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Resection of a recurrent cervical internal carotid artery pseudoaneurysm after failed endovascular therapy

Ha Son Nguyen, Akinwunmi Oni-Orisan, Joseph Cochran, Glen Pollock

Department of Neurosurgery, Medical College of Wisconsin, Milwaukee, WI, USA

E-mail: *Ha Son Nguyen - hsnguyen@mcw.edu; Akinwunmi Oni-Orisan - aoni@mcw.edu; Joseph Cochran - jcochran@mcw.edu; Glen Pollock - gpolloc1@hotmail.com
*Corresponding author

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Abstract

Background: Recurrence of a cervical internal carotid artery (ICA) pseudoaneurysm initially treated by endovascular means is rare. We report an instance where a patient returned with a recurrent, enlarging cervical ICA pseudoaneursym, 15 years after initial complete, endovascular occlusion of the ICA.

Case Description: Patient is a 64-year-old male with a history of a right cervical ICA pseudoaneurysm diagnosed 15 years ago after a car accident. At the time, he received endovascular occlusion of his right ICA. Recent serial imaging demonstrated progressive enlargement of his pseudoaneurysm, up to 6 cm × 5 cm × 5.5 cm, without evidence of internal flow or extravasation. Due to dysphagia and hoarseness, resection of the pseudoaneurysm was recommended. Dissection occurred down to the lesion, where its borders were skeletonized. Its stump at the proximal ICA was mobilized and clamped; the lesion was incised and the existing thrombus, as well as the coil mass, was removed. The distal ICA appeared completely scarred with no retrograde filling. There were branches from the external carotid artery that appeared to supply the pseudoaneurysm. The scarred remnant of the distal ICA was sutured and the stump at the proximal ICA was ligated. Once hemostasis was obtained, closure occurred via anatomical layers. Postoperatively, the patient woke up well; at discharge, he exhibited no respiratory distress or dysphagia. At 5 months follow-up, a computed tomography angiography of the neck revealed no evidence for a residual pseudoaneurysm. He continues on lifelong aspirin.

Conclusion: Recurrence of a cervical ICA pseudoaneursym is rare. We caution that such a clinical scenario is possible, even 15 years after endovascular occlusion of the ICA. Branches from the external carotid artery may feed the pseudoaneursym and cause recurrence. This mechanism has not been reported. Perhaps longer clinical follow-up is necessary, especially if endovascular therapy is the initial treatment option.

Key Words: Carotid pseudoaneurysm, endovascular therapy, recurrent pseudoaneurysm

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INTRODUCTION

A pseudoaneurysm of the cervical internal carotid artery (ICA) is uncommon. The most frequent etiology is trauma. Other etiologies include upper respiratory tract infections,[17] prior radiation,[2,7] iatrogenic,[13] postoperative,[6,9,18,20,26] deep neck infection,[4] retropharyngeal abscess,[14,22] and invasive

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fungal sinusitis.[12] Endovascular therapy is the principal option for such lesions.[3,11,23,27-29] Recurrence of a pseudoaneurysm initially treated by endovascular means is rare. We report an instance where a patient returned with a recurrent, enlarging cervical ICA pseudoaneursym, 15 years after initial complete, endovascular occlusion of the vessel.

CASE PRESENTATION

Patient is a 64-year-old male with a history of a right ICA pseudoaneurysm diagnosed 15 years ago after a car accident. At the time, he received endovascular occlusion of his right ICA. Recent serial imaging demonstrated progressive enlargement of his pseudoaneurysm, up to 6 cm × 5 cm × 5.5 cm [Figure 1a-c], without evidence of internal flow or extravasation. His neurological exam remained nonfocal through his evaluations. Once the patient became symptomatic with hoarseness and dysphagia, resection of the pseudoaneurysm was recommended.

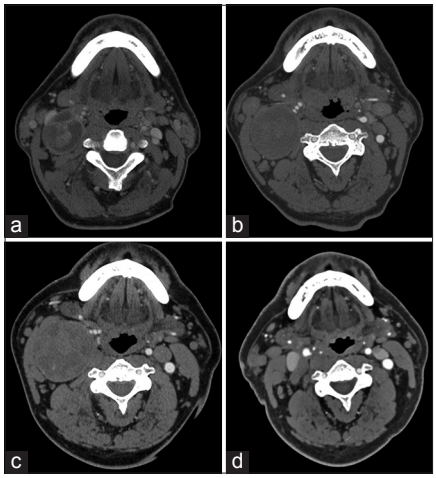

Figure 1: (a-c) Serial computed tomography angiographies demonstrate an enlarging cervical internal carotid artery pseudoaneurysm. (d) Postoperative computed tomography angiography at 5 months revealed no evidence for a residual pseudoaneurysm

An incision was made over the anterior aspect of the sternocleidomastoid muscle. Dissection occurred in the normal fashion, with exposure of the common facial vein, the jugular vein, and the anterior aspect of the sternocleidomastoid muscle. Deeper dissection revealed the large pseudoaneurysm, as well as the common and external branches of the carotid artery [Figure 2a]. Once the two existing branches of the carotid artery were clearly identified, the stump of the pseudoaneurysm was mobilized and clamped as its borders were skeletonized. Subsequently, the lesion was incised and the cavitron ultrasonic surgical aspirator was employed to remove approximately three quarters of the existing thrombus, as well as the coil mass [Figure 2b-e]. A portion of the thrombus was left in place as the distal ICA was mobilized. When it appeared that the pseudoaneurysm was completely bulbous, the rest of the thrombus was removed; this revealed the distal ICA, which was completely scarred with no retrograde filling [Figure 2f-h]. At this point, a large portion of the wall of the pseudoaneurysm was resected to reduce dead space; however, the posterior wall of the pseudoaneurysm was not disturbed, as the vagus nerve was intimately involved with this part of the pseudoaneurysm. There were branches from the external carotid artery that appeared to supply the pseudoaneursym. The scarred remnant of the distal ICA was sutured and the stump of the proximal ICA was ligated. Once hemostasis was obtained, closure occurred via anatomical layers.

Postoperatively, the patient woke up well with a baseline neurological exam; at discharge, he exhibited no respiratory distress or dysphagia. At 5 months follow-up, the patient noted some mild, persistent neck pain, likely from neuropathy due to the surgical dissection. A computed tomography angiography (CTA)

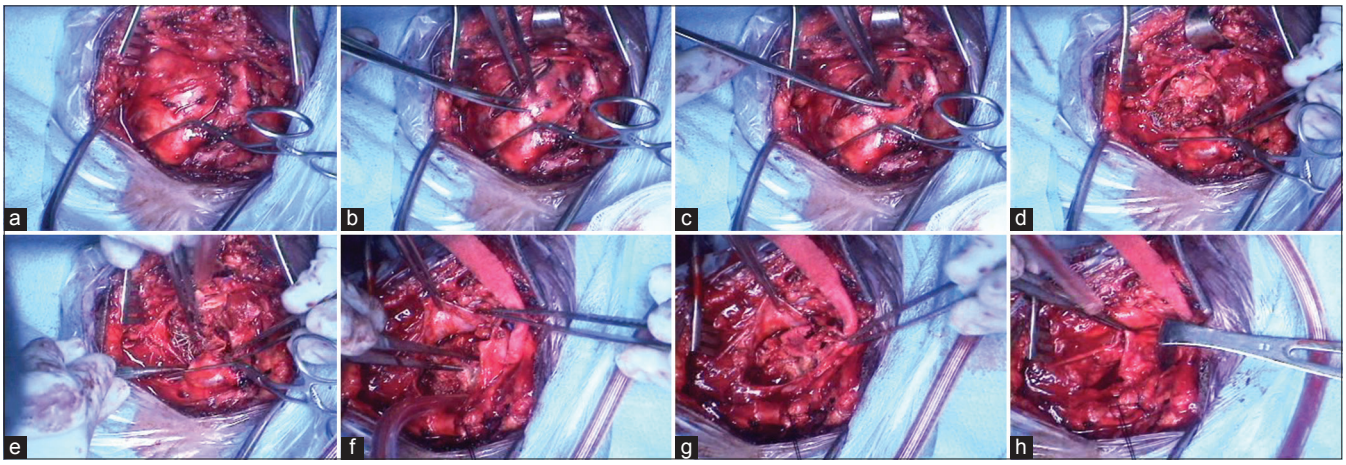

Figure 2: Exposure of the pseudoaneursym, followed by removal of the coiled mass and thrombus (a-h)

of the neck revealed no evidence for a residual pseudoaneurysm [Figure 1d]. He continues on lifelong aspirin.

DISCUSSION

The most common cause of ICA pseudoaneurysm is blunt trauma, where the pathology is under the umbrella term "blunt cerebrovascular injury" (BCVI). The incidence of BCVI ranges between 1.2% and 2.70% of patients with blunt injuries.[23] Various screening tools have been employed to assess trauma patients with potential for associated vascular injury. BCVI may cause neurologic deficits in up to 63% of patients while associated mortality rates can be as high as 15–31%.[29] A pseudoaneurysm may present as a neck mass, with associated bruit, respiratory distress, hoarseness, and dysphagia. Other symptoms include transient ischemic attacks, amaurosis fugax, oral or nasal hemorrhage, neck pain, lower cranial nerve palsies, and Horner's syndrome.[11] CTA is the preferred imaging study for diagnosis of a pseudoaneurysm.[1,23]

BCVI is classified based on severity.[29] The majority of low grade lesions (Grade 1 - irregularity of the vessel wall or luminal dissection with <25% luminal stenosis; Grade 2 - intraluminal thrombus, raised intimal flap, and luminal narrowing more than 25%) resolve on imaging in 7–10 days after injury; however, as much as 40% of Grade 2 lesions progressed to a pseudoaneurysm. High grade lesions (Grade 3 - pseudoaneurysms, Grade 4 - vessel occlusion, and Grade 5 - complete vessel transection with free contrast extravasation) frequently persist, demonstrating a potential for embolic strokes, and subsequently requiring treatment.[29] The treatment goal is to correct the lesion with preservation of the cerebral blood flow. ICA occlusion is an option if the patient passes a balloon test occlusion (BTO) or in the backdrop of life-threatening hemorrhage;[16,25] nevertheless, 5–22% of patients may still sustain an ischemic stroke; moreover, a potential risk is the development of an anterior communicating artery aneurysm due to the crossed flow augmentation.[21] If the patient fails the BTO, an extracranial–intracranial bypass is an option, which can be accompanied by surgical or endovascular entrapment.[15] Resection of the cervical ICA pseudoaneurysm followed by end-to-end anastomosis has also been implemented.[15]

Possible endovascular options include balloon embolization, coil embolization, stand-alone-stenting (typically with a covered stent), stent-assisted coiling, and flow diversion. Various studies have short-term follow-up, typically from 6 months to 2 years.[8,10,19,28,30] The recurrence of an ICA pseudoaneurysm after endovascular vessel occlusion is rare. The literature provides one instance where a patient had recurrent left ICA pseudoaneurysm after coil embolization, which was performed 4 years prior to presentation.[24] Our patient exhibited recurrence 15 years after ICA occlusion. Endovascular therapy was no longer an appropriate option. Based on vascular imaging, there was no flow within the ICA and no extravasation of contrast into the surrounding soft tissue. As such, there was no significant lumen to navigate a catheter for stenting or for embolization. A bypass procedure would not be necessary since the patient had tolerated occlusion of the right ICA for 15 years. Given that his symptoms were related to the mass effect from the pseudoaneurysm, surgical resection appeared fitting. The mechanism behind the recurrence of the pseudoaneurysm is unclear. Typically, a potential mechanism is a slow, progressive dilatation due to intermittent, sluggish retrograde blood flow that may not be detected with current vascular imaging. A related pathology may be recurrent carotid-cavernous fistula after prior ICA ligation, where the ICA is recanalized over time.[5] In our case, the distal ICA appeared well scarred during operative examination. Moreover, there were branches from the external carotid artery that seemed to supply the pseudoaneursym. We believe this supply from these branches lead to recurrence of the pseudoaneurysm; such an etiology has not been described in prior literature.

CONCLUSION

Recurrence of a cervical ICA pseudoaneursym is rare. We caution that such a clinical scenario is possible, even 15 years after endovascular occlusion of the ICA. Branches from the external carotid artery may feed the pseudoaneursym and cause recurrence. Perhaps longer clinical follow-up is necessary, especially if endovascular therapy is the initial treatment option.

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Conflicts of interest
There are no conflicts of interest.

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