

increased pressure can lead to rupture of the arterial wall at the weakest spot, which may be just past the distal dural ring where the ICA travels intracranially within the subarachnoid space.

**Conclusion** We highlight a newly encountered mechanism for potential injury to the distal ICA during mechanical thrombectomy. Sudden increase in pressure affecting the ICA in a system that is closed when performing angiography can rupture the distal ICA as it goes intracranially resulting in subarachnoid hemorrhage. It is important to be aware of this fatal complication when performing mechanical thrombectomy in patients with ICA terminus occlusion especially with proximal tandem carotid stenosis. Awareness of this complication will help operators to avoid performing angiographic runs in this potential closed space if not deemed necessary to avoid this potentially devastating complication.

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**E-113 MIDDLE MENINGEAL ARTERY EMBOLIZATION FOR TREATMENT OF CHRONIC SUBDURAL HEMATOMA: A PROSPECTIVE INSTITUTIONAL CASE SERIES**

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**Background** Embolization of the middle meningeal artery (MMA) has emerged a potential treatment for chronic subdural hematoma (cSDH), either as a stand-alone therapy or an adjunct to surgical evacuation.

**Methods** Information on patients with a cSDH at least 10 mm in maximal thickness selected for MMA embolization was entered into a prospectively collected database. The embolization procedure consisted of MMA catheterization followed by injection of 150–250 µm polyvinyl alcohol (PVA) particles until occlusion of the MMA distal to the sphenoid ridge. For patients who also underwent surgical evacuation, MMA embolization was performed after surgery in all cases. Descriptive statistics of treatment outcomes, which included cSDH size on final head CT and the incidence of cSDH surgical evacuation after MMA embolization, are provided.

**Results** MMA embolization was performed in 23 patients with 29 cSDHs. The mean age of the cohort was 72.3 years [Standard deviation (SD) = 9.2] and a majority of patients were male (n=24, 82.8%). History of anti-coagulation use was present in 14 patients (60.9%). Mean maximal dimension and associated midline shift of treated cSDHs were 18.1 (SD=4.9) and 4.6 mm (SD=3.9). Surgical evacuation prior to MMA embolization was performed for 12 cases (41.4%). A thromboembolic complication during MMA embolization resulting in a new minor neurologic deficit occurred in a single patient (4.3%). Overall, 27 cSDHs (93.1%) were reduced in size on final follow-up CT, and 10 were completely resolved (34.4%). Stratified by initial medical versus surgical management, 88.2% (n=15/17) and 100.0% (n=12/12) of cSDHs were reduced in size and 33.3% (n=4/12) and 35.3% (n=6/17) were completely resolved on last follow-up CT. Two cSDHs (6.9%) in a single patient initially treated with surgery required repeat surgical evacuation after MMA embolization.

Mean time between MMA embolization and last follow-up head CT was 3.7 months (SD=3.1).

**Conclusion** Our preliminary results suggest MMA embolization may be an effective treatment for cSDHs. Randomized trials are indicated.

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**E-114 THE USE OF CONE-BEAM CT NEEDLE GUIDANCE FOR PERCUTANEOUS SCLEROTHERAPY OF AIRWAY VENOUS MALFORMATIONS**

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**Background and Purpose** Venous malformations involving the posterior pharyngeal wall, hypopharynx and periglottic regions can result in substantial morbidity due to chronic and acute airway obstruction. Percutaneous sclerotherapy for management of these patients is challenging due to the proximity of these malformations to vital structures including the carotid and vertebral arteries. We retrospectively reviewed our institutional case series of patients who received sclerotherapy for airway venous malformations using a novel cone-beam CT needle guidance software.

**Methods** Following institutional review board approval, all patients with craniofacial venous malformations involving airway structures with the assistance of Philips Xper-Guide Cone Beam CT needle guidance were identified. We performed all interventions under general endotracheal anesthesia and the malformations were involving the airway. In general, patients were given an 8 mg dose of dexamethasone immediately prior to sclerotherapy. An XperCT was performed and XperGuide needle guidance was activated. Targets were chosen and using the needle guidance a 20 or 22 G spinal needle was advanced into the malformation. After confirmation of needle positioning with a venogram, Bleomycin (1 mg/1 mL) was injected slowly into the malformation using a negative roadmap technique. Following treatment, patients had airway monitoring in the ICU for a minimum of 4 hours following sclerotherapy and if no substantial swelling or airway compromise was noted, patients were extubated. Patients were generally sent home with a 5 day course of steroids to prevent swelling of the malformation following sclerotherapy. All patients received follow-up at 1 week, 6 weeks and 3 months. Studied outcomes included technical success rate, procedural complications and symptom improvement.

**Results** Over the past twelve months, a total of 12 consecutive patients received 20 sessions of bleomycin sclerotherapy for treatment of airway venous malformations with the assistance of Cone-Beam CT Needle Guidance (XperGuide, Philips). The most common indications for treatment were obstructive sleep apnea refractory to CPAP (6 patients) and difficulty swallowing solid foods (6 patients) For these 20 sessions, a total of 54 different venous malformations were targeted. In all cases, either 20G or 22G spinal needles were successfully advanced into the venous malformations and bleomycin sclerotherapy was administered. Thus, the technical success rate was 100%. There were no hemorrhagic or ischemic complications related to the sclerotherapy. In 19/20 sessions, patients were successfully extubated the day of the procedure. One patient required an additional day of intubation due to swelling of a

glottic venous malformation following sclerotherapy. One patient had a corneal abrasion. 11/12 patients had improvement in the size and symptoms of the venous malformations.

**Conclusions** Cone Beam CT/XperGuide needle guidance is a useful tool for treatment of deep seated venous malformations, particularly those around the airway. In our case series we had high rates of technical success for delivery of sclerosant to these malformations and a low complication rate.

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### E-115 PTERYGOVAGINAL ARTERY: A LESS RECOGNIZED RECURRENT BRANCH FROM THE DISTAL INTERNAL MAXILLARY ARTERY

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**Introduction** The pterygovaginal artery (PtVA) is one of the recurrent branches from the distal part of the internal maxillary artery (IMA), which courses through the pterygovaginal canal (PtVC) that connects the pterygopalatine fossa and the nasopharynx. Less attention has been paid to this artery in spite of its unique anatomical features and important anastomoses around the eustachian tube because on angiography this minute artery can be hardly distinguished due to overlaps of many IMA branches. Nevertheless, widespread utilization of cone beam computed tomography (CBCT) has enabled us depicting even extremely small arteries. In cases with hypervascular lesions, PtVA is often enlarged and can be identified with attentive observation. We present three cases of tumor embolization before endonasal endoscopic approach and underscore its clinical implications in neurointerventional surgery.

**Case 1 (Sinonasal renal cell-like adenocarcinoma)** A 66-year-old woman with a history of von Hippel-Lindau disease and multiple surgeries for intracranial hemangioblastomas was scheduled for a resection of an enlarging mass extending around the ethmoid and sphenoid sinuses. Along with branches from the left sphenopalatine artery (SPA), the left PtVA, branching from the most distal part of the IMA, was embolized selectively with 40% n-butyl cyanoacrylate.

**Case 2 (Sphenoid Sinus Hemangioma)** A 20-year-old man presented with the right abducens nerve palsy. MRI showed an

enhancing mass around the sphenoid sinus extending to the cavernous sinus. CBCT revealed that the main feeder from the IMA was the PtVA, branching from a relatively proximal portion of IMA, lateral to the pterygomaxillary fissure. The selective angiography from the PtVA showed a tumor stain and a branch to the nasopharyngeal roof anastomosing with the ascending pharyngeal artery (APhA) and ascending palatine artery. After the microcatheter was further advanced close to the lesion, embospheres of 300–500µm were cautiously injected and platinum coils were deployed in the PtVA. Post-embolization CBCT showed coils in the PtVC.

**Case 3 (Pituitaryoma)** A 69-year-old woman with a large sellar tumor underwent a preoperative embolization. The distal IMA, middle meningeal arteries, accessory meningeal artery, APhAs were embolized with coils. The tumor stain from the distal IMA was specifically derived from the PtVA, the Vidian artery, and the artery of the foramen rotundum.

**Conclusion** The PtVA has a medial or lateral origin from the distal IMA and anatomical knowledge for this artery is essential in neurointervention. Embolization should be performed with precaution to avoid unintended migration through dangerous anastomoses.

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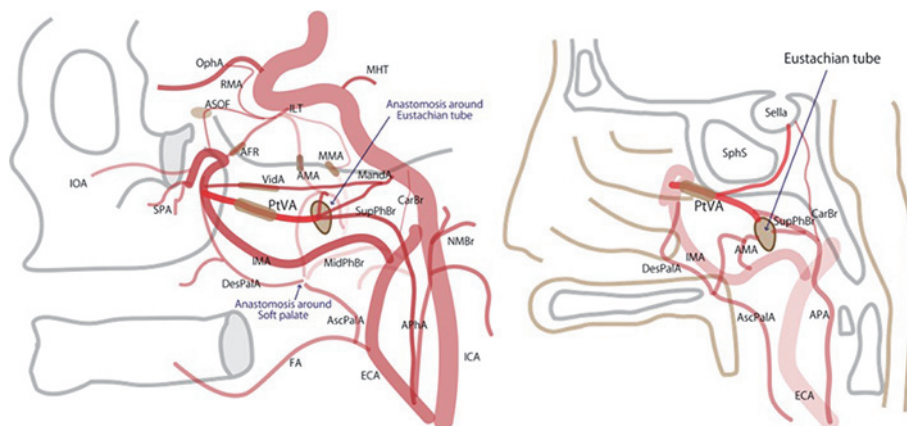
### E-116 LONG-TERM MORTALITY AFTER CAROTID STENTING

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**Background** Carotid artery stenting (CAS) is an established procedure for the treatment of atherosclerotic disease affecting the extracranial internal carotid artery. Recent population-based studies have suggested that long-term survival after CAS may be limited, thereby questioning its efficacy in a real-world scenario.

**Methods** We retrospectively reviewed outcomes of patients undergoing CAS for asymptomatic or symptomatic carotid stenosis by a neurosurgeon or interventional neuroradiologist at our institution between 2008 and 2018. Patient and disease characteristics were recorded, as was the incidence of peri-procedural and overall ischemia and mortality after CAS. Risk factors for recurrent ischemia and mortality were identified using a Cox proportional hazards model.



Abstract E-115 Figure 1