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Oral Abstract C102

Intracranial Vessel Size Comparison between European and Chinese Populations for Neurovascular Applications

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Introduction: Neurointerventional models are used to develop, test, and compare devices, and advance the understanding of pathophysiology, which depend on accurate vessel sizes that may be influenced by ethnic variations. This systematic review and meta-analysis attempts to determine if there vessel size differences exist between the European and Chinese populations.

Method: A systematic review of the literature using PubMed was performed to identify studies reporting vessel diameters on European and Chinese populations free of major comorbidities from Jan 2000 until Jul 2022. All Circle of Willis vessels were studied, a minimum of 5 articles per vessel were needed to perform a meta-analysis using a random-effects model. Analyses were performed using RStudio, and results were reported as means (in mm) with 95% CI pooled random-effects estimates.

Results: A total of 595 studies were screened, and 28 studies were included in the quantitative synthesis after restricting to studies that met the pre-specified study selection criteria. Vessels with at least 5 articles were the middle cerebral artery (MCA) M1 segment, basilar artery (BA), and vertebral artery (VA). The MCA M1 diameter for the European population (2.37mm [95% CI: 2.26–2.49]) was not different from the Chinese population (2.60mm [2.32–2.93]) (p=0.149). The BA diameter for the European population (2.92 [2.49–3.43]) was smaller compared to the Chinese population (3.66 [95% CI: 3.27–3.99]) (p=0.014). Lastly, the VA diameter for the European population (2.87 mm [95% CI: 2.57–3.20]) was similar to the Chinese population (2.67mm [95% CI: 2.32–3.07]) (p=0.427).

Conclusion: In this meta-analysis, the MCA M1 and VA diameters were found to be similar for European and Chinese populations, while the BA was smaller in the European population. This suggests most models and devices are already capturing ethnic variations in vessel size.

Oral Abstract C104

Comparison of Clinical Outcomes according to the Mismatching Judging from CT-Based and MR-Based Imaging

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Introduction: The development of endovascular devices and clinical experience, recanalization rate after intraarterial thrombectomy (IA-Tx) has increased. Recent papers reported that the amount of P/D-mismatching in digital analysis from computer tomography perfusion (CTP) image is well correlated well with P/D-mismatching from MR image.

Method: 218 patients with anterior circulation large vessel occlusion (LVO) treated by IA-Tx were included in this analysis. In the MRI group (n = 80), P/D-mismatching from MRI based image analysis by visual method and in the CTP group (n=138), P/D-mismatching was decided by automatized computer programmatic analyzed from CTP based image (Syngo.via program).

Results: Favorable outcome (modified Rankin Score: 0–2), mortality, recanalization, and clinically significant hemorrhage was 56.3% (45/80), 6.25% (5/80), 81.3% (65/80) and 25% (20/80) in MRI group and 4.9% (62/138), 8.9%(18/138), 91.3%(126/138) and 40.6% (56/138) in CTP group (p=0.000, 0.235, 0.007 and 0.013). Reperfusion injury (27.5% vs 15.0%, p=0.018) but favorable outcome was high 55.0% vs 44.9$, p=0.00) in the MRI study group.

Conclusion: In our study, patient selection according to the P/D-mismatching from MR-based imaging and CTP-based image was not different. But general anesthesia in IA-Tx, showed high recanalization rate but it also cause high incidence of hemorrhage and reperfusion injury.
Oral Abstract C105

Proper Indication of Decompressiv Craniectomy for the Patients with Massive Brain Edema after Intra-arterial Thrombectomy

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Introduction: Many studies have reported that early decompressive craniectomy (DC) for patients with major infarction, could be a life-saving and improve neurological outcomes. However, most of these studies were reported by neurologist before additional intra-arterial thrombectomy (IA-Tx) became popular.

Method: Sixty-seven patients with major anterior circulation major infarction who underwent DC after IA-Tx with or without intravenous tissue plasminogen activator (IV-tPA), were included in this analysis. We retrospectively reviewed the medical records, radiological findings and compare the neurologic outcomes according to the “surgical time window” and neurological status at the time of surgery.

Results: For patients treated with DC after IA-Tx, a Glasgow Coma Scale (GCS) score of 7 was the lowest score associated with a favorable outcome (p = 0.013). Favorable outcomes correlated significantly with successful recanalization after IA-Tx (p = 0.001) and perfusion/diffusion (P/D)-mismatch evident on magnetic resonance imaging performed immediately prior to IA-Tx (p = 0.007). However, the surgical time window (within 36 h, p = 0.389; within 48 h, p = 0.283) did not correlate with neurological outcomes.

Conclusion: From this study, indication for DC after IA-Tx, should include neurological status (GCS 7) because in some patients being treated early DC without considering the neurologic status may be underwent an unnecessary surgery.

Oral Abstract C106

Pressure Volume Index Withdrawal Could Be Express by Linear Curve and Has A Prognostic Value

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Introduction: Intracranial pressure (ICP) may be the most commonly applied neurophysiologic monitoring and correlates well with clinical outcomes of the neurosurgical patient. Timely and proper treatment to normalize the increased ICP, is critical for improving the patient clinical outcomes. But in some patients with similar initial ICP and Glasgow Coma Scale (GCS), their final clinical outcomes are different.

Method: 171 patients, their PVIw curve, which was validated in a linear curve (R2 0.95) were included in this analysis. The authors defined PVIw3, as initial ICP minus ICP at 3 cc of CSF withdrawal then divided by 3. Clinical outcomes were evaluated by the Glasgow Outcome Scale (GOS) at 6 months after initial treatment and favorable outcome was defined as GOS 4-5. We analyzed the correlation between the linear curve and the exponential curve of PVIw. And also, analyzed the correlation between the patient clinical outcome and initial ICP, PVIw3, and both initial ICP plus PVIw3.

Results: Brain compliance could be expressed by a linear curve as well as an exponential curve (correlation valid in 165/171 cases, p=0.047). And the correlation between the clinical outcome and these two types of curves was (p=0.061 in exponential curve and p=0.022 in linear curve). The clinical outcome (linear regression, R2 value) was 0.076 in initial ICP, 0.073 in PVIw3 and 0.093 in both initial ICP and PVIw3. On 2 analysis, PVIw3 values above 3, showed significant favorable outcome (p=0.017).

Conclusion: From this study, the ventricular pressure changes according to the CSF withdrawal could be expressed by a linear curve as well as an exponential curve. Calculating brain compliance by a linear curve (CSF 3 cc withdrawal=PVIw3) is more convenient than by an exponential curve. Initial ICP plus PVIw3, shows more significant prognostic value than initial ICP only.
Oral Abstract C107

Recanalization Rate and Clinical Outcomes of Intravenous Tissue Plasminogen Activator Administration for Large Vessel Occlusion Stroke Patients

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Introduction: Stroke caused from large vessel occlusion (LVO) has emerged as the most common stroke subtype worldwide. Intravenous tissue plasminogen activator administration (IV-tPA) and additional intraarterial thrombectomy (IA-Tx) is regarded as standard treatment.

Method: Total 300 patients undertook IA-Tx with confirmed anterior circulation LVO, were analyzed retrospectively. Brain CT-angiography (CTA) was the initial imaging study and acute stroke MRA followed after finished IV-tPA. Early recanalization rate was evaluated by acute stroke MRA within 2 hours after the IV-tPA. In 167 patients undertook IV-tPA only and 133 non-recanalized patients by IV-tPA, additional IA-Tx tried (IV-tPA+ IA-Tx group). And 131 patients, non-recanalized by IV-tPA (IV-tPA group) additional IA-Tx recommend and tried according to the patient condition and compliance.

Results: Early recanalization rate of LVO after IV-tPA was 12.0% (36/300). In recanalized patients, favorable outcome (mRS, 0-2) was 69.4% (25/36) while it was 32.1% (42/131, P=0.000) in non-recanalized patients. Among 133 patients, non-recanalized after IV-tPA and undertook additional IA-Tx, the clinical outcome was better than not undertaken additional IA-Tx (favorable outcome was 42.9% vs 32.1%, p=0.046). Analysis according to the P/D-mismatching or not, in patient with IV-tPA with IA-Tx (133 patients), favorable outcome was higher in P/D-mismatching patient (52/104=50.0%) than P/D-matching patients (5/29=17.2%, p=0.001). Which treatment tired, P/D-mismatching was favored in clinical outcome (iv-tPA only, p=0.008 and IV-tPA with IA-Tx, p=0.001).

Conclusion: Recanalization rate of IV-tPA in LVO patient was 12.0% in our study. The P/D-mismatching influences on the recanalization and clinical outcomes of IV-tPA and IA-Tx. The authors would like to propose that we had better prepare IA-Tx when LVO is diagnosed on initial diagnostic imaging.

Oral Abstract C108

What Is A Necessary and Sufficient Protection for CAS? Outcome of CAS under Flow Reversal and Analysis for The Intraprocedural Flow of Internal Carotid Artery

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Introduction: Carotid artery stenting (CAS) under flow reversal with dual protection using a proximal balloon and distal filter has been an established procedure for internal carotid artery (ICA) stenosis, even in cases involving vulnerable plaque. However, complete flow reversal in the ICA during CAS may be challenging if the external carotid artery (ECA) cannot be occluded during procedure. This study aims to compare the outcomes of CAS between with or without intraprocedural ECA occlusion and analyze the intraprocedural flow of the ICA during CAS under flow reversal.

Method: We reviewed 231 cases that underwent CAS under flow reversal with ECA occlusion as well as 27 cases without ECA occlusion. In the recent 9 of 27 cases without ECA occlusion, intraprocedural flow of the ICA was analyzed using ultrasound. The collateral index, defined as the total value of the maximum diameter of anterior and posterior communicating arteries as well as anterior and posterior cerebral arteries (A1 and P1), and the diameter of ipsilateral ECA were correlated with the intraprocedural flow direction of the ICA.

Results: There was no significant difference in the incidence of positive lesions in MR-diffusion weighted images and symptomatic stroke after CAS between the groups with or without intraprocedural ECA occlusion. In the recent 9 cases without ECA occlusion, intraprocedural flow of the ICA was analyzed using ultrasound. The collateral index, defined as the total value of the maximum diameter of anterior and posterior communicating arteries as well as anterior and posterior cerebral arteries (A1 and P1), and the diameter of ipsilateral ECA were correlated with the intraprocedural flow direction of the ICA.

Conclusion: The outcomes of CAS under flow reversal were acceptable even without intraprocedural ECA occlusion. Our results suggested that intraprocedural flow direction of the ICA during CAS under flow reversal may be determined by the balance between the intracranial collateral flow and retrograde flow of the ECA.
Outcome of Detachable Balloon Embolization in Traumatic Carotid Cavernous Fistula

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Introduction: Endovascular treatment with various embolization materials including detachable balloons, coils or covered stents have been used to occlude traumatic carotid cavernous fistula (TCCF). Purpose of this study was to evaluate efficacy of detachable balloon embolization and proposed some technique to improve outcome of treatment.

Method: We retrospectively collected data of TCCF patients at Rajavithi hospital during March 2020 to April 2023. All cases were treated by transarterial balloon embolization with single balloon delivery catheter. The clinical follow-up was performed at least 3 months postprocedure.

Results: A total of 21 patients and 22 fistulas were included in this study. Six cases (27%) were small size fistula, 13 cases (59%) were medium size and 3 cases were (14%) were large size. Fistula located at horizontal segment in 6 cases (27%), ascending segment in 16 cases (73%). Nineteen cases (86.4%) were successfully treated with balloon embolization in first procedure. Among these cases, 89% (17/19) uses only single balloon and 11% (2/19) cases uses two balloon. Those who fail on the first procedure, 2 cases were treated by coiling embolization and the other was treated by covered stent. Recurrent fistulas occurred in 3 patients. Two of them had minimal residual fistula after balloon detachment. In second procedures Two patients were treated by detachable balloon and coiling embolization, another patient was death before second procedures due to respiratory problem. Successful rate of detachable balloon embolization were 77.3% (17/22) and All patients had ICA preservation. Medium to large size fistula and ascending segment location were significantly associated with complete occlusion (p-value < 0.05).

Conclusion: Detachable balloon embolization is simple and effective treatment. Better understanding of cavernous sinus anatomy with appropriate balloon location can increase rate of ICA preservation and successful treatment.
Resolving Distal Vessel Occlusions Caused by Migrated Emboli: Outcomes of Modified Stent Retrieval Technique

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Introduction: The purpose of this study was to address the issue of newly migrated embolic particles during primary mechanical thrombectomy for patients with acute large vessel occlusion (LVO). To minimize risk and improve success, a modified stent retrieval (STR) technique was devised that controls the unsheathing level of the microcatheter. The aim of this research was to evaluate the safety and effectiveness of this technique in resolving distal vessel occlusions caused by migrated embolus.

Method: From January 2016 to February 2022, a modified stent retrieval technique was performed on 24 (5.4%) of the 445 patients who had an acute LVO stroke in the anterior circulation and secondary migration of the embolus into M2, M3, A2, or A3 branches. The procedure involved the use of radiopaque stent retrieval systems, including Trevo XP 4/20 and Solitaire Platinum 4/20, and involved adjusting the coverage range through partial re-sheathing of the delivery microcatheter after full unsheathing.

Results: After recanalizing the primary LVO with 8~9Fr balloon (20 cases) or 6~7Fr non-balloon guiding catheter (4 cases), secondary distal vessel occlusion (DVO) occurred in 12/6/4/2 patients in M2/M3/A2/A3, respectively (puncture to primary LVO recanalization, 45.5 ± 17 min). The modified Thrombolysis in Cerebral Infarction (mTICI) score was 2a in 8 patients and 2b in 16 patients for LVO. The one pass rate was 70.8% and the final recanalization rate of at least TICI 2c at the migrated DVO was successfully achieved 23 out of 24 patients (95.8%, mean duration, 23.2 ± 14 min) without significant complications. A favorable functional outcome (mRS, 0-2) was achieved in sixteen (66.7%) patients at 3 months.

Conclusion: The modified stent retrieval technique is a simple modification that can improve the safety and effectiveness of recanalization in distal vessel occlusion caused by migrated emboli.
Oral Abstract C111

Experience with Target Tetra Coil in Treating Small Saccular Aneurysms: User Perspectives and Initial Findings

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Introduction: This study aims to evaluate the early experience with a brand new ‘Target Tetra Coil’, including its feasibility, handling characteristics, and initial outcomes in the treatment of small saccular aneurysms.

Method: A retrospective analysis was conducted on a consecutive series of patients who underwent endosaccular coil embolization, and only cases where the Target Tetra Coil was utilized in over 50% of packed coil and played a significant role were enrolled for the study. The study period spanned from May 2023 to June 2023. Clinical and radiographic data were collected, including patient demographics, aneurysm characteristics, procedural details, and immediate post-procedural outcomes. Technical success, complications, and short-term clinical results were evaluated.

Results: This study included 25 small saccular aneurysms (mean maximal diameter: 4.07mm; mean neck size: 3.03mm) in 24 patients (5 males; mean age: 64 years old) who underwent treatment using the Target Tetra Coil. Twenty aneurysms were located in the anterior circulation, with the following distribution: anterior communicating artery (4), paraclinoid internal carotid artery (9), middle cerebral artery (5), posterior communicating artery (2), and accessory middle cerebral artery (1). The remaining four aneurysms were located in the posterior circulation. Among them, four aneurysms were in a ruptured condition. Coil embolization was performed with stent assistance in just seven out of the 25 aneurysms (28%). The mean number of coils used was 4, with an average length of 17.8cm, and a packing density of 32%. The immediate angiographic outcome of the treated aneurysms showed complete occlusion in four cases, residual neck in 19 cases, and residual sac in two cases. Additionally, two patients experienced thromboembolic issues, but these events did not have an impact on their clinical status. A 2-week post-procedural observation period revealed no clinical complications or adverse events in all cases.

Conclusion: Initial findings suggest potential efficacy and feasibility of the Target Tetra Coil in treating small saccular aneurysms, including cases without stent assistance.

Oral Abstract C112

Embolization of the Anterior Choroidal Artery Aneurysms: Technical Consideration

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Introduction: The anterior choroidal artery (AchA) supplies the brain area of the corticospinal tract associated with motor function of upper and lower limbs. Aneurysm arising at the AchA is not common and show various involvement pattern of AchA.

Method: We obtained interstitial review board approval for this study. Consecutive eighteen patients (M : F = 6 : 12, age range 38-68) with unruptured AchA aneurysm in recent 2 years were treated by embolization. Those patients were referred for coil embolization from the other hospital in which surgical clipping was offered. We present technical details, pre- and post-procedural clinical status, angiographic outcome and recurrence during mean 8 months follow-up.

Results: The patient with AchA (n=18) underwent stent-assisted coiling (n =14), coiling (n=2), or stenting only (n=2). Combination of the several techniques included low lying approach into the aneurysm as we previously described it, strut abutting (protecting) coiling compaction to avoid compromise the flow into AchA or direct intra-aneurysmal angiography via microcatheter. Angiographic results showed complete occlusion (n=12), neck remnant (n=4), and sac remnant (n=2). During follow-up, there were 2 recurrence and one required re-procedure. All the patients revealed no change of clinical status (modified Rankin score = 0) after procedure, and neither ischemic nor hemorrhagic event during follow-up period.

Conclusion: Although surgical clipping is a treatment option, AchA aneurysms can be managed by embolization with the help of several techniques. Such techniques may improve outcome and also safety. Further follow-up and larger study need to be required.
**Effectiveness of Wedge Filter Application in Reducing Lens Radiation Dose during Diagnostic Cerebral Angiography: A Prospective Study**

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**Introduction:** Diagnostic cerebral angiography poses a high risk of direct radiation exposure to the eye lens. This study aimed to evaluate the effectiveness of using a wedge filter to reduce radiation exposure to the eye lens during cerebral angiography.

**Method:** Twenty patients with intracranial aneurysms scheduled for diagnostic cerebral angiography were prospectively enrolled in the study. For each patient, the lens dose reduction protocol, which involved the application of a wedge filter available in the angiomachine, was used on one internal carotid artery (ICA), while the conventional protocol was applied to the other ICA. The lens dose was measured using photoluminescent glass dosimeters (GD-352M) and radiation dose metrics were compared between the two protocols. Quantitative analysis of image quality was performed using image noise, signal-to-noise ratio, and contrast-to-noise ratio.

**Results:** The lens dose reduction protocol resulted in a 64% reduction in mean dose from 2.23 mGy to 0.80 mGy per ICA angiography (P<.001) in the patient study. When comparing the measured doses in each eye, the lens dose in the conventional protocol was found to be an average of 0.76 mGy in the right eye and 3.70 mGy in the left eye. In contrast, the lens dose reduction protocol resulted in an average of 0.39 mGy in the right eye and 1.21 mGy in the left eye, representing significant reductions of 48% and 67%, respectively. There were no significant differences between the dose reduction and conventional protocols in terms of kerma area product (mean of 5.82 and 6.46 Gy·cm²), air kerma (mean of 36.1 and 39.5 mGy), and image quality.

**Conclusion:** The application of a wedge filter significantly reduced the lens radiation dose during cerebral angiography. Implementing appropriate wedge filter application can serve as a simple and effective method to reduce lens dose in clinical practice.
Comparison of Neuroform Atlas Stent Assisted Coiling and Coiling Alone in Ruptured Intracranial Aneurysms: A Propensity Score Matching Analysis

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**Introduction:** Although Neuroform Atlas stent is commonly used in stent-assisted coiling (SAC) to treat ruptured intracranial aneurysms (RIA), its safety and efficacy remain controversial.

**Method:** RIA treated with coiling alone and SAC between January 2017 and May 2021 were retrospectively reviewed. Demographics, periprocedural complication rates, angiographic outcomes, and clinical outcomes of the SAC using Neuroform Atlas group and the coiling-alone group were analyzed with 1:1 propensity score matching.

**Results:** A total of 375 aneurysms were enrolled, and 274 (63.1%) aneurysms were treated with coiling alone. In total, 101 (26.9%) aneurysms were treated with SAC, and Neuroform Atlas stent was used in 71 aneurysms. In propensity score matching, the SAC using Neuroform Atlas group showed higher incidence of complete occlusion (69.0% vs 56.3%, P=.029), lower rate of recanalization (11.3% vs 25.4%, P=.011), and lesser need for retreatment (7.0% vs 16.9%, P=.016) compared with the coiling-alone group. However, there were no significant differences in periprocedural complications such as intraprocedural thrombosis or postprocedural cerebral infarct between the 2 groups.

**Conclusion:** The use of Neuroform Atlas is safe and effective for SAC in RIA with comparable procedure-related complication rates but better angiographic outcome in comparison with coiling alone.
Endovascular Embolization of Intracranial Aneurysms Using Target Tetra Detachable Coils: Immediate Angiographic and Clinical Follow-up Results from a Single Center

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Introduction: Tight coil packing of the intracranial aneurysm sac is required for successful embolization and prevention of recurrence. Therefore the correct selection of coils (size, shape and conformation) should be optimized for specific coil embolization phase. Recently, Target Tetra Detachable Coil (TTDC) (Stryker, Fremont, CA, USA) has been introduced. By maintaining tetrahedral conformation inside the intracranial aneurysm it is feasible to treat aneurysms of small size which is advantageous especially during framing process. The purpose of this study is to report early experience with TTDC in the treatment of intracranial aneurysms, with a particular emphasis on the safety and efficacy of the device.

Method: We conducted a retrospective review of the medical records of 41 patients who underwent coil embolization of intracranial aneurysms of ≤ 10 mm with TTDCs between April 2023 and May 2023. Immediate post-procedural angiographic and clinical outcomes were reviewed.

Results: Of the 46 aneurysms (45 unruptured and 1 ruptured), 33 (71.7 %) aneurysms were treated with stent assisted technique, 13 (28.3 %) were treated using simple coil embolization technique. Immediate post-procedural angiography revealed complete occlusion in 30 aneurysms (65.2 %), neck remnants in 3 (6.5 %), and residual aneurysms in 13 (28.3 %). The mean packing density was 34.7 % (19.3 – 45.6 %) with TTDC coil length constituting a mean of 88.5 % of total coil length. There was no device- or procedure-related major complications nor morbidity.

Conclusion: The TTDC is a safe and effective device for the endovascular treatment of intracranial aneurysms. Follow-up studies are required to establish long-term results.
Etiologic Classification Using Machine Learning with Thrombus Retrieved from Endovascular Thrombectomy

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Introduction: Determination of the accurate etiology for acute ischemic stroke is important for secondary prevention. Thrombi acquired from endovascular thrombectomy may reflect the underlying etiology of stroke. This study aimed to develop and validate machine learning models that can predict the underlying etiology of stroke between cardioembolism and atherosclerosis.

Method: This was a retrospective study using a prospective nationwide cohort of patients who underwent endovascular thrombectomy and had thrombi collected. We included consecutive patients whose stroke was presumed to have been caused by either atrial fibrillation (AF) or large artery atherosclerosis (LAA). Patients who were diagnosed with AF during follow-up or who had both AF and LAA were included for testing of the models. Immunohistochemical staining was performed using platelet, fibrin, and red blood cell antibodies. Whole-slide scanning was performed to acquire digital images after immunohistochemical staining. Transfer learning with MobileNet, Inception, EfficientNet, and ResNet was used to develop models for each staining.

Results: A total of 183 patients were included (107 in the AF group, 43 in the LAA group, 30 in both etiology group, and 3 with AF diagnosed during follow up). Of 150 patients in the AF or LAA group, 111 patients were included for training dataset, and 39 patients for validation dataset. The best performing model used fibrin, showing area under the receiver operating characteristic curve of 0.876 (95% confidence interval, 0.814-0.938) on training and 0.835 (95% confidence interval, 0.644-1.000) on validation. The best performing models of each stain unanimously predicted AF for three patients who had paroxysmal AF detected during follow up.

Conclusion: Machine learning models may be used to differentiate between AF and LAA based on the analysis of thrombi images stained with immunohistochemical techniques.
IV-DSA Based AR-Guided Brain Arteriovenous Malformation Surgery

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Introduction: Augmented reality (AR) has emerged as a promising technology in various medical fields, revolutionizing surgical procedures and enhancing visualization. In the context of brain arteriovenous malformations (bAVMs) surgery, AR offers the potential to improve surgical accuracy and outcomes. This report aims to explore the applications of intravenous digital subtraction angiograms (iv-DSA) in AR-guided bAVMs resection surgery within a neurosurgical hybrid operating room (OR). By analyzing the workflow of iv-DSA based AR-guided bAVMs resection surgery, this study provides insights into the method’s feasibility and benefits.

Method: In the hybrid OR, we integrate the advanced angiography machine, surgical navigation system, and AR microscopy to develop a workflow of iv-DSA based AR-guided bAVMs resection surgery, including four main components. Firstly, source images are acquired through either i-Flow tailored or multiphase scans. Secondly, the identified targets are labeled. Thirdly, the surgical navigation system is utilized to integrate the labeled targets with the patient’s anatomical data. Finally, microscopic AR fusion is achieved. This step enables the superimposition of digital information onto the surgeon’s view.

Results: The report demonstrates the entire workflow of iv-DSA based AR-guided bAVMs resection surgery. It provides a comprehensive overview of each step, emphasizing the utilization of i-Flow tailored iv-DSA method and multiphase scans method for data acquisition in the hybrid OR. The incorporation of AR technology enhances surgical visualization, aids in accurate target localization, and facilitates precise resection of bAVMs. The real-time guidance and fusion of digital information contribute to improved surgical outcomes and patient safety.

Conclusion: iv-DSA based augmented reality is an innovative and promising technique for bAVMs surgeries. The workflow analysis presented in this report highlights the feasibility and benefits of utilizing iv-DSA and AR guidance in a neurosurgical hybrid OR setting.
Oral Abstract C122

Pre-Existing Intracranial Arterial Stenosis Can Extend the Potential Time Window for Acute Stroke Patients to Undergo Endovascular Thrombectomy.

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Introduction: Endovascular thrombectomy (EVT) s become a standard procedure in treating acute ischemic stroke with large vessel occlusion (LVO). In recent years, DAWN and DIFFUSE-3 trials proved the benefit of this procedure on 6-24 hours onset cases when the infarction volume was relatively small. Collateral circulation is crucial to the prognosis of LVO patients. Intracranial atherosclerosis disease (ICAS) is more common in Eastern people than in Western people. In this study, we evaluated the correlation between ICAS and the time window of emergent EVT.

Method: Cases who suffered from acute ischemic stroke were enrolled from January 2020 to May 2023, and those with anterior circulation ischemia and onset to puncture time of more than 8 hours were recruited. We used brain magnetic resonance imaging with RAPID for evaluation. The cases received EVT if the infarction volume was less than 100ml after their family agreed. The results of the procedure were also recorded.

Results: A total of 65 patients were possible cases for an overtime EVT. Among the 24 cases that could be intervened, 20 received the treatment. The average age was 70.25 +/- 15.86 years old. The average initial infarction volume was 54.64 +/- 26.42ml, and the average onset time to recanalization time was 739 +/- 185 minutes. Nine cases (45%) had combined pre-existing stenosis. The incidence of pre-existing stenosis in this group was higher than in all cases (10%) (p < 0.05). The average NIHSS improvement was from 18.13 +/- 4.7 to 9.79 +/- 6.15. By ECASS classification, the case numbers of type HI, PH1, and PH2 were 6, 3, and 1. No symptomatic ICH or craniectomy was noted.

Conclusion: The results supported our hypothesis that pre-existing intracranial stenosis is more prevalent in overtime EVT cases. The condition might help the brain to establish collateral circulation and offer a better chance for an overtime EVT.

Oral Abstract C123

INSTANT Study: A Recent Evaluation of Coiling in Aneurysm Treatment

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Introduction: Despite the development of new techniques like flow diversion and flow disruption, coiling is still the first-line endovascular treatment for the management of ruptured and unruptured aneurysms. This treatment was not evaluated in recent, large series. The European study INSTANT is evaluating endovascular treatment of intracranial aneurysms with OPTIMA coils (Balt, Montmornery, France) in a recent period.

Method: The goal of INSTANT study was to include 300 patients with ruptured, unruptured, or recanalized aneurysms treated with OPTIMA coils. Only patients treated for one aneurysm were included. The primary endpoint was evaluation of safety (morbidity and mortality at one-month). Several secondary endpoints were included to further evaluate safety and efficacy (anatomical results at one-year, evolution of aneurysm occlusion). All adverse events and anatomical results were independently evaluated.

Results: The study population for this analysis consisted of 294 patients (56.3 ± 12.0 years, 186 women, [63.3%]) included in 18 European centers during the period (04/2019 - 04/2022). Aneurysms were sacciform in all patients, ruptured in 133/294 patients (45.2%) and unruptured or recanalized in 161/294 patients (54.8%). Aneurysm location was anterior communicating artery in 126/294 patients (42.9%), middle cerebral artery in 52/294 (17.7%), carotid siphon in 95/294 patients (32.3%) and vertebrobasilar system in 21/294 (7.1%). Mortality at 1-month was 0.0% in patients with unruptured aneurysms and 3.0% in those with ruptured aneurysms, all related to subarachnoid hemorrhage and its complications. Morbidity at 1-month was 1.2% in patients with unruptured aneurysms and 21.1% in those with ruptured aneurysms. Other safety and efficacy data will be presented.

Conclusion: INSTANT study provides a recent evaluation of safety and efficacy of coiling in the management of ruptured and unruptured/recanalized aneurysms.
How to Evaluate Surface Modified Flow Diversers?  
Presentation of COATING Study

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Introduction: Flow diversion (FD) is the most efficacious technique for the endovascular treatment of intracranial aneurysms in term of complete occlusion at mid- and long-term. However its indications are still limited to unruptured and recanalized aneurysms due to the need of dual antiplatelet treatment (DAPT) before and after the treatment. To overcome this limitation, one way is to develop surface modification like Hydrophilic Polymer Coating (HPC, Wallaby-Phenox, Bochum, Germany) that will decrease platelet aggregation on the device, reduce the number of thromboembolic complications, and potentially permit to use single antiplatelet treatment (SAPT). COATING is the unique randomized controlled trial dedicated to the assessment of a surface-modified FD (p64-MW-HPC; phenox GmbH, Bochum, Germany).

Method: The subjects are randomized 1:1 in 2 arms: p64-MW (bare) and DAPT (prasugrel or ticagrelor + aspirin), and p64-MW-HPC (surface-modified) under single antiplatelet treatment (SAPT; prasugrel or ticagrelor). The primary endpoint is the rate of thromboembolic complications as assessed by an independent core lab on DWI-MRI 48 hours after the procedure. Secondary endpoints are evaluating safety, performance and efficacy.

Results: Out of 16 active European centers, 11 have already recruited. As of now (07/25/2023), 95 patients have been included. After inclusion of 85 patients, the interim assessment conducted by the Data Monitoring Committee recommended to continue enrollment with a final target population of 170 patients. Last inclusion is expected at the end of 2023.

Conclusion: Surface-modified flow diversers will potentially change the treatment strategy for intracranial aneurysms. COATING is the first RCT to evaluate a surface-modified FD under SAPT.

Frequency of Pial Feeder and Micro Arteriovenous Malformation in Tentorial Dural Arteriovenous Fistula and Their Treatment Strategies

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Introduction: The complications that bleed after the treatment of dural arteriovenous fistula (dAVF) having a pial feeder are known. We investigate the frequency of the coexistence with pial feeder and micro arteriovenous malformation (AVM) in tentorial dAVF patients and consider the treatment strategy.

Method: Of the 19 tentorial dAVF cases, which were treated from 2007 to 2022, were 16 cases in which the treatment image was obtained. We examined image findings, treatment complications, and mRS. Cases with pial feeder (excluding MHT, ILT, PMA) were evaluated for the coexistence with micro AVM in the brain.

Results: Of the 16 cases, 4 cases were caused by venous perfusion, and 3 cases were caused by bleeding. The location was SPS 7, tentorial sinus 3, incisura 3, straight sinus 2. In Cognard classification, 2 IIb, 5 III, 8 IV, and 1 V. In 3 of the six cases having a pial Feeder, micro AVM coexisted close to the drainer of dAVF. The treatment strategy was eight cases in TAE alone, 3 cases in TVE, 2 cases in combination TAE with surgery, and three cases in surgery alone. The complete occlusion rate of TAE was 50-60%. TAE complications were one cerebral infarction, one cerebral nerve palsy, and one NBCA migration, and surgery complication were one cerebral hemorrhage and one venous thrombosis. Postoperative cerebral hemorrhage rate was 33% of cases with pial feeder, including cerebral hemorrhage at the time of previous hospital treatment. In two cases which we noticed micro AVM before treatment, drainer of dAVF was cut off and pial AVM was resected, and no cerebral hemorrhage occurred. The complete occlusion rate at final follow-up is 69% (11 cases), and in three cases (19%) mRS worsend to 1.

Conclusion: In the tentorial dAVF, 38% had a pial feeder. And half of them had micro AVM adjacent to the dAVF. In the coexisting dAVF and pial AVM sharing a common drainer, treatment to both can reduce risk.
Oral Abstract C129

10-Year Single-Centre Retrospective Review on the Clinical Outcome Post Endovascular Treatment of Unruptured Intracranial Wide Neck Aneurysms

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Introduction: To evaluate clinical outcomes of patients undergoing endovascular treatment of unruptured intracranial wide neck aneurysms and potential risk factors associated with residual or recurrence after treatment.

Method: This is a single-centre, 10-year retrospective study of patients presenting with unruptured wide neck intracranial aneurysms admitted to Kwong Wah Hospital from January 2012 to December 2021 for endovascular treatment. Patients’ demographics and characteristics of aneurysms were reviewed. Subsequent endovascular treatment modality and its rate of complete aneurysm obliteration on follow-up neuroimaging was analyzed. Underlying risk factors associated with residual neck or recurrent aneurysms, and need for re-intervention were then evaluated.

Results: A total of 260 patients presenting with unruptured intracranial aneurysms were analyzed. 183 patients (49 male and 134 female, mean age 57) had wide neck aneurysms. A total of 208 wide neck aneurysms were included in our study. Complete obliteration rate of 44% could be achieved with simple coiling (mean dome-to-neck ratio 1.20, range 0.52-1.62). Patients undergoing stent-assisted and flow diverter-assisted coiling had a complete obliteration rate of 56.3% (mean dome-to-neck ratio 1.20, range 0.82-1.81) and 85.3% (mean dome-to-neck ratio 1.34, range 0.66-3.02) respectively, with no in-stent stenosis. 75.9% (mean dome-to-neck ratio 1.09, range 0.49-4.94) had complete obliteration after flow diverter insertion. 5.5% of patients required re-intervention of residual or recurrent aneurysms. Overall complication and mortality rate was 1.6% and 2.2% respectively.

Conclusion: Unruptured wide neck intracranial aneurysms with mean neck-to-dome ratio of less than 1.34 could be effectively treated endovascularly in our centre.

Oral Abstract C130

Endovascular Treatment on Wide-Neck Aneurysms: A Single-Center Study Evaluating Angiographic and Clinical Outcomes

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Introduction: Wide-neck aneurysms (WNAs) pose a significant challenge in the field of neurointervention. Due to their complex anatomy, treatment requires careful consideration and specialised techniques to ensure effective and safe outcomes. This study aims to review the efficacy and associated challenges of current endovascular techniques by evaluating the angiographic and clinical outcomes.

Method: We conducted a retrospective analysis of medical records from July 2017 to July 2022 at regional hospital. Patient demographics, aneurysm characteristics, procedural details and follow-up data were collected and analysed. Aneurysm occlusion was determined immediately post-procedure, at 6-month and 12-month follow-up and clinical outcomes were evaluated.

Results: A total of 88 patients underwent neurointerventions on WNAs. Treatment modalities were simple coiling in 25 patients, dual-catheter technique in 12 patients, stent-assisted coiling in 3 patients, flow diverter in 8 patients, and Comaneci-assisted coiling in 2 patients and Woven EndoBridge device in 1 patient. Among included WNAs (mean diameter: 5.8mm, mean neck width: 4.2mm), 65% were ruptured. Among patients available for follow-up, complete and adequate occlusions were observed in 35/56 (62.5%) and 48/56 (85.7%) at 6-month, respectively, and in 31/51 (60.8%) and 43/51 (84.2%) respectively at 12-month. The favourable clinical outcome (modified Rankin Scale <=2) for ruptured aneurysms were 29/57 (50.9%), 30/45 (66.7%) and 30/41 (73.1%) at 1-month, 6-month and 12-month follow-up respectively. For unruptured aneurysms, it was 31/31 (100%) at all time points. Peri and post-procedural complications were vasospasm in 10/88 (11.4%), thrombus formation in 1/88 (1.1%) and intracerebral hemorrhage in 1/88 (1.1%).

Conclusion: The treatment of WNAs in our center has demonstrated satisfactory effectiveness and safety, with consideration for various factors that can impact overall clinical outcomes.
Impact of Dissection after Drug-Coated Balloon Angioplasty for Intracranial Atherosclerosis Disease: Is Late Lumen Enlargement Possible

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Introduction: Drug-coated balloon (DCB) treatment for intracranial arterial stenosis can prevent vascular restenosis but may cause concerns about dissection.

Method: Patients with intracranial stenosis were divided into groups with/without postoperative dissection. Dissection severity, repair, and association with restenosis were studied. Primary endpoint: dissections affecting blood flow; secondary: dissections related to restenosis or late lumen enlargement.

Results: 120 lesions in 119 patients were treated with DCB; 53 had dissections, 9 needed stents. Six stents were due to dissection affecting blood flow. 30 underwent tracking; no restenosis post-stent. 24 dissections were fully repaired. Restenosis rate of 3.8% among postoperative dissection patients. Preoperative, postoperative, and follow-up stenosis rates: 76.9%, 38.1%, 39.7% without dissection; 83.8%, 38.1%, 32.3% with dissection. Lumen enlargement better in dissection group (5.8% vs -1.6%).

Conclusion: Stent can repair dissection. If no blood flow effect, conservative observation may suffice. Most self-heal, less likely to restenose; may show positive remodeling.
Vertebro-Vertebral Arteriovenous Fistula: A Series of Single-Center Experience of Endovascular Management

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**Introduction:** Vertebro-vertebral arteriovenous fistula (VVF) is a rare disorder characterized by a direct shunt between the vertebral artery and the veins of the vertebral venous plexus. It can arise spontaneously, or secondary to vascular injury. This case series presents the outcomes of endovascular treatments of VVF at Siriraj Hospital, Bangkok, Thailand.

**Method:** All patients with diagnosis of VVF who underwent treatment at our hospital from January 2000 to January 2023 were retrospectively reviewed. The study assessed patient demographics, presentation, location of fistula, treatment strategies, and outcomes.

**Results:** There were 14 patients, with 11 females, the age range from 25 to 79 years (median of 50 years). Eight patients had spontaneous VVF, notably 3 of them were diagnosed with NF1. Six cases were secondary to trauma, 3 had traffic accident, whereas the other 3 had iatrogenic injury. The presenting symptoms were related to venous drainage, including neck mass (6), neurological deficits (4), bleeding (3), tinnitus (3), proptosis (1) and congestive heart failure (1). One spontaneous presented with eye symptoms mimicking a carotid-cavernous fistula and one case had decompensated heart failure, due to the high-flow shunt. All VVF's were successfully obliteration, 12 cases (85.7%) had parent vessel sacrifice while the other 2 patients had vertebral artery preservation. Embolic materials included detachable balloons, detachable coils, and NBCA. All had clinically improvement of presenting symptom, however, ischemic complications occurred in 3 patients which manifested as TIA, mild weakness and vertigo.

**Conclusion:** Endovascular embolization is feasible in achieving complete VVF obliteration. Parent artery sacrifice should not be reluctant, if adequate collateral circulation is demonstrated.

Spinal Intradural Arteriovenous Shunts: A Review of Angiographic Characteristics and Treatment Outcomes at a Single-Center

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**Introduction:** Spinal intradural arteriovenous shunts (SAVS) are uncommon vascular diseases, primarily supplied by radiculomedullary and/or radiculopial arteries or both, often resulting in spinal venous congestion and hemorrhage. SAVS include subtypes such as spinal cord arteriovenous malformation (SCAVM), spinal cord arteriovenous fistula (SCAVF), filum arteriovenous fistula (filum AVF), and radicular AVM.

**Objective:** This study aims to demonstrate the clinical presentations, angiographic findings and treatment outcomes.

**Method:** Conducted as a retrospective study at Siriraj Hospital from 2010 to 2023, the investigation encompassed patient demographics, clinical presentations, radiological findings, treatment modalities, and patient outcomes.

**Results:** There were 27 patients (17 males; age range: 2-67; median: 26). Clinical presentations included hematomyelia (11 cases), subarachnoid/intraventricular hemorrhages (3), and progressive myelopathy (13). SCAVMs were identified in 16 cases, with 6 cases displaying comorbid spinal arteriovenous metameristic syndrome (SAMS). SCAVF's were revealed in 7 and filum AVF in 4. Radicular AVM was found in 3 cases of spinal AVM and AVF. Multiple intradural shunts were identified in 4 cases, one of them was Parkes-Weber syndrome. Primary treatment was transarterial NBCA (glue) embolization if the safety margin of the anterior spinal artery axis allowed. Endovascular treatment was achieved in 21 patients, combined with surgery in 1, surgery alone in 2, and conservative management in 3. Angiographic assessments indicated complete cure in 9 patients and partial obliteration in 15. Five patients experienced complete symptom resolution, while 17 patients exhibited residual neurological deficits. Throughout the mean follow-up period of 45 months, no exacerbation of symptoms or recurrence of bleeding was observed.

**Conclusion:** Transarterial glue embolization is an effective treatment of SAVS and proved to be benefit in improvement of neurological symptoms, even partial obliteration. However, the risk of occlusion of anterior spinal artery must be always in concern.
Orbital Venous and Venolymphatic Malformations: An Effective Treatment with Intralesional Bleomycin Injection

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**Introduction:** Orbital venous malformations (VM) and venolymphatic malformations (VLM) are low-flow vascular anomalies that lead to orbital congestion, pain, proptosis, and bleeding tendencies. Managing these complex challenges requires effective interventions. Intralesional Bleomycin Injection (IBI) has already demonstrated its effectiveness with promising results for all venous and lymphatic malformations. This study aims to evaluate the efficacy and safety of IBI in treating orbital VM and VLM.

**Method:** We conducted a retrospective review of patients with head and neck VM and VLM who underwent IBI at Siriraj Hospital between 2010 and 2023.

**Results:** Among 144 patients with head and neck VM, 23 patients (15.9%) presented with orbital lesions, with 12 of them being male. The age range was 1-61 years, with a median age of 23.5 years. Presenting symptoms included proptosis (7 cases), orbital pain (7 cases), visible mass (6 cases), hemorrhage (3 cases), and secondary glaucoma (1 case). Venous drainage connection to the cavernous sinus was observed in 8 patients. IBI was successfully administered to 20 patients, and 5 of them subsequently underwent cosmetic surgery. Conservative management was considered for 3 patients with small lesions. All 20 treated patients exhibited satisfactory results, with a reduction in lesion size and resolution of symptoms. One case experienced a serious complication immediately after the procedure, characterized by severe orbital swelling and deteriorating vision; however, this was successfully managed conservatively. One patient experienced symptom recurrence during the 3-year follow-up period. The mean cumulative dose of Bleomycin administered was 16.05 mg, with an average treatment frequency of 2 sessions.

**Conclusion:** This study further supports the evidence of the effective and safe use of intralesional bleomycin injection for treating orbital VM and VLM. Nevertheless, these patients require care from a multidisciplinary team using a common language approach.

Tandem Occlusion in Anterior Circulation Stroke: Challenges and Treatment Strategies

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**Introduction:** Tandem lesions were defined as a combination of severe stenosis or occlusion in extracranial carotid artery and concomitant intracranial large vessel occlusion. Patients with tandem occlusion tend to have higher morbidity and mortality than those with isolated intracranial occlusion. By far, there is no standard guideline about the optimal management. Whether carotid stenting should be performed in conjunction to thrombectomy or not remains controversial. This study aimed to evaluate the safety and efficacy of carotid stenting as an acute treatment of tandem lesions.

**Method:** Data from Pamela Youde Nethersole Eastern Hospital and Queen Elizabeth Hospital between Jan 2018 to Dec 2022 were analyzed. Patients suffered from tandem lesions with or without acute treatment of extracranial carotid pathology performed were included in this study. Thrombolysis in Cerebral Infarction (TICI) score of 2b or 3 was regarded as successful reperfusion. Good functional outcome was defined as modified Rankin Scale score of 0 to 2 at 3 months.

**Results:** Acute extracranial carotid treatment was performed in 70% of patients with tandem lesions. Successful reperfusion was achieved in 86% of patients who underwent treatment for extracranial carotid lesion, compared to 78% in those who underwent intracranial thrombectomy alone. Overall, a good functional outcome was observed in 38% patients, insignificantly higher than those are not treated for the extracranial carotid pathology. The peri-procedural complication and mortality rate were comparable between patients treated for acute extracranial carotid pathology and patients not treated.

**Conclusion:** Overall, acute treatment of extracranial carotid pathology in conjunction to thrombectomy is a safe and feasible treatment option to improve the successful reperfusion rate and clinical outcome without major differences in peri-procedural complications.
Oral Abstract C139

Intracavernous Sinus Pressure & Clinical Correlation in Cavernous Sinus Dural Arteriovenous Fistula

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Introduction: Nowadays, there is no data about intracavernous sinus pressure in cavernous sinus dural arteriovenous fistula (CS-DAVF) patients. The only strong indications for treatment of CS-DAVF are cortical venous reflux (CVR) or uncontrolled intraocular pressure (IOP). Some of CS-DAVF patients with minor visual symptoms or extraocular muscle (EOM) paresis may receive conservative treatment. Some of them are spontaneously resolved. Some of them are getting worse of disease. Aim of this study is to evaluate intracavernous sinus pressure with other clinical parameters in CS-DAVF patients eg. visual symptoms, EOM function, cortical venous reflux (CVR), superior ophthalmic vein (SOV) drainage.

Method: All 43 consecutive CS-DAVF patients from 2018 to 2022 were managed by endovascular transvenous treatment in our center. Intracavernous sinus pressure was measured by using Edward-manometer connected to microcatheter used for treatment. Intracavernous sinus pressure was correlated with visual symptoms, EOM function, CVR, and SOV drainage.

Results: The mean cavernous pressure in CS-DAVF is 41 mmHg. High cavernous sinus pressure related with Cortical venous reflux (P=0.021), Increased IOP (P=0.034). Cortical venous reflux related with ophthalmologic symptom (P=0.021).

Both cavernous sinus pressure & cortical venous reflux were not related with cranial nerve function.

Conclusion: Cavernous and cortical venous reflux were not related to cranial nerve function. No CVR does not mean having good CN function. Therefore, we consider thinking about the indication of treatment. Instead of treating patients who have CVR and Increased IOP, treating all CS-DAVF patients before ophthalmologic & cranial nerve function get worse.

Oral Abstract P100

Anatomical Predictors of Difficult Left Internal Carotid Artery Navigation in Transradial Access for Neurointervention

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Introduction: Transradial access (TRA) has received considerable attention in the field of neurointervention owing to its advantages over transfemoral access. However, the difficulty of left internal carotid artery (ICA) navigation under certain anatomical conditions of the aortic arch and its branches is a limitation of right TRA. In this study the authors aimed to investigate the anatomical predictors that impede navigation of the left ICA in right TRA.

Method: From January to October 2020, 640 patients underwent transradial angiography at a single institute. Among them, 263 consecutive patients who were evaluated by contrast-enhanced MRA before transradial angiography were included in the study and assigned to success or failure groups according to whether left ICA navigation was possible or not. Several anatomical predictors were investigated to evaluate the correlation of the success of left ICA navigation in right TRA.

Results: A higher grade of the aortic arch type (type I vs type III: OR 6.323, p = 0.0171), higher height of the right subclavian artery (OR 1.071, p = 0.0068), narrower turnoff angle of the left common carotid artery (CCA) (OR 0.953, p = 0.0017), wider distance between the innominate artery and the left CCA (OR 1.784, p<0.0001), steeper angulation of the right subclavian artery (tortuous vs kinking: OR 6.323, p = 0.0066), and steeper angulation of the left CCA (normal vs tortuous: OR 7.453, p=0.0087; normal vs kinking: OR 51.65, p<0.0001) were significantly associated with successful navigation of the left ICA. The cutoff value of the height of the right subclavian artery, distance between the innominate artery and the left CCA, turnoff angle of the left CCA, and diameter of the left CCA were 54.83 mm, 4.25 mm, 17°, and 6.05 mm, respectively.

Conclusion: Successful left ICA navigation in right TRA was related to the specific vascular geometry of the aortic arch and its branches. Preprocedural evaluation of the anatomical predictors identified in this study may enhance the success rate of left ICA navigation in right TRA.
Oral Abstract P101

Safety and Efficacy of Alpha-Stent for the Treatment of Wide-Necked Intracranial Aneurysm: A Single-Arm, Prospective Study

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Introduction: The Alpha stent™ is a newly available intracranial stent with a modified closed-cell design to enhance wall apposition. It recently underwent structural modifications to facilitate easier stent deployment. This prospective, single-arm study aimed to evaluate the safety and efficacy of stent-assisted coil embolization for unruptured intracranial aneurysms in distal internal cerebral artery (ICA) using the Alpha stent™.

Method: Between January 2021 and November 2021, 35 adult patients (median age, 60 years; 33 women [88.6%]) with 35 unruptured intracranial aneurysms were prospectively enrolled. For efficacy outcomes, magnetic resonance angiography at the 6-month follow-up was evaluated using the Raymond-Roy occlusion classification (RROC). The safety outcome evaluated the occurrence of symptomatic procedure-related neurological complications up to 6 months postoperatively.

Results: The median values for the maximum diameter and the dome-to-neck ratio were 5.52 mm and 1.17, respectively. Technical success was achieved in 34/35 (97.1%), as stent migration occurred during the retrieval of a delivery wire after stent deployment in one case. Six months postoperatively, aneurysm occlusion showed RROC I in 32/35 (91.4%) and RROC II in 3/35 (8.6%) patients. Procedure-related neurologic complications occurred in one patient (2.9%) who experienced hemiparesis due to acute lacunar infarction, which resulted in a 6-month modified Rankin Scale score of 1.

Conclusion: The Alpha stent demonstrated excellent efficacy and safety outcomes in stent-assisted coil embolization of unruptured distal ICA aneurysms. The stent may be particularly useful in tortuous ICA for its excellent conformability and the ability to be recaptured.

Oral Abstract P109

Prehospital Stroke Management with Internet Communication Tool in Rural Area in Japan

Ryo Yoshimura
Hashimoto Municipal Hospital, Japan

Introduction: There are still few neuroendovascular surgeons especially in rural area in Japan. However, it is necessary to activate a stroke team for acute ischemic stroke (AIS). We investigate to save time using internet communication tool (ICT) on prehospital phase.

Method: ICT, JON and JOIN Triage (Allum, Tokyo, Japan), have been activated in EMS, our hospital and our staffs. Medical information, FAST-ED scores and short movie of stroke patients, was immediately shared with ICT. Door-to-Needle and Door-to-Puncture time was estimated before and after the introduction of ICTs.

Results: 58 patients were registered. Before the ICT system installation, average Door-to-Needle time was 66 minutes, whereas 43 minutes under ICT. Surprisingly, no significant difference of Door-to-Needle time or Door-to-Puncture time between the conventional stroke management and the activation of the neuroendovascular surgeon located on over 50 kilometers from our hospital.

There are few medical resources especially in rural area. It is the most important to maximize the resources. There is one option using ICT, rapid sharing the medical information of patients, and rapid activation of all medical staffs of stroke management.

Conclusion: It is useful to enhance medical resources using ICT on acute stroke management, especially in rural area.
Curve-Centered Plaques Increase the Incidence of Periprocedural Complications among Patients with Severe Carotid Stenosis Undergoing Angioplasty and Stenting

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¹Department of Neurology, Jeju National University Hospital, Jeju National University School of Medicine, South Korea, ²Department of Neurosurgery, Jeju National University Hospital, Jeju National University School of Medicine, South Korea

Introduction: Carotid artery stenting (CAS) is currently performed as an alternative interventional treatment to carotid endarterectomy (CEA). However, pre-procedural consideration and anatomical risk factor analysis may not be sufficient. Therefore, we investigated the higher-risk anatomical appearance of CAS from the perspective of neurointerventionists to predict periprocedural complications.

Method: We retrospectively reviewed patients with carotid stenosis who underwent CAS in a comprehensive stroke center from January 2012 to December 2021. Curved-centered plaque was defined as the stenotic segment with a plaque located in the middle of the severely curved vascular appearance. We compared the demographic characteristics, past medical history, and anatomical appearance of the stenotic segment in two groups: those with complications and those without complications.

Results: We analyzed a total of 148 patients (64 women [43.2%]; median age, 73.0 [interquartile range, 65.5-79.0]). Complications occurred in 39 of 148 patients, mostly minor and transient. Of baseline or procedural characteristics, high initial National Institutes of Health Stroke Scale score (P=0.038), symptomatic stenosis (P=0.009) and CCP of the proximal ICA (P=0.012) were significantly associated with CAS complications in unadjusted analysis. The CCP remained as an independent risk factor for CAS complications after the adjustment. (Odds ratio 2.23[1.02-4.88], P=0.044)

Conclusion: High-risk vascular anatomical appearances, such as CCP, are associated with a high frequency of periprocedural complications of CAS. Tailored patient selection in carotid stenosis is crucial to prevent complications. Patients with CCP should consider an alternative treatment option, such as CEA, to achieve optimal clinical results.
Minimizing Eye Lens Radiation Exposure Using Lens-Tracking in Neurointerventional Procedures

Jae Ho Lee
Asan Medical Center, South Korea

Introduction: In neurointerventional procedures, the eye lens is at a high risk of direct radiation exposure. Accurate localization of the lens at various oblique working angles would avoid and minimize lens exposure. This study aimed to evaluate the effectiveness of a lens tracking method in reducing radiation exposure to the eye lens during coil embolization for intracranial aneurysms.

Method: A retrospective review was conducted on patients who underwent coil embolization for cerebral aneurysms at a tertiary hospital between January and March 2023. The lens tracking method, which involved marking the lens on the source images of 3D rotational angiography, was used to analyze the eye lens position on the working projections of the procedures. Additionally, an anthropomorphic head phantom was employed to simulate the procedures, and the radiation dose to the lens was estimated based on the entrance surface air kerma measured with photoluminescent glass dosimeters.

Results: The study included 42 patients (mean age, 59 years ± 13 [SD]; 12 men [29%]). The eye lens was included in the field-of-view of the procedure in 48% of cases. All instances of lens exposure occurred in the frontal plane, involving the eye lens ipsilateral to the aneurysm. Among these, in 45% of cases, lens exposure could have been potentially avoided through the application of collimation if the precise location of the eye lens had been determined. Five procedures (with plans to include more by presentation) were simulated using the phantom, and the average estimated lens dose on the frontal plane during the procedure was 4.9 mGy for the ipsilateral lens and 2.7 mGy for the contralateral lens. With the collimation, the both lens doses were expected to decrease to 1.7 mGy and 1.7 mGy, respectively.

Conclusion: These results highlight the importance of employing accurate lens tracking, combined with suitable collimation, to minimize lens dose during neurointerventional procedures.
Expansion of Mechanical Thrombectomy Service for Acute Ischaemic Stroke

Justin Chak Yiu Lam, Wai Tat Victor Chan, Chi Wai Jimmy Siu
Tuen Mun Hospital, Hong Kong SAR

**Introduction:** Meta-analyses have demonstrated the superiority of intra-arterial mechanical thrombectomy (IAT) combined with standard treatment over standard treatment alone for management of acute stroke (defined by onset within 24 hours) due to large vessel occlusion in the anterior circulation. We aim to review the impact of expansion of this service to 24/7 service.

**Method:** Mechanical thrombectomy service from acute ischaemic stroke has been expanded from an extended daytime (08:00-20:00) service to a round the clock (24/7) 365 days’ service in New Territories West Cluster, Hospital Authority since 1/10/2021. Retrospective analysis of all consecutive patients receiving IAT the year immediately before service expansion (1/10/2020-30/9/2020) and the first year after 24/7 service implementation. The timing of procedure for each case were evaluated.

**Results:** During extended daytime service, a total of 62 IATs were performed, with 13 (20.9%) cases performed outside office hour of 09:00-17:00 (i.e. from 08:00-08:59 and from 17:00-20:00). The number of IATs varied from 1 to 12 cases per calendar month (mean: 5.2 cases)

After expansion into round the clock service, a total of 91 IATs were performed, with case distribution as follows:
- During office hour (09:00-17:00) 37 cases (40.7%);
- During extended daytime hours (08:00-20:00) 53 cases (58.2%);
- Beyond extended daytime hours (20:01-07:59) 38 cases (41.8%) of which 18 (19.8%) cases were performed before midnight (20:01-23:59) and 20 (22.0%) cases were performed after midnight (00:00-07:59).

The number of IATs varied from 4 to 12 cases per calendar month (mean: 7.6 cases)

**Conclusion:** Only about 40% of IATs were performed during office hours, whereas more than 40% cases were performed beyond extended daytime hours, half of which performed after midnight. While IAT has been proven to be effective in acute ischaemic stroke management, the number of credentialed interventionists in an institution may affect the sustainability of such service. Careful planning of service expansion in a stepwise approach with adequate training of manpower will be essential.

**Table 1: Summary of cases distribution**

<table>
<thead>
<tr>
<th>No. of IAT cases during &quot;Extended daytime service&quot;</th>
<th>No. of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (N=62)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>During office hour</td>
<td>49</td>
<td>79%</td>
</tr>
<tr>
<td>Outside office hour</td>
<td>13</td>
<td>21%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of IAT cases after &quot;Expansion into round the clock service&quot;</th>
<th>No. of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (N=91)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>During &quot;Extended daytime service&quot;</td>
<td>53</td>
<td>-</td>
</tr>
<tr>
<td>During office hour</td>
<td>37</td>
<td>41%</td>
</tr>
<tr>
<td>Outside office hour</td>
<td>16</td>
<td>18%</td>
</tr>
<tr>
<td>Outside &quot;Extended daytime service&quot;</td>
<td>38</td>
<td>-</td>
</tr>
<tr>
<td>Before midnight</td>
<td>18</td>
<td>20%</td>
</tr>
<tr>
<td>After midnight</td>
<td>20</td>
<td>22%</td>
</tr>
</tbody>
</table>

**Figure 1A:** Illustration of Extended Day Service.

**Figure 1B:** Illustration of 24/7 Service after expansion.
Poster Abstract C138

Meta-Analysis of Clinical Outcomes Following Flow-Diverting Stent Treatment for Compressive Unruptured Large/Giant Intracranial Aneurysms

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Siriraj hospital, Mahidol university, Thailand

Introduction: The main purpose of this study is to evaluate efficacy of flow divider stents in improvement of mass effect from large/giant unruptured intracranial aneurysms and their safety.

Method: In this study we performed literature review on PubMed, SCOPUS, and Google Scholar were reviewed for primary clinical research studies regarding the effects of flow-diverting stent treatments on large/giant intracranial aneurysms causing compressive symptoms to the following criteria: 1) Publication in english 2) Retrospective or prospective study with ≥5 patients 3) Clinical follow up at least 6 months from intervention 4) Exclusion of case report, case series conference presentations, editorials and animal studies. The clinical status was classified into ‘improvement’, ‘stable’ and ‘worsening’. The morbidity and mortality from study was also evaluated. This meta-analysis was calculated with ‘Random-effect model’ using the ‘metafor’ package on cran R platform.

Results: The 7 studies with a total 209 patients were adopted into the analysis. The vertebro-basilar aneurysm was found in 9.5%(20/209) of candidates. The 97%(191/196) compressive effect from ICA aneurysm was neuro-ophthalmopathy. The adjunctive coil packing was found in 24.9%(52/209) of cases. No significant heterogeneity among selected studies was found. The summarized proportions and corresponding 95% confidence intervals (CI) of ‘improvement’, ‘stable’ and ‘worsening’ are 59.33% [52.54; 65.78], 20.61% [13.72; 29.75] and 7.01% [2.94; 15.78]. The morbidity and mortality were found in 11.36% [7.45; 16.96] and 2.62% [0.67; 9.66] of the pooled population.

Conclusion: The meta-analysis showed that the majority of the compression effect can be alleviated with FDS. However, unfavorable outcomes were not rare and can result in stroke, worsening mass effect, or death. These imply careful patient selection for FDS treatment is needed. Additional subgroup analysis of the FDS with adjunct coils and giant aneurysm and the pooled meta-regression for clinical outcome prediction from aneurysm characteristics and adjunctive coils are expected for better case selection.
**Poster Abstract C141**

**Multi-Modality of Arteriovenous Malformations Treatment in Siloam Hospitals, Indonesia**

Harsan Harsan  
Siloam Hospitals / Pelita Harapan Medial School, Indonesia

**Introduction:** Brain arteriovenous malformations (AVMs) are one of the most difficult disease to treat, especially in big size or in difficult locations. As a complicated disease, its management also requires a lot of consideration to determine the appropriate therapeutic method for a particular case.

**Method:** Case series in one hospitals

**Results:** One hundred and five patients had treatment for their AVMs in Siloam Hospitals, in the period of 2012 - 2022. 32 patients (30.5%) underwent surgery, while 73 (69.5%) had Gamma-Knife treatment for their AVMs. Starting form 2018, pre-operative embolization was used to help the surgery. Seven (41%), out of 17 patients had this procedures before the surgery.

**Conclusion:** In cases of brain hemorrhage, AVMs with a size of less than 3 cm and locations on the surface of the brain, surgery is the most preference. In certain cases, this operation is preceded by pre-operative embolization. For cases where the location is “deep” or very large, Gamma-Knife was used.

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**Poster Abstract P102**

**A Comparative Analysis of Patients with Acute Paramedial and Lateral Pontine Infarction**

Sang-Hun Lee, Hyung-Soo Lee, Do-Young Kwon  
Korea University Ansan Hospital, South Korea

**Introduction:** This study aimed to investigate the clinical manifestations, vascular risk factors, and prognosis of patients with pontine infarction, specifically classified into paramedian and lateral locations.

**Method:** Consecutive patients with acute isolated pontine infarction were retrospectively selected for this study. Inclusion criteria comprised admission to the Stroke Center within 7 days of symptom onset and undergoing MRI and MRA within 24 hours of admission, confirming a corresponding infarction in the pons through diffusion-weighted imaging.

**Results:** A total of 865 patients who experienced symptom onset within 7 days and exhibited pontine infarctions on DWI were enrolled. Among them, 292 patients met the aforementioned entry criteria, with 231 patients diagnosed with paramedian pontine infarction and 61 with lateral pontine infarction. There were no significant between-group differences other than TOAST subtype (cardioembolism). There was no statistical difference in clinical symptoms between the two groups, except for ataxia and progression of motor disability. Ataxia was significantly associated with lateral pontine infarction ($p<0.032$), while the rate of progression of motor disability was significantly associated with paramedian pontine infarction ($p<0.041$).

**Conclusion:** This study provides insight into the relationship between anatomical lesion locations within the pons and their corresponding clinical manifestations. Ataxia was significantly associated with lateral pontine infarction, while the rate of progression of motor disability was significantly associated with paramedian pontine infarction.
Endovascular Treatment for Ruptured Intracranial Aneurysm With Intracerebral Hematoma: Clinical Propriety of Less Invasive treatment

Takeshi Hara
Hiroshima University, Japan

Introduction: Intracerebral hemorrhage (ICH) caused by ruptured intracranial aneurysms (rIA) has been widely recognized as a poor prognostic factor for subarachnoid hemorrhage (SAH). Therefore, it can be challenging to perform endovascular treatment for rIA when ICH has developed with SAH because intraoperative anticoagulation may enlarge the ICH during the endovascular procedure. This retrospective study aims to compare the outcomes of SAH between with or without ICH treated by endovascular procedures.

Method: We reviewed 62 subjects who underwent endovascular treatment for rIA between January 2015 to April 2023. Subjects were divided into two groups: those suffering from SAH with ICH (group H, n=13), and those without ICH (group N, n=49). Patient demographics, aneurysm characteristics, WFNS grade, the incidence of symptomatic vasospasm and hydrocephalus, and modified Rankin Scale (mRS) at discharge were collected with the presence of ICH, and the outcomes after endovascular treatment for rIA were compared between the two groups.

Results: No case was required a removal of ICH after endovascular treatment for rIA. There were no significant differences in age (67.2±11.3 vs 61.6±15.7 years), gender (30.8% vs 22.5% male), maximum aneurysm size (5.7±1.9 vs 6.4±4.9 mm), WFNS grade (WFNS ≥ 4; 76.9% vs 61.2%, p=0.29), the incidence of symptomatic vasospasm (15.4% vs 18.4%, p=0.80) and hydrocephalus (5.9% vs 6.0%, p=0.99) between the two groups. In addition, the presence of ICH was not significantly associated with the poor outcomes at discharge (mRS ≥ 3; 76.9% vs 51.0%, p=0.09). Furthermore, the ICH volume was not significantly correlated with the poor outcome in group N.

Conclusion: The presence of ICH did not adversely affect outcomes after endovascular treatment for rIA. Endovascular procedure can be a first-line treatment for rIA under the condition of ICH that did not have massive mass effect.
Creation of Cerebral Aneurysm Model in Rats

Kyubong Lee
Asan medical center, South Korea

**Introduction:** There are many methods to create rat aneurysm model, such as common carotid artery and renal artery ligation, and using elastase and BAPN(β-Aminopropionitrile). The purpose of this study is to create a cerebral aneurysm model in rats using different methods and compare the methods.

**Method:** After accessing the Left Common Carotid Artery (LCCA) and Right Renal Artery (RRA), the vessels were ligated using 3-0 black silk. For this experiment, the animals were divided into four groups: Control group (n=3), surgery with high-salt diet group (n=13), surgery with normal diet group and elastase (n=13), and surgery with high salt diet and BAPN(β-Aminopropionitrile) group (n=12). 7 Tesla MRI was used to obtain cerebral angiography of the mice. We did serial follow up of cerebral angiography using MRI.

**Results:** The procedure times were 1 hour in the experimental group and 40 minutes in the control group. During a total of 20 weeks of follow-up, out of a total of 38 rats, 21 survived, and among them, 12 developed cerebral artery aneurysm. All the rats with aneurysm size of width of 0.77mm ± 0.02mm, and height of 0.80mm ± 0.03mm. Approximately one-third of each group died due to brain hemorrhage and infarction after surgery, except for the BAPN group, where around two-thirds of the animals died.

**Conclusion:** By using artery ligation, high salt diet and elastase, we could make an aneurysm in a more effective and safe manner in the creation of cerebral aneurysm model in rats.

**Table 1. Patients with perioperative thromboembolic complication**

<table>
<thead>
<tr>
<th>No</th>
<th>Age / Sex</th>
<th>Aneurysm site</th>
<th>Aneurysm size (W x H)</th>
<th>Fisher grade</th>
<th>Type</th>
<th>Timing</th>
<th>Rescue / Recanalization</th>
<th>Neurological deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>68/M</td>
<td>ACoA</td>
<td>3.2 x 2.7</td>
<td>3</td>
<td>Mechanical obstruction</td>
<td>Intra-operation</td>
<td>IA Tirofiban / mTICI 3</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>31/F</td>
<td>MCA bifurcation</td>
<td>11 x 9</td>
<td>Unruptured</td>
<td>Mechanical obstruction</td>
<td>Intra-operation</td>
<td>IA Tirofiban / mTICI 3</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>62/M</td>
<td>BA tip</td>
<td>5.4 x 5.6</td>
<td>Unruptured</td>
<td>Thromboembolic of distal artery</td>
<td>Intra-operation</td>
<td>IA Tirofiban / mTICI 3</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>80/F</td>
<td>ICA</td>
<td>7.4 x 10.3</td>
<td>Unruptured</td>
<td>Stent induced thrombus</td>
<td>Intra-operation</td>
<td>IA Tirofiban / mTICI 3</td>
<td>None</td>
</tr>
<tr>
<td>5</td>
<td>43/F</td>
<td>ACoA</td>
<td>2.9 x 3.8</td>
<td>3</td>
<td>Thromboembolic of distal artery</td>
<td>Intra-operation</td>
<td>IA Tirofiban / mTICI 3</td>
<td>None</td>
</tr>
<tr>
<td>6</td>
<td>59/F</td>
<td>BA tip</td>
<td>5.5 x 2.8</td>
<td>Unruptured</td>
<td>Thromboembolic of distal artery</td>
<td>Post-operation</td>
<td>Thrombectomy, IA + IV Tirofiban / mTICI 2b</td>
<td>Visual deficit infarction</td>
</tr>
</tbody>
</table>


**Figure.** Presentation of case 1. An 62-year-old man with diffuse SAH (A)CT volume rendering shows an saccular aneurysm (arrow) at anterior communicating artery. (B) Angiogram shows stent-assisted coiling was performed. (C)(D) During coil embolization, thromboembolic clot occlude ipsilateral anterior cerebral artery (A2). With intra-arterial Tirofiban infusion (1 mg), achieved successfully recanalized.
Endovascular Therapy for Wide-Necked Bifurcation Aneurysms Using Intrasaccular Flow Disruptor

Hidenori Oishi, Kosuke Teranishi, Takayuki Kitamura, Yumiko Mishima
Juntendo University, Japan

Introduction: Coil embolization for wide-necked bifurcation aneurysms remains technically challenging. Recently, the Woven EndoBridge (W-EB) device, developed by Sequent Medical in Aliso Viejo, California, has been introduced in Japan as a potential solution for treating wide-necked bifurcation aneurysms, which are characterized by a neck length of ≥4 mm or a dome-to-neck ratio (D/N) <2.

Method: In this retrospective study, we reviewed the anatomical outcomes of endovascular aneurysm embolization using the W-EB device at our institution from December 2020 until the time of abstract submission. The aneurysms were categorized into two groups based on the D/N ratio: Group A (D/N ≥ 1.5) and Group B (D/N <1.5). A total of 56 cases involving 59 aneurysms (4 ruptured, 55 unruptured) were included in this study. Among them, an angiographic follow-up evaluation was performed at 6 months for 33 aneurysms.

Results: Overall, complete occlusion was achieved in 51.5%, a neck remnant in 15.2%, and incomplete occlusion in 33.3%. Group A demonstrated favorable anatomical outcomes, with a complete occlusion rate of 75.0%, a neck remnant 12.5%, and an incomplete occlusion 12.5%. In contrast, Group B showed unfavorable anatomical results, with a complete occlusion rate of 29.4%, a neck remnant 17.6%, and an incomplete occlusion 52.9%.

Conclusion: Although the W-EB device is specifically designed as an innovative embolization device for wide-necked bifurcation aneurysms, it may not be suitable for treating all wide-necked bifurcation aneurysms, particularly those with a D/N ratio <1.5. Therefore, further investigation is necessary to determine the appropriate treatment modality for such cases.

Stent Assist Coil Embolization of Intracranial Aneurysm with Parental Vessel Diameter of 2 mm or Less

Shunsaku Goto, Takashi Izumi, Masahiro Nishihori, Ryuta Saito
Nagoya University Hospital, Japan

Introduction: Although new devices such as flow-diverting stents and WEBs have become popular in recent years, stent assisted coil embolization (SACE) is still essential for the treatment of cerebral aneurysms. Stent is indicated only for parent vessel larger than 2 mm in diameter, but they are often implanted in vessels smaller than 2 mm, and treatment results have not been reported. We reviewed SACE at our institution and examined the safety of SACE for cerebral aneurysms with small diameter vessels.

Method: We included 308 consecutive patients who underwent SACE from 2010 to 2022. Patient information, intraoperative thrombus, perioperative ischemic complications, and delayed ischemic complications were collected, and complication rates were compared in two groups: patients with a parent vessel smaller than 2 mm (small diameter group, group S) and patients larger than 2 mm (normal diameter group, group N).

Results: There were 93 patients in the group S and 215 patients in the group N, with a mean age of 61.3 years and a median follow-up of 41.5 months. Median parent vessel diameter was 1.8 mm (1.3-2.0 mm) and 3.2 mm (2.0-5.2 mm) in the group S and N, respectively. Intraoperative stent thrombus occurred in 6 patients (6.5%) in the group S, of which 4 (4.3%) were asymptomatic and 2 (2.2%) were transiently symptomatic. In the group N, 5 patients (2.3%), of whom 4 (1.9%) were asymptomatic and 1 (0.5%) had a decreased mRS. Perioperative symptomatic ischemic complications were 6 (6.5%) in the group S, of which 3 (3.2%) had a decreased mRS, and 22 (10.2%) in the group N, of which 7 (3.3%) had a decreased mRS. Delayed ischemic complications occurred in 4 (4.3%) and 5 (2.3%) patients in the group S and N, respectively.

Conclusion: SACE for unruptured cerebral aneurysms with a parent vessel smaller than 2 mm can be performed safely without increasing symptomatic ischemic complications. However, intraoperative thrombus occurred slightly more frequently than in the normal-diameter group, suggesting the importance of measures to avoid intraoperative thrombus and to deal with it when it occurs.
**Poster Abstract P115**

**A Novel Training Method for Endovascular Clot Retrieval Using A Portable Vascular Model and Red Film**

Tomotaka Oshima  
Aichi Medical University, Japan

**Introduction:** Hands-on training is a crucial part of education in neuroendovascular treatment to ensure safe and rapid acquisition of techniques. However, there is a significant gap between training and actual clinical practice.

**Method:** The Smart Vascular Model 3 in 1 (Nihon Light Service Inc.) was used. A pink pseudothrombus was inserted into the M1 (horizontal segment of the middle cerebral artery) section of the model. Then, a “red underlay” purchased at a stationery store was placed to cover the proximal part of M1 and beyond so that the pseudothrombus was not visible.

**Results:** The thrombus was retrieved during training by looking for the location of the thrombus based on the behavior and resistance of the tip of the guidewire and deployment of the stent retriever. The participants were required to have detailed observation skills and precise manipulation skills using a red film to prevent the direct visualization of the pseudothrombus.

**Conclusion:** The implementation of this innovation to the previous hands-on training made the training more practical and effective. If the exact thrombus location can be determined by the behavior of the wire tip, the device’s capabilities can be maximized, and rapid retrieval can be expected. It would also reduce complications because unnecessary peripheral guidance of the device could be avoided.

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**Poster Abstract P116**

**Illness Perception, Social Support, and Self-care of Unruptured Intracranial Aneurysms Patients**

Hae-Na Woo¹, Sun-Hyoung Bae², Yong-Cheol Lim³, JinWook Choi⁴, JooHee Lee¹  
¹Ajou University Hospital, College of Nursing, Ajou University, South Korea, ²College of Nursing, Ajou University, South Korea, ³Ajou University Hospital, South Korea, ⁴Ajou University school of medicine, South Korea

**Introduction:** Self-care is an important factor in the decision making for quality life of unruptured intracranial aneurysms (UIAs). Data on patients’ self-care after treatment still need to be supplemented with evidence. We have evaluated identify the significant predictors (among illness perception and perceived social support) of self-care in patients after endovascular or surgical treatment of incidental intracranial aneurysm.

**Method:** We recruited UIAs patients (N=150) who visited the neurosurgery outpatient. All participants voluntarily responded to our anonymous study and filled in four questionnaires assessing self-care, illness perception, and perceived social support. We performed a multivariate analysis of variance on self-care and hierarchical regression analyses to determine the respective importance of risk and protective factors of self-care.

**Results:** Among 150 UIAs patients, 85 (56.7%) of patients underwent coiling, 18 (12.0%) of patients underwent clipping, and 3 (2.0%) of patients underwent coiling and clipping. The average scores of self-care was 57.37±7.73 (out of 75). The self-care scores of clipping group was higher than self-care scores of coiling group, but it was not statistically significant. Hierarchical multiple regression analysis showed that family support and medical staff support (as subscales of perceived social support), illness perception, current smoking status, and current drinking status explained 12.2% of variance in self-care; the model predicted approximately 34.6% of the variance in patient safety competence (F=10.73, p<.001).

**Conclusion:** The findings of this study suggest that illness perception, family support, medical staff support, current smoking status, and current drinking status affect self-care performance in patients with UIAs. Thus, it would be important to consider these factors when developing intervention programs to increase self-care performance in patients diagnosed with unruptured intracranial aneurysms.
Flow Diverter Therapy for Internal Carotid Artery Aneurysm at the Ophthalmic Artery Bifurcation

Kohsuke Teranishi, Takayuki Kitamura, Yumiko Mishima, Hidenori Oishi
Department of Neurosurgery, Juntendo University School of Medicine, Tokyo, Japan

**Introduction:** Treatment with a flow diverter for unruptured cerebral aneurysms is considered an effective and safe therapeutic approach. However, aneurysms with branching vessels can become one of the factors contributing to incomplete occlusion after treatment. In this study, we retrospectively investigated the occlusion status and blood flow in the ophthalmic artery branch after flow diverter treatment for aneurysms located at the ophthalmic artery bifurcation.

**Method:** We extracted data from 26 cases of aneurysms located at the ophthalmic artery bifurcation out of a total of 199 cases of unruptured paraclinoid internal carotid artery aneurysms treated with endovascular therapy at our institution from 2015 to 2022.

**Results:** The mean age was 58 years (±11.1), and 92.3% were female. The mean maximum diameter of the aneurysms was 9.8mm±4.5 (range: 5.2-21.2), and the neck diameter was 5.3mm±2.3 (range: 2.3-14.3). Coil-assisted treatment was used in 12 cases (46%), and there were no ischemic or hemorrhagic complications. The final occlusion status (assessed using the O’kelly-Marotta grading scale) was D24, C1, B1, and in 5 cases (19%), blood flow loss or reduction in the ophthalmic artery was observed, with confirmation of collateral circulation from the external carotid artery.

**Conclusion:** While using coils in the aneurysm may be chosen to achieve early thrombosis, the risk of ophthalmic artery occlusion should be taken into consideration. Additionally, the relationship between the apposition of the stent to the parent vessel and the location of the ophthalmic artery bifurcation is also crucial.

Treatment Strategy of Transvenous Embolization for Cavernous Sinus Dural Arteriovenous Fistulas: Targeted Embolization vs Sinus Packing

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**Introduction:** For transvenous embolization (TVE) of cavernous sinus dural arteriovenous fistulas (CSDAVF), we believe that targeted embolization (TE) of the fistulous compartment only is ideal because sinus packing (SP) may carry the risk of cranial nerve deficit due to coil overpacking.

**Method:** We reviewed 27 patients with CSDAVF treated with TVE at our hospital from July 2006 to April 2023, and evaluated treatment strategies. Patient demographics, angioarchitecture, clinical and angiographic outcomes were analyzed between the two groups: TE group treated primarily with TE and SP group treated with SP.

**Results:** Twenty-two patients were female, with a median age of 74 years (38-94). Twenty-five patients presented with ocular symptoms including diplopia and 3 with intracranial hemorrhage (1 with both diplopia and hemorrhage). Seven of 8 patients with preoperatively identified localized fistulas and 4 of 10 patients with multiple fistulas were able to be treated with TE. Overall, 11 patients were in the TE group and 16 in the SP group. There were significantly more cases with inferior petrosal sinus occlusion in the TE group (8 of 11 vs 4 of 16, p=0.019). Postoperative abducens nerve palsy newly appeared in 3 patients in the SP group. Symptoms eventually resolved in 22 patients and improved in 2, while 3 patients in the SP group remained unchanged, although there were no significant differences between 2 groups. The TE group had a significantly higher rate of complete occlusion at 1 month than the SP group (9 of 11 vs 6 of 16, p=0.028).

**Conclusion:** Compared to the SP group, the TE group had a significantly higher rate of early complete occlusion of the fistula, and although there was no significant difference, postoperative deterioration of symptoms occurred only in the SP group and not in the TE group. The results of this study suggest the advantage for aiming TE and the importance of detailed evaluation of the fistula.
Outcomes of Endovascular Treatment for Unruptured Posterior Circulation Aneurysms and Treatment Strategies with Flow Diverters

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Introduction: In general, many posterior circulation aneurysms (PCAs) have been treated by the endovascular surgery, taking into account difficulties of the open surgical approach. Recent advancement in devices have further expanded the options for neurointervention. We reviewed our results of intervention for unruptured PCAs in the past decade and discuss their strategies.

Method: We searched our prospectively maintained database for patients who underwent intervention for unruptured PCAs between January 2013 and April 2023, and retrospectively reviewed. Furthermore, some cases treated with flow diverters (FDs) were examined in detail.

Results: Fifty-seven lesions were included in this study. All lesions were successfully treated except for one lesion that ruptured during the procedure. Fifteen lesions required multiple treatments during the study period. The maximum aneurysmal diameter in the multiple-treatment group was significantly larger than that in the single-treatment group (11.22 vs 6.57 mm, p= 0.034). There were 7 (9.9%) ischemic and 2 (2.8%) hemorrhagic procedural complications, and 3 (4.2%) worsened by 2 or more points on modified Rankin scale at 90 days after the procedure. After the introduction of FDs, 7 of 31 lesions were treated with FDs. These lesions were located in the vertebro-basilar junction or V4 portion of the vertebral artery, including 4 large or giant, 5 fusiform, and 2 partially thrombosed aneurysms. Three of these lesions were treated with FDs alone, and 4 were with FDs and adjunctive strategies; coiling in 2 and unilateral vertebral artery occlusion in 2. Four of the 7 lesions needed multiple treatments.

Conclusion: Almost all of procedures were successfully completed. While the introduction of FDs is an advantage in terms of increasing options for cases that have been difficult to treat with conventional intervention, case selection, adjunctive procedures, and timing of their use should be carefully considered case by case.

Endovascular Therapy for Common Carotid Arterial Injury with Distal Embolization, Combination of Carotid Arterial Stenting and Mechanical Thrombectomy: A Case Report

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Introduction: Cerebrovascular injury is rare but difficult to be treated. There is no standard strategy for it, but endovascular therapy is thought to be beneficial.

Method: We experienced a patient who got carotid arterial injury and treat him by endovascular procedures. We would like to share this experience and consider its foresight.

Results: 41-year-old man got injured when he used a washing machine. He was strangled on his neck. When he was rescued from the scene, we could see avulsion and congestion on his neck and face. He showed disturbance of consciousness, restlessness, therefore we couldn’t perform correct neurological examinations. We carried out radiographic examinations under sedation and revealed his right common carotid arterial (CCA) injury and middle cerebral arterial (MCA) occlusion. Soon after diagnosis, we achieved CCA restoration by carotid arterial stenting. Then we completed mechanical thrombectomy for MCA occlusion. We have removed large arterial intimal flap and thrombus from occluded lesion. Though partial right hemispheric infarction was progressed, he recovered his consciousness and didn’t experience left hemiparesis.

Conclusion: Cerebrovascular injuries cause ischemic stroke and this occur at the onset of injury in 37 to 44%. It was thought that the prevention of secondary stroke is important but avoidance of onset stroke is difficult. Recent years, mechanical thrombectomy is widely spread in the world. Immediate reconstruction of injured artery and recanalization with mechanical thrombectomy potentially rescue these patients.
Poster Abstract P121

Long-Term Outcome of Staged Carotid Artery Angioplasty and Stenting in Patients with Symptomatic Near Occlusion of the Internal Carotid Artery

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**Introduction:** Near occlusion of the internal carotid artery (NOICA) is defined as a very tight atherosclerotic stenosis in the ICA with slow flow and luminal collapse of the distal ICA beyond the stenosis.

**Method:** We analyzed patients with acute ischemic stroke and symptomatic NOICA from January 2013 to December 2020. Patients treated with CAS for symptomatic NOICA were included. The CAS procedure was divided into one- and two-stage CAS. Clinical and angiographic outcomes were compared between the one- and two-stage CAS groups. Factors associated with carotid restenosis were also investigated.

**Results:** Of the 106 patients who underwent CAS for symptomatic NOICA, 67 and 39 underwent one-stage and two-stage CAS, respectively. The likelihood of a poor functional outcome at two years was lower in the two-stage CAS group (odds ratio [OR] 0.443; 95% confidence interval [CI] -1.542 to 0.084, p = 0.029). Patients treated with one-stage CAS had higher rate of severe restenosis (≥70%) at one year after the procedure (11.9% vs 0%, p = 0.025). History of hyperlipidemia (OR 8.340; 95% CI 1.720–40.433, p=0.008) and presence of ulcer (OR 6.636; 95% CI 1.136–38.750, p = 0.036) were independently associated with severe carotid restenosis at two years after the procedure.

**Conclusion:** The two-stage CAS for symptomatic NOICA shows favorable clinical outcomes and decreased restenosis rate compared with one-stage CAS. The two-stage CAS is a feasible and safe procedure for symptomatic NOICA.

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Poster Abstract P122

Variant Thromboembolic Complications in Stent Assisted Coiling Embolization for Intracerebral Aneurysm and the Rescue Management

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**Introduction:** Perioperative thromboembolic complications might encountered during stent-assisted coiling (SAC), but seldom been reported. We aim to investigate the incidence of thromboembolic event, divide them into different types, and describe the preliminary efficacy and safety of rescue treatment.

**Method:** From January 2018 to June 2023, we performed stent-assisted coiling for 105 patients in our institute, of which patients with perioperativel thromboembolic events were retrospectively reviewed to extract baseline characteristics, procedural details, angiographic, and clinical outcomes. Further, the variant types of thromboembolic complications were classified into the following three categories: mechanical obstruction, distal thromboembolic, and stent-induced thrombus. Rescue treatment including intra-arterial tirofiban administration or emergent thrombectomy were separately assessed with mTICI score for the recanalization of the culprit vessel. Hemorrhage, ischemic stroke and perioperative death were also recorded.

**Results:** Perioperative thromboembolic events developed in 6 (5.7%) patients in our institute. Among the patients, 2 had a mechanical obstruction and were both bifurcation aneurysm, 1 had stent-induced thrombus, and 3 had distal thromboembolic occlusion. In the cases of mechanical obstruction and stent-induced thrombus, all were found during procedure and achieved good results following the use of tirofiban(1mg). In the cases of distal thromboembolic occlusion most achieved recanalization after immediate tirofiban infusion during procedure, except one patient launched emergent thrombectomy with intra-arterial tirofiban use, and followed intravenous tirofiban with overlapping antiplatelet regimen, with succeeding infarction still developed. Among all 6 patients, none has lobar hemorrhage nor perioperative death.

**Conclusion:** Thromboembolism is a well-known complication and could be categorized into mechanical obstruction, thromboemboli in distal artery and stent-induced thrombus. Tirofiban infusion seems to be efficacious and safe rescue without increasing the rate of hemorrhagic complications and death.
Selection of M2 Branch in Acute Middle Cerebral Artery Occlusion Thrombectomy: Superior or Inferior Branch?

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Introduction: It is known that the M2 inferior branch is usually larger than the superior branch in MCA occlusion, so it can be assumed that the successful recanalization rate will be higher if the inferior branch is selected for mechanical thrombectomy.

Method: Patients who underwent thrombectomy for MCA occlusion from January 2017 to December 2022 were retrospectively recruited. Only MCA M1 occlusion was enrolled, and M2 isolated occlusion was excluded. A Direct Aspiration First Pass Technique (ADAPT) was excluded to see the effect on MCA selection. Patients who underwent thrombectomy with stent retriever alone or combined technique with aspiration after microcatheter selection of M2 superior or inferior branch were analyzed. Successful recanalization was defined as modified TICI 2b or 3 grade.

Results: Of 74 patients with MCA occlusion, 55 patients were enrolled, excluding 19 who underwent ADAPT. Mean age was 68.5 years and mean NIHSS was 15.1. At the time of MCA occlusion thrombectomy, successful recanalization was found to be 36.2% in the group initially treated with superior branch selection and 51.1% in the group treated with inferior branch selection, but no statistical significance was found. When successful recanalization was achieved after multiple attempts, the successful recanalization rate was higher when the inferior branch was initially selected than the superior branch (31.9% vs 61.7%, respectively), and the successful recanalization rate was 12.8% when the M2 branch selection was switched mid-procedure. There were more patients in the inferior branch selection group during the first pass recanalization (62.5%), but no statistical significance was found.

Conclusion: In MCA occlusion, there was no difference in successful recanalization and fist pass effect when comparing stent retriever with superior or inferior branch selection. Larger studies with more patients are needed in the future.
Poster Abstract P124

**A Long Term Outcome Analysis in Large to Giant Aneurysms: A Single Centre Retrospective Study**

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**Introduction:** Large (>1cm) and giant aneurysm are associated with higher risk of rupture, peri-operative morbidity and mortality. Treatment options include clipping, coiling and flow diverters. This study aims at reviewing long term outcomes of these three modalities.

**Method:** This is a retrospective review of patients with large aneurysm in undergoing clipping, coiling, flow diverters or combination of them from 2010 to 2019. Information regarding patients' demographic, radiological features like location of aneurysm, clinical presentation, clinical outcomes are collected. Clinical outcomes in terms of modified Rankin Scale (mRS), aneurysm obliteration rate, re-operative rate, recanalization rate, re-rupture rate, 3 year survival rate are collected.

**Results:** There were 81 cases of large and giant aneurysms from 2010-2019. 31% of cases underwent clipping while 69% of cases underwent endovascular treatments. In patients undergoing clipping, both recanalization and reoperation rate are 12%. 32% patients achieve good long term functional outcomes (3-year post-operation mRS 0-3). 3-year survival rate post-treatment is 64%. In patients receiving endovascular treatment, recanalization rate is 39% and reoperative rate is 25%. 71% patients achieve good long term functional outcomes (3-year post-operation mRS 0-3). 3-year survival rate post-treatment is 86%. In endovascular group, use of flow diverter in addition to coiling alone can reduce recurrence and reoperation. Both surgical clipping and endovascular interventions show similar results in preventing recurrence and reoperation.

**Conclusion:** Endovascular intervention and surgical clipping have different benefits and drawbacks in managing large and giant aneurysms.

Poster Abstract P125

**Endovascular Treatment in Pre-Communicating (P1) Segment Aneurysms of Posterior Cerebral Artery**

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**Introduction:** Pre-communicating (P1) segment aneurysms of the posterior cerebral artery (PCA) are rare, with few studies reported to date. Herein, we address the clinical and radiologic outcomes of their endovascular treatment.

**Method:** For this study, we retrieved prospectively collected data on 35 consecutive patients with 37 P1 aneurysms, analyzing the clinical ramifications and morphologic outcomes of treatment. All subjects received endovascular interventions between January 2001 and October 2021.

**Results:** There were 16 aneurysms (43.2%) of P1 segment sidewalls and 21 (56.8%) at P1/posterior communicating artery (PCoA) junctions. Five (13.5%) were fusiform, and 14 (37.8%) were ruptured. In 14 patients (40%), 16 aneurysms (43%) were associated with intracranial arterial occlusive disease of the anterior circulation. Selective coiling was undertaken in 34 aneurysms (91.9%), using single (n=24) or double (n=4) microcatheters, microcatheter protection (n=2), or stents (n=4); and trapping was done in 3 (8.1%). No procedure-related morbidity or mortality resulted. Excluding the trapped lesions, angiographic follow-up of 29 aneurysms obtained >6 months after embolization (mean, 12.4 month) revealed stable occlusion in 21 (72.4%), with some recanalization in the other 8 (minor: 3/29, 10.4%; major: 5/29, 17.2%).

**Conclusion:** Aneurysms of P1 segment (vs other locations) are strongly associated with intracranial arterial occlusive disease of the anterior circulation and thus are likely flow related. Endovascular treatment of such lesions seems safe and efficacious, despite the array of technical strategies that their distinctive anatomic configurations impose.
Eagle Jugular Syndrome That May Cause Subarachnoid Hemorrhage, Intracerebral Hemorrhage, or Dural Sinus Thrombosis: Two Cases Presentation and Review

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Introduction: The styloid process may cause compression to the internal jugular vein (IJV) in the upper neck and spontaneous SAH, ICH, or dural sinus thrombosis. This has been called “Eagle jugular syndrome” since 2019. However, this syndrome often is ignored. I would like to do a review of the Eagle jugular syndrome (EJS) with presentation of two cases.

Method: Last year I encountered a case of EJS. A young male aged 20 complained of frequent dizziness and distension sensation in right ear for one year. Brain MRI showed hyperintensity in right IJV on T2-weighted images (Fig A, B). Post-contrast CT showed tight stenosis at C1 level, compatible with EJS (Fig C; Arrows: blue – IJV, red – C1 transverse process). I searched related published reports in various journals. This year, I encountered a male patient aged 70 with severe headache, nausea, and vomiting caused by SAH. No other cause of SAH was found on CT angiogram of brain. Different to previous angiogram for patient with SAH, we took angiograms from arterial to a late venous phase and found near occlusion in left IJV at upper neck. A post-contrast CT of neck confirmed a tight stenosis of left IJV at C1 level, being compressed between C1 transverse process and left styloid process, compatible with EJS.

Results: Because the 1st patient did not have critical symptom, he decided to take medical treatment and follow up. The second patient received styloidectomy. After the surgical treatment, the distension discomfort in his left head disappeared. A post-contrast CT after surgical treatment showed the left UV regained patency with no tight stenosis.

Conclusion: Understanding the possible complications of EJS is the key factor to make correct diagnosis and treatment for better prognosis after SAH.
Clinical Manifestations of Acute Brainstem Infarction according to the Rostrocaudal Axis

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Introduction: Clinical studies on brainstem infarction have been numerous, but there is a lack of research focusing on clinical symptoms along the rostrocaudal axis. To address this gap, we conducted an investigation on the clinical symptoms of acute brainstem infarction categorized by the rostrocaudal axis.

Method: Ischemic lesions were divided into three groups based on the rostrocaudal axis. The upper pons exhibited a relatively round shape with small and round-shaped aqueduct (n=111). The mid pons featured a square-shaped fourth ventricle, large middle cerebellar peduncles, and silhouettes of trigeminal nerves (n=105). The lower pons displayed a shape similar to the mid pons, but with images of the facial/acoustic nerves and grooves instead of trigeminal nerves (n=76).

Results: Motor disability was observed in 73% of the upper paramedian infarction group, 76.5% of the mid paramedian infarction group, and 91.2% of the lower paramedian infarction group. The incidence of motor disability was significantly higher in the lower paramedian infarction group compared to the upper and mid paramedian infarction groups (p = 0.026). Ataxia was observed in 68.2% of the upper lateral infarction group, 80% of the mid lateral infarction group, and 42.1% of the lower lateral infarction group. A noticeable trend of increasing incidence of motor disability was observed along the rostrocaudal axis. Additionally, the incidence of ataxia was significantly higher in the mid lateral infarction group compared to the upper and lower groups (p=0.042).

Conclusion: Our current analysis revealed significant associations between clinical symptoms, particularly ataxia and motor progression, and the axial location of the lesion. The incidence of motor disability was notably higher in the lower pontine infarction group, while the incidence of ataxia was significantly higher in the mid pontine infarction group.

Transvenous Embolisation of Dural Arteriovenous Fistula of The Hypoglossal Canal Causing Pulsatile Tinnitus.

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Introduction: Dural arteriovenous fistula (DAVF) in the region of hypoglossal canal at the skull base is a rare entity with complex angio-architectural phenotypes.

Method: We present a case of a middle-aged lady with debilitating pulsatile tinnitus and intermittent hypoglossal nerve paralysis secondary to DAVF of the hypoglossal canal. Through case discussion and literature review we describe the anatomical considerations involved in treating these lesions. We also highlight the clinical and radiological findings as well as therapeutic considerations for these lesions.

Results: The patient underwent successful transvenous embolisation of the fistula with subsequent resolution of the fistula and symptoms.

Conclusion: Transvenous embolisation represents a safe and effective treatment modality for dural arteriovenous fistula involving the hypoglossal canal.
Poster Abstract C129

Radical Embolization with Liquid Embolic Materials for Subtentorial Dural Arteriovenous Fistula: Experience of 81 cases

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Introduction: Dural arteriovenous fistula (DAVF) in subtentorial region shows various clinical manifestation. Particularly serious neurological symptoms associated with bleeding and parenchymal venous congestion are occasionally encountered in cases with much impairment of venous drainage. We reviewed angiographic and clinical states in our cases with subtentorial DAVF.

Method: Clinical materials are 81 patients including 59 males with subtentorial DAVF treated in Alfried Krupp hospital(Essen, Germany) and satellite hospitals. Clinical profile, angioarchitecture, clinical and angiographic results, clinical outcome were studied.

Results: The location of DAVF was falco-tentorial region in 16, foramen magnum in 9, tentorium below straight sinus in 30, tentorium at petrous bone in 26 cases, respectively. As for the clinical symptoms intracranial hemorrhage in 15 including 7 SAH, spinal dysfunction in 4, compression of brain stem in 1 and no neurological deficits in remaining 61 patients. Sixty-nine patients were treated with transarterial embolization, and 12 were embolized under transvenous approach. In all cases liquid embolic materials (NBCA, Onyx, PHIL and Squid) were used. Sixty-eight lesions were cured in one session. Complete occlusion of the shunt was obtained in all cases. Minor ischemic complications were seen in 4 cases.

Conclusion: Subtentorial DAVF often has complicated angioarchitecture and drainage pattern. It is important for successful occlusion to recognize the detailed shunt structure and to perform the proper embolization strategy with adequate liquid materials.

Poster Abstract C142

Clinical and Anatomical Characteristics of Non-Sinus-Type Parasagittal Dural Arteriovenous Fistulas.

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Introduction: Parasagittal dural arteriovenous fistulas (DAVFs), shunt flow is directly reflux to the cortical vein without sinus interruption. Although, the shunt point is on the falx cerebri, the venous structure anatomy of the falx cerebri is not well understood. We examined on the anatomical characteristic of parasagittal DAVFs and falx cerebri using cadaveric specimens.

Method: Between April 2009 and March 2019, we experienced 6 cases with parasagittal DAVFs. In 7 cadaver heads, we examined the entire falx cerebri length and the cortical veins flowing into it were noted. We compared features of parasagittal DAVFs with cadaveric findings.

Results: In all 6 cases, only the cortical vein was the draining vein ipsilateral to the shunt point. Intracerebral hemorrhage occurred in 2 cases (33.3%). Five cases were treated as follows: Transarterial embolization 1 case, direct surgical abrasion 2 cases, combined transarterial embolization with direct surgical abrasion 2 cases. In the cadaveric study, 7 side (50%) venous structures directly flowed into the falx cerebri and 5 side (35.7%) were located in the parasinus portion. The veins directly flowing into the falx ran through the dura propria on each side.

Conclusion: Many of parasagittal DAVFs presented aggressive clinical symptoms. Based on the anatomical features, shunt point of parasagittal DAVFs were attached to the depth of the falx cerebri. These findings were similar to those of tentorial DAVFs.
Combined Endovascular Antegrade and Direct Retrograde Carotid Artery Stenting for Chronic and Long Segment Common Carotid Artery Occlusion

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Introduction: Common carotid artery occlusion (CCAO) is a rare cause of ischemic stroke and bypass surgery is the common treatment approach. However, safer alternatives should be developed to treat CCAO.

Method: First, after a short sheath was inserted into the common carotid artery (CCA), the occluded CCA was retrogradely penetrated. Second, a micro-guide wire was guided to the aorta from the femoral sheath where it was caught using a snare-wire guided from the cervical sheath. Subsequently, the micro-guide wire was gently pulled out from the cervical sheath, penetrated the occluded lesion, and was secured to the femoral and cervical sheaths. Finally, the occluded lesion was dilated using a balloon and the stent was placed.

Results: A 68-year-old male was diagnosed with left-sided CCAO with decreased left visual acuity due to neck radiation therapy for laryngeal cancer. Recanalization therapy using a pull-through technique was initiated because cerebral blood flow progressively decreased during follow-up. The patient was discharged uneventfully five days post-procedure and exhibited improved left visual acuity.

Conclusion: Combined endovascular antegrade and direct retrograde carotid artery stenting is a versatile and minimally invasive treatment option for CCAO in terms of reliable penetration of obstructive lesions and reduction of embolic and hemorrhagic complications.
Transcranial Puncture through Parietal Foramen for The Treatment of Dural Fistula

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Introduction: Dural arteriovenous fistulas are cured by transarterial or transvenous to occlude the origin of the primary vein. However access to the shunts may not be possible via endovascular navigation in case of too tortuous vessels. We introduce a case of DAVF cured by transcranial puncture from a parietal foramen.

Method: Patient was 59-year-old man. The fistula was located at the occipital dura close to the superior sagittal sinus. The bilateral occipital artery (OA) and right superficial temporal artery (STA) went through a parietal foramen and supplied to the main meningeal artery. The DAVF drained into the superficial middle sylvian vein and vein of Labbe via a single internal occipital vein that harbored an aneurysm. There was no possible endovascular access via the middle meningeal arteries or via the tortuous OA and STA. Retrograde navigation in the vein did not seem achievable also that endovascular catheterization was not attempted. The cranial X ray and CT images demonstrated the precise location of the parietal foramen contained feeding artery.

Results: Transcranial puncture of the parietal foramen was achieved and 18G SURFLO LV CATHETER (TERUMO) was inserted to the feeder. Transcranial course was identified on a lateral projection that could be avoided too distal placement of a needle from the inner layer of cranial bone. After puncture, the 18G SURFLO outer catheter was connecter to the Y connector (MINVASIS). Marathon Micro Catheter (Medtronic) in combination to a ASAHI CHIKAI X10(ASAHI INTECC) was inserted through the SURFLO and navigated until the shunts. Injection of PHIL LV (MicroVention TERUMO) occluded the origin of draining vein and a complete occlusion of DAVF was achieved.

Conclusion: Transcranial direct puncture through the cranial foramen may allow successful treatment of DAVFs even if feeding vessels cannot be accessed by conventional endovascular navigation.
Chicane Technique of A Flow Diverter across An Unruptured Aneurysm of A H2-Type Anterior Communicating Artery: What We HaveConcerned

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Introduction: Flow diverters have been considered as another endovascular treatment of anterior communicating artery aneurysms (ACoA) in recent years. However, much should be concerned when planning such treatment. We would like to convey our concerns through one case with a H2-type wide-neck ACoA treated successfully using a Pipeline embolization device (PED).

Method: A 72-year-old man was found with an unruptured wide-neck ACoA (4.6-mm x 3.7-mm) incidentally during imaging work-up of an acute ischemic stroke. The bilateral A1 segments showed different diameters with <50 % difference between the sides (H2-type), and the left A1 segment was the dominant parent artery of the ACoA. After comprehensive considerations under the patient’s will, endovascular treatment using a flow diverter to treat the ACoA was decided. A PED (2.5-mm x 20mm) crossed successfully from the left A1 segment to the right A2 segment, which named as chicane technique.

Results: The patient did not suffer from any neurological deficits after the operation, and the aneurysm resolved partially 6 months later.

Conclusion: PED for an unruptured H2-type ACoA was feasible and efficient. Chicane technique offered good flow diversion from entering the aneurysm at a H2 configuration of vascular anatomy. However, risk of thromboembolic events should be concerned.
Successful Stent-Assisted Coil Embolization in the Patient with Iatrogenic Rupture of the Basilar Artery

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Introduction: We report a case where, during the treatment of acute cerebral infarction, an unintended vascular rupture occurred. Instead of completely occluding the entire vessel, we minimized complications using stents and coils.

Method: The iatrogenic rupture of a basilar artery is at high risk for heavy and prolonged, resulting in a grave outcome. Reconstructive endovascular treatment by stents with coiling seems to be a promising treatment option for a perforated basilar artery.

Results: A 78-year-old woman presented with a visual field defect and hemiparesis within 23 hours of onset. The occluded basilar artery, revealed by MRA, was recanalized using stent retrieval thrombectomy and balloon angioplasty. Despite procedural success, postoperative instability and a comatose state led to the discovery of SAH and hydrocephalus on follow-up MRI. A suspected vessel perforation was detected using TFCA, pinpointing contrast leakage from the proximal stenosis region. The rupture site was successfully blocked using a helical coil and stent deployment, with the final angiogram showing no further contrast leakage.

Conclusion: Basilar artery rupture is a grave condition that often necessitates aggressive endovascular treatment, given the challenge in pinpointing the exact rupture site. Ideally, the procedure should occlude the rupture site while preserving arteries stemming from the basilar artery. Precise identification of the rupture point, as in this case, allows for treatment using the smallest coil, which mitigates the risk of bleeding and minimizes ischemic complications.