UNILATERAL CEREBRAL VASOCONSTRICTION FOLLOWING COMBINED CAROTID NEUROSURGICAL AND ENDOVASCULAR CAROTID REVASCULARIZATION

L Sheikhi*, J Tsai, M Bain, G Toth. Cleveland Clinic, Cleveland, OH

INTRODUCTION Reversible cerebral vasoconstriction syndrome (RCVS) can occur spontaneously or may be a secondary response. RCVS is rarely reported in literature following carotid revascularization and thought to be a possible result of chronic cerebral hypoperfusion with disturbance of cerebral autoregulation. There is no standard treatment for this condition. Here we report occurrence and management of cerebral vasoconstriction following unique combined neurosurgical and endovascular carotid revascularization for symptomatic carotid occlusion.

METHODS We review a patient’s clinical and imaging characteristics following carotid artery revascularization.

RESULTS A female patient in her 70s with history of hypertension, controlled type 2 diabetes mellitus, and current smoker presented with recurrent episodes of transient left sided limb shaking. She was found to have a right internal carotid artery (ICA) occlusion at the cervical origin with a non-flow limiting 40% stenosis of the left ICA associated with an acute infarct in the right frontal white matter. A diagnostic cerebral angiogram confirmed the occlusion of the right ICA with limited and delayed retrograde filling from the vertebrobasilar system via the right posterior communicating artery and smaller collateral contribution via right external carotid to ophthalmic artery. Notably, there was no anterior communicating artery for contralateral cross-filling. She had several outpatient visits and hospital admissions for hypotensive episodes associated with recurrent stereotypic symptoms. Repeat imaging demonstrated overall small stroke burden and no hemorrhage. Upon careful discussion and review of possible options, a combined neurosurgical-endovascular carotid revascularization was performed with endarterectomy of an occlusive plaque involving the distal common carotid to the proximal ICA, and direct mechanical thrombectomy with aspiration and stentriever of the cervical ICA to the terminus. Additional angioplasty and stenting of proximal petrous ICA segment was performed via femoral access after closure of the surgical site. She clinically was doing well until 5 days post-operatively, when she developed recurrent symptoms. Imaging showed small new ischemic strokes without hemorrhage. Continuous video-EEG

Abstract E-086 Figure 1 Initial and interval cerebral angiograms of right internal carotid artery (ICA) Figure A is an anterior view of the abrupt right cervical ICA occlusion at the bifurcation (arrow). Figure B demonstrates robust right ICA filling upon final review of combined neurosurgical-endovascular revascularization of the right ICA (lateral view). Following symptom recurrence, Figure C is a repeat angiogram demonstrating interval right ICA focal severe segmental irregularities consistent with cerebral vasoconstriction. Figure D.1 is a magnified view of Figure B, followed 10 minutes post intra-arterial verapamil treatment with improvement in vessel caliber on Figure D.2.

Figure A: Initial right ICA angiogram showing occlusion at the ICA bifurcation. Figure B: Robust ICA filling upon final review of combined neurosurgical-endovascular revascularization. Figure C: Repeat angiogram demonstrating interval ICA focal severe segmental irregularities consistent with cerebral vasoconstriction. Figure D.1: Magnified view of Figure B, followed 10 minutes post intra-arterial verapamil treatment with improvement in vessel caliber on Figure D.2.
monitoring was negative for seizures. Transcranial doppler monitoring over the next few days demonstrated worsening velocities, with a repeat angiogram confirming severe focal segmental irregularities isolated to the right anterior territory. The surgical and stenting site remained widely patent. Her vasospasm was successfully treated with intra-arterial verapamil with improvement in vessel caliber and clinical symptoms.

**Conclusions** Post carotid revascularization cerebral vasospastication may be an unusual cause of clinical worsening after revascularization for chronic carotid stenosis or occlusion. Intra-arterial treatment with verapamil can be a safe and effective mode of therapy.

**Disclosures** L. Sheikhi: None. J. Tsai: None. M. Bain: 2; C; Stryker. 4; C; Rebound Therapeutics. G. Toth: None.

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**Abstracts**

**E-087 HYBRID OPEN AND ENDOVASCULAR APPROACH FOR OCCIPITAL ARTERIOVENOUS FISTULA WITH COMPLETE OBLITERATION: TECHNICAL NOTE**

1Lavie, 2M Mathkour*, 3P Gulotta, 3G Vidal, 3J Milburn, 2E Valle-Giler. 1Radiology, Ochsner Medical Center, New orleans, LA; 2Neurosurgery, Tulane Medical Center/Ochsner Medical Center, New orleans, LA; 3Neurology, Ochsner Medical Center, New orleans, LA

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**Background** Dural arteriovenous fistulas (DAVFs) are acquired abnormal shunting connexions between the meningeal arteries and dural sinus or cortical veins and are an important cause of intracranial hemorrhage. Lesions with retrograde cortical venous reflux carry a higher risk of bleeding and endovascular embolization is currently the first-line treatment for these lesions. We present a case of DAVF with cortical venous reflux not amenable to conventional transarterial or transvenous endovascular embolization treated with direct surgical access to the occipital artery and Onyx embolization.

**Method** A 67-year-old man with a history of seizure disorder who presented with a tonic-clonic seizure one month after stopping his antiepileptics. Neurologic examination was unremarkable aside from diminished hearing on the right. The patient presented for neurosurgical evaluation due to imaging findings performed for work-up of his most recent seizure. Non-contrast head CT was unremarkable. CT and MR angiogram were performed, demonstrating prominent cortical veins overlying the right temporal convexity, suspicious for dural AV fistula or arteriovenous malformation. Digital subtraction angiography confirmed a dural AV fistula with arterial supply from the right occipital and middle meningeal arteries and shunting to the transverse sinus with multiple dilated cortical veins, compatible with a Borden 3, Cognard 4 lesion. In addition, there was a type 3 aortic arch with an extremely tortuous right common carotid artery, precluding selective access to the external carotid artery by either transfemoral or transradial approach. Due to the inability to access the right external carotid artery via conventional endovascular approaches, we elected to perform a hybrid procedure with surgical cutdown for direct access to the right occipital artery for Onyx embolization.

**Result** Using ultrasound guidance, the right occipital artery was tracked over the posterior nuchal line. A linear incision was designed over it and the artery was exposed and catheterized with a short 5F sheath. Vessels loops were used to secure the sheath to the artery. An onyx compatible microcatheter was used to access the nidus of the fistula and under direct fluoroscopy the fistula was embolized. A Post-embolization angiogram from the right occipital artery demonstrated no residual filling of the fistula. The postoperative was unremarkable and follow up angiogram at 6 months shows complete obliteration.

**Conclusion** A variety of hybrid open and endovascular approaches have been described and the majority describes approaches involve a combination of a craniotomy followed by Onyx or NBCA embolization after direct cannulation of the artery or vein. In this case, we report a combined surgical and endovascular approach for Borden III DAVF that was inaccessible to standard endovascular approaches due to tortuous carotid anatomy via a direct cut-down. Direct cannulation of the occipital artery provided an elegant access to the fistula distal to the tortuous carotid artery with minimally invasive surgery without requiring a craniotomy, and a large volume of Onyx was able to be injected via the prominent occipital artery. Direct cannulation of feeding vessels to dural AVF represent a treatment option in patients that are not good candidates for conventional endovascular or open approaches.


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**E-088 PSYCHOLOGICAL IMPACT OF PULSATILE TINNITUS IN THE US POPULATION**

1E. Smith*, 2M Amans, 3K Meisel, 4D McCoy, 1Radiology, Medical College of Wisconsin, Milwaukee, Wi; 2Neurinterventional Radiology, University of California, San Francisco, San Francisco, CA; 3Neurosurgery, University of California, San Francisco, San Francisco, CA; 4Radiology, University of California, San Francisco, San Francisco, CA

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**Introduction/Purpose** Pulsatile tinnitus (PT) is the auditory perception of a rhythmic, cardiac-synchronized, 'whooshing' type of sound in the absence of an external source that affects 3–5 million Americans. In addition, several of the anomalies that cause PT can have serious sequelae such as ischemic stroke, blindness, or intracranial hemorrhage. In addition, it is common for patients to describe an inability to continue to function in their families and in society due to the psychological impact of PT (which may be depression, anxiety, or a combination). In our experience, treating the underlying cause of PT not only mitigates the risks of the vascular anomaly, but also the patients’ psychiatric illness. However, the prevalence of depression and anxiety in the PT population is unknown. The purpose of this study was to quantify the prevalence of depression and anxiety in the United States PT population, as well as identify relationships between patient characteristics, effects of PT on various aspects of life, depression, and anxiety.

**Materials and methods** Local IRB approval was obtained to survey the pulsatile tinnitus community. The survey used the validated Tinnitus Functional Index (TFI) to determine the severity of the PT condition (intrusive, sense of control, cognitive, sleep, auditory, relaxation, quality of life, emotional). In addition, the PHQ-9 and GAD-7 was used to obtain the prevalence of concurrent depression and anxiety, respectively. Logistic multiple regression analysis was performed for determining the associations of clinical and demographic variables with TFI total score. Additionally, PHQ-9 and GAD7 scores (binarized to indicate depression/anxiety) were modeled with TFI total score as the main exposure.