Treatment of a Recurrent Internal Carotid Artery Pseudoaneurysm with the Wallgraft Endoprosthesis

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Summary

The use of covered stents to treat traumatic carotid artery pseudoaneurysms is increasingly being documented. Adjunctive antiplatelet therapy is mandatory. We present a case of bilateral traumatic carotid artery pseudoaneurysms in which antiplatelet therapy was contraindicated at presentation, thereby dictating alternative treatment with coil embolization alone. Subsequent aneurysmal recurrence was successfully treated with the Wallgraft prosthesis. The literature on the use of the Wallgraft prosthesis for the treatment of carotid artery pseudoaneurysms is also reviewed.

Introduction

In recent years there have been a number of reports describing the use of endovascular techniques for the treatment of traumatic carotid artery pseudoaneurysms¹⁻⁸. Covered stents have gained interest due to their ability to completely obliterate the aneurysm whilst maintaining patency of the parent vessel. We describe an unusual case of a patient with bilateral carotid artery pseudoaneurysms in whom antiplatelet therapy was contraindicated at the time of presentation. This precluded the use of a stent in the initial management and both aneurysms were initially treated with coil embolization. Recurrence of one of the aneurysms

four months later when anticoagulation was no longer contraindicated led to successful treatment with the Wallgraft prosthesis.

Case Report

A 22-year-old man with a history of depression and anxiety disorder shot himself with a pistol crossbow weapon which fired short bolts into his right temporal region, neck and chest. Over the next two days he became confused and lethargic and presented to his general practitioner with a frontal headache. He was subsequently referred to his local hospital where on examination he was pyrexial and photophobic with a Glasgow Coma Scale of 14, hyperreflexic on the left side but with no other focal neurology. He had multiple wounds to both temples and either side of his neck with associated soft tissue swelling. Computed tomography (CT) of the head revealed a crossbow bolt traversing the cerebral parenchyma of both frontal lobes with fractures of the overlying frontal bones bilaterally. CT of the neck showed bilateral pseudoaneurysms of the right external carotid artery (ECA) and left internal carotid artery (ICA) at the level of the angle of the jaw.

The patient was referred to our institution for further management. Surgery was performed to remove the intracranial foreign body, and a subsequent CT showed intraparen-

Figure 1 CT head (23/10/02): demonstrates a crossbow bolt within the parenchyma of both frontal lobes.

chymal haematoma along the crossbow tract. Cerebral angiography demonstrated a boot-shaped aneurysm arising from the right ECA at the origin of the maxillary artery and a further moderately wide-necked pseudoaneurysm arising from the left mid-cervical ICA. The ICA aneurysm was considered to be an ideal candidate for endovascular stent insertion. However this would necessitate antiplatelet therapy which in the presence of intracranial haemorrhage was contraindicated in this patient. Coil embolization alone was considered a suitable alternative; in addition it was the treatment of choice for the ECA aneurysm.

A 7 Fr sheath was introduced into the right common femoral artery. The patient received systemic anticoagulation with heparin. A 5 Fr guiding catheter was advanced into the proximal right external carotid artery and following selective catheterisation of the aneurysm with a microcatheter (Fast 18 MX; Boston Scientific), a single 7 mm x 30 cm GDC 2D coil was deployed. A similar technique was used for deployment of the first coil (8 mm x 20 cm ACT

Figure 2 CT head (23/10/02): following removal of crossbow bolt. Intraparenchymal hematoma is identified along the tract of the crossbow.

Figure 3 CT head (11/11/02): ring-enhancing lesion in the right frontal lobe at the site of the previous foreign body.

spherical microcoil, Vascular Innovations) into the left ICA pseudoaneurysm. A different catheter (Excelsior, Boston Scientific) was used to deploy the second coil (2D 6 mm x 20 cm GDC). Immediate angiography showed good coil packing of both aneurysms with no evidence of coil extension into the parent vessel lumina. The patient made an uneventful post-operative recovery and was discharged to his local hospital four days later. After a further eight days he was readmitted with increasing lethargy and pyrexia. CT revealed a ring enhancing mass along the trajectory of the cross-bow in keeping with an abscess. This was subsequently aspirated and the patient was discharged without complications.

Follow-up angiography at three months showed complete occlusion of the right external carotid artery aneurysm, but in addition, considerable regrowth of an irregular neck of the left ICA aneurysm. Endovascular covered stent insertion was now both a feasible and appropriate therapeutic option. If this method were to fail, complete balloon occlusion of the proximal left internal carotid artery would be attempted. Anticoagulation consisted of clopidogrel 300mg prior to, and 5000 units heparin during the procedure. Bilateral femoral artery punctures were performed. Following placement of a 5 Fr guiding catheter into the proximal left ICA, and Amplatz ultrastiff guide wire (Boston Scientific) was passed across the lesion. A covered 6 mm x 3 cm endovascular stent (Wallgraft, Boston Scientific) was deployed across the aneurysm neck under road map guidance.

Post-procedural angiography confirmed complete exclusion of the aneurysm. The patient made an uneventful recovery and was discharged two days later on Clopidogrel 75 mg daily. Follow-up angiography performed four months later showed persistent complete occlusion of both aneurysms, with patency of the stented segment of the left ICA. These findings persisted on carotid duplex ultrasound at six months.

Discussion

Pseudoaneurysms of the extracranial ICA are rare. Trauma, both penetrating and blunt, has become an increasingly frequent cause, with series reporting incidences of up to 16% of all ICA aneurysms⁹. Transmural carotid dis-

Figure 4 Angio: Lobulated aneurysm arising from the right external carotid artery just above the level of the angle of the mandible.

Figure 5 Angiogram: Lobulated aneurysm arising from the L ICA at the level of the angle of the mandible.

Figure 6 A,B) Angiogram: Appearances post coiling show complete obliteration of both aneurysms.

ruption leads to the formation of a periarterial haematoma, the centre of which becomes a cavity that communicates with the arterial lumen. Surrounding tissues undergo a fibrotic reaction resulting in containment of the pseudoaneurysm¹⁰. Due to the rarity of the condition, the natural history of carotid pseudoaneurysms that are specifically a result of penetrating trauma is unclear. However, outcomes in patients with dissection related aneurysms due to blunt trauma show a low incidence of spontaneous resolution on conservative management¹¹. Thromboembolic complications are also well described^{9,12,13} and may manifest some time after the initial traumatic event¹⁴. Therefore obliteration of the aneurysm is the ultimate aim of successful treatment. Surgical techniques may involve extreme manoeuvres such as mandibular dislocation or resection to achieve adequate exposure of the ICA, and are fraught with a risk of cranial nerve injury. Thus an endovascular approach has developed as a favourable alternative and a variety of techniques are described.

These include permanent balloon occlusion of the proximal ICA¹⁵, coil embolization of the aneurysm¹, uncovered stent placement in the parent artery² and combined treatment with stents and coils³. The latter technique is of particular benefit in the treatment of wide-necked aneurysms, as the stent not only alters flow dynamics within the aneurysm but also serves as a scaffold for tighter aneurysmal coil packing. Nevertheless, the possibility of latent aneurysm recanalisation remains due to its persisting communication with the vessel lumen. This has led to the more recent use of covered stents.

To the best of our knowledge there have been seven reports describing the use of the Wallgraft prosthesis for the treatment of carotid artery pseudoaneurysms of varying aetiologies in a total of 14 patients^{4-8,16,17}. Clinical follow up was performed in all patients and ranged from one month to two years. Neurological symptoms were absent in all but one patient who developed a stroke due to a stent occlusion at five months. Ultrasound or CT fol-

Figure 7 Angiogram: Repeat angiogram four months later shows recurrence of the aneurysm at the L ICA.

Figure 8 Angiogram: Angiogram shows appearances post stent insertion at the L ICA.

low up ranging from four to 20 months was performed in six patients, and demonstrated a widely patent endograft lumen with resolution of the pseudoaneurysm.

Angiography was performed in two patients and showed 50% and 75% ICA stenoses at ten and seven months respectively. It is known that inflammatory wall changes and neointima formation occur following covered stent placement. However ovine studies have shown that these changes do not interfere with patent lumen areas¹⁸. Nevertheless such reports, albeit in small numbers, highlight the need for adequate peri- and post-procedural anticoagulation. There is ongoing debate regarding the exact dosage and length of anti-platelet therapy after stent placement. Current practice relies on data on management of coronary stents in which clopidogrel has shown to be both well tolerated and highly effective at minimising the risk of stent thrombosis¹⁹.

Our case illustrates a successful management approach for treatment of a relatively wi-

de-necked traumatic ICA pseudoaneurysm in a patient in whom antiplatelet therapy was contraindicated at the time of presentation. It was predicted that treatment of the aneurysm solely with coil embolization would lead to a high risk of recurrence, and there was the added potential for displacement of coils into the parent artery.

However it was felt that the benefits of temporary aneurysmal obliteration at the least would outweigh the risks of rupture or thromboembolic events arising from an untreated aneurysm.

In addition, coil embolization of the left ECA aneurysm in which the morphology was more conducive to such a treatment, could also be performed. Vigilant follow up with angiography enabled early detection of aneurysmal recurrence, and the preferred treatment of covered stent insertion was then instituted and was shown to be successful in achieving complete obliteration of the recurrent pseudoaneurysm.

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