emergency care to rehabilitation.

Methods: The WON FOCUS POCUS working group initiated a systematic multimodule POCUS development programme in 2021. The process encompassed clinical demand surveys, literature reviews, clinical question formulation, module design, and training programme development, implementation, and validation. A dedicated syllabus, curriculum, and governance framework were established for each module within a structured educational programme.

Results: Seven clinically driven POCUS modules were developed, each illustrated by representative clinical scenarios:
Focused cardiac ultrasound
Medical — lungs, abdomen, urinary tract, deep vein thrombosis
Neuro — transcranial, transorbital, peripheral nerves, muscles
Vascular — transcranial Doppler, temporal artery, limb vasculature, aorta
Interventional — peripheral and central vascular access, lumbar puncture
Pre-hospital
Mobile Stroke Unit

Conclusions: All seven modules were developed in direct response to the needs of daily clinical practice. Following implementation and evaluation, the integrated multimodule POCUS system — supported by a robust, high-quality educational and training programme — demonstrated high clinical value across settings.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP06

Ultrasound-assisted lumbar puncture in neurological practice: First-pass success and procedural outcomes from a prospective observational study

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Background: Lumbar puncture (LP) is an established diagnostic intervention, but landmark-guided palpation techniques can be technically challenging in certain patient cohorts, potentially contributing to procedural failure or traumatic attempts. While real-time needle guidance is described, pre-procedural static ultrasound mapping represents an alternative workflow. This study evaluates the clinical utility of pre-procedural bedside ultrasound for mapping anatomical landmarks, intervertebral spaces, and target depth in patients undergoing LP within an outpatient clinic.

Methods: This prospective observational study was performed sequentially in an Ambulatory Care Unit clinic from February 2025 to May 2026. Interventions were conducted weekly by a single clinician. Prior to needle insertion, a structured static bedside ultrasound protocol was executed to locate the midline, identify the optimal lumbar intervertebral space, and calculate depth to the ligamentum flavum. Key endpoints included first-pass success, overall success, specialized needle utilization, and procedural complications. Subgroup analyses focused on obese patients (BMI > 30 kg/m²).

Results: A total of 49 sequential patients underwent ultrasound-assisted LP (Indications: suspected idiopathic intracranial hypertension, n=25; suspected neuroinflammatory/demyelinating states, n=24). The cohort demonstrated an overall first-pass success rate of 98.0% (n=48/49) and a 100% final procedural success rate. Safety endpoints revealed a 0.0% traumatic tap rate (n=0) and a 2.0% post-LP spinal headache rate (n=1). Subgroup analysis of obese patients (BMI > 30 kg/m²; n=24) showed a 95.8% first-pass success rate (n=23/24), with 29.2% (n=7/24) requiring a long spinal needle guided directly by pre-procedural depth metrics.

Conclusions: Pre-procedural spinal ultrasound is associated with high first-pass and overall procedural success rates and low complication rates in a consecutive cohort of neurological patients. Ultrasound mapping facilitates anatomical localisation and supports pre-procedural needle selection, particularly in patients with obesity undergoing lumbar puncture.

PP07

Clinical, neurosonological findings and risk factors for late recurrence of craniocervical artery dissection

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Background: The risk of late recurrence of craniocervical artery dissection (CCAD) beyond one year is considered low and has not been prospectively studied.

Methods: To assess the risk factors associated with late CCAD recurrence, we analyzed clinical and neurosonological data from a cohort of patients who underwent long-term clinical and neurosonological follow-up. In this single-center study, 128 patients with CCAD were followed clinically and neurosonologically. Demographic data, neurosonological findings at baseline and follow-up, vascular risk factors, dissection-related risk factors, and genetic testing results were analyzed. Data are presented descriptively.

Results: The median follow-up duration was 7 years. Late CCAD recurrence occurred in 4 out of 128 patients. Two patients had involvement of one internal carotid artery (ICA), one patient had involvement of both ICAs, and one patient had involvement of both ICAs and one vertebral artery. Clinical symptoms were mild and transient, and imaging revealed no evidence of new ischemic lesions. Connective tissue disease was identified as a risk factor in 2 of 128 patients. One patient was a smoker with fibromuscular dysplasia, and in one patient, genetic testing results are still pending.

Conclusions: Late CCAD recurrence is rare, appears to be associated with underlying vasculopathy, and is generally characterized by mild and transient symptoms.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP08

Sonographic findings of cervicocranial arteries in a family harboring heterozygot variant of TGFB2 gene

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Background: Loeys–Dietz syndrome is an autosomal dominant aortic aneurysm disorder with widespread systemic involvement. The diagnosis should be confirmed by genetic testing.

Methods: A 50-year-old male patient with angina pectoris underwent a comprehensive cardiac evaluation, which revealed moderately severe mitral insufficiency. Carotid color Doppler ultrasonography demonstrated marked tortuosity of the craniocervical arteries, with multiple kinks and coils involving nearly all examined vessels. In addition, a fusiform aneurysm of the right vertebral artery in the distal V1 segment was identified and subsequently confirmed by computed tomography angiography (CTA). Genetic analysis identified a heterozygous variant of uncertain significance in the TGFB2 gene. A clinical geneticist was consulted, and cascade genetic testing was performed across the patient's family, demonstrating the presence of the same variant in multiple relatives. Consequently, a comprehensive neurosonological evaluation was conducted in all affected family members.

Results: The patient's father exhibited diffuse tortuosity of the craniocervical arteries. The patient's brother demonstrated irregular vessel walls involving both internal carotid arteries (ICAs). The 19-year-old son of the index patient exhibited S-shaped tortuosity of one internal carotid artery and combined tortuosity with a fusiform aneurysm of the contralateral ICA. Based on the clinical, imaging, and genetic findings, the consulting geneticist concluded that the identified TGFB2 variant is consistent with Loeys–Dietz syndrome type IV, presenting with a relatively mild clinical phenotype.

Conclusion: This was the first use of neurosonology to identify and reclassify a genetic variant from unknown to significant.

PP09

Clinical Loop: Development and Preliminary Evaluation of a Web-Based Educational Platform for Ultrasound Training

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Background: Point-of-care ultrasound (POCUS) has become an essential diagnostic and educational tool across multiple medical specialties. However, access to structured training resources remains heterogeneous. We developed *Clinical Loop*, a web-based educational platform designed to facilitate ultrasound training.

Methods: The design of Clinical Loop was informed by a systematic literature review conducted according to PRISMA recommendations. Comprehensive searches were performed in PubMed, Scopus, ScienceDirect, and Google Scholar. Filters were applied to include review articles published in English or Spanish during the previous five years. Study selection and screening were performed using Covidence®. Articles lacking abstracts, unrelated to healthcare ultrasound, ultrasound education, or vascular ultrasound training were excluded. A complementary review of ultrasound educational applications was conducted using the same methodology, alongside a mapping of Android and iOS app repositories to identify relevant functionalities, educational resources, and user-reported features. Based on these findings, low-fidelity wireframes and high-fidelity mockups were developed as proof-of-concept prototypes.

Results: Clinical Loop integrates educational documents, training videos, curated scientific literature, recommendations for accredited ultrasound courses, opportunities for hands-on hospital-based training, and the possibility of receiving portable ultrasound probes for supervised learning. The platform includes anonymized ultrasound videos from healthy volunteers and patients, each accompanied by explanations of image acquisition techniques, anatomical landmarks, and pathological findings. A usability evaluation involving neurologists and family physicians demonstrated high acceptability. Overall, 77.8% of respondents agreed that the platform was not complex, 100% reported that technical support would not be required, and 77.8% agreed that most users would rapidly learn to use the application. Educational content was positively rated, with 88.9% agreeing that videos were understandable and educationally valuable.

Conclusions: Clinical Loop represents a comprehensive digital ecosystem for ultrasound education. Initial usability testing demonstrated high user acceptance and perceived educational value, supporting further development and validation in larger healthcare populations.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP10

Ethnic Variation in Carotid Bulb Morphology and Vascular Geometry: Insights from Ultrasound Assessment

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Background: Ethnic differences in cerebrovascular atherosclerosis distribution are well established, with extracranial carotid disease occurring more frequently in White populations and intracranial disease predominating among Asian populations. While carotid bifurcation geometry has been implicated in local hemodynamics, ethnic differences in systemic vascular organization remain poorly understood. We investigated ethnic variation in carotid geometry and intersegmental vascular scaling using ultrasonography.

Methods: This prospective cross-sectional study included 200 adults (100 Caucasian and 100 Asian participants) without clinically relevant carotid artery stenosis. Bilateral ultrasound measurements of the common carotid artery (CCA), carotid bulb (CB), internal carotid artery (ICA), external carotid artery (ECA), and vertebral artery (V2 segment) were obtained using a standardized protocol. Proportional vessel geometry was assessed using diameter ratios (CB/ICA, CB/CCA, ICA/CCA, ECA/CCA, ECA/ICA, and outflow-to-inflow ratio ($(ICA^2+ECA^2)/CCA^2$)). Mixed linear models adjusted for demographic and vascular risk factors were applied. Exploratory analyses assessed intersegmental scaling relationships and carotid–vertebral arterial coupling.

Results: Asian participants demonstrated a significantly lower CB/ICA ratio, reflecting a proportionally smaller CB relative to ICA caliber, while CB/CCA, ICA/CCA, and outflow-to-inflow ratios were higher compared with Caucasian participants. Ethnic differences remained robust after multivariable adjustment. Beyond proportional geometry, Asian participants exhibited stronger intersegmental vascular coupling, including steeper CCA/CB-to-ICA scaling relationships and stronger ICA–V2 associations, suggesting distinct vascular organizational patterns between populations.

Conclusions: Ethnic differences in carotid bifurcation anatomy extend beyond localized carotid geometry and involve broader intersegmental vascular organization. These findings suggest population-specific vascular scaling phenotypes that may contribute to ethnic variation in cerebrovascular disease distribution and merit further hemodynamic investigation.

PP11

Left ventricular thrombus detected by neurologist-performed focus after acute ischemic stroke: A four-year multidisciplinary follow-up

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Background: Left ventricular (LV) thrombus is a recognized cause of cardioembolic stroke. Focused cardiac ultrasound (FoCUS), integrated within a point of care assessment, may facilitate bedside detection and longitudinal monitoring of cardiac embolic sources in stroke patients.

Methods: A 63-year-old man with a remote history of myocardial infarction presented with a left total anterior circulation stroke syndrome (NIHSS 23). Computed tomography angiography demonstrated a proximal left middle cerebral artery (M1) occlusion. Mechanical thrombectomy achieved complete reperfusion (TICI 3) with full neurological recovery. Etiological investigation included cervical and transcranial duplex ultrasound, Holter monitoring, neurologist-performed FoCUS, formal transthoracic echocardiography (TTE), and serial FoCUS assessments integrated into long-term neurological and cardiological follow-up.

Results: Neurosonological evaluation revealed only mild extracranial atherosclerosis without hemodynamically significant stenosis. Holter monitoring showed sinus rhythm. Bedside FoCUS performed by the neurologist identified a non-mobile hyperechoic apical LV mass associated with severe systolic dysfunction, prompting expedited cardiological assessment. Formal TTE confirmed a 30 × 14 mm adherent apical thrombus, spontaneous echo contrast, apical akinesia, and severely reduced left ventricular ejection fraction (LVEF 27%). The patient was treated with warfarin, a high-intensity statin, and guideline-directed heart failure therapy. Serial FoCUS examinations were subsequently used to monitor thrombus evolution, ventricular function, and treatment response. Progressive thrombus resolution was documented and later confirmed by comprehensive echocardiographic studies. Because of unstable INR values, anticoagulation was switched to edoxaban, with ongoing FoCUS surveillance supporting therapeutic management. During four years of multidisciplinary follow-up, no recurrent cerebrovascular events occurred. LVEF improved from 27% to 47% in 2024 and to 51% in 2026, while apical akinesia persisted.

Conclusions: This case highlights the value of neurologist-performed FoCUS bedside in the stroke unit for identifying and later monitoring cardioembolic sources after stroke, supporting therapeutic decisions and favorable long-term outcomes.

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PP12

Transcanial doppler ultrasound for hemodynamic flow pattern characterization in cerebral arteriovenous malformation: A clinical case

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Background: Cerebral arteriovenous malformations (AVMs) induce low-resistance arteriovenous shunting with profound distortion of cerebral hemodynamics. Transcranial Doppler (TCD) ultrasound enables real-time quantification of these alterations through velocity indices and spectral waveform analysis.

Methods: We present a clinical case of a cerebral AVM involving the left middle cerebral artery (MCA) M2 segment. Serial transcranial Doppler (TCD) assessments were performed, analyzing mean flow velocity (MFV), pulsatility index (PI), systolic/diastolic (S/D) ratio, Lindegaard ratios, and hemispheric asymmetry. Hemodynamic patterns were interpreted to distinguish feeding arterial flow and global circulatory adaptation.

Results: Profound hemispheric asymmetry was identified. The left MCA demonstrated markedly elevated MFV (120.9 cm/s) with reduced PI (0.7) and S/D ratio (1.91), consistent with a high-flow, low-resistance feeding artery.The contralateral MCA showed preserved resistance (MFV 41.9 cm/s; PI 0.8; S/D 2.08). Upstream recruitment was evident in the left internal carotid artery (MFV 51.3 cm/s; PI 0.5), with a Lindegaard ratio of 2.2, excluding vasospasm. Global hemodynamic redistribution was suggested by low-resistance basilar flow (MFV –60.7 cm/s; PI 0.62). Spectral morphology demonstrated increased diastolic flow and reduced pulsatility, defining a characteristic AVM hemodynamic signature. These findings directly prompted escalation of monitoring and supported indication for endovascular embolization.

Conclusions: TCD enables high-resolution bedside characterization of AVM hemodynamics. The integration of MFV, PI, and spectral morphology permits identification of feeding arterial patterns, exclusion of vasospasm, and detection of systemic flow redistribution. This approach provides actionable physiological data that directly informs therapeutic strategy in neurovascular disease.

PP13

Longitudinal TCD-BHI monitoring during donanemab therapy in early Alzheimer's disease: A proof-of-concept case report

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Background: Amyloid-Related Imaging Abnormalities (ARIA) represent the major safety concern during anti-amyloid monoclonal antibody therapy in Alzheimer's disease (AD). Increasing evidence supports a close interaction between vascular amyloid pathology, neurovascular unit dysfunction and cerebrovascular reactivity (CVR). In previous studies our group demonstrated that impaired CVR assessed by transcranial-Doppler Breath-Holding-Index (TCD-BHI) is associated with AD-core pathology and plasma/CSF biomarkers. We report the first longitudinal CVR monitoring data from an early AD patient undergoing donanemab.

Methods: A 70-year-old male patient with Mild Cognitive Impairment due to AD (MMSE 28/30;APOE ε2/ε4;A+T+N+) undergoing donanemab therapy within the NAVIGATE-AD prospective study underwent serial TCD-BHI assessment integrated with MRI surveillance and clinical monitoring. Baseline evaluation was performed immediately before the first infusion (February 2026), with follow-up reassessment one month later before the second infusion.

Results: Baseline CVR showed a mean flow velocity (MFV) increase from 55 cm/s to 73 cm/s during apnea, (BHI:1.09). During early treatment exposure, cerebrovascular reactivity progressively increased before scheduled MRI. At one-month follow-up, MFV increased from 57 cm/s to 82 cm/s, with BHI improvement to 1.46. MRI surveillance subsequently detected a single asymptomatic ARIA. Despite radiological ARIA, the patient remained clinically stable with early subjective cognitive benefit during therapy. Interestingly, longitudinal BHI modulation preceded MRI-detected vascular changes, suggesting that dynamic CVR alterations may occur earlier than structural neuroradiological manifestations.

Conclusions: This preliminary proof-of-concept observation supports the hypothesis that longitudinal TCD-BHI monitoring may dynamically reflect neurovascular responses during anti-amyloid therapy. Within the proposed framework of a dynamic balance between parenchymal and vascular amyloid burden during amyloid clearance; ARIA may represent the structural expression of vascular amyloid mobilization, while CVR changes could reflect earlier functional vascular adaptation. If confirmed in larger cohorts, TCD-BHI could provide an accessible, non-invasive biomarker capable of anticipating MRI changes and supporting integrated real-world monitoring strategies during anti-amyloid therapy.

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PP14

Quantifying Variability in Transcranial Doppler Microembolic Signals: From Frequency Modulation Index to Intra-Event Velocity Variability

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Background: Transcranial Doppler (TCD) monitoring detects microembolic signals (MES) in cerebral circulation. Although MES detection is well established, reliable differentiation between gaseous and solid emboli remains challenging. We developed a Frequency Modulation Index (FMI) to quantify cycle-to-cycle variability in Doppler signals. While FMI provides an intuitive clinical descriptor of signal dispersion, its discriminative capacity for embolus composition is unclear.

Objective: To evaluate the performance of FMI and intra-event velocity variability in differentiating gaseous and solid emboli.

Methods: TCD recordings containing 10 gaseous and 10 solid embolic events were analyzed. FMI was defined as: FMI = [t max – t min / t mean] × 100 % where t represents individual zero-crossing intervals within a 10 ms moving window. In addition, instantaneous Doppler velocity was derived from zero-crossing periods, and intra-event velocity variability was quantified as the standard deviation (SD) of velocity within ±20 ms around each event. Group differences were assessed using Welch's t-test and Mann–Whitney U test.

Results: FMI values showed substantial overlap between gaseous and solid emboli and did not significantly discriminate between groups. In contrast, intra-event velocity variability was markedly higher for gaseous emboli (46.9 ± 17.0 cm/s) compared to solid emboli (17.2 ± 7.9 cm/s; p = 0.00026). Effect size was large (Cohen's d = 2.23).

Conclusion: While FMI provides a clinically intuitive index of Doppler signal variability, intra-event velocity variability more accurately reflects the underlying physical behavior of emboli. Velocity SD appears to be a promising quantitative bio

PP15

S2 Phase–Locked Turbulence Signals Mimicking Microemboli in Transcranial Doppler: A Distal, Reflection-Driven Haemodynamic Phenomenon

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Background: Transcranial Doppler (TCD) is widely used for detection of cerebral microembolic signals (MES). However, haemodynamic phenomena, particularly flow-related turbulence, may generate high-intensity transient signals (HITS) that mimic emboli. Differentiating true MES from artefacts remains clinically important.

Methods: We performed a retrospective analysis of a high-quality TCD recording in a male 72 yrs old patient undergoing 25-minute middle cerebral artery (MCA) monitoring for assessment of embolic activity. Automated detection was performed using the Delica Advanced Solid/Artefact Algorithm with a threshold of ≥3 dB. All signals were independently reviewed by experienced TCD experts according to international consensus criteria. Signals were classified as MES only if they fulfilled all established criteria, including random occurrence within the cardiac cycle.

Results: A total of 412 HITS were detected. Expert verification identified 100% of signals as artefacts. Of these, 87% were classified as systolic turbulence artefacts occurring consistently during the S2 phase, approximately 200 ms after systolic onset. The remaining signals were attributed to movement (12%) and speech (1%). No true MES were identified. The detection algorithm achieved an overall classification accuracy of 92.5%. S2-related signals showed strict cycle-locking, short duration (~20 ms), and high intensity, closely mimicking embolic signals.

Conclusion: S2 phase–locked turbulence signals represent a distinct, non-embolic haemodynamic phenomenon that may closely mimic MES in TCD recordings. Their strict temporal coupling to the cardiac cycle distinguishes them from true emboli. These signals likely reflect reflection-driven haemodynamic effects occurring distally in the MCA, potentially related to proximal arterial pathology. Recognition of this pattern is essential to avoid false-positive embolus detection while prompting appropriate vascular evaluation.

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PP16

Characterization of carotid and vertebral artery flow spectra in cerebral circulatory arrest: A combined transcranial and extracranial doppler case series of 12 ICU patients with brain death

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Background: Cerebral circulatory arrest (CCA) underlies brain death, yet its bedside detection by transcranial color-coded Doppler (TCCD) is limited by inadequate temporal acoustic windows, reported in 8–20% of adults and exceeding 30% in ICU populations. Confirmatory angiography requires hazardous intrahospital transport and may show residual flow in clinically brain-dead patients, delaying diagnosis. The World Federation of Neurology consensus requires both intracranial and extracranial confirmation of CCA. When the temporal window is absent or insufficient, the extracranial internal carotid (ICA) and vertebral arteries (VA) may be the only accessible insonation site, yet their flow characteristics in CCA remain underreported.

Methods: In patients with angiographically confirmed absence of cerebral perfusion, a complete Doppler protocol was performed. We assessed all accessible intracranial arteries on TCCD (middle, posterior, and anterior cerebral arteries), the common, external, and internal carotid arteries, and the vertebral arteries. The aim was to characterize ICA and VA flow patterns in brain death, defining the typical extracranial appearance of CCA to inform future bedside selection of patients for confirmatory angiography. Recorded patterns included oscillating flow, short early-systolic spikes, and loss of documented signal.

Results: Twelve patients with angiographically confirmed brain death were studied. In all patients, the ICA and VA demonstrated characteristic CCA spectra — either oscillating flow or short early-systolic spikes. Where the temporal window was absent or no transtemporal flow could be visualized, these spectra were reliably identified in the cervical ICA and VA, providing non-invasive evidence of CCA when TCCD alone was non-diagnostic.

Conclusions: Extracranial ICA and VA Doppler reliably demonstrated characteristic CCA spectra in confirmed brain death, including when the temporal window was unavailable. This approach overcomes the principal limitation of TCCD and may serve as a valuable adjunct in the brain-death workup, especially in ICU patients in whom transport carries risk. These findings merit prospective validation

PP17

Transcranial color-coded Doppler monitoring in acute liver failure due to paracetamol intoxication: A case report of cerebral hemodynamic recovery following liver transplantation

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Background: Acute liver failure (ALF) is associated with a high risk of intracranial hypertension (ICH), occurring in up to 65–75% of patients with grade 4 hepatic encephalopathy (HE), and contributing to approximately 30% of deaths. Invasive ICP monitoring carries significant bleeding risk in the context of ALF-related coagulopathy. Current guidelines (EASL, SCCM, INASL) recommend transcranial Doppler as a non-invasive alternative for cerebral hemodynamic monitoring. We present a case demonstrating the utility of transcranial color-coded Doppler (TCCD) in guiding clinical decision-making and objectively confirming hemodynamic recovery following orthotopic liver transplantation (OLTx).

Methods: A 45-year-old female patient was admitted to the ICU with ALF secondary to paracetamol intoxication (MELD 41, HE grade 4, ammonia 155 µmol/l). Serial TCCD examinations of bilateral MCA (M1 segment) were performed at admission (17.02), following initiation of continuous veno-venous hemodialysis (CVVHD) on day 2 (18.02), and post-OLTx (21.02). Pulsatility index (PI) was recorded bilaterally at each time point.

Results: On admission, TCCD demonstrated markedly elevated PI bilaterally (L MCA: 1.85; R MCA: 1.86), consistent with raised ICP and impaired cerebral perfusion. Following CVVHD initiation and partial ammonia reduction, modest hemodynamic improvement was observed (L MCA: PI 1.64; R MCA: PI 1.63). Persistent high-resistance pattern prompted escalation to urgent OLTx (19.02). Post-transplant TCCD (21.02) demonstrated full normalization of waveform morphology with restoration of low-resistance pattern and diastolic flow. Ammonia levels declined progressively following OLTx, normalizing to below the reference range by day 10 post-transplant. The patient was discharged home in good neurological condition.

Conclusions: Serial TCCD monitoring provided real-time, non-invasive assessment of cerebral hemodynamics in ALF, supported the decision for urgent OLTx, and objectively confirmed post-transplant cerebrovascular recovery. This case supports the role of TCCD as a valuable bedside tool in the management of ALF-related intracranial hypertension.

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PP18 The transcranial Doppler pulsatility index as a marker of increased intracranial pressure in the ICU: A critical review of an oversimplified threshold with illustrative cases

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Background: European expert recommendations (ESICM 2021; B-ICONIC 2025) endorse the transcranial Doppler/transcranial color-coded duplex (TCD/TCCD) pulsatility index (PI) to screen for raised intracranial pressure (ICP) and cerebral edema, with a threshold of PI >1.3. However, PI is not specific for ICP: it reflects cerebrovascular impedance and depends on pulse pressure, cerebral perfusion pressure, arterial compliance, PaCO2, heart rate, and age. Consequently, PI may be elevated without any raised ICP, a limitation underemphasized in current guidelines.

Methods: We reviewed guidelines and the neurosonology literature on PI confounders, and present five documented ICU cases with PI above the threshold without signs of raised ICP.

Results: Whereas the literature widely treats elevated PI as a surrogate for ICP, our five cases showed elevated PI in MCA with no clinical or radiological signs of raised ICP: acute arterial hypertension (PI 1.59), aortic regurgitation before valve repair (PI 1.62, falling to 0.96 after repair), cardiogenic shock (PI 2.0), bradycardia preceding cardiac arrest (PI 3.5–4.0), and left internal carotid stenosis (peak systolic velocity 400 cm/s) with asymmetric MCA PI (left 1.1, right 1.8). Each mechanism is corroborated by the literature: PI rises with arterial stiffness, reduced diastolic flow (aortic regurgitation, cardiogenic shock), prolonged diastole (bradycardia), and age, while proximal carotid stenosis paradoxically lowers ipsilateral PI.

Conclusions: TCD/TCCD is increasingly used in intensive care, with growing reliance on PI as a surrogate for ICP. Yet neurosonology cannot be reduced to a single PI measurement to confirm or exclude raised ICP. ESICM guidance recommends only bilateral MCA assessment: adequate for diffuse edema, but post-traumatic or postoperative edema may be asymmetric or focal, yielding side-to-side PI differences. Moreover, posterior fossa or focal edema may leave MCA PI normal while other intracranial arteries show high PI. A complete neurosonological examination of all accessible vessels, not MCA alone, is therefore essential.

PP19 Epileptic seizure as the first symptom of Subarachnoid hemorrhage

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Abstract: We present a case of a 71-year-old woman who was admitted to our emergency department with an acute onset of repeated epileptic seizures and a thunderclap headache.

Introduction: Blood in the subarachnoid space is defined as subarachnoid hemorrhage (SAH). Epileptic seizures are one of the most common complications, usually occurring 24 hours or the following month after ones experienced SAH. On very rare occasions, epileptic seizures can be the first symptom of SAH.

Case Report: A 71-year-old female was admitted to our emergency department unconscious because of multiple epileptic seizures. After seizures management with intravenous diazepam, she regained consciousness and complained of blurred vision, headache, and emesis. CT scan revealed diffuse SAH, and intraventricular hemorrhage, Fischer scale IV. CT angiography (CTA) revealed an intracranial aneurysm of the right medial cerebral artery (MCA). During three weeks of hospitalization in our department, she was treated with Nimodipine 60mg per day, and Levetiracetam 500mg 2x per day. Her health condition gradually improved and she no longer experienced any epileptic crisis.

Discussion: Epileptic seizure are usually seen as a complication of SAH, and the scientific data is not enough to support that an epileptic seizure can be the cause of aneurismal rupture.

Conclusion: The procedure of neurological examination we used (CT scan and CTA) and the lack of literature regarding this correlation, deprived our conclusion that repeated epileptic seizures were the cause of cerebral aneurismal rupure or a complication of SAH. We recommend immediate usage of antiepileptic drugs for patients who experience epileptic seizures comorbid with SAH, to avert morbidity and mortality. Although until now is known that SAH usually causes epilepsy (after 24h or after a month), further research is needed to have a better understanding of cases that are represented by epileptic crisis are the first sign of SAH.

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Sunday 07 November

PP20

A simplified formula to estimate ICP based on the pulsatility index

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Background: The transcranial Doppler (TCD)–derived pulsatility index (PI) (1), most commonly measured in the middle cerebral artery (MCA), has long been associated with intracranial pressure (ICP). The Bellner equation (ICP = 10.93 × PI – 1.28) (2) represents one of the most widely cited empirical models linking PI to invasively measured ICP. However, its clinical adoption remains limited, partly due to the cumbersome mathematical complexity.

Methods: In order to facilitate non-invasive, point of care estimation of the ICP we sought to develop a simplified approximation of the Bellner equation using the pulsatility index (PI = (PSV – EDV) / MFV) (1).

We propose a simplified linear equation:

ICP(tcd)e = 10 x PI

This simplification preserves the dominant proportional relationship between PI and ICP and allows rapid bedside calculation.

Results: Normal PI values range from 0,5 to 1,2.

For PI values in range of 0,1 to 4,4 the results of the simplified formula deviate either less than 1,2 mmHg (in absolute value) or less than 6% (in relative terms) of the value resulting from the original Bellner formula. This can be easily verified by calculation.

These differences are unlikely to be clinically relevant given the known confidence limits of TCD based ICP estimation (3).

Conclusions: As G. Box wrote: 'All models are wrong, but some are useful'. This simplified Bellner derived equation may offer a pragmatic balance between physiological plausibility and bedside applicability. The proposed ICP(tcd)e formula is intended for rapid estimation, trend analysis, and educational purposes, particularly in settings where invasive monitoring is unavailable or delayed. It is not intended to replace invasive ICP measurement or guide definitive ICP targeted therapy.

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(2) doi: 10.1016/j.surneu.2003.12.007

(3) doi: 10.1007/s00134-026-08420-7

PP21

Point-of-care multimodal testing with BIS and TCCD to document supratentorial injury in the determination of death by neurological criteria after primary infratentorial brain lesions

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Background: The 2023 American Academy of Neurology "Pediatric and Adult Brain Death/Death by Neurologic Criteria Consensus Guideline" in recommendation statement 40 requires the demonstration of catastrophic supratentorial brain injury before diagnosing death by neurological criteria (DNC) in patients with primary infratentorial brain lesions. We report three cases where multimodal point-of-care monitoring using bispectral index (BIS) and transcranial color-coded duplex sonography (TCCD) documented this process.

Methods: Three patients with primary infratentorial brain injury and clinical findings consistent with DNC were evaluated. One patient had a postoperative posterior fossa hemorrhage, two patients had a basilar artery thrombosis. BIS monitoring was used to continuously follow up on evolving supratentorial brain damage and to optimize the timing for cerebral blood flow assessment using TCCD, to demonstrate catastrophic supratentorial injury following a primary infratentorial brain lesion.

Results: Multimodal point of care testing initially showed preserved supratentorial blood flow as well as frontal cortical electrical activity. Subsequent monitoring demonstrated the disappearance of both electrical activity (BIS value = 0) and supratentorial blood flow (a to-and-fro pattern in the middle cerebral artery (MCA), evolving to a systolic spikes pattern), occurring within 24-36 hours. Apnea testing, performed after demonstration of circulatory arrest in both MCA's, was positive and concluded the diagnosis of DNC in all three patients.

Conclusions: Multimodal point-of-care monitoring with BIS and TCCD may provide a practical strategy to demonstrate catastrophic supratentorial brain injury with the disappearance of cerebral blood flow and electrical activity. This way the timely declaration of DNC can be facilitated while avoiding more costly and hazardous ancillary investigations such as cerebral angiography. Prospective studies are warranted to more accurately assess the incidence of primary infratentorial lesions.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP22

Point-of-care ultrasound in neurological outpatient practice: A tool for early diagnosis

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Background: Point-of-care ultrasound in neurology (neuro-POCUS) is an emerging bedside imaging approach that provides quick answers to specific clinical questions. Neuro-POCUS may facilitate early diagnosis in neurological outpatient practice. We report three cases illustrating the role of neuro-POCUS in early diagnosis.

Methods: We retrospectively reviewed three patients evaluated in the neurology outpatient clinic of the Hospital of Gorizia, Italy, who underwent neuro-POCUS during the first clinical assessment.

Results: Case 1: A 77-year-old man with a family history of polymyalgia rheumatica was evaluated in the headache outpatient clinic. The patient reported a variation of a chronic headache with prominent bitemporal localization and masticatory pain. Giant cell arteritis was suspected and a temporal artery ultrasound was performed with evidence of halo sign. High-dose steroids were initiated and further workup confirmed the diagnosis.

Case 2: A 24-year-old woman was evaluated for a one-year history of headache, initially interpreted as a tension-type headache. The patient complained of a holocranial headache that worsened in the supine position. Phosphenes and pulsatile tinnitus were also reported. Due to symptoms of intracranial hypertension, an ocular ultrasound was performed with evidence of papilledema. A lumbar puncture was performed with an opening pressure greater than 35 cmH2O.

Case 3: A 75-year-old woman was evaluated in the epilepsy clinic for a first seizure. An MRI showed recent bilateral cortical ischemic strokes. She also complained of profound asthenia. A carotid ultrasound was immediately performed with evidence of multiple bilateral vertebral stenoses in the V2 tract. Large vessel vasculitis was suspected and later confirmed with an FDG-PET. In all cases, neuro-POCUS identified findings that aided the diagnostic process and accelerated diagnosis.

Conclusions: Our case series highlights neuro-POCUS as a fast, feasible, and cost-effective approach in outpatient clinics to answer specific clinical questions and shorten time to diagnosis and therapy.

PP23

Bilateral optic neuritis as initial presentation of MOGAD during pregnancy: Diagnostic value of transorbital ultrasound

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Background: Optic neuritis (ON) is one of the most common manifestations of myelin oligodendrocyte glycoprotein antibody-associated disease (MOGAD). In contrast to multiple sclerosis-ON, MOGAD-related ON frequently presents with bilateral and anterior optic nerve involvement, optic nerve swelling and perineural enhancement. Disease onset or relapses during pregnancy are exceptional in MOGAD, as pregnancy is considered an immunotolerant state in demyelinating diseases. Therefore, new-onset visual symptoms during pregnancy may represent a diagnostic challenge, particularly when ophthalmological examination is unremarkable. Transorbital ultrasonography has emerged as a bedside technique for evaluating the optic nerve, allowing visualization of optic nerve thickening, optic nerve sheath enlargement and papillary protrusion.

Methods: A 33-year-old woman at 32 weeks of pregnancy presented with progressive bilateral blurred vision, retro-orbital pain and impaired color vision. Visual acuity was 0.4 (right eye) and 1.0 (left eye). Neurological examination was normal except for a right relative afferent pupillary defect. Ophthalmological examination, including fundoscopy, was unremarkable.

Results: Orbital ultrasound demonstrated mild bilateral papillary protrusion (0.72 mm in right eye and 0.65 mm in left eye), asymmetric optic nerve thickening (5.4 mm in right eye vs 4.5 mm in left eye), and increased optic nerve sheath diameter, consistent with bilateral retrobulbar ON with mild anterior involvement. Blood tests, autoimmune screening, serologies, vitamin and cerebrospinal fluid analysis were unremarkable. Serum anti-myelin oligodendrocyte glycoprotein (MOG) antibodies were positive. Brain and spinal cord MRI showed bilateral optic nerve hyperintensity without other demyelinating lesions. Bilateral MOG-antibody-associated optic neuritis was diagnosed. High-dose corticosteroid treatment followed by oral tapering resulted in significant clinical improvement.

Conclusions: Transorbital ultrasonography is a useful bedside diagnostic tool that may support the early diagnosis of optic neuritis and help differentiate between inflammatory demyelinating disorders of the central nervous system. This approach may be particularly valuable during pregnancy, where minimizing potentially harmful diagnostic procedures is relevant.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP24

Discovering pathophysiology in brain tumor angiogenesis: A Doppler study

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Background: Angiotropic mechanism in brain tumor growth leds to pathological neoangiogenesis and abnormal vascularization of cerebral area incorporating cancer; however, it's not known how tumor neoangiogenesis affects whole brain circulation. Trans-Cranial-Doppler (TCD) application in neuroncology is confined to detecting flow changes during anaesthesia or rare vasospasm cases after surgery. Color-Doppler-Ultrasound is less used than B-mode in intraoperative setting, even if provides an assessment of tumor vascularization and feeding arteries and draining veins location. Using these techniques, our aim was to investigate if brain tumor angiogenesis could modify vascularization of its cerebral vascular territory.

Methods: We retrospectively collected patients affected by supratentorial high-grade neoplasia admitted to Trieste Neurosurgery (9.1.2023-3.31.2026) candidates to intervention. Complete TCD exam was performed before surgery and within 72 hours after operation and color-doppler intraoperative ultrasound was achieved when feasible. We evaluated flow differences between brain tumor vascular territory and contralateral healthy area and brain circulation changes before, during and after surgery. We used t-test or Wilcoxon signed-rank test as appropriate (statistically significance when $p<0.05$).

Results: 31 patients were included. No difference was found in hemodynamic values of brain major vessels between tumor vascular and healthy contralateral territories (PSV 76.6±26.5vs73.7±20.1 cm/s, p=0.418; EDV 27.1±10.9vs26.7±7.6 cm/s, p=0.819; MFV 45.9±16.1vs43.4±11.9 cm/s, p=0.260; median PI 1.11vs1.09, p=0.536; median RI 0.65vs0.65, p=0.536) or in cancer vascular territory before and after surgery (PSV 78.1±27.2vs80.6±28.2cm/s, p=0.448; EDV 27.8±11.2vs28.9±11.7 cm/s, p=0.538; MFV 46.8±16.5vs47.2±17.1 cm/s, p=0.854; median PI 1.11vs1.12, p=0.319; median RI 0.65vs0.65, p=0.906). Even selecting patients with high tumor vascularization in intraoperative setting or with more-than-50 mL size neoplasia or with more-than-75% surgical resection, no difference was found.

Conclusions: According to angiogenesis slow development and its peripherical infiltrative distribution, our study showed that brain tumor presence doesn't affect major vessels brain circulation and explains absence of hemodynamic symptoms during neoplastic growth and after its resection.

PP25

The Triple Pathology of PFO, Stroke, and Thrombophilia: Long-Term Outcomes and Multimodal Right-to-Left Shunt Assessment

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Background: Patent foramen ovale (PFO) is frequently diagnosed in younger stroke patients. Percutaneous PFO closure followed by antiplatelets is currently considered standard management for selected patients aged 18–60 years. Concurrent thrombophilia increases thrombotic risk and often requires long-term anticoagulation, questioning the benefit of closure alone in these cases. Optimal management of this "triple pathology" remains uncertain. We aimed to evaluate long-term outcomes of different therapeutic approaches in PFO-associated stroke patients with concurrent thrombophilia and to characterize right-to-left shunt findings across imaging modalities.

Methods: We conducted a retrospective cohort study of patients with PFO-associated stroke and concurrent thrombophilia identified from our hospital records. Major thrombophilias included factor V Leiden mutation, prothrombin G20210A mutation, antithrombin or protein S deficiency, and antiphospholipid syndrome. The primary outcome was recurrent stroke during follow-up. Echocardiographic and transcranial Doppler (TCD) findings were also analyzed.

Results: Sixty patients were included (mean age 47.2±10.2 years). Patients managed with anticoagulation alone (n=21) or PFO closure followed by anticoagulation (n=10) had no recurrent stroke during a median follow-up of 7 years. Among patients treated with PFO closure followed by antiplatelets (n=29), 17% developed recurrent PFO-associated stroke, corresponding to an annual stroke rate of 3.7%/year. Recurrent events occurred 1–8 years after closure (median follow-up 5 years). TCD frequently detected major functional shunts, including in patients with inconclusive or negative echocardiographic findings. Septal aneurysm on transesophageal echocardiography (TEE) appeared associated with larger shunt magnitude.

Conclusions: Long-term anticoagulation, with or without PFO closure, was associated with lower recurrent stroke risk in this population. TCD demonstrated high sensitivity for functional right-to-left shunt detection, whereas TEE provided important anatomical characterization, particularly of high-risk septal features. These findings support systematic thrombophilia investigation and individualized multidisciplinary management in PFO-related stroke patients.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP26

High resolution ultrasonography in the diagnosis of ischemic neuropathy post-arteriovenous fistula surgery: A case report

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Background: Neuropathy, though rare, is a complication of arteriovenous fistula surgery for hemodialysis. In general, the diagnosis is made through physical examination and electroneuromyography. High-Resolution Ultrasonography (HRUS) is a promising alternative method.

Methods: We report a case to highlight the usefulness of HRUS in diagnosing a case of ischemic neuropathy secondary to arteriovenous fistula surgery.

Results/Case report: A 60y female with chronic kidney disease underwent surgery to create an arteriovenous fistula. 50 days after surgery she complained of burning pain in the operated limb, more intense distally. Physical examination revealed hypoesthesia in median nerve territory and muscle paresis in the left ulnar territory with normal palpable pulses and normal cutaneous parameters. Electroneuromyography evidenced reduced sensory and motor potentials in left ulnar, median, and radial nerves. HRUS using a 12MHz linear transducer, readily identified enlarged cross-sectional areas with hypoechoic pattern compromising the left median and ulnar nerves and disclosed no sites of nerve compression. Compressive causes were also excluded through MRI neurography, that confirmed enlargement of the left median nerve along the forearm. The hypothesis of ischemic mononeuropathy multiplex as the cause of the observed sonographic changes, electromyographic and radiologic findings was settled.

Conclusion: Arteriovenous fistula surgery can result in complications such as compression neuropathy or ischemia of peripheral nerves due to blood flow redistribution. Symptoms include muscle weakness, loss of sensation, and pain. Differentiating between ischemic neuropathy and steal syndrome from dialysis access (SSDA), is essential. Ultrasonography emerges as a valuable tool as an accessible, bedside, harmless, and comfortable neuroimaging method, providing an effective alternative to traditional methods. Further studies are necessary to establish ultrasonography accuracy in this specific scenario. The evidence suggests that HRUS can play a crucial role in managing neuropathic complications in hemodialysis patients, improving clinical outcomes through a quicker and less invasive neuroimaging method.

PP27

Isoechoic substantia nigra on transcranial sonography in an unusual presentation of Segawa's disease with clubfoot deformity

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Background: Dopa-responsive dystonia (DRD), or Segawa's disease, is a rare disorder sometimes misdiagnosed as cerebral palsy, delaying levodopa treatment.

Methods: We report a representative case and highlight the diagnostic role of transcranial sonography (TCS).

Results/Case Report: A 41-year-old woman presented with an isolated foot deformity beginning at age 11, initially described as a "foot problem," with mild gait impairment. She underwent multiple evaluations over several years without a definitive diagnosis. Examination showed left cavus foot deformity with adduction and internal rotation suggesting spasticity, brisk reflexes, and a possible left Babinski sign. Strength, sensory testing, cranial nerves, muscle bulk, and static balance were preserved. Three electroneuromyographic studies were normal; one suggested dystonia or spasticity. Brain MRI showed mild gliosis. TCS demonstrated normal substantia nigra and basal ganglia echogenicity. Because of the atypical presentation and limited response to baclofen, a levodopa trial was performed, with clinical improvement. Genetic testing then identified a heterozygous deletion of exons 1 and 6 in the GCH1 gene, confirming DRD.

Conclusion: Although limb dystonia is the classic presentation of DRD, patients may also present with spastic paraparesis or, less commonly, late-onset levodopa-responsive Parkinsonism. In this case, a 30-year history of clubfoot deformity and subtle pyramidal signs delayed diagnosis until a positive levodopa trial prompted genetic confirmation. TCS may assist in the differential diagnosis of DRD, particularly in younger patients with Parkinsonian features. While substantia nigra hyperechogenicity is not consistently found in DRD, lenticular nucleus hyperechogenicity has been reported at rates similar to focal dystonia. Patients usually have normal DAT-SPECT findings, supporting a neurochemical rather than neurodegenerative mechanism. Substantia nigra hyperechogenicity, when present despite normal DAT-SPECT, may indicate nigral vulnerability in the GCH1 context. TCS may be a useful adjunct in suspected Segawa's disease, helping refine the differential diagnosis and expand understanding of imaging findings in DRD.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP28

Transcranial Ultrasonography Findings in a Case of Cerebral Hemiatrophy in Rasmussen Encephalitis

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Background: Scientific data on the use of transcranial sonography (TCS) in the assessment of cerebral hemiatrophy are scarce. We report a case evaluated by TCS to expand current knowledge of the structural abnormalities detectable by this method in a rare neurological disorder.

Methods: TCS was performed using a GE Logic system with a 1–5 MHz sector transducer. B-mode axial and coronal planes were obtained for bilateral assessment of the mesencephalon, third ventricle, lateral ventricles, and mesial temporal lobe structures. Doppler evaluation was also performed. Results: A 48-year-old woman with a history of measles encephalitis in childhood developed drug-resistant epilepsy and mild right hemiparesis. At age 23, neuroimaging performed during hospitalization for status epilepticus revealed left cerebral hemiatrophy. Current brain MRI demonstrates diffuse atrophy of the left cerebral hemisphere, with reduced parenchymal thickness and compensatory ex-vacuo dilatation of the ipsilateral ventricular system with marked left hippocampal atrophy. TCS showed ventricular asymmetry - the lateral ventricle body measuring 21.0mm on the left and 13.1mm on the right. Left hippocampal atrophy was also identified, with a temporal pole of 4.5mm and choroid fissure of 5.6mm with medial temporal lobe atrophy-sonography scale (MTA-S)[1] of 10.1mm, compared with 3.1mm, 3.9mm, and 7.0mm on the right, respectively. Mesencephalic measurements were normal. Doppler ultrasonography of the middle cerebral arteries showed mild asymmetry, with greater flow resistance on the left.

Conclusions: Rasmussen encephalitis is a rare progressive inflammatory disorder that typically begins in childhood and is characterized by focal seizures and progressive unihemispheric atrophy. In the present case, TCS enabled the identification of structural abnormalities that correlated well with MRI findings. These findings underscore the potential of TCS as an accessible and noninvasive neuroimaging modality for the detection and longitudinal follow-up of hemispheric hemiatrophy. [1] Yilmaz et al. 2020.

PP29

Transcranial Doppler cerebrovascular reactivity monitoring in patients with Alzheimer's disease receiving anti-amyloid therapy

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Background: Anti-amyloid monoclonal antibodies (MABs) are reshaping Alzheimer's disease (AD) care, but their implementation introduces important safety and monitoring challenges, particularly related to Amyloid-Related Imaging Abnormalities (ARIA). Increasing evidence supports a central role of cerebrovascular dysfunction and neurovascular unit impairment in AD pathophysiology. Previous studies from our group demonstrated that impaired cerebrovascular reactivity assessed through transcranial Doppler Breath-Holding Index (TCD-BHI) correlates with AD core biomarkers, including CSF Aβ42 and plasma p-tau181 levels, independently from vascular risk factors and MRI markers of small vessel disease. We aimed to longitudinally evaluate cerebrovascular reactivity changes in patients with early AD undergoing donanemab therapy.

Methods: This ongoing prospective observational pilot study enrolls patients with Mild Cognitive Impairment due to AD undergoing anti-amyloid therapy at the Dementia Center of Policlinico Tor Vergata, Rome. Patients undergo serial TCD-BHI assessments at baseline and during follow-up at 1, 3, 6 and 12 months, integrated with clinical evaluation, APOE genotyping, amyloid biomarkers and MRI surveillance for ARIA according to real-world anti-amyloid protocols. Consecutive eligible patients receiving donanemab through compassionate-use programs are currently being enrolled.

Results: Enrollment started in January 2026. Preliminary feasibility data demonstrate successful integration of serial TCD-BHI evaluations within routine anti-amyloid monitoring pathways, with high procedural tolerability and reproducibility. Early observations suggest dynamic longitudinal changes in cerebrovascular reactivity during treatment exposure, supporting the hypothesis of therapy-related modulation of neurovascular function. Ongoing analyses are exploring associations between BHI variations, APOE genotype, MRI findings and ARIA occurrence.

Conclusions: TCD-BHI assessment appears feasible and sustainable within real-world anti-amyloid treatment pathways and may provide a non-invasive, low-cost and dynamic biomarker of neurovascular response during anti-amyloid therapy, potentially contributing to ARIA risk stratification and personalized monitoring strategies in AD. Planned multicenter expansion will improve statistical power and support external validation of preliminary findings.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP30

Transcranial Doppler reveals dual-circulation hemodynamic failure in persistent trigeminal artery anatomy

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Background: Persistent trigeminal artery(PTA) is the most common persistent carotid-basilar anastomosis and may profoundly modify intracranial hemodynamics. In selected anatomical configurations, severe internal carotid artery (ICA) disease can simultaneously compromise both anterior and posterior circulation perfusion. We report a paradigmatic case in which transcranial Doppler (TCD) provided real-time functional assessment of dual-circulation hemodynamic failure and subsequent post-stenting intracranial re-equilibration.

Methods: A 68-year-old man presented with acute visual and balance disturbances. Brain MRI demonstrated right anterior watershed infarctions and bilateral posterior circulation borderzone lesions involving cerebellar territories. Carotid ultrasound revealed critical right ICA stenosis. Computed tomographic angiography and digital subtraction angiography demonstrated a giant PTA arising from the right ICA supplying the vertebrobasilar circulation, while both vertebral arteries were hypoplastic and PICA-terminal. TCD evaluation was performed during the acute phase and after urgent carotid artery stenting.

Results: Acute-phase TCD demonstrated marked hemispheric asymmetry, with severely reduced right middle cerebral artery (MCA) flow velocities compared with the contralateral side (right MCA peak systolic velocity 45 cm/s versus left MCA 135 cm/s), associated with anterior communicating artery collateral recruitment.The peculiar vascular anatomy created a hemodynamic condition in which a single critical ICA stenosis simultaneously endangered both anterior and posterior circulation territories. Urgent right ICA stenting was performed two days after presentation. One-month follow-up TCD demonstrated restoration of symmetrical bilateral MCA velocities (approximately 45 cm/s bilaterally) with disappearance of collateral recruitment patterns, indicating intracranial hemodynamic re-equilibration after revascularization.

Conclusions: This case highlights the pivotal role of TCD in the functional interpretation of complex cerebrovascular hemodynamics beyond anatomical vascular imaging alone. In dominant PTA anatomy, carotid stenosis may produce simultaneous anterior and posterior circulation ischemia through pure hemodynamic failure. Serial TCD assessment provided dynamic bedside evaluation of collateral activation and post-treatment cerebral flow normalization, supporting its value in acute cerebrovascular decision-making and neurovascular monitoring.

PP31

Survey about practice of neurosonology in Belgium

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Background: Ultrasound (US) is widely used across medical specialties. Within neurology, its applications are expanding, with increasing interest in both established and novel indications. Beyond its well-known role in vascular neurology, the non-invasive nature and bedside accessibility of US make it a valuable tool in various neurological settings. This survey aimed to assess the use of US in neurological practice across Belgian hospitals and to evaluate practitioners' familiarity with various US modalities.

Methods: Between October 15, 2024, and April 1, 2025, a 30-item online questionnaire created with Google Forms™ was distributed to the Heads of all Neurology Departments in Belgium.

Results: Out of 174 neurology Departments contacted, seven neurologists responded. Six worked in Comprehensive Stroke Centers and one in a Primary Stroke Center, performing a median of 334 US exams annually. Extracranial ultrasound examinations were performed more frequently than intracranial examinations. Four centres reported using ultrasound for nerve and muscle imaging, while two centres used it for the evaluation of movement disorders and two for guidance during botulinum toxin injections. Five were trained in Belgium, four received training in the Netherlands or Switzerland. Only three were certified neurosonologists.Three respondents acquired US training during residency, three afterwards and one during both periods, with a median duration of 12 months.

Conclusions: Despite the low response rate and the lack of quantitative analysis, this survey provides insight into neurosonology practice in Belgium, highlighting both its clinical utility and the need for broader implementation and standardized training.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP32

Neuro-POCUS Advantages in Acute Ischemic Stroke Patients Treated with Endovascular Thrombectomy

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Background: Neurological point-of-care ultrasound (Neuro-POCUS) is a valuable bedside tool in the management of stroke patients. Currently, it is not included in the international stroke treatment guidelines. This study aimed to evaluate the additional value of Neuro-POCUS in patients with acute ischemic stroke treated with endovascular thrombectomy (AIS-EVT).

Methods: The Neuro-POCUS, consisting of extracranial, transcranial color-coded duplex sonography (TCCS) and orbital sonography, was performed between January and April 2026. According to the protocol, ultrasound examinations were scheduled before AIS-EVT, and at 3, 24, and 72 hours after AIS-EVT. The results of the study were also independently reviewed by experts in neurosonology and neuroradiology.

Results: Neuro-POCUS was performed at least once in 78.6% (55 out of 70) of AIS-EVT patients (mean age 74.8 ±11.4; female 54.5%). Only 9.1% of them had the first examination performed before AIS-EVT. 54.5% of post-AIS-EVT patients were examined all three times. TCCS was non-informative in 25.5% (14 out of 55) because of an insufficient transtemporal window. In 18.2% of cases (10 out of 55), Neuro-POCUS provided important new information beyond brain computed tomography (CT) and digital subtraction angiography (DSA): 2 undetected cervical artery steno-occlusions, 1 symptomatic intracranial artery near-occlusion misclassified as an occlusion, 3 cases of hyperperfusion and 1 case of hypoperfusion of the optimally recanalized vessel, 1 case of acute carotid stent thrombosis in a comatose patient, 1 case associated with newly detected occlusion of the ipsilateral ophthalmic and central retinal arteries in a aphasic patient, and 1 case with detected symptomatic middle cerebral artery stenosis, missed in CT angiography and DSA, obscured by chronic contralateral cervical carotid artery occlusion associated with perfusion impairment on CT.

Conclusions: The use of Neuro-POCUS during the early AIS-EVT phase should be encouraged for all stroke survivors for optimal care at the individual level.

PP33

Neuro-POCUS in acute ischemic stroke patient with medium-sized brain artery occlusion treated by endovascular thrombectomy: Towards prompt diagnosis of infective endocarditis

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Background: Infective endocarditis (IE) is a life-threatening disease with high morbidity and mortality. A well-known complication of IE is embolism, which may cause a stroke. Recently, the Neuro-POCUS, neurological point-of-care ultrasound, dedicated to stroke patient management at the bedside, was referred to as stroke-POCUS. We present a clinical case of an acute ischemic stroke (AIS) patient treated with endovascular thrombectomy (EVT), for whom stroke-POCUS provided additional information leading to the prompt diagnosis of IE.

Methods: A 58-year-old patient was admitted due to acute left arm weakness after a night's sleep of 6 hours. Past history included acute popliteal vein thrombosis one month ago and prescribed rivaroxaban (not used), pulmonary embolism, and suspected metastatic adenocarcinoma. Neurological examination revealed severe left arm paresis and mild central facial paresis. The pre-EVT NIH Stroke Scale (NIHSS) score was 5. Urgent CT and angiography showed occlusion of the right middle cerebral artery, M3 segment, with penumbra. Urgent DSA confirmed M3 segment occlusion; EVT was successfully performed (mTICI 3), followed by Neuro-POCUS.

Results: Cervical carotid ultrasound 12 hours after EVT showed the absence of the diastolic blood flow spectrum component, whereas systolic velocities were normal, possibly due to aortic valve pathology. Transcranial insonation revealed increased velocities of intracranial arteries bilaterally; vasculitis/vasospasm and an inflammatory process of the cardiovascular system were suspected. Urgent echocardiography revealed signs of infective endocarditis in the aortic valve, and the appropriate treatment was initiated. Head CT after 24 hours showed no ischemia but minor SAH in the left temporal area. Post-EVT NIHSS score at 24 hours remained 5.

Conclusions: Stroke-POCUS may facilitate a faster diagnosis of IE in AIS patients, enabling prompt initiation of IE treatment and improving disease prognosis. EVT appears to be a safe therapeutic option in AIS with medium-sized intracranial artery occlusion related to IE.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP34

Prevalence of carotid web in patients with carotid atherosclerosis and 10-year risk of stroke: post-hoc analysis of ANTIQUE study

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Background: Carotid web (CaW) is a thin, shelf-like, triangular projection in the internal carotid artery associated with embolic stroke, particularly in young adults. Its prevalence and long-term outcome in older adults are unknown. We aimed to determine CaW prevalence among individuals aged >40 years and assess their 10-year stroke risk.

Methods: Three experienced sonographers reviewed carotid videos and images from baseline, 3-, 6-, and 10-year duplex sonographic examinations of ANTIQUE study participants (ClinicalTrials ID:NCT02360137). All eccentric carotid bifurcation lesions were selected and reclassified as definite CaW, suspected CaW, atherosclerotic plaque, or artifact. Agreement of at least two sonographers was required for final classification. TIA/stroke and vascular/all-cause mortality were recorded over 10-year follow-up.

Results: A total of 1,652 patients were included (744 men [45%]; median age 70 years [IQR: 63-75 years]). Among 122 patients with eccentric carotid lesions, CaW was identified in 70 arteries of 65 patients, while atherosclerotic plaque was identified in 59 arteries of 57 patients. The prevalence of CaW in the overall cohort was 3.9%.

During 10-year follow-up, ipsilateral stroke/TIA was numerically more frequent in the CaW group than in the plaque group (10.8% vs. 3.5%), without statistical significance (p=0.172). No significant differences were found for events in other vascular territories (7.7% vs. 7.0%; p>0.999), vascular mortality (3.1% vs. 5.3%; p=0.664), or all-cause mortality (24.6% vs. 26.3%; p=0.830). Combined ipsilateral cerebrovascular events before baseline and during follow-up were significantly more frequent in the CaW group (16.9% vs. 3.5%; p=0.019).

Conclusions: Prevalence of CaW in individuals aged >40 years was 3.9%. Follow-up ipsilateral cerebrovascular events did not differ significantly between groups, whereas lifetime ipsilateral cerebrovascular events were significantly more frequent in patients with CaW. Careful ultrasound differentiation of CaW from eccentric atherosclerotic plaque may improve stroke risk stratification in older patients.

PP35

Comparative analysis of blood flow waveforms in the internal carotid and middle cerebral arteries in patients with carotid stenosis: Implications for ischemic stroke

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Background: Transcranial Doppler (TCD) ultrasonography is a promising tool for detecting intracranial large vessel occlusion (LVO). The velocity curvature index (VCI), derived from middle cerebral artery (MCA) TCD waveforms, is lower in patients with LVO and may serve as a non-invasive biomarker. However, intracranial flow velocities results from proximal inflow, and it remains unclear whether extracranial internal carotid artery (ICA) stenosis affects MCA waveforms and VCI reliability, and if ICA VCI accurately reflects MCA, possibly opening opportunities in patients with insufficient transtemporal windows.

Methods: Adult patients with stroke or transient ischemic attack (TIA) were prospectively studied at the clinical neurophysiology department. Patients undergoing manual TCD assessment before carotid endarterectomy for symptomatic ICA stenosis >50% and patients referred for TIA screening were included. After standard vessel imaging, bilateral ICA and MCA measurements were consecutively performed using the Lucid M1 TCD system, using a handheld probe for ICA measurement. VCI was calculated from TCD waveforms. Primary outcomes were the effect of ICA stenosis on MCA VCI and ICA–MCA VCI agreement.

Results: Between March and May 2026, 17 patients (mean age 67±12 years; 94% male) were included. Six patients had ICA stenosis >50% (5 unilateral, 1 bilateral), and 11 stenosis <50%. MCA VCI was significantly lower in patients with ICA stenosis >50% compared to those without (Mann–Whitney U=12.50, Z=–3.49, p<0.001; r=0.60). ICA VCI was moderately associated with MCA VCI (B=0.771, R^2=0.22, p=0.005). Bland–Altman analysis showed wide limits of agreement (–3.64 to 1.72), indicating limited agreement between ICA and MCA VCI.

Conclusions: In this initial patient subset (inclusion ongoing), ICA stenosis >50% was associated with lower MCA VCI. Although ICA VCI correlated with MCA VCI, agreement was limited, indicating that ICA VCI cannot reliably substitute MCA VCI at the individual level.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP36

CAD: Recanalization matters? Predictive factors and outcomes from a retrospective study

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Background: Cervical Artery Dissection (CAD) results by a tear in vessel wall, leading to intramural hematoma, stenosis, occlusion, or pseudoaneurysm. Is an important cause of ischemic stroke (2%) in young adults (>25% in <50 yo), potentially leading to significant disability. Aim of this study was to evaluate factors associated with vessel recanalization and its impact on patient functional outcomes.

Methods: This is a retrospective study on patients with TIA or ischemic stroke, due to CAD, admitted in the Stroke Unit, University Hospital in Trieste and Neurology department of Gorizia, between 2020-2025. Data collection included demographic, event clinical characteristics, diagnostic investigations, treatment, clinical/instrumental follow-up.

Results: Data of 68 patients were analysed, divided into 2 groups according to the presence (35) or absence (22) of vessel recanalization at follow-up. All patients were admitted to our department, 11 patients followed up in a day-hospital setting. Eleven patients were lost to follow-up. Median age was lower in recanalization group (48 vs 54, p=0.222). Male predominance was found (77%). Headache, neck pain, Horner syndrome did not significantly differ between groups. Neurological deficits were more frequently in patients without recanalization (94.4% vs 71.4%; p=0.075). Patients who achieved recanalization presented lower admission NIHSS, (p=0.030); and better mRS at 3 months (p=0.039). ICAD was the most frequent localization in both groups (68.6% vs 61.1%). Intracranial extension of dissection was more frequent in patients without recanalization (72.2% vs 45.7%; p=0.085). Intraluminal thrombus was significantly associated with no recanalization (all patients, vs 51.7% recanalized, p=0.001). Acute riperfusive treatments and long-term anticoagulation/antiplatelet were equally represented. A trend in favour of anticoagulation was observed in recanalized patients (42.9% vs 33.3%).

Conclusions: Vessel recanalization is associated with better functional outcomes, and more favourable neuroimaging characteristics. No significant differences were observed regarding reperfusion or medical treatments.

PP37

Pivotal study on ultrasound-based sarcopenia assessment in acute stroke patients

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Background and objectives: Acute stroke is associated with early morphological and structural changes in skeletal muscle due to reduced mobility, and denervation. Ultrasound assessment of the vastus lateralis (VL) muscle, using pennation angle (PA) and muscle thickness (MT), is a non-invasive method to evaluate muscle quality; however, data in the acute stroke phase are limited. This study aimed to evaluate early muscle changes in patients with acute stroke.

Material and methods: Clinical, laboratory, and ultrasound data were collected from 20 patients with acute stroke and a neurological deficit affecting one lower limb, confirmed at 24 hours. The study was conducted between March and September 2025 at the Stroke Unit of the University Hospital of Trieste. PA and MT of both VL muscles were assessed by ultrasound. The first examination was performed 24–72 hours after symptom onset, with a follow-up assessment at 7 ± 2 days.

Results: Median age was 79 years (76–83), and median NIHSS at admission was 6 (5–13). Twelve patients underwent reperfusion therapy (five IVT and four IVT + EVT). Ultrasound evaluation showed a 14.8% reduction in PA and a 0.6 mm decrease in MT in the VL of the affected limb. In the unaffected limb, PA decreased by 13.6% and MT by 0.5 mm.

Conclusion: Ultrasound assessment may be a useful tool for early evaluation of muscle mass and sarcopenia in the acute phase of stroke. These preliminary findings warrant further investigation in larger cohorts to assess clinical relevance and implications for rehabilitation strategies.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP38

Patients with ischemic cryptogenic stroke have higher grades of carotid intraplaque microvascular flow assessed by Superb microvascular imaging than patients with known stroke etiology

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Background: The TOAST classification requires ipsilateral arterial stenosis greater than 50% to attribute a large-artery atherosclerosis etiology, potentially neglecting the role of non-stenotic plaques. Intraplaque neovascularization is a marker of plaque vulnerability. Superb microvascular imaging (SMI) is a non-contrast ultrasound technique capable of detecting intraplaque microvascular flow (IMVF). This study aimed to determine whether intraplaque neovascularization, assessed by SMI, is more prevalent in patients with cryptogenic ischemic stroke compared to patients with stroke of known etiology.

Methods: Observational study including consecutive patients admitted between January 2026 to May 2026 to the stroke unit of a university hospital. Inclusion criteria were: age≥18 years, acute ischemic stroke of the anterior circulation, carotid plaque with stenosis <50%. Patients underwent a complete etiological investigation including cervical duplex ultrasound with SMI. Video recordings of SMI were acquired. IMVF was classified using the Zamani scale (grades 0–4) by two observers. Patients were subdivided into two groups: undetermined etiology and known etiology according to TOAST. IMVF grades of the carotid artery ipsilateral to the index stroke were compared between the two groups.

Results: of 171 patients admitted to the stroke unit, 51 patients were included. Patients had a mean age of 72.3 (SD=10.27) years and 38.5% were female. The undetermined etiology group (n=20) had a median SMI grade of 3 (IQR 0–3). The known etiology group (n=31) had a median IMVF grade of 0 (IQR 0–1). A statistically significant difference in IMVF grade distribution was found between groups (p=0.037).

Conclusions: Intraplaque neovascularization in non-stenotic carotid plaques, assessed by SMI, was significantly more prevalent in patients with an undetermined stroke etiology. These findings suggest that vulnerable carotid plaques may represent an underrecognized mechanism in cryptogenic stroke, regardless of the degree of stenosis. SMI-based plaque characterization may improve etiological yield in the investigation of cryptogenic stroke.

PP39

Bilateral striopallidodentate calcinosis as seen through transcranial brain sonography

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Background: Bilateral striopallidodentate calcinosis (BSPDC), commonly known as Fahr's disease, is a neurodegenerative disorder characterized by the accumulation of calcium and mineral deposits in various brain regions, particularly the basal ganglia, thalamus, and cerebellum. Several case reports have been described in the literature in which calcifications were detected sonographically. However, sonographic detection has so far been limited to the striatum and globus pallidus. The assessment of alterations of the dentate nucleus has not yet been described.

Methods: Here, we applied the sonographically rarely used "cerebellar examination plane", which has so far been described primarily in the assessment of spinocerebellar ataxias. We present the case of a 61-year-old male, who presented to our Department of Neurology with a progressive extrapyramidal movement disorder, ataxic gait, and scanning dysarthria. Transcranial sonography (TCS) was performed to evaluate the parenchymal structures. Following the TCS, extensive diagnostic testing was conducted to exclude hyperparathyroidism and other calcium or mineral metabolic disorders, and a cranial CT was utilized to confirm the sonographic findings.

Results: TCS revealed marked bilateral hyperechogenicity of the lentiform nuclei as well as the dentate nuclei, highly suggestive of BSPDC. Cranial CT successfully confirmed these sonographic findings. Following extensive diagnostic testing, we excluded hyperparathyroidism and other calcium or mineral metabolic disorders.

Conclusions: TCS has evolved into a valuable, complementary neuroimaging tool in the differential diagnosis of movement disorders, providing a quick and inexpensive assessment of parenchymal brain abnormalities. Furthermore, dentate hyperechogenicity and the cerebellum can also be visualized via the transtemporal window using the "cerebellar examination plane", which should be included in the examination protocol.

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Sunday 07 November

PP40

Subclavian Steal: cephalo-brachial steal or haemodynamic cerebral shunting syndrome?

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Background: Subclavian steal syndrome is traditionally defined as retrograde vertebral artery flow caused by proximal subclavian artery obstruction, resulting in blood diversion from the cerebral to the upper limb circulation. This study investigated the actual hemodynamic mechanisms underlying cephalic blood diversion.

Methods: We retrospectively evaluated 25 patients diagnosed with subclavian steal syndrome by ultrasound examination. Most of them were admitted for cerebral ischemia: posterior circulation stroke (PCS) in 11 cases, anterior circulation stroke (ACS) in 5 cases and both anterior and posterior in 2 cases. Four patients had previous subclavian-axillary bypass or subclavian artery aneurysm, while the remaining patients presented with non specific neurological symptoms. All subjects underwent supra-aortic trunks and transcranial echo-color-doppler, CT/MR or Digital Angiography, when available.

Results: All patients showed vertebral flow abnormalities, including "bunny flow", alternating flow or complete flow reversal. Significant proximal subclavian stenosis was detected in 9/25 patients (36%), whereas 16/25 (64%) showed no prevertebral subclavian steno-occlusive lesions. PCS occurred in 11/25 subjects (44%), while ACS was observed in 5/25 (20%), combined PCS and ACS in 2/25 (8%) patients. Severe diffuse atherosclerotic burden with multiple extra-intracranial stenoses was found in 4/25 patients (16%), while vertebral artery occlusion collateral revascularization occurred in other 4/25 patients (16%). Radiological findings highlighted subclavian haemodynamic stenosis only in a few cases. No significant correlation emerged between subclavian stenosis and vertebral flow pattern ($P > 0.5$), whereas vertebral flow abnormalities were significantly associated with PCS ($P < 0.005$) and overall atherosclerotic burden.

Conclusions: These findings suggest a pressure-gradient-driven hemodynamic disorder rather than a simple proximal subclavian steal phenomenon. Hemodynamic diversion may occur between vascular territories with different perfusion pressures due to atherosclerotic, inflammatory, dysplastic or malformative disease, producing cephalo-brachial, interhemispheric or intrahemispheric shunt; these pathophysiological mechanisms trigger a hemodynamic cerebral steal leading to clinical symptoms and typical ultrasound findings.

PP41

Serial carotid duplex examinations in resolving carotid web uncertainty

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Background: Conventional imaging modalities often present diagnostic challenges when evaluating carotid pathology, particularly in distinguishing between structural lesions such as atherosclerotic plaques and carotid webs. In younger patients, where the etiology of cerebrovascular events may be less straightforward, carotid Doppler ultrasound (CDUS) offers a valuable non-invasive tool for characterizing carotid morphology and assessing hemodynamic significance.

Methods: We present a case of a 47-year-old man who presented to the emergency department with acute left arm weakness and dysarthria. Initial workup, including CT angiography and CT perfusion imaging, confirmed an embolic stroke, and the patient was subsequently treated with tenecteplase in the extended time window. During etiologic investigation, however, a diagnostic dilemma emerged: angiography revealed a non-stenosing thrombus at the right carotid bulb, transiently free- floating — though its underlying substrate remained indeterminate. He was discharged on dual antiplatelet therapy and high-intensity statin treatment pending further evaluation.

Results: Serial outpatient CDUS examinations were performed during follow-up. As the thrombus gradually resolved, CDUS revealed an underlying web-like lesion not confirmed on repeat CTA, raising the question of differential sensitivity between the two modalities. However, subsequent follow-up CDUS demonstrated regression of the lesion, arguing against the diagnosis of a true carotid web. The lesion was ultimately characterized as an unstable atherosclerotic plaque based on surface irregularity and evolving morphological features, confirming the need for continued aggressive medical management.

Conclusions: This case highlights the clinical utility of CDUS as a repeatable, non-invasive, and cost-effective adjunct in the investigation of cryptogenic stroke in younger patients. When conventional imaging leaves diagnostic uncertainty, serial ultrasound can provide dynamic insight into lesion behavior over time. Unstable plaques warrant intensive statin and antiplatelet therapy alongside close interval monitoring to reduce the risk of recurrent cerebrovascular events.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP42

Clinical utility of bedside neuro-POCUS in acute central nervous system infections, mimicking ischemic stroke

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Background: The diagnosis of central nervous system (CNS) infection without typical meningeal signs can be challenging. Neuroimaging is an important method for the diagnosis of acute encephalitis. Recently, the concept of neurological Point-of-Care Ultrasound (neuro-POCUS) was introduced. However, the data evaluating its specific role in the management of CNS infections remain scarce.

Methods: We report three cases of acute CNS infection that illustrate clinical utility of bedside neuro-POCUS, including transorbital sonography (TOS), extracranial and transcranial color-coded sonography (TCCS), in addition to blood and spinal fluid (CSF) tests, brain CT and MRI with angiography.

Results: Case 1. 77-year-old female with acute memory loss and speech disorder was initially misdiagnosed as ischemic stroke. Symptoms progressed, and headache occurred. TOS detected enlarged left optic nerve sheath diameter (ONSD) indicating elevated intracranial pressure (ICP), raising suspicion of neuroinfection. CSF showed mononuclear cytosis, molecular testing detected Epstein-Barr virus. MRI revealed left mesiotemporal lobe changes, characteristic of encephalitis.

Case 2. 58-year-old male presented with acute disorientation and left-sided paresis. Brain CT showed a hyperdense right MCA; acute ischemic stroke was suspected. However, angiography detected no MCA occlusion. Urgent TCCS revealed increased right MCA velocities, and vasculitis was suspected. CSF revealed mononuclear cytosis, molecular testing detected Herpes simplex 1 nucleic acid. MRI demonstrated typical view of herpetic encephalitis with signs of vasculitis.

Case 3. 64-year-old female admitted with a suspected acute stroke. CT described as normal, and intravenous thrombolysis applied. Neuro-POCUS identified severe vasculopathy and elevated ICP, guiding the diagnostic workup towards a complex bacterial brain abscess confirmed by biopsy.

Conclusions: Neuro-POCUS provides an important additional information, differentiating acute CNS infections and acute ischemic stroke. It allows to detect and monitor signs of increased ICP and associated vasculopathy. To establish neuro-POCUS as a standard modality in optimizing patient management and disease outcomes, large-scale multicenter trials are needed.

PP43

Unusual cause of unilateral headache in young adult

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Background: Secondary headache is clinically significant and finding the exact cause is challenging in some cases. We describe an unusual reason for secondary headache in young patient with early onset atherosclerosis.

Methods: 36-year-old male was admitted with severe unilateral headache in the right side with parietal, frontal and orbital pain persistent for 2 months. The headache was daily with a tightening character and paroxysmal increase. Pain was associated with ipsilateral tearing and nasal congestion. The headache was resistant to medical treatment. There was not any previous headache and no familiar medical history. Neurological examination was normal. EEG, CT, MRI, MRI-angiography did not reveal any pathology.

Results: Color-coded duplex sonography detected big fixed stenoting thrombus in right internal carotid artery. MRI was performed and the patient was referred to surgical intervention. Histologic finding revealed atherosclerotic plaque with myxoid degeneration, recent hemorrhages, plaque rupture. After the intervention headache completely disappeared. Carotid atherosclerosis showed very rapid progression, as new atherosclerotic plaque was detected in the right internal carotid artery six months later, and nine months later there was a 60% asymptomatic stenosis.

Conclusion: Headache is typical symptom for carotid artery dissection and very few cases with carotid thrombus were reported. Inflammatory activation around an unstable plaque or thrombus may sensitize trigeminovascular pathways.

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Sunday 07 November

PP44

Bilateral Internal Carotid Artery Stenosis Managed with Sequential Bilateral Carotid Endarterectomy: Case Report

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Background: Carotid atheromatosis represents a major cause of ischemic stroke and often requires multidisciplinary management involving both medical therapy and revascularization procedures. While treatment recommendations for unilateral carotid artery disease are well established, the management of bilateral carotid artery disease remains a subject of debate due to the substantial risks of periprocedural stroke, hemodynamic disturbances, and cerebral hyperperfusion syndrome.

Case presentation: We report the case of a 57-year-old woman with multiple vascular risk factors, (arterial hypertension, diabetes mellitus, overweight status and active smoking), who presented with sudden onset left homonymous hemianopia. Cerebral CT scan showed hypodense lesion in the right posterior cerebral artery territory (subacute ischemic event) and a hypodense area in the right precentral gyrus, in deep territory of the middle cerebral artery (ischemic sequelae). Carotido- vertebral Doppler ultrasound was performed, revealing bilateral internal carotid artery severe stenosis and right vertebral artery (V2 segment) occlusion, later confirmed on angiography. She underwent right endarterectomy and came back two weeks later for three generalized tonic-clonic seizure. Cerebral IRM demonstrated right hippocampal lesion with T2/FLAIR hyperintensity and diffusion restriction (acute ischemia - possible perioperative stroke). One month later, she had right-sided body paresthesias, completely resolved within 2 hours, being interpreted as a transient ischemic attack in left carotid territory. Consequently, a left carotid endarterectomy was performed. During follow-up at 1,3,6, and 9 months and at 1 year, the patient remained asymptomatic, with no new ischemic events documented.

Conclusion: This case highlights the complexity of managing severe bilateral carotid artery disease in a patient with sequential occurrence of ischemic and transient neurological events involving different vascular territories. In this case, staged bilateral carotid endarterectomy was associated with favorable clinical outcome, with no recurrent ischemic events during one-year follow-up, supporting the role of individualized, multidisciplinary management strategies in selected patients with bilateral carotid stenosis.

PP45

A multicenter study to optimize microembolic signal classification based on double-blind multiparametric assessment by human experts using an universal graphical and audible interface [MESOMEGA]

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Background and Rationale: The presence of microembolic signals (MES) in transcranial Doppler (TCD) monitoring is a powerful predictor of future cerebrovascular events. However, MES detection is technically demanding and requires expert interpretation, which hinders its implementation into widespread clinical practice.

Methods and Design: MESOMEGA is a prospective, randomized, double-blind, diagnostic validation study. All TCD users in the wider medical community with compatible TCD systems are invited to submit short TCD clips of presumed solid MES or non-MES high-intensity transient signals recorded from the proximal middle cerebral artery. Each clip will be independently assessed by two randomly assigned experts. Expert reading will utilize the TCD player, a vendor independent open software interface compatible with existing commercially available TCD systems, which allows assessment for predefined signal features that will be collected into a database: characteristic audible signal increase, characteristic oscillation of the raw signal, Emboli-to-Blood Ratio, Emboli-to-Mirror Ratio, signal duration, and average velocity of maximum intensity and characteristic waveform. Experts are blinded to each other as well as to clinical and source information. A supervised decision tree model will be developed on a training dataset and validation set. Performance will be assessed using statistical methods including sensitivity, specificity, and area under the receiver operating characteristic curve. A Delphi consensus process will then be used to evaluate and validate the model, aiming for expert agreement and readiness for clinical application.

Study Outcomes: Primary outcome: the classification of clips as MES or non-MES, using expert consensus as ground truth. The model will aim for ≥ 90% classification accuracy.

Conclusions: This study will utilize a supervised decision tree model for MES classification and benchmark it against prior MES detection approaches. By providing a reproducible framework for MES interpretation, this work aims to facilitate MES integration into future clinical trials and decision-making.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP46

Transcranial Color-Coded Duplex (TCCD) revealing Reversible Cerebral Vasoconstriction Syndrome (RCVS) as a case of persistent headache

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Reversible cerebral vasoconstriction syndrome (RCVS) is a rare case both of headache and of stroke. It is characterized by a constriction of the cerebral arteries with a centripetal progatation and assumed to have multiple etiologies (e.g. drugs / medication, trauma, sexual activity, idiopathic). The course of the disease is often progredient in a time window of 2-3 weeks with a peak of vasoconstriction on day 16 after an initial thunderclap headache and can lead to severe brain damage due to recurrent strokes. Diagnostic difficulties may arise from the initially often normal cranial imaging and unspecific presentation (headache). of diagnostic importance is the anamnesis (thunderclap headache, intake of vasoactive substances such als vasoconstringent medication oder drugs), the exclusion of other pathologies such as inflammatory liquor syndrome and the follow up diagnostic in case of initial negative findings. Therapeutic recommendations vary from symptomatic therapy, avoidance of the triggers, avoidance of hypotension, medication such as nimodipine, magnesium and acetylsalicylic acid as well as endovascular treatment with application of intra-arterial nimodipine. In our case we diagnosed a RCVS in an 55 year old woman after initial negative MR-Imaging and negative liquor analysis by TCCD finding progredient stenoses in all cerebral arteries. The episode of RCVS started after sexual intercourse with a medical history of until the moment of admission undiagnosed primary headache associated with sexual activity. A medication with oral nimodipine, magnesium and acetylsalicylic acid could just achieve temporary improvement and not prevent recurrent TIA symptoms and finally a stroke in the territory of the left a. cerebri posterior. Finally the intra-arterial application of nimodipine could resolve the spasm, improve the headache and prevent further strokes.

PP47

Intracranial stenosis and metabolic risk factors

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Background: Intracranial stenoses in the Caucasian population exhibit a significantly lower incidence compared to the Asian population. However, in an effort to identify potential risk factors, the following study was conducted over a period of 28 months to analyze the impact of metabolic risk factors (dyslipidemia, type 2 diabetes mellitus), both in the presence and absence of other modifiable risk factors (smoking), on the incidence of intracranial stenoses.

Methods: All patients involved in this study were evaluated using cervical and intracranial Doppler ultrasound and cerebral imaging through Angio-CT of the supra-aortic trunks to confirm the presence of intracranial stenoses clinicaly relevant.

Results: 2,197 patients were included, comprising 48.4% males and 51.6% females, with mean age of 71.5 years. of these, 167 patients (7.60%) exhibited intracranial stenoses; specifically, 63 females (37.72% of these patients) and 104 males (62.28%). Among females, 41 patients had metabolic risk factors without smoking, 18 were smokers with metabolic risk factors, 2 were smokers without metabolic risk factors, and 2 were non-smokers without metabolic risk factors. Among males, 64 patients had both metabolic risk factors and smoked, while some were non-smokers with metabolic risk factors, and only 9 were smokers without metabolic risk factors. Given the advanced age of the cohort, it is presumed that all female participants were in perimenopause or menopause, during which the endogenous estrogen's cardiovascular protective effects diminish.

Conclusions: Although the exact proportion of smokers among women versus men cannot be precisely determined, it appears that after the age of 50, smoking is the primary risk factor in men. Conversely, in women, especially post-menopause, metabolic risk factors without the association of smoking are more frequently observed in cases of intracranial stenoses. Therefore, postmenopausal women seem to be more predisposed to developing intracranial stenoses in the context of uncontrolled metabolic risk factors.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP48

Optic Nerve Ultrasound in the Neuro-POCUS Era: Technical Challenges and Emerging Solutions

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Background: The ultrasound assessment of the optic nerve head continues to evolve alongside advances in imaging technology, which are themselves driven by increasingly demanding diagnostic requirements. Initially confined primarily to ophthalmology, this technique has progressively expanded into other medical specialties, particularly neurology. In the current era of neuro-POCUS, it is important to distinguish between examination protocols according to the clinical setting and indication, including intracranial hypertension, demyelinating disorders, and ischemic optic neuropathy.

Methods and Comments: Regarding ischemic disorders, the ultrasonographic assessment of the ophthalmic artery and the central retinal artery and vein appears to be limited by the FDA-imposed Mechanical Index threshold. This restriction also hampers the evaluation of the ciliary arteries and other low-flow vascular branches. It may therefore be appropriate to reconsider these limits, taking into account the duration and safety profile of the examination.

With respect to the morphometric assessment of the optic nerve diameter (OND) and optic nerve sheath diameter (ONSD), a revised interpretation of the ultrasonographic anatomy may allow for more accurate identification of the relevant structures and improve the reliability of measurements. To this end, we are currently developing a dedicated method in collaboration with a team of engineers.

The proposed method is based on a semi-automated approach that requires operator input during specific phases of the measurement process. The procedure enables a more precise and accurate determination of the point located 3 mm posterior to the optic disc along the optic nerve and ensures the exact perpendicularity of the measurement line. The anatomical landmarks required to define this line are selected by the operator. Consequently, the method should not be regarded as a replacement for expert assessment but rather as a support tool designed to enhance measurement accuracy and reproducibility.

PP49

Repurposing transcranial Doppler ultrasonography as a teaching tool in undergraduate medical education

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Background and aims: Transcranial Doppler ultrasonography (TCD) is utilized in neurology and critical care medicine to assess intracranial arterial patency, stenosis, collateral flow, embolic signals, vasospasm, sickle-cell stroke risk, recanalization, and cerebral circulatory arrest. Proficient TCD acquisition and interpretation require applied knowledge of neuroanatomy, ultrasound physics, and cerebral hemodynamics. The present project proposes repurposing TCD as an educational tool in undergraduate medical education (UME) to facilitate the translation of abstract neurovascular anatomy and cerebrovascular physiology concepts into observable, real-time physiological signals.

Methods: A facilitator-led TCD teaching module has been developed for medical students. The session commences with an overview of the structural neuroanatomy of the Circle of Willis and the anterior and posterior circulations. Standard insonation windows (transtemporal, transorbital, suboccipital/transforaminal, and submandibular) are correlated with their respective target vessels. Instructors present foundational ultrasound physics, including skull attenuation and the rationale for selecting a low-frequency phased-array probe. Students are guided in interpreting duplex displays, grayscale anatomical landmarks, color-flow directionality, and spectral waveforms. Physiological demonstrations include 1. breath-holding and hyperventilation to assess COβ-mediated vasomotor reactivity. 2. Visual or cognitive activation paradigms to illustrate neurovascular coupling.

Expected Results: Students are expected to develop spatial and physiological understanding of cerebrovascular function. Real-time insonation should help learners conceptualize the spatial organization of intracerebral vascular anatomy, including the Circle of Willis, with depth, flow direction, and waveform morphology serving as cues to arterial location. Students should also be able to explain the biochemical processes underlying vasomotor reactivity and how the regional hemodynamic response to neuronal activation underlies neurovascular coupling. Finally, students should understand the methodological boundaries of TCD, including its limited ability to assess small-vessel and microvascular physiology directly.

Conclusion: TCD can be an effective teaching tool in UME, translating abstract concepts in neuroanatomy, ultrasound physics, and cerebrovascular physiology into observable, real-time signals.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP50

Transcranial Sonography for Bedside Assessment of the Thalamic Lesion After HIFU: A Pilot Concordance Study with MRI

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Background: MRI is the standard for documenting the lesion after HIFU thalamotomy in refractory essential tremor. Transcranial sonography (TCS) offers operational advantages. This pilot study explored the correspondence between both techniques.

Methods: Prospective pilot study with technique-blinded reading, assessing correlation and concordance between TCS and MRI (DWI, T1, T2) at 24h after HIFU thalamotomy for essential tremor.

Results: Twenty-two patients were evaluated; 4 excluded due to poor acoustic window (n=18). The most consistent echogenic zone was comparable to zone 2 on T1; T2 and DWI showed neither correlation nor concordance with TCS. For area (MRI T1 median: 35.5 mm²): moderate association (rho=0.68; p=0.002) and good concordance (CCC=0.66; 95% CI 0.34–0.84), with near-zero bias (–1.17 mm²) but wide variability (–13.6 to +11.2 mm²). For maximum diameter (MRI T1 median: 7.5 mm): association did not reach significance (rho=0.46; p=0.053), but concordance was moderate (CCC=0.50; 95% CI 0.09–0.77), with negligible bias (+0.07 mm) and variability of –1.69 to +1.83 mm. For centroid-to-midline distance (MRI T1 median: 14.8 mm): moderate association (rho=0.59; p=0.009) and moderate concordance (CCC=0.52; 95% CI 0.16–0.77), with bias of –0.48 mm and variability of –2.12 to +1.17 mm.

Conclusions: TCS identifies at 24h an echogenic zone with dimensions and lateral location comparable to zone 2 on T1. Individual variability is the main limitation. These findings support TCS as a promising bedside tool, pending validation in a confirmatory study.

PP51

Extracranial Internal Carotid Artery Vasospasm Causing Recurrent TIA/ Migraine-Like Attacks: Diagnostic Value of Acute Vascular Doppler Ultrasound

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Background: Extracranial internal carotid artery (ICA) vasospasm is a rare and a likely underrecognized cause of ischemic stroke/TIA in young patients, often mimicking hemiplegic migraine, with diagnosis dependent on acute vascular imaging (especially Doppler ultrasound), which is not consistently performed.

Methods: Case study.

Results: A 41-year-old Chinese woman experienced recurrent right periorbital headache with transient left hemiparesis. Initial brain-MRI and ultrasound Doppler studies were normal, leading to a diagnosis of probable hemiplegic migraine. Comorbidities included antithrombin-III deficiency (on vitamin-K antagonist therapy), non-atherosclerotic ischemic cardiomyopathy, hypertension and dyslipidemia. She was later admitted due to a more sustained episode. CT-angiography demonstrated subocclusive stenosis of the distal cervical right ICA, which fully resolved on repeat imaging within days alongside complete clinical recovery. Several days later, control CT-angiography also revealed an asymptomatic severe focal stenosis of the contralateral (left) ICA, with later resolution, supporting recurrent extracranial ICA vasospasm. Corticosteroid therapy was started without symptom recurrence. A calcium channel blocker was initiated. A customized vasospasm genetic panel identified a POLG variant of uncertain significance. Muscle biopsy confirmed multiple mitochondrial DNA deletions. Three years later, during gradual steroid tapering, she presented with acute total left hemispheric syndrome, associated with hypotension. CT-angiography again showed subocclusive stenosis of the left ICA. Doppler ultrasound demonstrated >70% ICA stenosis, with collateralization through the ophthalmic artery and parvus et tardus flow in the left anterior circulation (ACA/MCA). The right carotid axis was normal. Neurologic deficits rapidly resolved after fluid resuscitation and blood pressure optimization, with normalization on follow-up imaging. High-dose corticosteroids were administered. Given recurrence, suspected inflammatory contribution, and prior adherence issues, steroid-sparing immunosuppression (rituximab) was proposed.

Conclusions: Recurrent extracranial ICA vasospasm should be considered in young patients with cryptogenic TIA/ stroke or migraine-like episodes. Acute-phase vascular imaging is critical, and both hemodynamic and inflammatory mechanisms may contribute; optimal treatment remains individualized.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP52

CT perfusion imaging as prognostic factor for stroke outcome

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Background: Early neurological deterioration (END) is a determinant of outcome in ischemic stroke, occurring in 18–36% of patients with large vessel occlusion (LVO) and 20–30% of patients with lacunar stroke despite treatment. Established predictors include infarct location, stroke severity, and infection. We investigated whether global cerebral blood flow (gCBF), measured by CT perfusion (CTP), could serve as a prognostic marker across ischemic stroke subtypes.

Methods: We analyzed 394 patients with ischemic stroke, including 232 with LVO and 162 with MRI-confirmed lacunar stroke. gCBF was measured on CTP across hemispheres and the cerebellum, excluding hypoperfused regions. Patients were categorized into normal gCBF (>40 ml/100 g/min) and low gCBF (<40 ml/100 g/min) groups. Clinical variables and NIHSS scores were assessed, with change over the first 48 hours as the primary outcome.

Results: Mean gCBF was 34.9 ml/100 g/min in the LVO cohort and 37.7 ml/100 g/min in the lacunar cohort. Among LVO patients undergoing endovascular thrombectomy (EVT), neurological improvement was similar regardless of baseline gCBF. In contrast, LVO patients ineligible for EVT showed worse outcomes with low gCBF, including higher baseline NIHSS scores and no improvement over 48 hours, while patients with normal gCBF improved. In the lacunar cohort, both groups had identical baseline NIHSS scores (4.2), but outcomes diverged. Patients with normal gCBF improved by 1.3 NIHSS points, whereas those with low gCBF worsened by 1.1 points. END occurred in 37.8% of patients with low gCBF versus 3.1% with normal gCBF. Low gCBF was associated with deterioration across all lacunar stroke locations. Univariate analysis identified gCBF as an independent predictor of neurological outcome ($p<0.001$).

Conclusion: gCBF measured by CTP is a prognostic marker. Low gCBF is strongly associated with END and poorer outcomes, particularly in lacunar stroke and LVO patients not receiving reperfusion therapy. It may improve risk stratification and prognostication.

PP53

Early effects of Intensity-Modulated Radiotherapy in head and neck cancer: A Longitudinal Advanced Neurosonology Study

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Background: Volumetric modulated arc therapy (VMAT) improves dose distribution compared with conventional radiotherapy while providing greater sparing of organs at risk. In head and neck cancer (HNC), however, the carotid arteries remain exposed because of their proximity to the target volumes. Although radiation-induced arteriopathy is a well-recognized entity, the early vascular effects of VMAT have been insufficiently investigated.

Methods: This prospective longitudinal study included patients with HNC treated with VMAT. Neurosonological assessment was performed before VMAT, at 6 months, and at 2 years, including evaluation of the presence and size of carotid plaques, carotid intima-media thickness (IMT), Doppler velocimetry, and carotid and muscular stiffness using shear-wave elastography. The effects of radiation dose and irradiated volume received by each carotid artery were analyzed.

Results: Twenty-one patients were included, with a mean age of 66 ± 10 years; 20 (95%) were male. At baseline, plaques were present in 26 of 42 (62%) carotid arteries. No significant changes were observed at 6 months. At 2 years, 7 of 14 (50%) carotid arteries developed new plaques during follow-up. We observed an increase in IMT (0.75 vs. 0.82 mm, $p = 0.121$) in a dose-dependent manner ($\beta = +0.004$/Gy, $p = 0.034$), carotid stiffness (31 vs. 38 kPa, $p = 0.064$) in a volume-dependent manner ($\beta = +3.152$/cc, $p < 0.001$), and muscular stiffness (25 vs. 42 kPa, $p = 0.001$), also volume-dependent ($\beta = +3.120$/cc, $p < 0.001$). No significant changes were observed in the dimensions of pre-existing plaques, and one carotid artery (4%) progressed to >50% stenosis.

Conclusions: Carotid atherosclerosis is common in patients with HNC, and up to 50% develop de novo plaques between 6 and 24 months after VMAT. We observed a dose-dependent increase in IMT and a volume-dependent increase in both vascular and muscular fibrosis.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP54

Endovascular treatment and TCD monitoring of SAH related vasospasm

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Background: Delayed cerebral ischemia (DCI) caused by cerebral vasospasm (CVS) occurs in 20-30% of patients with after aneurysmal subarachnoid hemorrhage (aSAH) and is a major contributor of poor outcome after aSAH. Endovascular treatment (EVT) is reasonable rescue option for refractory vasospasm. However, the effect and safety of repeated EVT has not yet been clearly investigated.

Aim: The aim of this study is to show the benefit and evaluate safety of repeated EVT in combination with medical vasodilatation in cases of recurrent or refractory CVS.

Patients: We report 30 patients with CVS after aSAH who underwent EVT (112 vessel segments, 46 procedures). In 15 patients (50%) we performed EVT once and in 15 (50%), two or more EVT were done due to refractory or recurrent vasospasm. All EVT were combined with intra-arterial application of nimodipine. Daily transcranial Doppler (TCD) bedside monitoring was done.

Results: In our research 60% of patients who had two or more EVT had significantly better functional outcome (mRS 0–2) after 3 months (p=0.047) as opposed to 40 % of patients who had one EVT, reflecting the trend towards lower rates of DCI (58% vs. 67%) in patients with repeated EVT despite refractory or recurrent vasospasm. The overall median velocities on TCD change was 37.50% (IQR 27.00-48.00). The mean reduction in the Lindegaard index after treatment was 1.08. We found no EVT related complications.

Conclusion: Our results are suggesting that repeated EVT in combination with medical vasodilatation is safe and efficient as rescue therapy of CVS. Repeated vasodilatation is worthwhile strategy in recurrent or persistent vasospasm and prevention of DCI. TCD monitoring during vasospasm therapy, can be helpful in evaluating the improvement of cerebral hemodynamics based on the changes of the velocities and Linegaard index.

PP55

Arterial–Venous Neurovascular Coupling Indices Are Associated with Migraine Severity: A Transcranial Doppler and Color-Coded Duplex Study

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Background: Migraine is a disorder of neurovascular regulation rather than a purely vascular condition. While conventional transcranial Doppler (TCD) studies have yielded inconsistent results, the relationship between arterial pulsatility, venous hemodynamics, and clinical burden remains poorly understood. We investigated cerebral arterial and venous hemodynamics in migraine using conventional Doppler parameters and novel composite neurovascular indices.

Methods: Seventy-three consecutive patients fulfilling ICHD-3 criteria for migraine and referred to a tertiary Headache Center were enrolled, together with healthy controls without a history of primary headache disorders. Clinical assessment included migraine history, attack frequency, disability, and quality of life using HIT-6, MIDAS, and MSQ questionnaires. All participants underwent transcranial color-coded duplex ultrasonography. Arterial parameters included peak systolic velocity, end-diastolic velocity, mean flow velocity, pulsatility index, and resistance index, while venous flow velocities were also recorded. Two composite indices were calculated: the Venous Pulsatility Coupling Index (VPCI) and the Intracranial Pulse Transmission Index (IPTI), designed to assess arterial-to-venous pulsatility transmission and neurovascular coupling. Comparisons between groups and correlations with clinical variables were performed.

Results: Conventional arterial and venous Doppler parameters showed limited differences between migraine patients and controls and did not identify a reliable diagnostic biomarker. In contrast, composite neurovascular indices demonstrated clinically meaningful associations. Higher VPCI and IPTI values were observed in patients with greater disability, poorer migraine-specific quality of life, and higher overall disease burden. Both indices were positively associated with disease duration and functional impairment, suggesting progressive alterations in intracranial neurovascular dynamics.

Conclusions: Migraine appears to be characterized by alterations in global intracranial neurovascular dynamics rather than isolated abnormalities of individual Doppler parameters. VPCI and IPTI emerge as promising exploratory markers of neurovascular dysfunction and disease severity, supporting a role for altered arterial-to-venous pulsatility transmission in migraine pathophysiology. Further validation in larger prospective cohorts is warranted.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP56

Ultrasound-detected carotid atherosclerotic plaque width and plaque progression as markers of mortality risk: 10-year follow-up results from the antique study

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Background: The severity of carotid stenosis and the RADS classification of atherosclerotic plaque are markers for stroke and cardiac death. The ANTIQUE study (ClinicalTrialsID NCT02360137) aimed to analyze additional plaque features. We aimed to evaluate the relationship between carotid plaque width, plaque progression, and the risk of death during 10-year follow-up in ANTIQUE patients.

Methods: We examined 10-year follow-up data from patients in the ANTIQUE study. All participants had annual B-mode ultrasound scans, during which the maximal carotid plaque width was measured in the transverse view. Plaques were classified based on their maximum width: (A:≤0.25mm; B:0.26-0.35mm; C:0.36-0.45mm; D:0.46-0.55mm; E:>0.55mm). Plaque progression was calculated as the difference between the initial and final measurements, categorized as stable (1:≤0.2mm), minor (2:0.21–1.0mm), or major (3:>1.0mm). Death dates and causes were obtained from the national patient registry. Survival analysis was performed using Kaplan–Meier estimates and differences were tested with the log-rank test.

Results: The analysis included 1,652 patients (749 men; mean age 68.7±9.4years). Over a decade, 537 patients (32.5%) died, including 294 males with a mean age of 74.4±6.9 years. Both greater plaque width and increased plaque progression were significantly associated with a higher risk of death (both p<0.01), and these associations held across plaque sizes and progression levels. Specifically, patients with the largest plaques (>0.55mm) experienced an early, sharp decline in survival to under 20% by the end of follow-up, compared with over 80% in the reference cohort (≤0.25mm). In parallel, dynamic plaque growth conferred a gradual, steady long-term risk, with major progression (>1.0mm) culminating in the lowest overall survival rate, approximately 50%, compared with those with stable plaques.

Conclusion: Carotid plaque width and its progression are reliable indicators of long-term mortality risk. Regular monitoring of plaque changes over time can enhance risk assessment and help tailor preventive strategies for patients with carotid atherosclerosis.

PP57

Recurrent Vascular Events and Death in Patients at High Vascular Risk in Relation to Carotid Plaque Characteristics, Including Greyscale Median Echogenicity

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Background and Aim: High vascular risk patients receiving secondary prevention with statins and PCSK9-targeted therapies may experience changes in carotid plaque composition. These changes can be quantified using the grayscale median (GSM) obtained from B-mode ultrasonographic evaluations. We hypothesized that patients with less echogenic carotid plaques may have a higher risk of vascular recurrence or death during follow-up. We aimed to investigate the association between carotid plaque GSM values and vascular recurrence or death in a cohort of patients at high vascular risk.

Methods: We retrospectively analyzed a cohort of patients with previous vascular events who had been treated with PCSK9-targeted therapy or statins alone for at least 6 months. All patients underwent carotid ultrasonography and GSM assessment of carotid plaques. Clinical and demographic data were reviewed, and follow-up data were collected to identify vascular recurrences and death.

Results: A total of 225 carotid plaques were evaluated in 124 patients, with a median follow-up of 33.9 months. During follow-up, 24 patients experienced a vascular recurrence. Patients with and without recurrence had similar demographic and clinical characteristics, except for treatment group: vascular recurrences occurred in 2.9% of patients receiving PCSK9-targeted therapy compared with 21.4% of those receiving statin therapy alone (p=0.001). LDL-C levels did not differ significantly between patients with and without recurrence (52.07 mg/dL vs. 62.73 mg/dL, respectively; p=0.064). Carotid ultrasonographic evaluation showed no significant differences between groups in the number of plaques, plaque echogenicity, surface characteristics, or degree of stenosis. GSM values were also similar between patients with and without recurrence (79.96 vs. 72.17, respectively; p=0.301). However, hypoechoic carotid plaques were significantly associated with subsequent peripheral vascular recurrence (p<0.001).

Conclusion: In this cohort of patients at high vascular risk receiving secondary prevention, major adverse cardiovascular events (MACE) or death were not significantly associated with the number of carotid plaques, plaque echogenicity assessed by GSM, or other carotid plaque characteristics. However, hypoechoic carotid plaques were significantly associated with subsequent peripheral vascular recurrence. These findings suggest that plaque echogenicity may provide information regarding the risk of peripheral vascular events, although larger prospective studies are needed to confirm this association.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP58

Retrospective observational study on the safety and efficacy of endovascular treatment for subclavian artery stenosis and neurosonological evaluation (TENSA Study).

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Background: Evidence regarding subclavian artery stenosis (SAS) management remains limited. At our center, patients are treated with percutaneous transluminal angioplasty and stenting (PTAS). Neurosonological assessment is key for diagnosis, treatment decision and follow-up.

Methods: We performed a retrospective observational study based on a prospective registry of patients undergoing PTAS for SAS(2021-2026). Demographic, neurosonological, procedural, and outcome data were collected. Doppler ultrasound was performed before PTAS and at 24 hours, 1, 6, and 12 months thereafter, with additional assessments at 3 and 9 months in selected cases. Factors associated with restenosis were evaluated using logistic regression.

Results: Among over 550 angioplasty procedures performed during the study period, 29 SAS interventions in 26 patients were analyzed[mean age 68±10.4 years; 9(34.6%) female], 20(69.0%) involving the left subclavian artery. 13(46.6%) had vertebrobasilar transient ischemic attack, 6(21.4%) vertebrobasilar stroke, 3(10.7%) upper-limb symptoms and 6(21.4%) asymptomatic. Angiography identified severe stenosis in 23(79.3%), of which 20(87.0%) had been correctly identified by prior ultrasound: 17(58.6%) showed monophasic subclavian waveform, 18(62.1%) vertebral steal and 8(27.6%) basilar hemodynamic repercussion. Median ultrasound follow-up was 33 months(IQR:16–49). Early restenosis (<24 hours) was observed in 9(31.0%):6 moderate, 3 severe. Late restenosis occurred in 21(72.4%), progressing to severe in 12(41.4%). Two patients(6.9%) experienced new ischemic events(one vertebrobasilar). Repeat angioplasty was performed in two cases with severe restenosis at the discretion of the treating neurologist. Restenosis and repeat angioplasty were not associated with a worse functional outcome at one year(p=1.00 for both). Female sex was the only independent predictor of severe restenosis(OR 5.60;95% CI 1.08–30.00).

Conclusions: PTAS for SAS appears to be a safe and effective procedure. Neurosonology provides high diagnostic accuracy and is essential for follow-up. Restenosis is frequent but generally asymptomatic and does not appear to affect functional outcome, although women may require closer surveillance due to a higher risk of severe restenosis.

PP59

A Case of Symptomatic Carotid Web with an Underlying Mobile Thrombus Revealed by Cervical Duplex Ultrasound

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Introduction: Carotid web (CaW) is a recognized cause of artery-to-artery embolism originating from the internal carotid artery. However, visualization of the underlying thrombus remains challenging.

Methods: We report a case in which a mobile thrombus within a CaW cavity was identified by cervical duplex ultrasound (DUS).

Results: A 52-year-old woman was admitted to our stroke unit 3 hours after the onset of acute motor aphasia and mild right hemiparesis. Diffusion-weighted MRI demonstrated an acute ischemic infarction in the left middle cerebral artery territory, without visible arterial occlusion but with FLAIR vascular hyperintensities. The baseline NIHSS score was 7, and intravenous thrombolysis resulted in complete clinical recovery. Cardioembolic work-up was unremarkable. CT angiography (CTA) revealed moderate stenosis of the proximal left internal carotid artery (55% according to NASCET). DUS identified a protruding intraluminal structure suggestive of a thrombus trapped within a CaW. Anticoagulation with dabigatran was initiated for one month. Follow-up DUS demonstrated complete thrombus resolution, revealing a characteristic shelf-like CaW. Although thrombotic material within CaWs has been reported in histopathological studies, it is infrequently observed, likely because antithrombotic therapy is often initiated before surgery. CTA readily identifies classic free-floating thrombi but may miss thrombi confined within a CaW cavity. In contrast, DUS may better detect thrombotic content associated with CaW. In some patients, thrombus resolution on follow-up DUS may unmask the underlying CaW, enabling diagnostic confirmation and consideration of definitive treatment by carotid stenting or surgery.

Conclusion: This case highlights the value of duplex ultrasound for detecting thrombotic material within the carotid web cavity and may represent the non-invasive imaging modality of choice for both diagnosis and follow-up of suspected carotid web-associated thrombosis.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP60

Diagnostic performance of echo-doppler in the detection of carotid web using a standardized ultrasound scoring system

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Background: Carotid web (CaW) is a recognized cause of cryptogenic ischemic stroke, particularly in young women of African ancestry. Although computed tomography angiography of the supra-aortic trunks (CTA) is currently the reference standard for its diagnosis, the role of Doppler ultrasound of the supra-aortic trunks (DUS) remains insufficiently defined. A standardized ultrasound assessment tool, named ECHOWEB, was developed to improve the detection of carotid webs.

Methods: This retrospective single-center study was conducted at the South Francilien Hospital Center to evaluate the feasibility and consistency of the ECHOWEB scoring system, determine the sensitivity of its individual components, and compare the performance of DUS with that of CTA. Nineteen carotid webs in 18 patients were analyzed. Diagnosis was based on CTA findings validated by the CAROWEB registry and/or histopathological examination following surgery. The ECHOWEB scoring system included four criteria: the presence of a carotid spur on the sagittal view, the presence of a "burger sign" on the axial view, the presence of thrombus, and the absence of definite atherosclerotic features.

Results: The mean patient age was 53 years, and 57.9% were women. DUS identified a carotid spur in 84.2% of cases, a burger sign in 47.4%, and thrombus in 52.6%. The sensitivity of the main criteria was 87.5% for the carotid spur and 80.0% for the burger sign. Positive predictive values reached 93.3% and 100%, respectively. Agreement between DUS and CTA was 78.9% for the carotid spur, 84.2% for the burger sign, 78.9% for atherosclerosis, and 63% for underlying thrombus.

Conclusion: The ECHOWEB scoring system enables reliable identification of carotid webs using Doppler ultrasound. DUS appears to be an accessible, reproducible, and effective screening modality for carotid web when performed according to a standardized protocol. However, a larger prospective validation study is required before widespread implementation of this score in clinical practice.

PP61

Right to left shunt testing with transcranial Doppler Ultrasound: A Scoping Review and Statement by the Microembolic Study Workgroup of the World Organisation of Neurosonology

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Background: Testing for right to left shunt (RLS) is an essential element of screening for embolic source of stroke. TCD technology and practice technique have improved since the last guideline on TCD bubble study was published >20 years ago. The aim of this international panel of neurosonology experts was to critically review the literature of TCD bubble study technique and performance against other diagnostics and survey an international group of TCD experts to inform consensus criteria on how best to perform a TCD bubble study.

Methods: A web-based survey of 15 questions was sent to 21 international experts in the field of TCD. Each question could be answered with "yes," "no," or "uncertain." A scoping review of studies that report TCD bubble study technical features and performance as compared to TTE and TEE was conducted (PROSPERO CRD420251172152). Statistical analyses include a summary Forest plot and a Receiver Operating Characteristic (ROC) curve of diagnostic yield of TCD as compared to TTE.

Results: The survey data suggest a strong, but not unanimous, trend toward consensus on TCD bubble study technique as detailed in the previous guideline, but more uncertainty on the role of diagnostic grading scales and emerging technology such as robot-assisted TCD. There were 133 studies meeting criteria for review. Studies were reviewed systemically for specific technical components and overall trends were charted in table format. Five studies had specific enough test performance data for the Forest plot and ROC curve analyses. The analysis yielded the following diagnostic parameters for right to left shunt detection:

TCD: Sensitivity=99.9%, Specificity=96.8%

TTE: Sensitivity=79.4%, Specificity=98.4%

Conclusions: Our results support the use of TCD bubble study as a highly accurate test for RLS. There are trends toward consensus on best technical practices but no unanimity among surveyed global TCD experts, and we suggest literature-based best technique.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP62

The role of ultrasonography of the brachial plexus in differentiating between Parsonage-Turner syndrome and neuroborreliosis. A pictorial review

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Background: Parsonage-Turner syndrome (PTS), also known as neuralgic amyotrophy, is an inflammatory neuropathy of the brachial plexus characterized by acute neuropathic pain followed by weakness and muscle atrophy. In clinical practice, PTS should be differentiated from infectious brachial plexopathies, particularly early neuroborreliosis presenting as Bannwarth syndrome. Early and accurate diagnosis is crucial because management and prognosis differ substantially between these conditions.

Methods: A narrative review of the available literature and the authors' clinical experience were used to develop a high-resolution ultrasound (HRUS) examination protocol for assessment of the brachial plexus. Typical sonographic findings observed in PTS and infectious brachial plexitis associated with Borrelia infection were analyzed and compared.

Results: HRUS enables rapid, non-invasive evaluation of the brachial plexus and peripheral nerves. In PTS, characteristic findings include focal nerve enlargement, fascicular swelling, and the presence of nerve torsion with the so-called hourglass-like constriction sign. In contrast, infectious brachial plexitis typically demonstrates diffuse inflammatory changes without nerve twisting. The proposed examination protocol facilitates systematic assessment of the plexus and improves recognition of these distinguishing imaging features.

Conclusions: High-resolution ultrasound is a valuable diagnostic tool in the differential diagnosis of brachial plexopathies. Identification of characteristic sonographic features, particularly hourglass-like constrictions and nerve torsion, may support early differentiation of PTS from infectious brachial plexitis, enabling more appropriate therapeutic decisions and potentially improving clinical outcomes.

PP63

Subclavian steal syndrome in long-term parenteral nutrition patients.

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Background: A subset of patients with intestinal failure requires long-term parenteral nutrition (PN) over several years. Prolonged vascular access is associated with complications, including catheter-related infections and catheter-related bloodstream infections (CRBSI).

Methods: The local ethics committee approved the study, and informed consent was obtained from all participants. 30 patients undergoing long-term PN were consecutively recruited from the Department of General Surgery and Clinical Nutrition at the Center of Postgraduate Medical Education (CMKP). Ultrasound (US) examinations of the aortic arch arteries were conducted in the Vascular Laboratory of the Department of Neurology and Epileptology, CMKP. The prevalence of subclavian steal syndrome (SSS) was assessed in this cohort.

Results: The prevalence of subclavian steal syndrome (SSS) in this cohort was approximately 10%. In comparison, published literature reports a prevalence of 0.6% to 6.4% in the general population. Internal data from the Vascular Laboratory of the Department of Neurology and Epileptology at CMKP demonstrate an SSS prevalence below 2% in the overall examined population.

Conclusions: Patients receiving long-term parenteral nutrition appear to have a higher prevalence of SSS compared with the general population. This observation suggests a potential association that warrants further investigation.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP64

Renal function and glucose regulation are strongly associated with carotid disease severity in diabetic patients

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Background: Diabetes melitus (DM) is linked with peripheral vascular disease including carotide artery disease, and severity of carotid stenosis in patients with DM may be indicative of existence of polyvascular disease and confer a greater risk for vascular complications.

Methods: To estimate association of carotid stenosis with other DM risk factors, a total of 90 diabetic patients 34 males/56 females) with a mean age of 71.17±7.93 years and a mean diabetes duration of 23.41±10.47 years were included in this study. Laboratory tests (blood glucose concentration, HbA1, lipidogram), and eGFR were determined. Carotid artery Doppler was performed and severity of carotid disease was scored with 0 (normal, <50%), or stenosis 1(50-69%, 2 (70-89%), 3(>90%) and 4 carotide surgical treatment.

Results: Variance analysis showed that groups with 0, 1 and 4 degree of carotid disease differed statistically significantly in eGFR (F=6.973; p=0.002), HbA1c (F=5.747; p=0.005), duration of diabetes (F=6.839; p=0.002) and age (F=5.291; p=0.007), while differences in triglyceride, HDL- and LDL-cholesterol concentrations did not reach statistical significance (p>0.05). Games-Howell post hoc analysis showed that patients with 50–69% stenosis had significantly lower eGFR than patients with <50% stenosis (MD=20.87; p=0.016), suggesting an association between moderately advanced carotid atherosclerosis and poorer renal function. Also, the group with 50–69% stenosis was significantly older than the group with stenosis <50% (MD=5.98 years; p<0.001), confirming age as an important factor in the progression of atherosclerotic disease. Although the overall ANOVA test for HbA1c was significant, individual post hoc comparisons did not reach statistical significance. Similarly, for the duration of diabetes, a tendency for longer disease duration was observed in the operated patients compared to the other groups (p≈0.06), without formal statistical confirmation.

Conclusion: Overall results suggest that age, eGFR and glycoregulation are more significantly associated with the degree of carotid disease than lipid profile.

PP65

Beyond Flow Velocity: Critical Closing Pressure Identifies Subclinical Hemodynamic Compromise in Internal Carotid Artery Stenosis

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Background: Critical closing pressure (CCP) reflects the theoretical arterial pressure at which cerebral blood flow ceases and may serve as a marker of cerebral perfusion threshold. We investigated whether significant internal carotid artery (ICA) stenosis is associated with altered CCP despite preserved conventional transcranial Doppler (TCD) parameters.

Methods: In this prospective cross-sectional study, 40 consecutive patients hospitalized with suspected acute neurological disorders underwent CT angiography and continuous simultaneous bilateral TCD assessment of the middle cerebral arteries. Blood pressure and flow velocities were measured in supine, sitting, and standing positions. CCP was calculated using the two-point method based on systolic and diastolic blood pressure and flow velocity measurements. Cerebral autoregulation was assessed using CA slope (ΔVmean/ΔMAP) and Mx indices. Analyses were performed at the hemisphere level (80 hemispheres). Multivariable linear regression was used to identify independent determinants of CCP.

Results: The mean age was 56.6±15.1 years and 60% were male. Significant ICA stenosis (≥70%) was present in 32.5% of patients. Hemispheres with ipsilateral ICA stenosis demonstrated significantly higher mean CCP values than non-stenotic hemispheres (55.9±17.5 vs. 47.4±20.5 mmHg, p=0.040), with the greatest difference observed in the supine position (55.9±22.5 vs. 40.3±29.2 mmHg, p=0.012). In contrast, systolic and diastolic flow velocities, pulsatility index, CA slope, and Mx did not differ significantly between groups. In multivariable analysis, ipsilateral ICA stenosis remained the only independent predictor of elevated CCP.

Conclusions: Significant ICA stenosis is associated with increased CCP despite preserved conventional TCD flow and autoregulatory parameters. CCP may identify subclinical hemodynamic impairment not detected by standard neurosonologic measures and warrants further evaluation as a marker of cerebral perfusion vulnerability.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP66

Direct Evidence of In Situ Thrombus Formation Over a Carotid Web in Acute Ischemic Stroke

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Background: Carotid web is an uncommon and underrecognized vascular abnormality characterized by a shelf-like intraluminal projection arising from the posterior wall of the carotid bulb. Although rare, it has emerged as an important cause of ischemic stroke, particularly in younger patients without traditional vascular risk factors. However, direct imaging evidence of acute thrombus formation over a carotid web remains limited.

Methods: We describe a clinical case in which ultrasound examination detailed the thrombogenic evolution of a patient with carotid web, guiding therapeutic decisions.

Results: A 51-year-old woman with a history of smoking and overweight presented to the emergency department with a left partial anterior circulation stroke syndrome (NIHSS 14). Initial imaging demonstrated occlusion at the terminus of the left internal carotid artery (ICA), and successful mechanical thrombectomy was performed. Digital subtraction angiography during the acute phase revealed a subtle shelf-like intraluminal defect in the extracranial left ICA, consistent with carotid web, without visible thrombus. Following admission to the stroke unit, carotid ultrasound was performed and demonstrated a luminal protrusion compatible with carotid web, associated with an adherent, nonmobile thrombus causing approximately 20% stenosis. Twelve days after stroke, a second angiography confirmed persistence of a mural thrombus associated with the carotid web and a stent was placed. The patient remained stable without further vascular symptoms.

Conclusion: This case documents acute in situ thrombus formation over a carotid web, demonstrated by sequential imaging. These findings support carotid web as a local source of thrombus formation and ischemic stroke. This case also highlights the value of carotid ultrasound as a simple, non-invasive tool that can detect thrombus formation associated with carotid web, guiding therapeutic management of this uncommon cause of stroke.

PP67

Unilateral Recurrent Primary Central Nervous System Vasculitis presenting as ipsilateral embolic ischemic strokes: A case report with the role of Transcranial Color-Coded Duplex Sonography

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Background: Primary angiitis of the central nervous system (PACNS) is a rare inflammatory vasculopathy confined to the brain and spinal cord. Its diagnosis remains challenging due to nonspecific clinical and laboratory findings, and normal conventional vascular imaging.

Methods: We report a 45-year-old male who sustained four ischemic strokes exclusively in the right hemisphere over a period of 3 years. MRI demonstrated ischemic lesions within the right middle cerebral artery (MCA) and anterior cerebral artery (ACA) territories, with the most recent imaging revealing progressive atrophy of the right hemisphere. Laboratory workup revealed mild, transient elevations of erythrocyte sedimentation rate (ESR), C-reactive protein and white blood cell count (WBC) temporally associated with each stroke event in the absence of fever. Comprehensive vascular imaging - including CT angiography (CTA), MR angiography (MRA), and digital subtraction angiography (DSA) – showed no detectable vascular abnormalities, suggesting small-vessel involvement beyond the resolution of conventional angiography. TCCD demonstrated differences in pulsatility indices (PI) and velocities between left and right MCA.

Results: Based on the exclusively unilateral distribution, recurrent nature, mildly elevated ESR during acute events, and negative workup for systemic vasculitis, cardioembolic sources, coagulopathy, and large-vessel disease, unilateral recurrent PACNS is the leading diagnosis. Serial TCCD observed asymmetries in pulsatility indices and flow velocities between affected and unaffected territories provide real-time functional data.

Conclusion: This case highlights unilateral recurrent PACNS as a rare but important differential diagnosis in young patients with cryptogenic ischemic strokes confined to a single hemisphere. Negative angiography findings, and exclusion of other conventional stroke etiologies underscore the diagnostic challenge posed by CNS vasculitis. In this setting, TCCD emerges as a valuable adjunct, offering non-invasive, repeatable assessment of intracranial hemodynamics. Serial TCCD enables longitudinal monitoring of disease progression and treatment response.

Auditorium – Main Hall 12:00-13:30

Sunday 07 November

PP68

When microembolic signals tell the story!

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Background: Transcranial Doppler(TCD) detection of microembolic signals(MES) is a non-invasive technique that identifies solid or gaseous emboli and may aid stroke etiological diagnosis, risk stratification, and optimization of secondary prevention strategies.

Case report: A 44-year-old woman with an unruptured left para-ophthalmic internal carotid artery(ICA) aneurysm, previously treated with intra-saccular flow disrupting device(Countour) and chronic right ICA occlusion with prior right hemispheric transient ischemic attack, developed blurred vision and transient left monocular visual loss. Follow-up angiography revealed aneurysm persistence, prompting placement of a flow-diverting stent from the ophthalmic to the cavernous segment of the left ICA. After the procedure, transient left-sided hemihypoesthesia was noted. The patient was discharged on aspirin and ticagrelor. Four days later, she was readmitted with headache, nausea, vomiting, and worsening left lower limb(LLL) hypoesthesia and weakness(NIHSS 2). Brain CT/CT angiography showed no new abnormalities and preserved stent patency. Brain MRI revealed small acute ischemic lesions in the territory of both middle cerebral arteries. TCD demonstrated chronic right ICA occlusion and cross-flow from the left ICA through the anterior communicating artery supplying the right MCA, with bilateral MES detected in both MCAs. Platelet function testing, laboratory workup, and cardiac testing were unremarkable. Two days after the second discharge, acute worsening of LLL weakness and inability to walk(NIHSS 4). Follow-up MRI revealed new ischemic lesions in the same watershed territory. TCD again revealed persistent MES in both MCAs and the terminal left ICA, without MES in other intracranial territories, supporting an embolic mechanism from the recently implanted flow-diverting stent. In the first 24 hours of hospitalization, eptifibatide perfusion was initiated and the patient remained asymptomatic(NIHSS 0). Dual antiplatelet therapy was maintained, with no recurrent symptoms during 3-month follow-up.

Conclusion: This case highlights the value of TCD MES detection in investigating complex stroke mechanisms and cerebrovascular complications related to intracranial aneurysm endovascular treatment.

PP69

Ultrasound Assessment of Vulnerable Carotid Plaque in Ischemic Stroke Patients with Non-Severe Carotid Stenosis: A Systematic Review

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Background: Carotid atherosclerotic disease is an important cause of ischemic stroke, but the degree of luminal stenosis alone does not fully explain ischemic risk in patients with non-severe carotid stenosis. In this setting, ultrasound characterization of plaque vulnerability may provide additional prognostic information beyond stenosis severity.

Methods: A systematic review was conducted in accordance with PRISMA 2020 recommendations. PubMed/MEDLINE was searched for observational studies published between January 2015 and January 2026. Eligible studies included adults with ischemic stroke or transient ischemic attack and extracranial carotid plaque causing <70% stenosis, assessed by carotid ultrasound. Studies were selected through title/abstract screening followed by full-text review by two independent reviewers. Data were extracted using a standardized form, and methodological quality was assessed with the Newcastle–Ottawa Scale.

Results: A total of 126 records were identified, and 16 studies met the inclusion criteria. The most consistent ultrasound markers associated with plaque vulnerability and ischemic risk were intraplaque neovascularization, mainly assessed by contrast-enhanced ultrasound, and hypoechoic plaque composition. In recurrence studies, CEUS-detected neovascularization showed greater prognostic value than the degree of stenosis. In patients with embolic stroke of undetermined source, ipsilateral hypoechoic non-stenotic carotid plaque was independently associated with this stroke subtype. Advanced ultrasound techniques, including superb microvascular imaging, shear wave elastography and vector flow imaging, identified additional markers of vulnerability not captured by conventional ultrasound.

Conclusions: Ultrasound characterization of carotid plaque provides prognostically relevant information beyond the degree of stenosis in patients with ischemic stroke or transient ischemic attack and non-severe carotid stenosis. Intraplaque neovascularization and hypoechoic plaque composition were the most consistent markers. Prospective multicenter studies with standardized imaging protocols are needed to confirm their clinical utility and define their role in therapeutic decision-making.

Sunday 07 November

Auditorium – Main Hall 12:00-13:30

PP70

Friend or foe? Post-thrombectomy cerebral hyperperfusion on transcranial Doppler predicts early neurological improvement in an age-dependent manner in anterior large-vessel-occlusion stroke

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Background: Cerebral hyperperfusion is common after successful endovascular thrombectomy (EVT) for anterior large-vessel-occlusion (aLVO) stroke, but its determinants and prognostic meaning are unclear. Using the transcranial Doppler (TCD) peak-systolic-velocity (PSV) ratio (affected/unaffected hemisphere), we examined what drives hyperperfusion and whether it predicts major early neurological improvement (MNI).

Methods: Prospective single-centre pilot cohort study, including successful EVT (mTICI ≥2b) for aLVO. Post-procedure (<24h), bilateral robotic TCD and continuous arterial blood pressure were recorded; the PSV-ratio (stroke/healthy side) was computed (hyperperfusion ≥1.3), and cerebral autoregulation was quantified by transfer-function analysis and the moving-correlation index Mx. MNI was a ≥8-point NIHSS drop, or NIHSS ≤1, at 24h. Clinical determinants of the PSV ratio were assessed by multivariable linear regression; associations with MNI used Firth penalised logistic regression.

Results: Thirty-six patients were enrolled (MNI 67%; median age 72, 64% male). PSV-ratio was independently associated with larger core, younger age, lower NIHSS and shorter procedure time (multivariable R^2=0.41; all p<0.05). Hyperperfused (33%) and non-hyperperfused (67%) patients had similar overall MNI (62% vs 69%, p=0.7). The effect of hyperperfusion was age-dependent (PSV-ratio×age interaction significant and consistent across models, OR 0.63–0.77, p 0.008–0.017), surviving leave-one-out and exclusion of patients under 45 years. Hyperperfusion was protective in younger patients (MNI OR 3.5 per +0.1 PSV-ratio at age 35) and less associated with improvement in older ones (MNI OR 0.57 at 75), reversing at 62.7 years (95% CI 46.5–71.2). Among hyperperfused patients, non-improvers (n=5) were older (69 vs 50.5 years, p=0.045) and with worse autoregulation (Mx 0.59 vs 0.22, p=0.055) but not more severe. There were no differences in hemorrhagic transformation.

Conclusions: Post-EVT hyperperfusion on TCD is a bidirectional, age-dependent prognostic marker: protective in younger patients but attenuating and potentially detrimental with age, accompanied by a trend towards worse cerebral autoregulation.

PP71

Ultrasound examination in diagnostics of cerebral arteritis: benefits and pitfalls

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Ultrasound, including high-frequency ultrasound (HRUS), is a useful diagnostic tool for diagnosing inflammation of large-caliber extracranial vessels. The presence of characteristic ultrasound signs of vascular inflammation: vessel wall thickening, „halo" sign, and concentric stenosis (both with and without hemodynamically significant stenoses) are detected in Takayasu's arteritis and temporal arteritis (GCA). In the latter case, ultrasound should be supplemented with compression testing. Ultrasound is also helpful in diagnosing Transient Perivascular Inflammation of the Carotid Artery (TIPIC) and enables the detection of vascular pathology in the course of systemic diseases, such as Sjugren's disease. In the case of large-caliber intracranial arteries, transcranial ultrasound can reval occlusions/stenoses of large vessels and secondary collateralization of flow. In the course of inflammatory cerebral microangiopathy, TCD/TCCD examinations can detect impaired cerebral autoregulation and increased pulsatility index. Imaging methods complementary to ultrasound, used to confirm the presence of inflammatory infiltrates in the vessel wall or for differential diagnosis (e.g, differentiation from atherosclerosis or MoyaMoya disease), include: dedicated magnetic resonance imaging sequences (such as Black Blood MRI), positron emission tomography (PET) and conventional contrast angiography (DSA). Their complementary use, coupled with proper interpretation of the patient's clinical condition, allows for accurate diagnosis and avoidance of potential diagnostic pitfalls, exampled in the presented case of middle aged female.

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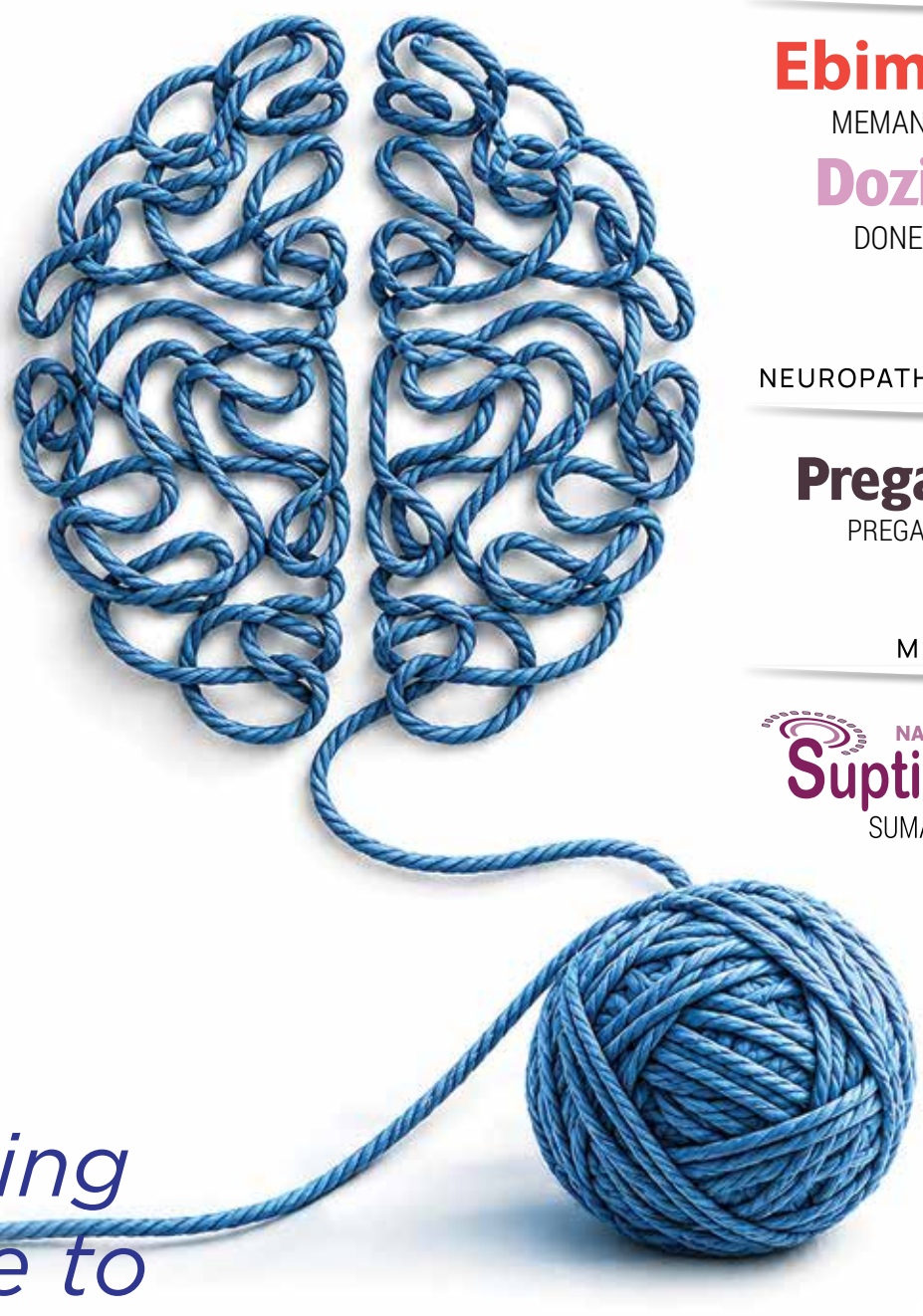
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Ως μία κορυφαία εταιρεία ιατρικής τεχνολογίας, επιδιώκουμε να διαμορφώσουμε έναν κόσμο όπου οι εξελίξεις στην υγειονομική περίθαλψη δημιουργούν νέες δυνατότητες, με βιώσιμο τρόπο. Για περισσότερα από 125 χρόνια, επαναπροσδιορίζουμε τα όρια της ιατρικής τεχνολογίας. Σήμερα, δραστηριοποιούμαστε στους τομείς της ιατρικής απεικόνισης, των διαγνωστικών, της ογκολογικής φροντίδας, και των ελάχιστα επεμβατικών θεραπειών – ενισχύοντας τις λύσεις μας με προηγμένες ψηφιακές τεχνολογίες και τεχνητή νοημοσύνη.

Με τον μοναδικό συνδυασμό των δυνατοτήτων μας στο Ψηφιακό Δίδυμο Ασθενούς[1], την Ιατρική Ακριβείας και την Τεχνητή Νοημοσύνη στην Υγεία, αντιμετωπίζουμε τις μεγαλύτερες προκλήσεις στην υγεία. Διευρύνουμε την πρόσβαση σε ποιοτική φροντίδα υγείας για κοινότητες με εριορισμένους πόρους παγκοσμίως και συμβάλλουμε ουσιαστικά στην αντιμετώπιση των πιο σοβαρών ασθενειών: των νευροεκφυλιστικών και καρδιαγγειακών παθήσεων, των εγκεφαλικών επεισοδίων και του καρκίνου. Συνεργαζόμαστε με παρόχους υγείας για να επιλύσουμε τις πιο επείγουσες προκλήσεις τους, ώστε να μπορούν να παρέχουν υψηλής ποιότητας, εξατομικευμένη φροντίδα στους ασθενείς, με τον πιο αποδοτικό τρόπο.

Με κινητήριο δύναμη τον σκοπό της Εταιρείας μας και καθοδηγούμενοι από τις αξίες μας, καλλιεργούμε ένα περιβάλλον εργασίας που προάγει τη διαφορετικότητα, την καινοτομία και τη συμπερίληψη. Οι ομάδες μας σε όλο τον κόσμο - μια κοινότητα περίπου 74.000 Healthineers σε περισσότερες από 70 χώρες - εργαζόμαστε με πάθος για να ξεπερνάμε συνεχώς τα όρια του δυνατού στην υγεία, ώστε οι ασθενείς να ζουν με αισιοδοξία και όχι με τον φόβο της ασθένειας.

1 Πρώιμη ανίχνευση, ακριβής διάγνωση, εξατομικευμένη επιλογή θεραπείας, προσομοίωση και σχεδιασμός, συνεχής παρακολούθηση και μετέπειτα φροντίδα.

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For ischemic strokes, the team administers clot-busting medication like tPA or TNK on the spot. For hemorrhagic strokes, blood pressure-lowering treatments may be given to help stabilize the patient.

Continuous monitoring & transport
While en route to the receiving hospital, the MSU team closely monitors the patient and communicates with hospital staff, ensuring they are prepared for further treatment upon arrival.

How do MSUs help improve patient care?

Faster diagnosis
Head CT imaging and telemedicine enable stroke specialists to evaluate patients on-site, eliminating delays in diagnosis, treatment, and triage decisions.

Quicker treatment
Early administration of the appropriate treatment helps restore blood flow, reduce disability, and improve recovery rates.

Specialized stroke care in the field
The dedicated MSU care team includes a paramedic/EMT, an advanced critical care nurse, a CT technologist, and a neurologist (onboard or via telemedicine). Their expertise ensures accurate diagnosis and timely intervention in the field.

Efficient patient triage
If advanced procedures like endovascular thrombectomy are required, the MSU bypasses non-equipped hospitals and transports the patient directly to a comprehensive stroke center, saving crucial time.

Improved patient outcomes
By reducing the time from stroke onset to treatment, MSUs increase survival rates, decrease complications, and promote better recovery, resulting in shorter hospital stays and reduced long-term disability.

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