clinical and translational neuroscience

IMPACT FACTOR 1.1

Indexed in: Scopus

Conference Report

# Abstracts of the 6th SFCNS Congress—Swiss Federation of Clinical Neuro-Societies Lausanne, Switzerland, 29–31 October 2025—United for Brain Health

Swiss Federation of Clinical Neuro-Societies (SFCNS)

MDPI

https://doi.org/10.3390/ctn9040045

clinical and translational neuroscience

MDPI

*Conference Report*

# Abstracts of the 6th SFCNS Congress—Swiss Federation of Clinical Neuro-Societies Lausanne, Switzerland, 29–31 October 2025—United for Brain Health

**Swiss Federation of Clinical Neuro-Societies (SFCNS)**

Swiss Neurological Society SNS c/o IMK Institute for Medicine and Communication Ltd., Münsterberg 1, 4001 Basel, Switzerland; sfcns@imk.ch

## Abstract

On behalf of the SFCNS, Swiss Federation of Clinical Neuro-Societies, we are pleased to present the Abstracts of the 6th SFCNS Congress, which will be held in Lausanne, Switzerland, 29–31 October 2025. In total, 182 abstracts were selected as ePosters, of which 60 abstracts are presented as short presentations during the ePoster Sessions and 2 abstracts are presented at the Neurosurgery Sessions. We congratulate all the presenters on their research work and contributions.

**Keywords:** neurosurgery; neurology; stroke; neuroradiology; biological psychiatry; epilepsy; neuropsychology; behavioral neurology; clinical neurophysiology; headache; neuropathology; neurorehabilitation



Academic Editor: Antonio Toscano

Received: 22 August 2025
Accepted: 2 September 2025
Published: 30 September 2025

**Citation:** Swiss Federation of Clinical Neuro-Societies (SFCNS). Abstracts of the 6th SFCNS Congress—Swiss Federation of Clinical Neuro-Societies Lausanne, Switzerland, 29–31 October 2025—United for Brain Health. *Clin. Transl. Neurosci.* **2025**, *9*, 45. https://doi.org/10.3390/ctn9040045



## O01

### Aspirin Continuation or Discontinuation in Surgically Treated Chronic Subdural Hematoma: A Randomized Clinical Trial

M Kamenova [1], L Pacan [2], C Mueller [1], M Coslovsky [2], K Lutz [3], S Marbacher [4], M Moser [5], A Hickmann [6], C Zweifel [7], R Guzman [1], L Mariani [1] and J Soleman [1]

[1] University Hospital of Basel, Basel, Switzerland
[2] University of Basel, Basel, Switzerland
[3] University Hospital of Bern, Bern, Switzerland
[4] Kantonsspital Aarau, Aarau, Switzerland
[5] Kantonsspital Luzern, Luzern, Switzerland
[6] Kantonsspital St. Gallen, St. Gallen, Switzerland
[7] Kantonsspital Graubünden, Chur, Switzerland

Introduction

Discontinuation of low-dose acetylsalicylic acid (ASA) during the perioperative phase of chronic subdural hematoma (cSDH) may reduce recurrence rates but may also increase the risk of cardiovascular or thromboembolic events. However, the efficacy and safety of discontinuing ASA in this patient population remain unclear. The aim of SECA is to assess the risk of recurrence of cSDH and cardiovascular events in patients undergoing surgical treatment of cSDH with continuous versus discontinuous ASA treatment.

Methods

Investigator-initiated, placebo-controlled, double blinded, multicenter randomized controlled trial from 2018 top 2023. Adults undergoing burr hole drainage of cSDH and

who were under ASA treatment prior to cSDH onset were included. The main outcome was recurrence rate of cSDH necessitating reoperation within 6 months. An intention-to-treat analysis was performed, calculating risk differences. Secondary outcomes were cardiovascular or thromboembolic events, other bleeding events, and mortality.

Results

Out of 1363 screened patients 155 participants (25 participants (16.1%) female) were included. 78 were assigned to continuous ASA and 77 to placebo treatment. A primary outcome event occurred in 13.9% for the ASA group and 9.5% for the placebo group (weighted risk difference 4.4%; 95% CI, −7.2 to 15.9; $p = 0.558$). The incidence of any cardiovascular or thromboembolic event was 0.27 per person half-year in the ASA group and 0.28 in the placebo group. The incidence of a cardiovascular event indicating ASA treatment was 0.02 per person half-year in the ASA group and 0.06 in the placebo group. Other bleeding events showed an incidence of 0.10 per person half-year in the ASA group and 0.08 in the placebo group. All-cause mortality occurred at an incidence of 0.06 per person half-year in the ASA group and 0.03 in the placebo group.

Conclusions

SECA suggests that discontinuing ASA treatment does not reduce recurrence rate of surgically treated cSDH within 6 months. Recurrence risk estimates for continuous ASA treatment in our trial are distinctly lower than previously reported.

Trial Registration: ClinicalTrials.gov NCT03120182; www.clinicaltrials.gov/study/NCT03120182.

**O02**

## Beyond Cement: Evaluating the Impact of Vertebral Implant Kyphoplasty vs. Stand Alone Vertebropplasty on Pain Reduction, Operative Time and Alignment

D Cipriani, J Jost, L Andereggen, G Schubert and M Bruder

Department of Neurosurgery, Kantonsspital Aarau, Aarau, Switzerland

Aims

Spinal osteoporotic fractures cause severe pain, functional impairment, and increased morbidity and mortality. Effective treatment is essential, but few studies clearly define the optimal approach. This retrospective single-center study compares the outcomes and safety of conventional vertebroplasty (VP) versus vertebral implant kyphoplasty (VI).

Methods

Seventy patients with 97 stable traumatic and/or osteoporotic spinal fractures treated at the Department of Neurosurgery, Kantonsspital Aarau, between February 2022 and February 2025 were included. Primary outcomes were pain reduction, kyphotic angle restoration, incidence of postoperative adjacent or sintering fractures, and operative time. Secondary outcome was postoperative complications. Patients with good realignment in the lying position underwent VP; those with insufficient realignment received VI.

Results

In total, 57 VPs were performed in 44 patients and 32 VIs in 26 patients. The median age was 75.9 years in the VP group and 74.2 years in the VI group ($p = 0.908$). Osteoporosis was known in 96.1% of VI patients and 95.5% of VP patients ($p = 0.623$). Both treatments achieved substantial pain reduction, with median VAS score decreases of 4.8 points (VI) and 4.7 points (VP) without significant difference ($p = 0.713$). The incidence of postoperative adjacent or sintering fractures was also similar ($p = 1.000$). Kyphotic angle restoration was significantly greater in the VI group, with a median reduction of 42.1%, compared to 14.4% in the VP group ($p = 0.0106$). Operative time was significantly shorter for VP (median 33.8 min) versus VI (median 41.1 min; $p = 0.014$). Cement leakage occurred in 4.29% of cases, with no other postoperative complications noted.

Conclusions

Both procedures effectively reduce pain. VI achieved significantly better correction of the kyphotic angle, but this did not translate into superior short-term pain relief. Whether this advantage provides long-term clinical benefit requires further follow-up. Despite greater vertebral height restoration in the VI group, the incidence of subsequent fractures was similar. This study supports both procedures as safe and effective, but the shorter operative time, lower costs, and comparable patient satisfaction make conventional vertebroplasty a viable and sufficient treatment option.

**P001**

**Long-Term 24-Month Findings of N-Acetyl-L-Leucine for Niemann-Pick Disease Type C**

T Bremova-Ertl [1], M Strupp [2], M Patterson [3] and K Martakis [4]

[1] Inselspital, Universitätsspital Bern, Bern, Switzerland
[2] Ludwig Maximilians University Hospital, Campus Grosshadern, Munich, Germany
[3] Intrabio, Ltd. Austin, Austin, USA
[4] Justus Liebig University, University Hospital Giessen and Marburg, Campus Giessen, Giessen, Germany

Introduction

The IB1001-301 clinical trial was a Phase III, double-blind, randomized, placebo-controlled trial comparing N-acetyl-L-leucine (NALL) with placebo for the treatment of neurological signs and symptoms in Niemann-Pick disease type C (NPC) after 12 weeks. The primary Scale for the Assessment and Rating of Ataxia (SARA) endpoint was reduced −1.97 points with NALL and −0.60 with placebo ($p < 0.001$). Extended follow-up data were obtained in an open-label Extension Phase (EP) to evaluate the long-term, neuroprotective effects of NALL for NPC.

Methods

Patients received treatment with orally administered NALL 2–3 times per day (patients 4–12 years receiving weight-based doses (2 to 4 g per day), those ≥13 years 4 g per day). The primary endpoint was the modified 5-domain NPC Clinical Severity Scale (5-Domain NPC-CSS) (range 0–25 points; lower score representing better neurological status). Comparisons were made to the expected annual trajectory of disease decline established in published natural history studies. Exploratory endpoints included the 15-domain NPC-CSS (excluding hearing) and SARA.

Results

54 patients aged 5–67 years were treated in the EP. After 24 months, the mean (±SD) change from baseline on the 5-domain NPC-CSS was −0.24 (±2.69) on NALL, compared to +3.0 (±6.32) in the historical cohort: mean difference −3.24 (95% Confidence Interval (CI) −5.59 to −0.89; $p = 0.009$). The result of the 15-domain NPC-CSS was supportive of the primary analysis and the improvements in neurological status demonstrated in the Parent Study's primary SARA endpoint were sustained over the 24-month long–term follow-up.

Conclusions

Treatment with NALL after 24 months was associated with a statistically significant and clinically meaningful reduction in disease progression and consistent with a neuroprotective, disease-modifying effect.

**P002**

**Clinical Characteristics, Biomarkers and Prevalence of Cerebral Amyloid Angiopathy in Alzheimer's Disease: Applying the Boston Criteria v2.0 in a Memory Clinic Population**

H Lalive [1], F Ribaldi [1], A Mendes [1], C Wang [1], C Chicherio [1], M Scheffler [2], KO Lövblad [3], G Frisoni [1] and A Lathuilière [1]

[1] Memory Center, Geneva University Hospitals and Faculty of Medicine, Geneva, Switzerland
[2] Division of Radiology, Geneva University Hospitals, Geneva, Switzerland
[3] Division of Neuroradiology, Geneva University Hospitals, Geneva, Switzerland

Aims
CAA diagnosis has become more important with the advent of anti-amyloid therapies, given its association with amyloid-related imaging abnormalities. While the Boston criteria are widely used in memory clinics, the prevalence and clinical correlates of CAA in biomarker-confirmed AD remain unclear.
To determine the prevalence of cerebral amyloid angiopathy (CAA) in cognitively impaired older adults with biomarker-confirmed Alzheimer's disease (CI-AD) using the Boston criteria v.2.0, and to compare clinical, cognitive, and biomarker profiles between CI-AD patients with and without CAA.
Methods
We retrospectively identified 506 patients with probable AD, confirmed by cerebrospinal fluid (CSF) or positron emission tomography (PET) biomarkers, from the Geneva University Hospitals Memory Center database (2012–2024). MRI scans were evaluated by a radiologist or neuroradiologist, independently reviewed by a blinded analyst, and diagnoses confirmed by a neurologist. Patients were classified as high (AD-CAA) or low probability of CAA (AD-nCAA) using the Boston criteria v.2.0. Clinical, cognitive, and biomarker profiles were compared using the Chi-squared test or Fisher's exact test for categorical variables and the Mann-Whitney U test for continuous variables. Longitudinal cognitive decline was assessed using a linear mixed-effects model.
Results
29% ($n$ = 146) of CI-AD patients had a high risk of CAA. Compared to AD-nCAA, AD-CAA patients were older, more frequently on antiplatelet therapy, and had greater cerebrovascular comorbidity, despite similar vascular risk. No group differences were observed in CSF/PET biomarkers or medial temporal atrophy. Baseline cognition, including memory and executive functions, was comparable. MMSE declined by 0.10 points/month (95% CI: $-0.12$ to $-0.08$, $p < 0.001$), with no difference in decline between groups ($p = 0.886$).
Conclusions
Nearly one-third of CI-AD patients had high risk of CAA, lower than pathology-based estimates. CAA status was not associated with biomarker burden or cognitive decline, highlighting the need for further research into its clinical implications in memory clinic populations; and questioning the use of the Boston criteria v.2.0 in AD.

**P003**

## Modified Titration of Donanemab Reduced ARIA-E Risk and Maintained Amyloid Reduction: 18-Month Results from TRAILBLAZER-ALZ 6

H Wang [1], ES Monkul Nery [1], P Ardayfio [1], R Khanna [1], DO Svaldi [1], S Shcherbinin [1], W Xu [1], SW Andersen [1], P Hauck [1], D Brooks [1], E Collins [1], M Mintun [1], J Sims [1] and A Lathuilière [2]

[1] Eli Lilly and Company, Indianapolis, USA
[2] Hôpitaux Universitaires de Genève, Centre de la Mémoire, Geneva, Switzerland

Background
TRAILBLAZER-ALZ 6 (NCT05738486) investigated the effect of various donanemab dosing regimens on the frequency of amyloid-related imaging abnormalities with edema/sulcal effusions (ARIA-E). The modified titration arm successfully met the primary objective by significantly reducing the frequency of ARIA-E compared to the standard dosing arm, while achieving similar amyloid reduction at 24 weeks. Here we report the 76-week results of this study.

Methods

Adults with early symptomatic Alzheimer's disease (AD) and confirmed amyloid pathology ($n$ = 843) were stratified by baseline amyloid levels and apolipoprotein E genotype and randomly assigned 1:1:1:1 (standard + three alternative donanemab dosing arms) in this randomized, double-blind, multicenter, phase 3b study. Each of the four treatment arms differed in the donanemab dosage per infusion and frequency of dosing. However, the total donanemab exposure was the same in each arm by week 16. Relative risk reduction (RRR) of ARIA-E was assessed with Bayesian logistic regression at 76 weeks. Amyloid and other AD related biomarkers were also assessed.

Results

ARIA-E frequencies for standard, modified titration, dose skipping, and Cmax arms were 24.2%, 15.6%, 18.6%, and 19.2%, respectively though 76 weeks. Consistent with the 24- and 52-week results, only the modified titration group met the predefined success criterion showing 87.1% posterior probability of achieving $\geq$20% RRR in ARIA-E frequency versus to the standard arm. Notably, no additional symptomatic ARIA-E events were observed in either arm between 52 and 76 weeks. The modified titration arm still had significantly lower ARIA-E radiographic severity ($p$ = 0.015) and a lower symptomatic ARIA-E frequency through 76 weeks (2.8% versus 4.8% in the standard arm). Serious adverse events, discontinuations or treatment-emergent adverse events in the modified titration arm were largely comparable to the standard dosing arm. Amyloid and plasma biomarker data will also be presented.

Conclusions

Consistent with the 24- and 52-week results, the 76-week data shows that a more gradual titration of donanemab dose significantly reduced ARIA-E risk versus standard dosing.

**P004**

**Congenital Nystagmus Protects Against Motion Sickness**

HM Rust [1], F Honegger [1], A Palmowski-Wolfe [1], JF Golding [2] and MA Gresty [3]

[1] University Hospital Basel, Basel, Switzerland
[2] University of Westminster, London, UK
[3] Imperial College London, London, UK

Aims

Motion sickness (MS) is provoked when ambiguity or 'conflict' within vestibular signals or within visual vestibular interactions challenge the constancy of 'uprightness', the parsing of tilt versus translation and the interpretation of self versus environmental motion. Frequently, such conflicts pit the 'slow phase' visual mechanisms of pursuit and optokinesis against the slow phase vestibular ocular reflex (VOR); as when reading in a car the VOR evoked by car motion is opposed by pursuit to maintain fixation on the text: the effort is rarely satisfactory and nausea ensues. The implication of slow phase eye movements in MS provocation raises the question of MS susceptibility in subjects with abnormal slow phase eye movements. A near-ideal population to test are subjects with 'CN' type congenital nystagmus who are normal in other respects relevant to nauseogenesis. During fixation of a stationary or moving target, both with and without head movement, the visual and vestibular slow phase eye movements of CN take the eyes 'off target' with exponentially increasing velocity. Frequent resetting saccades return the eyes to target creating a nystagmus.

Methods

We recruited 34 CN subjects who consented to being filmed and completed a validated motion sickness susceptibility questionnaire 'MSSQ' and a visually induced motion sickness susceptibility questionnaire 'VIMSSQ' (3).

Results
CN MSSQ scores were significantly lower ($p < 0.01$) for both childhood and adult motion sickness versus standard population norms. CN VIMSSQ scores were also lower for 'nausea' ($p < 0.01$) and 'headache' ($p < 0.05$) factors, marginally lower for 'dizziness' ($p = 0.08$), but similar to normal for 'fatigue', 'eye strain' and 'avoidance'.
Conclusions
The classical 'nausea' of motion sickness and the frequent secondary feature of 'headache' are absent or significantly low in the CN population. Evident explanations are twofold. Firstly, CN subjects could be highly adapted to motion from early life because their visual world is unstable from birth. Secondly, slow phase eye movements are an important component of visual-vestibular tonic control of balance and orientation. They are organised in a brainstem-cerebellar neural network. A disorder of the network, as in 'CN', could prevent the occurrence of 'conflicts' which provoke motion sickness.

**P005**

**Additive value of Retinal—and Serum—Biomarkers to predict disability in Multiple Sclerosis**

S Sellathurai [1], F Burguet Villena [1], K Schönholzer [1], N Cerdá Fuertes [1], L Hofer [1], S Schädelin [1], M Dsouza [1], A Maleska MacEski [1], B Fischer-Barnicol [1], V Kana [2], J Oechtering [1], A Petzold [3], L Kappos [1], C Granziera [1], K Gugleta [4], P Benkert [1], J Kuhle [1] and A Papadopoulou [1]

[1] Universitätsspital Basel, Basel, Switzerland
[2] Universitätsspital Zürich, Zürich, Switzerland
[3] The National Hospital for Neurology and Neurosurgery and Barts Health NHS Trust, London, UK
[4] Augenklinik Universitätsspital Basel, Basel, Switzerland

Aims
To investigate the additive value of OCT and serum biomarkers to prognosticate disability worsening in patients with multiple sclerosis (pwMS).
Methods
PwMS from the Swiss MS Cohort Study (SMSC) with $\leq$1 OCT and annual blood samples were included. Mean thickness of peripapillary retinal nerve fiber layer (pRNFL), ganglion cell inner-plexiform layer (GCIPL) and inner nuclear layer (INL) were assessed. Serum glial fibrillary acidic protein (sGFAP) and neurofilament light-chain (sNfL) Z scores were generated based on large healthy control databases. Expanded disability status scale (EDSS) linear trajectory in dependence on baseline (BL) OCT or serum levels was estimated using linear mixed-effects models, including an interaction term between BL measurement and time, adjusted for age at first symptoms, sex, disease duration at baseline, treatment at every visit and recent relapses. For the final model, patients were stratified into three groups based on a combination of most prognostic OCT and serum markers: (1) low Z Score of serum biomarker (below 3rd quartile, Q3) and thick OCT layer (>Q1); (2) low Z score and thin OCT ($\leq$Q1); (3) high Z score ($\geq$Q3) and thin OCT.
Results
257 patients were included (median age at (BL): 49 y, 63% female, median FU-time: 2.2 y). Both pRNFL ($\beta = -0.005$, $p < 0.001$) and GCIPL ($\beta = -0.002$, $p < 0.001$) at BL were associated with EDSS increase over time. A 10 µm GCIPL loss increased the EDSS trajectory by 0.02. INL showed no significant impact ($\beta = -0.17$, $p = 0.136$). sGFAP showed a trend ($\beta = 0.01$, $p = 0.050$), while sNfL.
Z scores were not prognostic ($\beta < 0.001$, $p = 0.913$). Based on these results, sGFAP was combined with GCIPL for stratification. Compared to group 1 (low sGFAP and thick GCIPL, $n = 141$), patients in group 2 (low sGFAP and thin GCIPL, $n = 43$) exhibited a steeper

increase in EDSS over time (β = 0.052, $p = 0.007$), while group 3 (high sGFAP and thin GCIPL, $n = 19$) showed the steepest EDSS slope (β = 0.102, $p = 0.0001$).

Conclusions

GCIPL as measure of neuronal loss and sGFAP as marker of astrocytic activation or injury in MS showed additive effects on EDSS worsening over time. Our findings highlight the potential of combining retinal and serum biomarkers for disability prediction and stratification of pwMS.5.

**P006**

**Multiple Sclerosis Patients Present with an Autoimmune CD8+ T Cell Response Specifically Targeting Astrocytes**

S Jones [1], S Perriot [1], A Mathias [1], R Genolet [2], H Lindsay [3], M Canales [1], A Meringa [1], S Bobisse [2], L Queiroz [2], C Sauvage [2], L Oberholster [1], R Bernard-Valnet [4], M Theaudin [4], C Pot [4], R Gottardo [3], A Harari [2] and R Du Pasquier [1]

[1] Laboratories of Neuroimmunology, Neuroscience Research Centre, Department of Clinical Neurosciences, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland
[2] Ludwig Institute for Cancer Research, Lausanne Branch, Department of Oncology, Lausanne University Hospital and University of Lausanne, Agora Cancer Research Center, Lausanne, Switzerland
[3] Biomedical Data Science Center, University of Lausanne and Lausanne University Hospital, Swiss Institute of Bioinformatics, Lausanne, Switzerland
[4] Service of Neurology, Department of clinical neurosciences, University Hospital of Lausanne and Lausanne University Hospital, Lausanne, Switzerland

Aims

CD8+ T cells are abundant and clonally expanded in MS brain lesions, suggesting antigen-driven proliferation. While most studies have focused on myelin antigens (Ags), recent assessments suggest that Ags expressed by astrocytes and neurons may be targeted by the immune system in MS. Since HLA class I upregulation in astrocytes and neurons is observed in active MS lesions, we sought to explore if MS patients present with CD8+ T cell responses against less explored targets such as astrocytes or neurons.

Methods

Using our recently developed autologous system, we generated human-induced pluripotent stem cells (hiPSC-) derived astrocytes and neurons from 8 MS patients and 6 age-matched healthy donors (HD). We then co-cultured them with peripheral blood mononuclear cells (PBMC) for 14 days to expand potential autoreactive CD8+ T cells. TCR repertoire of ex vivo CD8+ T cells were compared with astrocyte- or neuron-expanded CD8+ T cells to identify proliferating clonotypes that may be autoreactive. Selected clonotypes were cloned into NFAT-luciferase Jurkat cells to demonstrate that these CD8+ T cell clonotypes are indeed autoreactive. To phenotypically characterize these cells, we performed single cell RNA sequencing (scRNAseq) on expanded CD8+ T cells.

Results

We demonstrated that the CD8+ T cell repertoire of MS patients is specifically restricted after coculture with hiPSC-derived astrocytes but not with neurons. Of high interest, astrocyte-reactive clonotypes were only found in the MS cohort and not in the HD cohort (5/7 MS patients vs. 0/5 HD). Additionally, the majority of these clonotypes did not respond against autologous PBMC suggesting a restricted anti-astrocyte CD8+ T cell response. Finally, scRNAseq analysis identified that these astrocyte-specific CD8+ T cells were highly proliferative, activated and cytotoxic.

Conclusions

Using a fully autologous hiPSC-based system, we uncovered $CD8^+$ T cell responses targeting astrocytes, but not neurons, in MS patients only. Our findings suggest that, in MS, auto-antigens should be looked for beyond usual myelin suspects.

**P007**

**Immune Signatures Link Myelin-Oligodendrocyte Glycoprotein Antibody-Associated Disease to Other Autoantibody-Mediated Conditions**

J Schmid [1], C Alberti [1], L Power [1], NG Nuñez [1], D De Feo [1], S Tyystjärvi [2], L Kulsvehagen [3], V Kreiner [1], ABA Galvão Gomes [3], P Lipps [3], S Swinnen [3], F Ingelfinger [1], C Ulutekin [1], C Chaubet [4], S Unger [1], S Kreutmair [1], R Marignier [5], T Korn [2], A Pröbstel [3], R Liblau [6] and B Becher [1]

[1] University of Zurich (UZH), Zürich, Switzerland
[2] Technical University of Munich, Munich, Germany
[3] University Hospital Basel, Basel, Switzerland
[4] CHU Toulouse, Toulouse, France
[5] CHU Lyon, Lyon, France
[6] INSERM Toulouse, Toulouse, France

Aims
Myelin-oligodendrocyte glycoprotein antibody-associated disease (MOGAD) is a recently defined neurological autoimmune disorder characterized by pathogenic autoantibodies against MOG. The underlying immunopathogenesis remains unclear, and no specific therapies are approved. We aimed to comprehensively characterize alterations in the circulating immune system in MOGAD relative to healthy controls and MS patients.
Methods
We performed high-dimensional spectral flow cytometry on peripheral blood mononuclear cells (PBMCs) from two independent cohorts of MOGAD patients. Data were analyzed using conventional gating and explorative algorithm-guided approaches including unsupervised clustering and dimensionality reduction. Findings were compared to healthy controls and multiple sclerosis (MS) patients. Selected immune alterations were further investigated in a transgenic mouse model of MOG-specific autoimmunity.
Results
MOGAD patients displayed pronounced systemic immune perturbations compared to healthy controls and MS patients. In the B cell compartment, we observed an expansion of CD21- CXCR5- activated naïve and double negative (DN) B cell subsets, phenotypes previously linked to autoreactivity and also observed in systemic lupus erythematosus (SLE)(1). Innate immune cells, including NK cells, monocytes, and dendritic cells, showed altered expression of Fc gamma receptors. Within the T cell compartment, CXCR3+ CD4+ memory T cells were significantly reduced in the blood of MOGAD patients, a finding that was mirrored in a MOG-transgenic mouse model, which revealed CNS retention of this population during active disease. These systemic features suggest a peripheral immune signature consistent with ongoing CNS-targeted inflammation and immune dysregulation.
Conclusions
Our data reveal broad systemic immune alterations in MOGAD and demonstrate a distinct immune cell signature with parallels to other autoantibody-mediated diseases such as SLE or NMOSD. These findings position MOGAD as a neuroinflammatory disorder with marked and potentially targetable systemic immune components.

**P008**

**Clinical Profiles and Treatment Outcomes in Chronic Relapsing Inflammatory Optic Neuropathy: A Multicenter Longitudinal Retrospective Study**

M Graure [1], N Nierobisch [2], A De Vere-Tyndall [3], T Pakeerathan [4], I Ayzenberg [4], J Havla [5], M Ringelstein [6], D Tkachenko [7], M Hümmert [7], NA Cerdá Fuertes [8], A Papadopoulou [8], K Giglhuber [9], R Wicklein [9], A Berthele [9], M Weller [1], V Kana [1], P Roth [1] and M Herwerth [1]

[1] Department of Neurology, University Hospital Zurich, Zürich, Switzerland
[2] Department of Diagnostic and Interventional Neuroradiology, University Hospital Zurich, Zürich, Switzerland
[3] Department of Neuroradiology, Kantonsspital Winterhur, Winterthur, Switzerland
[4] Department of Neurology, Ruhr University Hospital Bochum, Bochum, Germany
[5] Department of Neurology, Ludwig Maximilian University, Munich, Germany
[6] Department of Neurology, Heinrich-Heine-University Düsseldorf, Düsseldorf, Germany
[7] Department of Neurology, University Hospital Hannover, Hannover, Germany
[8] Department of Neurology, University Hospital Basel, Basel, Switzerland
[9] Department of Neurology, Technical University of Munich, Munich, Germany

Chronic relapsing inflammatory optic neuropathy (CRION) is a rare, steroid-responsive form of optic neuritis (ON) with poorly understood pathophysiology. The discovery of autoantibodies against myelin oligodendrocyte glycoprotein (MOG-IgG) in a substantial subset of cases has complicated the diagnostic and therapeutic management of CRION. Although various immunosuppressive treatments show promise, standardized protocols are lacking, and long-term outcomes remain uncertain.

In this retrospective, multicenter study, annualized relapse rates (ARR), magnetic resonance imaging (MRI), cerebrospinal fluid (CSF), visual acuity (VA) and optical coherence tomography (OCT) were evaluated in 60 patients from six European tertiary centers who met the diagnostic criteria for CRION. All patients were tested for AQP4-IgG and MOG-IgG by cell-based assay. Clinical features and treatment responses were compared between MOG+ and MOG− patients.

MOG-IgG positivity was detected in 45% of CRION patients. In comparison to the MOG- subgroup, MOG + CRION was more frequently associated with older age at onset (median [interquartile range, IQR] 38 [32–50] versus 28 [24.5–39.5] years; $p = 0.015$), extensive ON (100% vs. 57.1%; $p = 0.020$), and antinuclear antibody positivity (40% vs. 15.2%; $p = 0.040$). CSF interleukin-6 levels were significantly elevated in MOG+ compared to MOG− (median [IQR] 50.9 pg/mL [2.3–89] vs. 1.7 [0.7–7]; $p = 0.044$), and early relapses occurred predominantly in MOG+ cases (53.8% vs. 26.6%; $p = 0.055$). Worsening of VA correlated with higher number of relapses across subgroups ($\beta = -0.036$, $p = 0.0176$), as did thinning of retinal layers compared to healthy controls.

Tocilizumab was associated with a significant reduction in ARR in the MOG+ subgroup (median [IQR] before 3 [1–3] vs. during tocilizumab 0 [0–1.5], $p = 0.047$), while rituximab and azathioprine appeared beneficial in MOG− patients (median [IQR] ARR before 1 [0.3–1.8] vs. during rituximab 0 [0–0], $p = 0.250$; before 1 [0–1.5] vs. during azathioprine 0 [0–1], $p = 0.250$).

These findings suggest the conceptualization of CRION as a heterogeneous syndrome encompassing immunologically distinct subgroups with divergent clinical trajectories and treatment responses. Despite steroid sensitivity, patients are at risk of accumulating visual impairment due to relapses, emphasizing the importance of optimal relapse prevention. Antibody status may help to guide therapeutic strategies.

**P009**

## Looking Inside the Brain Using Optical Coherence Tomography: Retinal Layer Thickness is Associated with Incident Cardiovascular Events—A UK Biobank Cohort Study

M Hänsel [1], J Deseoe [1], L Herzog [1], N Davoudi [2], B Menze [3], B Sick [4] and S Wegener [1]

[1] Department of Neurology and Clinical Neuroscience Center, University Hospital Zurich and University of Zurich, Zurich, Switzerland
[2] ETH Zurich, Institute for Biomedical Engineering, Department of Information Technology and Electrical Engineering, Zurich, Switzerland
[3] Department of Quantitative Biomedicine, University of Zurich, Zurich, Switzerland
[4] Epidemiology, Biostatistics & Prevention Institute, University of Zürich, Zurich, Switzerland

Aims
Over the past four decades, cardiovascular disease (CVD) was the leading cause of death worldwide. Effective screening is needed to identify patients at high risk for CVD. Optical coherence tomography (OCT) is a non-invasive, low-cost "quick look" into the brain and has shown thinning of certain retinal layers in patients with ischemic stroke. However, the potential of OCT measures to predict major adverse cardiovascular events (MACVE) is unknown.
Methods
Data of 51,293 participants (55.1% women) from the UK Biobank were analyzed. We investigated associations of the retinal nerve fibre layer (RNFL), and ganglion cell-inner plexiform layer (GCIPL) thickness with prior CVD and MACVE. We then used cause-specific hazard models to evaluate the association of RNFL and GCIPL thickness with incident MACVE, adjusting models for traditional cardiovascular risk factors (t-cvrf).
Results
Among the participants, 1506 (2.9%) had prior CVD. Comparing the retinal layers, RNFL (28.97 μm ± 6.02 vs. 29.70 μm ± 6.41, $p < 0.001$), and GCIPL (72.99 μm ± 8.54 vs. 74.21 μm ± 8.75, $p < 0.001$) were significantly thinner in the CVD group. Both RNFL thickness (HR 0.92, 95% CI 0.89–0.96, $p < 0.001$) and GCIPL thickness (HR 0.96, 95% CI 0.92–1.00, $p = 0.04$) were significantly associated with incident MACVE in cause-specific hazard models adjusted for t-cvrf. Median follow-up time was 14.7 years.
Conclusions
We show that RNFL and GCIPL thicknesses are associated with future/incident MACVE, even after adjusting for t-cvrf. Further research is warranted to determine the potential of OCT measurements in stratifying cardiovascular risk.

**P010**

## Perfusion-Weighted Magnetic Resonance Imaging and the Risk of Cerebrovascular Events after Transient Ischemic Attacks

S Shamailova [1], L Dalla Vecchia [1], E Auer [1], P Castigliego [1], V Ziegler [1], M Fluri [1], A Boronylo [1], M Kielkopf [1], M Kielkopf [1], M Kielkopf [1], A Hakim [2], A Mujanovic [2], J Kaesmacher [2], AL Liberman [3], B Birner [1], TR Meinel [1], MR Heldner [1], D Seiffge [1], T Horvath [1], M Arnold [1], U Fischer [1], S Jung [1], M Beyeler [1] and P Bücke [1]

[1] Department of Neurology, Inselspital, Bern University Hospital, and University of Bern, Bern, Switzerland
[2] Institute for Diagnostic and Interventional Neuroradiology, Inselspital, Bern University Hospital, and University of Bern, Bern, Switzerland
[3] Clinical and Translational Neuroscience Unit, Feil Family Brain and Mind Research Institute and Department of Neurology, Weill Cornell Medicine, New York, New York, USA

Background and Objective
Whereas MRI is known to be crucial for TIA work-up, the added value of perfusion-weighted imaging (PWI) is underexplored. Our study aimed to assess the association between focal hypoperfusion on baseline PWI MRI and the long-term incidence of subsequent acute ischemic stroke (AIS) after TIA.

Methods

Consecutive TIA patients who underwent baseline PWI MRI as part of their emergency consultation between January 2015 and December 2019 were retrospectively identified. For study inclusion, both a time-based (symptom duration <24 h) and an imaging-based (no signs of ischemia on diffusion-weighted imaging) TIA definition were applied. Long-term incidences of AIS after TIA were identified based on follow-up reports. Associations between focal hypoperfusion and subsequent AIS were assessed using Cox regression models adjusted for predefined predictors of stroke occurrence including symptomatic extra- or intracranial stenosis. In subgroup analyses, we aimed to determine effects of focal hypoperfusion within versus outside the expected TIA territory, defined as a brain region potentially correlating with TIA symptoms.

Results

Of 1359 eligible TIA patients, 1075 with PWI MRI (79%) were included (median age 70 years, 46% female). Focal hypoperfusion was identified in 211 patients (20%), in 116/211 (55%) within the expected TIA territory. The median time from symptom onset to imaging was 233 min (interquartile range [IQR] 131–632) for patients with focal hypoperfusion versus 229 min [IQR 140–441] for patients without ($p$ = 0.42). Focal hypoperfusion was associated with a higher incidence of AIS (adjusted hazard ratio [aHR] 2. 13, 95% confidence interval [CI] 1.19–3.80). Whereas this was observed for focal hypoperfusion within the expected TIA territory (aHR 3. 95, 95% CI 2.05–7.60), there was no such association in case of focal hypoperfusion outside the expected TIA territory (aHR 0. 72, 95% CI 0.25–2.03).

Conclusions

Focal hypoperfusion on acute PWI MRI was found in one in five TIA patients. It was associated with a higher incidence of AIS during long-term follow-up, especially when within the expected TIA territory. Further research is needed to clarify the predictive value of focal hypoperfusion in relation to the incidence of AIS after TIA and to explore potential therapeutic implications.

**P011**

**The Challenge of Diagnosing Labyrinthine Stroke—A Critical Review**

A Tarnutzer [1], S Lee [2], J Kim [3] and D Kaski [4]

[1] Kantonsspital Baden, Baden, Switzerland
[2] Korea University Medical Center, Seoul, South Korea
[3] Seoul National University Bundang Hospital, Seoul, South Korea
[4] University College London, London, UK

Aims

Acute vertigo or dizziness accompanied by sudden sensorineural hearing loss (SSNHL) often poses a diagnostic challenge. While a combined audiovestibular deficit makes an inner-ear pathology most likely, this does not necessarily exclude a vascular pathology. This is especially true for strokes within the territory of the anterior inferior cerebellar artery (AICA), because the labyrinth receives its vascular supply most often by branches of the AICA. Thus, acute labyrinthine ischemia may present in combination with focal neurologic deficits, but also in isolation or as a warning sign before focal stroke signs arise.

Methods

By performing a literature review, a systematic analysis of features that allow for a potential distinction between labyrinthine ischemia and idiopathic SSNHL was performed. Information on brain imaging obtained, clinical features examined and prognosis was extracted.

Results

We identified 3011 patients with SSNHL and/or acute vertigo/dizziness from 72 studies. Amongst all included patients, 45.9% reported dizziness or vertigo, whereas 96.1%

of patients suffered from SSNHL. Most frequent peripheral diagnoses identified were labyrinthine hemorrhage (16.2%), inflammatory inner ear disorders (3.9%) and tumors (1.4%). An MRI-DWI positive stroke was found in 235 patients, with 77.9% of strokes involving the AICA territory. In only 14.5% of all patients with ischemic stroke the central lesion(s) involved areas that belong to the central vestibular or auditory pathways, and could explain the cochlear and/or vestibular symptoms. Thus, in the remaining 85.5% it was more likely that in addition also an occlusion of the labyrinthine artery (or one/several of its branches) occurred. Vascular peripheral cochleovestibular pathologies were identified on MRI in 13 patients. This included MRI-confirmed labyrinthine ischemia on delayed contrast-enhanced 3D-FLAIR sequences or 3D-VISTA sequences ($n$ = 5), MRI-DWI positive lesions of the vestibulo-cochlear nerve ($n$ = 2), and hemostasis due to cerebral venous thrombosis ($n$ = 3).

Conclusions

For differential diagnosis structured history taking, targeted neuro-otologic examination (including the HINTS+ algorithm), laboratory audiovestibular testing and brain MRI including delayed 3D-FLAIR sequences are essential. For cases with confirmed central ischemic lesions that do not involve the auditory and vestibular pathways, labyrinthine ischemia is highly likely.

**P012**

**Utility of Magnetic Resonance Spectroscopy in Predicting Favorable Outcome in Adult Comatose Patients Following Cardiac Arrest**

U Fisch [1], K Breedlove [2], BM Scirica [2], S Snider [2], JW Lee [2] and AP Lin [2]

[1] Brigham and Women's Hospital/Harvard Medical School, Boston, USA; University Hospital Basel, Basel, Switzerland
[2] Brigham and Women's Hospital/Harvard Medical School, Boston, USA

Aims

To correlate brain metabolites with clinical outcomes using magnetic resonance spectroscopy (MRS) in patients after cardiac arrest (CA) and assess their prognostic performance for good recovery compared to MRI-based quantitative apparent diffusion coefficient (ADC) maps.

Methods

Comatose patients following CA who underwent MRI and concurrent MRS were prospectively enrolled. The primary outcome was coma recovery at hospital discharge, the secondary outcome was good neurological function at 6 months (good, Cerebral Performance Index 1–2, vs. poor, 3–5). Six MRS metabolites were measured in the posterior cingulate gyrus (PCG), parietal white matter (PWM), and brainstem. Mean ADC values, and percentage of ADC voxels <450 and <650 $\times$ $10^{-6}$ $\times$ $mm^2/s$ were computed for whole brain and specific regions. Prognostic performances were compared using Receiver Operating Characteristic (ROC) curves.

Results

Of 94 patients, 25 (27%) achieved coma recovery, and 22 (23%) attained a good outcome at 6 months. N-acetylaspartate/Creatine (NAA/Cr) in the PCG was most discriminative between patients with or without coma recovery (median 1.29, IQR 0.21 vs. 0.86, 0. 32, adjusted $p$-value < 0.0001). NAA/Cr had the highest area under the curve (AUROC) for coma recovery (0.9, 95% CI 0.84–0.96) and good outcome at 6 months (AUROC 0.88, 95% CI 0.82–0.95), significantly outperforming all quantitative ADC measurements, except mean ADC of the PCG for the secondary outcome (adj. $p$-value = 0.064). Multivariable models incorporating NAA/Cr or ADC, alongside clinical and EEG variables, demonstrated

improved performance compared to models with clinical and EEG variables alone, though the difference was not statistically significant.

Conclusions

MRS-derived metabolites, particularly NAA/Cr in the PCG, show promise as predictors of favorable short- and long-term neurological outcomes in comatose patients after CA, outperforming quantitative ADC measurements for coma recovery when used as single predictors. Further studies are needed to optimize MRS acquisition for multimodal neuroprognostication.

**P013**

**Linking Brain Networks to Tau Pathology in Alzheimer's Disease**

S Asadi [1], MG Preti [2], D Van De Ville [2], G Allali [1], G Frisoni [3], V Garibotto [3], S Stampacchia [2] and A Griffa [1]

[1] CHUV—Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland
[2] EPFL—Ecole Polytechnique Fédérale de Lausanne, Geneva, Switzerland
[3] HUG—Hôpitaux Universitaires de Genève, Geneva, Switzerland

Aim

Alzheimer's disease involves progressive tau pathology. Recent evidence highlights greater-than-expected inter-individual variability in tau accumulation patterns across brain regions, closely reflecting clinical heterogeneity, but the underlying mechanisms remain unclear. One hypothesis that aggregated tau spreads via white matter connections, and neural activity exacerbates tau release and spreading. The aims of this study were to (i) assess whether white matter structural connectivity (SC), neural activity synchronization (functional connectivity), or both relate to tau accumulation patterns in Memory Clinic patients, and (ii) devise a quantitative index summarizing the level of tau spreading through brain connections in individual patients.

Methods

We studied 198 Memory Clinic subjects (71.5 $\pm$ 7.7 yo;101 females) using amyloid-PET, tau-PET, MRI, and cognitive tests. Amyloid status (A+/-) was assessed on amyloid-PET. Regional tau load was quantified via SUVR. Reference SC and FC between 374 regions of interests were estimated from Human Connectome Project data. In addition, the regularized inverse of the correlation matrix between functional MRI recordings (pFC) was considered as a proxy of functional synchronization through monosynaptic structural connections. We used graph spectral analysis and graph signal processing, two emerging approaches in neuroscience, to (i) compare inter-individual tau covariance levels with brain connectivity dimensions (SC;FC;pFC), and (ii) quantify the level of tau spreading through brain connections at the individual subject level (diffusion index).

Results

Tau covariance was most strongly associated with pFC than SC, FC, or Euclidean distance between brain regions in both A+ ($N$ = 111) and A$-$ ($N$ = 87) groups. As expected (proof of concept), the tau diffusion index was higher in A+ than in A$-$ individuals ($p < 10^{-12}$), indicating a closer alignment of tau accumulation patterns to the underlying pFC brain graph. The diffusion index correlated with global tau SUVR (r = 0.53, $p < 10^{-8}$), and inversely with cognitive function (MMSE, r = $-0.37$, $p < 10^{-4}$) in A+ subjects.

Conclusions

Tau spread aligns most with monosynaptic functional connectivity, supporting a model where both structure and activity shape tau progression. By integration tau and connectivity information, the diffusion index may help predict individual disease trajectories. Further development is needed to integrate individual-level connectivity information.

**P014**

## Neuron-Reactive KIR+ CD8+ T Cells Harbor a Unique Transcriptional Program in Anti-Ri Autoimmune Encephalitis

S Perriot [1], S Jones [1], R Genolet [2], A Mathias [1], H Lindsay [3], S Bobisse [2], G Di Liberto [4], M Canales [1], L Queiroz [2], C Sauvage [2], L Oberholster [1], M Gimenez [1], D Begarie [1], S Kovac [5], V Desestret [6], M Theaudin [7], C Pot [7], H Wiendl [8], J Honnorat [6], D Merkler [4], R Gottardo [3], A Harari [2] and R Du Pasquier [1]

[1] Laboratory of Neuroimmunology, Neuroscience Research Centre, Department of Clinical Neurosciences, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland
[2] Ludwig Institute for Cancer Research, Lausanne Branch, Department of Oncology, Lausanne University Hospital and University of Lausanne, Agora Cancer Research Center, Lausanne, Switzerland
[3] Biomedical Data Science Center, University of Lausanne and Lausanne University Hospital, Swiss Institute of Bioinformatics, Lausanne, Switzerland
[4] Department of Pathology and Immunology, Division of clinical pathology, University and University Hospitals of Geneva, Geneva, Switzerland and Service of Neurology, Department of clinical neurosciences, University Hospital of Lausanne and Lausanne University, Lausanne, Switzerland
[5] Department of Neurology with Institute of Translational Neurology, University Hospital Münster, Albert-Schweitzer-Campus 1, Building A1, Münster, Germany
[6] French Reference Centre for Paraneoplastic Neurological Syndromes, Hospices Civils de Lyon; MeLis Institute, SynatAc Team, Inserm U1314/UMR CNRS5284, Lyon, France
[7] Service of Neurology, Department of clinical neurosciences, University Hospital of Lausanne and Lausanne University Hospital, Lausanne, Switzerland
[8] Department of Neurology and Neurophysiology, University Medical Center, Freiburg, Germany

Aims
Autoreactive CD8+ T cells targeting neurons are the principal suspects in autoimmune encephalitis (AIE) linked with intracellular antigens, but remains to be formally demonstrated. Our objective was to screen patients with Ri-AIE for the presence of neuron-reactive CD8+ T cells and compare the phenotype of these cells with those of age-matched (AgD) controls.
Methods
To assess the CD8+ T cell response against neurons, we developed a unique coculture system between peripheral blood mononuclear cells (PBMC) and autologous human-induced pluripotent stem cell (hiPSC)-derived neurons, as a source of natural presenting neuronal antigens, to induce the proliferation of putatively neuron-reactive CD8+ T cell clonotypes in 6 healthy donors (HD) and 1 Ri-AIE patient. Proliferating clonotypes were assessed for neuron reactivity by transfecting the identified TCRs in NFAT-luciferase Jurkat cells and culturing them back with autologous neurons. Validated neuron-reactive clonotypes were further investigated in an extended cohort (7 Ri-AIE, 3 AgD) via ex vivo $CD8^+$ T cell scRNAsequencing (RNAseq) to characterize global phenotypes and transcriptional programs.
Results
First, thanks to our autologous neuron:PBMC co-culture system, we were able to identify neuron-reactive CD8+ T cells in both the HD and the Ri-AIE groups (1). Second, single cell RNAseq enabled us to identify that these cells correspond to cytotoxic KIR+ CD8+ regulatory T cells. Intriguingly, we observed that KIR+ CD8+ T cells from Ri-AIE patients presented with a significant decrease in KIR expression as well as the key regulatory transcription factor IKZF2 (Helios), coupled with activated TCR signaling and increased TNF and IFNG gene expression. Importantly, KIR+ CD8+ T cells also displayed an increased

expression of TOX, a gene associated with encephalitogenic potential that was expressed in cytotoxic CD8+ T cells present in the brain lesions of one Ri-AIE patient.
Conclusions
Here, we report on an unbiased novel method to identify neuron-autoreactive CD8+ T cells in a unique human-based and autologous system. We further demonstrate that neuron-reactive CD8+ T cells are a common feature in both HD, AgD and Ri-AIE patients and that they present with a regulatory KIR+ CD8+ T cell phenotype. However it is only in the Ri-AIE group that these cells exhibit a loss of the regulatory activity and a shift toward a pathogenic profile, likely contributing to disease pathogenesis.

**P015**

**Tadpole Pupil in New Onset Cluster Headache—A Case Report**

AS Jauslin [1], U Germann [2], T Schlote [2] and A Papadopoulou [1]

[1] Department of Neurology, University Hospital Basel, Basel, Switzerland
[2] Day Clinic Ambimed, Basel, Switzerland

Aims
To present a previously undescribed association between new-onset cluster headache and tadpole pupil, indicating a potential link between these two pathologies.
Methods
Case report of a disease course including clinical features, diagnostic findings, and treatment response.
Results
A 42-year-old man noticed intermittent irregular deformation of his right pupil, often occurring alongside a new type of headache. The headache attacks consisted of severe periorbital pain, only on the right side, lasting approximately two hours, with ipsilateral lacrimation and conjunctival injection. Magnetic resonance imaging revealed no structural abnormalities, while ophthalmological examination suggested possible Horner's syndrome, given slight miosis and the induction of mild ptosis following apraclonidine administration. The patient was diagnosed with cluster headache, showing excellent response to oxygen. In the following months, he had recurrent episodes of cluster headache and/or ipsilateral tadpole pupil, occurring partly simultaneously. Preventive treatment with verapamile was suggested, but the patient declined it due to the excellent response to oxygen therapy, despite short remission periods only, hence fulfilling criteria for chronic cluster headache. An image illustrating the pupillary deformation is available and can be presented at the congress.
Conclusions
While several cases of tadpole pupil were reported in migraine[1], to our knowledge, this is the first case in cluster headache. This pupil deformation can be caused by segmental spasms of the iris dilator muscle[2], which is innervated by the sympathetic system; in line with this, tadpole pupil was also associated with Horner's syndrome[3]. Thus, sympathetic dysfunction, which is well-described in trigemino-autonomic cephalalgias, could be the underlying pathophysiological link between cluster headache and tadpole pupil. This expands the understanding of their pathophysiology and emphasises the need to consider atypical findings in headache diagnosis.

**P016**

**The Prognostic Role of Echocardiographic Parameters in Ischemic Stroke Patients with Atrial Fibrillation**

A Zietz [1], A Polymeris [1], B Kaufmann [2], S Schaedelin [3], L Hert [4], D Seiffge [5], J Lieb [6], B Wagner [1], C Traenka [7], V Altersberger [1], T Dittrich [8], J Fladt [1], J Kaufmann [7], J Frenger [1],

S Thilemann [1], GM De Marchis [8], H Gensicke [7], L Bonati [9], M Katan [10], U Fischer [5], L Philippe [1], S Engelter [7] and N Peters [11]

[1] Department of Neurology and Stroke Center, University Hospital Basel and University of Basel, Switzerland
[2] University Hospital Basel and Cardiovascular Research Institute Basel, Basel, Switzerland
[3] Clinical Trial Unit, Department of Clinical Research, University Hospital Basel, Basel, Switzerland
[4] Department of Intensive Care Medicine, University Hospital Basel, Basel, Switzerland
[5] Department of Neurology and Stroke Center, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland
[6] Department of Neuroradiology, Clinic of Radiology and Nuclear Medicine, University Hospital and University of Basel, Basel, Switzerland
[7] Department of Neurology and Stroke Center, University Hospital Basel and University of Basel, Basel, Switzerland; Department of Rehabilitation and Neurology, University Department of Geriatric Medicine Felix Platter, University of Basel, Basel, Switzerland
[8] Department of Neurology and Stroke Center, University Teaching and Research Hospital, Health Eastern Switzerland (HOCH), Cantonal Hospital St. Gallen, St. Gallen, Switzerland
[9] Department of Neurology and Stroke Center, University Hospital Basel and University of Basel, Switzerland; Research Department, Reha Rheinfelden, Rheinfelden, Switzerland
[10] Department of Neurology and Stroke Center, University Hospital Basel and University of Basel, Basel, Switzerland; Department for Neurology, University Hospital Zurich, Zürich, Switzerland
[11] Department of Neurology and Stroke Center, University Hospital Basel and University of Basel, Basel, Switzerland; Department of Rehabilitation and Neurology, University Department of Geriatric Medicine Felix Platter, University of Basel, Basel, Switzerland; Stroke Center, Klinik Hirslanden

Background and aims
Concomitant cerebral small vessel disease (cSVD) in stroke patients with atrial fibrillation (AF) has been shown to be associated with an unfavourable outcome. However, whether functional and structural echocardiographic parameters may have an additional prognostic role is unknown.
Methods
We included consecutive patients with recent AF-associated ischemic stroke who underwent echocardiogram and brain magnetic resonance imaging (MRI) from the prospective Novel Oral Anticoagulants in Ischemic Stroke Patients (NOACISP) registry. We investigated the association between echocardiographic parameters of the left atrium and ventricle and a composite outcome comprising (i) recurrent ischemic stroke; (ii) intracranial hemorrhage and (iii) all-cause death using unadjusted and adjusted (for age, sex, modified CHA2DS2VASc-Score, hyperlipidemia, oral anticoagulation prior and after stroke and MRI markers of cSVD) Cox proportional hazards regression. Furthermore, we explored the association between echocardiographic parameters and MRI markers of cSVD using logistic regression.
Results
We included 690 patients with AF-associated stroke (median age 80, 45.1% female) with a total follow-up of 1084 patient-years. In unadjusted analyses, left ventricular hypertrophy (HR [95%CI] 1.44 [1.05–1.97], $p = 0.02$) was associated with an increased hazard for the composite outcome, albeit missing statistical significance after adjustment for clinical and MRI cSVD markers (aHR 1.04 [0.73–1.46], $p = 0.82$). Left atrial dilatation (OR 1.96 [1.32–2.91], $p = 0.001$) and concentric hypertrophy were associated (OR 1.68 [1.08–2.62], $p = 0.02$) with the extent of white matter hyperintensities in unadjusted but not in adjusted analyses.

Conclusions
Among patients with recent AF-associated ischemic stroke, structural changes of the left ventricle and left atrial dilation were not independent prognostic marker for future cerebrovascular events or death.

**P017**

**Donanemab in Early Symptomatic Alzheimer's Disease: Efficacy and Safety from the TRAILBLAZER-ALZ 2 Long-Term Extension**

J Sims [1], J Zimmer [1], C Evans [1], ES Monkul Nery [1], H Wang [1], A Wessels [1], G Tronchin [1], S Sato [1], L Lau Raket [1], SW Andersen [1], C Sapin [1], M Paget [1], I Gueorguieva [1], P Ardayfio [1], R Khanna [1], DA Brooks [1], MA Mintun [1] and A Felbecker [2]

[1] Eli Lilly and Company, Indianapolis, USA
[2] Neurological Practice Felbecker & Käufeler, St. Gallen, Switzerland

Objective
Describe the clinical efficacy and safety of donanemab in early and delayed start participants treated during the TRAILBLAZER-ALZ 2 placebo-controlled trial and long-term extension.
Background
TRAILBLAZER-ALZ 2 (NCT04437511) is a multicenter, randomized, double-blind, placebo-controlled (PC) Phase 3 trial designed to assess the efficacy and safety of donanemab in participants with early symptomatic Alzheimer's disease. Donanemab treatment significantly slowed clinical progression in the PC period. Participants who completed the PC period were eligible to continue into the participant- and investigator-blinded long-term extension (LTE) period, lasting an additional 78 weeks.
Method
Early start participants (those initially randomized to donanemab in the PC period) were switched to placebo if treatment completion criteria were met based on amyloid level during any treatment period. Delayed start participants (those initially randomized to placebo in the PC period) started treatment with donanemab in the LTE. Matched participants from the Alzheimer's Disease Neuroimaging Initiative served as external control groups. All analyses are exploratory and not controlled for multiplicity.
Result
The results are expected to include efficacy analyses, biomarker analyses, and a safety overview. Data will be presented by the time of the conference.
Conclusions
Conclusions are pending completion of the final analysis.

**P018**

**Subcortical White Matter Microstructure in Patients with Alzheimer's Disease and Comorbid Small Vessel Disease**

A Miftari [1], Y Aléman-Gomez [2], A Griffa [1], P Hagmann [2], O Rouaud [1], G Allali [1] and G Bommarito [1]

[1] Department of clinical neurosciences, Lausanne University Hospital and University of Lausanne (CHUV-UNIL), Lausanne, Switzerland
[2] Department of Diagnostic and Interventional Radiology, Lausanne University Hospital and University of Lausanne (CHUV-UNIL), Lausanne, Switzerland

Background
Cerebral small vessel disease (CSVD), including cerebral amyloid angiopathy (CAA) and hypertensive arteriopathy (HTNA), is a frequent comorbid disorder in patients with Alzheimer's disease (AD) (1,2). The impact of CSVD on white matter microstructure

has not yet been assessed in patients with AD. Here, we propose to investigate differences in diffusion metrics between AD patients with and without CSVD.

Methods

In this retrospective study on 77 patients with AD (70.19 ± 7.60 years, 61% female) referred to the Leenaards Memory Center in CHUV, MRI were assessed for CSVD (CAA or HTNA) presence and severity, using established guidelines. Brain regions were segmented using state-of-the-art automatic pipelines (3–5). For each subject, we derived average mean diffusivity (MD) values in the posterior subcortical white matter. Global cognition was assessed with the Montreal Cognitive Assessment (MoCA). We explored (i) possible differences in MD between AD, AD + CAA, and AD + HTNA groups, (ii) the relation between MD and MoCA, and (iii) the relation between MD and radiological CSVD features using ANCOVA models.

Results

Out of 77 AD patients, 14 patients (72.30 ± 6.28, 57% female) presented with probable CAA and 7 patients (73.77 ± 4.55, 57% female) with HTNA. MD of the subcortical posterior white matter did not differ between groups and did not correlate with global cognition, independently from the group. CSVD radiological features as microbleeds and perivascular spaces counts were associated with subcortical white matter MD. These relationships were modulated by the group.

Conclusions

These findings suggest that CSVD severity relates to white matter microstructural integrity in AD patients and that this relationship is modulated by the presence of CAA or HTNA. This work highlights the importance of considering small vessel pathology when evaluating white matter changes in AD.

**P019**

**Corteo: A Novel Software for Integrated Brain Network Analysis**

C Mignardot [1], P Nevalainen [2], S Barlatey [1], C Friedrichs-Maeder [1], A Tzovara [3] and M Baud [1]

[1] Inselspital, Bern University Hospital, Bern, Switzerland
[2] Helsinki University Hospital, Helsiniki, Finland; [3] University of Bern, Bern, Switzerland

For people hoping for a surgical cure of their epilepsy success hinges upon accurately mapping epileptogenic networks, a challenge compounded by the intricate interplay between epileptic and functional cortical networks that underpin cognition. Carefully planning for epilepsy surgery demands the integration of diverse data modalities for crossing structural, functional, and electrophysiological information. Current methods often rely on static imaging and manual annotations of extensive intracranial EEG (icEEG) datasets, which are prone to subjectivity and risk overlooking the dynamic temporal and spatial complexities of the disorder.

To address these limitations and ensure reproducibility and standardization, we developed Corteo, a comprehensive software platform that unifies neuroimaging and electrophysiological data analysis. Corteo integrates structural, functional MRI, SPECT/PET, and postoperative CT co-registrations. It provides automated electrode localization, standardized icEEG preprocessing pipelines, and connectivity analysis for probing electrical pulses and seizures. We demonstrate the capabilities of our software by displaying summary maps of 182 seizures among 28 patients and their propagation paths within mapped brain network dynamics.

With its user-friendly interface, Corteo fosters collaboration and ensures reproducibility. By incorporating advanced mathematical tools, it automates the detection of localized neural events, such as epileptic discharges, while facilitating the exploration of effective connectivity. This versatility positions Corteo as a powerful resource for studying brain

network organization and dysfunction, with applications spanning epilepsy diagnostics and broader neuroscientific investigations.

**P020**

**Patients' Satisfaction with Subcutaneous Natalizumab Administration: A Swiss Multicenter Study**

C Zecca [1], GC Riccitelli [1], G Disanto [1], O Findling [2], CP Kamm [3], G Mallucci [1], C Pot [4], P Roth [5], Y Martinet [6], R Sacco [1] and C Gobbi [1]

[1] Neurocenter of Southern Switzerland, EOC, Lugano, Switzerland
[2] Kantonsspital Aarau, Klinik für Neurologie, Aarau, Switzerland
[3] Neurocenter, Lucerne Cantonal Hospital, Lucerne, Switzerland
[4] Service of Neurology, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland
[5] University Hospital Zurich and University of Zurich, Department of Neurology, Zurich, Switzerland
[6] Biogen Switzerland AG, Baar, Switzerland

Aims
Natalizumab (NAT) is available for the treatment of relapsing-remitting multiple sclerosis (RRMS) in intravenous (IV) and subcutaneous (SC) formulations. Shorter administration and lack of post-infusion observation after initial 6 doses of SC_NAT may enhance convenience and treatment satisfaction. We evaluated patients' satisfaction with SC_NAT in a routine Swiss healthcare setting.
Methods
Observational, prospective, multicenter study including RRMS patients treated with either $\leq$6 (starters) or >6 (long-term users) SC_NAT doses.
Participants completed the Treatment Satisfaction Questionnaire with Medication II and the Patient Satisfaction Questionnaire (PSQ) at baseline and month 9 (starters only). This analysis focused on PSQ (15 questions on treatment satisfaction, absenteeism, interaction with healthcare professionals). Chi-squared, Fisher exact test, Mann-Whitney Test and Wilcoxon Test were used.
Results
106 patients were included [78 (74%) female, median (interquartile range, IQR) age 39.6 (34.3–48.9), median EDSS 2.0 (1.5–3.0), 87 (82%) switchers from IV_NAT]. Median (IQR) visual analogue scale (VAS) for treatment satisfaction was 10 (9–10), main reason being 'short time needed for treatment' [85 (80.2%) participants]. 103 (97%) participants confirmed their choice of SC_NAT and 24 (100%) starters after 9 months.
83/105 (79%) patients spent $\leq$1 h and 22 (21%) >1 h in hospital/medical office for SC_NAT administration ($p < 0.001$). Receiving SC_NAT never affected work presence in 54/87 (62.1%) patients with a job, sometimes in 22 (25.3%) and always in 11 (12.6%, $p < 0.001$). Absence from work due to SC_NAT administration varied across patients [$\leq$2 h in 20 (40%), 2–4 h in 17 (34%), and $\geq$4 h in 13 (26%), $p = 0.477$].
Among 87 switchers from IV_NAT, 79 (90.8%) preferred SC_NAT, 3 (3.4%) IV_NAT and 5 (5.7%) had no preference ($p < 0.001$). Concerning time needed for treatment, 86 (98.9%) found SC_NAT of great advantage/advantage/of a certain benefit vs. 1 (1.1%) reporting no benefit ($p < 0.001$); 76 (87.4%) found time to discuss with healthcare professionals to be similar/improved [vs reduced in 11 (12.6%), $p < 0.001$].
Findings were consistent across groups and timepoints.
Conclusions
Long-term users and starters were satisfied with SC_NAT, mostly for the limited time required for treatment. SC_NAT was largely preferred over IV_NAT in switchers.

**P021**

**Circadian Corticoids and Hippocampal Seizures**

E Perez-Martinez and M Baud

University of Bern, Bern, Switzerland

Aims

While epilepsy is characterized by seemingly random occurrence of seizures, research shows they often follow daily patterns in both humans and animal models. Thus, circadian seizure timing could relate to biological clocks in the brain or the body. We hypothesize that circulating glucocorticoids (i.e., corticosterone in mice), which have a distinct circadian rhythm in the hippocampus time seizures in focal temporal lobe epilepsy by modulating neural excitability.

Methods

In this study we manipulated corticosterone levels by suppressing its secretion with a bilateral adrenalectomy and re-introducing variable doses of corticosterone in drinking water. To test the influence of corticosterone on seizure occurrence and timing, we recorded multisite EEG over months in the intra-hippocampal Kainic mouse model of epilepsy and analysed the signals by wavelet decomposition and circular statistics. In addition, to measure underlying levels of neural excitability, we actively probed the hippocampal circuits using optogenetics in excitatory neurons.

Results

Results from the months-long recording in the kainate mouse model shows that seizures and epileptic activity occur in a circadian pattern. The epileptic activity (EA) shows a peak at 24 h in the power spectrum density and the PLV of the seizures vary between 0.4 and 0.7 pointing towards the end of the active phase of the animals ($n$ = 12*/22). In the mice that underwent the bilateral adrenalectomy, there was no peak found at 24 h in the psd, and the PLV were 0.32 and 0.48 pointing towards the rise of the active-rest cycle ($n$ = 2).

Conclusions

Our preliminary results suggest that corticosterone, although not being essential for seizure occurrence, can influence seizure timing.

**P022**

**Mood and Age Predict Subjective Cognitive Decline: A Machine-Learning and Linear Modeling Approach**

F Sander [1], M Pittet [1], G Binarelli [1], V Manera [2], C Krebs [3], E Brill [3], A Brioschi-Guevara [1], J Demonet [1], P Robert [2], G Allali [1], S Klöppel [3] and A Sokolov [1]

[1] CHUV (Centre hospitalier universitaire vaudois), Lausanne, Switzerland
[2] Université Côte d'Azur, Nice, France
[3] University of Bern, Bern, Switzerland

Introduction

Subjective cognitive decline (SCD) is increasingly considered as an early marker of neurodegeneration and a target for preventive interventions in dementia and Alzheimer's disease. However, SCD has often been reported to be primarily modulated by mood, and difficult to capture with objective cognitive assessments. This study aimed to identify key predictors of SCD by examining the relationships between self-reported cognitive complaints, objective cognitive performance, and psychological and demographic factors. We also explored whether gamified cognitive assessments could better explain SCD than standard tests.

Methods

In this international multi-centric study, 98 participants (57 females; median age 72, range 55–86) from three memory clinics completed a questionnaire about cognitive complaints

(CFQ), as well as standard neuropsychological testing, a gamified cognitive assessment (ACE-X), and questionnaires assessing mood (HADS) and apathy (AMI). Feature selection was performed using elastic net regression and the BORUTA algorithm, followed by linear regression modeling.

Results

The final model explained a substantial proportion of within-sample variance (conditional $R^2 = 0.48$, marginal $R^2 = 0.33$). Specifically, HADS scores and age accounted for about a third of the variance. Center contributed to an additional 15%. When applied to the test data, the model showed similar performance, thus demonstrating its robustness (conditional $R^2 = 0.43$, marginal $R^2 = 0.34$).

Discussion

These findings underscore the importance of considering mood and age when evaluating cognitive complaints in older people, particularly for early detection strategies. By leveraging machine learning for streamlined variable selection and including a serious game-based cognitive assessment, this study contributes significantly to a deeper understanding of SCD and paves the way for earlier, proactive and more personalized and interventions for older people at risk of developing neurocognitive disorders.

**P023**

**Factors associated with Incorrect Prediction of 3 Months-Disability after Stroke: Challenging a Deep Learning Model**

H Handelsmann [1], L Herzog [1], J Brändli [2], M Schneeberger [3], M Hänsel [4], B Sick [2] and S Wegener [4]

[1] Universitätsspital Zürich, Zürich, Switzerland
[2] Zurich University of Applied Sciences, Winterthur, Switzerland
[3] University of Zurich (UZH), Zürich, Switzerland
[4] University Hospital Zurich, Zürich, Switzerland

Aims

Deep learning models can assist in outcome prediction in patients with acutely suspected stroke. However, area under the curve (AUC) values are often not greater than 0.7 for prediction of favourable versus unfavourable functional outcome (mRS 0–2 vs. 3–6) after 3 months. We aimed at identifying patient characteristics linked to correct/erroneous predictions to better understand and potentially improve model performance.

Methods

We descriptively summarized patients with correctly/erroneously predicted functional outcome and consulted the patients' medical record for additional information during the three months follow-up. We used logistic regression to link the most relevant patient characteristics to correct/erroneous predictions. Grad-CAM explanation maps were investigated for patterns associated with outcome prediction.

Results

The outcome prediction was incorrect in 74 out of all 293 stroke patients (25.3%). Among the 70 patients with unfavourable outcome, patients with false-positive outcome prediction presented with a lower NIHSS on admission (15 vs. 6, $p < 0.001$) and a lower rate of hypertension (91.5% vs. 60.9%, $p = 0.006$). In 14 of the 23 false-positive predictions, a new event occurring after the initial stroke could be identified from the medical record offering a possible explanation for the observed worse functional outcome (e.g., infection, treatment complication). In 8/14 cases, this event could be causally related to the stroke (e.g., intracranial haemorrhage, early seizures). In all 223 patients with favourable outcome, false-negatively predicted patients were older (74 vs. 66 years, $p < 0.001$), had a higher NIHSS on admission (9 vs. 3, $p < 0.001$), higher rates of atrial fibrillation (33.3% vs. 11.6%,

$p < 0.001$) and coronary heart disease (27.5% vs. 11.0%, $p = 0.004$). Grad-CAM explanation maps with maximum intensity in the dorsal brain regions ($n = 39$) had a high rate of false-negative outcome prediction ($n = 15$, 38.5%). Here, patients had a considerably higher frequency of hypertension (82.1% vs. 67.9%) and coronary heart disease (33.3% vs. 18.1%) compared to all stroke patients.

Conclusions

In a model with binary end point and 76.1% favourable outcomes, false-positive predictions were more frequent than false-negatives. Prediction of the mRS in stroke patients can be hampered by (unforeseeable) events. Distinct patterns of patient characteristics might be more prone to incorrect outcome prediction by deep transformation models.

**P024**

**Uncovering Novel Antigenic Targets of CNS-Reactive Autoantibodies in Autoimmune Neurological Syndromes**

I SENYUZ[1]; S JONES [1], M CANALES [1], R Bernard-Valnet [2], R GENOLET [3], M THEAUDIN [2], C POT [2], R DU PASQUIER [1] and A MATHIAS [1]

[1] Laboratories of Neuroimmunology, Neuroscience Research Center and Division of Neurology, Department of Clinical Neurosciences, Lausanne University Hospital and Lausanne University, Epalinges, Switzerland

[2] Service of Neurology, Department of Clinical Neurosciences, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland

[3] Ludwig Institute for Cancer Research, Lausanne Branch, Department of Oncology, University of Lausanne and Lausanne University Hospital, Lausanne, Switzerland

Aims

The recent exponential expansion of newly identified auto-antibodies (auto-Abs) and their antigenic targets has been a game changer in diagnosis and stratification of patients with autoimmune neurological syndromes including autoimmune encephalitis (AIE) and neuromyelitis optica spectrum disorders (NMOSD). Yet, 7–30% of the AIE; and 15% NMOSD patients remain seronegative for all currently known neural antigens (Ags). This observation highlights an urgent need to identify novel antigenic targets in order to improve diagnosis/prognosis of AIE seronegative patients.

Methods

We resorted to our recently published human induced pluripotent stem cell (hiPSC)-derived astrocyte or neuron 96-well cell-based assay (96-CBA) to identify patients with astrocyte and/or neuron reactive IgG in their serum and/or cerebrospinal fluid (CSF). To enable Ag discovery, memory B cells from peripheral blood mononuclear cells of selected patients were immortalized using Epstein-Barr virus (EBV) to generate B lymphoblastoid cell lines (BLCLs) secreting monoclonal antibodies (mAbs). These mAbs were screened using 96-CBA platform, and the B cell receptor (BCR) variable region of autoreactive B cell clones were sequenced allowing for downstream cognate Ag discovery.

Results

Out of 282 subjects screened, we identified 5 astrocyte-reactive and 5 neuron-reactive cases out of 18 seronegative AIE/NMOSD patients. To establish a robust pipeline for generating mAbs and identifying their cognate CNS antigens, we first generated astrocyte-specific mAbs from one AQP4+ NMO patient (used as a positive control). Using this fine-tuned pipeline, we immortalized memory B cells from one interesting patient suffering from an unidentified inflammatory neurological disease, who was seronegative for known auto-Ags tested in expert centers, yet astrocyte-reactive in our 96-CBA, opening a unique opportunity to discover previously unrecognized astrocyte Ags.

Conclusions

In this study, we present a robust and sensitive workflow combining iPSC-derived CNS cell assays with patient-derived mAbs for Ag discovery. This strategy should enable identification of novel CNS-reactive targets in seronegative patients and is broadly applicable to other autoimmune conditions. Our findings pave the way toward deeper immunopathological understanding and enhanced diagnostic precision in autoimmune neurology.

**P025**

**Cytomegalovirus is Linked to T Cell Senescence and to Disease Course in Multiple Sclerosis**

J Fuhrmann [1], O Boog [1], J Roux [2], P Benkert [3], M Käch [1], L Kappos [4], J Kuhle [5], E Galli [5] and M Mehling [5]

[1] Department of Biomedicine, University of Basel, Switzerland
[2] Swiss Institute of Bioinformatics, Basel, Switzerland
[3] Department of Clinical Research, University Hospital Basel, Basel, Switzerland
[4] Research Center for Clinical Neuroimmunology and Neuroscience (RC2NB), University Hospital and University of Basel, Basel, Switzerland
[5] Neurology Clinic and Polyclinic, University Hospital Basel, Basel, Switzerland

Aims

To investigate the interplay between immunosenescence and the disease course of multiple sclerosis (MS), in relation to cytomegalovirus (CMV) infection and disease-modifying treatment (DMT).

Methods

Patients from the Swiss Multiple Sclerosis Cohort (SMSC) study at the University Hospital Basel, Switzerland, were prospectively enrolled. Blood T cell subsets were functionally and phenotypically characterized using multiparameter flow cytometry. Plasma concentrations of anti-CMV IgG, and inflammatory molecules MCP-1, MMP-1, and GDF-15 were measured. Cross-sectional analyses were performed using the Mann-Whitney-U test, Kruskal-Wallis test, Fisher's exact test, and bivariate and partial nonparametric correlations.

Results

229 persons with MS (pwMS) were included in the study. 88 patients (37%) had positive CMV status. Patients were undergoing the following treatments: 39 untreated, 88 B cell depletion therapy (BCDT), 36 dimethyl fumarate (DMF) and 66 fingolimod. We describe CMV-related and age-related T cell profiles in all treatment groups. JAK-STAT pathway functionality in naïve T cells differs and differentially correlates with neurofilament light chain (NfL) serum levels based on CMV status. In DMF-treated patients, a differential association between T cell senescence and disease activity is seen based on CMV status.

Conclusions

CMV is a main driver of T cell senescence in pwMS, independent of DMT. CMV modulates the relationships between blood T cell immunosenescence and MS disease course.

**P026**

**Real-World Predictors on Disease Progression and Treatment Response in Multiple Sclerosis: Insights from the Bellevue Medical Group—MS Cohort**

J Held, N Pfender, I Jelcic, A Czaplinski and A Lutterotti

Bellevue Medical Group, Zürich, Switzerland

Background

Multiple sclerosis (MS) is a chronic, immune-mediated disorder of the central nervous system, characterised by substantial interindividual variability in disease trajectory and treatment response. While clinical trials yield essential efficacy data, real-world evidence

(RWE) is critical for understanding long-term treatment effectiveness and disease dynamics in routine care. The BMG-MS Cohort is a continuously expanding longitudinal dataset initiated in 2009, comprising approximately 2500 patients treated at the Bellevue Medical Group (BMG). Data collection is ongoing through 2029.

Objective

This study aims to identify clinical, imaging, and laboratory parameters associated with MS disease progression and to evaluate the real-world effectiveness of disease-modifying treatment (DMT) strategies. The overarching goal is to support more personalised, evidence-based therapeutic decisions and improve patient outcomes in routine care.

Methods

This is a retrospective-prospective observational study based on structured data from electronic health records. Clinical endpoints include disability progression (e.g., EDSS), relapse activity, and treatment response. Imaging parameters include lesion load and brain atrophy assessed via magnetic resonance imaging (MRI). Routine laboratory and inflammatory markers are also analysed. DMT data, including treatment initiation, switching, escalation, de-escalation, and discontinuation, are systematically recorded. Descriptive statistics characterise the cohort and subgroup differences. Parametric and non-parametric tests are used for comparative analyses. Longitudinal trends are explored through correlation analyses and mean comparisons.

Results

Baseline data from approximately 2200 patients, including demographics, disease duration, EDSS scores, MRI findings, and first-line DMT patterns, will be presented. Analyses will primarily focus on descriptive statistics and univariate associations between clinical markers and outcomes.

Conclusions

The BMG-MS Cohort provides robust real-world data on MS progression and treatment response. Findings are expected to guide the optimisation of DMT strategies and support individualised care pathways in clinical neurology.

**P027**

## Retinal Vessel Diameters as Markers of Microvascular Health and Disability in Multiple Sclerosis

K Schoenholzer [1], S Sellathurai [1], F Burguet Villena [1], N Cerdá Fuertes [2], L Hofer [3], S Schädelin [3], B Fischer-Barnicol [4], V Phavanh [5], P Benkert [3], T Derfuss [4], L Kappos [2], C Granziera [6], J Kuhle [3], K Gugleta [7], C Hauser [8], H Hanssen [8] and A Papadopoulou [1]

[1] Department of Clinical Research, Multiple Sclerosis Center, Neurology, Research Center for Clinical Neuroimmunology and Neuroscience Basel (RC2NB), Translational Imaging in Neurology (ThINK), University and University Hospital of Basel, Basel, Switzerland
[2] Department of Clinical Research, Research Center for Clinical Neuroimmunology and Neuroscience Basel (RC2NB), Translational Imaging in Neurology (ThINK), University and University Hospital Basel, Basel, Switzerland
[3] Department of Clinical Research, Multiple Sclerosis Center, Research Center for Clinical Neuroimmunology and Neuroscience Basel (RC2NB), University and University Hospital Basel, Basel, Switzerland
[4] Multiple Sclerosis Center, Neurology, Research Center for Clinical Neuroimmunology and Neuroscience Basel (RC2NB), University and University Hospital Basel, Basel, Switzerland
[5] Multiple Sclerosis Center, Neurology, University Hospital of Basel, Basel, Switzerland
[6] Multiple Sclerosis Center, Research Center for Clinical Neuroimmunology and Neuroscience Basel (RC2NB), Translational Imaging in Neurology (ThINK), University and University Hospital of Basel, Basel, Switzerland

[7] Department of Ophthalmology, University Hospital Basel
[8] Department of Sport, Exercise and Health, Preventive Sports Medicine and Systems Physiology, Medical Faculty, University of Basel, Basel, Switzerland

Background
Vascular risk factors (VRF) may contribute to disability in people with Multiple Sclerosis (pwMS). Retinal vessel diameters are biomarkers of microvascular health.
Aim
To investigate if retinal vessel integrity reflects vascular comorbidities and disability in pwMS.
Methods
PwMS from the Swiss Multiple Sclerosis Cohort received two fundus photographs per eye to assess central retinal arteriolar- (CRAE) and -venular equivalents (CRVE) via static vessel analysis. They also underwent neurological examination for the Expanded Disability Status Scale (EDSS) and optical coherence tomography for the Ganglion Cell-Inner Plexiform Layer (GCIPL). In case of interocular GCIPL-asymmetry, the eye with thinner GCIPL was excluded. First, unadjusted linear mixed models were used to explore the associations of CRAE/CRVE with each VRF. Then, the associations of CRAE/CRVE with disability (low: EDSS < 4 vs. high: EDSS $\geq$ 4) were investigated in linear mixed models adjusted for multiple covariates.
Results
177 pwMS were included (median age: 46 y, 73% female, EDSS: 2.25, CRAE: 184 $\pm$ 17 µm, CRVE 222 $\pm$ 17 µm and GCIPL 66.8 $\pm$ 7.5 µm).
Smoking was associated with 8.1 µm ($\beta = -8.1$, 95% CI [−14.7, −1.4], $p = 0.019$), and arterial hypertension with a 10.5 µm smaller CRAE ($\beta = -10.5$, 95%CI [−18.1, −2.9], $p = 0.007$). CRVE also showed a negative association with smoking ($\beta = -13.5$, 95%CI [−20, −6.9], $p < 0.001$).
PwMS with high disability had 8.4 µm narrower CRAE ($\beta = -8.4$, 95% CI [−14.9, −1.8], $p = 0.017$, $n = 148$) in the model adjusted for age, sex, DMT and VRF. After including GCIPL in the model this relation was not confirmed ($\beta = -4.2$, 95% CI [−10.9, 2.5], $p = 0.233$). A relation between DMT and CRAE was observed, whereby monoclonals were associated with larger CRAE (vs. oral: $\beta = 5.8$, 95% CI [0.9, 10.7], $p = 0.026$; vs. platform: $\beta = 12.4$, 95% CI [0.8, 24], $p = 0.044$).
CRVE was also negatively associated with disability ($\beta = -8.2$, 95% CI [−15.4, −1.1], $p = 0.030$), but not confirmed after adjustment for GCIPL ($\beta = -4.8$, 95% CI [−12.1, 2.6], $p = 0.219$).
Conclusions
Retinal vessel diameters are sensitive to vascular comorbidities in pwMS. Smaller arteriolar diameter is also related to higher disability in pwMS, although this relationship was not independent of retinal atrophy. Longitudinal analysis is ongoing, to disentangle the influence of local tissue loss vs. microvascular health on retinal vessel changes and further define their role as markers of disability progression and treatment response.

**P028**

## Reliable Change Index (RCI) Analyses to Detect Parkinson's Disease MCI—3 Year Follow-Up Study

K Toloraia, C Bauer, A Tasci, U Gschwandtner and P Fuhr

University Hospital Basel, Basel, Switzerland

Introduction
Parkinson's disease (PD) is a neurodegenerative disorder that presents significant challenges in particular due to its association with developing of dementia. We conducted

a longitudinal study on 42 patients with PD. Due to drop out, there were after 3 years only data of 30 patients. Sample consists of: Female/Male:12/18, Mean Age 66.8 $\pm$ 7.9 y, Mean education 14.7 $\pm$ 3.1 y, Mean Disease Duration 6.5 $\pm$ 3.4 y) over a period of 3 years. The research question of this longitudinal study is whether there is a benefit applying the Reliable Change Index (RCI) in detecting Mild cognitive impairment (MCI) detection in PD.

Methods

The patients were trained with computerized cognitive training program. We calculated sensitivity and specificity. Then we analyzed group differences with the generalized linear models (GLM) with confoundation.

Results

RCI from the following tests: Phonematic & Semantic Fluency, Wisconsin Card Sorting Test, Rey Figure test and Test of Alertness where divided with respect to a cut-off value 1.96 which reflects a significant change. The result of the training showed 4% reliable decline, 5% reliable improvement, 91% showed no change. The GLM results confounded with Age, Gender, Education showed no significant difference. The following cognitive tests in prediction of PD-MCI with the best specificity 0.08 where verbal fluency, Wisconsin Cart Sorting Teat and Rey Figure Test.

Conclusions

Even if no GLM result was significant, the detection of PD-MCI was very good in applying the highly specific Reliable Change Index (RCI).

**P029**

## Differences Between Late- and Early-Onset Multiple Sclerosis: Insights from a Large Swiss Cohort

L Steinegger [1], V Kana [2], N Nierobisch [2], A Elshahabi [2], M Weller [2], M Herwerth [2] and P Roth [2]

[1] Schulthess Clinic Zurich, Zürich, Switzerland

[2] University Hospital Zurich, Zürich, Switzerland

Aims

Multiple sclerosis is commonly seen in young adults, but the onset age varies from pediatric-onset to late-onset multiple sclerosis (LOMS), defined as clinical onset after age 50 (1). LOMS often poses diagnostic challenges due to clinical and radiological differences from early-onset multiple sclerosis (EOMS) and a higher prevalence of possible differential diagnoses in this age group (1–4). However, comparative research on EOMS versus LOMS remains limited. We aimed to address this gap in a retrospective cohort study.

Methods

We identified 148 patients with LOMS (pwLOMS) treated at the neuroimmunology outpatient clinic of the University Hospital Zurich between 2013 and 2023. We retrospectively analyzed clinical, imaging and cerebrospinal fluid (CSF) data and included a comparison group of 148 patients with EOMS, defined as onset between age 18 and 40, matched by year of diagnosis.

Results

While pwLOMS presented more often with a primary progressive subtype compared to EOMS ($p < 0.001$), a relapsing-remitting course was still the most frequent presentation in LOMS. Clinically, motor and multiple symptom presentation was more frequent in LOMS, while patients with EOMS presented more often with visual and sensory symptoms ($p < 0.001$). Cognitive symptoms and/or fatigue were reported more often in LOMS ($p < 0.001$). Inflammatory disease characteristics like gadolinium-enhancing lesions and a CSF pleocytosis were less frequent in LOMS ($p < 0.001$). Total T2-lesion load on MRI was higher in LOMS ($p = 0.026$). No difference was found in the occurrence of CSF-specific

oligoclonal bands. We found a significant diagnostic delay in LOMS ($p < 0.001$) and a lower probability to start a disease-modifying treatment (DMT, $p < 0.001$) despite a higher symptom burden in LOMS shown by a higher Expanded Disability Disease Scale (EDSS) at the time of diagnosis ($p < 0.001$).

Conclusions

Our study shows important clinical, radiological and CSF differences between patients with LOMS and EOMS. The finding of a higher prevalence of fatigue and cognitive impairment underscores the need for early intervention strategies to address this issue. The higher total T2-lesion load and lower Gadolinium-enhancing lesions emphasize the importance of tailored diagnostic criteria for this age group. The lower likelihood of starting DMT in LOMS probably reflects the limited available data about efficacy and safety of DMT in elderly patients.

**P030**

**Fatigue Investigation Using Digital Outcomes (FIDO): Clinical Trial Description**

M Stegmann [1], M Hilty [2], RS Naeeni [3], D Ferrario [3], A Disko [4], A Burkard [4], M Gölzer [4], V von Wyl [1], J Held [2], A Czaplinski [2], B Bujan [4], A Lutterotti [2], I Penner [5], P Oldrati [1] and L Barrios [1]

[1] University of Zurich, Zürich, Switzerland
[2] Bellevue Medical Group, Zürich, Switzerland
[3] CSEM, Neuchâtel, Switzerland
[4] Klinik Lengg, Zürich, Switzerland
[5] Inselspital—Universitätsspital Bern, Bern, Switzerland

Background and Objectives

Fatigue is a highly prevalent and disabling symptom in both multiple sclerosis (MS) and long COVID, yet it remains poorly understood and inadequately managed. Traditional assessment methods rely heavily on self-reported instruments (questionnaires) and infrequent clinical assessments, limiting their sensitivity and ecological validity. There is a growing need for objective, continuous measures that can capture the fluctuating and multidimensional nature of fatigue in real-world settings. This clinical trial aims to evaluate novel mobile- and wearable-derived biomarkers of fatigue and explore how lifestyle factors and the gut microbiome may contribute to fatigue in MS and long COVID.

Methods

This two-month observational study includes two site visits and continuous remote monitoring using digital tools in a group of 62 MS patients, 30 long COVID patients, and 30 healthy controls. Study participants are provided with two wearable devices (an ActiGraph LEAP and a consumer-targeted alternative (Apple Watch Series 9 or Garmin Venu 2)) and a smartphone-based application (FIDO)1, 2. Following baseline assessments, participants wear the devices 24/7 for eight weeks while using the FIDO app1, 2 to complete brief fatigue-related tasks (tapping and cognitive fatigability assessment test (cFAST)2) every two days and complete periodic questionnaires. Our study also incorporates gut microbiome sampling, with stool samples collected at weeks 4 and 8 for later analysis. The Fatigue Scale for Motor and Cognitive Functions (FSMC)3 is administered mid-study, and participants complete a usability questionnaire prior to the final visit. Final assessments and participant feedback are collected at study conclusion. The study protocol was reviewed and approved by the Cantonal Ethics Committee of Zurich and uploaded to kofam.ch (SNCTP000006337).

Conclusions

This trial aims to capture a comprehensive dataset for the objective quantification of fatigue in MS and long COVID in daily life. By leveraging wearable sensors and smartphone

tasks, this approach complements traditional subjective assessments with continuous, ecologically valid measurement. The integration of physiological, behavioral, and gut microbiome data may provide new insights into fatigue mechanisms and support the development of personalized therapeutic interventions.

**P031**

**Toward a Reliable Brain Imaging Marker in ALS: Accounting for Dropout in Longitudinal MRI Studies**

MJ Wendebourg [1], P van Lieshout [2], B Kalkhoven [2], A Michielsen [2], W van Hoek [2], L van den Berg [2], L van den Berg [2] and H Westeneng [2]

[1] Neurology Clinic and Policlinic, Department of Clinical Research, University Hospital Basel, University of Basel, Basel, Switzerland
[2] Department of Neurology, University Medical Centre Utrecht Brain Centre, Utrecht University, Utrecht, Netherlands

Background
Amyotrophic Lateral Sclerosis (ALS) is a fatal neurodegenerative disease without curative treatment. Clinically feasible longitudinal imaging biomarkers are promising and urgently needed to track progression and evaluate treatment effects in trials. However, biomarker development is complicated by disease heterogeneity and rapid progression. As disability advances, many patients are unable to undergo follow-up MRI scans (e.g., due to respiratory or motor impairment), introducing attrition bias. This can obscure true longitudinal changes. Joint modelling techniques can correct for this bias by integrating survival data into longitudinal analysis.
Objectives
To investigate cortical thickness, subcortical volumes, and major white matter tracts as longitudinal imaging biomarkers in ALS—while correcting for attrition bias—and to assess their potential to improve statistical power in clinical trials.
Methods
We conducted longitudinal T1- and DTI-weighted brain MRI in 539 patients with ALS (total 1105 scans) across up to five visits (3–6-month intervals). Imaging features were extracted using FreeSurfer. We assessed relationships between imaging parameter change, disease severity, and study dropout using Bayesian joint models. Results were compared to conventional linear mixed models. Sample size estimates were calculated for future trials using imaging biomarkers versus ALSFRS-R as endpoints.
Results
We found significant associations between dropout and imaging decline across widespread brain regions, especially in motor and frontal cortices, subcortical structures, and major white matter tracts-confirming the presence of attrition bias. Correcting for this, joint modelling revealed significant widespread longitudinal decline (notably, precentral cortex thinning of $-0.34$ SD/year; 95% CI $-0.42$ to $-0.\ 26$, $p < 0.001$). Compared to conventional linear mixed models, joint models produced up to 1.5-fold larger estimates of decline. Sample size calculations showed that using imaging biomarkers could reduce the number of participants needed to detect a 30% treatment effect by up to 70% compared to ALSFRS-R.
Conclusions
Attrition bias significantly affects longitudinal imaging studies in ALS. Joint modelling corrects for this bias, revealing more accurate estimates of cerebral decline. Imaging markers corrected for attrition show strong potential as sensitive progression markers and could substantially reduce sample size needs in ALS trials.

**P032**

## Longitudinal Investigation of Cervical and Thoracic Spinal Cord Gray and White Matter in Amyotrophic Lateral Sclerosis

MJ Wendebourg [1], EM Kesenheimer [2], R Jetzer [3], L Sander [1], W Matthias [4], C Weidensteiner [4], T Haas [5], P Madoerin [5], C Neuwirth [6], N Braun [6], M Weber [6], N Naumann [7], K Schweikert [7], C Granziera [1], M Sinnreich [8], O Bieri [4] and R Schlaeger [1]

[1] Neurology Clinic and Policlinic, Department of Clinical Research, University Hospital Basel, University of Basel, and Translational Imaging in Neurology (ThINk), University of Basel, Basel, Switzerland
[2] REHAB Basel, Basel, Switzerland/Department of Neurology, University Hospital Basel and University of Basel, Basel, Switzerland
[3] Neurology Clinic and Policlinic, Department of Clinical Research, University Hospital Basel, University of Basel, Basel, Switzerland
[4] Division of Radiological Physics, Department of Radiology and Biomedical Engineering, University Hospital Basel and University of Basel, Basel, Switzerland
[5] Division of Radiological Physics, Department of Radiology, University Hospital Basel, Basel, Switzerland
[6] Kantonsspital St. Gallen Muskelzentrum/ALS Clinic, St. Gallen, Switzerland
[7] Neurology Clinic and Policlinic, University Hospital Basel, Basel, Switzerland
[8] Neurology Clinic and Policlinic, University Hospital Basel, and Department of Biomedicine (DBE), University of Basel, Basel, Switzerland

Background
Amyotrophic Lateral Sclerosis (ALS) is characterized by progressive upper (UMN) and lower motor neuron (LMN) degeneration. The spinal cord (SC) contains UMN axons and LMN cell bodies, enabling the examination of changes in both UMN and LMN. Multiecho data image combination (MEDIC) and Averaged Magnetization Inversion Recovery Acquisitions (rAMIRA) [1] MRI enable the measurement of SC substructures. Cross-sectionally, SC total cord area (TCA) and gray matter area (GMA) show atrophy compared to healthy controls (HC) [2], with GMA correlating with clinical disability and muscle strength in ALS [3]. Longitudinal changes of cervical and thoracic GMA and white matter areas (WMA) have not been investigated yet. We aimed to investigate longitudinal changes of SC metrics using rAMIRA in ALS.
Methods
Patients with ALS and age and sex-matched HC underwent axial 2D rAMIRA imaging at the intervertebral disc levels C2/C3–C5/C6 and the thoracic enlargement (Tmax) at baseline and after 12 months. We segmented TCA, GMA and WMA using JIM 7. We compared SC metrics between ALS and HC at baseline and follow-up, using linear models with interaction terms to evaluate differences in longitudinal trajectories.
Results
We included 41 patients with ALS (15 women, mean age 61.9 years (SD 13.0)) and 41 HC (15 women, 62.4 years (12.3)). The median ALSFRS-R score at baseline was 39.0 (IQR 35.0–44.0), the median ALSFRS-R slope was 0.31 (0.22–0.48). At baseline, patients showed significant atrophy in TCA, GMA, and WMA at all levels except for WMA at Tmax. Longitudinally, cervical and thoracic TCA and GMA declined significantly in ALS compared to HC. We found the most pronounced decline close to the cervical enlargement (C4/C5: mean decline TCA $-2.77$ mm$^2$, $p = 0.013$, GMA $-1.44$ mm$^2$, $p = 0.002$, WMA ns) and at Tmax (TCA $-3.70$, $p = 0.055$, WMA ns, GMA $-2.75$ mm$^2$, $p = 0.002$, WMA ns). HC showed no significant longitudinal area reductions.

Discussion

While HC showed no significant decline, rAMIRA imaging revealed significant atrophy of cervical and thoracic TCA and GMA over the observation period of one year in this group of patients with relatively slow disease progression. WMA reductions were non-significant, indicating that the TCA reductions observed are mainly driven by gray matter atrophy.

**P033**

**Stroke Outcomes in Obese Patients Receiving Acute Stroke Therapy**

M Kielkopf [1], C Inauen [2], M Branca [3], M Göldlin [1], A Scutelnic [1], S Kaufmann [1], A Boronylo [1], J Kaesmacher [4], T Meinel [1], D Seiffge [1], P Bücke [1], M Heldner [1], A Luft [2], C Globas [2], M Arnold [1], U Fischer [1], S Jung [1], S Wegener [2], M Beyeler [1] and H Sarikaya [1]

[1] Department of Neurology, Inselspital, Bern University Hospital, and University of Bern, Bern, Switzerland
[2] Department of Neurology, USZ, Zürich University Hospital, and University of Zürich, Zürich, Switzerland
[3] CTU Bern, Institute of Social and Preventive Medicine, University of Bern, Bern, Switzerland
[4] Institute for Diagnostic and Interventional Neuroradiology, Inselspital, Bern University Hospital, and University of Bern, Bern, Switzerland

Background

The influence of obesity on stroke outcomes remains controversial. Some studies suggest a beneficial effect—a phenomenon known as the "obesity paradox", where obese patients may recover better due to greater metabolic reserves and a less severe catabolic response. This study investigated the association between obesity and functional outcomes in acute ischemic stroke (AIS) patients treated with intravenous thrombolysis (IVT) and/or endovascular therapy (EVT).

Methods

The ISOT Study was a prospective cohort study conducted at two comprehensive Stroke Centers in Switzerland between January 2016 and September 2021. The study enrolled patients treated with IVT and/or EVT, who were functionally independent prior to AIS (modified Rankin Scale [mRS] 0–2). Body weight was measured on the first day after AIS using a calibrated chair scale. Obesity was defined as a BMI $\geq$ 30.0 kg/m$^2$. Functional outcome was assessed at 3 months and 1 year after AIS.

Results

Of the 271 patients enrolled (median age 70 years, 65% male, median NIHSS 5 [interquartile range 3–11]), 153 (56%) were treated with IVT, 56 (21%) with EVT and 62 (23%) with IVT + EVT). A total of 54 patients (20%) were classified as obese. At 3 months, 14% of patients ($n$ = 37/271) had a poor functional outcome (mRS 3–6), including 24% of the obese group ($n$ = 13/54) compared to 11% of the non-obese group ($n$ = 24/217). At 1 year, 65% patients ($n$ = 158/244) had an excellent outcome (mRS 0–1), including 50% of the obese group ($n$ = 25/50) and 69% of the non-obese group (133/194). Obesity was associated with poor functional outcome at 3 months (adjusted odds ratio [aOR] 2.65, 95% confidence interval [CI] 1.18–5.95) and a lower likelihood of excellent functional outcome at 1 year (aOR 0.44, 95% CI 0.22–0.86).

Conclusions

Obesity was associated with worse functional outcomes at 3 months and 1 year in AIS patients undergoing acute stroke therapy, contradicting the "obesity paradox". Further research should explore mechanisms behind these differences.

**P034**

**Imaging of mGluR5 Upregulation in Amyotrophic Lateral Sclerosis**

N Braun

Kantonsspital St. Gallen HOCH, St. Gallen, Switzerland

Aim

Amyotrophic lateral sclerosis (ALS) has unclear pathophysiology, but glutamate driven excitotoxicity is believed to play a key role. Post mortem analyses demonstrated elevated mGluR5 expression in the brain of ALS patients, especially in the medulla and pons. This study aims to visualize and quantify mGluR5 expression in CNS of ALS patients using the positron emission tomography (PET) tracer [$^{18}$F]PSS232, a selective radioligand that enables non-invasive in vivo imaging of mGluR5. By combining PET with magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS), we aim to investigate receptor distribution, potential regional differences, and longitudinal changes over the disease course.

Methods

A total of twenty patients and ten age-matched healthy controls will be enrolled. [$^{18}$F]PSS232 PET imaging has so far been performed in four patients with ALS (two women, two men; aged 48–69 years) and three healthy control subjects (one woman, two men; aged 36–72 years). All participants underwent a standardized infusion protocol. Tracer kinetics were analyzed using compartmental modeling, and parametric maps were generated using PMOD software. Volumes of interest (VOIs) were selected based on established mGluR5 expression patterns. Regions included the medulla oblongata, bilateral pons, amygdala, hippocampus, anterior cingulate cortex (ACC), dorsolateral prefrontal cortex (DLPFC), and cerebellum. The cerebellum served as a reference region due to its low mGluR5 expression.

Results

Preliminary quantitative analysis of [$^{18}$F]PSS232 PET data demonstrated increased mGluR5-associated binding in several brain regions of the ALS patient relative to the healthy control. The most pronounced differences were detected in the medulla and pons.

Conclusions

This preliminary comparison of [$^{18}$F]PSS232 PET data of one ALS patient and one healthy control revealed increased mGluR5 expression in brain regions associated with ALS pathology, such as the medulla and pons. This supports the hypothesis of region-specific glutamatergic dysregulation in ALS. The elevated tracer uptake in these areas aligns with post-mortem findings of pronounced mGluR5 expression. The exact role of this upregulation, whether contributing to excitotoxicity or serving as an adaptive mechanism, remains unclear. Further MR spectroscopy studies focusing on glutamine metabolism may help elucidate this. Understanding mGluR5's involvement could identify it as a potential therapeutic target.

**P035**

**Enhancing ALS and FTD Diagnosis Through pTau:tTau Ratio and Multimodal Biomarkers**

L Hering, S Mukhija, SJ Schreiner, FA Lehner, J Loosli, T Weiss, HH Jung and N Briel

Department of Neurology and Clinical Neuroscience Center, University Hospital Zurich and University of Zurich, Zürich, Switzerland

Objective

Amyotrophic Lateral Sclerosis (ALS) and Frontotemporal Dementia (FTD) lack established biomarkers for early diagnosis, currently relying on extensive clinical assessments. The phosphorylated-tau to total-tau ratio (pTau:tTau) shows promise in discriminating the

ALS | FTD spectrum from differential diagnoses. This study aimed to identify an optimal set of clinicodemographic and fluid biomarkers to differentiate ALS | FTD from 4R-tauopathy, Alzheimer's disease, Lewy body diseases, normal pressure hydrocephalus, and controls.
Methods
This retrospective study included 230 patients from the University Hospital Zurich (2016–2025) who underwent lumbar puncture for suspected neurodegenerative disease. Diagnoses followed international consensus criteria. Controls exhibited no signs of neurodegenerative disease. Data encompassed demographics, disease duration, cognitive performance, cerebrospinal fluid (CSF) basic workup, CSF dementia biomarkers, and comorbidities. Predictors were prioritized, and final models were built using XGBoost.
Results
The pTau:tTau ratio was lowest in ALS | FTD ($n$ = 6 6, 0.109 $\pm$ 0.033), followed by 4R-tauopathy ($n$ = 2 8, 0.129 $\pm$ 0. 034, $p < 0.05$), Alzheimer's disease ($n$ = 5 1, 0.162 $\pm$ 0. 021, $p < 0.001$), and other conditions ($n$ = 8 5, 0.134 $\pm$ 0. 035, $p < 0.001$). In ALS | FTD, lower ratios correlated with an elevated CSF-serum albumin ratio and reduced global cortical atrophy and medial temporal lobe atrophy. A multivariable model integrating the ratio with temporal disease features, immunological/amyloid CSF markers, serum albumin, and white matter lesions achieved superior diagnostic accuracy (AUC = 0.85) compared to the ratio alone (AUC = 0.75).
Conclusions
This study contextualizes the pTau:tTau ratio within blood-brain barrier dysfunction and cerebral structural integrity in ALS/FTD. Integrating CSF biomarkers with clinical and demographic features significantly enhances diagnostic precision beyond conventional approaches. However, clinical-biological heterogeneity among ALS and FTD subtypes may drive additional variation. Prospective validation in larger cohorts and earlier disease stages is essential.

**P036**

## Optical Coherence Tomography Predicts Events of Cognitive Worsening in People With Multiple Sclerosis

N Cerdá Fuertes [1], S Sankar [2], S Pless [2], L Hofer [3], S Sellathurai [1], K Schoenholzer [1], F Burguet Villena [1], A Demirtzoglou [2], B Fischer-Barnicol [4], M D Souza [2], P Calabrese [5], P Benkert [2], J Müller [2], K Gugleta [6], T Derfuss [2], C Granziera [1], L Kappos [2], J Kuhle [2] and A Papadopoulou [1]

[1] Translational Imaging in Neurology (ThINK) Basel, Department of Medicine and Biomedical Engineering, University Hospital Basel and University of Basel, Basel, Switzerland
[2] Research Center for Clinical Neuroimmunology and Neuroscience, University of Basel, Basel, Switzerland
[3] Clinical Trial Unit, Department of clinical research, University of Basel, Basel, Switzerland
[4] Neurologic Clinic and Policlinic, Switzerland, Departments of Medicine, Clinical Research and Biomedical Engineering, University Hospital Basel and University of Basel, Basel, Switzerland
[5] Department of Psychology and Interdisciplinary Platform Psychiatry and Psychology, Division of Molecular and Cognitive Neuroscience, University of Basel, Basel, Switzerland
[6] University Eye Clinic Basel, University Hospital Basel and University of Basel, Basel, Switzerland

Introduction
Neuroaxonal integrity in the retina, as measured by optical coherence tomography (OCT) has been associated with cognitive disability in people with multiple sclerosis (pwMS), but longitudinal data are scarce.

Objective/Aim
We aimed at assessing the value of OCT measures to predict events of cognitive worsening in pwMS.
Methods
Longitudinal study with OCT at baseline (BL) and the brief international cognitive assessment for MS (BICAMS), comprising the Symbol Digit Modalities Test (SDMT), the german version of the Rey Auditory Verbal Learning Test, known as "Verbaler Lern- und Merkfähigkeitstest" (VLMT, and Brief Visuospatial Memory Test (BVMT), at BL and yearly visits. Mean thickness of peripapillary retinal nerve fiber layer (pRNFL) and ganglion cell-inner plexiform layers (GCIPL) were assessed. Eyes with prior optic neuritis and/or inter-eye asymmetry were excluded. Cognitive progression independent of relapse activity (cognitive PIRA) in each BICAMS test was defined as >10% decrease compared to the previous visit, confirmed after 12 months, in absence of relapses within the 90 days before and 30 days after the event- and confirmation visits. Cox regression models with adjustment for age at first symptom, disease duration, years of education, recent relapse rate and disease modifying therapy were performed.
Results
98 MS patients (at BL: 63.3% female, 80.6% relapsing remitting MS, mean ± SD age 50.5 ± 11.6 years, disease duration 18.7 ± 9.9 years, education 14.1 ± 3.3 years and median EDSS: 3.0) were included. We identified 11 SDMT-, 21 VLMT- and 10 BVMT PIRA events during a mean follow-up time of 5 ± 1.4 years.
Thinner pRNFL at baseline by 1 mcm was associated with a 6% increase in the risk for a PIRA event in SDMT performance (HR = 1.06, $p = 0.017$), but not in VLMT or BVMT. Moreover, thinner GCIPL at baseline by 1 mcm was associated with a 12.5% increase in the risk for a PIRA event in the SDMT (HR = 1.13, $p = 0.011$) and a trend for an increased PIRA risk in VLMT (HR = 1.06, $p = 0.058$).
Conclusions
Axonal (pRNFL) and neuronal (GCIPL) loss in the retina, as part of the CNS may be associated with higher risk of cognitive PIRA, particularly regarding information processing speed, independently of relapse activity and treatment. Larger studies could shed more light into the value of retinal measures in predicting cognitive vs. physical disability in pwMS.

**P037**

## SMARTCARE—The Value of Video Recorded Assessments for the Neurostatus EDSS Performed by Health Care Professionals

N Cerdá Fuertes [1], G Mallucci [1], N Sfikas [2], J Kel [1], I Athanasopoulou [1], V Phavanh [1], L Sanak [3], J Suter [3], B Friedli [3], T Trouillet [1], A Ocampo [2], W Wei [2], A Papadopoulou [4], B Kieseier [2], C Kamm [1], L Kappos [1], M D'Souza [5]

[1] Research Center for Clinical Neuroimmunology and Neuroscience Basel (RC2NB), University Hospital Basel and University of Basel, SwitzerlandBasel
[2] Novartis Pharma AG, Basel, Switzerland
[3] Neurocenter, Lucerne Cantonal Hospital, Lucerne, Switzerland
[4] Translational Imaging in Neurology (ThINK) Basel, Department of Biomedical Engineering, Faculty of Medicine, University Hospital and University of Basel, Basel, Switzerland
[5] Research Center for Clinical Neuroimmunology and Neuroscience Basel (RC2NB), University Hospital Basel and University of Basel, Basel, Switzerland

Introduction
In a recent multicenter, randomized, cross-over study ("SMARTCARE"), 100 people with Multiple Sclerosis (pwMS) underwent two neurological examinations, one performed by a

trained neurologist and one by a health care practitioner (HCP), after dedicated training (Visit 1). At the next visit, the reverse order was applied by the same raters (Visit 2). All examinations were video recorded. The consistency between neurologists and HCP for the assessment of Neurostatus-Expanded Disability Status Scale (EDSS) was high, but there were also non-concordant assessments.

Objectives

To analyse the role of video recordings in evaluating and understanding inconsistencies between HCP and neurologists participating in the SMARTCARE study.

Methods

We analysed the assessments with non-concordant EDSS values at visit 1. Firstly, a consistency check was performed on the calculation of EDSS, Functional System Scores (FSS) and Ambulation Score (AS) using the validated Neurostatus-eEDSS algorithm®. Remaining non-concordant assessments were analysed by an independent EDSS expert using only the video recordings.

Results

From a total of 100 pwMS, 13 assessments had non-concordant EDSS values, 2 of which due to an error in calculation of the score. The remaining 11 assessments with "real" discrepancies (53 subscores and 3 AS) were analysed using the videos. For the 56 discrepancies, the outcomes were as follows: correct scoring only by the neurologist for 26 items (46%), correct only by the HCP in 10 items (18%); in 7 cases (13%), both neurologist and HCP were correct, and the discrepancy was due to difference in performance by the patient; in 3 cases (5%) both scorings were incorrect. In 10 (18%), the independent EDSS expert was not able to assess the discrepancy on the video. Pyramidal was the most commonly discrepant FSS (in 7 of the 11 assessments), followed by Brainstem, Sensory and Cerebral FSS.

Conclusions

This study demonstrated that HCP can perform the Neurostatus-EDSS assessments reliably since discrepancies between Neurostatus- EDSS trained HCPs and neurologists were rare. The video recordings help to clarify inter-rater discrepancies. In most cases, either the HCP (46%) or the neurologist (18%) gave a scoring considered wrong by an expert, most frequently affecting the pyramidal functions. Videos and documented errors can be used to improve the training programs both for HCP and neurologists and enable a broader use of Neurostatus-EDSS.

**P038**

## Real-World Experience with Tofersen in Switzerland: Disease Progression in ALS Patients with SOD1 Mutation

O Hoptar [1], A Lascano [2], V Loser [3], C Neuwirth [1] and M Weber [1]

[1] HOCH Health Ostschweiz, Kantonsspital St. Gallen, St. Gallen, Switzerland
[2] Hôpitaux Universitaires de Genève, Geneva, Switzerland
[3] Centre Hospitalier Universitaire Vaudois (CHUV), Lausanne, Switzerland

Aims

Tofersen, an antisense oligonucleotide targeting SOD1 mRNA, has shown promise in slowing disease progression in patients with SOD1-associated amyotrophic lateral sclerosis (ALS) (1, 2). As regulatory approval for Tofersen is still pending in Switzerland, we aimed to assess real-world clinical data from Swiss ALS patients treated with Tofersen in the early access program, focusing on functional decline and respiratory function before and during therapy.

Methods

We are retrospectively analyzing Revised Amyotrophic Lateral Sclerosis Functional Rating Scale (ALSFRS-R) scores and forced vital capacity (FVC) data from 8 SOD1-ALS patients

treated with Tofersen at three Swiss ALS centers. Data are being extracted from routine clinical follow-up visits before and after Tofersen initiation. ALSFRS-R and FVC slopes are being calculated for each patient over time, comparing the periods. The monthly progression rate is being determined using mixed models, which have demonstrated their validity in capturing longitudinal changes (3).

Results

So far, ALSFRS-R scores of 5 patients from ALS clinic, St. Gallen, were analyzed. The average rate of ALSFRS-R decline was reduced by approximately 53% following initiation of Tofersen. While patients showed heterogeneous disease progression prior to therapy, most demonstrated stabilization or slower decline in function during treatment. Data from additional patients treated at two other centers (CHUV, HUG) will be included in the final presentation.

Conclusions

Our interim real-world data suggest that Tofersen may significantly slow functional decline in patients with SOD1-ALS in Switzerland, in line with findings from previous clinical trials (1, 2). These findings support the clinical relevance of Tofersen as a disease-modifying therapy and may be of particular importance in the context of the ongoing national regulatory evaluation.

References

1. Hamad AA et al. Tofersen for SOD1 amyotrophic lateral sclerosis: a systematic review and meta-analysis. Neurol Sci. 2025;46(5):1977-85.
2. Wiesenfarth M et al. Effects of tofersen treatment in patients with SOD1-ALS in a "real-world" setting—a 12-month multicenter cohort study from the German early access program. EClinicalMedicine. 2024;69:102495.
3. Cheah BC et al. Neurophysiological index as a biomarker for ALS progression: validity of mixed effects models. Amyotroph Lateral Scler. 2011;12(1):33-8.

**P039**

## Cortical Lesions as Predictor of Progression Independent of Relapse Activity in Multiple Sclerosis

R Pretzsch [1], A Cagol [2], M Ocampo-Pineda [3], P Benkert [4], S Schaedelin [4], L Melie-Garcia [3], M Weigel [5], Ö Yaldizli [1], J Oechtering [1], M DSouza [1], B Fischer-Barnicol [1], T Derfuss [1], JM Lieb [6], D Leppert [7], A Pröbstel [8], L Kappos [7], MP Sormani [9], J Kuhle [1] and C Granziera [3]

[1] Multiple Sclerosis Centre, Departments of Neurology, Clinical Research and Biomedicine, University Hospital and University Basel, Basel, Switzerland
[2] Department of Health Sciences, University of Genova, Genova, Italy
[3] Translational Imaging in Neurology (ThINK) Basel, Department of Biomedical Engineering, Faculty of Medicine, University Hospital Basel and University of Basel, Basel, Switzerland
[4] Department of Clinical Research, University Hospital Basel, University of Basel, Basel, Switzerland.
[5] Division of Radiological Physics, Department of Radiology, University Hospital Basel, Basel, Switzerland
[6] Division of Diagnostic and Interventional Neuroradiology, Clinic for Radiology and Nuclear Medicine, University Hospital Basel, University of Basel, Basel, Switzerland
[7] Research Center for Clinical Neuroimmunology and Neuroscience Basel (RC2NB), University Hospital Basel and University of Basel, Basel, Switzerland
[8] Center of Neurology, Department of Neuroimmunology, University Hospital Bonn, Bonn, Germany; German Center for Neurodegenerative Diseases (DZNE), Bonn, Germany
[9] Istituto di Ricovero e Cura a Carattere Scientifico, Ospedale Policlinico San Martino, Genova, Italy

Aims
Cortical lesions (CL), indicative of focal inflammation within the cortex, are associated with cognitive deficits, physical impairment and disease progression in individuals diagnosed with multiple sclerosis (MS). A key mechanism contributing to disability accumulation in MS is the progression independent of relapse activity (PIRA). In this study, we investigated whether the presence of CL, as assessed on 3T MRI T1-weighted images, could serve as a predictor of future PIRA events among individuals with MS.
Methods
We included patients diagnosed with MS prospectively followed at the University Hospital Basel as part of the Swiss Multiple Sclerosis Cohort (SMSC) study. Two raters blinded to subjects' clinical information manually assessed the presence and number of CL on the first available 3T MRI scan obtained during the longitudinal follow-up. For CL identification, the following MRI sequences were used: (1) 3D 1 mm isotropic MP2RAGE for the subgroup of patients participating in the INsIDER study ($n$ = 95), and (2) 3D 1 mm isotropic MPRAGE for the remaining participants ($n$ = 93). T2-lesion volume (T2LV) was calculated automatically with a deep learning-based software followed by manual correction. We evaluated the predictive value of the presence and number of CL for PIRA events during the subsequent follow-up in a Cox-regression model, adjusting for age, sex, disease phenotype, disease duration, and T2LV.
Results
We included a total of 188 individuals with MS (median [IQR] age: 49.7 [41.1–57.59] years, median [IQR] disease duration: 16.1 [6.8–24] years, 147 with relapsing-remitting MS and 41 with progressive MS). Over a median [IQR] follow-up of 4.5 [3.0–6.0] years, 45 PIRA events were detected. In the multivariable Cox-regression model the presence of CL was associated with a 2.96-fold [95% confidence interval (CI), 1.29–6.81] increase in the risk of PIRA ($p$ = 0.01). The number of CL showed a trend in predicting events of PIRA (HR [95% CI] 1.03 [0.10–1.06], $p$ = 0.05). The predictive value of CL for time-to-PIRA was not significantly different between MP2RAGE and MPRAGE scans.
Conclusions
Our results support the value of the presence of CL in identifying individuals with MS at increased risk of PIRA. We will validate our results in a larger cohort (expected total number of patients = 700).

**P040**

**Microscopic Colitis Associated with Levodopa-Benserazide in Parkinson's Disease: A Case Report**

S Fischer [1] and M Arnold [2]

[1] Department of Neurology and Neurorehabiliation, Cantonal Hospital of Lucerne, Lucerne, Switzerland
[2] Department of Internal Medicine, Cantonal Hospital of Nidwalden, Stans, Switzerland and Department of Neurology and Neurorehabiliation, Cantonal Hospital of Lucerne, Lucerne, Switzerland

Aim
Levodopa combined with dopa decarboxylase inhibitors is widely used to treat Parkinson's disease. Diarrhea is a known side effect, but in rare cases, it may reflect underlying microscopic colitis (1,2).
Methods
We present a case of drug-associated microscopic colitis in a patient with Parkinson's dis-ease and describe its diagnostic work-up and management. An 85-year-old male with neurodegenerative Parkinson's disease confirmed by functional imaging (DaTscan) began

treatment with levodopa/benserazide. Initially well tolerated, he developed persistent non-bloody diarrhea (3–5 stools/day) approximately 3 months after initiation. Infection with Campylobacter jejuni was initially detected and treated, but diarrhea persisted.
Results
Despite symptomatic management, the patient was hospitalized for generalized weakness, attributed to diarrhea-associated hypokalemia, which was corrected with oral potassium. Repeated stool cultures, including for Clostridioides difficile, were negative. Serologic testing for celiac disease (tissue transglutaminase antibodies) was also negative. A gastroscopy and colonoscopy showed unremarkable findings except for villous atrophy in the terminal ileum. Finally, histological analysis of intestinal biopsies confirmed lymphocytic enterocolitis, a subtype of microscopic colitis. A treatment with oral budenoside was initiated and parkinson's treatment was switched from levodopa/benserazide to levodopa/carbidopa. The diarrhea subsided until the patient was discharged. Aside from statin use, no other risk factors (NSAIDs, PPIs, smoking) were present. A preceding Campylobacter infection has been associated with microscopic colitis. (3,4) However, in our patient, symptoms resolved after medication switch and the association is weaker for C. jejuni than for other subspecies. (3)
Conclusions
We demonstrate a rare case of biopsy-proven microscopic colitis associated with levodopa/benserazide. It aligns with a 2021 case series (1), which described Parkinson's patients with suspected or confirmed microscopic colitis, many of whom improved after switching to carbidopa-based therapy. Persistent diarrhea in Parkinson's patients should prompt evaluation for underlying microscopic colitis and consideration of a switch in dopa decarboxylase inhibitor when colitis is suspected or confirmed.

**P041**

## Self-Motion Perception After Stroke: Insights into Vestibular Neglect and Hemispheric Representation

S Hösli [1], D Hansson [2], C Bockisch [1] and D Straumann [1]

[1] Universitätsspital Zürich, Zürich, Switzerland
[2] Universität Zürich, Zürich, Switzerland

Introduction
Perception of self-motion depends on integrating visual, proprioceptive, and vestibular inputs (Greenlee MW. et al. Curr Opin Neurol 2016:29:39). Although no primary vestibular cortex has been identified, vestibular processing involves a distributed cortical network, predominantly in the right hemisphere of right-handed individuals (Dieterich M. et al. Brain 2003:126:155). Right-hemispheric stroke is believed to disrupt central vestibular processing despite intact peripheral function, a condition termed spatial neglect (Karnath HO. et al. Brain 2006:129:394; Kerkhoff G. Prog Neurobiol 2001:63:1). The vestibular and spatial attention networks overlap in right-hemispheric regions like the superior temporal cortex, and vestibular stimulation can reduce spatial neglect symptoms (Cappa SF. et al. Ann Neurol 1987:21:227; Utz KS. et al. Neuropsychologia 2010:48:2789). We aimed to develop a paradigm to assess vestibular neglect and investigate the effects of right-hemispheric lesions on self-motion perception.
Methods
We studied 25 participants (16 male): 15 with right-hemispheric and 10 with left-hemispheric lesions. Vestibular heading perception was assessed using a 6-degrees-of-freedom motion simulator under sensory-deprived conditions. Pure translational and combined rotational-translational movements were tested. Responses were analysed with psychometric functions and mixed-effects models to estimate perceived straight ahead (PSA) and discrimination thresholds (DT).

Results
Both groups detected rotation-induced PSA shifts. Rightward yaw caused a significant leftward PSA shift ($-3.51^\circ$, CI $-6.91$ to $-0.11$, $p = 0.043$). Discrimination thresholds did not differ significantly between conditions or groups. However, a subgroup of poor performers was identified among right-hemispheric patients. Prior visual neglect did not significantly affect vestibular-driven self-motion perception.
Conclusions
Left- and right-hemispheric stroke patients performed well in this self-motion task, suggesting a certain degree of resilience in central vestibular networks. The lack of hemispheric differences supports bilateral vestibular representation. However, the subgroup of right-hemispheric patients with poor performance may reflect lesions in key cortical vestibular areas and warrants further investigations.

**P042**

**Artificial Intelligence in Clinical Neurology: Current Applications and Future Directions**

S Neidhart and B Tettenborn

Bellevue Medical Center Zurich AG, Zürich, Switzerland

Aims
Artificial intelligence (AI) is rapidly transforming clinical neurology, with a growing number of tools supporting diagnosis, monitoring, and clinical decision-making. We present and highlight selected examples of AI applications in neurology to illustrate both the progress made and the challenges ahead.
Methods
We conducted a focused review of recent high-impact, PubMed-indexed publications (2019–2025) that showcase representative applications of AI in clinical neurology and compared that with our clinical experience. Priority was given to systematic reviews, meta-analyses, and large-scale or clinically validated studies. The selected examples span neuroimaging, electroencephalography (EEG), and general clinical decision support.
Results
In neuroimaging, AI has shown expert-level performance in diagnostic classification of neurodegenerative disorders. A 2023 systematic review of 255 studies confirmed that deep learning models often outperform traditional classifiers, though challenges in dataset diversity and external validation persist (Borchert RJ et al. Alz Dement 2023;19:5885). In epilepsy care, AI-based EEG interpretation has made substantial advances. SCORE-AI, trained on over 30,000 EEGs, demonstrated expert-level accuracy in multiple diagnostic domains (Tveit K et al. JAMA Neurol 2023;80:746). On a broader level, AI frameworks for clinical decision support are gaining traction. Recent reviews have outlined the potential of AI-driven systems in patient triage, risk stratification, and workflow optimization, while also underscoring unresolved ethical and regulatory issues (Rizzo M et al. Ann Neurol 2025;97:707 and 721).
Conclusions
AI is becoming an integral part of clinical neurology, with diverse applications under active development. While this abstract highlights only selected use cases, they exemplify the broader potential of AI to support clinical reasoning, reduce diagnostic variability, and improve patient outcomes. As adoption increases, challenges around transparency, generalizability, and integration into clinical workflows must be addressed through interdisciplinary efforts and standardized evaluation practices.

**P043**

**Therapeutic Patient Education in Parkinson's Disease: Design of a Multidisciplinary Feasibility Study Targeting Neuropsychiatric Burden**

T Corbet, E Tomkova, S Catalano Chiuvé, S Baudois, C Foehn and V Fleury

Hôpitaux Universitaires de Genève, Geneva, Switzerland

Background
Therapeutic Patient Education (TPE) is a structured, evidence-based process that enhances self-management, treatment adherence, and quality of life in chronic illness. Parkinson's disease is the second most common neurodegenerative disease affecting approximately 1% of the population over the age of 65. While PD is primarily characterized by motor symptoms, non-motor symptoms, particularly neuropsychiatric symptoms such as depression, anxiety, apathy, shame and cognitive disturbances, are increasingly recognized as major contributors to the disease burden. These symptoms have a profound impact on both patient's and caregivers' quality of life.
Objective
This study aims to evaluate the feasibility of implementing a structured, multidisciplinary TPE program for people with PD at Geneva University Hospitals (HUG), with a particular focus on neuropsychiatric and cognitive burden, emotional well-being, and patient empowerment.
Methods
The study is designed as an adaptative, two-phase prospective observational protocol. In phase 1, participants undergo individualized therapeutic sessions across three different pathways: (1) Nursing-led education (2) Psychological support (3) Neuropsychological support. This phase includes a structured assessment of patient-expressed needs and expectations, which will guide the design of targeted group modules in Phase 2. In Phase 2, group sessions will be introduced. This phase will be designed to address the key challenges identified in Phase 1, and to test the implementation and long-term integration of the program within routine care at HUG. During the whole study, clinical outcomes will be assessed using validated tools (e.g., MDS-UPDRS, HAD, SPARK, CD-RISC), complemented by qualitative feedback from both patients and caregivers.
Expected outcomes
Primary outcomes focus on feasibility (recruitment, adherence, satisfaction, data completeness). Secondary outcomes include changes in non-motor symptoms, resilience, self-perception, and illness coping strategies. Results will inform a scalable model of PD-specific TPE adapted to the Swiss healthcare context.
Conclusions
This study addresses a critical gap in PD care by developing a person-centred, multidisciplinary intervention targeting neuropsychiatric and neurocognitive symptoms. It integrates clinical practice, education, and implementation science to support long-term adoption of TPE as part of integrated PD management in Switzerland.

**P044**

**Assessing the Use of Optical Coherence Tomography in the Care of People with Multiple Sclerosis and Related Disorders in Switzerland: A National Survey**

V Kana [1], N Cerdá-Fuertes [2], F Burguet Villena [2], FC Fierz [3], M Herwerth [4], J Kuhle [2], P Roth [5] and A Papadopoulou [2]

[1] Department of Neurology, University Hospital Zurich, Zurich, Switzerland
[2] Clinic of Neurology, University Hospital of Basel and Department of Clinical Research, University Hospital Basel and University of Basel, Basel, Switzerland

[3] Department of Ophthalmology, University Hospital Zurich, Zurich, Switzerland
[4] University Hospital Zurich, Department of Neurology and Neuroscience Center Zurich, University of Zurich and ETH Zurich and Institute of Pharmacology and Toxicology, University of Zurich, Zurich, Switzerland
[5] Department of Neurology, University Hospital Zurich and Neuroscience Center Zurich, University of Zurich and ETH Zurich, Zurich, Switzerland

Background
Optic neuritis is a common symptom in multiple sclerosis (MS), and upcoming revisions to the McDonald criteria will include the optic nerve as a fifth topographical region. Optical coherence tomography (OCT) is a non-invasive tool with potential for longitudinal and prognostic assessment of optic nerve involvement.
Objective
To evaluate the current use of OCT in MS care in Switzerland.
Methods
A national online survey of Swiss neurologists was conducted, comprising 11 questions on visual pathway diagnostics, access to and knowledge of OCT, and its clinical use.
Results
Thirty-four neurologists from all major Swiss regions responded (53% hospital-based, 47% private practice). All assessed the visual pathway in cases of first demyelinating event and optic neuritis, primarily using MRI (88.2% and 91.2%, respectively), often in combination with VEP. OCT was used by 32% (first demyelinating event) and 44% (optic neuritis). Only 26.5% had institutional access to OCT, all MS specialists (100%), mainly hospital-based (66.7%). OCT was infrequently used for monitoring (20.6%) or treatment decisions (8.8%).
Conclusions
Despite increasing the sensitivity of diagnostic criteria for MS, OCT is currently rarely utilized in MS care in Switzerland, with limited access outside specialized centers. While awareness, education and guidelines for reliability and comparison across centers are essential, current research should also focus on the additional value of OCT for monitoring the course of MS and treatment responses.

**P045**

## Inflammation-Triggered Extracellular Matrix Remodelling Drives Infiltration, Neuronal Precursor Cell Persistence and Epileptogenicity in Ganglioglioma

JA Menstell [1], L Hoffmann [2], I Blümcke [2], O Schnell [3], D Delev [3], DH Heiland [3], R Sankowski [4], J Beck [5] and K Jan [3]

[1] Department of Neurosurgery, Kantonsspital Graubünden, Chur, Switzerland
[2] Department of Neuropathology, University Hospital Erlangen, Erlangen, Germany
[3] Department of Neurosurgery, University Hospital Erlangen, Erlangen, Germany
[4] Department of Neuropathology, University Hospital Freiburg, Freiburg, Germany
[5] Department of Neurosurgery, University Hospital Freiburg, Freiburg, Germany

Lntroduction
Gangliogliomas (GGs) are rare, mixed glio–neuronal tumors linked to pharmacoresistant focal epilepsy. Although surgical resection often improves seizure control, the mechanisms underlying GG pathogenesis and epileptogenicity are uncertain. The role of the neuronal component, whether preexisting or neoplastically transformed, remains controversial and poses challenges for neuropathological diagnosis and understanding of the epileptogenic phenotype.
Objective
This study used spatial transcriptomics to examine neuronal markers and differentially regulated signaling pathways in GGs.

Methods

Spatial transcriptomic data from 10XGenomics of eight histopathologically confirmed GG samples were analyzed using SPATA2. Cell type deconvolution (cell2Iocation) and Weighted Gene Correlation Network Analysis (WGCNA) characterized the tumor microenvironment.

Results

The transcriptional landscape in GGs demonstrated was heterogeneous, matching the variable histomorphologic phenotype. Three main transcriptional patterns were identified: (i) immature neuronal niches enriched in progenitor-like genes (NRP2, HOPX); (ii) extracellular matrix (ECM) remodeling impacting neuronal development, tumor morphology, and homeostasis; and (iii) distinct cellular niches. WGCNA identified eight transcriptional groups covering astrogliosis (GFAP, S100A1), glial homeostasis (ALDH1L1, SLC1A2, KCNJ10) and oligodendroglial response (MBP, PLP1). lnterestingly, immature neurons (HOPX, GRIA 1) associated with ECM remodeling and immune infiltration, represented by microglia/macrophages (CD63, FGF12, S100A10) and neuroinflammatory response (CX3CL 1, CD44, MAPK10), suggest a tight interaction between immune and tumor cells. Activation of synaptic signaling (SNAP25, SYP) and plasticity (ENC1, CHGA, CHGB) in neuron-rich groups pointed towards dysfunctional network remodeling.

Conclusions

Mapping transcriptional patterns in GGs reveals a progenitor-like neuronal population impacted by immune cell infiltration. Our results further suggest that the inflammatory response triggers ECM and malfunctional neuronal network remodeling, thereby contributing to increased epileptogenicity in Ganglioglioma.

**P046**

**Chronic Subdural Hematoma Recurrence: A Machine Learning based Risk Factor Analysis**

A Rasadurai [1], T Stoessel [1], R Guzman [1], DJ Stekhoven [2] and J Soleman [1]

[1] University and University Hospital of Basel, Basel, Switzerland
[2] ETH Zurich and Swiss Institute of Bioinformatics, Zürich, Switzerland

Aims

Chronic Subdural Hematoma (cSDH) is a common neurosurgical condition, particularly in the elderly population. The surgical treatment via burr hole drainage poses a risk for recurrence. Recently, new adjunct treatments have been presented, potentially reducing the risk of recurrence (e.g., steroids, statins, MMA embolisation). However, the optimal patient subgroup prone to higher recurrence rates eligible for these treatments remains unclear. This study aims to identify potential risk factors for recurrence by using parametric and non-parametric models to improve the management of cSDH patients.

Methods

Consecutive patients undergoing burr hole drainage for cSDH from 2012 to 2023 at our tertiary university hospital were included. Baseline, clinical, radiographic, laboratory, and follow-up data were recorded. The primary outcome measurement was recurrent cSDH in need of surgical evacuation. Missing values were imputed using missForest. Multivariate logistic regression (parametric) and random forest (non-parametric) strategies were used to identify potential risk factors for the primary outcome.

Results

We included 766 consecutive patients (29% female) with a median age of 76 years at surgery (IQR: 71–84) and a recurrence rate of 11%. The multivariate analysis showed absence of the diagnosis hypertension, larger preoperative hematoma volume and subacute hematoma age as risk factors. Some of these were also supported by the random forest model including additional potential risk factors such as lower thrombocyte count, higher BMI, and older age at operation.

Conclusions
The potential identification of novel risk factors for cSDH recurrence can be improved using non-parametric machine learning methods in addition to multivariate logistic regression. Personalised cSDH treatment strategies and post-operative monitoring can potentially be optimized based on our findings. Further external validation in prospective datasets is needed to confirm our findings.

**P047**

**Natural History of Tectal Gliomas with "Low-Grade Appearance" on Imaging**

D Nasiri [1], L Imwinkelried [1], P Becker [2], A Raabe [1], P Schucht [1], F Wagner [2] and L Häni [1]

[1] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurochirurgie, Bern, Switzerland
[2] Inselspital—Universitätsspital Bern—Universitätsinstitut für Diagnostische und Interventionelle Neuroradiologie, Bern, Switzerland

Aims
While often considered indolent lesions, recent studies have raised concerns reporting radiological or clinical progression in a relevant proportion of tectal gliomas. Therefore, our aim was to characterize the natural history of sporadic tectal gliomas with "low-grade appearance" on imaging based on volumetric data from high resolution MRI scans.
MethodsWe included patients with a radiological diagnosis of a tectal glioma with "low-grade appearance" between 01/2010 and 23/2023 with thin-sliced MRI scans available. We excluded tumors with unambiguous nodular enhancement, cystic lesions or extensive diencephalic or pontine involvement. Tumors were volumetrically analyzed using the first and last available thin-sliced MRI scan. The primary endpoint was tumor growth as a binary variable, assessed via a two-step method: (1) a $\geq$51.59% volume increase, representing the 90th percentile of our intrarater measurement variation; (2) confirmation through visual inspection and repeated measurement. The secondary endpoint was the relative annual growth rate (RGR).
Results
Twenty patients were included (60% male; median age 22.47 years, IQR 18.7–39.6 years). Headache was the most common symptom (60%), with 20% developing new neurological symptoms during FU. Endoscopic third ventriculostomy was the primary treatment in 60% of cases, followed by ventriculoperitoneal shunt. Median follow-up was 6.28 years (IQR 2.20–9.78 years). Median relative volumetric change from the first to the last imaging follow-up was +3.25% (IQR −10.53–+28.47%). Only one patient (5%) fulfilled our criteria for tumor growth. However, the increase in volume was marginal with a RGR of 7%/year over 12.8 years of follow-up. Overall, the median RGR in our cohort was +0.87%/year (IQR −1.28–+11.05%/year). No malignant transformation occurred in our cohort.
Conclusions
We confirm that tectal gliomas presenting with a "low-grade appearance" on imaging are an indolent disease with very slow, if any tumor growth at all. Neither biopsy nor active tumor-directed treatment should be pursued in the absence of worrisome imaging features.

**P048**

**Comprehensive Tumor-Immune Surface Marker Atlas Reveals IDH-Dependent Signatures in High-Grade Gliomas and Identifies Novel Immunotherapy Targets**

JC Kienzler [1], N Nunez [2], F Westermann [3], V Dobernig [3], M Weller [4], M Greter [3], S Tugues [3], M Neidert [5], G Hutter [6] and B Becher [3]

[1] University of Zurich, Zürich, Switzerland; University Hospital Lausanne (CHUV), Lausanne, Switzerland

[2] Facultad de Ciencias Químicas, Departamento de Bioquímica Clínica, Universidad Nacional de Córdoba y Centro de Investigaciones en Bioquímica Clínica e Inmunología, Córdoba, Argentina
[3] Institute of Experimental Immunology, University of Zurich, Zürich, Switzerland
[4] Department of Neurology, University Hospital Zurich, Zürich, Switzerland
[5] Hoch Health Ostschweiz Kantonsspital St. Gallen, St. Gallen, Switzerland
[6] University Hospital Basel, Basel, Switzerland

Glioblastoma remains fatal despite aggressive treatment, with immunosuppressive tumor-associated macrophages creating formidable barriers to effective therapy. While IDH-mutant and IDH-wildtype tumors exhibit distinct immune landscapes, comprehensive surface marker profiling of tumor and immune cells to identify precision immunotherapy targets has been lacking.
To establish a comprehensive surface marker atlas of tumor and immune cells distinguishing IDH-mutant from IDH-wildtype glioblastomas and identify novel therapeutic targets for precision immunotherapy.
The initial surface marker screening utilized LEGENDScreen™ technology across 371 markers with 4 patient-derived tumor cell lines. Based on this, we performed high-dimensional spectral flow cytometry analysis using two 40-marker panels on 46 high-grade glioma specimens. UMAP clustering with differential abundance testing identified distinct cellular populations. CITE sequencing validated surface markers on tumor cells and immune cells and characterized the subsets in-depth. Tumor cell subset depletion in tumor explants assessed survival impact.
IDH-wildtype glioblastomas demonstrated an immunosuppressive signature with elevated cycling monocyte-derived macrophages expressing CD39, CD112, CD31, CD276, and PDL1, as well as increased GM-CSF receptor expression. Tumor cells exhibited unique profiles including GPR56, CD271, CD71, CD112, CD323, and CD146. Functional validation through depletion and assessment of impact on survival in tumor explants identified highly malignant tumor cell subsets. Patients with elevated CD169 + CD163 + CD206 + MERTK+ perivascular macrophages experienced worse survival, while lower GM-CSF receptor expression correlated with prolonged survival. Preclinical GM-CSF knockout in glioblastoma models confirmed significantly improved survival outcomes. Transcriptomic analysis validated our findings of immunosuppressive perivascular macrophages expressing EREG, APOBEC3A, and S100A8/9, while mature inhibitory macrophages showed high APOE, APOC1, and C1QA expression.
This comprehensive atlas establishes distinct, targetable surface marker signatures differentiating IDH-mutant from IDH-wildtype glioblastomas. The identification of survival relevant tumor cell subsets, validated through functional studies and preclinical models, provides a rational foundation for precision combination immunotherapies, potentially transforming outcomes for patients with this devastating disease.

**P049**

## Development of the CLIPS Grading System to Predict Invasion of Cavernous Sinus Compartments in Pituitary Adenomas

F Constanzo [1], J Rychen [2], JH Decker [1], N Fischbein [1], JC Fernandez-Miranda [1]

[1] Stanford University, Stanford, USA
[2] Universitätsspital Basel, Basel, Switzerland

Aim
Preoperative assessment of cavernous sinus (CS) invasion is of paramount importance in the surgical planning of pituitary adenomas. The most widely used classification—the

Knosp grading system—has several limitations, such as its evaluation of only superior and inferior compartments, and common discrepancy in the positioning of the lines, leading to widely variable incidences of true CS invasion and low interobserver agreement. Therefore, we set out to develop a new MR-based classification with intraoperative validation to address these shortcomings.

Methods

The CLIPS classification was developed based on the evaluation of clinoidal space and each CS compartment (Lateral, Inferior, Posterior, Superior). For each compartment, a single line bisecting the carotid artery, following anatomical planes, was used to grade the lateral extension of the adenoma. Tumors medial to these lines were graded as 0, and those lateral to it were graded as 1. The classification was used to evaluate 255 patients (510 CS) that underwent endoscopic endonasal approach (EEA), either with transcavernous extension (TC-EEA group = 139 CS) or without it (EEA group = 371 CS). Invasion of each compartment was validated by intraoperative assessment in the TC-EEA group, and by postoperative MRI in the EEA group. Results were compared with the Knosp classification, stratified by the presence of apoplexy, hormonal status, and previous surgery, and then, inter-observer agreement (IOA) was calculated.

Result

Cavernous sinus compartment invasion was present in 37% of patients. CLIPS classification yielded an overall sensitivity of 90.8% (95% CI 86.6–94%), specificity of 98.4% (95% CI 97.8–98.9%), PPV of 86.5% (95% CI 82.3–89.8%), NPV of 99% (95% CI 98.5–99.3%), and accuracy of 97.6% (95% CI 96.9–98.2%), with comparable results in all compartments. Previous surgery increased the rate of invasion for CLIPS grade 0 in the superior and posterior compartments, as well as in Knosp grade 2 cases. IOA was almost perfect for superior and inferior compartments; and substantial for lateral, posterior, and clinoidal space. Knosp classification only achieved moderate agreement.

Conclusions

The CLIPS classification provides a reliable and accurate tool to evaluate CS compartment invasion by pituitary adenoma, outperforming and complementing the Knosp classification.

**P050**

## Infection Following Cranioplasty Implantation: Insights from Clinical Multicenter Practice

I Zaed [1], FC Mannella [2], A Cardia [1] and F Servadei [3]

[1] Department of Neurosurgery, Neurocenter of Southern Switzerland, Regional Hospital Lugano (EOC), Lugano, Switzerland
[2] University of Milan, Milan, Italy
[3] Humanitas University, Milan, Italy

Objective

To evaluate clinical management strategies and outcomes of postoperative infections following cranioplasty with custom-made porous hydroxyapatite (PHA) implants, based on a large multicenter European cohort.

Methods

This retrospective non-interventional study analyzed data from 984 patients who underwent cranioplasty using custom-made PHA implants. Data were collected as part of a post-market clinical follow-up initiative across multiple European neurosurgical centers. Records were reviewed to identify demographics, primary diagnoses, implant characteristics, postoperative complications, infection profiles, microbiological findings, treatment strategies, and outcomes. Descriptive statistics and chi-square tests were used to assess associations between clinical variables and infection risk or explantation rates.

Results

Of the 984 patients, 76 (7.7%) developed infections. Infection risk was significantly associated with second-line treatments ($p = 0.011$) and implant location ($p = 0.037$), but not with age, gender, or primary diagnosis. Most infections were superficial (92.1%) and early-onset ($\leq$2 months post-cranioplasty, 61.9%), with Staphylococcus spp. being the predominant pathogens. Explantation was required in 77.6% of infected cases, with deep infections and early-onset infections showing higher removal rates. Conservative management with systemic antibiotics alone was attempted in 18 patients, with successful implant retention in 88.9% of cases—particularly when broad-spectrum antibiotics were administered for a prolonged period. Surgical revision strategies included implant replacement with different materials (40.8%), backup PHA implants (21%), or newly manufactured PHA devices (5.3%). The type of infection treatment, surgical cleaning, and the use of in situ antibiotics alone were significantly associated with explantation rates (all $p < 0.001$). Notably, no explants occurred among patients who received both in situ and adequately prolonged systemic antibiotic therapy. No significant association was found between pathogen type and explantation risk.

Conclusions

Postoperative infection after PHA cranioplasty remains a clinically relevant complication, with treatment line and implant location being key risk factors. While explantation is often necessary, our findings suggest that conservative management with prolonged systemic antibiotics—especially in superficial infections—can lead to successful outcomes in selected cases.

**P051**

## Feasibility Study for In-Vivo Tissue Classification During Neurosurgery Using Wide-field Imaging MUELLER Polarimetry

O Rodriguez-Nunez [1], É Gros [2], T Lucas [3], C Hahne [4], S Chae [3], D Hasler [1], T Maragkou [2], R Mckinley [4], T Novikova [3] and P Schucht [1]

[1] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurochirurgie, Bern, Switzerland
[2] Institute of Pathology, University of Bern, Bern, Switzerland
[3] LPICM, CNRS, Ecole polytechnique, IP Paris, Paris, France
[4] Support Center for Advanced Neuroimaging (SCAN), University Institute for Diagnostic and Interventional Neuroradiology, Inselspital Bern, Bern, Switzerland

Aims

Accurate intraoperative differentiation between neoplastic and healthy brain tissue is crucial to maximize glioma resection while preserving neurological function, especially near eloquent areas where wide safety margins are not feasible. This study investigates the feasibility of using wide-field Imaging Mueller Polarimetry (IMP) as a non-contact, real-time method for in vivo tissue classification during neurosurgery. In previous ex vivo studies, we demonstrated the sensitivity of IMP to the optical anisotropy of healthy brain white matter (WM) and used it for brain tissue differentiation. Here, our objective is to evaluate the feasibility of using IMP to visualize WM fiber tracts intraoperatively.

Methods

We implemented an IMP system in a reflection configuration to image WM fiber tracts using maps of depolarization, scalar retardance, and azimuth of optical axis as polarimetric markers. The instrument includes an incoherent light source, a polarization state generator, and a detection arm with autofocus, a polarization state analyzer and image sensor. The IMP optical head is mounted on a mechanical arm, integrated into a portable, ergonomic, and mobile unit suitable for operating room use. Sequential intensity images were acquired from the targeted brain regions. $4 \times 4$ Mueller matrix (MM) images were reconstructed using the eigenvalue calibration method. Polarimetric marker maps were ob-

tained by applying the Lu-Chipman decomposition. Machine learning algorithms, trained and validated on histologically annotated polarimetric images of ex vivo brain samples, were applied for segmentation of in vivo brain tissue (tumor vs. healthy) based on these polarimetric markers.
Results
Under surgical conditions, our analysis revealed decreased depolarization values in both gray and white matter regions of neoplastic brain tissue compared to healthy tissue. Linear retardance reduction was observed only in the WM of neoplastic tissue. These findings were corroborated by the segmentation results. Additionally, WM fiber tract orientation was visualized using optical axis azimuth maps.
Conclusions
The integration of a wide-field polarimetric imaging system, with dedicated image processing enabled intraoperative brain tissue assessment. WM fiber tracts were clearly identified using polarimetric markers. These results underscore the potential of IMP to assess fiber orientation, tissue architecture, and lesion extent, advancing intraoperative tissue classification.

**P052**

**Minimally Invasive Tailored Endoscopic Transnasal Approach for Pituitary Adenoma Surgery: Single-Center Interdisciplinary Experience**

A Eldesouky [1], A Consuegra [1], H Briner [2] and R Reisch [1]

[1] Zentrum für endoskopische und minimal-invasive Neurochirurgie, Klinik Hirslanden, Zürich, Switzerland
[2] Zentrum für Otorhinolaryngologie, Hals- und Gesichtschirurgie, Klinik Hirslanden, Zürich, Switzerland

Aims
To evaluate the surgical outcomes and complication rates of a minimally invasive, tailored endoscopic transnasal approach for pituitary adenoma surgery, performed in close interdisciplinary collaboration with ENT surgeons. Our strategy emphasizes maximal preservation of nasal structures through a flexible corridor adapted to each patient's anatomy.
Methods
We conducted a retrospective single-center study of patients undergoing endoscopic transnasal pituitary adenoma resection between 2019 and 2024. The primary workhorse approach consisted of a mononostril transethmoidal transsphenoidal technique. No turbinate resection was performed. In selected cases, a direct paraseptal approach was used. All procedures were performed in a consistent interdisciplinary setting with both ENT and neurosurgical surgeons present. Data were collected on patient demographics, tumor characteristics, extent of resection, endocrine outcomes, and postoperative complications.
Results
A total of 61 patients were included, with a mean age of 55.3 years. The cohort comprised 31 male and 30 female patients. The series included 44 non-functioning adenomas and 17 functioning adenomas, the latter consisting of 8 lactotrophic, 1 somatotrophic, 3 corticotrophic, and 5 plurihormonal tumors. Gross total resection was achieved in 46 patients, corresponding to a rate of 75%. Postoperative complications included cerebrospinal fluid leak in 6 patients (9.8%), transient or permanent diabetes insipidus in 2 patients (3.3%), meningitis in 2 patients (3.3%), and syndrome of inappropriate antidiuretic hormone secretion in 6 patients (9.8%).
Conclusions
Our minimally invasive tailored endoscopic transnasal strategy for pituitary adenoma surgery, performed in a consistent interdisciplinary workflow with ENT surgeons, provides

a flexible surgical corridor with maximal preservation of nasal structures. The approach achieves a high rate of gross total resection and acceptable complication rates, in line with published literature. These results support its role as a modern standard for pituitary surgery. Further prospective evaluation is ongoing.

**P053**

**Full-Endoscopic Resection of an Intradural Bone Spur Causing CSF Leak**

A Simonin and J Fournier

Hôpital du Valais—Centre Hospitalier du Valais Romand (CHVR), Sion, Switzerland

Introduction
The main cause of spinal cerebrospinal fluid (CSF) leak is a 2–3 mm bone spur, located anteriorly of the spinal cord. It is often located at the upper thoracic region. Thus, it may be difficult to access safely from posterior approaches.
Methods
We present a case of a 45-year-old female patient, presenting with severe paraparesis. Imaging studies showed a thoracic spine extra-arachnoid CSF collection, with compression of the spinal cord. Myelography revealed a CSF fistula located at the T2-3 level, with a suspected bone spur causing a tear. Due to neurological impairement, surgical management was offered.
Results
A full-endoscopic transforaminal (T2-3 foramen) resection of the intradural bone spur was performed, using navigation and neuromonitoring. Postoperative evolution was unremarkable, with re-expansion of the spinal cord visible on post-operative MRI.
Conclusions
Full-endoscopic transforaminal resection of an intradural thoracic bone spur causing CSF leak is feasible, safe and effective.

**P054**

**Lumbar Pedicle Screws Versus Cortical Bone Trajectory: A Systematic Review of Long-Term Outcomes**

A Moniakis, S Olei, A Cardia, I Cabrilo and D Milani

Neurosurgery Department, Neurocenter of Southern Switzerland, Ente Ospedaliero Cantonale, Lugano, Switzerland

Aims
To compare the long-term clinical and radiological outcomes of traditional lumbar pedicle screw fixation versus cortical bone trajectory (CBT) screw placement, based on a structured review of the current literature.
Methods
A literature search was performed using PubMed to identify clinical studies comparing lumbar pedicle screw (PS) and cortical bone trajectory (CBT) fixation techniques, with a focus on long-term outcomes ($\geq$12 months). A total of 26 studies published between 2011 and 2025 were included. Data were extracted on fusion rates, screw loosening, adjacent segment disease (ASD), reoperation rates, and patient-reported outcomes (ODI, VAS). Studies included both degenerative and spondylolisthesis populations, with techniques ranging from open to minimally invasive approaches.
Results
CBT demonstrated comparable fusion rates to traditional PS in most long-term studies, with some reporting lower rates of screw loosening due to its bicortical engagement and medial-to-lateral trajectory. CBT was associated with less paraspinal muscle dissection, potentially

reducing postoperative pain and enhancing early recovery. However, its biomechanical strength in multilevel constructs remains debated. Adjacent segment disease rates were similar across both groups, though some studies suggested a trend toward lower ASD with CBT due to the more medial screw entry point. Reoperation and hardware failure rates did not differ significantly. Patient-reported outcomes (ODI, VAS) improved similarly in both techniques over long-term follow-up.
Conclusions
CBT is a viable alternative to traditional pedicle screw fixation, offering comparable long-term outcomes in terms of fusion rates, complication profiles, and patient satisfaction. Its muscle-sparing nature and potential for reduced invasiveness make it particularly attractive in selected patients. Further high-quality, prospective studies are needed to validate its use in multilevel pathology and to refine patient selection criteria.

**P055**

**Cottonoid-Guided "Live Navigation" During Brain Surgery: A Simple and Effective Intraoperative Orientation Technique**

A Moniakis, A Giardina, A Cardia and D Milani

Neurosurgery Department, Neurocenter of Southern Switzerland, Ente Ospedaliero Cantonale, Lugano, Switzerland

Aims
To introduce and describe a low-cost intraoperative technique that uses cottonoids as real-time anatomical markers to enhance orientation and safety during brain surgery.
Methods
The technique involves placing a cottonoid—one of the simplest and most widely used tools in neurosurgery—directly on the target area within the operative field. Next, the ultrasound probe is introduced, and the cottonoid is gently removed while real-time ultrasound imaging captures its movement. This sequence allows the surgeon to accurately gauge the depth and spatial relationship between the cottonoid and the lesion of interest. The cottonoid is easily distinguishable from both normal brain tissue and pathological structures, and its removal produces a recognizable motion on the ultrasound screen. This transforms the cottonoid into a reliable "live navigation" tool, providing continuous feedback on anatomical positioning during surgery.
Results
Repeated use of this technique throughout the procedure offers constant spatial orientation. The cottonoid acts as a dynamic intraoperative landmark, enabling progressive and safe resection of the lesion. It enhances anatomical awareness of lesion margins and nearby critical structures, and can be applied independently or in conjunction with standard neuronavigation systems. The necessary equipment is inexpensive and widely available, and the learning curve for intraoperative ultrasound is modest, making this method easily reproducible in most neurosurgical settings.
Conclusions
Cottonoid-guided "live navigation" is a practical, low-cost technique that enhances intraoperative orientation in brain surgery. Its simplicity, reliability, and adaptability make it a valuable adjunct to existing navigational tools, especially in resource-limited environments.

**P056**

**Public Perception of Robot-Assisted Spine Surgery**

A Moniakis [1], L Fumagalli [1], A Pagnamenta [2], A Cardia [1] and I Cabrilo [1]

[1] Neurosurgery Department, Neurocenter of Southern Switzerland, Ente Ospedaliero Cantonale, Lugano, Switzerland

[2] Faculty of Biomedical Sciences, Università della Svizzera Italiana, Lugano, Switzerland; Faculty of Health Sciences and Medicine, University of Lucerne, Luzern, Switzerland

Aims
The potential advantages of robot assistance during spinal procedures are a "hot topic" currently. However, patient perception of the use of robots during spinal operations has not yet been explored. This study aims to investigate the general public's perceptions, expectations, and concerns regarding robot-assisted spine surgery.
Methods
In 2024, a questionnaire was distributed to attendees during an Open Day at the Neurocenter of Southern Switzerland, where the Globus ExcelsiusGPS™ spine surgery robot was demonstrated live on a mannequin. The 15-item questionnaire, divided into six sections, assessed demographic data, prior knowledge of medical robots, mental representation of surgical robots, expectations, emotions, and feedback after witnessing the demonstration. The data were analyzed using descriptive statistics, chi-square, Wilcoxon, McNemar, and logistic regression tests.
Results
A total of 110 questionnaires were collected, with a majority of participants being female (64.4%) and having no direct experience with spinal pathology (79.8%). Most respondents (87.2%) were aware of robotic surgery, and 65.1% specifically knew about its use in spine surgery. After observing the live demonstration, 81.9% of participants felt reassured by the robot's presence in surgery, compared to 61.3% before the demonstration ($p = 0.007$). The preference for robot-assisted surgery increased from 50.5% to 64.5% ($p < 0.001$). Notably, individuals with back-related issues showed greater confidence in the robot's capabilities ($p = 0.032$).
Conclusions
The general public holds a positive perception of robotic spine surgery, viewing the technology as faster, more precise, and capable of performing tasks that humans may not be able to. The study highlights the importance of live demonstrations in enhancing trust and acceptance of robotic systems, suggesting that public exposure to such technologies could further increase their adoption. These findings also have economic implications, as patients may prefer hospitals that offer robotic-assisted surgery.

**P057**

**Microsurgical Approaches to the Retroinfundibular Region: Comparative Anatomical Analysis of the Pretemporal Versus Posterior Petrosal Routes**

A Mellal [1], A Dembreville [1], A Vandenbulcke [1], S Schranz [2], H Cadas [2], S Sabatasso [2], D Starnoni [1], M Messerer [1], RT Daniel [1] and L Giammattei [1]

[1] Department of Neurosurgery, Lausanne University Hospital, Lausanne, Switzerland
[2] Unité Facultaire d'Anatomie et de Morphologie (UFAM), University Center of Legal Medicine Lausanne-Geneva (CURML), Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland

Aims
The endoscopic endonasal approach is widely regarded as the gold standard for most retroinfundibular lesions, offering direct midline access without brain retraction. However, when a nasoseptal flap is unavailable or in previously irradiated or operated patients, transcranial approaches may provide better exposure and control. In such cases, the pretemporal and posterior petrosal approaches are the two main alternatives. To date, no study has directly compared the surgical exposure offered by these two transcranial routes in relation to lesion volume. This study aims to quantitatively evaluate and compare the

exposure provided by the pretemporal and posterior petrosal approaches, focusing on how exposure varies with increasing tumor size.

Methods

Ten sides from five formalin-fixed, latex-injected cadaveric specimens were dissected by an experienced skull base neurosurgeon. Each side was approached using both surgical routes. Retroinfundibular lesions were simulated with Foley balloon catheters inserted endoscopically and inflated to 5, 10, 15, and 20 mL. Correct positioning was confirmed by contrast-enhanced CT. Surgical exposure was measured via stereotactic navigation, and areas of exposure were calculated using Heron's formula.

Results

The pretemporal approach offered a wider surgical field overall (mean: 7.70 $cm^2$) than the posterior petrosal approach (mean: 4.13 $cm^2$). However, for larger lesion volumes, the posterior petrosal route provided greater direct exposure. At 20 mL, tumor exposure averaged 1.38 $cm^2$ via the posterior petrosal approach, compared to 0.92 $cm^2$ via the pretemporal route. While the exposure with the pretemporal approach plateaued beyond 15 mL, the posterior petrosal approach maintained or improved access, particularly through the infra- and supra-oculomotor corridors. Additionally, fewer perforating arteries were encountered using the posterior route.

Conclusions

Although the pretemporal approach offers a broader operative field overall, the posterior petrosal approach proves more effective for large retroinfundibular lesions. It not only provides progressively greater tumor exposure with increasing lesion volume but also offers significantly improved access to the inferior surface of the optic chiasm, a key area often hidden from anterior trajectories. Furthermore, the posterior route is associated with fewer interposed perforating arteries, potentially reducing the risk of neurovascular injury.

**P058**

## Profiling the Peripheral Immune Response Following Neurosurgical Resection of Glioblastoma

A Patterson [1], A Zeitlberger [1], L Wiebe [1], N Pikor [1], O Bozinov [1], M Weller [2], B Ludewig [1] and M Neidert [1]

[1] Cantonal Hospital St Gallen, St. Gallen, Switzerland
[2] University Hospital Zurich, Zürich, Switzerland

This project will address the potential release of tumor antigens into the periphery during neurosurgical resection of glioblastoma by examining if there is an increase in the number of antigen-specific T cells following surgery.

Patients are consented and enrolled in the study before surgery and peripheral blood mononuclear cells (PBMC) are isolated before surgery and again 2, 4, and 12 weeks following surgery. An autologous tissue lysate is created from bulk tumor tissue as the source of antigens for later T cell stimulation. A pre-stimulation co-incubation of tumor lysate and autologous PBMC is carried out for 10 days, with a survival dose of IL-2 every 48 h. After pre-stimulation, PBMC are re-stimulated for 12 h using tumor lysate as well as positive and negative controls. The activation expression profiles of PBMC are examined via flow cytometry using a 30-marker-panel.

Preliminary data using longitudinal blood sampling shows that autologous tumor lysate elicits activation of CD3+ cells based on a panel of classical T cell activation markers, especially 2–4 weeks after surgery. Activated T cells are FACS-sorted and their T cell receptor repertoire and gene expression is assessed on the single-cell level. In addition, tumor-reactivity is shown using autologous patient-derived organoids in T cell killing assays.

This study provides evidence for an increase in activated T cells following neurosurgical resection of glioblastoma, potentially via antigen release during surgery. It not only helps to improve our understanding of the dynamics of T cell activation after glioblastoma surgery for informed timing of blood draws for cellular therapies but also suggests a strategy for selecting and expanding antigen-specific T cells from the periphery for later adoptive transfer.

**P059**

**Prognostic Trends for Adults with Glioblastoma from 2011–2022: A Monocentric Retrospective Analysis**

A Firtinidou [1], A Alfieri [2] and M Halatsch [2]

[1] H-OCH Kantonsspital St. Gallen, St. Gallen, Switzerland
[2] Winterthur Cantonal Hospital, Winterthur, Switzerland

Aims
Glioblastoma is the most aggressive intrinsic brain tumor in adults and, despite numerous innovations and therapeutic developments, remains an incurable disease, with a median overall survival (OS) of 14–16 months (1). Survival seems to be longer in younger patients, with more complete resection and further postoperative treatment (1, 2). This study aimed to evaluate prognostic trends in adult glioblastoma patients over a 12-year period to identify factors influencing outcomes.
Methods
We conducted a monocentric, retrospective analysis of 169 patients with histologically confirmed glioblastoma who were treated at the Cantonal Hospital of Winterthur, Switzerland, between 2011 and 2022. Data on demographics, treatment modalities and molecular markers were collected. Overall survival and progression-free survival (PFS) were analyzed using Kaplan-Meier curves and log rank tests.
Results
No significant differences in OS or PFS were observed between the 2011–2015 and 2016–2022 cohorts (mean OS: 18 months; mean PFS: 7.48 months; $p > 0.05$). However, age $\geq 65$ years was associated with worse OS ($p < 0.001$) and PFS ($p < 0.001$), while complete resection of contrast-enhancing tumor (CRET) significantly improved both OS ($p = 0.003$) and PFS ($p < 0.001$). MGMT promoter hypermethylation was associated with improved PFS ($p < 0.001$) but did not significantly impact OS ($p > 0.05$) in this series.
Conclusions
Despite advancements in surgical and medical therapies, this study demonstrates that only modest improvements have been made in OS and PFS of glioblastoma patients over the past decade. In our cohort, as described in the literature, younger patients with CRET tend to have better outcomes, underscoring the importance of patient-specific factors and surgical diligence in managing glioblastoma (1, 2, 3). In our retrospective cohort, MGMT promoter hypermethylation significantly impacted PFS but not OS, confirming the discrepancy between OS and PFS as prognostic tools (3). These findings highlight the need for continued research into novel treatment strategies to address the persistent challenges in glioblastoma management.

**P060**

**Prolonged Occurrence of Delayed Cerebral Ischemia in aneurysmal Subarachnoid Hemorrhage**

C Kissling, T Petutschnigg and W Z'Graggen

Insel Gruppe, Bern, Switzerland

Background
Delayed cerebral ischemia (DCI) is a critical outcome determinant after aneurysmal subarachnoid hemorrhage (aSAH). While DCI typically occurs between 3 and 14 days after the initial aSAH, it occasionally presents beyond this period. This study aimed to identify clinical and radiological risk factors associated with the occurrence, duration and severity of DCI.
Methods
We conducted a monocentric, retrospective cohort study at our tertiary neurointensive care unit, including aSAH patients requiring interventional rescue therapy for DCI between 2014 and 2024. Clinical characteristics, radiological findings, and outcome parameters were analyzed in relation to DCI occurrence.
Results
Of 149 included patients, 26 (17%) required interventional rescue therapy for DCI later than 14 days after initial aSAH. These patients underwent more chemical interventional rescue therapies (4 vs. 2, $p < 0.05$) over a longer duration (8.5 vs. 2 days, $p < 0.05$) and had longer hospital stays (28.5 vs. 22 days, $p < 0.05$) compared to those with non-prolonged DCI. Younger age was identified as a significant risk factor for prolonged DCI (OR 0.92, $p = 0.02$). Long-term functional outcome, assessed as modified Ranking Scale (mRS) grades, showed 99 (67%) patients with good outcome (mRS 0–2) and 43 (29%) with poor outcome (mRS 3–6). There was no significant difference in outcome between those with and without prolonged DCI ($p = 0.62$).
Conclusions
Younger age is significantly associated with the occurrence of DCI beyond 14 days after initial aSAH. Patients with prolonged DCI did not have worse long-term functional outcomes despite requiring more interventional rescue therapies. We recommend extended neurointensive care monitoring particularly for younger aSAH patients.

**P061**

## Unraveling the Cause of Microspurs in Spontaneous Intracranial Hypotension Type I: Osteogenic Origin or Calcified Hofmann's Ligament?

D Nasiri [1], T Maragkou [2], B Dislich [2], L Häni [1], J Goldberg [1], EI Piechowiak [3], T Dobrocky [4], J Beck [5], A Raabe [1] and RT Schär [1]

[1] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurochirurgie, Bern, Switzerland
[2] Inselspital—Universitätsspital Bern, Bern, Switzerland
[3] Inselspital, Bern, Switzerland
[4] Inselspital—Universitätsspital Bern—Universitätsinstitut für Diagnostische und Interventionelle Neuroradiologie, Bern, Switzerland
[5] Universitätsklinikum Freiburg im Breisgau, Freiburg, Germany

Aims
Spontaneous intracranial hypotension with a ventral CSF leak (type I) is thought to be caused by osteophytes or discogenic microspurs. Recently, this hypothesis was questioned claiming the Hofmann's ligament, a fibrous connective tissue between the dura and posterior longitudinal ligament (PLL), to be the cause of a spinal dural tear.
Methods
Patients with ventral CSF leaks treated at our institution in whom histopathological reports on microspurs were available were included. All histological analyses were repeated and tissues classified into either a fibrotic (Hofmann's ligament) or discogenic group. Correlation analysis of microspur localization in the spine and their origin was conducted. Microspur length and Hounsfield units on CT were compared between both groups.
Results

27 patients (19 women, 8 men) with a median age of 57 years (IQR 46–64 years) were analyzed. We identified 9 microspurs originating from fibrous tissues (Hofmann's ligament) and 13 microspurs of discogenic origin, while 5 microspurs could not be classified into either group. 9 microspurs were found at the cervicothoracic or thoracolumbar junction, while 18 microspurs were located within the mid-thoracic spine. Location of microspurs did not correlate with the histological origin of the microspur ($p = 0.29$).
The length of a microspur ($p = 0.29$) as well as its density measured in Hounsfield units ($p = 0.90$) did not show a statistical significant difference between the fibrous and discogenic group.
Conclusions
Our findings confirm that microspurs in patients with ventral CSF leaks originate from both the intervertebral disc and fibrous epidural ligament suggestive of Hofmann's ligament.

**P062**

**Evaluation of a Single-Use Neuronavigation Device for External Ventricular Drain Placement: A 3D-Print and Cadaveric Proof-of-Concept Study**

D de Wilde [1], A Saemann [1], R Ramseyer [2], J Stifter [2] and R Guzman [1]

[1] University Hospital Basel, Basel, Switzerland
[2] Medivation AG, Baden, Switzerland

Aims
External ventricular drain (EVD) placement is a common procedure in neurosurgery, yet misplacement rates reach 38%, risking complications1. Stereotactic and ultrasound guidance improve accuracy, but more straightforward solutions are needed. Our single-use optical tracking navigation (OTN) system provides real-time EVD guidance with minimal equipment. This proof-of-concept study evaluates its accuracy and usability using 3D-printed and cadaveric models.
Methods
The single-use OTN device includes an infrared camera fixed to the burr hole and a receiver on the EVD catheter, displaying real-time navigation relative to CT images. Accuracy was assessed for both models via fluoroscopy images using Kakarla grading and Euclidean distance from the catheter tip to the foramen of Monro. Additionally, placement duration and user satisfaction were assessed. In the 3D-printed models, three neurosurgeons with varying experience each performed three EVD placements at Kocher's point. In the second step, EVDs were placed on a cadaveric head. All EVD placements were carried out under a standardized protocol in both models under the supervision of an independent investigator.
Results
Nine EVD placements (three per surgeon) were performed on 3D-printed models and two on a cadaveric head. OTN-assisted placements achieved 100% accuracy on both models (3D-printed: $n = 9$, Kakarla grade 1; cadaveric: $n = 2$, Kakarla grade 1). The Euclidean distance to the foramen of Monro was 14.28 mm $\pm$ 6.53 for the 3D-printed models and 22.15 mm $\pm$ 3.18 for the cadaveric head. The duration of placements, including registration and calibration, was 12.1 $\pm$ 2.1 min. The average Net Promoter Score was 7/10 $\pm$ 0.82.
Conclusions
The OTN enables precise, reliable placement of EVDs, achieving high levels of accuracy and user satisfaction in both 3D-printed models and cadaveric specimens. Subsequent steps involve performing cadaver trials with increased sample sizes alongside clinical trials to substantiate the clinical viability of the OTN system.

**P063**

**Vertebral Implant Kyphoplasty in Instable Fractures: A Case Series**

D Cipriani, S Ulmer, J Jost, L Andereggen, G Schubert and M Bruder

Department of Neurosurgery, Kantonsspital Aarau, Aarau, Switzerland

Aims
The optimal surgical management of traumatic vertebral fractures remains under debate, particularly regarding the extent of posterior stabilization. Traditional approaches often require long-segment fixation for stability. Vertebral implant systems offer anterior support via intravertebral expansion, potentially allowing shorter posterior constructs while maintaining alignment and biomechanical integrity.
Methods
This retrospective case series included nine patients with traumatic, unstable vertebral fractures treated at our institution. Five patients received vertebral implant kyphoplasty with short-segment posterior stabilization (one vertebra above and one below), and four patients had two-level stabilization above and below. Clinical and radiological follow-up was performed. Sagittal alignment, especially kyphosis and lordosis correction, was measured postoperatively, at 6 weeks in all patients, and selectively at 3 and 12 months.
Results
Fracture types included two AO B2, two AO B1, one A3, one A4, and three OF 4 fractures. The median age was 71 years; 44.5% had osteoporosis. Male patients were treated twice as often as female patients. Postoperative imaging showed good fracture reduction and sagittal alignment restoration. Kyphosis/lordosis improved from a median of 11.7° preoperatively to 4.3° postoperatively (65% correction). Correction remained stable at 6 weeks (median 5.4°). One patient developed postoperative spondylodiscitis with sintering and kyphosis progression from 8.4° to 34.8°. Follow-up at 6 weeks was complete; longer follow-up was partial. Fracture reduction and implant stability remained satisfactory. Clinically, patients showed good outcomes without instability or neurological decline. The median operative time was 155.6 min. Findings suggest that vertebral implants enabled better sagittal correction and a minimally invasive, percutaneous approach.
Conclusions
Vertebral implant kyphoplasty combined with short-segment stabilization appears to offer sufficient anterior support and biomechanical stability for traumatic unstable vertebral fractures. Compared to long-segment fixation or corpectomy, this method may preserve motion segments, reduce invasiveness, and shorten surgery time. Larger studies are needed.

**P064**

**Silent Hypoperfusion in a Giant Middle Cerebral Artery Aneurysm: Rationale for "Prophylactic" Double STA–MCA Bypass and Perfusion CT as the Diagnostic Standard**

E Torche Velez [1], S Iglesias Vargas [1], E Lopez Ferrada [2], M Torche Velez [1], J Varela Varela [2], JP Caze Candia [3], J Correa Peña [4] and J Mura Castro [5]

[1] Sanatorio aleman, Concepción, Chile
[2] Hospital guillermo grant benavente, Concepción, Chile
[3] Hospital Naval Almirante Adriazola Talcahuano, Concepción, Chile
[4] Hospital Herminda Martin, Chillan, Chile
[5] Institute of neurosurgery Dr Alfonso, Santiago, Chile

Aims
To synthesize current evidence on giant middle cerebral artery (MCA) aneurysms and highlight the value of routine perfusion computed tomography (CT) in detecting clinically silent

hypoperfusion. Such findings may justify revascularization strategies prior to aneurysm clipping in order to reduce the risk of ischemic complications. Additionally, we present a case of a patient with a giant MCA aneurysm who, despite minimal symptoms, demonstrated perfusion deficits and was successfully treated with a prophylactic double-barrel superficial temporal artery-to-MCA (STA–MCA) bypass, followed by aneurysm clipping and reconstruction of the MCA bifurcation.

Methods

We conducted a systematic PubMed search (January 2015–April 2025) using the terms "giant aneurysm" AND "middle cerebral artery." The search yielded 213 records, of which 20 studies met inclusion criteria after full-text review. Data extracted included imaging protocols, treatment approaches, complications, and functional outcomes. Separately, we describe the case of a 56-year-old woman with a 30 mm left M1 segment aneurysm. Perfusion CT demonstrated increased mean transit time and time-to-peak with preserved cerebral blood flow, prompting prophylactic double-barrel STA–MCA bypass followed by microsurgical clipping.

Results

Only 3 of the 20 studies incorporated preoperative perfusion CT. In cases where hypoperfusion was identified, treatment shifted toward high- or intermediate-flow bypass in 83% of instances [1, 2]. Overall, 81% of aneurysms were treated surgically, while 19% underwent endovascular intervention. Postoperative cerebral infarction was the most common complication, occurring in up to 49% of patients treated with trapping without revascularization, and was strongly associated with poor collateral circulation [3]. Mortality was 3.8%, with no significant difference between surgical and endovascular approaches.

Illustrative Case

Our patient's bypass enabled successful aneurysm clipping and restored normal left hemispheric perfusion. She remains neurologically intact at 12-month follow-up (mRs 0), with post-treatment angiography demonstrating normalization of cerebral flow dynamics across all angiographic phases.

Conclusions

Both the literature and our experience suggest that perfusion CT should be considered the diagnostic standard in all cases. The identification of silent hypoperfusion warrants a revascularization-first strategy to optimize cortical perfusion and reduce ischemic risk.

**P065**

**Supraclinoid Internal Carotid Artery Fenestration and Ophthalmic Aneurysm Treatment: Updated Review and Illustrative Case**

E Torche Velez [1], S Iglesias Vargas [1], E Lopez Ferrada [2], M Torche Velez [1], J Varela Varela [2], JP Caze Candia [3], J Correa Peña [4] and J Mura Castro [5]

[1] Sanatorio aleman, Concepción, Chile
[2] Hospital guillermo grant benavente, Concepción, Chile
[3] Hospital Naval Almirante Adriazola Talcahuano, Concepción, Chile
[4] Hospital Herminda Martin, Chillan, Chile
[5] Institute of neurosurgery Dr Alfonso, Santiago, Chile

Aims

To synthesize contemporary evidence (2015–2025) on supraclinoid internal carotid artery (ICA) aneurysms associated with fenestration, and to compare these findings with a surgically managed case from our institution.

Methods

A PubMed search (2015–2025, English-language publications) was conducted to identify case reports, series, and reviews describing supraclinoid ICA fenestration aneurysms. Ex-

tracted variables included clinical presentation, aneurysm morphology, treatment modality, follow-up, and outcome. In parallel, we present the case of a 52-year-old woman with an unruptured supraclinoid ICA aneurysm associated with fenestration. Due to her specific vascular anatomy, surgical management was selected. She underwent a minipterional craniotomy and direct microsurgical clipping.

Results

Seven studies comprising 31 patients met inclusion criteria. Most aneurysms were saccular (28/31, 90%) and presented with subarachnoid hemorrhage (SAH) or focal neurological deficits. All were treated via endovascular techniques: stent-assisted coiling ($n$ = 11), flow-diverters ($n$ = 3), simple coiling ($n$ = 2), or targeted occlusion of the hypoplastic fenestrated limb ($n$ = 3). Favorable functional outcomes (modified Rankin Scale [mRS] 0–2) were achieved in 85–100% of cases, with no procedure-related mortality. Asymptomatic occlusion of a hypoplastic branch was the most commonly reported event.

In our case, the patient had a wide-necked ophthalmic segment aneurysm. Microsurgical clip reconstruction preserved both limbs of the fenestration, achieved complete angiographic occlusion, and the patient remained neurologically intact (mRS 0) at 9-month follow-up.

Conclusions

Although modern endovascular techniques offer high success rates for supraclinoid ICA aneurysms with fenestration, surgery still remains as a good treatment option. Thorough anatomical assessment and institution-specific expertise should guide individualized treatment strategies. Multicenter registries are needed to refine selection criteria and develop evidence-based management algorithms.

**P066**

**Surgery of the Vertebral Artery**

F Baumann

Kantonsspital Luzern, Luzern, Switzerland

Unlike for the common carotid artery, surgery on and around the vertebral artery (VA) requires—due to its close relationship to the bony structures of the spine and craniocervical junction, due to its relationship to neural structures and due to its diverse pathologies—unique anatomic knowledge and preparatory skills that are inherently familiar to the neurosurgeon. Pathologies not only include aneurysms of the V4 segment but also tumors in the artery's vicinity or compressive syndromes in the artery's extracranial course. On the one hand, diseases are rare, on the other hand, they can often be treated by endovascular techniques. Schwannomas of the cervical nerve roots are classically treated via a posterior approach (hemilaminectomy/laminotomy) to decompress the spinal cord, but this route is insufficient for treating tumor tissue located extraforaminally on the lateral aspect of the spine. In large tumors the VA is compressed and needs to be under control before tumor resection. Pathologies directly affecting the VA, for example narrowing of the lumen due to hypertrophied facet joint, cannot be addressed via the standard anterior cervical discectomy approach. To reach the perivertebral space of the neck, the lateral approach (Voie latérale) was developed in the 1980s, which is essentially a pre-sternocleidomastoid retrojugular trans-longus colli muscle approach. This article is to present examples of pathologies concerning the V1 and V2 segments of the VA necessitating surgical treatment via the lateral approach and our surgical experience.

**P067**

**Educational Informed Consent Video in Neurosurgery: A Randomized Controlled Trial**

FC Stengel [1], T Herrmann [2], A Hickmann [1], AM Zeitlberger [1], MC Neidert [1], O Bozinov [1] and IC Hostettler [1]

[1] Kantonsspital St. Gallen HOCH, St. Gallen, Switzerland
[2] Technical University of Munich, Munich, Germany

Background
Informed consent in neurosurgery faces unique challenges due to the complexity of the procedures and the limited clinical time. This study evaluates the ability of preoperative educational videos to improve patient comprehension and satisfaction compared to standard consent processes.
Methods
Single-center RCT, with 171 patients scheduled for elective intracranial surgery (March 2022–August 2023). Patients were randomized (1:1) into standard consent plus individualized educational video versus standard consent alone. We assessed patients' comprehension, consent satisfaction, and overall satisfaction using questionnaires before and after surgery. Multivariable analysis was corrected for patient distress according to the Patient Health Questionnaire 4.
Results
The two groups were well-balanced regarding age (median 60 years in both groups), sex (47.6% female in video group, 56.2% in control group), and tumour entity. We did not find significant differences between the groups regarding correct answers to comprehension questions neither pre- (67.1% vs. 60.7%, aOR 1.48 [0.81–2.70], $p = 0.20$) nor postoperatively (64.6% vs. 58.4%, aOR 1.38 [0.76–2.50], $p = 0.29$). Overall satisfaction with provided information (89.7 $\pm$ 12.3 vs. 92.5 $\pm$ 10.3, $p = 0.19$), consent process (90.3 $\pm$ 11.6 vs. 90.9 $\pm$ 11.5, $p = 0.86$), and hospital stay (89.5 $\pm$ 13.1 vs. 90.3 $\pm$ 16.6, $p = 0.50$) were similar between groups. The video was well accepted and perceived among patients, with very positive ratings (rating very good and good in >90%) and comprehensibility (rating very easy and easy in >80%).
Conclusions
Video-assisted informed consent was equivalent to standard consent in neurosurgery with regards to patient satisfaction and comprehension. The fact that video-assisted consent did not significantly improve patient comprehension and satisfaction significantly is most likely explained by a ceiling effect as the rating was high in both arms. The high satisfaction rate indicates established and effective current consent procedures. The use of video-assisted informed consent could play a valuable role in the future, especially in saving time in the informed consent process.

**P068**

**Epidemiological Trends of Intracerebral Abscesses in Germany: A 19-Year Population-Based Study**

F Corr, D Grimm, E Schulz, A Firtinidou, AM Zeitlberger, IC Hostettler, O Bozinov and MC Neidert

Hoch Health Ostschweiz Kantonsspital St. Gallen, St. Gallen, Switzerland

Background
Intracerebral abscesses remain life-threatening infections requiring urgent intervention, yet contemporary epidemiologic data are limited. This study aimed to evaluate national trends in incidence, treatment, and in-hospital mortality in Germany over a 19-year period.

Methods
We conducted a retrospective, population-based cohort study using inpatient data from the German Federal Statistical Office (2005–2023). We included all hospitalizations with a principal diagnosis of intracerebral abscess (ICD-10: G06.0) across Germany. Trends in incidence, mortality, neurosurgical procedures, discharge disposition, and hospital length of stay (LOS) were assessed using Poisson and linear regression models.
Results
Between 2005 and 2023, annual intracerebral abscess cases in Germany rose from 821 to 1836 (+123.7%), corresponding to a 4.2% annual increase (IRR = 1.042; $p < 0.001$). Incidence per 100,000 population more than doubled (+121.3%), with the steepest increases in patients aged 60–89 years. In-hospital deaths rose from 153 to 684 annually (+347%), though proportional mortality remained stable (mean 5.05%). Neurosurgical interventions increased significantly: trepanation (+125%), EVD placement (+163%), CSF shunting (+320%), and stereotactic drainage (+49%) (all $p < 0.05$). Age was the strongest independent predictor of mortality.
Conclusions
The incidence and absolute mortality of intracerebral abscesses in Germany have risen over the past two decades, driven largely by older adults. Despite more frequent use of neurosurgical interventions, in-hospital mortality remains high and strongly age-dependent. These findings emphasize the need for further research into age-sensitive diagnostic approaches, treatment strategies, and prevention efforts.

**P069**

**Giant Intradiploic Epidermoid Cyst: A Case Report and Literature Review**

F Bonneville, K Huscher, A Simonin and J Fournier

Hôpital de Sion, Sion, Switzerland

Primary epidermoid cysts are rare, benign tumors of ectodermal origin that develop within the diploë. Due to their silent growth, these tumors can reach considerable sizes before causing neurological or aesthetic symptoms. We report the complex case of a 60-year-old female patient, known for severe anorexia and treated for a skin ulcer, in whom an expansive lesion was incidentally discovered in the context of transient episode of altered consciousness. CT and MRI revealed a giant left parietal extradural mass measuring 110 × 55 × 81 mm, with bone lysis and significant intracranial extension. A marked inflammatory syndrome, with a CRP level of 170 mg/L, led the involvement of the infectious diseases department. Multiple microbiological samples were taken to exclude an infectious etiology, but no pathogens were isolated. A total surgical excision followed by cranioplasty using bone cement was performed. No postoperative complications or neurological impairments were observed. The histopathological analysis confirmed the diagnosis of an intradiploic epidermoid cyst (IEC). A literature review was conducted, emphasizing the rarity of this type of lesion and the importance of interdisciplinary collaboration.

**P070**

**Clinical Usefulness of MGMT Promoter Methylation Quantification in Glioblastoma (GBM) Patients Treated with Chemo-Radiation Therapy**

F Marchi [1], B Muoio [2], S Epistolio [3], F Polinelli [1], I Zaed [1], P Spina [3], N Sahnane [4], M Cerati [4], S Balbi [5], F Sessa [4], C Di Serio [6], A Cardia [1] and M Frattini [3]

[1] Department of Neurosurgery, Neurocenter of Southern Switzerland, Regional Hospital Lugano (EOC), Lugano, Switzerland
[2] Division of Medical Oncology, Oncology Institute of Southern Switzerland (IOSI), Ente Ospedaliero Cantonale (EOC), Bellinzona, Switzerland

[3] Institute of Pathology, Ente Ospedaliero Cantonale (EOC), Locarno, Switzerland
[4] Unit of Pathology, Department of Medicine and Technological Innovation, University of Insubria, ASST Sette Laghi, Varese, Italy
[5] Division of Neurological Surgery, Department of Biotechnology and Life Sciences, University of Insubria, ASST Sette Laghi, Varese, Italy
[6] University Center for Statistics in the Biomedical Sciences (CUSSB), Vita-Salute San Raffaele University, Milan, Italy

Introduction
MGMT promoter methylation is a factor improving survival in IDH1 wt glioblastoma (GBM). Several methods can be used to assess MGMT methylation. Little is known about the level of methylation in MGMT promoter and whether this parameter may influence patients' follow-up.
Methods
We enrolled 119 IDH1 wt GBM cases diagnosed from 2004 to 2022 in two neurosurgical centers (EOC and Insubria University Hospital, Italy) and treated by temozolomide (TMZ). MGMT promoter methylation was assessed by the non-quantitative Methylation-Specific PCR (MSP) and by the new semiquantitative real-time EpiDirect® (Pentabase ApS, Denmark). Cohen index and Kaplan-Meier curves were applied.
Results
By MSP 41/119 (34.5%) patients were methylated (M), 72/119 (60.5%) unmethylated (UM) and 6/119 cases (5.05%) not evaluable. By EpiDirect®, M was observed in 45/119 cases (37.8%) and UM in 74/119 (62.2%): all the cases were evaluable by EpiDirect®. Nine evaluable cases (5 M and 4 UM), corresponding to 8%, showed discrepant results between EpiDirect® and MSP. The concordance of the methodologies was high (K Cohen index = 0.829). Considering the different MGMT promoter methylation levels identified by Epidirect® and survival, no statistically significant association was found.
Conclusions and Funding
EpiDirect® is a robust methodology enabling a faster, more sensible and easier evaluation of cases even in presence of a highly damaged DNA, with a high level of superimposition with MSP. The feature of EpiDirect® to quantify the percentage of MGMT promoter methylation does not seem to play clinical relevance on patients' survival. The project has been supported by Eurostars (E12513, SensiScreen Glioma).

**P071**

## In Situ Light-Source Delivery During 5-Aminulevulinic Acid-Guided High-Grade Glioma Resection: Spatial, Functional and Oncological Informed Surgery

F Marchi [1], L José Pedro [2], A Elhag [2], N Kalyal [2], E Mthunzi [2], M Awan [2], O Wroe-Wright [2], A Diaz Baamonde [2], A Mirallave-Pescado [2], Z Reisz [2], R Gullan [2], F Vergani [2], K Ashkan [2] and R Bhangoo [2]

[1] Department of Neurosurgery, Neurocenter of Southern Switzerland, Regional Hospital Lugano (EOC), Lugano, Switzerland
[2] King's College Hospital NHS Foundation Trust, London, UK

Background/Objectives
5-aminulevulinic acid (5-ALA)-guided surgery for high-grade gliomas remains a challenge in neuro-oncological surgery. Inconsistent fluorescence visualisation, subjective quantification and false negatives due to blood, haemostatic agents or optical impediments from the external light source are some of the limitations of the present technology.
Methods
The preliminary results from this single-centre retrospective study are presented from the first 35 patients operated upon with the novel Nico Myriad Spectra System©. The

microdebrider (Myriad) with an additional in situ light system (Spectra) can alternately provide white and blue light (405 nm) to within 15 mm of the tissue surface to enhance the morphology of the anatomical structures and the fluorescence of the pathological tissues.
Results
A total of 35 patients were operated upon with this new technology. Eight patients (22.85%) underwent tubular retractor-assisted minimally invasive parafascicular surgery (tr-MIPS). The majority had high-grade gliomas (68.57%). Fluorescence was identified in 30 cases (85.71%), with residual fluorescence in 11 (36.66%). The main applications were better white–blue light alternation and visualisation during tr-MIPS, increase in the extent of resection at the border of the cavity, identification of satellite lesions in multifocal pathology, the differentiation between radionecrosis and tumour recurrence in redo surgery and the demarcation between normal ependyma versus pathological ependyma in tumours infiltrating the subventricular zone.
Conclusions
This proof-of-concept study confirms that the novel in situ light-source delivery technology integrated with the usual intraoperative armamentarium provides a spatially, functionally and oncologically informed framework for glioblastoma surgery. It allows for the enhancement of the morphology of anatomical structures and the fluorescence of pathological tissues, increasing the extent of resection and, possibly, the prognosis for patients with high-grade gliomas.

**P072**

**Late-Onset Contrast-Induced Encephalopathy After Endovascular Permanent Stent-Assisted Coiling: A Case Report**

G Bühler and S Marbacher

Kantonsspital Aarau, Aarau, Switzerland

Background
With the increasing use of endovascular techniques for the treatment of cerebrovascular diseases, contrast-induced encephalopathy (CIE) has been recognized as a rare but significant complication, presenting with a broad spectrum of neurological symptoms. To date, the literature has described cases of early-onset CIE, in which symptoms appear shortly after the intervention. This case report documents a case of a late-onset CIE.
Case Description
A 53-year-old woman with a re-recurrent anterior communicating artery (ACoA) aneurysm with coil-impaction, having a history of two aneurysmal subarachnoid hemorrhages (SAH) 14 years and 6 months prior, underwent stent-assisted re-recoiling. On the evening after the procedure, she experienced a single generalized tonic-clonic seizure. Postprocedural CT imaging was unremarkable, and MRI the following day showed no abnormalities. Six days later, she developed new-onset right-sided leg weakness and fine motor impairment. Subsequent MRI findings indicated CIE, with marked FLAIR signal changes in the distal circulation area of the coiled aneurysm, and multiple microbleeds. After initiating dexamethasone, she showed neurological improvement at discharge and achieved full recovery without residual deficits at three-month follow-up.
Conclusions
This case appears to be one of the first documented occurrence of late-onset CIE, highlighting the importance of thorough postinterventional neurological monitoring. Furthermore, it demonstrates the efficacy of high-dose corticosteroid therapy as the preferred treatment for restoring blood-brain barrier integrity.

**P073**

**Assessing Endovascular Treatment Techniques for Bifurcation Aneurysms in an Elastase-Digested Rabbit Model**

G Canzanella [1], Y Irmak [2], J Rey [3], K Catalano [3], L Andereggen [3], S Marbacher [3], D Casoni [4] and B Grüter [5]

[1] Spitalzentrum Biel/Centre Hospitalier Bienne, Biel/Bienne, Switzerland
[2] Luzerner Kantonspital, Luzern, Switzerland
[3] Kantonsspital Aarau, Aarau, Switzerland
[4] Experimental Surgery Facility, Faculty of Medicine, University of Bern, Bern, Switzerland
[5] Department of Neurosurgery and Neuroradiology, HOCH Health Ostschweiz, St. Gallen, Switzerland

Aims
Animal models showing characteristics close to those of humans are essential for preclinical studies which aim to test, improve and develop endovascular treatments and devices for intracranial aneurysms. The bifurcation elastase-digested aneurysm model in New Zeeland White rabbits has already demonstrated highly interesting rheological, hemodynamic and aneurysm wall conditions. The aim of this study was to test the feasibility and compare the occlusion rates of different endovascular occlusion techniques in this model.
Method
Bifurcation aneurysms were created by end-to-side anastomosis of the right common carotid artery (CCA) to the left CCA with interposition of an autologous, elastase-digested (incubated with 100 U elastase/20 min) arterial CCA pouch in New Zealand White rabbits. Pouch and parent artery patency were assessed by fluorescence angiography immediately after creation. Each animal was randomized into: (1) open intraoperative coiling, (2) endovascular coiling, (3) endovascular stenting. At follow-up, all rabbits underwent contrast-enhanced magnetic resonance angiography. Aneurysm volume at creation and volume of rest perfusion were estimated using the cylindrical volume formula: V = 3.146(width/2)2 $\times$ height.
Results
A total of 23 female New Zealand White rabbits underwent surgery. Two were excluded because one aneurysm showed poor patency immediately after creation, and one rabbit died postoperatively. The mean aneurysm volume at creation was 7.39 +/− 2.44 mc. Eight rabbits were allocated to open coiling during aneurysm creation, 7 rabbits underwent endovascular coiling at 16 +/− 4 days after surgery and 6 rabbits were stented at 14 +/− 1 days after it. At follow-up, 6 of in the intraoperatively coiled aneurysm showed residual perfusion (mean volume 3.1 +/− 2.8 mc); 6 of 7 in the endovascularly coiled aneurysm showed a residual perfusion (4.3 +/− 3.1 mc) and 6 of 6 in the endovascular stented aneurysm showed a residual perfusion (12.3 +/− 3.9 mc). One aneurysm in the open coiling group and one in the endovascular coiling group were associated with partial thrombosis of the right CCA.
Conclusions
This study demonstrates the feasibility of coiling and stenting in this model and its suitability for preclinical studies of endovascular therapies. Coiling alone showed an adequate, if not complete, occlusion rate. Stenting alone did not achieve occlusion and 5 of 6 (83%) experienced further aneurysm growth.

**P074**

**Predictive Factors in Development of Postoperative Delirium in Geriatric Patients with Chronic Subdural Hematomas: A Prospective European Study**

I Zaed [1], S Chibbaro [2], C Mallereau [2], M Ganau [2] and A Cardia [1]

[1] Department of Neurosurgery, Neurocenter of Southern Switzerland, Regional Hospital Lugano (EOC), Lugano, Switzerland
[2] Centre Hospitalier Universitaire de Strasbourg, Strasbourg, France

Introduction
Chronic subdural hematoma (CSDH) is a complex disease with an overall incidence of 1.7–20.6 per 100,000 persons per year and is more commonly encountered in the elderly population. It is projected to be one of the most common neurosurgical procedure. Postoperative delirium is a common complication associated with the elderly, causing increased morbidity and prolonged hospital stay. However, its risk factors in chronic subdural hematoma patients have not been well studied.
Methods
A total of total of 202 consecutive patients with chronic subdural hematoma at different neurosurgical centers in Europe between January 2018 and January 2023 were enrolled. Various clinical indicators were analyzed to identify independent risk factors for postoperative delirium using univariate and multivariate regression analyses. Delirium risk prediction models were developed as a nomogram and a Markov chain.
Results
Out of the 202 patients studied, 63 (31.2%) experienced postoperative delirium. Univariate analysis identified age ($p < 0.001$), gender ($p = 0.014$), restraint belt use ($p < 0.001$), electrolyte imbalance ($p < 0.001$), visual analog scale score ($p < 0.001$), hematoma thickness ($p < 0.001$), midline shift ($p < 0.001$), hematoma side ($p = 0.013$), hematoma location ($p = 0.018$), and urinal catheterization ($p = 0.028$) as significant factors. Multivariate regression analysis confirmed the significance of restraint belt use ($p < 0.001$), electrolyte imbalance ($p = 0.001$), visual analog scale score ($p = 0.016$), and midline shift ($p = 0.007$). Hematoma thickness and age had no significant impact.
Conclusions
Increased midline shift and visual analog scale scores, alongside restraint belt use and electrolyte imbalance elevate delirium risk in chronic subdural hematoma surgery. the development of prediction models may offer reference value in this context.

**P075**

**Minimally Invasive Management of Cervical Spondylodiscitis. A Multicenter Experience**

I Zaed [1], C Mallereau [2], G Dannhoff [2], H Cebula [2], M Ganau [2], J Todeschi [2], B Carangelo [3], G Spatola [4], A Cardia [1], A Romano [5] and S Chibbaro [2]

[1] Department of Neurosurgery, Neurocenter of Southern Switzerland, Regional Hospital Lugano (EOC), Lugano, Switzerland
[2] Centre Hospitalier Universitaire de Strasbourg, Strasbourg, France
[3] University of Siena, Siena, Italy; [4] ASST Spedali Civili di Brescia, University of Brescia, Brescia, Italy; [5] AOU Parma, Parma, Italy

Introduction
The urgent etiological diagnosis represents the main management objective of cervical spondylodiscitis (CSD) to start as soon as possible antibiotic treatment to prevent neurological deterioration. The present study aimed to evaluate a multicenter experience implementing a minimally invasive surgical approach (MISA) to manage CSD such pathology vs. the most complex and aggressive surgical strategies currently used.
Methods
This retrospective multicenter study used a database of 70 patients from five European neurosurgical centers. Patients with primary CSD underwent MISA via a limited funnel shaped cervical microdiscectomy with 4-mm anterior and 6-mm posterior longitudinal

ligaments incision, PUS drainage, and extensive washing of the interbody and epidural space without fusion. Diagnosis was confirmed by clinical, imaging, laboratory, and perioperative histopathology and bacteriology.
Results
Of the 70 patients, 41 were men (58.5%), with an average age of 47.67 years. Severe neck pain affected 45 patients, while 51 had single-level cervical spondylodiscitis, 14 had double-level, and 5 had triple-level involvement. Staphylococcus aureus was identified in 49 cases. Each patient received a mean of three months of antibiotics. Inflammatory markers (C-reactive protein) were moderate for four weeks, then normalized by 8–12 weeks, except in one recurrence. After an average 48-month follow-up, all patients fully recovered without neurological deficit, spinal instability, or kyphotic deformity. Radiological exams confirmed bony fusion, with no recurrences of infection.
Conclusions
MISA treatment offers a valuable, stable, and less invasive option for treating CSD, effectively identifying causative microorganisms and decompressing the spinal cord, leading to excellent patient outcomes.

**P076**

**Tips and Tricks of Spinal Cord Biopsy: Insights from a Multicenter Series**

I Zaed [1], C Mallereau [2], G Dannhoff [2], J Todeschi [3], F Severac [4], N Aghakhani [4], M Ganau [3], N Hamdan [5], T Le Van [6], F Proust [2], B Carangelo [7], A Cardia [1], G Spatola [8], C Bruno [9], H Cebula [3] and S Chibbaro [3]

[1] Department of Neurosurgery, Neurocenter of Southern Switzerland, Regional Hospital Lugano (EOC), Lugano, Switzerland
[2] Chru Strasbourg, Strasbourg, France
[3] Centre Hospitalier Universitaire de Strasbourg, Strasbourg, France
[4] Bicetre Hospital, Paris, France
[5] University Hospital Jean Minjoz, Besançon, France
[6] Centre Hospitalier Universitaire Dijon, Dijon, France
[7] University of Siena, Siena, Italy
[8] Spedali Civili Hospital of Brescia, University of Brescia, Brescia, Italy
[9] andria hospital, Andria, Italy

Purpose
Whenever the radiological and clinical presentation of diffuse spinal cord lesions pose diagnostic and therapeutic dilemmas, the role of primary spinal cord biopsies (SCB) can represent a crucial surgical step to guide further management. However, the benefits of SCB comes with the risks of significant neurological worsening and potentially non-diagnostic findings. An evidence-based algorithm to assess the appropriateness of SCB and its chances of successful diagnosis is currently lacking.
Method
A multicenter retrospective study was conducted across 8 tertiary neurosurgery European centers and included all patients undergoing primary SCB between January 2005 and December 2020. The main objective of this study was to assess the positive diagnostic rate, while the secondary objective was to evaluate the rate of neurological deterioration.
Results
Histological diagnoses were obtained in 91.8% (56/61) of cases. Lesions spanning more than three spinal levels were significantly associated with non-diagnostic biopsies ($p = 0.03$). Neurological deterioration occurred in 47.5% (29/61) of patients, with 48.3% recovering within three weeks. Independent risk factors for postoperative deterioration included low-grade glioma (LGG) ($p = 0.005$) and lymphoma ($p = 0.007$). Intraoperative Ultrasound (IoUS)

was significantly associated with reduced postoperative deficits ($p = 0.030$). Surprisingly, preoperative clinical and radiological diagnoses differed from histopathological findings in 47.5% of cases.

Conclusions

SCB are relatively safe and effective diagnostic procedures despite their inherent risk of significant perioperative neurological worsening. The decision to undertake a primary SCB should always be made in a multidisciplinary setting after careful review of clinical and diagnostic findings.

**P077**

**Expect the Unexpected—Rare Intramedullary Primary Leptomeningeal Melanocytoma in the Cervical Spine—A Case Report**

I Mendelowitsch and D D' Alonzo

Kantonsspital Baden, Baden, Switzerland

Primary leptomeningeal melanocytomas (PLMs) are exceedingly rare tumor entities, particularly in their intramedullary form along the spinal cord. To date, fewer than fifty cases of spinal PLMs have been reported worldwide. This case report presents a young woman in whom a tumor located at the C7 level was incidentally discovered on an MRI of the cervical spine, which was ordered due to acute right-sided radicular pain corresponding to a C4/5 disc herniation. The radicular pain was managed conservatively, while the tumor was surgically resected via an intradural, intramedullary approach with intraoperative neuromonitoring. Postoperatively, the patient developed transient left leg weakness (M4/5), which resolved over the one-year follow-up period. After receiving adjuvant radiation therapy, the patient remains free of recurrence.

**P078**

**Cavernous Sinus Compartment Invasion by Pituitary Adenomas: Patterns of Invasion and Surgical Outcomes**

F Constanzo [1], J Rychen [2], JC Fernandez-Miranda [1]

[1] Stanford University, Stanford, USA
[2] Universitätsspital Basel, Basel, Switzerland

Aim

Cavernous sinus invasion (CSI) remains a major challenge in pituitary adenoma surgery, limiting both gross total resection (GTR) and endocrinological remission (ER). With advances in surgical anatomy and technique—particularly through the endoscopic endonasal transcavernous approach (TC-EEA)—surgeons can now better assess the compartmental patterns of invasion. This study aims to analyze the specific patterns of invasion into individual compartments of the cavernous sinus and evaluate their associations with tumor subtype, surgical outcomes, and complications.

Methods

A retrospective review was conducted on 276 patients who underwent endoscopic endonasal surgery for pituitary adenoma from 2018 to 2023 at Stanford Medical Center (USA). Patients were classified by CSI status: no CSI, medial wall invasion only (MWCSI), and compartmental CSI. Intraoperative findings—including compartmental occupation, carotid adherence, and tumor consistency—were analyzed in relation to GTR, ER, and complications.

Results

CSI was observed in 34.3% of patients, most commonly involving the superior compartment (71%). GH- and ACTH-secreting adenomas were more likely to show fibrous consistency

and carotid adherence. GTR was achieved in 90.9% of patients overall but dropped significantly in cases with lateral compartment invasion (64%). ER was achieved in 84% of functioning adenomas overall, and 69.2% in those with compartmental CSI. Lateral and posterior compartment invasion were significantly associated with reduced ER. Transient cranial nerve palsies occurred in 10.3% of explored cavernous sinuses, primarily involving CN III and VI, and resolved fully in all cases.

Conclusions

Invasion of cavernous sinus compartments by pituitary adenomas varies with hormonal subtype and impacts surgical and endocrine outcomes. Lateral and posterior compartment involvement markedly reduce the likelihood of complete resection and remission, underscoring the need for compartment-based surgical planning.

**P079**

## The Influence of a Patient's Mother Tongue on Parameters of Cortico-Cortical Evoked Potentials

J Wermelinger [1], PA Alvarez Abut [1], S Sivanrupan [1], C Wyss [2], L Hostettler [2], A Raabe [1], P Schucht [1] and K Seidel [1]

[1] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurochirurgie, Bern, Switzerland
[2] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurologie, Bern, Switzerland

Objective

Surgical intervention in patients with language-eloquent tumors remains high-risk due to the challenge of balancing maximal tumor resection with preservation of language function. While awake surgery with intraoperative language mapping is considered the gold standard, it is not always feasible. Cortico-cortical evoked potentials (CCEPs) have emerged as a promising potential alternative for monitoring the integrity of the language network. This study aimed to examine whether a patient's mother tongue influences key CCEP features elicited from the functional Broca's area and recorded at the functional Wernicke's area (BtW), and vice versa (WtB).

Methods

We analyzed 108 CCEP recordings from 20 patients undergoing asleep-awake-asleep resection of low- and high-grade gliomas. Electrode placement was guided by Penfield stimulation of positive language sites and arcuate fascicle fiber tracking. Patients were grouped by mother tongue: German ($n$ = 8), "Romance" (French ($n$ = 4), Italian ($n$ = 1) or Portuguese ($n$ = 2)), and "Balkan/Slavic" (Albanian ($n$ = 2) or Serbian ($n$ = 2)). We used ANOVAs and post-hoc tests to assess the effect of mother tongue on onset and peak latencies, amplitudes, and main frequency of the N1 and N2 components. To control for confounding variables—tumor location, histopathology, intraoperative seizures, arousal state, stimulation direction (BtW vs. WtB), and gender—we performed multiple linear regression analyses.

Results

We found that German and Romance speakers exhibited significantly longer N1 onset latencies and lower N1 and N2 amplitudes compared to Balkan/Slavic speakers. The linear regressions revealed that after correcting for confounders, mother tongue remained a significant predictor of N1 amplitude. Additionally, gender and histopathology significantly affected latency measures, while stimulation direction and arousal state influenced the main frequency.

Conclusions

Our findings suggest that a patient's native language impacts specific features of CCEP signals, particularly amplitude. The cognitive demands imposed by the structural properties

of each language group may shape both the anatomical connectivity and functional responsiveness of the language network. This suggests that intraoperative language network monitoring via CCEPs might be tailored to a patient's linguistic background to enhance both safety and accuracy in language-eloquent tumor surgery.

**P080**

**Spontaneous Regression of Intracranial Aneurysms—Case Report and Systematic Review of the Literature**

K Catalano [1], L Andereggen [1], G Schubert [1], S Marbacher [1] and B Grüter [2]

[1] Kantonsspital Aarau, Aarau, Switzerland
[2] Kantonsspital St Gallen, St. Gallen, Switzerland

Background/Objectives
The natural course of intracranial aneurysms (IAs) remains unclear. Many of them remain stable over time and few experience patterns of growth. The spontaneous regression of IAs without any microsurgical or endovascular treatment is a very rare phenomenon. This paper reports the case of a 56-year-old female who experienced spontaneous regression of her IA. Furthermore, it contains a systematic literature review to explore reported cases of spontaneous IA regression.
Methods
The case of a 56-year old female patient who presented with an anterior communicating artery (ACom) IA that thrombosed spontaneously after 108 months follow-up is reported. Additionally, a systematic literature search was conducted using the Medline database to identify reported cases.
Results
The IA showed spontaneous regression without any surgical or endovascular intervention. We identified 33 articles describing IAs with spontaneous regression. Reported reasons for spontaneous IA thrombosis included (1) anatomical factors like narrow aneurysmal necks; (2) coagulation pathway modifications, including antifibrinolytic activity that promotes thrombosis; and (3) hemodynamic changes such as altered blood flow dynamics and external vascular compression. These findings suggest that spontaneous regression, while rare and unpredictable, can be associated with distinct physiological and anatomical conditions.
Conclusions
The spontaneous regression of IAs is an extremely rare phenomenon. It cannot reliably be predicted and may be associated with changes in the hemodynamic situation, specific anatomical constellations, or coagulation pathways.

**P081**

**Thalamic Deep Brain Stimulation versus MRI-Guided Focused Ultrasound in Patients with Tremor: A Retrospective, Single-Centre, Single-Surgeon Comparison**

LH Stieglitz, CR Baumann, A Fleisch, S Mahendran, M Uhl, C Freudinger, E Efthymiou, MF Oertel and F Büchele

University Hospital Zurich, Zürich, Switzerland

Aims
Bilateral deep brain stimulation (DBS) and unilateral MRI-guided focused ultrasound (MRgFUS), both targeting the ventral intermediate nucleus (VIM) of the thalamus, are currently the two most established interventions for pharmaco-resistant tremor. However, treatment selection remains challenging due to a lack of direct comparative data.

Methods
In this retrospective study, we compared clinical outcomes of patients with pharmacoresistant tremor who underwent either bilateral VIM-DBS ($n$ = 30) or unilateral VIM-MRgFUS ($n$ = 52), performed by a single neurosurgeon between 2014 and 2022. The primary measure of efficacy was the improvement in tremor severity of the more affected hand at 6 months, assessed using the Washington Heights-Inwood Genetic Study of Essential Tremor (WHIGET) scale. Safety was evaluated by comparing treatment-, surgery-, and hardware-related adverse events (AEs), categorized by their impact on activities of daily living (ADLs). Serious adverse events (SAEs) were defined retrospectively as events requiring prolonged or repeated hospitalization or resulting in persistent symptoms affecting ADLs.
Results
Tremor reduction in the more affected hand was comparable between groups (DBS: 62.4% [41.3–87.9] vs. MRgFUS: 69.4% [42.4–77.7]; $p$ = 0.958). However, improvements in contralateral and axial tremors were only observed in the DBS group. DBS was associated with a significantly higher rate of surgery- and hardware-related AEs (17% vs. 2%; $p$ = 0.023), but a non-significantly lower rate of persistent treatment-related AEs impacting ADLs at 6 months (7% vs. 13%; $p$ = 0.343). The incidence of SAEs (23.3% vs. 19.2%; $p$ = 0.779) and persistent deficits at 6 months (10% vs. 13%; $p$ = 0.82) was similar between groups.
Conclusions
Despite differing safety profiles, both DBS and MRgFUS yielded a comparable overall burden of adverse events. While tremor control in the more affected hand was equivalent, bilateral DBS offered additional benefits for contralateral and axial tremors.

**P082**

**Reconsideration of the Resection Strategy of Eloquent Brain Metastasis in the Era of Postoperative Stereotactic Radiotherapy: A Comparative Analysis with Non-Eloquent Metastasis**

L Häni [1], D Nasiri [2], A Gächter [3], A Klimov [3], M Branca [4], N Söll [5], A Raabe [5], D Aebersold [5], E Herrmann [5], E Ermis [5], S Vulcu [5], N Bachmann [5] and P Schucht [5]

[1] Inselspital, Bern University Hospital, Bern, Switzerland
[2] Inselspital—Universitätsspital Bern, Bern, Switzerland
[3] Inselspital Bern, Bern University Hospital, Bern, Switzerland
[4] CTU Bern, University of Bern, Bern, Switzerland
[5] Inselspital Bern University Hospital, University of Bern, Bern, Switzerland

Purpose
To decrease the recurrence rate after complete resection of a brain metastasis, removal of a surgical safety margin is advocated. This is not always feasible when resecting a metastasis in an eloquent location. We aimed to assess the recurrence rate after resection of metastases in an eloquent location followed by postoperative stereotactic radiotherapy to the resection cavity.
Methods
We retrospectively included patients with 1–3 brain metastases undergoing gross total resection and postoperative stereotactic radiotherapy between 2010 and 2022. Primary endpoint was local recurrence free survival (LRFS). Secondary endpoints were overall survival and distant brain failure free survival. Patients were grouped according to the location of their metastasis into eloquent and non-eloquent. Eloquent localization was considered a surrogate for resection without a surgical safety margin according to our institutional practice.
Results
We included 193 patients with 201 resected metastases. Ninety-five metastases (47.3%) were classified as eloquent and 106 (52.7%) as non-eloquent. Kaplan-Meier analysis showed

no difference in LRFS between eloquent and non-eloquent metastases (HR 0.821, 95%–CI 0.447–1.507, $p = 0.523$). Only increased preoperative tumor volume was associated with worse LRFS (HR 1.015, 95% CI 1.001–1.028, $p = 0.033$). There was no difference concerning secondary endpoints between eloquent and non-eloquent metastases.

Conclusions

Omission of a surgical safety margin in at least a part of the resection cavity due to eloquence of adjacent tissue had no detrimental effect on local control after resection and postoperative stereotactic radiotherapy of a brain metastasis. This could influence the strategy during resection of an eloquent metastasis.

**P083**

**Identification and Relevance of Ultra-Early Progression After Resection of Glioblastoma**

L Häni, A Hakim, L Gehrig, M Staruch, J Goldberg, S Rüssli, N Söll, A Raabe, E Ermis and P Schucht

Inselspital, Bern University Hospital, Bern, Switzerland

Objective

This study analyses the relevance of tumor progression in the interval between surgery and radiotherapy in patients with glioblastoma, and its interaction with the extent of surgical resection.

Methods

In a retrospective cohort study, we enrolled all patients undergoing resection for a glioblastoma, IDH wildtype, at our institution between January 2011 and February 2023 who had early postoperative and an additional pre-radiotherapy MRI available for analysis. Early postoperative MRIs were graded according to whether they showed neither enhancing nor non-enhancing residual tumor (group 1a), no contrast-enhancing but residual non-enhancing tumor (group 1b), or residual contrast-enhancing tumor (group 2). The primary outcome was overall survival. Risk factors for ultra-early progression were assessed using a binary logistic regression analysis.

Results

We included 133 patients with a median age of 66.0 years. Sixty-four patients (48.1%) had ultra-early progression. Overall survival was significantly worse among patients with ultra-early progression ($p < 0.001$). The only risk factor identified for ultra-early progression was the resection category ($p < 0.001$). While ultra-early progression was seen in 10.3% of patients in group 1a, it occurred in 43.8% and 85.2% of patients in group 1b and 2, respectively ($p < 0.001$). Patients with ultra-early progression showed no difference in survival whether or not they had undergone a complete resection of enhancing tumor ($p = 0.850$).

Conclusions

Ultra-early progression after resection of a glioblastoma is a frequent finding with a profound prognostic impact. Complete resection of enhancing and non-enhancing tumors reduces the frequency of ultra-early progression. Nevertheless, new strategies for management of ultra-early progression are urgently needed to improve the prognosis.

**P084**

**Transnasal Adenomectomy with Medial Cavernous Sinus Wall Resection for Hormone-Secreting Pituitary Adenomas: Safety and Short-Term Outcome**

M Roethlisberger, RE Cottier, S Negoias, J Hench, S Frank, ER Christ, M Christ-Crain and L Mariani

University Hospital Basel/University of Basel, Basel, Switzerland

Introduction

Hormone-secreting pituitary adenomas (HsPA) frequently involve the medial cavernous sinus wall (MCSW), even when this is not expected by MR findings and/or intraoperative visual inspection [1,2]. Even experienced neurosurgeons may prefer not to remove tumor tissue in the MCSW because of the risk of neurovascular injury and unclear benefit in terms of the remission rate. We analyzed the safety and short-term outcome of adenomectomy with systematic MCSW resection (MCSWR) in a consecutive cohort of patients with HsPA.

Methods

We performed from February 2024 to 31 January 2025, in addition to the classic endoscopic adenomectomy, a systematic MCSWR in all patients harboring an HsPA in contact with the MCSW as seen on the preoperative MRI. The preoperative data included the demographic information, clinical presentation, imaging, Knosp grade, and endocrine profiles. Perioperative complications and short-term endocrinological outcomes were assessed prospectively. CS invasion was demonstrated histologically by synaptophysin immunohistochemistry.

Results

There were 16 patients in the cohort, with a mean age of 48 years (range 30–72); 8 (50%) were female, 9 (56%) had acromegaly, 6 (37.5%) had a prolactinoma, and 1 (6.5%) had Cushing's disease. Eight (50%) of the tumors were macroadenomas. The Knosp grades were 0 in four, 1 in five, 2 in five, and 3 in two patients (respectively 25%, 31%, 31%, and 12.5%). Gross-total resection was achieved in all cases. There were no permanent or major surgical complications; Cavernous sinus (CS) involvement was identified by intraoperative visual inspection in 10 of the 16 patients (63%). MCSW involvement was confirmed by histology in 7 cases (3 of them with Knosp Grade 0), while the analysis of the remaining 9 cases was technically not possible or inconclusive. There was no new postoperative pituitary insufficiency. Short-term endocrinological follow-up (mean 3.2 months) was available for the remaining 15 patients. One prolactinoma patient with high preoperative prolactin levels (>900 mcg/L) was in partial remission 4 months after surgery; the other 14 patients were all in full remission.

Discussion

Endoscopic adenomectomy with systematic MCSWR reveals histological confirmation of CS invasion, even in four tumors with low Knosp grades. The excellent short-term endocrinological outcomes suggest that MRI underestimates CS involvement and that overall long-term remission rates can be improved by systematic MCSWR.

**P085**

## Improving the Diagnosis, Therapy and Prognostication of Gliomas through Proteomic Plasma Profiling: Leveraging the Plasma Proteome in the Era of Minimally-Invasive Approaches

MM Etter [1], W Duchemin [1], T Shekarian [1], A Gerber [1], C Durano [2], D Kaymak [2], A Buck [3], J Oechtering [1], J Kuhle [1], M Ritz [1], R Guzman [1], T Weiss [3], C Granziera [1] and G Hutter [1]

[1] University Hospital Basel, Basel, Switzerland
[2] University Hopsital Basel, Basel, Switzerland
[3] University Hospital Zurich, Zürich, Switzerland

Background

Advancement in the diagnosis, therapy and surveillance of gliomas has been limited, resulting in diagnostic and therapeutic challenges. Definite diagnosis, distinction of progression and pseudo-progression, as well as prognosis assessment still depends on invasive tissue biopsy. In the era of minimally-invasive approaches, liquid biomarkers as a multifaceted tool are emerging.

Methods
In a discovery cohort of 133 glioma patients and 50 healthy individuals, their plasma proteomes were analyzed. The proteomic data was correlated with the overall survival (OS), progression free survival (PFS), tumor volumes and anatomical phenotypes on imaging and the molecular information of each patient. After identification of a solid, relevant protein set for glioma diagnosis, surveillance and prognostication, protein sets were externally validated in a cohort of 50 glioma patients and 25 healthy controls.
Results
Overall, we measured 646 total proteins across glioma plasma samples, which were used for further downstream analysis. Twenty-six single proteins significantly discriminated the plasma proteome of glioma patients from healthy individuals. A set of 13 proteins allowed to differentiate gliomas from healthy controls with a sensitivity of 0.942 and specificity of 0.965. Moreover, we identified proteins significantly associated with the time of survival and the anatomical phenotype of the tumor.
Conclusions
Using the plasma proteome as a tool for diagnosis, surveillance and prognostication of glioma patients is feasible with a relatively high accuracy. Moreover, the plasma proteome correlated with the anatomical phenotype of the tumor, potentially bearing therapeutic implications in the future.

**P086**

**Treatment of Pediatric and Adult Hydrocephalus due to Fourth Ventricle Outlet Obstruction: Our Institutional Experience and Systematic Review of the Literature**

MM Etter, T Vernik, F Ebel, L Greuter, R Guzman and J Soleman

University Hospital Basel, Basel, Switzerland

Objective
Fourth ventricle outlet obstruction (FVOO) is a rare form of non-communicating tetraventricular hydrocephalus, characterized by disproportionate enlargement of the fourth ventricle due to occlusion of the foramina of Magendie and Luschka. It is associated with central nervous system infections, intracranial hemorrhage, and congenital anomalies such as Chiari malformation type I (CMI). If no cause is identified, it is termed idiopathic FVOO. Due to its varied etiology and frequent misdiagnosis, standardized management guidelines are lacking. This study aimed to identify and analyze reported FVOO cases in the literature and from our institution, focusing on diagnostic approaches and management strategies.
Methods
A systematic literature search identified studies published up to November 2024. Included were randomized controlled trials, prospective and retrospective studies, case reports, and case series in English or German. Cases secondary to posterior fossa tumors were excluded. Additionally, institutional cases of both primary and secondary FVOO were retrospectively reviewed.
Results
A total of 933 records were identified; after removing duplicates, 650 were screened, and 45 studies met inclusion criteria, yielding 119 patients. Of these, 39 (32.8%) were children. Seventy-five (63%) had primary FVOO, 19 (16%) congenital forms, 17 (14.3%) a history of CNS infection, 6 (5%) perinatal intraventricular hemorrhage, and 2 (1.7%) arachnoid cysts. Endoscopic procedures (ETV or occipital endoscopy) were performed in 89 patients (74.8%), craniotomy in 22 (18.5%), and ventriculoperitoneal shunt (VPS) in 10 (8.4%).
In our institutional database, 14 FVOO cases were identified. Three patients (21.5%) had primary FVOO, 9 (64.3%) had CMI, 1 (7.1%) had arachnoiditis, and 1 (7.1%) an arachnoid cyst. Among CMI cases, 7 (77.8%) underwent hydrocephalus treatment (ETV or VPS),

while 2 (22.2%) had foramen magnum decompression alone. All three primary FVOO cases, as well as the patient with the arachnoid cyst, were treated with ETV. The patient with arachnoiditis underwent suboccipital craniotomy and adhesiolysis.
Conclusions
FVOO is a rare, often underdiagnosed cause of tetraventricular hydrocephalus with varied etiologies. Endoscopic approaches, particularly ETV, are the most frequently used and effective treatments. Accurate diagnosis—often requiring advanced MRI techniques—is crucial. Given its heterogeneity, individualized treatment is essential, and furthe.

**P087**

**The Intra-Tumoral Heterogeneity of T Cell Antigens in Glioblastoma**

G Medici [1], M Wacker [2], M Dubbelaar [2], J Bauer [2], F Hanssen [3], C Schwitalla [3], AB Patterson [4], AM Zeitlberger [4], O Bozinov [4], H Rammensee [2], E Le Rhun [1], L Regli [1], M Weller [1], JS Walz [2] and MC Neidert [4]

[1] University Hospital Zurich/University of Zurich, Zürich, Switzerland
[2] University and University Hospital Tübingen, Tübingen, Germany
[3] University of Tübingen, Tübingen, Germany
[4] Hoch Health Ostschweiz Kantonsspital St. Gallen, St. Gallen, Switzerland

Aims
Glioblastoma remains the most common, ultimately fatal malignant brain tumor in adults. The limited effectiveness of current glioblastoma treatments can be attributed, at least in part, to the intricate intra- and inter-tumoral heterogeneity.
Methods
To entangle this complexity, we employed a multi-omics approach, focusing on the immunological landscape in three distinct tumor regions: the hypoxic/necrotic center (CORE), the contrast-enhancing rim (CER) and the peritumoral infiltration zone (INF). We mainly focus on the peritumoral infiltration zone, as this region is likely to be left behind after surgery and contributes to tumor recurrence. Our study offers a comprehensive regional map of T cell antigens derived from a multi-omics methodology encompassing HLA ligandomics, transcriptomics, and whole-exome sequencing.
Results
We provide novel knowledge on the intra-tumoral heterogeneity of both HLA-I and -II naturally presented tumor-specific peptides in glioblastoma: A total of 31,227 unique HLA-I and 22,340 unique HLA-II peptides from all three zones were identified in 12/15 patients with glioblastoma. Overlap analysis of glioblastoma-derived peptides and a benign tissue immunopeptidome database (https://hla-ligand-atlas.org) identified 44% of HLA-I and 44% of HLA-II peptides as tumor-exclusive. Among these exclusive HLA class I ligands, 16%, 17%, and 15% and of the HLA-II tumor-associated antigens (TAAs) 16%, 19%, and 42%, were exclusively presented in the INF, CER, or Core zones, respectively. 6% of HLA-I and 1% of HLA-II peptides were presented with high frequency among all three zones. Top-ranking targets underwent further functional characterization through in vitro immunogenicity assays with autologous regional TIL and PBMC, revealing peptide-specific T cell memory responses for both types of immune cells compartments.
Conclusions
This extensive exploration sheds light on the intra- and inter-tumoral heterogeneity of naturally presented T cell antigens as well as their immune recognition within the tumor and in the periphery.

**P088**

**Prognostic Value of the Therapy-Disability-Neurology (TDN) Scale for Surgical Adverse Events in Glioblastoma: A Multi-Center Analysis**

AM Zeitlberger [1], APR Terrapon [1], V Kälin [1], S Voglis [2], F Vasella [2], M Overstijns [3], N Neidert [3], J Beck [3], R Drexler [4], M Mohme [4], A Bieber [5], TA Juratli [5], IY Eyüpoglu [5], EA West [1], M Weller [2], L Regli [2], O Bozinov [1] and MC Neidert [1]

[1] Hoch Health Ostschweiz Kantonsspital St. Gallen, St. Gallen, Switzerland
[2] University Hospital Zurich, Zürich, Switzerland
[3] Medical Center University of Freiburg, Freiburg, Germany
[4] University Medical Center Hamburg-Eppendorf, Hamburg, Germany
[5] Carl Gustav Carus University Hospital, Technische Universität Dresden, Dresden, Germany

Aims
As new treatments for glioblastoma are being investigated, surgery remains at the forefront of therapy for this invariably fatal tumor entity. The systematic reporting of adverse events (AE) is crucial for comparing surgical outcomes across clinical trials and other research studies. The Therapy-Disability-Neurology (TDN) scale was recently introduced as a multidimensional, patient-centered classification system for assessing AE in neurosurgery. This multi-center study aimed to assess the robustness and utility of the TDN scale in patients receiving surgery for glioblastoma.
Methods
We included adult patients undergoing surgery for IDH1/2 wildtype glioblastoma across five neurosurgical departments in Switzerland and Germany between 2013 and 2020. AE occurring until discharge and during the 3-month follow-up were classified according to the TDN scale. Demographic, clinical, and volumetric data from both prospective and retrospective patient registries were analysed. The correlation between the TDN score and preoperative clinical markers, including the Karnofsky Performance Status (KPS) and tumor volume, was assessed. Additionally, multivariate analysis was used to examine the relationship between the TDN score at discharge and the 3-month follow-up with survival, adjusting for potential confounders such as the MGMT promotor methylation status.
Results
In total, 1181 patients (40.4% female, mean age at surgery 62.9 $\pm$ 13.1 years) undergoing surgery for histologically confirmed IDHwt glioblastoma were included. AE were reported in 335 (28.4%) patients at discharge and 330 (27.9%) patients at the 3-month follow-up. The severity of AE at discharge as graded by the TDN score correlated with the overall survival.
Conclusions
A higher TDN score correlated with poorer survival outcomes in our cohort of glioblastoma patients. This highlights the potential of the TDN score as a valuable prognostic tool for assessing both postoperative complications and long-term survival. Our findings suggest that the TDN score could enhance outcome reporting in clinical trials and improve the evaluation of adverse events following tumor resection.

**P089**

**Predicting Preoperative and Postoperative Risk of Epilepsy in Patients Undergoing Craniotomy for Supratentorial Meningiomas: A Comprehensive Clinical and Radiological Analysis**

M Valença [1], J Fandino [1] and J Kienzler [2]

[1] Klinik Hirslanden Zürich, Zürich, Switzerland
[2] CHUV—Centre hospitalier universitaire vaudois, Lausanne, Switzerland

Aims
This study investigated clinical and radiological factors that may predict the onset of epilepsy in patients before and after craniotomy for supratentorial meningioma excision. We also aimed to develop a scoring system to evaluate the risk of epilepsy before and after surgery.
Methods
The clinical and radiological data of 343 adult patients who underwent meningioma resection at the Kantonsspital Aarau (2008–2018) were retrospectively analysed. Follow-ups were scheduled at 3–8 weeks, 1 year, 2 years, and 5 years after surgery. A systematic review and meta-analysis were conducted using Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines. Univariate analyses were performed using chi-square tests, and multivariate analyses were performed using logistic regression to identify independent predictors. Meta-regression was conducted on data pooled from 19 studies to identify significant risk factors.
Results
Meta-regression analysis showed that the absence of preoperative deficits (OR 2.4914, $p = 0.027$) and peritumoural oedema (OR 2.2254, $p < 0.001$) were independent predictors of the preoperative seizures. Peritumoural oedema (OR 1.5248, $p = 0.019$), postoperative complications (OR 3.3502, $p < 0.001$), preoperative seizures (OR 2.80, $p < 0.001$), tumour recurrence/progression (OR 1.92, $p = 0.011$), and tumour size > 3.5 cm (OR 1.6076, $p = 0.050$) were identified as independent predictors of postoperative seizures at the 1-year follow-up in the meta-analysis. A predictive score was designed using these findings and R-script.
Conclusions
This study of 343 patients and meta-analysis identified that preoperative seizure risk increased with male sex, absent focal deficits/headaches, prior radiation, and peritumoral edema, while stroke history and skull base location were protective. Postoperatively, complications, infiltration of the brain, midline shift, tumor volume, and reoperation increased risk, while right-sided tumors and hemosiderin deposits were protective. Our predictive score offers a valuable tool for optimizing AED timing and surgical planning, though additional prospective validation studies across diverse populations and settings are needed to confirm its reliability and adaptability.

**P090**

## Outcomes of Anterior Temporal Lobectomy Compared to Gross Total Resection for the Treatment of Temporal Glioblastoma

M Philipp [1], J Fandino [2] and JC Kienzler [1]

[1] Universität Zürch, Zürich, Switzerland
[2] Hirslanden AG, Klinik Hirslanden, Zürich, Switzerland

Objective
This study aimed to compare clinical and radiological outcomes of anterior temporal lobectomy (ATL) and standard gross total resection (GTR) in patients undergoing surgical treatment of temporal Glioblastoma (GBM). The primary endpoints were progression-free survival (PFS) and overall survival (OS). The secondary endpoints included postoperative morbidity, seizure-freedom, and cognitive performance.
Methods
This retrospective analysis included a series of 39 patients who underwent surgical treatment for temporal GBM at Kantonsspital Aarau between January 2007 and December 2020. A total of 23 (59%) patients underwent ATL (ATL group) and 16 patients (41%) underwent GTR (GTR group). Tumor characteristics, including size, WHO grade, radiological, molecular and histopathological findings alongside clinical variables including sex, age,

perioperative morbidity, and postoperative Karnofsky Performance Status (KPS) were included in this study.
Results
No significant difference in PFS was observed between the ATL and GTR groups (HR = 0.75, $p = 0.45$). However, a trend towards prolonged PFS was observed in the ATL group. OS did not differ significantly between the two groups (HR = 1.14, $p = 0.68$). Postoperative morbidity and preoperative and postoperative seizures did not differ significantly ($p > 0.05$) between the groups. Across the cohort, the median PFS was 10.3 months, and the median OS was 17.5 months. Tumors in the ATL group were significantly larger ($p < 0.05$) and more diffusely infiltrating ($p = 0.031$) than those in the GTR group.
Conclusions
ATL appears to be a safe surgical approach for temporal GBM demonstrating a trend towards prolonged PFS, without significant differences in OS, seizure-freedom, postoperative morbidity, and cognitive performance, compared to GTR. Despite the larger and more infiltrative tumors in the ATL group, the results of this study demonstrated a trend rather than a significant improvement in PFS, likely due to tumor size and diffuse infiltration acting as confounding factors.

**P091**

**The clinical impact of ventriculostomy-related hemorrhage**

R Chen, M Poretti, FM Ebel and M Roethlisberger

Universitätsspital Basel, Basel, Switzerland

Background
Ventriculostomy-related hemorrhage (VRH) is a common complication of external ventricular drain (EVD) insertion, but its clinical significance remains unclear. A previous study suggested an association between EVD-associated infection (EVDAI) and VRH. However, due to small sample size, no definitive conclusion could be drawn. This study aims to assess the significance of VRH and investigate whether VRH extent is a risk factor for EVDAI.
Methods
We conducted a retrospective analysis of patients who underwent ventriculostomy at our institution from 2009 to 2023. VRH were diagnosed by computed tomography. VRH volumes were quantified using a semi-automated segmentation tool and were classified as Grade 1 ($\leq$1 cc), Grade 2 (>1 cc and $\leq$7.5 cc), and Grade 3 (>7.5 cc).
Results
A total of 494 patients were included, with a VRH and EVDAI rate of 13% (63/494) and 10% (50/494), respectively. Three out of 494 (<1%) patients developed new neurological symptoms due to VRH, all of whom had at least VRH Grade 2 (Grade 2: 2/14 [14%], Grade 3: 1/2 [50%]). No significant association was found between VRH extent and EVDAI ($p = 0.54$). However, greater VRH extent was associated with symptomatic VRH ($p < 0.001$), with a significant association between Grade 3 VRH and symptomatic cases (OR: 28.13, 95% CI: 1.29–649.98, $p = 0.034$).
Conclusions
This study found no significant association between VRH extent and EVDAI. However, larger VRH volumes were found to be associated with an increased risk of developing new neurological symptoms, highlighting the predictive value of volumetric assessment.

**P092**

**Spinal Cord Injury in Severely Injured Patients: Results from the Swiss Trauma Registry**

N Hejrati [1], F Stengel [1], MG Fehlings [2], C Maschmann [1], MN Stienen [1] and KO Jensen [3]

[1] HOCH Health Ostschweiz, Kantonsspital St. Gallen, St. Gallen, Switzerland
[2] University Health Network, Division of Neurosurgery and Spine Program, University of Toronto, Toronto, Canada
[3] Universersity Hospital Zürich, Zürich, Switzerland

Background and Objectives
Traumatic spinal cord injuries (SCIs) in the context of severe trauma are rare, and patient demographics are infrequently reported. This study aimed to assess patient demographics in acute traumatic SCI in the context of severe injuries in Switzerland and to evaluate differences in demographics and outcomes stratified by timing of surgery.
Methods
We analyzed data from the Swiss Trauma Registry (STR) from 2015–2024. The STR includes patients with major trauma (injury severity score [ISS] $\geq$ 16 and/or abbreviated injury scale [AIS] head $\geq$ 3) admitted to any level-one trauma centre in Switzerland. We evaluated patient characteristics, complications, and hospital outcomes, which were further stratified by early (<24 h) and late ($\geq$24 h) surgery.
Results
Among 24,328 patients, 6819 (28%) sustained spinal injuries, and 383 (1.6%) had concurrent SCI with an incidence of 0.44 cases per 100'000 inhabitants. The median age was 52 years (IQR 31–70) and 73.6% were male. The primary causes were falls (63.1%) and road traffic accidents (29.6%). The in-hospital mortality rate was 4.7%. Late surgery patients more often had concomitant moderate or severe traumatic brain injuries (31% vs. 14%, $p = 0.009$) and were more likely to have no fractures or dislocations of the spine (22.8% versus 6.8%, $p = 0.001$). Patients who underwent early surgery had shorter hospital stays (9 d, [5–16] versus 16 d, [9–24]; F = 13.92, $p < 0.001$). Late surgery was associated with a higher likelihood of developing two and more complications (OR 2.57, 95% CI 1.18–5.63, $p = 0.018$), including urinary tract infections (OR 12.13, 95% CI 2.76–53.41, $p = 0.001$) and multiple organ failure (OR 12.99, 95% CI 1.64–102.83, $p = 0.015$).
Conclusions
This study offers insights into the characteristics and outcomes of acute SCI care in severely injured patients. Despite its low incidence, the acute management of this patient population remains highly challenging. Our findings suggest early stabilization of spinal injuries in severely injured patients may reduce hospital stays and complications.

**P093**

## Bidirectional control of subthalamic beta-activity via deep brain stimulation neurofeedback in Parkinson's disease

O Bichsel [1], M Oertel [2] and L Stieglitz [2]

[1] Zurich, Switzerland
[2] University Hospital Zurich, University of Zurich, Zürich, Switzerland

Aims
A lack of cognitive and motor flexibility is a hallmark of Parkinson's disease (PD). Exaggerated beta-activity (13–30 Hz) in motor cortico-striato-thalamo-cortical (CSTC) circuits is a known correlate of motor symptoms in PD. Early evidence suggests a similar role of beta-activity in cognitive CSTC loops, potentially contributing to cognitive impairment. As the subthalamic nucleus (STN) integrates both motor and cognitive information, we aimed to investigate whether patients with PD can learn to bidirectionally modulate STN beta-oscillations through neurofeedback using deep brain stimulation (DBS) electrodes.
Methods
Two previously published cohorts of PD patients with implanted STN-DBS electrodes participated in neurofeedback sessions. During these sessions, patients attempted to both

upregulate and downregulate STN beta-power using cognitive strategies, compared to a baseline (motor and cognitive rest). The pooled dataset allowed for sufficient power to evaluate bidirectional control. A linear mixed-effects model (LMEM) was employed to assess the effects of training and condition on beta-peak activity.

Results

Patients demonstrated significant learning effects over time in bidirectional beta-modulation ($p < 0.01$). Downregulation of beta-activity was particularly robust, with a mean reduction of approximately 22% relative to resting state ($p < 0.0001$). Interestingly, even upregulation attempts led to reduced beta-activity when compared to the cognitive rest condition, where pathological beta-levels were elevated.

Conclusions

This study provides evidence that patients with PD can learn to bidirectionally modulate subthalamic beta-activity via DBS-based neurofeedback. Notably, while both directions of control were learned, downregulation proved more effective. The finding that beta-activity was reduced during upregulation attempts relative to cognitive rest suggests that cognitive activation may inherently decrease pathological beta-activity. These results support the notion that heightened subthalamic beta-oscillations may underlie not only impaired motor flexibility but also deficits in cognitive flexibility in PD.

**P094**

**External Validation of the Timed Up and Go (TUG) Test in Spinal Tumor Patients—First results from the Swiss Spinal Tumor Register (Swiss-STR)**

O Kemp [1], S Rüssli [1], M Ziga [1], S Bäbler [1] and E Nevzati [2]

[1] Luzerner Kantonsspital (LUKS), Luzern, Switzerland
[2] University of Colorado School of Medicine, Aurora, CO, USA

Aims

Outcomes of patients after spinal surgery relies on physician or patient based subjective assessment, e.g., Patient related outcome measures (PROMs). The need for objective outcome measurements in spinal surgery has become more relevant in recent years. We aim to evaluate the validity of the Timed up and Go (TUG) test as an objective functional assessment tool in spinal tumor patients through its correlation with standardised outcome measures.

Methods

We conducted a prospective observational study using data from the Swiss Spinal Tumor Registry (Swiss-STR). Patients with spinal tumors and any degree of walking difficulty, due to neurological deficit or mechanical pain, undergoing surgical treatment were included. All patients were preoperatively assessed completing both, objective functional tests, TUG, Karnofsky Performance Status (KPS); and PROMs, Oswestry Disability Index (ODI), EQ-5D, Spine Oncology Study Group Outcomes Questionnaire (SOSGOQ2.0), and Visual Analog Scale (VAS). Pearson correlation coefficient (PCC) was used to assess the correlation between objective and subjective outcome measures. The values between 0–0.3 represent negligible, 0.3–0.4 weak, 0.4–0.7 moderate, and 0.7–1 strong correlations. $p$ value of $< 0.05$ was considered to be statistically significant.

Results

Forty patients out of 73 primarily screened were included with a mean age of 60 years (45% females). Metastatic tumors were predominant (72.5%). Primary spinal tumors (27.5%) included sarcomas, ependymomas, solitary fibrous tumors (SFT), astrocytomas, and osteoblastomas.

Subjective and objective measures included: mean TUG test time of 15.5 s, mean KPS of 73%, VAS pain score of 4.8, ODI of 41.1, SOSGOQ2 of 54.9, and EQ-5D index of 0.7. The TUG test showed moderate positive correlations with ODI (r = 0.52) and VAS (r = 0.40),

indicating that higher TUG times are associated with greater pain and disability. Moderate negative correlations were seen with KPS ($r = -0.53$) and EQ-5D ($r = -0.51$), reflecting that better functional status and quality of life were associated with faster TUG times. All correlations were statistically significant.

Conclusions

The external validation of the objective and simple to perform TUG Test showed a significant correlation with subjective outcome measures in perioperative spine tumor patients. The results support the TUG Test as a valid and useful tool, an appealing addition to routine clinical assessment in spinal tumor management.

**P095**

**Innovative Technique of Anchoring the Upper End of the Cervical Plate with C1 Anterior Arch Screw for Upper Cervical Tumors**

PK SINGH [1], D AGARWAL [2] and S CHANDRA [2]

[1] All India Institute of Medical Sciences, New Delhi, India
[2] AIIMS, Delhi, India

Aims

Upper cervical spine bony tumors pose a challenge to the surgeon due to their extensiveness and proximity to vital structures. It mandates reconstruction following resection to prevent instability. Our objective is to describe a technical note on upper cervical spine bony tumors, managed by surgical resection and C1 anterior arch screw with mesh cage reconstruction for anchoring the upper end of the cervical plate.

Methods

A retrospective review of patients with primary bony tumors of the upper cervical spine who underwent surgical resection between 2018 and 2022 was included in the study. Imaging work-up included computed tomography (CT), magnetic resonance imaging and CT angiogram.

Results

A total of 4 patients with primary bony tumors of the upper cervical spine underwent C1 anterior screw with mesh cage reconstruction. The mean age was $33.8 \pm 14.3$ years. Tumor extent was C2-4 in 2 patients (50%) and C2 in 2 patients (50%). Three patients had spinal instability neoplastic score (SINS) greater than 12 and were deemed unstable preoperatively, mandating stabilization procedure at the same setting. All patients underwent surgical resection: gross total resection (1, 25%), near-total excision (1, 25%), and tumor decompression (2, 66.7%). Surgery was staged in 3 patients (75%) due to the extensiveness of the tumor and massive blood loss. There was no perioperative mortality with major complications in all 4 patients. Mean post-operative Nurick grading was $1.5 \pm 1.3$ (range 0 to 3). All patients were ambulatory and showed neurological improvement post-operatively with a mean follow-up of $37.5 \pm 21.9$ months (range 22 to 70 months) with no recurrence and evidence of fusion on the latest imaging. Three patients (75%) received adjuvant therapy.

Conclusions

Radical resection of tumors involving the upper cervical spine requiring C2 corpectomy is rare and extremely challenging. En-bloc resection is not always feasible. Neurosurgeons can consider using the anterior arch as an anchor point. The use of intraoperative navigation facilitates the precise placement of the C1 arch screws.

**P096**

**Evolution in Management of Hangmans Fracture: From C2 Pedicle Alignment to C2 Pedicle Reformation**

PK SINGH [1] and S CHANDRA [2]

[1] All India Institute of Medical Sciences, New Delhi, India
[2] AIIMS, Delhi, India

Aims
Opinions vary regarding optimal treatment of unstable hangman's fractures. Upper cervical spine surgery is complex and challenging. Advent of intra operative computed tomography and image guidance has revolutionized its treatment. Aim is to demonstrate anatomical repair of C2 pedicle in hangman fracture and to do pedicle reformation in old and complicated hangmans fracture.
Method
This is a prospective observational study. Nine patients operated by single surgeon from 2012 to 2018 were included. In initial seven patients C2 pedicle screw C3 C4 lateral mass screw and rod fixation was done. The last two patients operated were old injuries with no C2 pedicles available for pedicle screw.
Results
Patients age ranged from 14 years to 60 years with male female ratio of 8:1. All 5 patients having neurological deficit have improvement in power. Initial 7 patients have good healing of fractured C2 pedicle. The last 2 patients were old fractures with one having severe angulation and displacement and other having spondyloptosis with C2 body placed anterior to C4 body. In both of these patients there was no C2 pedicle as it got absorbed. In both these patients direct C2 body screw were placed and pedicle reconstruction was done. Both patient improved and are doing well. C1 C2 joint motion was preserved in all.
Conclusions
We have first time in world developed technique of C2 pedicle reformation in 2 old hangmans fracture with reabsorbed pedicles. We have not included C1 in any instrumentation which helped us in preservation of motion at C1 C2 joint.

**P097**

**Pediatric Cervical Kyphosis—An Enigma**

R Kumar

AIIMS, New Dehli, India

Aim
To understand etiopathogenesis and management dilemma of pediatric cervical kyphosis.
Methods
We report series of three cases of pediatric cervical kyphosis in very young age less than five years. All of these patients had partial agenesis of cervical vertebra from C 3 TO C7 with C4-5 anterolisthesis causing severe cord compression, leading to quadriparesis. All patients underwent 360 degree fusion in two stage procedures. Challenge was to achieve good fixation as cervical vertebra were partially formed, hence each patient needed individualized management and fixation techniques.
Results
All patients stood surgery well. Two patients had improvement in Neurological status and one had stable neurological status without further progression of neurological deficit. There were no complications.
Conclusions
Pediatric cervical kyphosis is a challenge and needs individualized, meticulous planning for successful outcome.

**P098**

**Swiss National Spinal Implant Registry SIRIS Spine: Methods and First Results**

T Jentzsch [1], R Schär [2], D Bellut [3], D Haschtmann [4] and E Aghayev [5]

[1] Balgrist University Hospital, Zürich, Switzerland
[2] Inselspital Bern, Bern, Switzerland
[3] USZ, Zürich, Switzerland
[4] Schulthess Klinik, Zürich, Switzerland
[5] Lindenhofgruppe AG, Bern, Switzerland

Introduction
Spinal surgery practices vary widely, highlighting the need for real-world data to inform clinical and policy decisions. We herein introduce SIRIS Spine, the world's first mandatory nationwide spinal implant registry, aimed at advancing spine surgery through systematic data collection and analysis.
Methods
SIRIS Spine, governed by the SIRIS Foundation and operated by EUROSPINE with IT support from NEC Software Solutions, is backed by national professional associations and integrated into Switzerland's acute care quality framework (ANQ) since January 2021. Hospitals are mandated to register eligible cases and bear the associated costs. A scientific advisory board ensures data integrity, while a steering committee oversees operations. The registry collects demographic, clinical, and implant data, with optional electronic patient-reported outcomes. Participating hospitals receive comparative reports. Initially, the registry included lumbar fusions (2021) and expanded in 2022 to include kypho-/vertebroplasties for osteoporotic fractures and related revisions.
Results
From 2021 to 2023, SIRIS Spine registered 12,815 surgeries across 11,789 patients from 91 hospitals, involving 75,522 implants from 40 manufacturers. Degenerative disease was the most common indication (61.6%). Patients had a mean age of 66.8 years, were predominantly female (58.7%), and mostly non-smokers (76.6%). The average BMI was 26.3 $kg/m^2$, with ASA category 2 being most frequent (53.1%). Nearly half had prior surgeries at the same or adjacent segment (49.6%). Midline approaches (74.8%) and TLIF prodedures (56.7%) were most common. Reoperations/revisions occurred in 6.9%, with higher rates among older, overweight, and higher-risk patients.
Conclusions
SIRIS Spine is the first mandatory nationwide spinal implant registry globally. Its realization highlights the importance of strong organization and stakeholder involvement. Initial analyses confirm a robust data foundation, though simpler inclusion criteria and better validation in clinical practice are needed. Future efforts will focus on improving data quality and expanding inclusion to all lumbar surgeries involving implants. SIRIS Spine will continue as a valuable national and international initiative.

**P099**

**Risk of Recurrence and Remnant Growth of Clipped Intracranial Aneurysm in the Era of Three-Dimensional Digital Subtraction Angiography: A Systematic Review and Meta-Analysis**

S Marbacher [1], DR Vogt [2], P Trost [3], DW Zumofen [4], R Jabbarli [5], M Wostrack [6], GA Schubert [3], BE Grüter [7], L Andereggen [8] and L Andereggen [8]

[1] Kantonsspital Aarau, Aarau, Switzerland
[2] Department of Clinical Research, University of Basel, University Hospital Basel, Basel, Switzerland

[3] Department of Neurosurgery, Kantonsspital Aarau, University of Bern, Bern, Switzerland
[4] Neurosurgery, Maimonides Medical Centre, SUNY Downstate University, New York, NY, USA
[5] Department of Neurosurgery and Spine Surgery, University Hospital Essen, University of Duisburg-Essen, Essen, Germany
[6] Department of Neurosurgery, School of Medicine and Health, Technical University of Munich, Munich, Germany
[7] Department of Neurosurgery and Neuroradiology, HOCH Health Ostschweiz, St. Gallen, Switzerland
[8] Department of Neurosurgery, Kantonsspital Aarau, Aarau, Switzerland

Background
Our current understanding of intracranial aneurysm (IA) recurrence and remnant growth after surgical clipping is primarily based on literature utilizing two-dimensional digital subtraction angiography (2D-DSA) imaging data. However, 2D-DSA is known to miss small remnants, which makes it difficult to clearly differentiate between these two clinically relevant conditions. As a result, current risk estimates could be inaccurate.
Aim
By conducting a systematic review and meta-analysis focusing on 3D-DSA based data we aim to obtain more robust estimations on incidence rates of IA remnants, remnant growth, and IA recurrence after clipping. The findings are intended to provide a basis for more accurate patient education and more patient-specific follow-up strategies after IA clipping.
Methods
A systematic literature review was performed in PubMed up to 11 April 2024. Meta-analyses were performed using mixed-effects logistic regression models with a random intercept for each study. Using 3D-DSA as the reference standard, we calculated the false negative rate of 2D-DSA in detecting aneurysm remnants. We report event rates and risk ratios for IA recurrence in completely versus incompletely clipped aneurysms and analyze remnant growth in relation to rupture status, remnant size, patient sex, or age.
ResultsOut of 11,221 articles screened, 38 studies met the inclusion criteria and were included in the final analysis. The average proportion of remnants was estimated at 23.5 [19, 28.7]% when using 3D-DSA. The false negative rate of 2D-DSA in detecting remnants was 51.7 [38.6, 64.6]% overall, and 78.9 [65.5, 88.1]% for remnants <2 mm. The relative risk for remnants is about twice as high for ruptured as for unruptured IAs (RR 2.0 [1.4, 2.9]). Recurrence of incompletely clipped IAs was more frequent 21.5 [13.4, 32.6]% than recurrence of completely clipped IAs 0.7 [0.2, 2.3]%, corresponding to a fifteen times higher relative risk (RR 15.7 [7.5, 32.7]).
Conclusions
Based on 3D-DSA data, the rate of IA remnants after clipping is substantially higher than previously reported, particularly in ruptured IA. The risk of recurrence of a completely clipped IA is extremely low or negligible, while on average every fourth to fifth IA remnant demonstrates regrowth. These findings provide a more accurate basis for patient counselling, re-defined risk assessment, and individualized patient-specific follow-up strategies for patients undergoing IA surgery.

**P100**

**Ultrasound-Guided Versus Stereotactically Navigated Ventriculoperitoneal Shunt Placement: A Randomized, Controlled Trial**

S Leu, T Hallenberger, J Rychen, L Pacan, E Christodoulou, KA Blackham, L Greuter, FS Halbeisen, E Taub, B Westermann, R Guzman, L Mariani and J Soleman

University Hospital of Basel, Basel, Switzerland

Background
Ventriculoperitoneal shunt (VPS) placement is a common neurosurgical procedure, and accuracy of catheter placement is crucial to the outcome. Short operation times are important for cost-effectiveness and to prevent infections. Ultrasound-guided (US-G) VPS placement has not yet been compared to stereotactically navigated placement in a randomized controlled trial.
Methods
Patients undergoing VPS placement at our institution were randomly assigned to US-G or stereotactically navigated VPS placement in a 1:1 ratio. The randomization was stratified by age (over/under 40 years) to avoid intergroup differences in age-correlated etiologies of hydrocephalus. Ultrasound guidance was performed with a burr hole probe, and stereotactic navigation with standard optical tracking. The primary outcome in this trial was the surgical intervention time, which is the total duration of the preoperative measures taken in the operating room by the neurosurgical team, and of the operation itself. Secondary outcomes included the accuracy of catheter positioning, incidence of VPS dysfunction and need for revision surgery, operation and anaesthesia times, number of ventricular puncture attempts, and complications.
Results
136 patients were recruited and operated on from February 2020 to June 2024. Patients in the US-G group had significantly shorter surgical intervention times compared to patients in the stereotactic navigation group ($p$ = 0.001). Accuracy of catheter placement, VPS dysfunction needing revision surgery, and rate of complications were comparable in both groups. Number of ventricular puncture attempts was significantly higher in the US-G group, probably explained by the steep learning curve of the technique.
Conclusions
US navigation is significantly more time-efficient than stereotactic navigation while yielding comparable accuracy in catheter placement and complication rates.

**P101**

## Selection of the Recipient Vessel in Double-Barrel STA-MCA Bypass Surgery with the Assistance of Intraoperative ICG Fluorescence: A Case Report

S Bauer [1], T Kahles [2], M Diepers [3], G Schubert [1], L Andereggen [1] and S Marbacher [1]

[1] Department of Neurosurgery, Cantonal Hospital Aarau, Aarau, Switzerland
[2] Department of Neurology and Stroke Center, Cantonal Hospital Aarau, Aarau, Switzerland
[3] Department of Neuroradiology, Cantonal Hospital Aarau, Aarau, Switzerland

Introduction
Selection of the optimal recipient artery in superficial temporal artery to middle cerebral artery (STA-MCA) in extracranial intracranial (EC/IC) bypass surgery is crucial for ensuring adequate cerebral perfusion. To facilitate this, various tools for pre- and intraoperative selection of the target vessels for STA-MCA EC/IC bypass surgery have been proposed with mixed results. Here, we present the use of intraarterial indocyanine green fluorescence video angiography (ICG-VA) to guide surgeons in intraoperative choosing recipient arteries in a case of double barrel STA-MCA EC/IC bypass surgery. ICG-VA provides real-time visualization of cerebral hemodynamics, assisting in vessel selection and anastomotic evaluation.
Case description
The presented case is about a 68-year-old patient with a history of ischemic stroke due to atherosclerotic right-sided MCA M1 occlusion with STA-MCA double barrel bypass surgery two years ago. During follow-up, an occlusion of the contralateral M1-segment occurred with subsequent hemodynamic cerebral ischemia and a need for bypass surgery of the left

MCA territory. Intraoperatively, we used intraarterial ICG-VA to guide decision-making in choosing the recipient arteries. Postoperative imaging studies showed restored cerebral perfusion. The patient is doing well upon follow-up with complete regression of symptoms and patency of all four bypasses.

Conclusions

This case highlights the usefulness of intraoperative ICG-VA in optimizing recipient vessel selection in double-barrel STA-MCA EC/IC bypass surgery. In traditional bypass surgery, the recipient vessel was selected based on diameter of the recipient and donor vessel and based on closeness to the hypoperfused parenchyma. ICG-VA shows the real-time perfusion of potential recipient vessels and helps eliminating hypoplastic or atherosclerotic vessels. Thus, fluorescence imaging enhances decision-making and has the potential to improve patient outcome by optimized revascularization of vascular territories with the most pronounced hypoperfusion.

**P102**

**Risk Factors for the Recurrence of Chronic Subdural Hematomas in Patients Undergoing Burr-Hole Drainage**

T Stössel

University Hospital Basel, Basel, Switzerland

Background

Chronic subdural hematoma (cSDH) is a common neurosurgical disease, particularly in the elderly. The recurrence of cSDH remains a clinical challenge, with several risk factors postulated. Although adjacent treatments to surgery exist, such as steroids, statins, and middle meningeal artery embolization, the number needed to treat is high, and patient selection remains unclear. This retrospective study aimed to identify risk factors for recurrence after burr hole drainage of cSDH.

Methods

A single-center retrospective study included consecutive patients undergoing burr-hole trepanation for cSDH between February 2012 and May 2023. The primary outcome was cSDH recurrence requiring surgical treatment. Demographic variables, preoperative radiological findings, medications, comorbidities, and postoperative findings were analyzed. Potential risk factors were analyzed using a univariate comparison.

Results

A total of 766 patients with a recurrence rate of 11.2% (86/766) were included. Significant preoperative risk factors for recurrence included subacute and separated hematoma types ($p = 0.038$, $p = 0.02$), larger hematoma volume (158 mL vs. 128 mL, $p = 0.004$), greater midline shift (8.46 mm vs. 7.24 mm, $p = 0.006$), lower preoperative GCS group (13–15 86% vs. 93.1%, 9–12 8.1% vs. 4.9%, <8 5.8% vs. 2.1%, $p < 0.001$), and higher Markwalder score ($p = 0.012$). Postoperative findings significantly associated with recurrence were larger cavity (74.1 mL vs. 52.9 mL, $p = 0.005$), greater midline shift (8.97 mm vs. 3.38 mm, $p = 0.01$) and on the day of discharge a higher Markwalder score ($p = 0.01$) and mRS score ($p < 0.001$).

Conclusions

This study highlights larger hematoma volume and greater midline shift both pre- and postoperatively, as well as hematoma characteristics (subacute and separated type), are key radiological predictors of cSDH recurrence. Additionally, lower neurological scores preoperatively and at discharge represent an increased risk of recurrence.

**P103**

**Long-Term Quality of Life and Mortality in Patients with Chronic Subdural Hematoma: 10-Year Follow-Up of the TOSCAN Trial**

T Petutschnigg, S Aschwanden, D Nasiri, D Bervini, M Murek, L Häni, CM Jesse, WJ Z'Graggen, A Raabe, P Schucht and J Goldberg

Inselspital—Universitätsspital Bern—Universitätsklinik für Neurochirurgie, Bern, Switzerland

Background
Despite the widespread perception that chronic subdural hematoma (CSDH) follows a benign course after treatment, growing evidence suggests an increased risk of excess mortality in affected patients. However, the determinants of this excess mortality and the long-term impact on quality of life (QoL) compared to an age-matched population remain largely unknown.
Methods
We followed-up patients treated for CSDH within the randomized controlled TOSCAN trial after 8–12 years. QoL was evaluated using repeated EORTC QLQ-C30 assessments via telephone interview and compared to an age-matched European cohort. Mortality was assessed by cross-referencing with the Swiss National Death Registry and its predictors were investigated with survival analysis.
Results
A total of 359 patients with a mean age at admission of 73.4 years (SD 11.0) were included. The mean follow-up duration was 10.5 years (SD 1.2). During this period, 157 patients (44%) died at a mean age of 83.5 years (SD 9.0). Of the 202 surviving patients, 145 (72%) were successfully contacted for QoL assessment. At a mean age of 79.8 years (SD 10.4) the mean global QoL score of survivors was 68.6 (0 = worst health state imaginable, 100 = best health state imaginable), which did not differ from the age-matched European reference population (69.6, $p = 0.54$). Significant predictors of mortality corrected for age were: NIHSS at admission (HR 1.10, $p < 0.05$), cardiac arrhythmia (HR 2.00, $p < 0.05$), presence of malignancy (HR 1.88, $p < 0.05$) and the 6-month modified Rankin scale (mRS) (HR 1.70, $p < 0.05$).
Conclusions
We identified key factors associated with mortality in CSDH patients, including higher NIHSS at admission, cardiac arrhythmia, malignancy and 6-month mRS. The long-term QoL remained comparable to the European reference population, indicating a favorable long-term prognosis after CSDH treatment.

**P104**

**The Efficacy and Safety of Microvascular Decompression Surgery for Neurovascular Compression Syndromes with a Retromastoid $\leq$2 cm-Keyhole Approach—A Systematic Review**

VF Weiger, R Guzman and J Rychen

Klinik für Neurochirurgie, Universitätsspital Basel, Basel, Switzerland

Aims
Neurovascular compression syndromes (NVCS) such as trigeminal neuralgia (TN) or hemifacial spasm (HFS) are characterized by paroxysmal craniofacial pain or spasms. Microvascular decompression (MVD) surgery—traditionally performed via a retromastoid craniotomy—is the preferred treatment when drug therapy fails or botox injections are insufficient. With growing interest in minimally invasive approaches and recent advancements in neuroendoscopy, neurosurgeons have started to use smaller approaches pushing the boundaries of a 2 cm-bone window. This study presents the first systematic review on the efficacy and safety of MVD via a $\leq$2 cm-keyhole retromastoid approach.

Methods
PubMed and Embase databases were searched. Studies involving adults with TN, HFS, GPN, geniculate neuralgia or vestibular paroxysmia who underwent de-novo MVD, Internal Neurolysis (IN) or Partial Rhizotomy (PR) via a retromastoid keyhole approach (diameter $\leq$2 cm) were included. Primary outcomes were long-term symptom relief (efficacy), mortality and complication rates (safety). Studies were excluded, if patients had undergone prior percutaneous surgical or radiotherapeutic procedures or had secondary causes of their condition. The methodological quality of eligible studies was quantified with the MINORS (Methodological Index for Non-Randomized Studies) tool.6.
Results
Out of 4110 screened records, 32 met the inclusion criteria (cumulative cohort of 5883 patients). The mean MINORS score was 9.9 $\pm$ 1.4 out of 16 (range: 7–12). 2219 (37.7%) of the patients had TN, 3625 (61.6%) HFS and 39 (0.7%) GPN. Procedures included MVD in 5825 (99.0%), IN in 43 (0.7%) and MVD combined with PR in 15 cases (0.3%). Excellent outcomes (i.e., complete symptom relief) were reported in 87.5% (14 studies, 1589/1815 patients) for TN, 88.6% (17 studies, 3204/3616 patients) for HFS and 89.7% (2 studies, 35/39 patients) for GPN patients. The overall surgical complication rate was 13.8% ([95% CI (11.1–16.5%)], 796/5767 patients), whereas the overall permanent complication rate was 10.3% ([95% CI (7.7%–13.0%)], 594/5767 patients).
Conclusions
MVD surgery via a retromastoid keyhole of $\leq$2 cm yields good outcomes across the most common NVCS, with excellent outcome rates similar to or exceeding those reported in large populations undergoing standard craniotomies. Complication rates were similarly consistent with existing literature. In total, these findings support the use of retromastoid keyhole approaches for NVCS.

**P105**

**Association of Baseline Infarct Size and Reperfusion Grade on Intracranial Hemorrhage in Patients Undergoing Thrombectomy**

A Stebner [1], SL Bosshart [1], S Fujiwara [2], D Frei [3], J Tarpley [4], D Dowlatshahi [5], JL Rempel [6], MD Hill [7], M Goyal [7] and J Ospel [7]

[1] University Hospital Basel, Basel, Switzerland
[2] Kobe City Medical Center General Hospital, Kobe, Japan
[3] Radiology Imaging Associates, Englewood, USA
[4] Providence Saint John's Health Center and The Pacific Neuroscience Institute, Torrance, USA
[5] University of Ottawa Faculty of Medicine, Ottawa, Canada
[6] University of Alberta Faculty of Medicine & Dentistry, Edmonton, Canada
[7] University of Calgary, Calgary, Canada

Aims
Better reperfusion status is associated with smaller infarct volumes and improved long-term clinical outcomes following mechanical thrombectomy in patients with acute ischemic stroke. However, if large tissue volumes are already infarcted at baseline, the integrity of the blood brain barrier becomes impaired, which is associated with an increased risk of intracranial hemorrhage. This study aims to investigate the interaction between reperfusion status, baseline ischemic changes, and subsequent intracranial hemorrhage following thrombectomy.
Methods
This is a secondary analysis of the ESCAPE-NA1 trial, a multicenter randomized controlled investigation in which patients with acute large vessel occlusion stroke undergoing endovascular treatment were randomized 1:1 to receive either the neuroprotective drug

Nerinetide or a placebo. Logistic regression models adjusted for age, sex, baseline NIHSS, hypertension, baseline glucose, onset time to randomization, and intravenous thrombolysis were used to estimate the association of ASPECTS and eTICI scores on post-treatment hemorrhage. Effect modification was assessed by including multiplicative interaction terms (ASPECTS*eTICI) in these models.

Results

A total of 1077 patients were included. Median age was 70.8 (interquartile range 60.7–79.7) and 543 (50.4%) patients were female. Any intracranial hemorrhage on 24-h follow-up imaging occurred in 368/1077 (34.2%) patients. There was evidence of effect modification for baseline ASPECTS and final angiogram eTICI score on the occurrence of any intracranial hemorrhage ($p = 0.008$). Marginal probabilities showed an increased risk of hemorrhage in patients with lower ASPECTS when eTICI scores were higher. This association was reversed in patient with small baseline ischemic changes and successful reperfusion. No association was found between higher eTICI scores and an increased risk of symptomatic intracranial hemorrhage or parenchymal hematoma.

Conclusions

The association between post-thrombectomy reperfusion status and post-treatment hemorrhage may be modified by the extent of baseline ischemia. Reperfusion appears to be associated with a reduced risk of hemorrhage in patients with small baseline infarcts but with an increase hemorrhage risk in patients with extensive ischemic changes at baseline. However, no significant association was found between the reperfusion grade and an increased risk of symptomatic intracranial hemorrhage or parenchymal hematoma.

**P106**

## Comparison of MRI-Based Traumatic Axonal Injury Grading Scores for Predicting Patient Outcome

E Debiolles

CHUV—Lausanne University Hospital, Lausanne

Amongst TBI, TAI is particularly associated with severe neurological impairment. While various MRI-based scoring systems exist to estimate injury severity, their respective ability to predict clinical outcomes is not established.

This study investigates the prognostic utility of seven established MRI-based scoring models in predicting: (1) in-hospital mortality, (2) early coma presentation—differentiating disorders of consciousness [DOC] from cognitive-motor dissociation [CMD], and (3) functional recovery at 6 months post-discharge, measured by the Glasgow Outcome Scale–Extended (GOSE).

We retrospectively analyzed 107 patients with moderate-to-severe TBI, based on GSC scores, admitted to our Acute Neurorehabilitation Unit. All underwent initial brain CT (Marshall classification), and 91 a subsequent brain MRI.

TAI lesions on MRI were qualitatively rated by two certified radiologists using the criteria specific to each scoring system which are the Adams (0–3), Firshing (0–5), Abu Hamdeh (0–4), Stockholm (1–4), Trondheim (0–5), Lausanne logistic regression (LR, 0–24) and Lausanne support vector machine (SVM, 0–31). Multivariable logistic regression, adjusted for age, GCS, and Marshall score, was used to examine the association between each score and three outcomes: in-hospital mortality, unfavorable coma profile (i.e DOC), and 6-month unfavorable outcome (GOSE $\leq 4$), with a corrected $p$-value set $< 0.007$ as multiple testing were performed. The relative performance of each score was compared using receiver operating characteristics curves.

87 patients survived and 17 had DOC, among the seven MRI-TAI scores, only the Lausanne LR (OR: 1.38[1.10–1.74], $p = 0.006$) and SVM (OR: 1.31[1.08–1.59], $p = 0.005$) scores significantly predicted in-hospital mortality. The Trondheim grading score (OR: 2.68[1.46–4.94],

$p$ = 0.002), Lausanne LR (OR:1.30[1.11–1.51], $p$ = 0.001) and SVM (OR: 1.23[1.09–1.39], $p$ = 0.001) scores significantly predicted the DOC status, with similar performance ($p$ = 0.47). Two scores were significantly related to poor functional outcome at 6 months in particular Stockholm grading score (OR: 3.37[1.53–7.40], $p$ = 0.003), Lausanne LR (OR:1.28[1.11–1.47], $p$ = 0.001) and SVM (OR: 1.15[1.05–1.26], $p$ = 0.002) with similar performance ($p$ = 0.89). Only the Lausanne score (LR and SVM), consistently predicted in-hospital mortality, DOC phenotype classification, and long-term functional outcome, which reinforce its significance in assessing patients 'outcome and prognostication.

**P107**

**Clinical presentation and Outcome of ruptured Basilar Artery Perforator Aneurysms—Results from the PERForator Aneurysm Registry (PERFAN)**

JM Raabe [1], S Rajbhandari [1], B Serrallach [1], EIP Piechowiak [1], J Goldberg [2], D Bervini [2], D Seiffge [3], J Gralla [1], WJ Z'Graggen [3], J Kaesmacher [1] and T Dobrocky [1]

[1] Inselspital—Universitätsspital Bern—Universitätsinstitut für Diagnostische und Interventionelle Neuroradiologie, Bern, Switzerland
[2] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurochirurgie, Bern, Switzerland
[3] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurologie, Bern, Switzerland

Background
Basilar Artery Perforator Aneurysms (BAPAs) are rare, but with the increasing availability of high- resolution imaging techniques, increasingly recognized etiology in patients presenting with a perimesencephalic subarachnoid hemorrhage (pmSAH).
Methods
BAPA cases were recruited from the international, multicenter, observational PERForator Aneurysm (PERFAN) registry spanning 2013 to 2025 and comprising 60 centers across 19 countries). The primary endpoint was excellent outcome (mRS 0–1) at 3–6 months. The secondary outcome included comparison of outcomes between patients managed conservatively (best supportive care) and those who received active treatment. Safety outcomes encompassed in-hospital mortality, and the rate of treatment associated adverse events.
Results
In total, 148 patients from 45 centers were included (83 treated with best supportive care, 65 actively treated). Age, WFNS on admission, aneurysm type, prevalence of hydrocephalus and vasospasm did not differ significantly between patients treated actively and those managed with best supportive care. There was a significant difference in the aneurysm size between the two groups (1.2 mm vs. 2 mm, $p$ value = < 0.001). Excellent outcome (mRS 0–1) at 3–6 months follow-up was observed in 71% (49/69) of conservatively, and in 56% (26/47) of actively treated patients.
The in-hospital mortality in conservatively treated patients was 12% (9/74) and 7% (4/58) among actively treated patients. The rate of treatment associated adverse events in actively managed patients included aneurysm rebleed, thromboembolic events and other peri- or postinterventional complications and was 23% (15/65).
Conclusions
This study presents the largest cohort of ruptured BAPA patients to date and challenges the historically benign perception of the entity, demonstrating non-negligible in-hospital mortality. Management decisions should carefully balance the high mortality observed in conservatively treated patients against the substantial risk of peri-interventional complications. These findings underscore the need for an individualized, risk-adapted treatment approach in patients presenting with pmSAH due to BAPA rupture.

**P108**

**Impact of Time Delay Between Symptom Onset and Presentation on Brain MRI Findings and Lumbar Infusion Test Parameters in Spontaneous Intracranial Hypotension**

BL Serrallach [1], L Häni [1], R Schär [1], J Kaesmacher [1], EI Piechowiak [1], J Beck [2] and T Dobrocky [1]

[1] Bern University Hospital (Inselspital), Bern, Switzerland
[2] University Hospital Freiburg i.B., Freiburg, Germany

Aims
Spontaneous intracranial hypotension (SIH) is a debilitating condition caused by a spinal CSF leak. Diagnosis relies on clinical symptoms (i.e., orthostatic headache) and imaging findings supporting the diagnosis. While symptom duration is known to influence clinical and lumbar infusion test (LIT) findings, its impact on imaging remains less well defined. This study examines how symptom duration affects brain MRI findings and LIT parameters.
Methods
This retrospective study included patients from 2012–2019 with SIH and a reference group without CSF leakage. Inclusion criteria were: (1) confirmed spinal CSF leak, (2) brain MRI within three months of LIT, and (3) documented symptom onset. Patients were stratified by duration between symptom onset and work-up into acute ($\leq$12 weeks) and subacute/chronic (>12 weeks) groups. The reference group had negative diagnostics. Brain MRI was assessed using the Bern SIH score. CSF dynamics were acquired during LIT.
Results
In total, 80 patients were included (33 acute SIH, 14 subacute/chronic SIH, 33 reference). Patients presenting acutely had significantly higher Bern SIH scores (9, IQR 6–9) than subacute/chronic (7, IQR 4–8) and reference groups (3, IQR 2–5; $p < 0.001$), more frequent dural enhancement (91% vs. 57% vs. 61%; $p = 0.008$), and smaller prepontine cisterns (2.6 mm, IQR 2.0–3.6 vs. 3.9 mm, IQR 3.4–4.6 vs. 5.6 mm, IQR 5.1–6.3; $p < 0.001$). SIH score, dural enhancement and prepontine cistern size were associated with symptom duration (all $p < 0.02$).
Patients with acute SIH also showed altered CSF dynamics, including lower lumbar baseline pressure (3.5 mmHg, IQR 1.5–5.2), plateau pressure (16.3 mmHg, IQR 12.4–21.6), and CSF outflow resistance (2.5 mmHg/[mL/min], IQR 2.0–4.2), vs. other groups (all $p < 0.01$, some < 0.001). Parameters normalized in the subacute/chronic group.
Conclusions
Symptom duration has a clear impact on SIH, shaping both brain MRI signatures and LIT-derived CSF dynamics. As the interval from symptom onset lengthens, both Bern SIH scores and lumbar pressure-volume parameters drift back toward normal; changes that may reflect progressive re-equilibration of the CSF compartment itself. Accounting for this time-dependent evolution can therefore sharpen diagnostic accuracy and staging in SIH.

**P109**

**Locating Spinal Leaks in Spontaneous Intracranial Hypotension: How Many Dynamic Myelographies Does It Take?**

S Rajbhandari [1], T Petutschnigg [2], L Häni [2], D Nasiri [2], J Goldberg [2], C Schankin [3], A Scutelnic [3], P Breiding [1], L Grunder [1], P Cimflova [1], D Brustmann [4], A Raabe [2], J Gralla [1], J Kaesmacher [1], J Beck [5], R Schär [2], E Piechowiak [1] and T Dobrocky [1]

[1] Inselspital—Universitätsspital Bern—Universitätsinstitut für Diagnostische und Interventionelle Neuroradiologie, Bern, Switzerland
[2] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurochirurgie, Bern, Switzerland
[3] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurologie, Bern, Switzerland

[4] Department of Radiology, University of Hradec Kralove, Hradec Kralove, Czech Republic
[5] Universität Freiburg, Department Neurozentrum, Klinik für Neurochirurgie, Freiburg, Germany

Background and Purpose
Accurate localization of cerebrospinal fluid (CSF) leaks in patients with spontaneous intracranial hypotension (SIH) is crucial for enabling targeted therapy. This study evaluates the diagnostic performance of dynamic myelography techniques in identifying the site of spinal CSF leaks and examines how many examinations are typically required-stratified by leak type and spinal level.
Materials and Methods
We retrospectively reviewed all SIH patients with a spinal longitudinal extradural CSF collection (SLEC) who underwent dynamic myelography at our institution between January 2013 and February 2025. 205 patients were included, all of whom underwent a diagnostic work-up using conventional dynamic myelography (CDM) and/or dynamic computed tomography myelography (DCTM) to localize the site of the CSF leak.
Results
Of the 205 SLEC-positive SIH patients (mean age: 50 $\pm$ 12 years; 67% female), 198 were included in the final analysis. Leak locations were ventral in 147 patients (74%), lateral in 49 patients (25%), and primary dorsal in 2 patients (1%). The CSF leak was localized on the first, second, third, or fourth dynamic myelography in 97 (49%), 70 (35%), 16 (8%), and 11 (6%) patients, respectively. The median number of dynamic myelography exams per patient was 2 (IQR 1–2; range 1–8), varying by leak type: 1 (IQR 1–2; range 1–5) for ventral leaks, 2 (IQR 1–2; range 1–6) for lateral leaks, and 6 (IQR 5–7; range 4–8) for dorsal leaks. A total of 160 patients (81%) were referred for microsurgical closure. The leak was confirmed intraoperatively at the pre-identified level in 153 patients (96%). Spontaneous sealing occurred in 2 pateints (1.3%) and wrong-level surgery was performed in 5 patients (3%).
Conclusions
Dynamic myelography is a reliable and accurate technique for localizing spinal CSF leaks in SIH patients with SLEC. In nearly half of cases, the leak is successfully identified on the first examination. When repeat imaging is required, results from prior exams can guide optimization of technique and patient positioning. Though rare, primary dorsal leaks present a notable diagnostic challenge due to low initial suspicion and complex imaging characteristics.

**P110**

## Patient Management After Flow Diversion for Unruptured Intracranial Aneurysms: A Literature Review and DELPHI Consensus

A Stebner [1], M Schüngel [2], SL Bosshart [3], S Fujiwara [4], G Milot [5], D Volders [6], K Uchida [7], C Hawkes [8], P Cimflova [9], M Monreu [10], I Fragata [11], A Paul [12], U Pensato [13], C Ulfert [14], D Frei [15], P Bhogal [16], J Schaafsma [17], S Nardai [18], S Zaidi [19], M Almekhlafi [3], S Nimjee [20], P Mosimann [21], J Kennedy [22], J Rempel [23], I Violiza [24], S Yoshimura [25], M Ribo [26], D Lopes [27], J Wong [3] and J Ospel [3]

[1] University Hospital Basel, Basel, Switzerland
[2] University Hospital Halle, Halle, Germany
[3] University of Calgary, Calgary, Canada
[4] Kobe City Medical Center General Hospital, Kobe, Japan
[5] Laval University, Quebec, Canada
[6] Dalhousie University, Halifax, Canada
[7] Hyogo Medical University, Nishinomiya, Japan

[8] Sunnybrook Health Sciences Centre/University of Toronto, Toronto, Canada
[9] University Hospital Bern, Bern, Switzerland
[10] Hospital Clinico San Carlos, Madrid, Spain
[11] ULS São José, Lisbon, Portugal
[12] Albany Medical Center, Albany, USA
[13] Department of Urology, IRCCS Humanitas Research Hospital, Rozzano, Milan, Italy
[14] UniversitätsKlinikum Heidelberg, Heidelberg, Germany
[15] Colorado Neurological Institute, Denver, USA
[16] The Royal London Hospital, Barts NHS Trust, London, UK
[17] University Health Network, Division of Neurosurgery and Spine Program, University of Toronto, Toronto, Canada
[18] Semmelweis University Center of Neurosurgery and Neurointervention, Budapest, Hungary
[19] University of Toledo, Toledo, USA
[20] Ohio State University Wexner Medical Center, Columbus, Canada
[21] University of Toronto & Toronto Western, Toronto, Canada
[22] Radcliffe Department of Medicine, Oxford, UK
[23] University of Alberta, Edmonton, Canada
[24] University of Tennessee Health Science Center, Memphis, TN, USA
[25] Department of Neurosurgery, Hyogo Medical University, Nishinomiya, Japan
[26] Universitat Autònoma de Barcelona, Barcelona, Spain
[27] Cerebrovascular and Comprehensive Stroke Center, Advocate Illinois Masonic Medical Center, Chicago, USA

Background
Unruptured intracranial aneurysms are a common and can have devastating outcomes if ruptured. Flow diversion has expended treatment options, especially for wide-necked and blister aneurysms. Yet, optimal follow-up re-treatment strategies in case of treatment failure remain unclear. A DELPHI consensus was initiated to understand current practice in aneurysm management after flow diverter treatment.
Methods
This DELPHI consensus was conducted during the 5T Think Tank, following a scoping literature review. Experts discussed the results, responded to iterative questionnaires, which started with four open-ended questions, and concluded with ten closed-ended questions.
Results
Of the 40 attendees, 24 participants (60%) identified as experts in flow diversion and participated in the DELPHI process, which involved a literature search and three DELPHI rounds. Consensus was reached on performing the first assessment of the flow diverter during the procedure using cone-beam CT (77.8%), and on timing of the first follow up (at 6 months, 70.8%). For follow-up timing, an annual (57%) or semi-annual (43%) schedule was favored. No preference emerged for the follow-up imaging modality, with slight preferences for MRA (29%), followed by DSA (25%), DSA + MRA (21%), CTA (17%), and DSA + CTA (8%). Aneurysm growth (>2 mm) was identified as a key criterion for re-treatment. It was thought that combining clinical and angiographic metrics could potentially improve re-treatment decision making compared to a purely angiographic outcome.
Conclusions
This DELPHI consensus highlights the complexity of decisionmaking for unruptured intracranial aneurysms. Despite these challenges, there was consensus among international experts on follow-up timing and decision drivers for re-treatment.

**P111**

**Predictors of Fast Progression in Glioblastoma: A Multi-Variable Analysis of Patient Characteristics, Tumor Genetic Alterations and MRI Perfusion Parameters**

R Ludovichetti, G Bertalan, N Hainc, A Bink, Z Kulcsar and A Todea

Department of Neuroradiology, University Hospital Zurich, Zurich, Switzerland

Purpose
The aim of this study was to identify clinical, molecular and imaging biomarkers predictive of rapid glioblastoma progression and their correlations with overall and progression-free survival.
Methods
A retrospective analysis was conducted on patients with glioblastoma between 2017 and 2021. The patients underwent DSC-MRI and DCE-MRI at the initial diagnosis, followed by surgery and radiochemotherapy. OS, PFS, and time to first radiological progression—defined as days between surgery and the first MRI indicating tumor progression—were calculated for each patient. Patients were classified as fast-progressors if progression was suspected within 3 months after surgery, and as non-fast progressors if progression occurred after 3 months. Tumor progression was defined based on the RANO 2.0 criteria (1). Correlations between perfusion parameters (rCBV, Ktrans, Vp and Ve) and molecular markers (MGMT promoter methylation, EGFR amplification, tp53 mutation) with OS and PFS were analyzed within these two groups. The Wilcoxon Rank-Sum Test was used for comparisons between groups. Statistical significance was set at $p < 0.05$.
Results
In total, 65 patients (mean age 58 $\pm$ 13 years; 37 males, 56.9%) with glioblastoma were included in the study. Of these, 23 were fast-progressors and 42 were non-fast progressors. Mean Ve values were 43% lower in fast-progressors compared to non-fast progressors ($p = 0.04$). In patients without EGFR amplification Ve values were 65% higher compared to those with amplification ($p = 0.008$). PFS was 19% longer in tp53 wild-type patients (228 $\pm$ 187 days) than in tp53-mutated patients (192 $\pm$ 217 days, $p = 0.04$). No significant difference in PFS was observed based on MGMT promoter methylation; however, OS was longer in methylated patients (726 $\pm$ 421 days) than unmethylated patients (442 $\pm$ 225 days, $p = 0.004$). No other significant correlations were found.
Conclusions
Although DSC-MRI is typically used for glioblastoma perfusion imaging, this study revealed that DCE-MRI had a stronger association with clinical outcomes. Lower Ve values on DCE-MRI were connected to rapid tumor progression, likely reflecting higher tumor cellularity and a reduced extracellular-extravascular space. Ve values were also lower in patients with EGFR amplification, a recognized marker of poor prognosis. These biomarkers may serve as non-invasive early indicators of tumor aggressiveness and prognosis.

**P112**

**Spinal CSF Volumetry in Patients with Spontaneous Intracranial Hypotension and Spinal CSF Leaks**

EI Piechowiak [1], J Gralla [1], A Raabe [2], R Schär [2], J Kaesmacher [1], T Petutschnigg [2], F Pisi [1], K Wolf [3], J Beck [3], J Rossel [4] and T Dobrocky [1]

[1] Inselspital—Universitätsspital Bern—Universitätsinstitut für Diagnostische und Interventionelle Neuroradiologie, Bern, Switzerland
[2] Inselspital, Universitätsklinik für Neurochirurgie, Bern, Switzerland
[3] Universität Freiburg, Department Neurozentrum, Klinik für Neurochirurgie, Freiburg, Germany
[4] Department of Clinical Research, University of Bern, Bern, Switzerland

Background and Purpose
Spontaneous intracranial hypotension (SIH) arises from cerebrospinal fluid (CSF) leakage at the spinal level, leading to craniospinal CSF depletion and frequently disabling symptoms. While alterations in intracranial CSF volume—particularly early depletion and post-treatment normalization—are well established in SIH, data on spinal CSF volumetry remain limited. This study aimed to quantify intrathecal spinal CSF volume in SIH patients before and after definitive leak closure and to compare these measurements with those of non-SIH controls.
Materials and Methods
In this retrospective single-center study, 35 patients with SIH and confirmed spinal CSF leaks (types 1–3) and 10 non-SIH controls were included. All SIH patients underwent surgical or endovascular closure and had high-resolution pre- and post-treatment isotropic 3D T2-weighted MR imaging. Intrathecal spinal CSF volumes were measured using semi-automated segmentation, excluding spinal longitudinal epidural fluid collections (SLEC) when present. Paired and unpaired statistical tests were applied.
Results
Following leak closure, SIH patients demonstrated a significant increase in spinal CSF volume (+13%, $p < 0.001$). Volume increases were observed in both SLEC-positive (+18%, $p < 0.001$) and SLEC-negative (+5%, $p = 0.018$) subgroups. No significant difference was found between pre-treatment SIH patients and controls, but post-treatment CSF volumes in SIH patients were significantly higher than those of controls (+13%, $p = 0.043$).
Conclusions
Spinal CSF volumetry effectively captures significant post-treatment increases in intrathecal CSF volume in SIH patients. The observation that post-treatment volumes exceed those of non-SIH controls may indicate a compensatory overshoot mechanism following prolonged CSF loss. These findings highlight spinal CSF volumetry as a promising biomarker for treatment response in SIH.

**P113**

## A Multistep Percutaneous Treatment Strategy for Aggressive Vertebral Hemangiomas Involving Direct Epidural Ethanol Injection

EI Piechowiak [1], T Dobrocky [1], J Gralla [1], J Kaesmacher [1], M Pileggi [2], I Maurizio [2], A Cardia [2], A Raabe [3], R Schär [3] and A Cianfoni [2]

[1] Inselspital—Universitätsspital Bern—Universitätsinstitut für Diagnostische und Interventionelle Neuroradiologie, Bern, Switzerland
[2] EOC Lugano, Lugano, Switzerland
[3] Inselspital, Universitätsklinik für Neurochirurgie, Bern, Switzerland

Introduction
Vertebral hemangiomas (VHs) are commonly incidental and asymptomatic spinal lesions, present in approximately 10–12% of the population. However, aggressive vertebral hemangiomas (AVHs) can extend into the spinal canal, leading to spinal cord or nerve root compression and requiring timely intervention to prevent permanent neurological deficits. Surgical treatment is often complicated by the high vascularity of AVHs, which increases the risk of significant intraoperative blood loss. While intraosseous ethanol injection is a well-established method for lesion sclerotization, it may inadequately address epidural components.
Methods
We conducted a retrospective analysis of 12 patients with symptomatic AVHs treated between 2017 and 2024 at three tertiary care centers. All patients underwent direct epidural ethanol injection followed by vertebral body cement augmentation. Clinical

and radiological outcomes were assessed using pre- and post-treatment imaging and follow-up evaluations.

Results

The cohort (mean age 50 years; 50% female) exhibited extensive epidural involvement with symptomatic spinal cord compression and/or pain. In 8 of 12 patients, the epidural component showed a size reduction exceeding 75%, and 11 patients experienced complete symptom resolution. Laminectomy was performed in 3 cases; corpectomy was avoided in all. Two patients experienced transient neurological worsening—one fully recovered, while the other had mild residual deficits attributed to a focal spinal cord ischemic lesion identified on follow-up MRI. No other major complications were observed.

Conclusions

Targeted direct epidural ethanol injection offers a minimally invasive alternative to more extensive surgical approaches such as corpectomy. This technique facilitates rapid reduction of compressive epidural components and may reduce the risk of retrograde arterial ethanol flow. Adjunctive vertebroplasty contributes to mechanical stabilization of the treated vertebral segment.

**P114**

## Complete Resolution of CSF Leak and Intracranial Hypertension Following Venous Stenting for Transverse Sinus Stenosis: A Case Report

E Torche Velez [1], S Iglesias Vargas [1], E Lopez Ferrada [2], M Torche Velez [1], J Varela Varela [2], JP Caze Candia [3], J Correa Peña [4] and J Mura Castro [5]

[1] Sanatorio aleman, Concepción, Chile
[2] Hospital guillermo grant benavente, Concepción, Chile
[3] Hospital Naval Almirante Adriazola Talcahuano, Concepción, Chile
[4] Hospital Herminda Martin, Chillan, Chile
[5] Institute of neurosurgery Dr Alfonso, Santiago, Chile

Aims

To describe the complete and sustained resolution of intracranial hypertension (IH) secondary to distal right transverse sinus stenosis with associated spontaneous cerebrospinal fluid (CSF) leak, and to contextualize venous stenting within the current evidence base.

Methods

A 27-year-old woman (body mass index: 32 kg/m$^2$) presented with daily holocranial headache for two years, later complicated by intermittent clear posterior rhinorrhea. Lumbar puncture revealed an opening pressure of 30 cm $H_2O$; fundoscopy showed no papilledema. Digital subtraction angiography demonstrated critical stenosis of the distal right transverse sinus with a trans-stenotic pressure gradient of 12 mm Hg. Under general anesthesia, an 8 $\times$ 40 mm self-expanding stent (Everflex) was deployed following systemic heparinization and dual antiplatelet therapy. In parallel, we conducted a narrative review of major series and meta-analyses on transverse sinus stenting for IH, and its association with spontaneous CSF leaks.

Results

The trans-stenotic pressure gradient decreased to <2 mm Hg immediately post-stenting. Headache and rhinorrhea resolved within 48 h. At one-month follow-up, the opening pressure was 18 cm $H_2O$ with no evidence of CSF leak. Follow-up digital subtraction angiography at 10 months demonstrated sustained stent patency and normalized venous flow. According to registry and pooled data (>900 patients), transverse sinus stenting results in clinical improvement in 80–96% of cases, with major complications in <2% and restenosis rates of 10–14% [1–4]. Case-control studies show that up to 79% of patients with spontaneous CSF rhinorrhea have significant transverse sinus stenosis [5,6].

Conclusions

Transverse sinus stenting effectively eliminates the pathological venous pressure gradient and can result in complete resolution of both intracranial hypertension and spontaneous CSF leak, even in the absence of papilledema. Venous imaging should be part of the diagnostic workup in atypical IH presentations. When a trans-stenotic pressure gradient $\geq$10 mm Hg is confirmed, stenting should be considered a first-line therapeutic option. Prospective multicenter trials are warranted to compare stenting with shunting or conservative management, and to establish evidence-based guidelines for antiplatelet therapy duration.

**P115**

## Complete Resolution of Trigeminal Neuralgia Secondary to a Pontine Arteriovenous Malformation Treated by Trans—Arterial Onyx Embolisation: Case Report

E Torche Velez [1], S Iglesias Vargas [1], E Lopez Ferrada [2], M Torche Velez [1], J Varela Varela [2], JP Caze Candia [3], J Correa Peña [4] and J Mura Castro [5]

[1] Sanatorio aleman, Concepción, Chile
[2] Hospital guillermo grant benavente, Concepción, Chile
[3] Hospital Naval Almirante Adriazola Talcahuano, Concepción, Chile
[4] Hospital Herminda Martin, Chillan, Chile
[5] Institute of neurosurgery Dr Alfonso, Santiago, Chile

Aims

To present a rare case of drug-refractory trigeminal neuralgia (TN) caused by a small pontine arteriovenous malformation (AVM) and to discuss the role of targeted Onyx embolisation in achieving immediate pain relief and angiographic cure in the context of the current literature.

Methods

A 60-year-old woman with paroxysmal lancinating pain in the right V2 division (Barrow IV) unresponsive to carbamazepine underwent MRI and digital subtraction angiography (DSA). Imaging showed a 16 $\times$ 9 mm pontine AVM (Spetzler–Martin II) fed by the anterior inferior and superior cerebellar arteries, draining via two tentorial veins with a 3 mm venous aneurysm. Under general anaesthesia, a microcatheter (Marathon) was navigated into the distal AICA and an Onyx-18 was injected until complete treatment of the malformation. Fluoroscopy time was 49 min. Post-operative and follow-up assessments included Barrow Facial Pain Scale and CT-angiography at 6 weeks and 5 months.

Results

Pain disappeared immediately after embolisation; the patient discontinued medication and remains Barrow I at 7 months. Follow-up angio-CT at 5 months confirmed persistent occlusion with no residual nidus or new lesions. No neurological deficits or haemorrhagic events occurred. A review of published AVM-related TN series shows complete pain relief in 66–100% after microvascular decompression or resection but with higher morbidity, whereas endovascular embolisation affords rapid analgesia in 60–100% and lower complication rates, particularly for small posterior-fossa AVMs supplied by a single feeder [1–4]. Stereotactic radiosurgery achieves $\geq$80% nidus obliteration at 5 years yet delays symptom improvement by several months and often needs bridging therapy [4,5].

Venous aneurysms increase annual rupture risk from 2–4% to 6% and strengthen the indication for early intervention [6].

Conclusions

Trans-arterial Onyx embolisation can be curative for Spetzler–Martin I–II pontine AVMs producing TN, offering immediate and sustained pain relief, complete angiographic obliteration and minimal morbidity. When anatomy is favourable—a single feeder and superficial

drainage—embolisation should be considered first-line ahead of radiosurgery or open surgery. Prospective multicentre studies comparing treatment sequences, quality-of-life metrics and cost-effectiveness are needed to refine therapeutic algorithms.

**P116**

## Monitoring Carotid Artery Stiffness Using Non-Contrast-Enhanced 4D Dynamic MR Angiography

I Montón Quesada [1], T Baumgartner [2], AC Ogier [1], R Ferincz [1], J Ledoux [3], CW Roy [1], J Yerly [3], L Hirt [2] and RB van Heeswijk [1]

[1] Department of Radiology, Lausanne University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland
[2] Cerebrovascular Center, Neurology Service, Department of Clinical Neuroscience, Lausanne University Hospital (CHUV), Lausanne, Switzerland
[3] Department of Radiology, Lausanne University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland & CIBM Center for BioMedical Imaging, Lausanne, Switzerland

Aims
Static carotid artery anatomy and atherosclerotic plaque can be studied with magnetic resonance imaging (MRI) [1], but stiffness and other dynamic properties are routinely evaluated using ultrasound (US) by tracking the diameter changes in the common carotid artery [2]. An operator-independent 3D MRI technique to measure the carotid diameter change throughout the cardiac cycle could therefore be complementary to the existing toolset. The goal of this study was thus to develop and characterize a technique that combines free-running (i.e., without any triggering or gating) carotid MR angiography (MRA) and diameter change quantification in one scan without contrast agent injection.
Methods
$n$ = 18 healthy volunteers were included and divided into two age subgroups: a junior cohort (9 volunteers, 3F, 29 $\pm$ 5 Y) and a senior cohort (9 volunteers, 6 F, 61 $\pm$ 7 Y). They were scanned using both a US Philips scanner and a 3T MR scanner (Siemens Prisma) using a free-running 3D radial GRE acquisition [3, 4] and slab-selective water excitation to increase the blood MR signal. MRI data were retrospectively sorted into 80 ms cardiac phases using pulse oximetry and reconstructed using compressed sensing [5].
Carotid artery stiffness was evaluated using the stiffness parameter $\beta = (\ln(Ps/Pd))/((Ds-Dd)/Dd)$, where Ps and Pd are the brachial systolic and diastolic pressures (measured with an arm cuff), respectively, and Ds and Dd are the systolic and diastolic lumen diameters, measured manually in the case of the US images and semi-automatically in the case of the MRA.
Paired Student's $t$-tests were used to compare stiffness between age groups and between imaging techniques.
Results
The average carotid stiffness measured with MRA was higher in the case of the senior cohort ($\beta$senior_MRA = 4.8 $\pm$ 0.8 vs. $\beta$junior_MRA = 3.5 $\pm$ 0.9, $p$ = 0.004). When measured with US, $\beta$senior was significantly higher, although it also presented much larger intersubject variability ($\beta$senior_US = 7.2 $\pm$ 3.0, $p$ = 0.03), while no significant difference was found for the junior cohort ($\beta$junior_US = 3.5 $\pm$ 0.7, $p$ = 0.88).
Conclusions
Free-running 4D MRA enables precise, non-invasive assessment of carotid anatomy and dynamics, offering measurements comparable to US and enabling the detection of age-related increases in arterial stiffness, demonstrating its potential as a complementary tool for 3D vascular aging assessment.

**P117**

**Results and Clinical Applications of the TopCoW Challenge**

K Yang [1], F Musio [2], Y Ma [3], S Hirsch [2], S Wegener [4] and B Menze [1]

[1] University of Zurich, Zürich, Switzerland
[2] Zurich University of Applied Sciences, Zürich, Switzerland
[3] Zhongnan Hospital of Wuhan University, Wuhan, China
[4] Zurich University Hospital, Zürich, Switzerland

Aims
The TopCoW challenge was a medical image analysis competition for computer vision tasks on the Circle of Willis (CoW) imaged on two common non-invasive angiography modalities: computed tomography angiography (CTA) and magnetic resonance angiography (MRA). The main tasks were multiclass segmentation of the CoW vessels and the classification of CoW variants. The competition was held in 2023 and 2024 and attracted high-quality submissions from global participants. As the organizers of the challenge, we were interested in the clinical relevance, clinical applications, as well as the generalizability of the best performing algorithms submitted to the TopCoW challenge. We envisioned several potential clinical scenarios where the relevant computer vision algorithms on the CoW could benefit clinicians and patients, and evaluated the performance by the TopCoW best submissions.
Methods
The algorithms were first ranked on their performance on the internal testsets consisting of 140 CTA and MRA scans. The segmentation algorithm performance were assessed by various metrics including volumetric-overlap-based and surface-distance-based metrics, and topology-aware metrics such as the centerline-Dice scores, and Betti number errors. The CoW variant classification was evaluated via a variant-balanced accuracy for both the anterior and posterior variants. The top 6 algorithms for either CTA or MRA were selected. Then we curated four external testsets of 86 scans from publicly available datasets on CTA and MRA modalities and evaluated the performance and generalizability of the best algorithms. For clinical scenarios, we evaluated the algorithm's ability to classify CoW variants, detect important CoW vessel components, classify fetal-type PCA variants, and locate intracranial aneurysms (IAs) using the CoW anatomy.
Results
For nearly all testsets, the balanced accuracy for CoW variant classification and the F1 score of detection of communicating arteries were generally above 70%. Fetal-type PCA variants could be classified with precision and recall of around 80% and above. Best algorithms could successfully locate IAs in at least 11 of 12 CTA scans with IAs. We have made both the data and algorithms public on Zenodo.
Conclusions
The TopCoW challenge for computer vision tasks on CoW gathered strong algorithm baselines that can be applied in several potential clinical scenarios with good generalizability across multicenter testsets.

**P118**

**An Effective MRI Perfusion Threshold Based Workflow to Triage Additional 18F-FET PET in Posttreatment High Grade Glioma**

KR Kadali [1], N Nierobisch [2], F Maibach [3], P Heesen [2], P Alcaide-Leon [4], M Hüllner [2], M Weller [2], Z Kulcsar [2] and N Hainc [5]

[1] Universitätsspital Zürich & Universität Zürich, Zürich, Switzerland
[2] Universitätsspital Zürich, Zürich, Switzerland

[3] UniversitaetsSpital Zuerich, Zürich, Switzerland
[4] Toronto Western Hospital, Toronto, Canada
[5] University Hospital Zurich, University of Zurich, Zürich, Switzerland

MRI is the preferred method for follow-up imaging of post-treatment WHO grade 3 or 4 gliomas. While positron emission tomography with O-(2-[18F]fluoroethyl)-L-tyrosine) (18F-FET PET) offers higher diagnostic accuracy, its use is limited due to low availability. We propose a sequential, threshold-based workflow to triage patients for additional 18F-FET PET scans based on MRI dynamic susceptibility contrast (DSC) perfusion-derived rCBV values, to optimize 18F-FET PET resource allocation. Patients with high-grade gliomas who had undergone standard-of-care treatment and developed new or enlarging contrast-enhancing post-treatment lesions on MRI were included, with a 18F-FET PET study performed within 4 months of the MRI. Patients were excluded if there were significant changes in lesion size or treatment between the MRI and 18F-FET PET scan. An rCBV threshold was determined and the performance of a threshold-based imaging workflow was evaluated compared to the gold standard defined here as surgical verification or long-term imaging follow-up without further intervention. Forty-one patients with a total of 49 lesions were included (tumor progression $n = 40$, treatment-related changes $n = 9$). Above the rCBV threshold of 2.4, MRI was 100% accurate (21/21 patients) in diagnosing tumor progression. Below the threshold, MRI identified 9 true negatives but produced 19 false negatives. 18F-FET PET reclassified 18/19 (95%) false negatives resulting in an overall accuracy of 48/49 (98%) for the workflow. Our MRI DSC perfusion rCBV-based threshold workflow for triaging patients for additional 18F-FET PET imaging in post-treatment high grade glioma has the potential to optimize 18F-FET PET resource allocation.

**P119**

## Middle Meningeal Artery Embolization in Chronic Subdural Hematoma: Single-Center Experience with 95 Patients

L Grunder, L Kreienbühl, J Gralla, E Piechowiak, P Breiding, J Kaesmacher, S Pilgram-Pastor, P Cimflova, W Z'Graggen, D Bervini, T Petutschnigg, S Rajbhandari and T Dobrocky

Insel Gruppe AG, Inselspital Bern, Bern, Switzerland

Aims
Middle meningeal artery embolization (MMAE) has shown promising efficacy in randomized controlled trials (EMBOLISE, MAGIC-MT, STEM) for managing chronic subdural hematomas (cSDH). We present one of the largest national single-center cohorts, analyzing clinical and radiological outcomes.
Method
We retrospectively evaluated 95 patients treated with MMA embolization (131 hematomas). Treatment indication included SDH recurrence after surgery, or primary MMAE in case of contraindications to surgery. Techniques included particles, EVOH (Squid), or combined agents. Outcomes assessed were imaging resolution (at least 3 month after treatment), and treatment failure (defined as reoperation due to clinical worsening or radiological increase in hematoma size).
Results
Of 95 patients, 59 were treated unilaterally, 36 bilaterally. Most procedures used EVOH (50%), particles $\pm$ coils (37%), and NBCA (10%). Treatment failure occurred in 9 of 95 patients (9.5%). In subgroup analysis, treatment failure was more frequent in cases embolized with particles alone or coils alone. No severe adverse events were recorded. Notably, over half of follow-up imaging data (73/131) is pending.

Conclusions
Our cohort confirms the safety and effectiveness of MMA embolization in routine clinical practice, with failure rates comparable to RCTs (EMBOLISE 4.1%, MAGIC-MT 6.7%, STEM 16%). Imaging success and procedural safety were high. EVOH-based embolization showed the lowest recurrence trend. Our data supports MMA embolization as a standard adjunct in recurrent or high-risk cSDH.

**P120**

**The Effect of Absorbable Hemostatic Agents on T1 MRI Relaxation Time in Intraoperative Brain Imaging: Potential for Mimicking Tumor Tissue**

MJ Kupka [1], MF Molina Fuentes [1], G Negrão de Figueiredo Miller [1], Z Kulcsar [1], C Serra [2] and T Schubert [1]

[1] USZ Neuroradiology, Zürich, Switzerland
[2] Department of Neurosurgery, USZ, Zürich, Switzerland

Aims
Intraoperative MRI (iMRI) is a critical tool for guiding glioma resections. However, hemostatic agents such as Surgicel can cause hyperintense signal alterations on T1-weighted imaging that may mimic residual tumor. This study aimed to characterize the T1 appearance of Surgicel and evaluate its impact on intraoperative interpretation, using signal-to-noise ratio (SNR) analysis for tissue comparison.
Methods
We retrospectively analyzed iMRI scans from 99 patients (mean age: 47.2 years; range: 1–78; 58 males, 41 females) who underwent glioma resection with intraoperative use of Surgicel. T1-weighted, FLAIR, and SWI sequences were reviewed. Morphological features of T1 hyperintensities were correlated with operative notes and follow-up imaging. In a subset of cases ($n$ = 17), SNR was calculated in regions covered by Surgicel and compared to adjacent parenchyma not exposed to hemostatic material.
Results
Surgicel appeared as linear or punctiform T1 hyperintensities along the resection cavity in 83% of cases with confirmed Surgicel use. No T1 hyperintensity was seen in 17% of patients where Surgicel was not applied. These hyperintensities often co-occurred with SWI and FLAIR abnormalities, although those sequences lacked specificity. SNR values were significantly higher in Surgicel-covered areas compared to surrounding brain tissue ($p < 0.01$), supporting a distinct signal behavior of hemostatic material. Most T1 hyperintensities resolved within one month, indicating a postoperative transient effect. Alternative causes of T1 shortening, such as hemorrhage or coagulative necrosis, displayed different morphological and temporal patterns.
Conclusions
Surgicel induces distinct T1 hyperintensities that can mimic residual tumor in iMRI. These changes are transient and correlate with areas of hemostatic application. SNR analysis helps to differentiate Surgicel from surrounding tissue and supports accurate intraoperative image interpretation, helping to reduce misdiagnosis and unnecessary reoperation.

**P121**

**Reconstructing Highly Folded Mammalian Cortices: A Few-Shot Learning Approach to Investigate Universal Brain Folding**

T Blattner [1], V Mello [2], K Avelino-de-Souza [3], N Patzke [2], B Mota [3], R Wiest [1] and R McKinley [1]

[1] Inselspital, Universitätsspital Bern, Bern, Switzerland

[2] HMU Health and Medical University, Potsdam, Germany
[3] Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

Neuro-morphometry has emerged as a critical biomarker in clinical settings for monitoring disease progression. Recent advancements in deep learning technologies have enabled the accurate generation of 3D cortical surface reconstructions, a capability predominantly utilized in human neuroimaging. However, we demonstrate that these innovations can be extended to comparative neuroanatomy, facilitating interspecies brain analysis. Traditional methods of cortical surface measurements still depend on brain dissection and manual slice tracing and estimates therefrom.

In this study, we present a novel methodology for reconstructing the cortical surfaces of large, highly folded mammalian brains using structural MRI scans. Our approach leverages a deep learning model that is trained on a small set of 2D manual tracings to segment the entire 3D brain volume. Given the inherent complexity of cortical folding, we first reconstruct the white matter surface and subsequently apply a diffeomorphic transformation to accurately map it to the pial surface. We validate this approach on eight mammalian brains, including four land mammals and four cetaceans, producing the first accurate 3D reconstructions and cortical measurements for these species.

Our 3D measurements offer stronger empirical evidence supporting the hypothesis that cortical folding is a function of cortical surface area and the square root of cortical thickness, rather than the number of cortical neurons. Additionally, our findings lend support to the hypothesis that cetaceans exhibit systematically increased cortical folding. This enhanced gyrification may be driven by the unique environmental pressures faced by aquatic mammals, which could have played a key role in the evolution of extreme cortical gyrification in these species.

This concept of a universal brain scaling law has previously been applied to human brain morphometry, encompassing individual lobes and even specific cortical regions. By mapping measurements of cortical thickness, surface area, and exposed surface area into a new multidimensional space, three independent components I, K, and S have been previously identified. These components provide a more sensitive and precise biomarker for monitoring disease progression in clinics.

**P122**

## Differentiating Etiologies in Perimesencephalic SAH: Clinical Insights into Basilar Artery Perforator Aneurysms

T Dobrocky [1], S Rajbhandari [1], JM Raabe [1], B Serrallach [1], D Bervini [2], EI Piechowiak [1], J Gralla [1], A Raabe [2], W Z'Graggen [3] and J Kaesmacher [1]

[1] Inselspital—Universitätsspital Bern—Universitätsinstitut für Diagnostische und Interventionelle Neuroradiologie, Bern, Switzerland
[2] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurochirurgie, Bern, Switzerland
[3] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurologie, Bern, Switzerland

Background and Purpose

Perimesencephalic subarachnoid hemorrhage (pmSAH) is often considered a benign condition, with a presumed venous origin. However, recent advances in imaging have increasingly been able to identify basilar artery perforator aneurysms (BAPAs), which account for a subset of cases historically labeled as non-aneurysmal, atraumatic (NAA) pmSAH. The aim of this study is to compare the clinical characteristics and outcomes of patients with NAA, BAPA and ruptured posterior circulation aneurysms (r-pc-AN), to assess the impact of underlying etiology of pmSAH on outcome.

Materials and Methods

A retrospective cohort of 444 patients were included: NAA ($n$ = 167), BAPA ($n$ = 157), and r-pc-AN ($n$ = 120). Patients with BAPAs were recruited from the PERForator Aneurysm (PERFAN) registry and the remaining two cohorts were recruited from a single high-volume tertiary care center. Clinical data, including demographics, presentation, management, and outcomes were compared across three groups. An excellent outcome was defined as an mRS score of 0–1 at 3–6 months.

Results

At follow-up, excellent outcomes were achieved in 137/167 (82%), 96/140 (69%), and 56/102 (55%) in the NAA, BAPA, and r-pc-AN cohorts, respectively ($p < 0.001$), with corresponding mortality rates of 1/167 (1%), 16/140 (11%), and 18/102 (18%), respectively. Compared to BAPA, patients with NAA had significantly higher odds of excellent outcome (aOR 2.0, 95% CI 1.2–3.4, $p = 0.01$). In contrast, r-pc-AN was associated with significantly lower odds of excellent outcome (aOR 0.5, 95% CI 0.3–0.9, $p = 0.01$). Hydrocephalus and EVD rates were highest in the r-pc-AN group (83% and 87%), followed by the BAPA group (48% and 44%), and the lowest rates in the NAA group (28% and 16%) ($p < 0.001$). Vasospasm rates were comparable between BAPA (33%) and r-pc-AN (30%) ($p = 0.66$), but lower in NAA (9%) ($p = < 0.001$).

Conclusions

BAPA patients demonstrated significantly worse outcome compared to NAA but better than r-pc-AN. Although pmSAH has been traditionally considered benign, our findings challenge this view, particularly in cases involving ruptured BAPAs. Future research is warranted for distinguishing BAPA from benign pmSAH, and for establishing diagnostic and management approaches for BAPA.

**P123**

**Endovascular Management of Intracranial and Extracranial Dissections Using Non-Permanent Stenting**

V Stonys, T Schubert and Z Kulcsar

University Hospital Zürich, Zürich, Switzerland

Introduction

Intracranial (IAD) and extracranial (EAD) artery dissection is a rare but important cause of ischemic stroke. Its management lacks standardization, usually relying on antithrombotic therapy. In cases of acute neurological symptoms, endovascular treatment is applied. While permanent stenting is widely practiced, it requires dual antiplatelet therapy (DAPT), which increases the risk of hemorrhagic complications, particularly in patients with large infarcts or concurrent SAH.

Aim of study

To present six cases and evaluate the feasibility, safety, outcomes and highlight the potential of non-permanent stenting as an alternative treatment option for IAD/EAD with flow-limiting arterial stenosis.

Method

We included six cases of non-permanent stenting for IAD/EAD. All patients underwent pre- and postinterventional non-invasive angiographic imaging (CTA or MRA) and clinical evaluation (NIHSS score and mRS at 90 days was recorded). The endovascular technique involved deploying a stent retriever for recanalization, followed by glycoprotein IIb/IIIa infusion during deployment of the stent retriever. Stent retrievers were atraumatically retrieved at the end of the intervention.

Results

Successful vessel recanalization was achieved in the majority of cases (5/6, 83.3%). Follow-up imaging demonstrated resolution of the dissection without significant residual stenosis and without new ischemic events. Minor complications included two instances of self-limiting subarachnoid hemorrhage, but no major bleeding events or recurrent dissections were observed. One patient ultimately required a permanent stent, this technical failure was attributed to dissection at the Carotid-T, involving both A1 and M1 segments.

Conclusions

Non-permanent stenting using stent retrievers may represent a valuable addition to the therapeutic approaches for IAD/EAD, especially in patients with a high risk of intracranial hemorrhage.

**P124**

**Brain Perfusion Imaging by Arterial Spin Labeling Predicts Postsurgical Seizure Freedom in Pediatric Focal Lesional Epilepsy: A Pilot Study**

AG Gennari, L Gaito, D Cserpan, R Kottke, N Krayenbühl, A Rügger, R Tuura O'Gorman and G Ramantani

University Children Hospital Zurich, Zürich, Switzerland

Objective

This study was undertaken to determine whether integrating arterial spin labeling (ASL) perfusion imaging into presurgical planning improves postsurgical seizure outcomes in children with pharmacoresistant focal lesional epilepsy associated with focal cortical dysplasia (FCD) or low-grade epilepsy-associated tumors (LEATs).

Methods

We retrospectively analyzed magnetic resonance imaging (MRI) scans from 18 children (median age = 4.8 years, interquartile range = 1.9–11.5) who underwent resection for FCD-or LEAT-associated pharmacoresistant epilepsy, with at least 1 year of follow-up.

All patients underwent presurgical ASL imaging along with pre-and postsurgical structural MRI. Image postprocessing, including segmentation and coregistration, assessed the completeness of resection of the anatomical lesion and ASL-derived perfusion changes. DICE similarity scores measured the alignment of pre-to postsurgical segmentations, and the residue ratio assessed the percentage of presurgical segmentation remaining postresection. These metrics were then correlated with postsurgical seizure outcomes.

Results

Fourteen (78%) patients achieved seizure freedom, and 13 (72%) had complete lesion resection. Qualitative analysis showed that complete inclusion of the perfusion changes within the resection cavity significantly correlated with seizure freedom ($p = 0.009$), whereas complete resection of the anatomical lesion did not ($p = 0.57$). Quantitative analysis indicated that higher alignment of the perfusion changes with the resection cavity, measured by the DICE score, was significantly associated with seizure freedom ($p = 0.043$), whereas alignment between lesion and resection was not ($p = 0.44$). Larger residual perfusion volumes significantly correlated with seizure recurrence ($p = 0.008$).

Significance

Incorporating ASL perfusion imaging into presurgical evaluation may better delineate the epileptogenic zone, potentially improving postsurgical.

**P125**

**Early EEG in Stroke: Identifying Patients at High Risk for Post-Stroke Epilepsy**

KM Schubert [1], D Vijaya [2], AL Oliveira [3], C Tatillo [4], G Naije [4], A Strzelczyk [5], G Merlino [6], M Valente [6], N Gaspard [4], V Punia [2], M Galovic [1] and C Bentes [3]

[1] Department of Neurology, Clinical Neuroscience Center, University Hospital and University of Zurich, Zürich, Switzerland
[2] Epilepsy Center, Cleveland Clinic, Cleveland, USA
[3] Department of Neurosciences and Mental Health (Neurology), Hospital de Santa Maria-ULSSM. Centro de Estudos Egas Moniz, Faculdade de Medicina, Universidade de Lisboa, Lisbon, Portugal
[4] Department of Neurology, Hôpital Universitaire de Bruxelles—Hôpital Erasme, Brussels, Belgium
[5] Epilepsy Center Frankfurt Rhine-Main, Department of Neurology, Goethe-University Frankfurt, Frankfurt am Main, Germany
[6] Department of Medicine, University of Udine and Clinical Neurology, Udine University Hospital, Udine, Italy

Aim
Seizures negatively affect outcomes after stroke. Although early clinical and neuroimaging markers have been used for prediction, most patients who develop post-stroke epilepsy (PSE) have no acute symptomatic seizures (ASyS). We aimed to determine if early EEG findings improve prediction of PSE, especially in patients without ASyS.
Methods
In a multicenter cohort of 1105 patients with acute ischemic stroke (mean age 71 years, 54% male) who underwent EEG within 7 days post-stroke, we analyzed electrographic markers (epileptiform activity, regional and generalized slowing) using Cox and Fine–Gray subdistribution hazard models, adjusted for clinical covariates. A novel SeLECT-EEG prognostic model was developed and compared with the established SeLECT2.0 model.
Results
Post-stroke epilepsy occurred in 119 patients (11%), including 21% with ASyS and 79% without ASyS. Epileptiform activity (SHR 2.3, 95% CI 1.5–3.4, $p < 0.001$) and regional slowing (SHR 1.7, 95% CI 1.1–2.7, $p = 0.02$) were independently associated with higher risk. At 5 years, the risk was 42% (95% CI 30–49%) in patients with epileptiform activity versus 13% (95% CI 9–16%) in those without, and 24% (95% CI 18–29%) versus 11% (95% CI 5–15%) for patients with and without regional slowing, respectively. In patients without ASyS, the SeLECT-EEG model (including NIHSS, cortical and MCA involvement, large-artery atherosclerosis, epileptiform activity, and regional slowing) outperformed SeLECT2.0 (C-statistic 0.75 vs. 0.71, $p < 0.001$), yielding a 10-year risk of 2.5% for low scores and 95% for high scores. Model calibration was robust across derivation and external validation cohorts.
Conclusions
Early EEG findings, especially regional slowing and epileptiform activity, significantly improve the prediction of post-stroke epilepsy beyond clinical and neuroimaging risk factors. The SeLECT-EEG model allows improved risk stratification and patient counseling, providing a foundation for selecting high-risk patients for targeted surveillance and future antiepileptogenic trials.

**P126**

**Effects of Sedation on EEG Detection of Epileptiform Activity in Patients with Altered Consciousness**

M Guinchard, AO Rossetti [1], K Schindler [2], S Ruegg [3], V Alvarez [4] and J Novy [1]

[1] CHUV (Centre hospitalier universitaire vaudois), Lausanne, Switzerland
[2] Bern University Hospital (Inselspital), Bern, Switzerland
[3] Basel University Hospital, Basel, Switzerland
[4] Hôpital du Valais—Sion, Sion, Switzerland

Background
Midazolam and propofol are the most frequently used sedative agents in intensive care units (ICU). Their effects on EEG interpretation in patients with altered consciousness received limited attention. We aim to assess the effects of sedation on EEG diagnostic yield for epileptiform abnormalities.
Methods
This retrospective analysis of a multicenter randomized clinical trial (CERTA) included adult patients with acute consciousness disorders. All patients had EEG recordings and they were randomized 1:1 to either a continuous EEG (cEEG) or two routine EEG (rEEG). Patients were stratified according whether or not they received sedative medications and their dosage. We scored sedation combining dosage of midazolam and propofol (as a proportion of a previous study). Association of sedation and EEG epileptiform activity was analyzed.
Results
We analyzed 364 patients, 246 (67.6%) received sedative medication; 99 were sedated with propofol (40.2%), 52 with midazolam (21.1%) and 95 with propofol and midazolam (36.8%). Median dose of propofol were 0.89 mg/kg/h (range: 0.01–12.55 mg/kg/h) and 0.08 mg/kg/h (0.01–2.64 mg/kg/h) for midazolam. Sedated patients tended to have more frequently a structural brain injury, and lower GCS and FOUR scores. Interictal/ictal epileptiform discharges were more frequent in cEEG (70 vs. 30%, $p < 0.001$), women (68 vs. 32%, $p < 0.001$), higher GCS and FOUR scores (medians: 5 vs. 3 and 3 vs. 3, $p < 0.001$), lower SAPS II score (median: 53 vs. 47, $p = 0.002$), with a higher proportion of antiseizure medication (ASM) administered (73 vs. 27%, $p < 0.001$). Sedation was however not independently associated with differences in EEG epileptiform activity.
Conclusions
Despite its potential of suppressing epileptiform activity, we found no difference in terms of detection of epileptiform activity whether patients received sedation or not. Continuously administrated sedation may have less effect on EEG than when administered in bolus.

**P127**

**Neuronal Firing During "On Demand" Optogenetic Limbic Seizure**

S Folschweiller, A Adamantidis and MO Baud

Inselspital, University Hospital Bern, University of Bern, Bern, Switzerland

Aims
Epilepsy likely stems from an imbalance between excitation and inhibition (E-I). In hippocampal circuits, most frequently involved in focal epilepsy, the E-I balance is regulated through complex networks of recurrent connections between parahipocampal, entorhinal and hippocampal cortex, and their local microcircuitry of excitatory and inhibitory neurons. Despite thorough mapping of hippocampal circuits, the specific imbalance in their dynamics underlying seizure onset and propagation remains unclear.
We aimed to develop a system that enables on-demand seizure induction to perform high-density electrophysiological recordings to investigate the dynamic processes within the hippocampus during seizures in mice.
Methods
To drive seizures, we optogenetically stimulated entorhinal or contralateral CA3 excitatory neurons projecting to CA1 at 20 Hz using ChR2. Concurrently, we performed acute Neuropixels (1.0 and 2.0) recordings in the ipsilateral hippocampus of awake mice yielding local field potentials (LFP) and single units' activities.

Results

In the initial experimental steps, we successfully triggered seizures optogenetically in 3 out of 5 mice, and the precise control of seizure timing enabled recording of single neurons and local field potential during the onset and progression of seizures with high spatial resolution. Results suggest dynamic changes in depolarizations induced by the imposed stimulation immediately preceding the onset of seizures. After reliably detecting the spiking activity of defined hippocampal cells, we observed units inhibited by the first seconds of stimulation before showing a drastic increase in their firing rates. Following the triggering stimulus and during self-sustained seizure, action potentials could still be reliably detected, showing highly synchronous activities.

Conclusions

Our set-up combining high-resolution large-scale electrophysiology and on-demand optogenetic seizures in healthy animals will help understand the complex neural dynamics occurring during the onset of provoked seizures. Future work will focus on refining data analysis methods and exploring the functional roles of specific neuronal populations in seizure generation.

**P128**

## Sex-Related Disparities in Post-Cardiac Arrest Prognostic Indicators and Outcome: A Prospective Cohort Study

A Vanat [1], J Novy [1], N Ben Hamouda [2], S Benghanem [3] and AO Rossetti [1]

[1] Lausanne University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland
[2] Lausanne University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland
[3] Cochin Hospital, Paris Cité Université, APHP, Department of Urology, Paris, France

Aim

Sex-related disparities in outcomes after cardiac arrest (CA) received increasing attention with conflicting data in the literature1–5: globally, women appear to experience worse recovery and survival2,3,5. This study aimed to determine whether sex is independently associated with poor neurological outcome or death at 3 months in comatose patients following cardiac arrest, considering sex-related differences in CA characteristics and prognostic indicators.

Methods

We analyzed a registry of consecutive comatose adults admitted to the CHUV following CA resuscitation (January 2016–February 2025). Standardized post-resuscitation care including targeted temperature management and multimodal neuroprognostication was applied6. Neurological outcome was assessed at 3 months using the Cerebral Performance Categories (CPC) and modified Rankin Scale (mRS). Good outcome was defined as CPC 1–2, or CPC 3 with mRS 0–37.

Results

Among 944 patients, 270 (28.6%) were women. Age, mean time to ROSC and the proportion of patients treated with ECMO did not differ across sex. Women were more likely to have non-cardiac etiology (52.6% vs. 32.3%) and non-shockable rhythms (69.9% vs. 46.6%, both $p < 0.001$), and to exhibit worse prognostic profiles: non-reactive EEGs (early EEG: 42.7% vs. 32.4%, $p = 0.004$), highly-malignant early EEG patterns 8 (42.1% vs. 34.2%, $p = 0.028$), absent SSEPs (36.1% vs. 22.7%, $p < 0.001$), and higher serum NSE within 48 h (87.6 vs. 67.9 μg/L, $p = 0.026$). At 3 months, women had lower rates of favorable outcome (39.6% vs. 48.4%, $p = 0.014$) and higher mortality (54.1% vs. 45.1%, $p = 0.013$). However, after adjusting for variables showing imbalances across sex or outcomes, female sex had comparable poor

neurological outcome (OR 0.90; 95% CI 0.51–1.56; $p = 0.702$; goodness of fit: $p = 1.000$), or death (OR 0.98; 95% CI 0.55–1.77; $p = 0.955$; goodness of fit: $p = 1.000$) as men.

Conclusions

Although women exhibited lower rates of neurological recovery and higher mortality, sex was not independently associated with neurological recovery or mortality at 3 months after adjustment. This suggests that the observed sex-related differences in outcome are primarily driven by unfavorable CA characteristics—resulting in more severe encephalopathy—rather than disparities in post-resuscitation care or intrinsic biological differences in ischemia–reperfusion injury.

**P129**

**Pharmacological Modulation of Cortical Excitability in Epilepsy**

C Friedrichs-Maeder, E van Maren, CG Mignardot, R Widmer and MO Baud

Sleep-Wake-Epilepsy Center, Center for Experimental Neurology, Department of Neurology, Inselspital Bern, University Hospital, University of Bern, Bern, Switzerland

Aims

Epileptic seizures are thought to arise from states of cortical hyperexcitability, with anti-seizure medications (ASMs) presumed to prevent seizures by lowering excitability below a critical threshold. Recent work suggests that active cortical probing via progressively increasing stimulation intensity offers a more direct excitability measure than passive electroencephalographic (EEG) signals (Lepeu et al. 2024 Nat. Com. 2024:15(1):6945). However, the influence of pharmacotherapy on these stimulation–response curves (SRC) is largely unexplored. In this work, we introduce an excitability index (ExI) derived from the SRC to quantify cortical responsiveness and assess the impact of ASMs.

Methods

Seven patients with focal drug-resistant epilepsy underwent intracranial EEG ($92 \pm 12$ channels) covering mesiotemporal, laterotemporal, frontal, parietal, and insular cortices. Triplicate 1 ms biphasic pulses (0.5–12 mA) were delivered at randomized $\geq$4 s intervals between adjacent hippocampal or neocortical contacts. Cortico-cortical evoked potentials at each intensity were quantified via line-length to construct SRCs; ExI was their normalized area under the curve (Friedrichs-Maeder et al. Curr. opin. in neurol. 2025:38(2):140–50). Significant (effective) connections were those for which the ExI exceeded a surrogate distribution. To evaluate pharmacological modulation, ExI was compared before and after ASM administration (levetiracetam: $n = 3$, brivaracetam: $n = 3$, lamotrigine: $n = 1$), and differences in significant connections were tested against a null distribution of shuffled AUC values.

Results

On average, $23.7\% \pm 8.9\%$ of possible connections ($38.2 \pm 15.8$ channels) showed significant evoked responses across stimulation intensities from hippocampal/neocortical sites. Of these connections, $30.3\% \pm 21.5\%$ ($13.0 \pm 12.8$ channels) exhibited a significant post-ASM decrease in ExI, whereas $22.1\% \pm 13.9\%$ ($7.5 \pm 4.9$ channels) showed a significant post-ASM increase in ExI. The magnitude of the decrease was not significantly different from the increase (Wilcoxon sign rank test, $p > 0.5$).

Conclusions

The ExI emerges as a robust, quantitative measure of cortical excitability that is sensitive to ASM. Observing both weakened and strengthened connections points to distinct network-specific pharmacological effects. As a medication-responsive biomarker, the ExI may guide personalized ASM selection and dose optimization to maximize seizure control while minimizing side effects.

**P130**

**Cortico-Limbic Signaling and Excitability in the Human Brain**

E Van Maren [1] and M Baud [2]

[1] Inselspital—Universitätsspital Bern, Bern, Switzerland
[2] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurologie, Bern, Switzerland

Aim
Variable and intricate dynamics are core to cortical communication in the human brain, but degenerate in epilepsy. We here aimed at mapping the macro-scale signaling dynamics in the sleeping and awake cortex, testing the hypothesis that signals flow from the neocortex to the limbic structures (hippocampus) during wakefulness and inversely during sleep.
Methods
In 15 epilepsy patients undergoing iEEG for diagnostic reasons, we repeatedly probed connectivity with single-pulse electrical stimulations (1 ms, 0.5–12 mA) across the sleep-wake cycle (Median [IQR] 288 [119, 320] trials over 46 h [36, 58]). To capture the probability (P) of signal transmission in each effective connection in one (PAB) and the other (PBA) direction, we evaluated the number of significant cortical responses in electrode B at single-trial level, out of the total number of stimulations delivered in electrode A and inversely. The directionality index (DI) results from the ratio between PAB and PBA and indicates whether a brain region is rather sending or receiving signal. The excitability index (ExI) results from the responsiveness of a connection upon stimulation from 0.5 to 12 mA.
Results
Across participants, 37'850 effective connections showed a probability and directionality that depended on the identity ($p < 0.01$) and distance ($p < 0.01$) of connected brain regions and correlated with their excitability (Pearson's rho = 0.63, $p < 10^{-180}$). Notably, the amygdala (P = 0.59, DI = +0.61, $p < 10^{-9}$) and the hippocampus (P = 0.40, DI = +0.35, $p < 10^{-5}$) had clear tendencies to send about twice as much signals than they received and correspondingly outgoing connections had higher excitability than incoming connections to these structures (ExI = 0.58 vs. 0.53, $p < 10^{-5}$). During sleep the excitability increased (ExI +7–10%) for connections between the neocortex and the amygdala and hippocampus, except for outgoing connections from the hippocampus (ExI -5–6%), contrary to a long-standing hypothesis in the field.
Conclusions
In our study, we directly probed the human cortex with hundred-thousand minute electrical stimulations and unprecedented precision and duration, unraveling the signaling dynamics in regions-specific and state-specific effective connections. This foundational work provides a dynamic map for the future development of neuromodulation protocols.

**P131**

**Characterizing Pain in Multiple Sclerosis: A Descriptive Cohort Study. Unmasking the Limitations of the DN4 Score and Exploring Objective Assessment**

N Drobinska, E Sukockiené, P Lalive and A Lascano

Geneva University Hospitals, Division of Neurology, Geneva, Switzerland

Aims
Pain is a frequent and disabling symptom in multiple sclerosis (MS), yet assessment often relies on subjective tools that may not fully capture its complexity. This study aimed to evaluate the utility of objective neurophysiological measures—laser-evoked potentials (LEP) and somatosensory evoked potentials (SEP)—compared to standard assessments such as pain descriptions and the DN4 questionnaire, to better distinguish neuropathic from nociceptive pain.

Method
Fifty MS patients (any subtype), followed at the Neuroimmunology Department of Geneva University Hospitals, reporting pain other than headache or trigeminal neuralgia, were included. Assessments included DN4, EDSS, VAS, HADS-A, HADS-D, and FMSC. All patients underwent LEP and SEP testing. Descriptive statistics and Pearson's correlation were used to examine relationships between clinical, subjective, and neurophysiological variables.
Results
Most patients (78%) had relapsing-remitting MS, with a mean disease duration of 11 (±7) years. Pain mainly affected the limbs (90%), with continuous symptoms reported in 42%. Mean pain intensity was VAS 4 (±1). LEP was pathological in 86% (upper limbs) and 42% (lower limbs); SEP was abnormal in 16% (upper) and 94% (lower). LEP and SEP results correlated significantly with each other ($p$ = 0.006) and with EDSS. DN4 scores did not correlate with LEP or SEP but were modestly correlated to HAD-anxiety scores ($p$ = 0.028).
Conclusions
LEP and SEP offer valuable insights into pain mechanisms in MS and outperform DN4 in identifying nociceptive pain. Incorporating objective testing may improve diagnostic accuracy and therapeutic decisions.

**P132**

**Cortical Activity in Response to Stimulation of the Corticospinal Tract in the Spine: The Anti D-Wave. A Small Case Series**

P Alvarez Abut [1], SN Zurita Perea [2], A Raabe [1] and K Seidel [1]

[1] Inselspital, Bern Univeristy Hospital, Bern, Switzerland
[2] Hospital Privado Universitario de Córdoba, Córdoba, Argentina

Aim
Intraoperative neurophysiological monitoring of the D-wave has demonstrated a prognostic and even preventive value for injury in intramedullary spinal cord tumour (IMSCT) surgery. Electrical stimulation of the spinal cord evokes somatosensory evoked potentials and an earlier potential, likely due to antidromic activation of the corticospinal tract (CST), known as the anti D-wave. We hypothesize that the anti D-wave may facilitate identification of the CST during IMSCT surgery. As a proof of concept, this study investigates the feasibility of eliciting the anti D-wave after spinal cord stimulation and assesses its characteristics compared to the D-wave.
Methods
Both D-wave and anti D-wave were recorded from patients undergoing intradural spinal cord tumour surgeries under total intravenous anesthesia. D-wave was elicited through transcranial electrical stimulation, with recordings typically distal to the tumour via a subdural catheter. Anti D-wave stimulation involved either an epidural/subdural catheter for cathodal stimulation or a bipolar concentric probe. The stimulation parameters were 1–30 mA intensity, 0.2–0.5 ms pulse duration, 1.7–2.7 Hz frequency, and 20–60 averages. The recording montages included Cz'/Fz, C3'/C4', and C3/C4.
Results
Four patients were included (three IMSCT (one cervical, one cervico-thoracic, one lower thoracic) and one intradural extramedullary tumour (upper thoracic)). D-wave latencies were 4.2 to 5.7 ms. Anti D-wave latencies were 0.1 to 1.4 ms longer, except for bipolar stimulation, which elicited a 3.5 ms longer latency compared to the corresponding D-wave. D-wave amplitudes were 7 to 25 µV. Anti D-wave amplitudes were 6 to 14 times lower. Best recording montages were Cz'/Fz and C3/C4. Polarities were negative.

Conclusions

The anti D-wave represents a novel and promising approach to monitor CST activity through its antidromic response. To our knowledge, this study is the first to report anti D-wave recordings following subdural and bipolar concentric stimulation. By standardizing and further understanding of the waveform, we may gain deeper insights into CST physiology and potentially enhance surgical outcomes in motor pathway mapping and monitoring.

**P133**

**Evaluation of the Blink Reflex in Patients with Trigeminal Neuralgia with Ocular Involvement and Healthy Volunteers**

T Badel [1], D Zadravec [2], I Savic Pavicin [1], L Banjsak [1], J Bosnjak [3] and O Zrinscak [2]

[1] School of Dental Medicine, Zagreb, Croatia
[2] Clinical Hospital Centre "Sisters of Charity", University of Zagreb, Zagreb, Croatia
[3] Health Center Zagreb, Zagreb, Croatia

Purpose

Blink reflex (BR) was analyzed in patients with affected ophthalmic branch of trigeminal neuralgia (TN).

Methods

In this study, 15 patients with TN—Subgroup TN (mean age ± SD was 47.80 ± 13.95 years) were included, who also had the ophthalmic branch involved in combinations. All patients underwent a neuroelectrophysiological BR test for the diagnosis of the trigeminal nerve. The control group included neurologically healthy volunteers (Subgroup HV) who participated in a previous study of disc displacement of temporomandibular joint disorder (mean age ± SD was 30.59 ± 7.91 years). BR has main components: ipsilaterally early R1 and late R2 response, R2c as a contralaterally expressed late response, and ipsilateral/contralateral R3/R3c component. An independent samples *t*-test, paired-samples *t*-test, and Fischer's exact test were used.

Results

In 6 (60%) patients, all three branches of the trigeminal nerve were involved, and in 9 (40%) patients, a combination of the ophthalmic and maxillary branch was involved. There was no difference in sex distribution between TN and HV subgroups (Fischer's exact test, $p > 0.05$). The pairs of the same variables were analyzed between the left and right sides of healthy individuals (HV subgroup), the difference was significant only for R2c latency (paired *t*-test $p < 0.05$). Also, the difference in the number of patients with a pathological difference between the latency values R2 (Fischer's exact test $p = 0.0016$) and R2c (Fischer's exact test $p = 0.0019$) was significant. The significance of higher occurrence of R3, R3c latencies and contralateral occurrence of R1c between members of TN and HV subgroups was not observed (Fischer's exact test, $p > 0.05$). The validity of the method was checked by two independent researchers at an interval of 6–12 months on 9 volunteers. No statistically significant difference (*t*-test, $p > 0.05$) was found for R1, R2 and R2c latencies.

Conclusions

The BR method can be a useful diagnostic tool to distinguish asymptomatic patients from symptomatic patients with TN: the abnormality of R2, R2c latencies plays an important role. Although the R3 component of the BR is nociceptive in nature, its occurrence in healthy volunteers is explained as innocuous stimuli.

**P134**

**Longitudinal Quantification and Radiological Correlates of Generalized Periodic Discharges After Cardiac Arrest—A 10-Year Retrospective Study**

U Fisch [1], S Snider [2], B Scirica [2], L Hsu [2], E Amorim [3] and JW Lee [2]

[1] Brigham and Women's Hospital/Harvard Medical School, Boston, USA; University Hospital Basel, Basel, Switzerland
[2] Brigham and Women's Hospital/Harvard Medical School, Boston, USA
[3] Zuckerberg San Francisco General Hospital/University of California, San Francisco, USA

Aims
To examine the relationship between quantitative metrics of generalized periodic discharges (GPDs) on continuous encephalography (cEEG), coma recovery, and brain magnetic-resonance-imaging (MRI) in comatose post-cardiac arrest patients.
Methods
Retrospective single-center study of comatose adult patients with brain MRI and cEEG recordings within 120 h post-cardiac arrest, with the occurrence of any GPDs according to the EEG report. cEEGs were automatically quantified for GPD burden (i.e., percentage per time) with Sparcnet, a state-of-the-art deep-learning algorithm, and background continuity measured with the Background Continuity Index (BCI). K-means clustering featuring time-binned averaged GPDs and BCI between 24 and 96 h identified different temporal patterns. MRI apparent diffusion coefficient (ADC) values were extracted from patient-individual anatomically segmented brain MRIs. Coma recovery was defined as the ability to follow commands at discharge.
Results
Of 109 patients (cumulative 7476 EEG hours), 33 (30%) recovered from coma at discharge. These patients had a later onset of frequent GPDs than patients who did not recover (median 53.5 vs. 31 h, $p = 0.003$). Among patients who eventually recovered, those with low mean BCI in the first 48 h exhibited a delayed but increased GPD burden after 48 h. Based on qualitative assessment, delayed GPDs were at least partially of triphasic morphology.
Five patient clusters (C) were identified: C1 (48% recovery), low GPDs/high BCI; C2 (40%), delayed GPDs, increasing BCI; C3 (9%), high GPDs, high BCI; C4, (0%), decreasing GPD and BCI; C5 (0%), decreasing GPD, low BCI.
ADC values across multiple anatomical regions were similar for C1/2/3, while C4/5 had significantly lower ADC values.
Conclusions
We describe 5 clinically meaningful, distinct temporal GPD patterns after cardiac arrest. Notably, patients with delayed appearance of GPDs have a chance to recover from coma. Patients with a constant high GPD burden have a similar extent of brain injury, compared to patients with less GPD burden, of whom half recover. This raises the question whether a constant high GPD burden reflects a potentially reversible seizure network-related cause rather than a disconnection phenomenon due to extensive structural damage.
We advocate for a distinction of GPDs for neuroprognostication, based on their temporal evolution in combination with background continuity and GPD morphology.

**P135**

**Sex Disparities in the Management and Outcome of Critically Ill Patients Needing EEG**

V Urbano [1], V Alvarez [2], K Schindler [3], S Rüegg [4], CD Hahn [5], I Beuchat [1], S Benghanem [6], J Novy [1] and AO Rossetti [1]

[1] CHUV (Centre hospitalier universitaire vaudois), Lausanne, Switzerland
[2] Hôpital du Valais, Sion, Switzerland

[3] Inselspital—Universitätsspital Bern, Bern, Switzerland
[4] University Hospital Basel/University of Basel, Basel, Switzerland
[5] The Hospital for Sick Children and Department of Paediatrics, University of Toronto, Toronto, Canada
[6] Hôpital Cochin, Paris Descartes University, Paris, France

Aims
Sex-related discrepancies concerning the management of patients in intensive care are increasingly described. However, information about management and outcome of critically ill patients undergoing EEG is scarce.
This study explores sex-related disparities in management and clinical outcomes in critically ill patients needing EEG for clinical purposes.
Methods
In this post-hoc analysis of the multicenter CERTA trial, which included adults with impaired consciousness requiring EEG, we explored correlations between sex and the timing of EEG, detection of EEG abnormalities, mechanical ventilation, sedation, anti-seizure therapy, mortality and favorable functional outcome (CPC 1–2) at 6 months, using uni- and multivariable analyses.
Results
Among 364 patients (33.8% women), women showed a higher prevalence of intracranial hemorrhage (women 30.9%, men 19.5%, $p = 0.015$) and epileptiform EEG discharges (women 27.6%, men 21.2%, $p = 0.008$), but use of sedation, anti-seizure medication and mechanical ventilation was similar between sexes. Although mortality was similar (adjusted odds ratio (OR) 0.83, 95% confidence interval (CI) 0.47–1.47), women were less likely to reach CPC 1–2 (adjusted OR 0.54, 95% CI 0.31–0.97).
Conclusions
Critically ill women and men requiring EEG appear to receive similar clinical management and have comparable mortality, although long-term functional outcome in surviving women is worse. Further research is needed to address this concerning discrepancy.
Trial registration
Continuous EEG Randomized Trial in Adults (CERTA); NCT03129438; 25 July 2019.

**P136**

**An Unsupervised Deep Learning Algorithm for Burst Suppression Detection in Pediatric EEG Data: Assessing Generalizability**

C Arzaga [1], O Staubli [2], M Birbaumer [2], G Ramantani [3] and E Keller [4]

[1] Kinderspital Zürich—Eleonorenstiftung, Zürich, Switzerland
[2] Lucerne University of Applied Science and Arts, Luzern, Switzerland
[3] Universitäts-Kinderspital Zürich, Zürich, Switzerland
[4] Universitätsspital Zürich, Zürich, Switzerland

Aims
To assess the generalizability of a previously validated unsupervised algorithm for Burst Suppression pattern (BSP) detection on pediatric continuous electroencephalography (cEEG) data. To develop and evaluate a novel unsupervised deep learning ensemble architecture, combining the algorithm with a denoising Variational Autoencoder (dVAE), to improve BS detection performance and automate the computation of bursts per minute (BPM).
Methods
This study was conducted in two phases using continuous electroencephalography (cEEG) data from four pediatric intensive care patients at Universitäts-Kinderspital Zürich (KISPI). In Phase I, a pre-validated surrogate model was tested for generalizability after training

on 15 min of patient data. In Phase II, a novel ensemble architecture was created by processing the EEG data through a denoising Variational Autoencoder (dVAE) to generate reconstructed signals, which were then classified by the surrogate model. The performance of both standalone and ensemble models was evaluated against ground truth labels from two expert human annotators using metrics such as Area Under the Receiver Operating Characteristic Curve (AUROC), recall, specificity, and precision.

Results

In Phase I, the standalone surrogate model demonstrated limited generalizability. While achieving high precision for the majority suppression class, it yielded low precision for the minority burst class, with AUROC scores often near random chance (e.g., mean AUROC of 0.41). The model struggled with the data's imbalanced nature. In Phase II, the dVAE + BSUPP ensemble architecture improved the AUROC on a single patient inference dataset to 0.53, an increase of approximately 30% over the standalone model. The ensemble achieved a perfect recall of 1.00 for burst detection, but this came at the cost of specificity (0.06) and precision (0.00), indicating a high false-positive rate.

Conclusions

A pre-validated unsupervised algorithm for BSP detection shows limited direct generalizability to heterogeneous pediatric data, primarily due to data imbalance. However, integrating it with a dVAE into a novel ensemble architecture is feasible and improves discriminative ability, specifically by boosting recall and AUROC score. This work highlights the potential of unsupervised deep learning to enhance automated BS detection in clinical settings, though further refinement is needed to balance the trade-off between sensitivity and specificity.

**P137**

**Guyon's Canal Syndrome: Diagnostic Utility of Ultrasonography**

M Dolezal

Luzerner Kantonsspital (LUKS), Luzern, Switzerland

A 56-year-old right-handed woman presented with progressive right hand weakness and wrist pain over six months, impairing fine motor tasks such as typing, locking doors, and handling laundry. Neurological examination revealed atrophy and weakness of ulnar-innervated intrinsic hand muscles, sparing the long flexors, with a resting benediction posture and positive Froment's and Wartenberg's signs. Sensory deficits involved both volar and dorsal aspects of the medial hand and ulnar digits. She had a prior history of bilateral ulnar nerve decompression at the elbow, with residual right-sided numbness and intermittent elbow pain. Cervical MRI excluded C8–T1 radiculopathy. A pronounced prolongation of distal ulnar motor latency and marked asymmetry in the lumbrical–interossei comparison study—with a 1.7 ms difference between ulnar and median latencies on wrist stimulation—localised the lesion to Guyon's canal (Zone 1). No conduction block or slowing across the elbow was detected. Neuromuscular ultrasound (NMUS) provided critical diagnostic insight, visualising pre- and poststenotic dilatation, intraneural hypoechogenicity, and fascicular disruption at the wrist. A ganglion compressing the ulnar nerve was identified and confirmed by MRI. Additionally, NMUS demonstrated normal cross-sectional areas at the ulnar groove and cubital tunnel. Surgical decompression confirmed the ganglion as the primary compressive lesion. In addition, an accessory abductor digiti minimi (AADM) muscle—originating from the palmaris longus and inserting into the fifth proximal phalanx—was found overlying the ulnar nerve. Although AADM is a known anatomical variant (present in 22–25% of individuals), it was not the principal cause of compression in this case but likely contributed to crowding within Guyon's canal. Both the ganglion and AADM were excised, and neurolysis of the deep motor branch

was performed. At six-week follow-up, the patient exhibited marked improvement in hand strength and pain. This case illustrates the diagnostic complexity of Guyon's canal syndrome and underscores the essential role of NMUS. It is a noninvasive, time-efficient, and cost-effective bedside tool, localising pathology, visualising etiology, establishing diagnosis when electrophysiology is inconclusive, and excluding alternative causes. Routine inclusion of NMUS in distal ulnar neuropathy workup is recommended to enable timely intervention and prevent irreversible axonal injury.

**P138**

**Scalp High-Frequency Oscillations as a Biomarker of Seizure Activity and Treatment Response in Neonates with Hypoxic-Ischemic Encephalopathy**

P Karatza [1], D Cserpan [1], SP Lo Biundo [1], A Grubenmann [1], A Rüegger [1], F Pisani [2], J Sarnthein [3] and G Ramantani [1]

[1] University Children's Hospital and University of Zurich, Zürich, Switzerland
[2] Child Neurology and Psychiatry Unit, Sapienza University of Rome, Rome, Italy
[3] University Hospital Zurich and University of Zurich, Zürich, Switzerland

Rationale
Neonates with hypoxic-ischemic encephalopathy (HIE) are at high risk for seizures. While some centers use continuous EEG to enable early detection and treatment, this approach is resource-intensive and not widely available. Identifying neonates with seizures based on routine EEG could help guide clinical decisions. This study investigates whether scalp high-frequency oscillation (HFO) rates in routine EEG performed in the first days of life (1) can differentiate neonates with HIE and seizures from those without seizures, and (2) serve as a marker of treatment response.
Methods
We analyzed scalp EEG recordings from 29 neonates with HIE (15 with seizures, 14 without seizures). A validated automated HFO detector was used to quantify HFO rates. For all neonates, we documented HIE severity, therapeutic hypothermia, and EEG background activity. For neonates with seizures, we noted exposure to phenobarbital (PB) and levetiracetam (LEV).
Results
We included 29 HIE neonates, 7 had severe, 14 moderate, and 8 mild HIE; 10 neonates underwent therapeutic hypothermia. EEG recordings were performed at a median age of 2 days (range: 0–10 days). HFO rates were significantly higher in neonates with seizures ($n$ = 15, 0.12 $\pm$ 0.11 HFO/min/channel) than in those without seizures ($n$ = 14, 0.03 $\pm$ 0.02 HFO/min/channel; $p$ = 0.004). In both neonates with and without seizures, HFO rates did not differ according to HIE severity, therapeutic hypothermia, or EEG background activity. Among neonates with seizures, 5 received PB only, 7 LEV only, and 2 both PB and LEV. HFO rates were significantly lower in neonates treated with PB ($n$ = 7; 0.05 $\pm$ 0.04 HFOs/min/channel) compared to those not treated with PB ($n$ = 8; 0.18 $\pm$ 0.13 HFOs/min/channel; $p$ = 0.03). In contrast, HFO rates did not differ significantly between neonates treated with LEV ($n$ = 9; 0.15 $\pm$ 0.13 HFOs/min/channel) compared to those not treated with LEV ($n$ = 6; 0.06 $\pm$ 0.04 HFOs/min/channel; $p$ = 0.15).
Conclusions
Scalp HFOs differentiate HIE neonates with seizures from those without and decrease following PB—but not LEV—administration. These findings support the potential of scalp HFO as a noninvasive biomarker of seizure activity and treatment response in neonates. Although the observed difference between PB and LEV in HFO suppression aligns with their reported differences in clinical efficacy for seizure control, the precise clinical relevance of HFO modulation by different treatments remains to be determined.

**P139**

## High-Density EEG vs. 10–20-EEG: Detection of High Frequency Oscillations in Pediatric Epilepsy

D Cserpan, J Castelmur, P Karatza, D Goncalves Carvalho, SP Lo Biundo, K Moser and G Ramantani

University Children's Hospital Zurich, Zürich, Switzerland

Background
High-frequency oscillations (HFOs) are emerging biomarkers of epileptogenicity, but their detection is limited with conventional 10–20 EEG due to sparse electrode coverage and the focal nature of HFOs. High-density EEG (HD EEG), using ≥64 electrodes, may enhance spatial resolution and improve detection.
Aim
To assess whether HD EEG improves HFO detection compared to conventional 10–20 EEG, with the goal of establishing HD EEG as a potential tool for prognostic evaluation in pediatric epilepsy surgery.
Methods
We implemented a clinical HD EEG protocol at the Children's Hospital Zurich and recorded HD EEG in pediatric patients with lesional epilepsy, both pre- and postoperatively. HFOs were automatically detected in artifact-free N2 sleep segments using average montage and quantified as HFO rate, defined as the number of detected events across all channels per minute. Each recording was analyzed under two conditions: (1) full HD EEG (128 channels) and (2) a simulated 10–20 montage (19 channels). The Wilcoxon signed-rank test was used for paired comparisons; $p < 0.05$ was considered significant.
Results
Nineteen patients were enrolled. As of June 2025, nine recordings from seven patients have been analyzed. The mean HFO rate was significantly higher with HD EEG ($4.12 \pm 3.29$ HFO/min) than with the 10–20 montage ($0.46 \pm 0.42$ HFO/min; $p = 0.004$).
Conclusions
HD EEG substantially improves HFO detection compared to standard EEG and may serve as a valuable tool in future studies of HFOs as prognostic biomarkers for treatment response in pediatric epilepsy surgery.

**P140**

## Intravascular Lymphoma Mimicking Inflammatory Cerebral Amyloid Angiopathy: A Case Report

A Rhally [1], J Cuony [1], K Battistini [2], M Uginet [1], J Worley [3], AJ Lobrinus [3], PH Lalive [4] and L Sveikata [5]

[1] Neurology Department, Geneva University Hospitals, Geneva, Switzerland
[2] Neuroradiology Department, Geneva University Hospitals, Geneva, Switzerland
[3] Clinical Pathology Department, Geneva University Hospitals, Geneva, Switzerland
[4] Department of Pathology and Immunology, Faculty of Medicine, University of Geneva, Geneva, Switzerland
[5] Geneva University Hospitals (HUG) and University of Geneva (Unige), Geneva, Switzerland

Introduction
We report the case of a 74-year-old woman admitted for a new-onset generalized seizure, subsequently attributed to acute cerebral hemorrhages in the absence of identifiable predisposing factors.

Case Report

A 74-year-old woman with a several-month history of progressive cognitive decline was admitted following a first-time generalized tonic-clonic seizure.

Brain MRI revealed subcortical vasogenic edema, an extensive burden of lobar microbleeds as well as macrohemorrhages, and widespread cortical superficial siderosis.

Cerebrospinal fluid (CSF) analysis showed elevated protein levels (1.32 g/L), lymphocytic pleocytosis (16 G/L; 62% lymphocytes), and abnormal Alzheimer's disease biomarkers (tau: 1700 ng/L, Aβ42/Aβ40 ratio: 0.05). Comprehensive infectious and immunologic workup and peripheral blood flow cytometry were unremarkable.

Based on imaging and CSF findings, cerebral amyloid angiopathy-related inflammation (CAA-ri) was suspected. High-dose intravenous methylprednisolone (1 g/day for 3 days, then tapered) and lacosamide (100 mg twice daily) were initiated, leading to initial clinical improvement. The patient was transferred to a neurorehabilitation unit.

Two weeks later, she developed acute neurological deterioration (GCS 8, NIHSS 26) with new right hemiparesis. Repeat MRI showed a left frontal intracerebral hemorrhage and progression of lobar microbleeds. Per family wishes, palliative care were initiated. She passed away eight days later.

Postmortem examination revealed a high-grade intravascular B-cell lymphoma (IVL) with extensive necrotic-hemorrhagic foci, alongside neuropathological evidence of Alzheimer's disease. Notably, there was no histopathological evidence of cerebral amyloid angiopathy.

Discussion

IVL is a rare, aggressive lymphoma characterized by malignant lymphoid cells proliferating within small to medium vessels, especially in the CNS. Its presentation often mimics neuroinflammatory or vascular conditions, contributing to frequent misdiagnoses. In this case, radiologic and CSF findings suggested CAA-ri, but were ultimately due to vascular infiltration by lymphoma cells. Microhemorrhages and white matter changes can occur in both entities, highlighting the overlap.

Conclusions

In cases of rapidly progressive neurological decline with atypical imaging and inconclusive CSF findings, IVL should be considered. Brain biopsy remains essential for definitive diagnosis and may allow timely initiation of life-saving treatment.

**P141**

## Bone Health in Migraine Patients Treated with Anti-CGRP Monoclonal Antibodies: A Prospective Observational Pilot Study

G Mallucci [1], C Camponovo [2], A Cordella [3], R Sacco [3], A Bellotti [1], A Ceschi [4], P Trimboli [2], C Gobbi [1] and C Zecca [1]

[1] Neurocenter of Southern Switzerland, EOC, Lugano, Switzerland
[2] Ente Ospedaliero Cantonale, Regional Hospital of Lugano, Clinic for Endocrinology and Diabetology, Lugano, Switzerland
[3] Neurocenter of Southern Switzerland, EOC, Lugano, Switzerland
[4] Clinical Trial Unit, Ente Ospedaliero Cantonale, Lugano, Switzerland

Aims

Calcitonin gene-related peptide (CGRP) is implicated in migraine pathophysiology and plays a regulatory role in bone metabolism. Concerns have emerged regarding possible osteocatabolic effects of anti-CGRP monoclonal antibodies (mAbs) used as preventives in migraine patients. We report the 6-month results from an ongoing 24-month prospective study assessing the impact of anti-CGRP mAbs on bone mineral density (BMD), trabecular bone score (TBS), and bone turnover markers in migraine patients.

Methods
Migraine patients initiating anti-CGRP mAbs (erenumab, galcanezumab, or fremanezumab) and with no comorbidities or medications affecting bone metabolism, were compared to age- and sex-matched migraine patients with no preventive migraine therapies. BMD was measured at lumbar spine (L1–L4), TBS was calculated using the TBS iNsight® software from lumbar images. Bone metabolism turnover markers included β-CTX and P1NP. Changes from baseline (T0) to month 6 (T6) were analyzed using non-parametric tests and linear mixed-effects models including time × group interaction.
Results
38 patients [25 treated, 13 controls; mean (SD) age 36.3 (9.2) years; 32 (84%) females] completed baseline and 6-month evaluations.
At baseline, BMD, TBS, and bone turnover markers were within normal ranges and comparable between the two groups.
At 6 months, lumbar spine BMD remained stable in both groups (treated +0.02 gr/cm$^2$, $p = 0.65$; controls −0.01 gr/cm$^2$, $p = 0.32$). TBS remained unchanged in treated patients (−0.001; $p = 1.000$), while it increased in controls (+0.052; $p = 0.026$), with a significant time x group interaction ($p = 0.022$; β = −0.053 [−0.098; −0.008]). β-CTX and P1NP remained stable in both groups. with no significant changes in treated (+0.032 µg/L, –2.80 µg/L) or control patients (−0.003 µg/L, −3.73 µg/L), respectively, and no significant time × group interaction ($p = 0.517$ and $p = 0.591$).
Anti-CGRP therapy led to a reduction in monthly migraine days (–9.13, $p < 0.001$) in treated patients.
Conclusions
Anti-CGRP mAbs treatment was not associated with significant changes in BMD, TBS or bone turnover markers over 6 months in migraine patients.
Funding
This study was supported by a grant from AFRI.

**P142**

## Fremanezumab for the Prevention of Menstrually-Related Migraine Attacks—A Prospective Observational Phase 4 Study According to Routine Neurological Care in Switzerland (FROMM)

A Scutelnic [1], GS Merki-Feld [2], R Agosti [3], B Anders [4], P Balcerak [5], AR Gantenbein [6], A Papadopoulou [7], P Ryvlin [8], S Wegener [9], C Zecca [10], B Haertel [11] and C Schankin [12]

[1] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurologie, Bern, Switzerland
[2] Department of Neurology, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland
[3] Kopfwehzentrum Hirslanden, Zurich, Switzerland
[4] Schmerzzentrum Granata, Zurich, Switzerland
[5] Department of Neurology and Stroke Center, Cantonal Hospital St. Gallen, St. Gallen, Switzerland
[6] Praxis Neurologie am Untertor, Bülach, Switzerland
[7] Department of Neurology, University Hospital Basel, University of Basel, Basel, Switzerland and Department of Clinical Research (DKF), University of Basel, Basel, Switzerland
[8] Department of Clinical Neurosciences, CHUV, Lausanne, Switzerland
[9] Department of Neurology, University Hospital and University of Zurich, Zurich, Switzerland
[10] Neurology department, Neurocenter of Southern Switzerland, EOC, Lugano, Switzerland
[11] TEVA Pharma AG, Basel, Switzerland
[12] Bellevue Medical Group, Zentrum für Migräne und Kopfschmerzen, Zurich, Switzerland

Question/Objective
Menstrually-related migraine attacks (MM) occurring during cycle days −2 to + 2, are more severe, of longer duration and respond less to acute medications. For many women those attacks induce a high burden with significant impact on quality of life. Data on the prevention of MM by anti-CGRP antibodies are scarce. The aim of this abstract is to introduce the study FROMM. The study will assess the response of MM to preventive treatment with fremanezumab in women with migraine. We hypothesize that MM respond equally well to treatment with fremanezumab as non-menstrual attacks.
Methods
This is a 30-month (24-month recruitment, 6-month treatment) study with fremanezumab treatment according to the Summary of Product Characteristics. Recruitment is planned at 10 sites in Switzerland. Pre-menopausal women with at least 2 days of MM and at least 8 migraine days per month will be included. The primary end-point is the difference in relative reduction of migraine days between MM and non-MM at follow-up. Estimates of the effectiveness of fremanezumab in relative reduction from baseline to follow-up in MM days comparing to non-MM days will be assessed. Exploratory endpoints are the change from baseline at follow-up in disability scores, migraine-specific quality of life, sleep quality, libido, number of days and intensity with typical symptoms of endometriosis, and number of migraine days in patients with and without concomitant hormonal treatment. Data will be collected using a headache diary (migraine days, migraine characteristics, aura, headache medication) and patient records (data on endometriosis, hormonal therapy, comorbidities).
Results
Three interim analyses are planned after 6 months treatment with fremanezumab of one third, two thirds and of all planned participants.
Conclusions
FROMM will provide insights into the treatment of MM and on the education of the largest group of people with migraine.

**P143**

## Impact of Symptom Duration on Brain Imaging Findings in Spontaneous Intracranial Hypotension

P Cimflova; L Schnider [1], L Brunner [1], T Petutschnigg [2], L Häni [2], D Nasiri [2], J Goldberg [2], A Scutelnic [3], S Rajbhandari [1], D Brustman [4], A Raabe [2], J Kaesmacher [1], N Lützen [5], K Wolf [6], J Beck [6], RT Schär [2], EI Piechowiak [1] and T Dobrocky [1]

[1] Inselspital—Universitätsspital Bern—Universitätsinstitut für Diagnostische und Interventionelle Neuroradiologie, Bern, Switzerland
[2] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurochirurgie, Bern, Switzerland
[3] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurologie, Bern, Switzerland
[4] University Hospital Hradec Kralove, Department of Radiology, Hradec Kralove, Czech Republic
[5] Universitätsklinikum Freiburg, Klinik für Neuroradiologie, Freiburg, Germany
[6] Universitätsklinikum Freiburg, Klinik für Neurochirurgie, Freiburg, Germany

Introduction & Aims
Spontaneous intracranial hypotension (SIH) is characterized by distinctive brain imaging findings. The Bern SIH score integrates the most important imaging features to aid diagnosis and standardize the radiological work-up. This study aimed to assess association between symptom duration and the Bern SIH Score.
Methods
All consecutive patients evaluated for SIH at our department between January 2013 to January 2025 were screened. Those with a confirmed CSF leak were categorized into

three groups based on the symptom duration: ≤10, 11–52, and >52 weeks. The evolution of the SIH score severity and the specific score items was analyzed.
Results
In total, 216 SIH patients (mean +/− SD age of 51 +/− 14 years; 63% of females) were included. The median Bern SIH score at baseline was 7 [Interquartile range (IQR) 4–9]. The initial Bern SIH score was significantly lower in patients with CSF-venous fistula. When stratified by symptom duration, the median Bern SIH score showed a significant decline: 8 (IQR 6–9) in patients with symptom duration ≤10 weeks, 5 (IQR 3–9) in 11–52 weeks, and 4.5 (IQR 2.0–6.0) in >52 weeks; $p < 0.001$. A gradual normalization of individual SIH score components—including dural enhancement, venous distention, subdural hygroma, supracellar cistern size, and mamillopontine distance—was observed over time.
Conclusions
The Bern SIH score is typically high in the acute phase (within 10 weeks) but tends to decrease over time. These results underscore the dynamic nature of SIH and highlight the importance of interpreting diagnostic tests within the temporal context of symptom duration and disease evolution.

**P144**

**Learnings from a Case of Familial Visual Snow Syndrome**

L Weichsel [1], N Slavova [1], F Riederer [1], A Scutelnic [1], A Klein [1], S De Beukelaer [1], A Schaller [2], C Zweier [2] and C Schankin [1]

[1] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurologie, Bern, Switzerland
[2] Department of Human Genetics, Bern University Hospital, University of Bern, Bern, Switzerland

Aims
Visual Snow Syndrome (VSS) is a neurological condition characterized by persistent visual static and a constellation of visual and non-visual symptoms. Despite its significant impact on quality of life, effective treatments remain elusive. This study aimed to describe a multigenerational family cluster of VSS to explore phenotypic variability and highlight the potential role of genetic and environmental factors.
Methods
Following a report of familial clustering by an index patient with VSS, we conducted a detailed clinical assessment of his family. In structured interviews we assessed onset age, symptomatology, triggering factors, and comorbidities across affected individuals spanning three generations.
Results
A total of six family members across three generations were diagnosed with VSS. The presentation varied significantly among individuals, with differing onset ages, symptom profiles, and triggers. Some reported visual symptoms exclusively, while others experienced prominent non-visual features such as tinnitus and migraine. Identified triggers included stress and pregnancy. The intrafamilial phenotypic variability suggests incomplete penetrance and possible environmental modulation.
Conclusions
This is the first detailed familial case series of VSS, demonstrating the condition's heterogeneity even within the same genetic background. Our findings support the hypothesis of a hereditary component in VSS and underline the importance of trigger avoidance in genetically predisposed individuals. Further genetic investigations in multiplex families may offer critical insights into pathophysiological mechanisms and guide future preventive and therapeutic strategies.

**P145**

**Posterior Fossa Syndrome in Adults with a Clinical Phenotype of Disorders of Consciousness: Case Series and Scoping Review**

E Maslias, IA Meyer, J Jöhr, V Dunet and K Diserens

Lausanne University Hospital (CHUV), Lausanne, Switzerland

Aims

Posterior Fossa Syndrome (PFS) is a complex neurobehavioral condition frequently reported in children after cerebellar injury, but rarely described in adults (1). Recognition of PFS in adults, particularly through careful clinical examination for subtle signs in patients presenting with a phenotype of a Disorder of Consciousness (DoC), is crucial due to its significant diagnostic and prognostic implications (2). This study aims to characterize the clinical phenotype of PFS in adults with an initial DoC presentation, identify implicated neuroanatomical structures, and evaluate potential misdiagnoses such as clinical Cognitive Motor Dissociation (cCMD) (3).

Methods

We conducted a scoping review in accordance with the Joanna Briggs Institute (JBI) methodology and PRISMA-ScR guidelines, with a systematic literature search across six databases (4). Eligibility criteria were defined using the PCC framework: adult and pediatric patients (P), PFS in the context of DoC (C), and the field of clinical neurosciences (C). In parallel, we report a case series of 5 adult patients with PFS and initial DoC phenotype treated in our neurorehabilitation unit. Clinical, imaging, and outcome data were extracted and analyzed. No meta-analysis was conducted due to study heterogeneity.

Results

Preliminary findings from our case series and scoping review suggest that PFS in adults is underrecognized in patients presenting as behaviorally unresponsive based on the Coma Recovery Scale-Revised (CRS-R). Careful assessment of motor behavior and identification of clinical features such as mutism, ataxia, hypotonia, and affective dysregulation should raise clinical suspicion. Neuroimaging consistently revealed involvement of cerebellar efferent pathways, particularly the dentato-thalamo-cortical tract. Our findings indicate that detection of subtle signs of intentional behavior in this population may support the diagnosis of clinical Cognitive Motor Dissociation (cCMD), allowing for a more accurate differential diagnosis in patients with an initial phenotype of DoC.

Conclusions

This is the first study to systematically investigate PFS in adults with an initial phenotype of DoC. Our findings support the need for increased clinical awareness of PFS as a differential diagnosis for DoC and regognition of cCMD, especially in cerebellar lesion contexts. Accurate recognition may prevent misdiagnosis, refine prognostic estimations, and inform tailored neurorehabilitation strategies.

**P146**

**Escitalopram Promotes Recovery from Hand Paresis in Cortical Sensorimotor Stroke—A Randomized, Double-Blind, Placebo-Controlled Longitudinal Study**

V Vallesi [1], W Krammer [2], A Federspiel [2], JH Missimer [3], P Manuela [4], G Kägi [5], R Wiest [2] and B Weder [2]

[1] Swiss Paraplegic Research, Nottwil, Switzerland

[2] Support Centre for Advanced Neuroimaging (SCAN), Institute for Diagnostic and Interventional Neuroradiology, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland

[3] Laboratory of Biomolecular Research, Paul Scherrer Institute, Villigen, Switzerland

[4] Gerontechnology and Rehabilitation Group, Artificial Organ Center for Biomedical Engineering Research (ARTORG), University of Bern, Switzerland
[5] Department of Neurology, University Hospital and University of Bern, Bern, Switzerland

Aims
This study investigated whether early escitalopram administration improves hand motor recovery after first-ever ischemic stroke involving the pre- and/or postcentral gyrus. A secondary objective was to assess cortical reorganization associated with motor recovery.
Methods
In a prospective, multi-centre, double-blind, placebo-controlled trial, 21 patients with moderate to severe hand paresis following a first-ever ischemic stroke in the sensory-motor cortex were randomized to receive escitalopram or placebo during the first three months post-stroke. Escitalopram dosing was titrated to a maximum of 20 mg/day. Patients underwent repeated assessments at baseline, three months, and nine months. Motor function was evaluated using a sensitive imitation task during fMRI, involving observation and execution of dynamic within-hand object manipulations (finger gaiting), simulating coordinated grasping and re-grasping movements. This task was designed to assess manual dexterity with minimal cognitive load and was complemented by behavioral tests, particularly subtests of the Jebsen-Taylor Hand Function Test. fMRI data were analyzed using SPM12, and a voxel-wise ANOVA across time points and groups (verum, placebo, healthy controls) was conducted to identify significant activation changes during motor execution.
Results
The escitalopram group demonstrated significantly greater long-term improvements in manual dexterity, particularly in finger gaiting and card turning tasks ($p < 0.05$), compared to the placebo group. fMRI revealed increased activation in key motor-related brain regions, including the left frontal OP6, Brodmann area 44, anterior insula, posterior putamen, and right premotor subarea 6v3. In contrast, the placebo group showed increased activation in the left mediodorsal thalamus at nine months.
Conclusions
Early escitalopram treatment accelerated recovery from hand paresis and promoted functional reorganization in regions critical for fine motor control in the left hemisphere and spatial hand coordination in the right hemisphere. Delayed recovery in the placebo group was characterized by compensatory activation of the left dorsolateral prefrontal loop during the early chronic phase. These findings support the therapeutic potential of SSRIs in stroke rehabilitation and underscore the value of task-specific within-hand assessments.

**P147**

## Impact on Everyday Cognition, Fatigue and Quality of Life of a Novel Cognitive Neurorehabilitation Protocol Using a Real-Time Adaptive Exergame in Multiple Sclerosis: a Randomized Controlled Trial

P Menoud [1], E Sallard [1], G Binarelli [1], P Grivaz [1], EL Fischer [2], C Moser [1], CA Pestiaux [1], FW Sander [1], G Eberlé [1], P Ryvlin [1], M Théaudin [1], C Pot [1], RA Du Pasquier [1], JA Anguera [3], A Gazzaley [3], R Bove [3] and A Sokolov [1]

[1] CHUV (Centre hospitalier universitaire vaudois), Lausanne, Switzerland
[2] CHUV (Centre hospitalier universitaire vaudois), Lausanne, Switzerland; Bern University Hospital (Inselspital), Bern, Switzerland
[3] University of California, San Francisco, CA, USA

Aims
This pilot two-arms RCT assessed the feasibility (adherence, safety and satisfaction) and provided preliminary insights into the clinical efficacy of the cognitive exergame Body-Brain Trainer (BBT) for cognitive neurorehabilitation of people with multiple sclerosis (pwMS).
Methods
Twenty-four pwMS (18–65 years) with cognitive complaints and objective cognitive deficits were randomly allocated to the BBT intervention ($n$ = 12) or to an expectancy-matched active control group Mind-Body Trainer (MBT; $n$ = 12). Both groups attended 12 supervised in-lab sessions over four weeks. Cognitive and physical assessments were conducted at baseline and post-training. The primary outcome was the change in processing speed from baseline to post-training, measured with the Symbol Digit Modalities Test (SDMT). Secondary measures included patient-reported outcomes (PROMs) assessing everyday cognition (Multiple Sclerosis Neuropsychological Screening Questionnaire; MSNQ-s, Rating Scale of Attentional Behaviour; RSAB), fatigue (Modified Fatigue Impact Scale; MFIS) and quality of life (Multiple Sclerosis Quality of Life; MSQoL-54).
Results
Adherence was high (91.67%) and no Serious Adverse Events (SAEs) were reported during the protocol. Participants in both groups reported high enjoyment (BBT: 7.2 $\pm$ 1.99; MBT: 6.58 $\pm$ 1.83) on a custom-made experience questionnaire (fun; 1 = not at all, 9 = extremely).
Both the BBT and MBT groups improved on the SDMT, with mean increases of 2.5 (SD = 7.35, $n$ = 10) and of 4.92 points (SD = 8.21, $n$ = 12), respectively. Between-group analyses revealed no statistically significant differences (B = −2.48 [−8.25, 3.28], $p$ = 0.42). Whitin-group analyses showed improvements for the BBT group in everyday cognition (MSNQ-s: B = −4.95, 95% CI [−8.42, −1.49], $p$ = 0.006; RSAB: B = −5.68, 95% CI [−9.82, −1.54], $p$ = 0.009), fatigue (MFIS total score: B = −10.92, 95% CI [−20.94, −0.89], $p$ = 0.034) and quality of life (MSQoL-54, mental composite: B = 10.2, 95% CI [0.75, 19.65], $p$ = 0.035). No statistically significant between-group differences were observed.
Conclusions
This study confirms the feasibility of the BBT intervention among pwMS and shows promising preliminary results supporting the development of a larger confirmatory RCT. Moreover, these results highlight the value of PROMs as meaningful outcomes that, alongside objective measures, contribute to a more patient-centered assessment of improvements following cognitive neurorehabilitation.

**P148**

**Left Atrial Enlargement in Patients with Atrial Fibrillation and Breakthrough Stroke**

E Auer [1], A Zietz [2], T Meinel [1], L Räber [3], A Polymeris [2], P Lyrer [2], S Engelter [2], N Peters [4] and D Seiffge [1]

[1] Inselspital—Universitätsspital Bern—Universitätsklinik für Neurologie, Bern, Switzerland
[2] Universitätsspital Basel Neurologie, Basel, Switzerland
[3] Inselspital—Universitätsspital Bern—Universitätsklinik für Kardiologie, Bern, Switzerland
[4] Klinik Hirslanden Zürich—Neurologie und Stroke Center, Zürich, Switzerland

Background
Mechanisms of ischemic stroke despite oral anticoagulation (OAC) in patients with atrial fibrillation (AF), so-called “breakthrough strokes”, and factors affecting stroke recurrence remain poorly understood. We aimed to compare echocardiographic markers of left atrial (LA) size and assess associations with stroke recurrence in AF-patients with breakthrough and OAC-naïve stroke.

Methods

Data of this retrospective, cross-sectional secondary analysis derives from the prospective, single-centre cohort NOACISP (NCT03826927). We included AF-patients with ischemic stroke and available echocardiographic data on LA-diameter (LA-diam) and LA-volume-index (LAVI). Patients were categorised according to OAC-status (breakthrough vs. OAC-naïve). Left atrial enlargement (LAE) measured in LA-diam and LAVI was the primary and stroke recurrence during follow-up the secondary outcome. Associations between LAE, OAC-status, and their influence on stroke recurrence were analysed using logistic and Cox proportional models, adjusting for predefined confounders.

Results

We included 536 patients (45.9% female, median age 80, median CHA2DS2-VASc 5, 45% with breakthrough stroke). Breakthrough patients were more likely to have a larger LA (aOR for higher LA-diam 1.6 [95%-CI 1.2–2.5] and for LAVI 1.6 [95%-CI 1.2–2.4], $p = 0.005$) with larger absolute LA-size (median LA-diam 44 mm vs. 40 mm and LAVI 48 mL/m$^2$ vs. 40 mL/m$^2$, $p < 0.001$). During a median follow-up of 23.3 months, 44 recurrent strokes occurred (8.9%/year in breakthrough vs. 2.1%/year in OAC-naïve patients, $p < 0.001$). Breakthrough stroke was associated with higher stroke recurrence (aHR 5.5 [95%-CI 2.66–12.43], $p < 0.001$). LA-diam (aHR 1.0, [95%-CI 0.65–1.1], $p = 0.65$) and LAVI (aHR 0.98 [95%-CI 0.96–1.01], $p = 0.06$) however were not independently associated with stroke recurrence.

Conclusions

AF-patients with breakthrough stroke exhibit more pronounced LA-enlargement compared to OAC-naïve stroke patients. After adjusting for confounders, LA size was not associated with stroke recurrence.

**P149**

## Evolution of Perihematomal Edema Mean Hounsfield Unit and Its Association with Clinical Outcome in Intracerebral Hemorrhage: A Post Hoc Analysis of the i-DEF Trial

A Polymeris [1], V Lioutas [2] and M Selim [2]

[1] University Hospital Basel, Basel, Switzerland
[2] Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, USA

Background

Lower mean Hounsfield unit (mHU) values, indicating greater CT hypodensity of perihematomal edema (PHE), have been proposed as a novel quantitative imaging marker in intracerebral hemorrhage (ICH). We explored its evolution and prognostic importance in a post-hoc analysis of the Intracerebral Hemorrhage-Deferoxamine (i-DEF) trial (NCT02175225).

Methods

We included participants with primary supratentorial ICH who had available CT scans at baseline and follow-up after 72–96 h, and 90 and/or 180 days outcome data. The primary exposure variable was the mHU of PHE measured on the follow-up CT scan. We investigated (i) its change from baseline and (ii) its association with unfavorable outcome (modified Rankin Scale score 3–6) in adjusted mixed-effects models, accounting for between-center and between-participant variability.

Results

Among 273 of 293 i-DEF participants eligible for analysis (median age 61 years, 39% female), the median (IQR) mHU of PHE was 30.3 (28.3–32.7) at baseline and 26.8 (24.6–29.2) at follow-up. The mHU of PHE decreased from baseline to follow-up scan by an average of 3.6 (95%-CI 3.2–4.0, $p < 0.001$). There was no association between the mHU of follow-up PHE with unfavorable outcome at 90 days ($N = 273$; OR 1.05, 95%-CI 0.95–1.17, $p = 0.32$), nor at 180 days ($N = 261$; OR 1.01, 95%-CI 0.92–1.11, $p = 0.81$).

Conclusions

PHE after ICH tends to grow more hypodense on CT by day 3–4 compared to baseline. The degree of PHE hypodensity is not associated with long-term clinical outcomes, challenging its utility as a radiological marker in ICH research.

**P150**

**Radiomics Analysis of Brain Magnetic Resonance Imaging Improves the Identification of a Cardioembolic Source of Stroke**

J Deseö [1], E de la Rosa [2], H Baazaoui [3], B Menze [2] and S Wegener [1]

[1] Universitätsspital Zürich & Universität Zürich, Zürich, Switzerland
[2] Universität Zürich, Zürich, Switzerland; [3] Universitätsspital Zürich, Zürich, Switzerland

Aims

Secondary prevention of ischemic stroke due to a cardiac source is insufficient with platelet inhibitors but requires anticoagulation. Thus, early identification of patients with a cardioembolic (CE) source of stroke is crucial. We aimed to identify patients with CE source of stroke based on post-stroke brain magnetic resonance imaging (MRI) and clinical data.

Methods

We performed a pilot study using data from 113 ischemic stroke patients with large vessel occlusion treated at the University Hospital Zurich. Stroke etiology was determined by the treating clinician after diagnostic workup and classified according to the TOAST criteria. Stroke etiology was divided into CE (TOAST 2) and non-CE (TOAST 1, 4). Patients with undetermined etiology or incomplete work-up (TOAST 5) were not included in the study. 56 patients were classified as CE, 57 patients were classified as non-CE.

We performed automated stroke lesion segmentation [1]. By consequently registering images with the Montreal Neurological Institute atlas [2] with vascular territory annotations [3] we extracted the distribution of the lesions. Further, we performed a brain tissue volumetry based on FLAIR sequences [4]. Finally, we extracted radiomics features from lesions on DWI imaging using pyradiomics [5].

We built a logistic regression model for detecting a CE source of stroke based only on clinical data (age, sex and medical history). We then selected 10 features from clinical and imaging data using maximum relevance minimum redundancy [6] and built a second logistic regression model. We evaluated model performance using 10-fold cross validation.

Results

The model based only on clinical data achieved an area under the receiver operating characteristic curve (ROC AUC) of 0.726 (95% CI 0.642–0.810) for detecting a CE source of stroke. Higher age ($p < 0.001$) and female sex ($p = 0.01$) were significantly associated with a CE source of stroke. The model based on clinical data and imaging features achieved an improved ROC AUC of 0.818 (95% CI 0.716–0.893). Bilateral lesions and markers of brain atrophy such as increased volume of extra-cerebral CSF and smaller hippocampal volume were associated with a CE source of stroke.

Conclusions

In our pilot study, features automatically extracted from MRI after stroke can improve detection of CE source of stroke, beyond models based on clinical data only. We plan on further investigating this in larger, multicenter datasets.

**P151**

**Towards Individualized Outcome Prediction and Treatment Effect Estimation in Patients with LVO Stroke**

L Herzog [1], P Bühler [2], E de la Rosa [3], B Sick [4] and S Wegener [1]

[1] University and University Hospital of Zurich, Zürich, Switzerland
[2] Zurich University of Applied Sciences, Zürich, Switzerland
[3] University of Zurich, Zürich, Switzerland
[4] Zurich University of Applied Sciences, University of Zurich, Zürich, Switzerland

Aims
Although acute ischemic stroke treatment has seen huge advances, treatment decisions and early prognoses in patients with large vessel occlusion (LVO) stroke are challenging while functional recovery is variable even after successful mechanical thrombectomy (MT). We aimed at evaluating different causal machine learning models for functional outcome prediction and individualized treatment effect (ITE) estimation.
Methods
We used pre-treatment data of 449 LVO stroke patients of the MR CLEAN trial to develop models predicting favorable (modified Rankin Scale (mRS) of 0–2 at 3 months) vs. unfavorable (mRS of 3–6) functional outcome. Besides the most relevant clinical features, we included non-contrast CT (NCCT) and CT angiography (CTA) features extracted from novel foundation models for CT data to make use of advanced imaging information. We compared single-learners, including treatment information as treatment indicator variable, to X-learners, which learn separate prediction models for treated and untreated subjects. The ITE is the difference of predicted probabilities for favorable functional outcome under MT vs. no MT. All models were evaluated in a five-fold cross validation (CV) in terms of discrimination and calibration regarding prediction performance and ITE estimation.
Results
Only 32.6% of the 233 patients treated with MT had a favorable outcome. The average treatment effect was 0.14 (Odds ratio 2.09). The highest prediction performance was achieved in a single-learner logistic regression without treatment interactions based on clinical and NCCT features (AUC of 0.723 [0.671, 0.777]). Using clinical data only (AUC of 0.714 [0.660, 0.772]) or adding CTA to clinical and NCCT features (AUC of 0.696 [0.643, 0.752]) did not improve prediction performance. More complex single-learner models allowing for treatment interactions (Grouped LASSO, Random Forest, XGBoost) yielded similar performances but did not capture treatment effects anymore. X-learners improved treatment effect estimation but prediction performance dropped slightly.
Conclusions
Using advanced CT imaging information improved functional outcome prediction and ITE estimation slightly. Prediction performance was barely affected by adding imaging to clinical features but a valid treatment effect estimation required careful variable/model selection.

**P152**

## Canadian Outcome Scale for Minor Stroke (COSMOS): Inter-Rater and Intra-Rater Reliability Study of a Novel Outcome Measure

M Goyal [1], A Ganesh [1], S Bosshart [2], A Stebner [3], N Singh [4], B Menon [1], S Coutts [1], J Ospel [1], M Almekhlafi [1], J Kromm [1], P Couillard [1], D Dowlatshahi [5], B Buck [6], B van Adel [7], K Ryckborst [1], A Trivedi [4], C Bogiatzi [8], A Poppe [9], M Mehdi [1], L Catanese [7], R Whelan [10], R Fahed [11], B Sivanandan [1], M AlShamrani [1], S Mishra [6], U Pensato [12], B Agnelli [1], I Sebastian [1], A Tkach [13], K Ignacio [1], M Wan [1], S Alcock [4], R Swartz [14], G Mclean [15], S Greco [1], C Kenney [1], A Demchuk [1] and MD Hill [1]

[1] University of Calgary, Calgary, Canada
[2] Universitätsspital Basel Neurologie, Basel, Switzerland
[3] Universitätsspital Basel, Basel, Switzerland
[4] University of Manitoba, Winnipeg, Canada

[5] University of Ottawa, Ottawa, Canada
[6] University of Alberta, Edmonton, Canada
[7] McMaster University, Hamilton, Canada
[8] London Health Sciences Centre and Western University, London, Canada
[9] Université de Montréal, Montréal, Canada
[10] Royal University Hospital Stroke Program, Saskatoon, Canada
[11] University of Ottawa and Ottawa Hospital Research Institute, Ottawa, Canada
[12] Humanitas University, Milan, Italy
[13] Interior Health, Kelowna, Canada
[14] Sunnybrook Health Sciences Centre/University of Toronto, Toronto, Canada
[15] Vancouver Coastal Health Research Institute, Vancouver, Canada

Background
The vast majority of patients with minor stroke achieve what are considered good or excellent outcomes on the modified Rankin Scale(mRS 0–1/0–2), yet many are dissatisfied with their outcomes. There is a need for a functional outcome measure tailored for minor stroke that better reflects the spectrum of clinical outcomes within this population. We developed the Canadian Outcome Scale for MinOr Stroke (COSMOS) and performed an inter-rater and intra-rater reliability study.
Methods
COSMOS is a 7-point scale ranging from 0(No symptoms) to 6(Loss of independence for an instrumental or basic activity of daily living[ADL], or worse), that accounts for performance limitations and losses of a person's hobbies or passions and of their employment, educational, service, or caregiving pursuits, besides just ADLs. 100 test case vignettes were developed. Stroke physicians, fellows, and research nurses/staff were invited to review training materials and provide the COSMOS grade for 20 cases representing all COSMOS grades (0–6). After a minimum two weeks "wash-out" period, participants were asked to grade the same 20 cases again. Inter-rater and intra-rater agreement were assessed using Cohen's Kappa, weighted Kappa, percentage agreement, and intraclass correlation coefficient(ICC).
Results
Among 33 participants (18 attending physicians, 9 stroke fellows, 6 research staff/nurses), median 12.5 years of experience), COSMOS had substantial inter-rater reliability (80.5% agreement, 95%CI: 75.7–85.3%; Cohen's Kappa 0.77, 95%CI: 0.72–0.84) and almost-perfect intra-rater availability overall (87.1% agreement, 95%CI:84.4–89.7%, Kappa 0.85, 95%CI:0.82–0.88); weighted Kappa showed almost perfect agreement for both inter-rater (0.88, 95%CI:0.85–0.92) and intra-rater reliability (0.92, 95%CI:0.90–0.94). The overall chance-adjusted simultaneous intra-/inter-rater agreement using ICC was 0.95 (95%CI:0.94–0.97). Results were similar with substantial to almost-perfect agreement when considering key subgroups based on position (attendings, fellows, research nurse/staff) and years of experience.
Conclusions
The newly proposed COSMOS scale demonstrated substantial inter-rater and intra-rater reliability. The scale merits further study in cohort studies and clinical trials of minor stroke.

**P153**

**Decision-Making for Endovascular Thrombectomy in Patients with Large Vessel Occlusions and Mild Neurological Deficit—A Consensus Statement**

S Bosshart [1], M Kappelhof [2], A Stebner [3], S Fujiwara [4], P Cimflova [5], M Schüngel [6], G Milot [7], P Mosimann [8], J Schaafsma [9], M Ribo [10], A Paul [11], C Ulfert [12], M Almekhlafi [13], I Fragata [14], S Nardai [15], D Lopes [16], B Menon [13], P Bhogal [17], U Pensato [18], C Hawkes [19],

S Yoshimura [20], V Inoa [21], A Ganesh [13], D Volders [22], M Moreu [23], K Uchida [20], S Nimjee [24], J Saver [25], MD Hill [13] and JM Ospel [13]

[1] Universitätsspital Basel Neurologie, Basel, Switzerland
[2] Amsterdam University Medical Centers, Amsterdam, Netherlands
[3] University Hospital Basel, Basel, Switzerland
[4]Kobe City Medical Center General Hospital, Kobe, Japan
[5] Bern University Hospital (Inselspital), Bern, Switzerland
[6] University Hospital Halle, Halle, Germany
[7] CHU de Quebec-Universite Laval, Quebec, Canada
[8] University of Toronto & Toronto Western Hospital, Toronto, Canada
[9] University Health Network, Toronto, Canada
[10] Hospital Vall d'Hebrón, Barcelona, Spain
[11] Albany Medical Center, Albany, USA
[12] UniversitätsKlinikum Heidelberg, Heidelberg, Germany
[13] University of Calgary, Calgary, Canada
[14] ULS S. José, Lisbon, Portugal
[15] Semmelweis University, Budapest, Hungary
[16] Advocate Aurora Health Inc, Park Ridge, USA
[17] The Royal London Hospital, Barts NHS Trust, London, UK
[18] Humanitas University, Milan, Italy
[19] Sunnybrook Health Sciences Centre/University of Toronto, Toronto, Canada
[20] Department of Neurosurgery, Hyogo Medical University, Nishinomiya, Japan
[21] University of Tennessee Health Science Center, Memphis, TN, USA
[22] Dalhousie University, Halifax, Canada
[23] Hospital Clínico Universitario San Carlos, Madrid, Spain
[24] The Ohio State University Wexner Medical Center, Columbus, USA
[25] University of California, Los Angeles, USA

Background and Purpose
Acute ischemic stroke patients with mild deficits (NIHSS 0–5) but confirmed large-vessel occlusions (LVO) present a clinical challenge for endovascular thrombectomy (EVT) decisions due to limited evidence and the absence of clear guidelines.
Methods
A Delphi consensus was conducted at the 2024 5T Think Tank conference with 40 international stroke experts. Following a systematic literature review, three iterative Delphi rounds were employed to explore EVT decision-making in strokes due to LVO with low NIHSS. Data were collected through surveys and in-person discussions, focusing on disability evaluation, imaging markers, procedural risk, and outcome scales.
Results
Consensus was achieved on key factors influencing EVT decisions. Experts emphasized the importance of symptom-specific disability (e.g., aphasia, vision loss) over NIHSS scores alone. Early neurological deterioration (END) was perceived as main concern in this patient population. Imaging markers such as proximal occlusion, poor collaterals, and large penumbra were expected to be predictors of END. The anticipated technical difficulty and patient-specific factors, such as independence and quality of life, also guided decisions. The PRISMS trial definition of disabling deficits and the 9-level mRS were favored as outcome measures for future studies.
Conclusions
EVT decisions for acute ischemic strokes with mild deficit but proven LVO require nuanced, individualized approaches beyond NIHSS thresholds. Disability assessment, imaging-

based risk evaluation, and patient-centered discussions are critical for optimizing outcomes, emphasizing the need for further research and standardized guidelines.

**P154**

**Bacterial Translocation and Gut Barrier Dysfunction After Acute Ischemic Stroke: The Role of Short-Chain Fatty Acids as Key Regulators of the Brain-Gut Axis**

J Castillo González, M Mousavi, L Buscemi, M Price and L Hirt

CHUV (Centre hospitalier universitaire vaudois), Lausanne, Switzerland

Aim

Ischemic stroke, caused by the occlusion of a brain artery, leads to neuronal death, blood-brain barrier breakdown, neuroinflammation, and gut-brain axis dysregulation, linked to worsened clinical outcomes and impaired recovery. Despite improved treatments, stroke remains the second leading cause of death globally, with post-stroke infections (PSIs) as the main life-threatening complication (30–45% of patients, 20% of mortality). Traditionally attributed to nosocomial infections or medical procedures, recent groundbreaking research reported that PSIs primarily originate from bacterial translocation following gut barrier disruption. Despite the high mortality associated with PSIs, current treatments, remain largely ineffective, underscoring the urgent need for a better understanding of their etiology. While the connection between bacterial translocation and PSIs is increasingly acknowledged, the underlying mechanisms remain unidentified. Short-chain fatty acids (SCFAs), microbiota-derived metabolites with neuroprotective, anti-inflammatory, and antimicrobial properties, are key regulators of this axis. However, their role in PSIs, the mechanisms involved, and their therapeutic potential remain unexplored. To address this, we investigated the effects of SCFAs administration on bacterial translocation, gut integrity, and immune response following stroke.

Methods

Using a preclinical stroke model (transient middle cerebral artery occlusion, MCAO) in young male mice, SCFAs were administered starting at 24 h after stroke for 3 days. Mice were sacrificed on day 4, when infections typically emerge. Liver, heart, lungs, spleen, brainstem, and blood were homogenized and plated to identify colony-forming units. The brain and gut were collected to assess infarct volume and gut integrity.

Results

Our preliminary findings demonstrate that stroke leads to bacterial translocation to several organs (e.g., liver, heart, brainstem). Importantly, SCFAs treatment significantly reduces bacterial translocation, modulates gut barrier integrity, immune response, and gut motility. Additionally, SCFAs exert a beneficial effect by reducing brain lesion size and improving functional recovery.

Conclusions

These findings emphasize the crucial role of SCFAs in the gut-brain axis following stroke and their potential to reduce infection-related complications, which may offer a promising therapeutic strategy for one of the least understood yet most lethal complications of stroke.

**P155**

**Acute Ischaemic Stroke Sub-Group analysis of Door-To-Groin and 90 Days mRS relationship in Drip and Ship CHUV Patients**

R Mospan, P Pozeg, D Strambo, P Michel, G Thevoz, J Richiardi and F Puccinelii

CHUV (Centre hospitalier universitaire vaudois), Lausanne, Switzerland

Aim
We aim to confirm that in drip-and-ship (D&S) acute ischemic stroke (AIS) patients longer Door-to-Groin-time (DTG) is associated with a poor outcome.
Methods
Using the ASTRAL registry, we identified all consecutive patients admitted to Lausanne University Hospital between 2018 and 2021 via the D&S pathway who underwent mechanical thrombectomy (MT) with complete data for outcome and covariates included in our analysis. We performed a multivariable logistic regression analysis to evaluate the independent association of DTG with poor functional outcome at 90 days, defined as modified Rankin Scale (mRS) >2. The model was adjusted for covariates with known associations with the outcome: age, gender, hypertension, atrial fibrillation (AF), coronary artery disease (CAD), smoking, prior TIA/Stroke, diabetes, Onset-to-Door-time (OTD), admission NIHSS (NIHSS) and adjusted Charlson Comorbidity Index. To assess whether the association between DTG and functional outcome was influenced by other clinical variables, we performed interaction analyses by fitting separate logistic regression models, each including an interaction term between DTG and a given covariate. Subgroup analysis compared fast (<45 min) vs. slow (≥45 min) DTG groups with good and bad outcomes.
Results
A total of 160 patients were included, with a median age of 74 years, 43% female, median admission NIHSS of 12, intravenous thrombolysis (IVT) rate of 72%, and median DTG of 38 min.
In the multivariable analysis, longer DTG was independently associated with poor 90-day mRS (OR = 1.03, 95% CI 1.01–1.05, $p = 0.003$). No significant interaction was found between DTG and any of the tested covariates. In the fast DTG group and the slow DTG group, the proportion of patients achieving good functional outcome was 65.5% and 38.0%, respectively. Among patients with poor outcome those with short DTG had higher median age (82 vs. 76, $p = 0.42$). Amongst patients with good outcome, those with short DTG had higher median admission NIHSS (9.5 vs. 7.0, $p = 1.0$); both not statistically significant.
Conclusions
Consistent with previous studies, longer DTG was associated with poorer 90-day functional outcomes even within the D&S paradigm. This association remained consistent across all examined clinical parameters. Both good and poor outcomes were observed despite short or long DTG, confirming that other baseline factors, such as patient age and stroke severity also play critical roles influencing outcomes.

**P156**

## Clinical and Cognitive Outcomes After bi-Thalamic Stroke: Multicenter Artery of Percheron Stroke Registry

C Meyruey [1], N JENDOUBI [1], K MELAIKA [2], G THÉVOZ [3], D STRAMBO [3], I SLAUTAITĖ [2], M VAIDAS [4], T VANAGAS [4], K JURJĀNS [5], A VILIONSKIS [2], D JATUŽIS [2], F Assal [1], P MICHEL [3], R MASILIŪNAS [2] and L SVEIKATA [1]

[1] Neurology Division, Department of Clinical Neurosciences, Geneva University Hospital, University of Geneva, Geneva, Switzerland
[2] Clinic of Neurology and Neurosurgery, Institute of Clinical Medicine, Faculty of Medicine, Vilnius University, Vilnius, Lithuania
[3] Stroke Center, Neurology Service, Lausanne University Hospital, Lausanne, Switzerland
[4] Lithuanian University of Health Sciences, Kaunas, Lithuania
[5] Department of Neurology and Neurosurgery, Riga Stradiņš University, The Red Cross Medical College of Riga Stradiņš University, Neurology Department, Pauls Stradiņš Clinical University Hospital, Riga, Latvia

Background and Aims
Artery of Percheron stroke (AOPS) is a rare infarction subtype bilaterally affecting the paramedian thalami. Owing to its rarity and atypical presentation, AOPS is often challenging to diagnose and manage with an uncertain long-term outcome.
Methods
We assessed clinical and radiological data of AOPS from six centers in Switzerland, Lithuania and Latvia between 2003–2023. Patients were eligible if they were admitted within 72 h of onset, with AOPS confirmed by CT/MRI.
Results
We identified 84 AOPS cases (mean age 67.8 $\pm$ 15.2 years, 42.9% female). A wake-up stroke was present in 31%, and median time to ED was 151 min (IQR 72–722). Main symptoms included decreased or fluctuation of consciousness (71%), corticospinal signs (67%), aphasia (38%), gaze palsy (38%), and confusion (36%). Stroke diagnosis was delayed in 21.5%, which was possibly associated with prolonged hospital stay duration. None of these missed cases underwent MRI as first neuroimaging. Acute stenosis/occlusion or hypoperfusion were observed in 21.8%, and 16 (19%) received revascularization therapy (10 thrombolysis, 2 thrombectomy, 4 bridging). Favorable functional outcomes were uncommon, with only 41% of patients achieving a mRS $\leq$ 2 at 3 months.
Conclusions
In this large multicenter AOPS cohort, MRI as first-line imaging in atypical stroke presentations may help recognition. Revascularization therapy may offer better outcomes, underscoring the need for improved diagnostic strategies. Ongoing analyses focus on acute and neuro-psychological/psychiatric outcomes and comparisons with anterior circulation strokes.

**P157**

## The Value of Intravenous Thrombolysis for Patients with Suspected Lacunar Stroke: An International Survey Study

J Gorzolka [1], C Kämpf [2], S Simona [3], H Chen [4], U Fischer [5], B Campbell [6], D De Aguiar Dias De Sousa [7], V Pütz [8], G Thomalla [9], B Cheng [9], C Cordonnier [10], G Boulouis [11], E Kristoffersen [12], MD Hill [13], L Sposato [14], MD Ton [15], H Yamagami [16], W Hu [17], M Katan [1], TN Nguyen [18] and J Fladt [1]

[1] Universitätsspital Basel, Basel, Switzerland
[2] Universität Basel, Basel, Switzerland
[3] University of L'Aquila, L'Aquila, Italy
[4] PLA Northern Theater Command General Hospital, Shenyang, China
[5] Inselspital, Universitätsspital Bern, Bern, Switzerland
[6] Royal Melbourne Hospital, Melbourne, Australia
[7] Centro Hospitalar Universitário Lisboa Central, Lisbon, Portugal
[8] Universitätsklinikum Carl Gustav Carus Dresden, Dresden, Germany
[9] Universitätsklinikum Hamburg-Eppendorf (UKE), Hamburg, Germany
[10] Centre Hospitalier Universitaire Lille, Lille, France
[11] CHU Tours, Tours, France
[12] Akershus University Hospital, Akerhus, Norway
[13] University of Calgary, Calgary, Canada
[14] London Health Sciences Centre, London, Canada
[15] Bach Mai Hospital, Hà Nội, Vietnam
[16] NHO Osaka National Hospital, Osaka, Japan
[17] The First Affiliated Hospital of the University of Science and Technology of China, Hefei, China

[18] Boston Medical Center, Boston, USA

Aims
Intravenous thrombolysis (IVT) is the approved treatment for all ischemic stroke subtypes; however, its effectiveness in lacunar stroke remains uncertain. To explore this, we conducted an international survey to assess clinician perspectives on the management of suspected lacunar stroke. We examined treatment preferences across clinical scenarios, attitudes toward IVT and dual antiplatelet therapy (DAPT), and support for future randomized trials comparing these approaches.
Methods
We conducted a cross-sectional international survey with scenario-based questions and Likert-scale responses using REDCap. Descriptive statistics were used to analyze treatment preferences across subgroups.
Results
A total of 393 physicians participated, including 61.1% vascular neurologists and 38.9% non-stroke specialists. IVT was the preferred treatment across all scenarios (67.9%), with no major differences observed between specialties or between comprehensive stroke centers and other settings. DAPT was most frequently considered (40.7%) in a scenario involving a 61-year-old patient with vascular risk factors and a lacunar stroke presenting as sensorimotor hemiparesis predominantly affecting the right leg (National Institutes of Health Stroke Scale [NIHSS] 3); 74.9% of respondents felt this case was not well represented in current IVT guidelines. Willingness to enroll similar patients in a randomized trial comparing DAPT and IVT was high, ranging from 88.8% in the low NIHSS case to 79.5% in a more severe presentation (NIHSS 7) involving dementia and leukoencephalopathy.
Conclusions
Clinician preferences varied across lacunar stroke scenarios, particularly in lower NIHSS presentations, indicating clinical equipoise. These findings underscore the need for a randomized controlled trial comparing DAPT and IVT in patients with suspected lacunar stroke.

**P158**

**Microclots and Neutrophil Activation as Potential Indicators for Stroke Risk and Reperfusion Failure**

T Bergaglio [1], LB Otto [1], J Droux [1], M El Amki [1], P Nirmalraj [2] and S Wegener [1]

[1] University of Zurich and University Hospital Zurich, Zürich, Switzerland
[2] Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland

Aims
Since introducing mechanical thrombectomy, clinical outcomes of stroke patients have drastically improved. However, despite successful macrovascular reperfusion (recanalization), patients with stroke still have a significant risk (about 40–50%) of remaining severely disabled, a scenario called “futile recanalization”. One of the causes for this lack of treatment effect is capillary obstruction, potentially resulting from activated neutrophils and micrometre-sized blood clots. Thus, there is a critical unmet need to identify patients at risk of poor outcomes and stroke recurrence. This study aims to characterize the morphological changes of neutrophils and composition of microclots in stroke patients as potential indicators of a pro-thrombogenic condition and risk of reperfusion failure. In addition, we aim to investigate their association with stroke risk and stroke etiology.
Methods
We are prospectively enrolling 500 patients with acute and chronic ischemic stroke, as well as a control group of individuals with different stroke risk factors. We employ label-free

digital holo-tomographic microscopy (DHTM) and atomic force microscopy (AFM) to study the morphology of altered neutrophil phenotypes and composition of microclots in peripheral blood samples. Quantitative, morphological characteristics such as the size and overall shape of microclots and neutrophils will be correlated with clinical outcomes, including reperfusion failure, stroke recurrence, and functional recovery.

Results

Patient recruitment for this observational study began in February 2025. So far, we can show that DHTM allows for the detection of neutrophil morphological alterations and confirmation of the presence of microclots in plasma.

Conclusions

Current diagnostic tools for stroke are insufficient in predicting treatment response, clot source and stroke recurrence risk. By leveraging advanced label-free microscopy tools, our project has the potential to discover new, clinically applicable blood-based biomarkers for bedside risk stratification, ultimately enabling individualized stroke treatment and secondary prevention.

**P159**

**Can Serious Games Enhance Memory Screening? Evidence from the ACE-X Gem Chaser**

G Binarelli [1], M Pittet [1], M Touya [1], V Manera [2], T Popa [1], A Brioschi-Guevara [1], C Krebs [3], C Moser [1], C Pestiaux [1], E Fischer [3], P Grivaz [1], P Ryvlin [1], J Anguera [4], A Gazzlay [4], S Klöppel [5], G Allali [1], J Démonet [1], P Robert [2] and A Sokolov [1]

[1] CHUV, Lausanne, Switzerland
[2] Université Côte d'Azur, Nice, France
[3] University of Bern/Insel Data Science Center, Inselspital, Bern, Switzerland
[4] University of California, San Francisco, USA; [5] University of Bern, Bern, Switzerland

Aims

This multicenter international study evaluated the discriminant validity of the ACE-X Gem Chaser serious game by comparing patient performance to that of an age-matched cognitively typical control group.

Method

We assessed the ability of Gem Chaser to detect memory deficits using discriminant validity analysis (one-sample *t*-tests comparing participant scores to normative data). We also examined convergent validity between Gem Chaser, ACE-X, and the Corsi Block-Tapping Test through agreement and correlation analyses. Linear mixed models explored the effects of age, test modality (gamified vs. standard), and their interaction on memory scores.

Results

A total of 98 patients (56 female; median age = 72; age range 55–86) were recruited across three memory centers in Switzerland and France. Gem Chaser successfully distinguished patients with mild neurocognitive disorder (mNCD) from normative data in both forward ($t(96) = -7.55$, $p < 0.001$, $d = 0.77$) and backward modalities ($t(96) = -8.93$, $p < 0.001$, $d = 0.91$). Convergent validity between Gem Chaser and standard tests was significant but modest (forward spans: $\rho = 0.35$, $p < 0.001$; backward spans: $\rho = 0.35$, $p < 0.001$). A significant interaction between age and test modality on backward span scores ($\chi^2 = 4.07$, $p = 0.043$) indicated a steeper age-related decline in performance on the gamified task.

Conclusions

Our findings highlight the potential of serious games like ACE-X Gem Chaser as practical tools for cognitive screening in older adults. The game effectively detected impairments in visuo-spatial short-term and working memory and showed reasonable agreement with the Corsi Block-Tapping Test. Combined with its engaging and portable design, Gem Chaser

offers promise for early detection and monitoring of cognitive decline, contributing to improved management of Alzheimer's disease.

**P160**

**Brain Perfusion Measured By Arterial Spin Labeling In Patients With Versus Without Atrial Fibrillation And Its Association To Cognitive Functioning**

P Zuber [1], M Coslovsky [2], S Aeschbacher [3], R Paladini [3], M Amann [4], M Duering [4], T Sinnecker [3], M Guenther [5], N Rodondi [6], M Haller [6], T Reichlin [6], P Krisai [3], G Moschovitis [7], L Grazioli Gauthier [7], D Conen [8], CS Zuern [3], S Osswald [3], M Kühne [3] and LH Bonati [1]

[1] Reha Rheinfelden, Rheinfelden, Switzerland
[2] University of Basel, Basel, Switzerland
[3] University Hospital Basel, Basel, Switzerland
[4] Medical Image Analysis Center MIAC AG, Basel, Switzerland
[5] University Bremen, Bremen, Germany
[6] University of Bern, Bern, Switzerland
[7] Regional hospital of Lugano, Lugano, Switzerland
[8] McMaster University, Hamilton, Canada

Aims
Alterations in cerebral blood flow (CBF) have been proposed as a potential mechanism underlying cognitive impairment in patients with atrial fibrillation (AF). We aimed at comparing gray matter CBF in patients with AF to patients without AF and to study its association with cognitive functioning.
Methods
We included 157 patients of the Swiss AF cohort (47% paroxysmal, 35% persistent, 28% permanent) and 157 risk-factor comparable control patients without AF, using coarsened exact matching for age (M = 76.2 years), sex (21% female) and education (3.8% basic, 43% middle, 54% advanced). CBF in whole-brain gray matter was cross-sectionally measured using arterial spin labeling (ASL), corrected for infarcts. Cognitive functioning was assessed using education-adjusted Montreal Cognitive Assessment (MoCA), measured on the same day. A linear model was used to study differences in global CBF between AF-patients and controls. As the MoCA was not normally distributed, the relationship between CBF and MoCA in all patients was studied using a median ($\tau = 0.5$) quantile regression. To study the effect of AF on the relationship between global CBF and MoCA, the interaction term group (AF vs. controls) x CBF was added to the quantile regression model. Models were corrected for age, sex, educational level, study center, hypertension, anticoagulation, antihypertensive drugs, heart failure, diabetes and smoking status.
Results
No difference in CBF could be detected between AF-patients (M = $45.0 \pm 8.8$ mL/100 g/min) and controls (M = $46.0 \pm 8.6$ mL/100 g/min). There was a trend towards an association between MoCA and CBF ($\beta = -0.02$, 95% CI: $-0.05$ to 0.009). In this model, MoCA was negatively linked to higher age and active smoking and positively linked to higher education, female sex and use of anticoagulation. A CBF x group interaction ($\beta = 0.056$, 95% CI: 0.01 to 0.09) indicated higher CBF with higher median MoCA scores in AF-patients and higher CBF with lower MoCA scores in controls. In this model, MoCA scores were negatively linked to history of hypertension and active smoking and positively linked to higher education and female sex.
Conclusions
The inverse relationship between brain perfusion and cognition in controls might be explained by a compensatory mechanism. Different mechanisms seem to underly the

relationship between brain perfusion and cognition in AF-patients. Following those novel results, further research is needed to understand the mechanisms at action.

**P161**

**Synchronizing with the Sun: Circadian and Seasonal Influences on BDNF in Older Adults**

T Hartmann [1], G Deuring [2], S Reckels [2], J Otte [2], C Epple [2], B Reuthebuch [2], C Garbazza [2], M Meyer [2], H Slawik [2], C Cajochen [2], A Kawasaki [3], S Jaeggi [4], A Eckert [1] and M Münch [2]

[1] University of Basel, Neurobiology Lab for Brain Aging and Mental Health, Transfaculty Research Platform Molecular & Cognitive Neuroscience, Basel, Switzerland
[2] Psychiatric Hospital of the University of Basel, Basel, Switzerland
[3] Hôpital Ophtalmique Jules Gonin, Fondation Asile des Aveugles, University of Lausanne, Switzerland
[4] Northeastern University, Boston, USA

Aim
In a multimodal personalised circadian intervention with a co-design approach over six months we aimed to improve subjective sleep quality in older adults with sleep complaints and to test the effect of these measures on ageing biomarkers.
Methods
The study was designed as a semi-blinded, randomised controlled trial and included 66 older adults >65 years (mean age ± SD: 72.2 ± 5.7; 40 females, 26 males). Inclusion criteria for sleep complaints was a global score > 5 on the Pittsburgh Sleep Quality Index. Participants were randomly assigned to either the intervention (IG) or the control group (CG). After one baseline week, during which measures were collected at home, the IG received low-threshold recommendations regarding sleep, light exposure, physical activity and meal times. The CG underwent identical procedures but received general sleep hygiene recommendations. Both groups implemented the recommendations into their daily routines. Blood samples were taken at the initial visit and six months after the intervention. The aim was to determine whether the brain-derived neurotrophic factor (BDNF), which is known to be sensitive to age-related physiological and behavioural changes, had positive effects over six months, when compared to the CG. BDNF levels were determined in serum using ELISA assays. Linear mixed models were applied, with age, sex, comorbidities and day length as covariates.
Results
The interaction between both groups over time did not reach statistical significance ($p = 0.1$). A main effect of time indicated an overall BDNF decline ($p = 0.02$). Exploratory analyses showed BDNF levels declined in the control group by 12.5% ($p = 0.01$; d = 0.66), while they remained stable in the intervention group (−4.4%; $p = 0.42$; d = 0.20). Longer day lengths increased BDNF overall (between solstices; $p = 0.008$; d = 0.64).
Conclusions
The intervention may reduce BDNF decline over time, suggesting a potential neuroprotective effect.

**P162**

**A Roadmap for Selecting Key Topics for Research on Communication Impairments in People with Aphasia**

J Annoni [1] and M Charalambous [2]

[1] University of Fribourg, Fribourg, Switzerland
[2] Cyprus University of Technology, Limassol, Cyprus

Background
People with chronic post-stroke aphasia face communication and psychological challenges. There is a need to establish internationally recognized priority topics for research and intervention in chronic aphasia, particularly during the post-rehabilitation phase. This period is critical as people with aphasia (PWA) must make strategic decisions to adapt to a new way of life.
Methods
Following indications of the People with Aphasia and Other Layperson Involvement (PAOLI) framework for meaningful patient involvement, the International Aphasia Association (AIA), the Aphasia Hispano-American Ligue (LIHA), and various European aphasia groups collaborated by sharing experiences and insights through online meetings. Together, they identified a preliminary list of topics considered priorities by PWA. These topics were discussed individually by each participating country. Finally, all participating members voted to select the topics deemed most important.
Results
The attendance rate of the national representative at the voting meeting was 70%. The 4 top priority topics were: (1) Raising awareness of aphasia within society and family, (2) Psychological changes associated with aphasia (including challenges related to intimacy), (3) Rebuilding self-confidence after aphasia and (4) Exploring the ongoing need for speech therapy and the attitude toward aphasia therapy within hospital settings.
Conclusions
Social and psychological challenges appear to be of paramount importance for people living with chronic aphasia. Additionally, there is a strong need for reassurance regarding the quality and international standards of available therapy programs.

**P163**

## Functional 7T MRS Reveals Age-Related Differences in Glutamate and Lactate Dynamics during Cognitive Processing Speed Task

A Kaiser, Y Xiao, M Widmaier and L Xin

CIBM Center for Biomedical Imaging, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

Introduction
Processing speed declines with age and contributes to cognitive dysfunction across neuropsychiatric conditions [1,2]. While structural and hemodynamic changes are abundantly reported, real-time neurometabolic processes remain underexplored. Functional magnetic resonance spectroscopy (fMRS) enables in vivo tracking of metabolite dynamics during cognitive engagement [3,4]. We used 7T fMRS to assess glutamate and lactate responses in the dorsal medial anterior cingulate cortex (dmACC) during a processing speed task in young and older adults [5].
Methods
Twenty-six young (mean age = 28.0 $\pm$ 10.9 years) and eight older adults (mean age = 75.4 $\pm$ 4.4 years) performed a symbol-digit matching task in alternating 128-s task/rest blocks (4 cycles; 16 total blocks) during 1H-MRS acquisition (semi-adiabatic SPECIAL, TE/TR = 16/4000 ms, voxel = 20 $\times$ 20 $\times$ 25 mm3) on a 7T Siemens Terra.X. Spectra were processed with LCModel and normalized to water. Glutamate and lactate dynamics were analyzed block-wise using generalized linear models. Spectral quality was high (water linewidth: young = 12.3 Hz, old = 14.4 Hz).
Results
In young adults, glutamate concentrations increased during early activation blocks, suggesting dynamic neurometabolic engagement and possible fatigue-related effects during

later blocks. Older adults showed consistently lower glutamate levels across blocks, in accordance with known age-related reductions in glutamate concentrations [6,7]. Although fluctuations in older adults were not statistically significant ($p > 0.4$), the temporal pattern differed from the young group, with a trend toward lower glutamate during activation. Sub-block analysis confirmed significant task-related increases in young adults ($p = 0.003$), absent in older participants. Behaviorally, older adults showed reduced DSST scores (68.7 vs. 50.0, $p < 0.001$), slower TMT-A/B performance ($p < 0.001$), and lower MOCA scores ($p = 0.004$), consistent with age-associated cognitive decline.

Conclusions

7T fMRS reveals robust, dynamic glutamate modulation during cognitive effort in young adults, contrasting with attenuated and lower overall glutamate levels in older adults. These findings highlight group differences in neurometabolic responsiveness and support the use of fMRS as a tool to track metabolic flexibility and cognitive aging in vivo.

**P164**

**Aberrant Functional Gradients as a Transdiagnostic Feature Underlying Psychotic Symptoms**

A Ferrari [1], B Wan [2], A Saberi [3], S Kaiser [1], S Valk [3] and M Kirschner [1]

[1] Division of Adult Psychiatry, University Hospitals of Geneva, Geneva, Switzerland/Faculty of Medicine, University of Geneva, Geneva, Switzerland
[2] Division of Adult Psychiatry, University Hospitals of Geneva, Geneva, Switzerland/Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany
[3] Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany/INM-7, Brain and Behavior Jülich, Jülich, Germany/Institute of Systems Neuroscience, Medical Faculty and University Hospital Düsseldorf, Düsseldorf, Germany

Aims

Schizophrenia (SZ) and bipolar disorder (BD) exhibit transdiagnostic disruptions in functional brain networks1. The Bipolar-Schizophrenia Network on Intermediate Phenotypes (B-SNIP)2 consortium provides a neurobiologically grounded framework, integrating biomarkers, genetics, and intermediate phenotypes, to study these disorders. This study aims to examine how alterations in functional gradients relate to psychosis dimensions across diagnostic boundaries, leveraging a dataset that includes patients, first-degree relatives (REL), and healthy controls (HC).

Methods

Resting-state functional MRI and clinical data are obtained from B-SNIP (547 patients, 410 REL, and 242 HC), enabling analysis of transdiagnostic features and familial risk. Imaging data are preprocessed with MICApipe3 and functional connectivity matrices are generated using atlas-based parcellation: 360-parcel Glasser atlas4 for cortical regions, and Melbourne atlas5 for subcortical structures. Functional gradients are derived via diffusion map embedding6 and aligned to a normative template for group comparison. Subcortical embedding scores are calculated by averaging each region's association with the cortical gradients. Group differences in cortical gradients and subcortical embedding are assessed, and partial least squares (PLS) analysis was used to link these features to symptom dimensions.

Expected Results

Drawing on prior evidence, we anticipate significant alterations in the principal functional gradient in psychosis, especially reduced separation between sensory and transmodal cortical regions8,9. Subcortical regions, particularly the thalamus and striatum, are expected to show abnormal gradient loadings, indicating disrupted integration with associative networks10,11. First-degree relatives are anticipated to exhibit intermediate profiles along a spectrum of gradient alterations, reflecting subtle brain changes associated with familial

risk that bridge the continuum between HC and clinically diagnosed patients12. PLS is predicted to reveal associations between gradient features and symptom severity (positive, negative, cognitive) by identifying latent dimensions that capture shared variance between brain organization and clinical measures, independent of diagnosis.

Conclusions

Overall, these findings should clarify how large-scale brain organization is altered across the psychosis spectrum and in at-risk individuals, supporting functional gradients as transdiagnostic biomarkers.

**P165**

**Cerebrospinal Fluid Macrophages Can Serve as a Surrogate to Brain Parenchymal Microglia In Vivo**

E Morel [1], Q Amossé [2], AM Badina [3], BB Tournier [3], Y Tang [4], R Stoop [4], G Allali [5], G Frisoni [6], P Millet [3], A Lathuilière [6] and S Tsartsalis [7]

[1] Leenaards Memory Center and Neurology Service, Department of Clinical Neurosciences, Centre for Psychiatric Neuroscience, Department of Psychiatry, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland
[2] University of Lausanne, Lausanne, Switzerland
[3] Department of Psychiatry, University Hospitals of Geneva and University of Geneva, Geneva, Switzerland
[4] Centre for Psychiatric Neuroscience, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland
[5] Leenaards Memory Center and Neurology Service, Department of Clinical Neurosciences, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland
[6] Memory Center, Department of Rehabilitation and Geriatrics, Geneva University Hospitals and University of Geneva, Geneva, Switzerland
[7] Centre for Psychiatric Neuroscience, Lausanne University Hospital, Lausanne, Switzerland and University of Lausanne, Department of Psychiatry, University Hospitals of Geneva and University of Geneva, Geneva, Switzerland

Aims

Brain myeloid cells, and especially microglia, are important regulators of brain physiology. Genetic and neuropathological approaches indicate that they contribute to the pathophysiology of several brain diseases, such as Alzheimer's disease (AD)(1,2). However, we currently lack tools to study them in vivo in clinical cohorts. Recently, single cell RNA sequencing (scRNAseq) studies revealed the existence of macrophages in the cerebrospinal fluid (CSF), i.e., accessible through lumbal puncture(3–5). These CSF macrophages show transcriptomic similarities to microglia and macrophages of the brain parenchyma(6,7). We hypothesize that they can serve as a surrogate for the study of parenchymal myeloid cells.

Methods

We performed scRNAseq in patients' CSF samples and re-analysed in vivo CSF and postmortem human brain scRNAseq datasets. We reasoned that the transcriptomic alterations of CSF macrophages from patients with neurodegenerative disease, compared to controls, should reflect the alterations of postmortem parenchymal microglia from the same groups of patients. As CSF macrophages are transcriptomically similar to brain microglia, we tested the specificity of this similarity compared to other myeloid cells in the CSF and blood. We thus compared the enrichment of microglia-specific genes among myeloid cell types using expression-weighted cell type enrichment (EWCE). Finally, we investigated if CSF macrophages shared with microglia the enrichment for genes associated to genome-wide association study (GWAS) loci for AD.

Results
CSF macrophages are robustly present in CSF samples irrespective of the disease status. In patients presenting with Alzheimer's pathology, CSF macrophages show transcriptomic alterations in pathways compatible with the alterations of parenchymal microglia (notably proinflammatory, lipid metabolism, senescence and stress response). CSF macrophages uniquely and highly significantly express microglia-specific genes compared to the other myeloid cells of the CSF and the blood. Finally, CSF macrophages show a significant and specific enrichment for Alzheimer's GWAS genes highly similar to parenchymal microglia.
Conclusions
CSF macrophages can serve as in vivo surrogates of parenchymal microglia. Their accessibility can provide clinical insight into microglial dysfunction in brain disease. Through longitudinal studies, they can reveal alterations with a potentially causal role and accelerate the development of immune-based therapeutics.

**P166**

**A Transdiagnostic, Multimodal Vulnerability Signature of Emotion Dysregulation Across Patients, Offspring, and Healthy Individuals**

LF Saccaro [1], T Larrieu [2], F Delavari [3], C Pellaton [4], B Meuleman [5], N Perroud [1], D Van De Ville [6], N Toni [7] and C Piguet [1]

[1] UNIGE/HUG, Geneva, Switzerland
[2] University of Lausanne & Lausanne University Hospital, Lausanne, Switzerland
[3] École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland
[4] Lausanne University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland
[5] University of Geneva (UNIGE), Geneva, Switzerland
[6] EPFL—Ecole Polytechnique Fédérale de Lausanne, Geneva, Switzerland
[7] Center for Psychiatric Neuroscience, Department of Psychiatry, Centre Hospitalier Universitaire Vaudois (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland

Aims
Emotion dysregulation (ED) is a core transdiagnostic feature of several psychiatric disorders, including borderline personality disorder, bipolar disorder, and attention-deficit/hyperactivity disorder. These emotion dysregulation disorders (EDD) exhibit overlapping clinical presentations, shared heritability, and common neurobiological substrates, highlighting the need for a transdiagnostic framework to identify early and multimodal markers of vulnerability—particularly in high-risk populations such as the offspring of EDD patients (EDDoff).
Methods
A total of 237 participants (97 EDD patients, 67 EDDoff, 73 healthy controls) completed a multimodal assessment including clinical evaluations, diffusion MRI, and functional MRI (hippocampal dynamic functional connectivity computed through micro-coactivation pattern analysis, uCAP), and immune and neurotrophic serum biomarkers. Dimensionality reduction was performed using principal component analysis (PCA), and random forest (RF) models were trained for group classification and symptoms prediction.
Results
PCA on the full multimodal dataset yielded eight components, two of which significantly differed between groups—one reflecting high ED and altered hippocampal dFC, for which EDDoff showed an intermediate phenotype (padj < 0.00001 for all Tukey-adjusted post hoc comparisons), and another driven by systemic inflammation (padj < 0.02). Modality-specific PCA identified significant inter-modality correlations, including reduced white matter integrity with increasing inflammation, and positive correlations between hippocampal

dFC and both ED symptoms and inflammation ($p$ = < 0.01 for all correlations). A RF classifier accurately distinguished controls from EDD/EDDoff individuals (85.7% accuracy; $p$ = 0.001). Multimodal non-clinical features reliably predicted ED symptoms ($p$ < 0.01), but not unrelated symptom domains.

Conclusions

This study identifies a specific, clinically meaningful, transdiagnostic, and multimodal signature of vulnerability to ED, spanning behavioral, neural, and immune systems. The transdiagnostic convergence of clinical emotion dysregulation, disruption of emotion-regulating and visual-sensorimotor networks, and inflammation provides novel mechanistic insights into the multi-system pathophysiology underlying EDD. This multimodal profile may inform future early intervention strategies targeting at-risk populations, such as EDDoff, to reduce EDD emergence and progression.

**P167**

**Central Proinflammatory Signalling is Reduced in Bipolar Disorder: A Multi-Omic Study of Glial Cells**

L Abjean [1], Q Amossé [2], B Tournier [1], A Badina [1], K Ceyzeriat [3], P Millet [1] and S Tsartsalis [1]

[1] University of Geneva and Geneva University Hospitals (HUG), Geneva, Switzerland
[2] Lausanne University, Lausanne, Switzerland
[3] CIBM Center for Biomedical Imaging, Geneva, Switzerland & Department of Radiology and Medical Informatics, University of Geneva, Geneva, Switzerland

Aims

Abnormal immune responses have been suggested among the mechanisms responsible for the onset and progression of bipolar disorder (BD), notably because of reports of increased peripheral inflammatory markers in patients. However, evidence of central immune dysregulation in BD is scarce.

In this study, we aimed to clarify the involvement of central molecular alterations and identify cell-type-specific immune changes in the BD brain using a multi-omics approach.

Methods

Flash-frozen anterior cingulate cortex (aCC) samples from BD subjects and age- and sex-matched controls were employed. We performed bulk proteomic analysis using nanoLC-MS/MS DIA quantification ($n$ = 9 per group) followed by Weighted Gene Co-expression Network Analysis (WGCNA) to identify altered proteomic pathways. To assess cell-type-specific transcriptomic changes in glial cells, we conducted a snRNAseq analysis after fluorescence activated nuclei sorting enrichment ($n$ = 20 BD/15 controls).

Results

Bulk tissue proteomics revealed a downregulation of growth factor and proinflammatory signaling, as well as proteins involved in the citrate cycle and mitochondrial structure, accompanied by an upregulation of lipoprotein metabolism and apoptosis-related proteins. These altered proteins were predominantly expressed in glial cells, prompting further analysis via snRNAseq to identify cell-type-specific changes in BD. Focusing on microglia, the resident immune cells of the brain, we identified 689 differentially expressed genes, of which 341 were significantly downregulated and 348 significantly upregulated (padj < 0.1, |logFC| > 0.1). Functional enrichment analysis highlighted a downregulation of biological pathways related to immunity and inflammation (e.g., antigen processing and presentation via MHC Class II, regulation of type I interferon production) and an upregulation of DNA repair, RNA processing and post-translational modifications.

Conclusions

Our findings indicate that proinflammatory signaling is downregulated in microglia, in contrast to increased peripheral proinflammatory cytokines observed in BD patients. We

hypothesize that glial cells, particularly microglia, may exhibit a dystrophic or exhausted phenotype, potentially resulting from chronic activation during the various episodes of the disease. We currently develop an in vivo PET imaging study of glial cells to validate this immune dysregulation in the disease and identify its clinical correlates.

**P168**

**Effects of Physical Activity on Telomere Lengths in Major Depressive Disorder**

T Mikoteit [1], S Galli [1], A Pfefferl [1], R Cody [2], J Kreppke [2], J Beck [3], S Brand [4], C Imboden [1], U Lang [4], A Eckert [4] and M Gerber [2]

[1] Psychiatric Hospital of Solothurn, Solothurn, Switzerland
[2] Department of Sport, Exercise, and Health, University of Basel, Basel, Switzerland
[3] Psychiatric Clinic Sonnenhalde, Riehen, Switzerland
[4] University Clinics of Psychiatry, Basel, Switzerland

Background
Major Depressive Disorder (MDD) is associated with a lifestyle of physical inactivity (PIA), allostatic load, chronical stress, reduced resilience and with accelerated cell and brain aging. In research it has been established that shorter telomere lengths (TL) are associated with the process of aging [1]. However, physical activity (PA) can be associated with longer TL [2]. In this study, we examined if in a cohort of patients with MDD PA would affect TL. We expected (1) an association of low degrees of PA or high degrees of PIA with decreased TL. While (2) increased PA or/and decreased PIA would result in longer TL. Over one year's time, we assessed PA and PIA with both, subjective and objective methods.
Methods
The sample consisted of 107 in-patients (age (M $\pm$ SD) = 42.1 $\pm$ 13.0 years, 50.5% women) with MDD. Baseline (BL) assessment was two weeks after admission and the outcome assessments were at six weeks (T1) and 12 months (T2) after discharge. PA was measured with accelerometers for seven consecutive days. Subjective PA was assessed with the Simple Physical Activity Questionnaire (SIMPAQ). TL were determined with quantitative polymerase chain reaction (qPCR). Partial correlations between TL and PA or PIA, resp., were controlled for effects of age and visceral fat.
Results
At baseline objective PIA correlated with shorter TL (r = $-0.212$, $p = 0.038$). However, no aspect of objective PA did correlate with longer TL. At T1, six weeks after discharge, subjective PA (sport) was negatively correlated with TL (r = $-0.227$, $p = 0.027$). At T2, 12 months after discharge, patients with a subjective more active lifestyle (moderate-vigorous PA and light PA (walking)) showed increased TL (r = 0.217, $p = 0.045$; r = 0.228, $p = 0.035$).
Conclusions
During acute depression phases, lower degrees of objective PIA (sedentary lifestyle), but not PA, were related to longer TL. However, one year after discharge, patients with more subjective PA presented with longer TL than patients with less PA. Because TL indicates cell vitality and a decrease of TL is associated with an advanced ageing process, our long-term results suggest prevention of premature cell ageing for patients who are more frequently active. We conclude that interventions, which aim at implementing more PA in daily routine and lifestyle, will support cellular vitality in patients with MDD.

**P169**

**In Vivo Assessment of Human Brain TCA Cycle and Neurotransmitter Metabolism Using interleaved 1H and 13C MRS at 7T: Toward Clinical Translation**

Y Xiao [1], B Lanz [1], D Wenz [1], A Döring [1], I Bègue [2], P Hagmann [3], L Mattera [4], N Philippe [4], A Kaiser [1], K Pierzchala [1], M Widmaier [1], R Gruetter [5] and L Xin [1]

[1] CIBM Center for Biomedical Imaging, Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland
[2] Neuroimaging and Translational Psychiatry Lab, Synapsy Centre for Neuroscience and Mental Health Research, Department of Psychiatry, University of Geneva, Geneva, Switzerland
[3] Department of Radiology, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland
[4] Fondation Campus Biotech Genève, Geneva, Switzerland
[5] Laboratory for Functional and Metabolic Imaging (LIFMET), Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

Aim
Mitochondrial dysfunction and impaired brain energy metabolism are key factors in neurodegenerative and psychiatric disorders. $^{13}$C magnetic resonance spectroscopy (MRS) offers a unique, non-invasive method to measure cerebral metabolism in vivo. However, clinical use has been limited by low sensitivity, complex procedures, including blood sampling for input function estimation, and high RF power demands from decoupling. This study aims to develop and validate a clinically translatable $^{1}$H/$^{13}$C MRS protocol at 7T for quantifying brain energy and neurotransmitter metabolism, with a focus on non-invasive measurement of the tricarboxylic acid (TCA) cycle rate (VTCA). By eliminating blood sampling and enhancing modeling accuracy, this approach facilitates broader clinical application.
Methods
Two healthy female volunteers (overnight fasted) were scanned on a 7T MRI scanner using a dual-tuned 3-channel $^{1}$H/2-channel $^{13}$C surface coil targeting the frontal lobe. A 10% [1-$^{13}$C]-glucose solution (0.5 g/kg) was infused intravenously over 1 h. MRS was performed with an interleaved protocol: ACE-STEAM1 (TE/TM/TR = 7.9/35/4000 ms) for indirect $^{1}$H-[$^{13}$C] and ISIS-DEPT2 (TR = 4000 ms) for direct $^{13}$C-[$^{1}$H] detection, both without decoupling. Glucose (Glc-C1) and metabolites (Glu-C4, Gln-C4, Glx-C3) were quantified using LCModel3. A previously published metabolic model4,5 was adapted, and Glu-C4, Gln-C4, and Glx-C3 time courses were fitted using nonlinear least squares in MATLAB.
Results
This interleaved $^{1}$H and $^{13}$C MRS protocol enabled real-time tracking of glucose metabolism, including $^{13}$C labeling into Glc-C1, Glu-C4 and Gln-C4 (visible ~15 min into infusion), and later into Glu-C3/Gln-C3 (~40 min). Total glucose concentrations ranged from 1.17–2.47 mM, and [1-$^{13}$C]-glucose reached 0.95–1.24 mM. We demonstrate the feasibility of using the glucose fractional enrichment as an input function for metabolic modeling. The estimated VTCA was 0.47 $\pm$ 0.03 μmol/g/min using the MR-derived input function, aligning with previous reports 6–9.
Conclusions
This study establishes a non-invasive, high-temporal-resolution $^{13}$C MRS protocol at 7T for measuring brain energy metabolism with clinical potential. Direct measurement of brain glucose input and metabolite $^{13}$C labeling enables accurate metabolic modeling, supporting future applications in studying mitochondrial function and neurotransmission in neurological and psychiatric research.

**P170**

## Thalamic GABA and Glutamate Imbalance Associates with Cortical Degeneration in Early Psychosis: A 7T MRI Study

Z Wang [1], Y Alemán Gómez [2], M Cleusix [2], R Jenni [2], L Alameda [2], P Conus [3], M Bach Cuadra [4], P Hagmann [5], KQ Do [2] and L Xin [1]

[1] CIBM Center for Biomedical Imaging, EPFL, Lausanne, Switzerland
[2] Center for Psychiatric Neuroscience, Department of Psychiatry, Centre Hospitalier Universitaire Vaudois (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland
[3] Service of General Psychiatry, Department of Psychiatry, Centre Hospitalier Universitaire Vaudois (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland
[4] CIBM Center for Biomedical Imaging, EPFL, Lausanne, Switzerland
[5] Diagnostic Neuroradiology, Centre Hospitalier Universitaire Vaudois (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland

Introduction
Cognitive impairments in schizophrenia remain a treatment challenge, as no current medications directly target these deficits. This is partly due to a limited understanding of their neurobiological basis. The glutamate and GABA balance is crucial for neural plasticity and cognition. Elevated glutamate can cause excitotoxicity, leading to cortical thinning, while imaging studies consistently report thalamocortical dysfunction in schizophrenia. However, its neurochemical basis and link to cortical structure and cognition remain unclear.
We hypothesize that altered thalamic glutamate and GABA levels contribute to remote cortical morphological changes. Using 7T 1H-MRI and 1H-MRS, we quantified thalamic glutamate and GABA in early psychosis (EP) patients and examined associations with cortical morphology and cognition.
Methods
We studied 42 EP patients (<3 years of illness) and 35 healthy controls (HC). Neurocognition was assessed via the MATRICS Consensus Cognitive Battery. MRI scans were performed on a 7T Siemens system with MP2RAGE T1-weighted imaging and sSPECIAL MRS in the right thalamus (RTh). Metabolites were quantified with LCModel. Cortical morphometry (volume, thickness, area) was analyzed using Freesurfer. General Linear Model (GLM) with age, gender, and intracranial volume as covariates was applied, corrected via permutation ($n$ = 1000).
Results
EP patients showed slower processing speed ($p < 0.001$), lower verbal ($p = 0.001$), and visual learning scores ($p = 0.014$). In HC, cortical thickness in the right middle frontal gyrus positively correlated with verbal learning (r = 0.75, $p < 0.01$) and was greater than in EP ($p = 0.03$, F = 5.01). In EP, RTh GABA positively correlated with surface area in the left lateral occipital/fusiform regions (r = 0.52, $p < 0.01$), while RTh glutamate negatively correlated with thickness in the left inferior temporal/fusiform regions (r = $-0.83$, $p < 0.01$). These associations were absent in HC.
When dividing EP by RTh glutamate levels, the high-Glu subgroup had significantly thinner cortex in the left inferior temporal gyrus than both the low-Glu EP ($p < 0.05$, F = 9.54) and HC groups ($p < 0.05$, F = 11.19).
Conclusions
Our findings suggest that variations in GABA and glutamate concentration in the right thalamus can impact structural alteration of the inferior temporo-occipital region among early psychosis patients, supporting the role of excitation-inhibition impairment in thalamocortical dysfunction associated with psychosis.

**P171**

**Electroconvulsive Therapy Modulates Functional Brain Networks in Depressed Patients—A Minimum Spanning Tree Analysis Using High-Density EEG**

S Ulrich, E Schneider, G Deuring, M Ridder, J Sarlon and AB Brühl

Center for Affective, Stress and Sleep Disorders, University Psychiatric Clinics (UPK) Basel, Basel, Switzerland

Aims
Electroconvulsive therapy (ECT) is the oldest neurostimulation method with particular efficacy in depression, schizophrenia, mania, and catatonia. It is particularly used in difficult-to-treat cases. It involves a short series of electrical stimuli to induce a generalized seizure while the patient is under anesthesia and muscle relaxation. Although it is one of the most effective treatment methods in psychiatry, the underlying mechanisms of action still remain unclear. One discussed potential mechanism of action is the modulation of functional brain circuits. Measuring resting-state EEG, we investigated changes in functional brain network metrics in patients undergoing ECT due to a depressive episode using minimum spanning tree parameters. The minimum spanning tree method offers a potential alternative for overcoming difficulties in thresholding when conducting brain network analyses.
Methods
Depressed patients ($N$ = 22, mean age = 40.1 years, 10 females) undergoing ECT at the University Psychiatric Clinics (UPK) of Basel were included in the study. We used high-density EEG (64 electrodes) to measure resting-state EEG before and after the acute ECT treatment series to calculate changes in functional brain network metrics. To analyse possible changes, we calculated minimum spanning tree parameters in the alpha frequency band, including leaf fraction, tree hierarchy and diameter.
Results
Comparing pre- to post-ECT, the patients showed an increased tree hierarchy. The effect of leaf fraction did not reach statistical significance, but there was a clear trend toward an increase. The network diameter was not significantly changed.
Conclusions
The combined results indicate that while the network diameter seems not to be affected, there is a shift in the network organization towards a more integrated functional brain network after the ECT acute series. As previous literature points towards more segregated functional brain networks in patients in the depressed state, our results might indicate a trend toward normalization of the functional resting-state brain network.

**P172**

**The Role of FKBP5 rs1360780 and rs4713916 in Early Response in Patients with Major Depression**

T Mikoteit [1], S Galli [1], C Staeuble [2], M Zeising [3], A Steiger [3], H Meyer zu Schwabedissen [2] and M Hatzinger [1]

[1] Psychiatric Hospital of Solothurn, Solothurn, Switzerland
[2] Department of Pharmaceutical Sciences, University of Basel, Basel, Switzerland
[3] Max Planck Institute of Psychiatry, Munich, Germany

Aims
Major Depressive Disorder (MDD) has been connected to a dysregulation of the neuroendocrine stress-response system with disinhibition of the hypothalamic-pituitary-adrenal (HPA) axis. The HPA-axis is adjusted by negative feedback via cortisol binding to glucocorticoid receptors (GR), which are regulated by the FK506-binding protein 51 (FKBP51). The expression of FKBP5, the gene for FKBP51 protein, predicted the response to antidepressant (AD) treatment after six weeks [1]. In this study, we examined the effects of two FKBP5 polymorphisms rs1360780 and rs4713916, on very early AD response in MDD in-patients.
Methods
Eighty-one in-patients with MDD (M $\pm$ SD age = 44.3 $\pm$ 13.4 years, 52.5% female) were assessed with the Hamilton Depression Rating Scale (HDRS) at baseline and after one week of AD treatment. Genotyping of the FKBP5 rs1360780 with the reference T and the variant

C allele identified 9 T/T, 31 T/C, and 41 C/C carriers. Genotyping of the FKBP5 rs4713916 with the reference A and the variant G allele identified 8 A/A, 30 A/G and 43 G/G carriers. As the two alleles were in strong linkage equilibrium (D' = 0.831, r2 = 0.637), we assessed their combination: six patients had two, 28 had one and 47 had no reference gene. We examined the association between the FKBP5 expressions, separately and in combination, with the early improvement of HDRS.

Results

After one week of AD treatment, heterozygotes showed more reduction of HDRS scores compared to homozygotes. This pattern of results was found for FKBP5 rs1360780 and rs4713916 separately, but more significantly for the linkage of both ($t(78) = 2.166$, $p = 0.033$, $g = -0.512$). According to categories of very early response (VER: $\geq$ 30% HDRS reduction at week 1; $N = 40$) and very early non-response (VENR: < 30% HDRS reduction at week 1; $N = 40$) VER occurred more likely in subjects with only one reference gene ($X2\ (2) = 6.199$, $p = 0.045$).

Conclusions

This study confirms previous evidence that FKBP5 genotype is predictive to antidepressant treatment response and displays predictive value even concerning very early treatment response at week one. More specifically the FKBP5 genotypes rs1360780 and rs4713916 and their combination associated with very early favourable treatment response when presenting in heterozygote genotype, compared to homozygotes genotypes.

**P173**

**Quantifying Ecological Intelligence: Building Metrics for the Green Brain Capital Model—A Systematic Review**

O Abdelraheem

The American University in Cairo, Cairo, Egypt

Aims

The Green Brain Capital (GBC) model highlights the bidirectional relationship between brain health and environmental sustainability. As a novel brain capital subdomain, GBC supports public policy and mental health strategies. Ecological Intelligence (EI) has been proposed as a core pillar of GBC, but its conceptual clarity and measurement approaches remain underdeveloped. This systematic review aims to define EI, outline its key components, and identify quantitative tools that can inform future GBC metrics.

Methods

A systematic search was conducted using Scopus, ScienceDirect, and indexed secondary literature sources. Studies were included if they defined EI or provided tools for its assessment. Global open-access databases from reputable organisations were also searched for existing EI-related indicators at the national level.

Results

A total of 11 articles met the inclusion criteria. EI was identified as a multidimensional construct comprising cognitive, affective, and behavioural domains. Seven measurement tools were identified. Among them, the Ecological Intelligence Measurement Tool (Okur-Berberoglu) and the Ecological Intelligence Scale (Akkuzu) demonstrated strong theoretical grounding and psychometric validity. No indicators reflecting EI at the national level were identified in international databases.

Conclusions

Current tools are designed for individual-level assessment in research and educational contexts, within specific cultural settings. There is a gap in scalable, country-level indicators that could support policymaking and global comparison. Developing such indicators

is essential for integrating environmental awareness into brain health promotion and sustainable development efforts.

**P174**

**Power Spectral Analysis of Resting-State EEG in Cognitive Decline and Healthy Aging**

C Bouhour [1], V Rochas [2], D Brunet [3], K Toussas [1], PG Unschuld [4] and L Bréchet [1]

[1] UNIGE-Faculté de médecine, Geneva, Switzerland
[2] FCBG Fondation Campus Biotech Geneva, Geneva, Switzerland
[3] CIBM Center for Biomedical Imaging, Cognitive and Affective Neuroimaging Section, University of Geneva, Geneva, Switzerland
[4] HUG—Geneva University Hospitals, Geriatric Psychiatry Service/UNIGE, Geneva, Switzerland

Aims
Mild cognitive impairment (MCI) is the transitory stage between normal aging and dementia, affecting 10–20% of adults aged 65 and older (1). Despite its prevalence, the mechanisms underlying the MCI stage of cognitive decline remain largely unclear (1). Resting-state electroencephalography (EEG) power spectral analysis is a widely used technique to investigate functional brain changes associated with cognitive decline and aging. Previous research indicates that Alzheimer's Disease (AD) is characterized by increased power in slow-wave (delta and theta) and decreased power in fast-wave (alpha and beta) frequencies (2–5). Similar, though less consistent, spectral patterns have been observed in individuals with MCI (2–5). In contrast, healthy aging is generally associated with reduced slow-wave and alpha activity, alongside increased beta power (3, 6–7). In this study, we performed a power spectrum analysis of resting-state EEG recordings from three groups: individuals with MCI, healthy older adults, and healthy younger adults.
Methods
High-density EEG recordings (257 channels) were obtained from 149 participants in total ($N$ = 58 Older adults; $N$ = 58 Younger adults; $N$ = 33 MCI adults) during a 5-min resting-state with eyes closed. The EEG signal was preprocessed on Cartool (8) and the power spectrum analyzed using the Welch method across frequencies between 1 to 70 Hz. Independent samples $t$-tests were applied on each frequency band (delta: 1–4 Hz; theta: 4–8 Hz; alpha: 8–12 Hz; beta: 12–30 Hz; low gamma: 30–48 Hz; high gamma: 52–70 Hz) and FDR corrected between each pair of groups across all 204 kept channels.
Results
Results revealed a reduction in alpha power in both MCI and healthy older adults over occipital and temporal regions, consistent with typical age-related neural changes (6, 9). MCI patients also showed increased theta power compared to healthy controls over frontal and right temporal regions, indicating EEG slowing. Interestingly, beta power increased in MCI patients compared to healthy controls over frontal, parietal, and occipital regions, which may reflect age-related changes as older adults also had increased power compared to younger ones.
Conclusions
These findings suggest that early cognitive decline in MCI may primarily involve increases in slow-wave activity, while decreases in fast-wave activity may occur later during progression toward AD.

**P175**

**Exploring Pain, Anxiety and Adverse Effects Associated with Lumbar Puncture in a Memory Clinic Population: A Prospective Longitudinal Study**

HM Lalive [1], A Accorroni [2], D Donayre [2], U Nencha [2], C Wang [1], AJ Mendes [3], F Ribaldi [3], GB Frisoni [1] and A Lathuilière [1]

[1] Geneva Memory Center, Department of Rehabilitation and Geriatrics, Geneva University Hospitals & Faculty of Medicine, University of Geneva, Geneva, Switzerland
[2] Geneva Memory Center, Department of Rehabilitation and Geriatrics, Geneva University Hospitals, Geneva, Switzerland
[3] Laboratory of Neuroimaging of Aging (LANVIE), University of Geneva & Faculty of Medicine, University of Geneva & Geneva Memory Center, Department of Rehabilitation and Geriatrics, Geneva University Hospitals, Geneva, Switzerland

Objective
To longitudinally evaluate pain, anxiety and adverse events (AEs) associated with lumbar puncture (LP) in older adults, and to investigate their association with patients' perceptions, clinical characteristics, and Alzheimer's disease (AD) cerebrospinal fluid (CSF) biomarker levels.
Background
LP is a common procedure in memory clinics to assess AD biomarkers and is generally considered safe and well-tolerated due to a low complication rate. However, patient discomfort before, during, and after LP may be underrecognized and underreported.
Methods
We prospectively recruited 133 consecutive Memory Clinic patients (mean age 70.7 $\pm$ 8.8 years; 49% female) undergoing their first LP for cognitive assessment at the Geneva University Hospitals Memory Center (February 2024–May 2025). Pain, anxiety, and AEs were assessed using structured surveys and the Beck Anxiety Inventory at four time points: before LP, immediately after, one hour post-procedure, and during a follow-up call 24–72 h later. Categorical variables were analyzed with Cochrane's Q test, non-parametric continuous variables were analyzed using Wilcoxon's or Friedman's tests, and multivariate regression was performed to examine associations between patient characteristics, CSF biomarkers, anxiety, AEs, and pain.
Results
Most participants reported minimal anxiety throughout the procedure. Mild AE, including headaches, back pain, and fatigue, were common, while only one case of severe AE (postdural puncture headache) was observed. AE were associated with higher anxiety at follow-up, but not with cognitive status or CSF biomarkers. Pain during LP was lower than expected, remained low after the procedure, and was strongly associated with the presence of AE. Older patients reported less pain than younger ones. Overall satisfaction was high, with 83% of patients willing to undergo LP again.
Conclusions
LP is well tolerated in older adults, with low levels of pain and anxiety and rare serious AE, regardless of baseline anxiety, cognitive status, or AD CSF biomarkers. These findings support the continued use of LP for AD biomarker assessment in memory clinics and may help guide patient counseling.

**P176**

**Comparing Cerebrospinal Fluid Biomarkers of Alzheimer's Disease in Memory Clinic Patients with and Without Motoric Cognitive Risk Syndrome: A Retrospective Study**

HM Lalive, E Poinsignon-Clavel, G Bommarito and G Allali

Leenaards Memory Center, Department of Clinical Neurosciences, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland

Objective
To examine cerebrospinal fluid (CSF) biomarkers of Alzheimer's disease (AD) in memory clinic patients with and without Motoric Cognitive Risk (MCR) syndrome.
Background
Early identification of individuals at risk for dementia is critical given its growing global burden and the increasing emphasis on preventive strategies and targeted interventions. MCR syndrome, characterized by subjective cognitive complaints and slow gait speed, was developed as a screening tool to identify older adults at high risk of developing dementia, including AD. However, the CSF AD biomarker profile of older adults with and without MCR in memory clinics remains unclear.
Methods
CSF biomarkers from 60 patients (mean age 68.2 $\pm$ 8.4 years, 48% female) attending the Leenaards Memory Clinic (CHUV) and the Geneva Memory Center (HUG) were retrospectively compared between individuals with and without MCR syndrome. MCR was defined by the presence of subjective cognitive complaints and gait speed $\leq$1 standard deviation below age- and sex-specific norms, assessed over a 4-m distance on a flat surface. CSF was collected in polypropylene tubes during routine clinical lumbar puncture, and concentrations of Amyloid-β 42, phosphorylated Tau, and total Tau were analyzed using the Fujirebio Lumipulse platform. A/T/N classification and A/T profiles were determined according to the NIA-AA research framework. Group comparisons were conducted using chi-squared or Fisher's exact test, as appropriate.
Results
55% ($n$ = 33) of patients were classified as MCR+, and 45% ($n$ = 27) as MCR-. The two groups were comparable in age, sex, education, and general cognitive performance. The proportions of A+, T+, and N+ individuals did not significantly differ between MCR+ and MCR– groups (A+: 42% vs. 26%, $p$ = 0.183; T+: 42% vs. 37%, $p$ = 0.672; N+: 45% vs. 44%, $p$ = 0.938). In both groups, the most common A/T profile was A–T– (49% in MCR+, 63% in MCR–), followed by A+T+ (33% in MCR+, 26% in MCR–).
Conclusions
In memory clinic populations, MCR syndrome is associated with a heterogeneous CSF biomarker profile, similar to that of older adults without MCR. These findings suggest that high-risk individuals identified by MCR may represent a biologically diverse subgroup and underscore the need for biomarker-based diagnosis in clinical practice.

**P177**

## Brain Care Score for French-Speaking Patients: a Prospective Study on Motivation to Improve Brain Health

HM Lalive [1], AJ Watkins [1], M d'Esneval [1], A Rhally [1], S Bernasconi-Xhepa [1], A Lingenberg [1], J Senff [2], SD Singh [2], F Assal [1], J Rosand [2] and L Sveikata [1]

[1] Division of Neurology, Department of Clinical Neurosciences, Geneva University Hospitals, Geneva, Switzerland
[2] Department of Neurology, Massachusetts General Hospital, Boston, USA

Objective
We aimed to validate a French version of McCance Brain Care Score (BCS-F) and examine its association with patients' motivation to improve brain health.
Background
Promoting brain health is essential for managing the growing burden of dementia, stroke, and depression, as approximately 45% of dementia cases are linked to modifiable risk

factors. The Brain Care Score (BCS) was developed to support risk reduction by assessing these factors and empowering patients to adopt prevention strategies. However, no validated French-language tools currently address modifiable brain health determinants.
Methods
The BCS was translated into French using forward and back translation by two independent translators and validated by an expert committee. 95 patients (mean age 70.7 $\pm$ 13.4 years, 39% female, mean MoCA score 22.3 $\pm$ 5.5/30) were recruited from the Cognitive Disorders Outpatient Clinic between March 2024 and January 2025. 43 participants received the BCS-F and 52 received standard of care (SoC). Primary outcomes included willingness to improve brain health determinants and specific items patients chose to change.
Results
Both groups were comparable in age, sex and general cognitive performance. Willingness to improve brain health was reported by 81% ($n$ = 35) of the BCS-F group and 48% ($n$ = 25) of the SoC. Commonly targeted changes included blood pressure control, aerobic activity, and alcohol consumption. Use of the BCS-F was associated with a 69% higher likelihood of reporting willingness to improve brain health (Risk Ratio: 1.69, $p < 0.001$), adjusting for age. One additional person expressed willingness to act for every three patients who completed the survey (number needed to treat: 3.00).
Conclusions
The BCS may help fill the gap in accessible brain health assessment tools for memory clinic patients including French-speaking populations. Furthermore, it may serve as a valuable resource to inform patients about their brain health and empower them to reduce their risk of dementia, stroke, and depression.

**P178**

**Cerebral Amyloid Angiopathy In Memory Clinics: A Systematic Review Of The Diagnostic Accuracy Of The Boston Criteria In Non-Hemorrhagic Presentations**

HM Lalive [1], F Assal [1], A Charidimou [2] and L Sveikata [1]

[1] Department of Clinical Neurosciences, Division of Neurology, Geneva University Hospitals, Geneva, Switzerland
[2] Department of Neurology, Boston University Chobanian & Avedisian School of Medicine, Boston, USA

Objective
We evaluated the diagnostic accuracy of the Boston Criteria v2.0 for cerebral amyloid angiopathy (CAA) in non-hemorrhagic presentations and assessed the risk of bias in existing studies.
Background
The Boston Criteria are widely used for in vivo CAA diagnosis in memory clinics. Accurate diagnosis in this population is essential for clinical decision-making and treatment planning. However, the performance of the Boston Criteria v2.0 in non-hemorrhagic cases, including patients presenting with transient focal neurological episodes, cognitive impairment, or dementia, remains unclear.
Methods
A systematic review was conducted per PRISMA 2020 guidelines (PROSPERO: CRD42024550655). PubMed and Embase were searched for studies evaluating the diagnostic accuracy of the Boston Criteria in non-hemorrhagic presentations, using neuropathology as the reference standard. Due to limited eligible samples and potential cohort overlap, studies were synthesized narratively. Risk of bias (RoB) was assessed using QUADAS-2.

Results
Four studies (six samples; $n$ = 447) were included. Patient demographics varied in mean age at MRI (74.7–88.4 years) and sex (24–69% females). Sensitivity ranged from 4.5% to 59.6%, while specificity was consistently higher, reaching up to 96.4%. Area under the receiver operating curve (AUC) values ranged from 0.47 to 0.76, indicating low to moderate diagnostic performance. Higher values were reported in studies with hospital-based cohorts compared to community-based samples. Positive predictive values ranged from 25.0% to 96.4%, and negative predictive value ranged from 46.0% to 70.3%, reflecting substantial variability across settings. All studies had moderate RoB, primarily due to retrospective designs and non-random patient selection.
Conclusions
The Boston Criteria v2.0 demonstrate limited diagnostic for non-hemorrhagic CAA presentations, particularly in community-based settings. These findings underscore the need for prospective validation across diverse populations and support the development of complementary diagnostic tools—such as 7T MRI, fluid and molecular biomarkers—to improve CAA diagnosis in non-hemorrhagic cases.

**P179**

**Conceptualising Green Brain Capital: A Hybrid Model Analysis Integrating Brain Health and Environmental Resilience**

O Abdelraheem

The American University in Cairo, Cairo, Egypt

Aims
Brain health is increasingly recognised as a foundational asset for human development and societal well-being. However, global environmental crises pose growing threats to neurological integrity. The Green Brain Capital (GBC) model is proposed as a novel interdisciplinary framework linking cognitive capacity with ecological sustainability. This study aims to conceptualise and validate GBC, clarifying its core attributes and identifying measurable indicators for future application.
Methods
We employed Schwartz-Barcott and Kim's hybrid concept analysis model, combining a scoping review with a Delphi consensus study. The scoping review mapped diverse definitions of Brain Capital and extracted candidate attributes relevant to sustainability and environmental exposure. The Delphi study involved two iterative rounds with interdisciplinary experts (N = 31; retention = 93.9%) to assess the clarity, relevance, and feasibility of proposed attributes.
Results
The concept analysis yielded a structured definition of Green Brain Capital comprising four core attributes: ecological intelligence, green skills, digital literacy, and the link between environment and brain health. Delphi participants reached strong consensus on the inclusion of ecological intelligence and environmental determinants as essential components. Preliminary indicators were identified for each attribute, drawing from high-quality, publicly available datasets suitable for global comparison and monitoring.
Conclusions
This is the first study to offer a comprehensive and validated conceptual framework for Green Brain Capital. The model lays the groundwork for developing a global index to support policy design, strategic investment, and research on the intersection of brain health and environmental change. While certain domains—such as eco-emotions and digital literacy—require further empirical exploration, this framework provides a robust foundation for cross-sectoral applications in clinical, environmental, and policy settings.

**P180**

**Individual MRI-based EEG Source Localization Accuracy in Mild Cognitive Impairment**

K Toussas [1], D Brunet [2], C Bouhour [1], S Vulliemoz [2], P Unschuld [3] and L Bréchet [1]

[1] Department of Clinical Neurosciences, Division of Neurorehabilitation, University of Geneva, Geneva, Switzerland
[2] Department of Clinical Neurosciences, EEG & Epilepsy Unit, University Hospital of Geneva, Geneva, Switzerland | CIBM Center for Biomedical Imaging, HUG-UNIGE EEG Section, Geneva, Switzerland
[3] Geriatric Psychiatry Service, University Hospitals of Geneva (HUG), Thônex, Switzerland | Department of Psychiatry, University of Geneva, Geneva, Switzerland

Aims
Electromagnetic Source Imaging (ESI) aims to localize brain regions generating scalp-recorded electrical activity. While template head models have facilitated the widespread use of ESI, age and disease-related structural changes, such as neuronal loss, cortical thinning, and ventricular enlargement, can alter tissue conductivities and compromise source localization accuracy. We hypothesized that individual MRI-based head models would yield more precise localization than templates, particularly in mild cognitively impaired (MCI) patients.
Methods
As part of the MemStim randomized clinical trial, 33 MCI, 35 age-matched HO and 35 HY participants underwent high-density EEG and T1-weighted MRI. Resting-state EEG microstates A-D are brief periods of stable scalp electrical activity topographies reflecting transient brain-states. EEG microstates were source-localized using personalized and template head models.
Results
We observed distinct activity patterns between individual MRI- and template-based activity maps across all four microstates. Microstate A exhibited predominantly frontal-temporal activity in HY and HO subjects, but more temporal-parietal activity in MCI patients. Microstate B showed frontal-temporal activity in all groups, with MCI subjects showing primary activity in the temporal lobe. Microstate C indicates dominant activity in the parahippocampal gyrus bilaterally, except in MCI patients with only left-hemispheric activity. Microstate D was localized primarily in bilateral temporal-parietal regions, whereas for MCI patients, activity was in right temporal and bilateral occipital regions. The individual-based head model showed less spread activity to other areas, such as the cerebellum, and more focal activity than template-based head models.
Conclusions
Although both ESI approaches show similar activation patterns, individual MRI-based ESI is more homogenous across groups with less widespread and more specific activity in each microstate. Microstate C was consistently localized in the medial temporal lobe, reflecting the advantages of individual MRI- over template-based ESI. All groups showed generally similar microstate localization, except for microstate A, where MCI patients showed more temporal-parietal activity and microstate D where activity was more right lateralized than in HY and HO subjects. These findings highlight the importance of personalized head models in EEG source localization for aging and neurodegeneration research.

**Funding:** This research received no external funding.

**Conflicts of Interest:** The authors declare no conflict of interest.