

**Presentation
Number:** KC8

**Publishing
Title:** Duplex Findings of Symptomatic Internal Carotid Artery Fenestration and Literature Review

Author Nessa E. Miller, MD, Don Bosway, RVT, Joann M. Lohr, MD.

Block: TriHealth Good Samaritan Hospital, Cincinnati, OH

OBJECTIVES: This is a report of a symptomatic cervical internal carotid artery fenestration first diagnosed by duplex ultrasound. Case reports of similar radiologic findings in symptomatic patients are scattered throughout the international literature amongst multiple specialties: neurosurgery, neuroradiology, neurology, ENT, radiology, vascular surgery. This heterogeneity is likely secondary to the diverse ways these patients can present.

METHODS: The image presented here was obtained by our diagnostic vascular laboratory as part of an outpatient exam. We researched this individual case and performed a comprehensive review of the literature. A MRA of neck and head were also obtained, confirming the duplex findings.

RESULTS: This patient is a 32 year old female six months post partum; her pregnancy was complicated by preeclampsia and preterm labor. She began having tinnitus after her delivery. While there are reports that cerebral blood vessels can have embryological variations and defects, it is likely that fenestrations such as this patient's are actually chronic dissections.

CONCLUSIONS: Vascular surgeons and those that read vascular ultrasound studies should be aware of this unusual presentation of symptomatic carotid fenestration and cognizant that it may represent chronic dissection.

**Abstract
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**Presentation
Number:** KC9

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Title: **Impact of Aortic Transection on Patients Aged 80 years or older**

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OBJECTIVES: Aortic transection (AT) is rare; information on elderly patients with AT has not been published. This study describes the clinical spectrum and evaluates the treatment outcomes of AT in a cohort of elderly patients.

METHODS: All patients > 80 years with AT treated in a Level 1 trauma center over a 19-year period were included. Outcomes of interest were length of intensive care unit (ICU) and hospital stay (LOS), and early morbidity and mortality.

RESULTS: There were 5 (50%) males and 5 (50%) female patients with AT and mean age of 86 years (range from 80 to 95). All ATs were secondary to blunt trauma. All but one patient who fell were involved in motor vehicle accidents. The mean ISS was 29 ± 12 . The most significant component of the ISS was thorax followed by head trauma. Two (20%) patients (ISS=36 and 33) succumbed in the emergency department during initial evaluation and 6 (60%) patients were treated nonoperatively. The remaining 2 (20%) patients (88 and 84 years) underwent open aortic repair with patch angioplasty and Dacron interposition graft. No postoperative paraplegia and stroke related to surgery occurred. All but two admitted patients died in the ICU with a median stay of 12 days (range, 1 to 65). An 87-year-old male treated nonoperatively (ISS=50) and an 88-year-old (ISS=21) male treated with aortic interposition graft survived, and were discharge to a rehabilitation facility. The length of LOS and ICU stay for those two survivors were 23 and 75, and 21 and 62 days.

CONCLUSIONS: AT in elderly patients carries high mortality rates regardless of head injury or overall ISS. A prolonged LOS and ICU stay can be anticipated. It remains to be investigated whether or not endovascular therapy can decrease mortality, expedite discharge, and ultimately reduce the burden on healthcare costs in this subset of patients.

**Abstract
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**Presentation
Number:** KC10

**Publishing
Title:** Blunt Carotid Injury and Motor Vehicle Collision: Demographics, Associated Injuries, and Outcomes

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**Abstract
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OBJECTIVE: Blunt carotid injury (BCI) is a rare injury associated with motor vehicle collision (MVC). There are few population based analyses evaluating carotid artery dissection associated with blunt trauma and their associated injuries. The objective of this study was to describe the reported frequency of BCI, delineate associated injuries, evaluate the interventions performed, and the assess outcomes.

METHODS: The NIS 2003-2010 data was queried to identify patients after MVC who also had documented carotid dissection diagnosed during their hospitalizations utilizing ICD-9 codes. Demographics, associated injuries, interventions performed, length of stay, and overall cost were evaluated.

RESULTS: 1,686,867 patients were estimated having sustained MVC; 1,168 BCI were estimated. No patients with carotid dissection underwent an open repair, 4.24% had a carotid stent, and 95.76% of patients had no operative intervention. BCI age groups: 18-24 (27.8%), 47-60 (22.3%), 35-46 (20.6%), 25-34 (19.1%), >61 (10.2%). Associated injuries included long bone fractures (28.5%), cranial injuries (25.6%), thoracic injuries (23.6%), cervical fractures (21.8%), facial fractures (19.9%), skull fractures (18.8%), pelvic fractures (18.5%), hepatic (13.3%), and splenic (9.2%). Complications following BCI included respiratory (44.2%), stroke (28.5%), bleeding (16.1%), and urinary tract infections (8.9%). Overall mortality following BCI was 14.1% without significant difference between those with and without intervention (18.5% vs. 13.9%; P=0.36). Stroke was independently associated with a 2.1 times greater risk of mortality. Mean length of stay for patients with BCI undergoing stenting compared to no intervention were similar (13.1 days vs. 15.9 days) but had a greater mean cost (\$83,030 vs. \$63,200).

CONCLUSION: Blunt carotid dissection is a rare injury associated with motor vehicle traumas, most frequently reported in younger patients. Frequently associated injuries were long bone fractures, thoracic injuries, and pelvic fractures which may be associated with the force of the injury rather than anatomic location. The majority of patients were treated without intervention, but when carotid stenting was utilized, it did not impact mortality and tended to increase cost.

Presentation Number: KC11

Publishing Title: A Rare Case of Carotidynia Presenting as a Carotid Artery Dissection

Author: Monica Sethi, MD, Karan Garg, MD, Mark A. Adelman, MD, Frank J. Veith, MD, Neal S. Cayne, MD.

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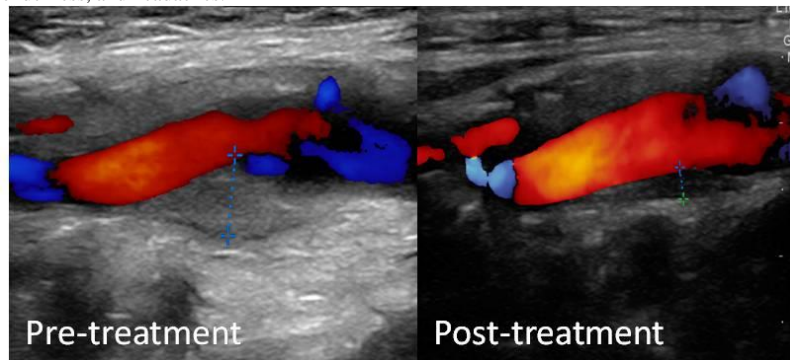
INTRODUCTION: We report the unusual case of carotidynia initially diagnosed as a carotid dissection. A 50-year old healthy female presented with acute onset of severe right neck pain of five days duration, associated with tenderness and headache. On physical exam, the patient was neurologically intact with focal tenderness over her right carotid triangle. There were no systemic signs or symptoms of infection. The patient underwent carotid duplex ultrasound, which demonstrated a thrombosed dissection versus intramural hematoma visualized at the common carotid artery (CCA) bulb and proximal internal carotid artery (ICA). In the setting of adenomyosis and heavy menstrual bleeding, additional imaging was obtained to confirm the diagnosis of dissection prior to initiating anticoagulation. T1 weighted magnetic resonance and computed tomography imaging suggested abnormal asymmetric soft tissue surrounding the right CCA and ICA without luminal narrowing or a dissection flap.

METHODS: Based on the composite results of multiple imaging modalities, the patient was diagnosed with carotidynia, specifically idiopathic inflammatory pseudotumor of the carotid sheath. Treatment with NSAIDs was initiated.

RESULTS: The patient's pain was significantly improved within 2 days of NSAID therapy. Repeat duplex performed 3 days later showed 50% decrease in wall thickness near the carotid bulb(Figure 1).

CONCLUSION: We herein describe a rare case of carotidynia, initially mistaken for a carotid artery dissection. Clinicians should consider idiopathic inflammatory pseudotumor of the carotid sheath as a diagnosis in cases of spontaneous neck pain and tenderness, and headaches.

Abstract Body:



**Presentation
Number:** KC12

**Publishing
Title:** Carotid Artery Revascularization Following Failed Stenting

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OBJECTIVES: Enthusiasm for carotid artery stenting (CAS) in both community and academic Medical Centers has resulted in a new cohort of patients requiring complicated carotid artery revascularization following failed stenting.

Methods: A retrospective review of five patients who were referred for complications of CAS. Each case was reviewed and analyzed. The difficulties in CAS involved a variety of different scenarios: including problems occurring at the time of carotid artery stenting, failure of long-term artery patency and for continuing or progressive neurologic events following carotid artery stenting.

Results: The first patient developed a high-grade in-stent re-stenosis. The stent was placed for recurrent disease following redo carotid endarterectomy and was located 2.5 cm above a high bifurcation. Patient two was referred for in-stent re-stenosis 3.9 cm above the bifurcation. Patient three had primary stenting for an asymptomatic severe stenosis, had multiple TIAs followed by a hemispheric stroke two months after CAS and was noted to have a severe complex in-stent restenosis. Patient four developed severe extensive recurrent asymptomatic restenosis after CAS involving the common and internal carotid arteries. Patient five underwent carotid artery stenting. During completion angiography it was revealed that the patient had an anomalous takeoff of the internal carotid artery that was covered by the stent. He was having crescendo TIA's.

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Operative interventions consisted of tedious carotid artery exposure with hypoglossal nerve preservation. The digastric muscle was transected in 4 cases. One patient underwent mandibular subluxation by the otolaryngology service. Three patients required intraoperative shunting. Three patients underwent enbloc resection of the internal carotid artery and reconstruction with saphenous vein interposition grafting. Two cases had stent extraction, re-endarterectomy and Dacron patch angioplasty. Postoperatively, three patients had hypoglossal nerve paresis with full recovery within 6 months. There were no other cranial nerve injuries, no perioperative strokes and there were no other major complications. Length of stay ranged from 23 hours to 3 days. Follow-up ranged from 4 to 48 months.

Carotid duplex scans revealed no hemodynamically significant recurrences (>60%) and no patients had ischemic neurologic events in a 4 to 48 month follow-up.

Conclusions: With an increasing number of CAS being performed, vascular surgeons can anticipate increased numbers of complicated and difficult open procedures for failed stenting. Appropriate preoperative planning is essential for good surgical outcomes.

**Presentation
Number:** KC13

**Publishing
Title:** Calcification Predicts In-Stent Restenosis After Carotid Artery Stenting in High-Risk Patients

Author Block: **Kirstyn Brownson, MD¹**, Roland Assi, MD¹, Michael Hall, MD¹, Penny Vasilas, RN², Bart Muhs, MD, PhD³, Alan Dardik, MD, PhD³.

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OBJECTIVES: Carotid artery stenting (CAS) is an alternative treatment for high risk patients with carotid disease, with recent studies reporting reasonable stroke protection and reduced myocardial infarction compared to carotid endarterectomy (CEA). However, the criteria defining restenosis and the factors predicting restenosis remain controversial.

METHODS: The records of all patients who underwent CAS at our institution between January 2006 and December 2012 were reviewed; patients with combined procedures or with stents placed in the origin of the common carotid artery were excluded. Preoperative, operative, and postoperative data was reviewed. JMP 9.0.0 software was used for data analysis.

RESULTS: 34 patients underwent 35 CAS interventions with 38 stents [19 internal carotid artery (ICA 50%), 1 common carotid artery (CCA 3%), 18 ICA and CCA (47%)]; 29% of stents were closed cell and 71% were open cell. All patients were male with a mean age of 70±7 years; 21 (60%) had prior ipsilateral neck surgery; 9 (26%) had a history of neck radiation; 8 (23%) reported ipsilateral stroke or transient ischemic attack (TIA) within 6 months prior to CAS. Angiographic success of CAS was 100%; perioperative mortality and cerebrovascular complications were 0% and 3% (n=1) respectively. The mean follow-up time was 37.4±24.2 months during which 6 (17%) patients underwent angioplasty with or without stenting for in-stent restenosis.

Restenosis was defined using three ICA peak systolic velocity (PSV) maximum values (>250, >300, >350 cm/sec); intervention for restenosis was correlated with all 3 criteria, with 8 (23%; p=0.005), 7 (20%; p=0.0017), and 5 (14%; p=0.001) patients developing restenosis, respectively. Similarly, restenosis was also defined using three ICA/CCA PSV ratios (>3.75, >4.0, >4.25); intervention for restenosis was also correlated with all 3 of these criteria, with 8 (23%; p=0.005), 7 (20%; p=0.0017), and 6 (17%; p=0.0004) patients developing restenosis, respectively. Presence of calcification, ulceration, stent type, and preoperative maximal PSV were predictive of restenosis using univariable analysis. Multivariable analysis showed that calcification was predictive of restenosis defined by PSV >250 cm/sec (p=0.0496).

CONCLUSIONS: CAS can be performed in a selected, high-risk population with excellent perioperative results. Development of in-stent restenosis depends on the criteria used to define it. Calcification predicts in-stent restenosis, and patients with carotid calcification may form a group needing more intense post-procedure surveillance.

**Abstract
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**Presentation
Number:** KC14

**Publishing
Title:** The Use of Covered Stents in the Management of Carotid Artery Pseudo-Aneurysms: A Review

Author Block: **Khanjan H. Nagarsheeth, MD,** Ariful Alam, MD, Saqib Zia, MD, Jonathan Schor, MD, Kuldeep Singh, MD, Jonathan S. Deitch, MD.

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Objective: Carotid artery pseudo-aneurysms are traditionally treated surgically however open surgical repairs are associated with a high rate of morbidity and mortality. In recent years various endovascular techniques have evolved to treat PSA in this location. We review the literature pertaining to the use of covered stents to manage non-infected, extracranial carotid artery PSA sustained iatrogenically or from trauma.

Method: An extensive review of the literature using Ovid, PubMed and Google Scholar was performed. All published cases in the English language since 1997 were identified using the following keywords: "pseudoaneurysm," "carotid," "endovascular repair," and "stent." Studies that involved a hybrid procedure, involving a combination of open and endovascular approaches, bare metal stents, or coiling and stent placement were excluded.

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Results: Eighty-two cases of post traumatic or post procedural carotid artery PSA treated with a covered stent were identified. These patients ranged in age from 12 to 87 years old, and 62.2% were male. Fifty-one percent of pseudo-aneurysms identified were iatrogenic (42), 13.4% were after blunt trauma (11) and 35.4% were after penetrating injury (29). Post-procedural follow-up ranged from 5 days to 108 months. There was an overall complication rate of 33% (27/82). Sixteen complications occurred within the first 24 hours. Perioperative myocardial infarction and cerebrovascular events occurred in 9.8% of patients. Mortality in this series was 3.7% (3). Other complications included endoleak (3, 3.7%), hematoma (1, 1.2%) and intimal flap (1, 1.2%). Pseudo-aneurysm persisted in 3.7% (3), significant stenosis occurred in 3.7% (3) and complete occlusion of the stent occurred in 6.1% (5).

Conclusion: Endovascular placement of a covered stent for the treatment of carotid PSA has been shown to be effective and it carries a similar risk to an open repair. An endovascular approach should be considered when treating carotid artery pseudo-aneurysms.