CASE REPORT

Carotid artery aneurysm: last among equals

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SUMMARY

A 66-year-old man presented initially with a swelling in the left side of the neck, which was confirmed to be a carotid artery aneurysm on ultrasonography. He was subsequently admitted reporting intermittent episodes of visual loss in the left eye and right arm weakness. Further imaging confirmed multiple, small acute infarcts in the left cerebral hemisphere. The patient underwent open repair of the aneurysm and made an uncomplicated recovery with no persisting neurological deficit.

BACKGROUND

It is not uncommon for patients with neck swellings, particularly if they appear to be pulsatile, to be referred for vascular review, but carotid artery aneurysms are actually uncommon, with a reported incidence of <1%. Their treatment accounts for 0.2–0.5% of all carotid surgeries.^{1 2} In our centre, the ultrasound department receives 10–15 referrals annually for assessment of a neck lump to exclude carotid artery aneurysm, yet this is our only positive diagnosis in the past 5 years. Pulsatility in neck swellings is more usually due to transmission of the carotid pulsation through an overlying mass or a result of vessel tortuosity.

Aneurysm of the extracranial carotid artery can be defined as a localised increase in vessel calibre of more than 50% compared with the reference value; at the level of the carotid bulb, the diameter of the normal vessel would be expected to be in the region of 10 mm.³

CASE PRESENTATION

A 66-year-old man presented to his general practitioner having been aware of an increasingly prominent lump in the left side of his neck for 6 weeks. The patient denied cerebrovascular symptoms and, other than a neck ultrasound, declined further investigation or treatment. One month later, he developed a transient history of left visual field disturbance and right arm weakness.

His extensive medical history suggested a background of vascular disease; 19 years previously, he had undergone a left femoropopliteal artery bypass using an autologous long saphenous vein, which was complicated by a deep vein thrombosis. He had also previously had a right cerebral hemisphere transient ischaemic attack 10 years earlier, with episodic weakness of the left arm and leg. A CT scan of the brain at that time showed small lacunar infarcts. Carotid artery Duplex ultrasonography had shown marked intimal thickening with a moderate amount of heterogeneous plaque in the left common carotid artery and minimal intimal

thickening with moderate heterogeneous plaque in the right common carotid artery. He was started on aspirin and dipyridamole. He was diagnosed with an inferoseptal myocardial infarction 6 years earlier; the coronary artery disease was subsequently bypassed. After recovering from the myocardial infarction, he underwent right common iliac artery thrombectomy, common femoral endarterectomy and a right-to-left femorofemoral crossover bypass graft for critical leg ischaemia.

The patient was a treated hypertensive, and also suffered chronic lower urinary tract obstructive symptoms secondary to benign prostatic hyperplasia. At the time of presentation, the patient was a heavy smoker of 20 cigarettes per day, with a 45-year history. He was not known to have diabetes and was already prescribed clopidogrel, simvastatin, omeprazole, paracetamol, finasteride, zopiclone and nicotine patches.

On physical examination, there was an easily palpable, pulsatile mass in the anterior triangle of the left side of the neck. There was a demonstrable visual field defect in the superior half of the left eye with normal vision in the right eye. Neurological examination of the limbs revealed reduced motor power, 4/5 on the Medical Research Council scale, in the right arm only. Funduscopy by an ophthalmologist revealed the left eye visual defect to be secondary to multiple emboli in the retinal arterioles.

INVESTIGATIONS

Initial ultrasonography performed to investigate the neck swelling revealed a left carotid artery aneurysm with a diameter of 17 mm, which was lined with a chronic-appearing thrombus. On a subsequent CT angiogram when the patient presented with ischaemic neurological symptoms, there was confirmation of the earlier ultrasound findings: significant dilation of the carotid bulb lined with a thick 'rind' of thrombus. Conversely, the left internal carotid artery itself was relatively spared, with only a minor stenosis at its origin. The right carotid bulb was also slightly dilated at 13 mm but with less thrombus load. An MRI of the brain showed multiple left-sided anterior and posterior circulation territory acute infarcts with the incidental finding of a right middle cerebral artery aneurysm.

DIFFERENTIAL DIAGNOSIS

Differential diagnosis of a pulsatile neck mass:⁴

- ▶ Carotid artery aneurysm
- ▶ Tortuosity of the carotid artery
- ▶ Cystic hygroma
- ▶ Neoplastic mass
- ▶ Peritonsillar abscess

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- ▶ Castleman disease
- ▶ Branchial cyst

TREATMENT

At the time of presentation with neurological symptoms, the patient was started on aspirin 300 mg daily. He underwent expedited repair of the left carotid artery aneurysm (figure 1), under a general anaesthetic, using a synthetic, re-enforced polytetrafluoroethylene conduit. Open surgery was carried out due to the high risk of emboli migrating to cause a stroke. The conduit was threaded over the distal limb of an intraoperative Pruitt-Inahara shunt (figure 2), around which the anastomoses were completed in order to maintain ipsilateral cerebral perfusion during the procedure. The shunt was removed before completing the proximal anastomosis. Having restored flow from the common carotid artery proximally to the internal carotid artery distally, excluding the aneurysm, the origins of the external carotid and superior thyroid arteries were ligated; the rich collateral vascular supply mitigates any risk of ischaemic complications (figure 3). The patient made a satisfactory recovery and remained free of further cerebrovascular ischaemic events. Dual antiplatelet therapy with aspirin and clopidogrel was started on the first postoperative day.

OUTCOME AND FOLLOW-UP

On review at 6 weeks, the patient had persisting right arm weakness but normal visual fields and no new neurological deficits. He was referred to neurosurgery for consideration of his right middle cerebral artery aneurysm.

DISCUSSION

The patient had suffered thromboembolism from the thrombus lining the left carotid artery aneurysm and was at risk of further, potentially more devastating cerebrovascular events. The

Figure 1 Carotid artery aneurysm dissected. CCA, common carotid artery; ECA, external carotid artery; ICA, internal carotid artery.

Figure 2 Placing of the re-enforced polytetrafluoroethylene graft over the Pruitt-Inahara shunt. CCA, common carotid artery; ICA, internal carotid artery.

indication for intervention beyond best medical therapy was to reduce the risk of further embolic events, analogous to the indication for carotid endarterectomy in the treatment of symptomatic, significant carotid stenoses. Unlike carotid stenosis, however, extracranial carotid artery aneurysms are a rare source of thromboembolism, in addition to being a rare cause of neck swelling, with an incidence of <1%. There is, therefore, a paucity of evidence to inform the natural history of carotid artery aneurysms or to guide clinicians in their optimal management strategy. Medical, open surgical and endovascular approaches have all been advocated. Open surgery remains the 'gold standard' treatment for symptomatic aneurysms; endovascular solutions have been described in small case series only.

A review of 67 carotid artery aneurysms in 65 patients managed with open surgery over a 35-year period at the Texas Heart Institute reported an overall postoperative mortality and/or major stroke incidence of 9%, although the group included postoperative pseudoaneurysms and traumatic aneurysms as well as atheromatous aneurysms. In the subgroup of 23 patients who underwent open surgery for atheromatous aneurysms, 1 patient had a perioperative myocardial infarction, 3 patients experienced cranial nerve deficits and 1 patient suffered a postoperative stroke. The authors concluded that surgical treatment is of benefit in reducing the risks of cerebral ischaemia from thromboembolism and of preventing aneurysm rupture.⁵

There have been comparisons of endovascular techniques (stent graft exclusion, stent placement with coil exclusion or endovascular balloon exclusion) with open repair (resection and interposition graft, resection and patch angioplasty or carotid ligation), but individual series tend to be small and vary in their

Figure 3 Final position of the re-enforced polytetrafluoroethylene graft after anastomosis. CCA, common carotid artery; ECA, external carotid artery; ICA, internal carotid artery.

approach and outcome measures; none have mid-term or long-term follow-up. In one retrospective review of 42 patients with extracranial carotid artery aneurysms, 14 patients were treated with an endovascular approach while the remainder underwent open surgery (17 resection of the aneurysm and interposition bypass grafting, 6 resection of the aneurysm and patch angioplasty, 5 carotid artery ligation). In the endovascular group, there were significantly fewer cranial nerve injuries, wound complications and lower 30-day stroke and death rates as well as shorter hospital stays.² Despite this, in the most extensive contemporary review of the scarce literature, which encompassed a total of 1239 patients, Welleweerd *et al*⁶ concluded that it probably is reasonable to consider intervention for carotid artery aneurysms, particularly if they are symptomatic, and that there are actually low numbers of procedure-related strokes following either surgical or endovascular intervention. They noted that the literature is mired by small case series, heterogeneity of

study design, missing data and likely publication bias. They recognised that given the unclear natural history and the lack of an evidence base by which to guide management, there was a need for an international registry, which has been established in the Netherlands (<http://www.carotidaneurysmregistry.com>). Clinicians are encouraged to submit data for all extracranial carotid artery aneurysms electronically.

Learning points

- ▶ Carotid artery aneurysms are an uncommon cause of neck swelling—pulsatility of neck masses is more usually due to transmission through an overlying structure or to vessel tortuosity.
- ▶ The natural history of carotid artery aneurysms is not clear, but intervention is probably indicated where neurologically ischaemic events can be attributed to the ipsilateral vessel.
- ▶ The optimal intervention remains the subject of debate, although periprocedural risks are probably low with either open surgical or endovascular techniques.
- ▶ An international registry of carotid artery aneurysms has been established in the Netherlands with the aim of systematically improving understanding of this rare condition and how best to manage patients (<http://www.carotidaneurysmregistry.com>).

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