Management of a nontraumatic extracranial internal carotid aneurysm with external carotid transposition

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Primary aneurysms of the extracranial internal carotid artery are exceptionally rare, with only a very few reports in the medical literature that are not related to known connective tissue disease or antecedent trauma. The natural history of these entities has not been precisely defined. Nevertheless, the embolic risk that an aneurysm at this location represents mandates prompt intervention when identified. We present the case of a 42-year-old female who was found to have a 3-cm aneurysm of the right extracranial internal carotid artery after seeing a physician for refractory headaches. In an austere environment with limited resources, this patient was successfully managed with the use of external carotid transposition to the distal internal carotid artery, cephalad to the aneurysm. (J Vasc Surg 2010;51:465-7.)

Aneurysms of the extracranial internal carotid artery (ICA) are very uncommon, with only 12 reported cases identified in a recent review of the medical literature.[1] While their rarity precludes the establishment of a precise natural history for these lesions, significant risk for embolic events mandates urgent intervention. As endovascular techniques continue to evolve, their role in this setting can be considered, provided appropriate capabilities are available. Anatomic considerations, however, may confound the safe utilization of such minimally invasive approaches. Surgical options more commonly utilized for other indications can also be effectively adapted for use in addressing aneurysmal disease at this unique location. A spectrum of techniques, including bypass with vein or synthetic grafts, are surgical options. When anatomy permits, however, transposing the external carotid artery (ECA) is an attractive approach that may be associated with better outcomes than other alternatives because of shorter clamp times, all autogenous conduit, and a single anastomosis.

CASE REPORT

We present the case of an otherwise healthy 42-year-old Iraqi female who was referred to the 332nd Air Force Theater Hospital, a remote, semi-fixed combat treatment facility, after a work-up by a host-national physician for persistent headaches revealed a palpable, pulsatile mass of the right neck. Preoperative evaluation revealed no evidence of diabetes, hypertension, or other common artherosclerotic risk factors. She had no previous surgical history. On physical examination, she did have evidence of poor dental condition with a number of chronically carious teeth, but no lymphadenopathy or evidence of soft tissue infection of lymphadenopathy. Computed tomography (CT) of the brain was normal. A subsequent CT with angiography (CTA) of the neck revealed a 3-cm right internal carotid aneurysm that extended from just cephalad of the bifurcation of the common carotid to the C1 vertebral body. The contralateral carotid and vertebral vasculature was normal (Figs 1 and 2). On CTA, the external carotid artery appeared compressed, but of adequate size for use as a bypass conduit. Great saphenous vein (GSV) in the thigh was available if a bypass was required. After a comprehensive discussion with the patient regarding the risk and benefits of surgical intervention, she chose to undergo surgery.

After induction of anesthesia, the patient's jaw was subluxed to provide adequate exposure. Subluxation was achieved by attachment of intradental wire from the ipsilateral mandibular bicuspid to an intradental wire around the contralateral maxillary bicuspid. Subsequent operative exposure revealed no evidence of inflammatory changes or infection. The common carotid artery (CCA) was controlled proximal to the bifurcation and encircled with a Rummel tourniquet (Fig 3). The ECA was likewise dissected free and divided 4 cm distal to the bifurcation after the ICA distal to the fusiform aneurysm was controlled with a vessel loop. No postaneurysm stenosis was noted. After administration of 5000 U of systemic heparin and occlusion a distal stump pressure reading of 65 mm Hg was obtained. The exposed aneurysm contained thrombus, but no evidence of inflammatory or infectious changes. The distal end of the ICA beyond the aneurysm was then sewn to the proximal ECA in an end-to-end spatulated fashion using 7-0 Prolene sutures (Fig 4). Hemostasis was obtained after restoration of flow, and the superficial tissues were closed in layers over a 7-mm drain. The patient underwent additional extraction of several carious teeth by our oral surgeon after completion of the carotid procedure. On awakening from anesthesia in the operating room, the patient was found to be alert and neurologically intact.

The patient was monitored in the intensive care unit overnight without incident. Her drain was removed on postoperative day (POD) #1 and she was transferred to the floor. Normal diet and activity were resumed without event and she was discharged to home POD #2. On subsequent 2-week follow-up in an outpatient

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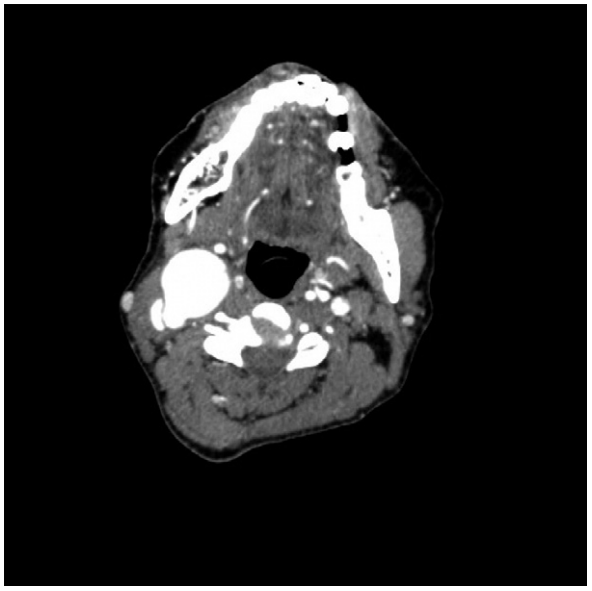

Fig 1. Computed tomography angiography (*CTA*) of the neck showing right internal carotid artery (*ICA*) aneurysm.

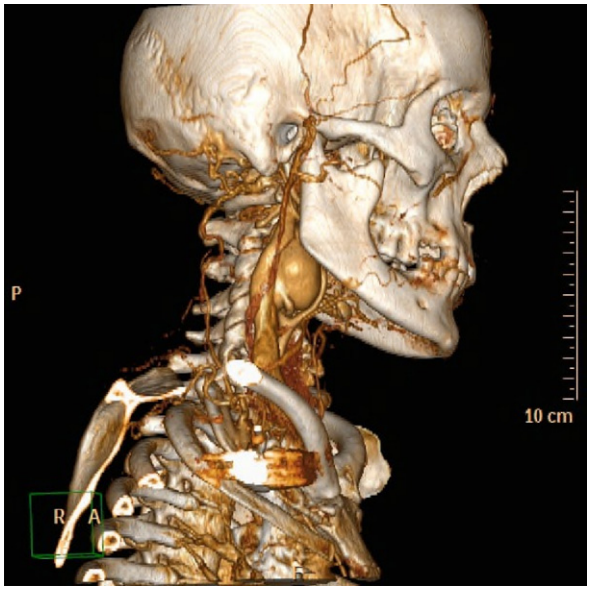

Fig 2. Three-dimensional reconstruction of computed tomography angiography (*CTA*), showing right internal carotid artery (*ICA*) aneurysm.

setting, her wounds were well healed and she remained symptom free. Although imaging capabilities in this austere environment were limited, she was found to have normal flow velocity spectra in the transposed segment and the distal internal carotid artery on duplex ultrasound during the 2-week follow-up appointment.

DISCUSSION

The incidence of true aneurysms of the extracranial ICA is unknown. Although such lesions have been described in the setting of known vasculopathies[2] or as a result of antecedent trauma,[3-5] their finding in the absence of these associations is very rare. In a recent review conducted by the Vascular Group of the Cleveland Clinic Foundation,[1] the investigators were only able to identify 12 reported total cases, including eight from their own facility over a 17-year period. Among these, presenting symptoms included such complaints as dysphagia and hoarseness. The majority, however, proved asymptomatic. In our case it was difficult to determine if the patient's symptoms were indeed a sequela of her aneurysm or if they resulted from the

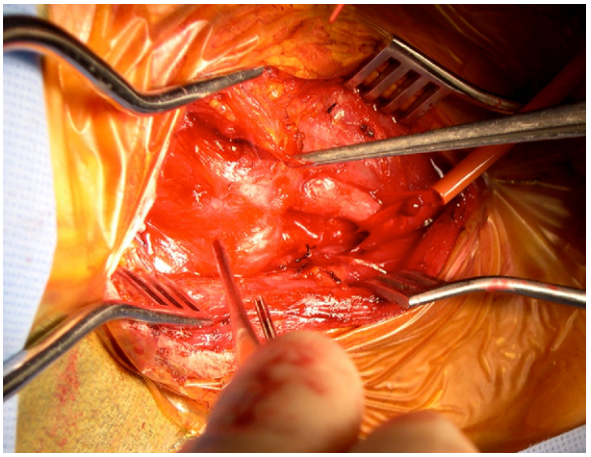

Fig 3. Dissection showing Rummel control of common carotid and ongoing dissection of external carotid artery (*ECA*) and internal carotid artery (*ICA*) aneurysm (*head is to the left of the photo*).

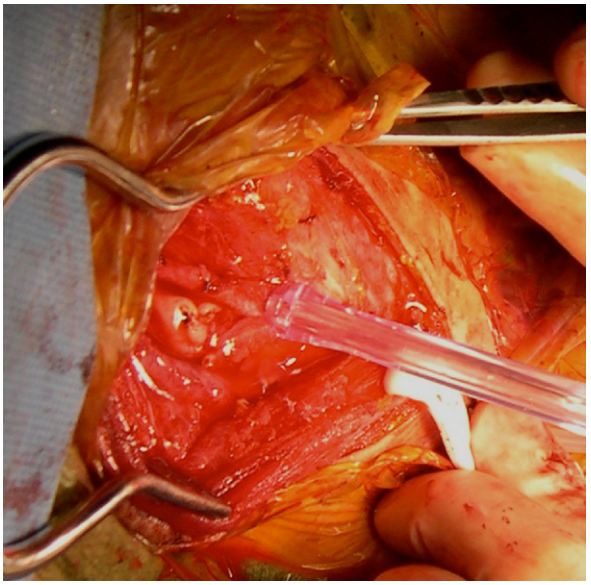

Fig 4. Completed external carotid artery (*ECA*) to internal carotid artery (*ICA*) bypass with end-to-end anastomosis (*head is to the left of the photo*).

discomfort associated with the severely decomposed teeth she harbored in her upper jaw on arrival.

As with aneurysms at other peripheral locations, the primary risk associated with ICA aneurysms is that of embolic events. Concern for impending transient ischemic attack or stroke, subsequently, dictates the need for urgent intervention. Therapeutic options include endovascular stenting and a variety of possible surgical approaches.

Endovascular interventions require conducive anatomy and a skilled provider armed with the correct equipment to facilitate successful treatment via this modality. Using this approach one must also be concerned with the possibility that the vessel of the patient may continue to undergo age-related growth or dilation around the inserted device. In addition, despite increasing experience with the use of endovascular techniques for atherosclerotic, thrombotic[6] and post-traumatic lesions,[7] there exists no significant experience with the use of endovascular techniques in the treatment of ICA aneurysms. Subsequently, follow-up guidelines and the role of postprocedure anticoagulation/antiplatelet use have not been well validated.

Possible surgical approaches for the treatment of ICA aneurysms include bypass using synthetic or native saphenous vein graft and external carotid transposition. Transposition has been effectively utilized in the treatment of vascular pathologies of various arterial positions,[8-12] including the internal carotid artery.[13-16] When anatomical concerns permit, the ECA is an attractive option because it eliminates the need for vein harvest or the use of synthetic materials. The need for prolonged antiplatelet or anticoagulant therapy is also mitigated with ECA use. In the described case, the ECA proved an excellent size match and the patient was able to be discharged to home without anticoagulation or anti-platelet therapy on POD #2.

CONCLUSION

Extracranial aneurysms of the ICA are rare and represent a challenging management dilemma. Their considerable risk for embolic risk mandates prompt surgical intervention. ECA transposition represents an excellent option for management, especially in an austere environment that negates the need for subsequent antiplatelet or anticoagulation therapy and can be performed safely and expeditiously.

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