

contrast, proteins associated with red blood cells, platelets, histones, complement, and the clotting cascade all showed minimal relationship to CCT.

Immune response was among the biological processes most upregulated in the 'Delayed CCT' group according to Gene Ontology. KEGG functional analysis identified neutrophil extracellular trap formation as the most upregulated process, while Reactome identified neutrophil degranulation and the innate immune response as most over-represented.

Conclusion Neutrophil extracellular traps within stroke thrombus have been associated with procedural duration, number of passes, and inferior outcomes. Delayed cerebral circulation time after stroke thrombectomy has also been associated with inferior clinical outcomes. The identification of proteins associated with neutrophils and the innate immune response in thrombi from patients with delayed CCT may help to explain these phenomena.

Disclosures L. Thompson: None. S. Akkipeddi: None. D. Schartz: None. V. Dhar: None. P. Valdes Barrera: None. D. George: None. P. Romiy: None. N. Ellens: None. T. Mattingly: None. T. Bhalla: None. K. Welle: None. C. Morrell: None. M. Bender: None.

E-173

RARE ECA-ICA ANASTOMOSIS AVOIDS OPHTHALMIC ARTERY CATHETERIZATION

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10.1136/jnis-2024-SNIS.278

Background The extensive anastomotic network between ECA-ICA plays an important role in extra- and intracranial vascular pathologies, such as arteriovenous shunts, skull base tumors as well as various steno-occlusive diseases.^{1, 2} When performing endovascular treatment (EVT), especially in the skull base region, lacking knowledge of this network can be potentially hazardous and associated with serious complications. Often referred to as 'dangerous anastomoses', their identification is crucial to avoid non-target embolization from proximal catheter positions. We present the unusual case of a rare anastomotic branch between the infraorbital and the dorsal nasal arteries which could be successfully used for safe and effective embolization.

Material and Methods A 16-year-old girl with a previously embolized frontal scalp arteriovenous fistula (AVF) presented recurrent symptoms and swelling in her forehead. A control DSA revealed the residual AV shunting supplied by branches of the ophthalmic artery (OA) and distal internal maxillary artery (IMA). The OA was only moderately enlarged, its frontal branch coursing upwards to the AV shunt connected also with an anastomotic loop arising from the infraorbital artery (IOA) and the dorsal nasal artery. Because of the small caliber of the OA, and thus elevated risks of spasm or thromboembolic complications with potential visual impairment, this anastomotic loop was chosen. Using a triaxial approach (NeuronMAX 90, 5F Sofia) allowed navigation of a 1.3F Headway Duo (MicroVention) into the distal IMA, IOA, and through the anastomoses into the frontal branch of the OA. From here, PHIL 25% (MicroVention) was injected until complete occlusion of the residual shunting was observed. The patient woke up without new neurological or visual symptoms.

Summary This case illustrates the value of understanding functional vascular anatomy between distal ICA and ECA territory in the EVT of craniofacial lesions. Using low-profile microcatheters, even very small anastomoses may nowadays be used to perform distal catheter navigation for safe and effective embolizations.

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Disclosures R. Dahl: None. G. Benndorf: None.

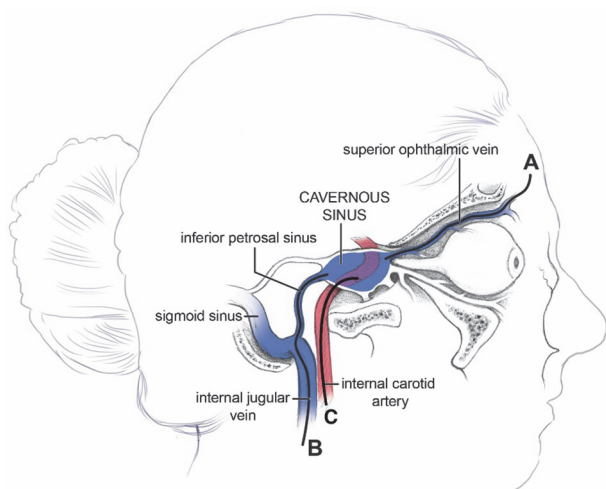
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ENDOVASCULAR APPROACHES FOR THE TREATMENT OF DURAL CAROTID-CAVERNOUS FISTULAS: A SYSTEMATIC REVIEW

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10.1136/jnis-2024-SNIS.279

Dural carotid-cavernous fistulas (dCCFs), also known as indirect carotid-cavernous fistulas, represent abnormal connections between the arterial and venous systems within the cavernous sinus that are typically treated via endovascular approach. We aimed to investigate the clinical characteristics of patients with dCCFs based on endovascular treatment approach and assess angiographic and clinical outcomes. A systematic review of the literature was performed. Data including number of patients, demographics, presenting clinical symptoms, etiology of fistula, Barrow classification, and embolization material were collected and evaluated. Outcome measures collected included degree of fistula occlusion, post-operative symptoms, complications, and mean follow-up time. A total of 48 studies were included examining four primary endovascular approaches for treating dCCFs: transarterial, transfemoral-transvenous (transpetrosal or other), transorbital(percuteaneous or via cut-down), and direct transfacial access. Overall data was collected from 694 patients with 756 dCCFs. Transarterial approaches exhibit lower dCCF occlusion rates (75.5%) compared to transvenous techniques via the inferior petrosal sinus (89.0%). The transorbital approach via direct puncture or surgical cut-down offers a more direct path to the cavernous sinus, although with greater complications including risk of orbital hematoma. The direct transfacial vein approach, though limited, shows promise with up to 100% occlusion rates and minimal complications. In summary, available endovascular treatment options for dCCFs have expanded and provide effective solutions with generally favorable outcomes. While the choice of approach depends on individual patient factors and technique availability, traditional-transvenous procedures have emerged as the first-line endovascular treatment. There is growing, favorable literature on direct transorbital and transfacial approaches; however, more studies directly comparing these general transvenous options are necessary to refine treatment strategies.



Abstract E-174 Figure 1

Disclosures E. Dowlati: None. E. Harake: None. E. Nieblas-Bedolla: None. Z. Wilseck: None. N. Chaudhary: None. R. Armonda: None. A. Pandey: None.

E-175 PARTICLE EMBOLIZATION OF THE MIDDLE MENINGEAL ARTERY FOR SUBDURAL HEMATOMA: EFFICACY AND COST CONSIDERATIONS

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10.1136/jnis-2024-SNIS.280

Introduction/Purpose Subdural hematoma is an increasingly common pathology encountered in an aging population. Due to medical comorbidities in elderly patients and risks associated with hospitalization and surgery, optimal management of asymptomatic or minimally symptomatic chronic subdural hematoma (cSDH) can be challenging. Embolization of the middle meningeal artery (MMA) is a procedure with low invasiveness and has been shown to be efficacious in reducing subdural hematoma thickness. The recent presentation of the EMBOLISE, MAGIC-MT, and STEM trials show the safety and efficacy of liquid embolizate for MMA embolization when compared to surgery alone for cSDH. Our study aims to reinforce the efficacy of particle embolization and demonstrate the feasibility of particle embolization with monitored anesthesia care (MAC).

Materials and Methods A retrospective review was conducted at a single academic institution. Patients were included who underwent middle meningeal artery embolization for subdural hematoma from 2020–2022. Medical records were reviewed for patient demographics, medical comorbidities, nature of symptoms, and procedural details. Radiographic data was collected from imaging review for thickness of subdural hematoma in greatest dimension prior to the procedure and at most recent follow-up. The primary endpoints were rescue surgical evacuation of subdural hematoma after MMA embolization and decrease in subdural hematoma thickness by 50%.

Results A total of 63 patients were identified and 59 were included, with 43 male patients and 16 female patients. Average age of patients was 72 years (range 52–90). Pre-procedure

thickness of subdural hematoma on average was 14.7 ± 6.2 mm and average midline shift on pre-procedure CT was 6.2 ± 4.5 mm. Thirty-one patients (52.5%) were on antiplatelet medications prior to admission. Nineteen patients (32.3%) were on anticoagulation medications prior to admission. All patients were treated with polyethylene vinyl (PVA) particles. Three patients required general anesthesia for the procedure, whereas MAC was utilized for the other 56. Post-procedurally, 6 patients had symptomatic SDH recurrence requiring operative intervention (10.2%). Thirty-three (55.9%) patients had decreased SDH size by 50% at last follow up. Zero patients suffered neurologic deterioration on comparison of admission and follow-up modified Rankin scale.

Discussion This single center retrospective review demonstrates similar efficacy and safety outcomes for particle embolization of the MMA for cSDH treatment compared to recent trials for liquid embolizate. The cost of 45–150 micron PVA particles is \$153, which is more than 20 times cheaper than a vial of Onyx, which is \$3334. Trials on a larger scale are necessary to compare embolic agents in the setting of major cost differences to hospital systems and patients.

Disclosures V. Shah: None. J. Shepherd: None. A. Azghadi: None. Q. Nguyen: None. D. Defta: None. J. Sirinit: None. B. Hika: None. M. Huerta: None. S. Amin-Hanjani: None. A. Ray: None. Y. Hu: None.

E-176 SHOULD WE INTERVENE EARLIER IN NEONATES WITH VEIN OF GALEN MALFORMATIONS? REVISITING THE BICÊTRE SCORE

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10.1136/jnis-2024-SNIS.281

Introduction Neonates with Vein of Galen malformations (VOGM) require early assessment to determine the need for endovascular embolization. The Bicêtre Neonatal Evaluation Score, a 21-point risk stratification score published in 2006, was historically used to inform management: under 8 points suggested withdrawing treatment, 8 to 12 points suggested neonatal intervention, and over 12 points suggested delaying to the infantile period. However, the score is no longer strictly employed and may bias outcomes. As endovascular techniques and technology have improved over time, a new decision-making paradigm may more accurately reflect modern treatment outcomes.

Methods A single-center retrospective review identified all VOGM patients presenting in the neonatal period from January 2012 to May 2023. Patients were included if they had fetal or neonatal imaging within the first ten days of life and if they had not previously received intervention. Intervention at our center was offered based on the neonate's cardiopulmonary status, neurologic status, and responsiveness to medical management. Bicêtre scores were retrospectively calculated from available data at the time of the decision to offer neonatal or infantile intervention.

Results Forty-four patients with VOGM were identified. Twenty-six patients received neonatal intervention, with Bicêtre scores ranging from 6 to 17, and 18 patients were delayed for infantile intervention with Bicêtre scores ranging from 17 to 21. The median Bicêtre score of the neonatal treatment