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Case Report
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Endovascular Repair of Carotid Artery Pseudoaneurysm

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Abstract

Arterial Pseudoaneurysms (PA) lack all three layers of the arterial wall that include the intima, media, and adventitia [1]. PA is most commonly seen after injuries to the artery in the form of blunt trauma and puncture and is less common after surgeries such as Carotid Endarterectomy (CEA) [1]. PA of the carotid artery is a very uncommon complication following CEA with an incidence of less than 1% of cases [2,3].

Introduction

The etiology of PA formation includes bunt trauma, suture failure, degeneration of arterial wall, or patch material and infection [4,5]. Infection as a cause of carotid PA is uncommon as the incidence of post-CEA infection is as low as 0.025% to 0.625%; this is mostly caused by *Staphylococci* [6-8]. In some cases, endovascular repair of PA may be the only hope for the patients, who are not surgical candidates. We describe our experience of endovascular repair of carotid PA here.

Case Presentation

The patient was a 71-year-old Caucasian male with past medical history of hypertension, obesity, hypercholesterolemia, and left CEA twice, with the first event eight years before current presentation and the second event on the same side three years earlier due to restenosis with core matrix patch. The patient presented with a neck mass that was pulsatile on examination, and first duplex was performed that showed aneurysmal dilatation of the left carotid artery. CT angiogram showed an aneurysmal dilatation of a portion of the left internal carotid artery and distal common carotid artery. An aneurysm measured 3.2 cm x 2.7 cm (Figure 1). Surgical intervention was considered but discounted due to the history of two previous carotid surgeries, old age, and obesity. The decision was made to proceed with an endovascular approach after ruling out infection and receiving informed consent from the patient.

First, a diagnostic angiogram was performed. The right common femoral artery was accessed with amodified Seldinger technique using a micropuncture wire, and access was closed with a Perclose. A pigtail catheter was placed in the arch of the aorta and images were obtained. Left common carotid artery was a large caliber vessel, the patent in the proximal segment. Selective cannulation of the left common carotid artery was performed using a Wilson catheter and images were obtained that showed left common carotid artery is a large caliber vessel. The distal segment showed evidence of an aneurysm which appeared to be pseudoaneurysm based on angiographic appearance. The flow lumen measured up to 3 cm. The aneurysm length was 43 mm. There was no evidence of any extravasation. It was decided to coil embolize the external carotid artery and then perform covered stent placement of the standard, internal carotid artery with a self-expanding wire band stent at a later date.

Endovascular Repair Procedure

Again, the patient was brought to the catheterization laboratory. The groin was cleansed bilaterally and prepped in a sterile fashion. The aortic arch and the right common femoral artery was accessed with a modified Seldinger technique using a micropuncture needle, and a pigtail catheter was placed in the arch of the aorta. Subsequently, imaging was obtained. The left internal carotid artery was cannulated with a 0.035-inch wire; it was made to cross the aneurysm of the internal carotid artery itself. Over a stiff wire, the 5-French sheath was removed,and a 7-French destination sheath was placed. After the distention sheath was placed in the common carotid artery, the external carotid artery was cannulated with a microcatheter and coil embolization was performed. The internal carotid artery was wired with 0.014-inch wire, and a 0.035-inch wire was placed after confirming the size of the internal carotid artery with intravascular ultrasound and the size of the

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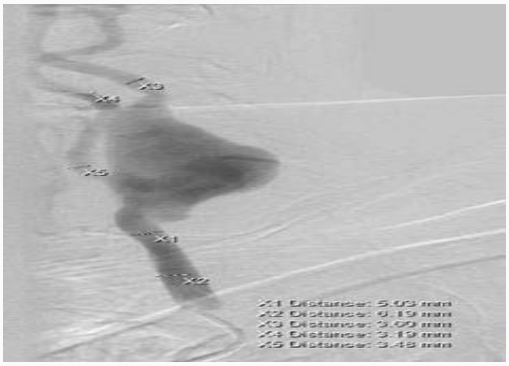

Figure 1: PA before Repair.

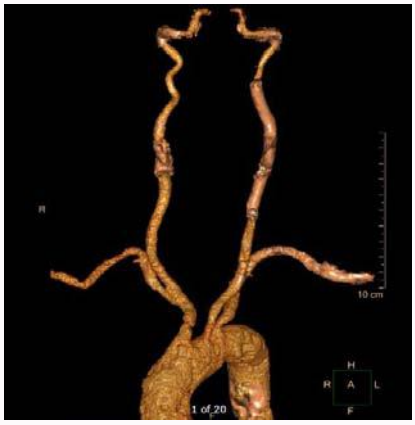

Figure 2: After Procedure with Exclusion of PA (3D model).

Figure 3: After Procedure with Exclusion of PA (Cross View of PA).

common carotid artery with intravascular ultrasound. A decision was made to place a long wire band stent to cover the internal carotid artery extending into the external carotid artery. Post-dilatation was performed only at the landing zones. Final angiography showed complete exclusion of an aneurysm with graft replacement with a covered stent from the internal carotid artery extending into the common carotid artery. The patient tolerated the procedure well without any complication (Figure 1-4).

Discussion

Patching of Carotid Endarterectomy (CEA) is a standard technique frequently performed to prevent early perioperative stroke and late

Figure 4: After Procedure with Exclusion of PA (Cross View of PA 2).

Figure 5: After Procedure with Exclusion of PA (Cross View of PA 3).

recurrent stenosis. The use of autologous venous tissue has been the gold standard for patching after CEA. However, bioengineered synthetic and bioprosthetic patches have been developed in an attempt to reduce postoperative thrombosis and recurrent stenosis. PA is not an infrequent complication of bioprosthetic patches, CorMatrix is a porcine small intestinal submucosa derived patch associated with 10% incidence of PA. Previously, open surgical management was the only surgical approach for treating carotid PA, with significantly higher reported mortality and morbidity rates than those obtained in primary interventions [10], while possibly leading to a high rate of cranial nerve injury [11]. With the worldwide diffusion of less invasive techniques in vascular surgery, an endovascular approach has also been attempted in patients with carotid trauma and pseudoaneurysms. The first experiences indicated satisfactory results regarding technical and clinical success [12-15].

Our patient did well after the endovascular repair. We suggest utilizing dual antiplatelet medications as a treatment strategy after the endovascular repair with clopidogrel and aspirin. Duration of dual antiplatelet treatment is unclear, and further studies are needed to find the same period of dual antiplatelet therapy. We suggest 12 months for dual antiplateletstherapy and then aspirin only. We also recommendthat the endovascular approach for the PA should be offered to the patients with surgical history in carotid PA. We also suggest that further studies should be done to find the exact etiology of PA formation.CTA is a useful initial imaging modality for stent and PA surveillance. However, duplex is the imaging method of

choice for annual surveillance if the stent is not obscured by the skull base or thoracic inlet. Further studies are needed to see what imaging will be standard of care for surveillance of PA.

Conclusion

Carotid PA after CEA is rare with an incidence of 0.37%. It is a severe condition requiring urgent treatment to prevent possible complications. Case reports have shown infection is responsible for the one third of cases of PA, and consequently, factors which can predispose to infection like prolonged operation time (>2 hrs), inadequate hemostasis, and rough handling of tissues must be avoided and strict aseptic techniques have to be followed to reduce the incidence of infection. As almost one-quarter of patients developed PA within the first year after CEA, a follow-up duplex scan during the first postoperative year can prove beneficial for an early detection strategy. Endovascular treatment of a post-CEA PA with a stent graft has shown encouraging results, but long-termdata is needed to make a definitive decision that this is the therapy of choice. Endovascular repair of PA should be offered as an alternative to surgical repair of PA to patients.

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