Internal Carotid Pseudoaneurysm Associated with Tortuosity after Tonsillectomy: A Case Report

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Abstract

Keywords

- carotid tortuosity
- pseudoaneurysm
- carotid radiation

We present a patient who was found to have an internal carotid pseudoaneurysm 3 years after tonsillectomy and chemoradiation for tonsillar cancer. He also had severe tortuosity of both internal carotid arteries. The lesion was in an anatomically challenging location, but an endoluminal approach was not feasible because of the extreme tortuosity. He underwent open repair with resection of the pseudoaneurysm and direct anastomosis with good results.

Case Report

A 52-year-old man presented to the vascular clinic 3 years after treatment for poorly differentiated squamous cell carcinoma of the right tonsil T(T2N2cM0). In 2008, he was treated for a right-sided neck mass, his treatment involved tonsillectomy followed by cisplatin chemotherapy and concurrent radiation. He returned to the oncology clinic for follow-up reporting occasional neck cramping. Computed tomography of the neck showed a new 11 mm pseudoaneurysm of a highly tortuous right internal carotid artery (ICA). Subsequent carotid angiogram and duplex confirmed a tortuous distal right ICA and left ICA without any hemodynamically significant stenosis or limitation in flow (► **Figs. 1 and 2**). The patient had no neurologic symptoms.

After discussion with the patient, an open right ICA pseudoaneurysm repair was performed. Exposure was technically difficult given the previous neck radiation and the anatomic location of the lesion at the level of the C2 vertebrae. There appeared to be a segment of the ICA from which the aneurysm emanated, which was very tortuous and made a sharp angulation and s-loop.

Stump pressure measurements were performed and this did not indicate a need for shunting, his systolic pressure measured with a 21-g needle in the internal carotid after occluding the common and external carotid was greater than 50 mm Hg. The area of tortuosity and pseudoaneurysm was

then resected and an end-to-end anastomosis was completed in a tension-free fashion (► **Figs. 3 and 4**). Intraoperative ultrasound was performed and revealed no technical defects or areas of stenosis. He had no neurologic deficit postoperatively. The pathologic examination revealed arterial dilation with obliteration of the media layer. A postoperative carotid duplex 1 month later showed no stenosis of other abnormalities.

Discussion

We present a patient with carotid tortuosity and pseudoaneurysm that had history of neck radiation. He was asymptomatic and underwent open repair with good result.

No direct link can be made, in this case, between irradiation and direct arterial damage, however, complications of neck irradiation are complex and can involve both damage to the skin and soft tissues of the neck as well as deleterious effects to the carotid artery wall itself. Studies have proven an increased incidence of carotid stenosis along with an accelerated progression of atherosclerosis as a complication of external beam radiation in patients with head and neck malignancy.^{1–4} Radiation has also been shown to thicken the medial and intimal layers of the carotid artery.^{5–7}

Carotid tortuosity can occur naturally and is found in up to 10 to 16% of cerebral angiograms, typically in the lower third of the extracranial carotid artery.^{8–10} Possible etiologies for

Fig. 1 Carotid angiogram demonstrating pseudoaneurysm.

carotid tortuosity include embryological causes, atherosclerosis, fibromuscular dysplasia, and collagen-vascular disorders. This tortuosity may develop from elongation of the vessel within the restrictive confines of the neck resulting in a curved C- or S-shaped configuration.^{11,12} While radiation has not been directly shown to cause tortuosity, it can contribute to vessel degeneration and possible elongation. DeRubertis et al recently showed an increased mean angulation of the proximal internal carotid in patients with a history of cervical irradiation compared with patients without prior irradiation. They also showed that irradiated patients had a significantly higher ICA length-to-distance ratio.¹³

Carotid pseudoaneurysms have multiple etiologies, in our patient it may be related to the tonsillectomy. Pseudoaneurysm has also been shown as a complication after cervical neck irradiation.^{14,15} Complications associated with carotid pseudoaneurysms include rupture and life-threatening hemorrhage, embolization, thrombosis, infection, and compression

Fig. 3 Redundant internal carotid and pseudoaneurysm after dissection.

of surrounding anatomic structures. Surgical treatment for carotid pseudoaneurysm is indicated in these given risks. Repair of carotid pseudoaneurysms has included both open and endovascular techniques. One of the largest review series showed the overall mortality and stroke incidence with open repair to be 9%, with a 6% incidence of cranial nerve injury.¹⁶ Endoluminal stenting has been described in posttraumatic and postoperative carotid pseudoaneurysms with the use of both bare stents and covered stents.¹⁷⁻²⁰ The use of stents for treatment of carotid pseudoaneurysms is not without its risk. With the presence of thrombus, the risk for embolization during passage of guide wires and deployment of the device should always be considered. The risk of graft thrombosis and poor adaptation of the device to the wall also exists.

Fig. 2 The internal carotid was very tortuous as seen in the computed tomography angiogram.

Fig. 4 The segment of the internal carotid with the pseudoaneurysm was resected and end-to-end anastomosis was performed.

Our patient was found to have tortuosity of both ICAs dating back to his first neck imaging for a separate diagnosis of squamous cell carcinoma in 2008. Although he received neck irradiation, his tortuosity cannot be considered radiation induced. Surgical intervention for carotid tortuosity alone is controversial and must be carefully considered based on individual symptoms and risk factors.²¹ We felt that treatment of the contralateral tortuous internal carotid was not indicated in our patient. Treatment for carotid pseudoaneurysm is less debatable given the risks of hemorrhage and thromboembolization and open versus endovascular repair should be considered. In this case, the heavily tortuous carotid made an endoluminal exclusion of the pseudoaneurysm unfeasible. The patient was relatively young and did not have significant comorbidities, we felt that endoluminal repair would be technically very challenging because of the tortuosity and thus selected the open approach. Although the irradiated field created more distorted tissue planes, careful dissection allowed for successful open repair.

References

- Brown PD, Foote RL, McLaughlin MP, et al. A historical prospective cohort study of carotid artery stenosis after radiotherapy for head and neck malignancies. *Int J Radiat Oncol Biol Phys* 2005;63(5):1361–1367
- Carmody BJ, Arora S, Avena R, et al. Accelerated carotid artery disease after high-dose head and neck radiotherapy: is there a role for routine carotid duplex surveillance? *J Vasc Surg* 1999;30(6):1045–1051
- Cheng SW, Ting AC, Ho P, Wu LL. Accelerated progression of carotid stenosis in patients with previous external neck irradiation. *J Vasc Surg* 2004;39(2):409–415
- Cheng SW, Ting AC, Lam LK, Wei WL. Carotid stenosis after radiotherapy for nasopharyngeal carcinoma. *Arch Otolaryngol Head Neck Surg* 2000;126(4):517–521
- Cheng SW, Ting AC, Wu LL. Ultrasonic analysis of plaque characteristics and intimal-medial thickness in radiation-induced atherosclerotic carotid arteries. *Eur J Vasc Endovasc Surg* 2002;24(6):499–504
- Dorresteijn LD, Kappelle AC, Scholz NM, et al. Increased carotid wall thickening after radiotherapy on the neck. *Eur J Cancer* 2005;41(7):1026–1030
- So NM, Lam WW, Chook P, et al. Carotid intima-media thickness in patients with head and neck irradiation for the treatment of nasopharyngeal carcinoma. *Clin Radiol* 2002;57(7):600–603
- Najafi H, Javid H, Dye WS, Hunter JA, Julian OC. Kinked Internal Carotid Artery. *Clinical Evaluation and Surgical Correction. Arch Surg* 1964;89:134–143
- Vannix RS, Joergenson EJ, Carter R. Kinking of the internal carotid artery. Clinical significance and surgical management. *Am J Surg* 1977;134(1):82–89
- Koskas F, Bahnini A, Walden R, Kieffer E. Stenotic coiling and kinking of the internal carotid artery. *Ann Vasc Surg* 1993;7(6):530–540
- Metz H, Murray-Leslie RM, Bannister RG, Bull JW, Marshall J. Kinking of the internal carotid artery. *Lancet* 1961;1(7174):424–426
- Ballotta E, Thiene G, Baracchini C, et al. Surgical vs medical treatment for isolated internal carotid artery elongation with coiling or kinking in symptomatic patients: a prospective randomized clinical study. *J Vasc Surg* 2005;42(5):838–846, discussion 846
- Derubertis BG, Hyncek RL, Kent KC, Faries PL. Carotid tortuosity in patients with prior cervical radiation: increased technical challenge during carotid stenting. *Vasc Endovascular Surg* 2011;45(7):619–626
- Minion DJ, Lynch TG, Baxter BT, Lieberman R. Pseudoaneurysm of the external carotid artery following radical neck dissection and irradiation: a case report and review of the literature. *Cardiovasc Surg* 1994;2(5):607–611
- Ellens DJ, Hurley MC, Surdel D, Shaibani A, Pelzer H, Bendok BR. Radiotherapy-induced common carotid pseudoaneurysm presenting with initially occult upper airway hemorrhage and successfully treated by endovascular stent graft. *Am J Otolaryngol* 2010;31(3):195–198
- El-Sabrouh R, Cooley DA. Extracranial carotid artery aneurysms: Texas Heart Institute experience. *J Vasc Surg* 2000;31(4):702–712
- Bush RL, Lin PH, Dodson TF, Dion JE, Lumsden AB. Endoluminal stent placement and coil embolization for the management of carotid artery pseudoaneurysms. *J Endovasc Ther* 2001;8(1):53–61
- Scavée V, De Wispelaere JF, Mormont E, Coulier B, Trigaux JP, Schoevaerdts JC. Pseudoaneurysm of the internal carotid artery: treatment with a covered stent. *Cardiovasc Intervent Radiol* 2001;24(4):283–285
- Simionato F, Righi C, Melissano G, Rolli A, Chiesa R, Scotti G. Stent-graft treatment of a common carotid artery pseudoaneurysm. *J Endovasc Ther* 2000;7(2):136–140
- Hertz JA, Minion DJ, Quick RC, Moore EM, Schwartz TH, Endean ED. Endovascular exclusion of a postendarterectomy carotid pseudoaneurysm. *Ann Vasc Surg* 2003;17(5):558–561
- Grego F, Lepidi S, Cognolato D, Frigatti P, Morelli I, Deriu GP. Rationale of the surgical treatment of carotid kinking. *J Cardiovasc Surg (Torino)* 2003;44(1):79–85