CASE REPORT

**Bilateral Extracranial Carotid Artery Aneurysms Treated by Staged Surgical Repair**

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**Introduction:** Bilateral extracranial carotid artery aneurysms (ECAAs) are very rare. The case of a patient with bilateral ECAA who underwent staged surgical repair is reported.

**Report:** A 35 year old man was referred with a slow growing pulsatile neck mass causing mild discomfort. Computed tomography and duplex ultrasound showed a right ECAA, with a 3.0 cm diameter 5 cm long true aneurysm, and a left ECAA, with 2.1 cm diameter 4.5 cm long true aneurysm. In two stages, both aneurysms were excised and bypassed with an interposition graft using saphenous vein.

**Discussion:** ECAAs are rare with an incidence of about 4% of all peripheral aneurysms. Selection of treatment options is largely dependent on the aneurysm anatomy, including size and length. During open repair, it is important to avoid nerve injury.

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INTRODUCTION

Extracranial carotid artery aneurysms (ECAAs) are rare and account for 0.4—1% of all arterial aneurysms and about 4% of all peripheral arterial aneurysms. Surgical treatment of the ECAA is required in most cases because of the high risk of fatal complications related to embolisation, rupture, and local compression.

A case of bilateral ECAAs presenting with parapharyngeal pulsatile masses that were treated by staged surgical repair within 1 month of the diagnosis is reported.

CASE REPORT

A 35 year old man was referred with a slow growing pulsatile neck mass that caused mild discomfort. He had no history of vasculopathy, neck trauma, or other events that might have precipitated the development of the aneurysms. The palpable mass was prominent below the angle of the mandible.

There was a two year history of hypertension and hyperlipidemia but no medical treatment had been prescribed. There were no oral or genital ulcers. The erythrocyte sedimentation rate was 39 mm/hour (normal range 0—15 mm/hour), and the C-reactive protein level was 0.18 mg/L (normal range 0—0.5 mg/L). Blood tests for vasculitis were normal.

A duplex scan and computed tomography angiogram revealed a right ECAA, 3.0 cm in diameter with a 5 cm long true aneurysm, and a left ECAA 2.1 cm in diameter with a 4.5 cm long true aneurysm (Fig. 1A).

It was decided to remove both aneurysms and create a bypass with an interposition graft using the saphenous vein in two stages. The right carotid aneurysm was larger and had more intraluminal thrombus than the left, so the right ECAA was selected for treatment first. Under general anaesthesia, the aneurysm was exposed through a T-shaped, curvilinear incision that extended from the mastoid tip to the mid-neck. After elevation of the subplatysmal flap, the contents of the submandibular fossa were dissected and exposed up to the level of the mylohyoid muscle. The sternocleidomastoid fascia was incised, and the internal jugular vein and ECAA were dissected. Care was taken to preserve the hypoglossal and vagus nerves. The posterior belly of the digastic muscle and stylohyoid ligaments were divided to ensure adequate exposure.

During dissection, aneurysm manipulation was minimised to prevent embolisation of the luminal thrombus. After injection of heparin (3,000 IU intravenously), the internal, external, and common carotid arteries were encircled and clamped. The external carotid artery (ECA) was resected and ligated with sutures because of aneurysmal change. After opening the internal carotid aneurysm, a carotid shunt was inserted between the common carotid artery and the distal internal carotid artery (ICA) (Fig. 2A). After removal of the carotid aneurysm sac, a bypass with an interposition graft was created with autologous saphenous vein (Fig. 2B).
The patient recovered without any serious complications. One month after the first operation, a second operation for the left ECAA was performed using the same procedures as in the first operation. Post-operative computed tomography angiography revealed patent grafts 1 year after the second operation (Fig. 1B). Pathological examination of the aneurysm sac revealed atherosclerotic change without any evidence of vasculitis or fibromuscular dysplasia (Fig. 2D).

DISCUSSION

ECAAs are rare with an incidence of about 4% of all peripheral aneurysms. ECAAs are more commonly observed in males, with a male to female ratio of 2:1. The affected population has a wide age range (18–70 years). Of all ECAAs, 46–70% are related to atherosclerosis and other causes, including fibromuscular dysplasia, trauma (cervical trauma and hyperextension of the neck), iatrogenic lesions, infection, congenital defects, irradiation arteritis, Behçet disease, and Ehlers–Danlos syndrome.

The most frequent site of ECAAs is the common carotid artery, particularly its bifurcation, and the proximal ICA. Rosset et al. reported 27 cases (6.2%) of bilateral ECAAs from 434 ECAAs.

Selection of treatment options largely depends on the aneurysm anatomy including size and length. Operative options include resection with patch repair and resection with interposition. The preferred surgical technique is resection of the aneurysm with restoration of anatomical

Figure 1. Computed tomography angiography shows a right extracranial carotid artery aneurysm (ECAA), with a 3.0 cm diameter, 5 cm long true aneurysm, and a left ECAA with a 2.1 cm diameter, 4.5 cm long true aneurysm (A) (arrows). Post-operative computed tomography angiography shows a patent graft one month after the second operation without aneurysmal dilatation (B).

Figure 2. Operative image shows a true aneurysm with intramural thrombus after application of an intraluminal shunt (A), reconstruction of the right internal carotid artery (ICA) with autologous great saphenous vein after resection of the right extracranial carotid artery aneurysm (B) and reconstruction of the left ICA with autologous great saphenous vein (C). Pathological examination of the surgical specimen revealed atherosclerotic change with no vasculitis or fibromuscular dysplasia (D).
continuity with end to end anastomosis or interposition graft. Autogenous vein is advocated as the graft of choice. However, Faggioli et al. recommended the use of a Dacron or polytetrafluoroethylene graft because of recurrent postoperative aneurysmal changes after vein graft. Aneurysmal dilation and fibrous degeneration are the major limitations to the use of autogenous vein as an arterial graft. In young patients, autogenous vein was preferred because of the good patency rate. If vein is not available, autogenous arteries, such as the radial, femoral, and hypogastric arteries, can be used.

If the distal ICA cannot be clamped because of a high lesion, the artery can be controlled internally with a Fogarty catheter, a T-shunt, or an appropriately sized olive-tipped metal dilator. Distal exposure of high ICA aneurysms can be facilitated by sectioning the digastric muscle via mastoidectomy with detachment of the sternocleidomastoid muscle from the mastoid process, or often via anterior subluxation of the mandible.

Endovascular treatment with coil embolisation or covered stent placement has also been described and is being used with greater frequency. Endovascular repair may represent a minimally invasive alternative for these difficult access aneurysms. The risk of intracranial embolisation can be limited by using a semi-closed technique with controlled back bleeding from the ICA aneurysm during endograft deployment. Although these newer options have shown promise, associated complications have also been reported, and data on long-term results are not available. Treatment should, therefore, be individualised to the patient’s anatomy and overall medical condition.

Peripheral nervous system complications after surgery with dissection of the hypoglossal nerve have been described by some authors. These complications usually regress after a few months but are permanent in 2.6–5.5% of patients. Therefore, nerve injuries should be avoided during dissection of these aneurysms.

CONFLICT OF INTEREST
None.

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