Case Report

Endovascular repair of giant traumatic pseudoaneurysm of the common carotid artery

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BACKGROUND: Delayed presentation of carotid artery pseudoaneurysm following many years after self-inflicted penetrating injury of the neck is extremely rare. Open surgical carotid repair may involve sternotomy for proximal vascular control. Endovascular treatment is evolving as a less-invasive treatment option.

METHODS: We report a 55-year-old man with a history of paranoid schizophrenia who presented with a progressively enlarging left sided neck mass many years after attempted suicide. CT scan confirmed a 6 cm pseudoaneurysm arising from the common carotid artery.

RESULTS: Through an open retrograde puncture of the distal common carotid artery, the common carotid pseudoaneurysm was successfully repaired with a BARD fluency carotid stentgraft of 8 mm×80 mm (BARD, Tempe, AZ). The patient recovered well with no neurological deficits and was discharged on postoperative day 4. Dual antiplatelet agents of aspirin and clopidogrel were given for six months and then clopidogrel was administered lifelong. The neck mass decreased in size gradually and became non pulsatile upon follow-up.

CONCLUSION: Endovascular stenting of giant carotid pseudoaneurysm is an acceptable less invasive treatment option for giant carotid pseudoaneurysm. Long-term follow-up and a greater number of cases are mandatory to establish the safety of this strategy.

KEY WORDS: Carotid pseudoaneurysm; Carotid injury; Attempted suicide; Endovascular; Stentgrafts

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INTRODUCTION

Giant pseudoaneurysm of the extracranial carotid artery larger than 4 cm after traumatic neck injury is extremely rare, with less than five reported cases worldwide.^[1–4] It often presents with exsanguination or a rapidly enlarging mass in the neck, with pressure symptoms on surrounding aerodigestive organs. Surgical exploration is mandatory if the platysma is penetrated for any injury between angle of mandible and cricoid cartilage (zone II).^[5] Treatment should be immediate to prevent exsanguination or asphyxiation.

We report a case of delayed presentation of a gradually enlarging giant common carotid pseudoaneurysm,

successfully treated with a stentgraft more than twenty years after self-inflicting sharp injury. Open surgical carotid repair, in this case, may involve sternotomy for proximal vascular control. Endovascular treatment is evolving as a less-invasive treatment option.

CASE REPORT

A 55-year-old man with a long history of paranoid schizophrenia on oral and depot anti-psychotics sustained attempted suicide more than twenty years ago with self-inflicted knife injury to the neck. He was treated at his local hospital, and was thought that he

sustained superficial laceration without major vessels injury at the time. The skin was sutured and he remained asymptomatic afterwards.

He presented in 2006 to a regional head and neck clinic with a non-tender progressively enlarging pulsatile and expansile left neck mass. There was no pain, hoarseness of voice, stridor nor dysphagia. Physical examination showed a 6 cm left lower neck pulsatile expansile mass with deviation of the trachea to the contralateral side. He was subsequently referred to our institution for further management, and the common carotid pseudoaneurysm measured 58 mm×38 mm (Figure 1).

He underwent endovascular repair with open retrograde puncture of the distal common carotid artery with insertion of a BARD fluency carotid stentgraft 8 mm×80 mm (BARD, Tempe, AZ). Cerebral protection device was not used. He recovered well with no neurological deficits and was discharged on postoperative day 4. Dual antiplatelet agents of aspirin and clopidogrel were given for six months and then clopidogrel was administered lifelong. The neck mass decreased in size gradually and became non pulsatile upon follow-up. He remained asymptomatic. Surveillance CT scan three months (Figure 2) and duplex ultrasound six monthly up to three years later showed patent graft with much decreased in size in the aneurysm.

Figure 1. The common carotid pseudoaneurysm measured 58 mm×38 mm.

Figure 2. Surveillance CT scan.

DISCUSSION

Carotid injuries after blunt or penetrating trauma can result in transection, pseudoaneurysm, arterio-venous fistula, dissection, occlusion or aneurysm formation. Pseudoaneurysm development has been described within hours to several years after initial arterial injury, normally presenting within five years.^[6] To our knowledge, this is the first case presentation in the world's literature of a delayed presentation of giant carotid pseudoaneurysm more than twenty years after self-inflicted neck injury.

Ever since Sir Astley Cooper documented the first successful treatment of internal carotid aneurysm in 1808, ligation remained the mainstay of treatment over the next century and a half. However, this was associated with a significant stroke risk of 25% and a mortality of 20%.^[7] By the 1970s, aneurysm resection with open carotid artery reconstruction became standardized. Reconstruction methods included interposition graft, patch angioplasty and recently extracranial-intracranial bypass. Open surgery still invokes a relatively high stroke risk and a mortality of 9% in one of the largest series reported by El-Sabrou et al,^[8] especially if the carotid artery had significant atherosclerotic disease. Cranial nerves injuries occurred in 2.2%–44%.^[9,10] Extensive and invasive exposure is required if the aneurysm is in the proximal common carotid artery, where sternotomy may be necessary for proximal control and if lesion high in the skull base where additional maneuvers necessary for distal control.

Endovascular treatment is emerging as a less invasive approach. Previous techniques using coil embolization and balloon occlusion may sacrifice the parent vessels. In the case of enlarging pseudoaneurysm or active bleeding where immediate seal is required, endovascular covered stents (stentgrafts) repair may be less invasive. At least eight commercially available covered stents are in the market, broadly divided to self-expanding and balloon expandable devices (Table 1). Self-expanding stent is preferred especially crossing carotid bifurcation where it accommodates the difference in diameters between the common and internal carotid arteries. Balloon expandable stent is more commonly used for caroto-jugular fistula for their ability to over dilate the vessel, avoiding endoleak between the graft and vessels wall. The lack of flexibility in some stents may damage fragile vessels.

Current evidence supporting endovascular treatment of traumatic carotid aneurysm is still lacking. We have performed a literature search through PubMed and OVID Medline, and showed that there are no randomized trials to compare open and endovascular treatment for carotid

Table 1. Different types of covered stents

Types	Device	Manufacturer	Materials
Self expanding	Craggstent	Boston Scientific	Nitinol stent covered with polyester fabric
	Wallgraft	Boston Scientific	Cobalt super alloy stent covered with PET
	Fluency	Bard	Nitinol stent covered with ePTFE
	Gore Viabahn	Gore and Associates	Nitinol stent covered with ePTFE
	Symbiot	Boston Scientific	Nitinol stent covered with ePTFE
Balloon expandable	Jostent coronary stent graft	Abbott Vascular	ePTFE graft sandwiched between two stainless steel stents
	Advanta V12	Atrium Medical Corporation	ePTFE covered single stainless steel stent
	Prograft SX	Vascular Concepts	ePTFE graft sandwiched between two stainless steel stents

PET: polyethylene terephthalate; ePTFE: expanded polytetrafluoroethylene.

aneurysms. Current best evidence is mainly based on small cohort-studies and case series. Two larger case series^[7,11] and three systemic reviews^[9,10,12] addressed this issue. Cox et al^[11] reported their own series of 13 traumatic pseudoaneurysms of the head and neck in 11 patients. In this series, seven pseudoaneurysms were treated with coil embolization, 1 with gelfoam embolization, 2 with stent grafts, 2 with open repair and 1 with observation alone. The only complication was early occlusion in one of the stent graft without stroke. All the pseudoaneurysms resolved on follow up imaging. Toit et al^[7] reported another 19 carotid artery injuries (pseudoaneurysms and AVFs) treated with endovascularly. In this study, there was only one early stroke and one non-stent-graft related procedural death. Four patients were lost to follow up, and the remaining 14 patients had a mean follow up of nearly 4 years. No stent graft related death or complication was recorded, although one instance of late occlusion was documented.

DuBose et al^[12] summarized 31 published reports of 113 patients with various carotid injuries including pseudoaneurysm (60.2%), AVF (16.8%), dissection (14.2%), partial transection (4.4%), occlusion (2.7%), intimal flap (0.9%) and aneurysm (0.9%) managed with endovascular stenting. Initial endovascular stent placement was successful in 76.1%. Radiographic and clinic follow up periods ranging from 2 weeks to 2 years revealed patency of 79.6%. There were no stent related mortalities. New neurologic deficits occurred in 3.5%.

Li et al^[9] summarized 113 studies involving 224 extracranial carotid artery aneurysms. Procedural success rate was reported 92.8%, postoperative endoleak 8.1%, stroke 1.8%, cranial nerve injury 0.5%, and overall in-hospital mortality 4.1%. The mean time of follow up was 15.4±15.3 months. The patency rate of stent graft was 93.2%. An interesting finding in the subgroup analysis comparing covered stent (68.4% of patients) with bare metal stent (31.6% of patients) revealed that patients

treated with covered stents presented a slight decrease in postoperative endoleak ($P=0.068$), a significant decrease in re-intervention, overall late complications and stent graft related stenosis and a significant increase in thrombosis of the aneurysmal sac.

Alaraj et al^[10] reviewed 73 studies involving 164 covered stents in 150 patients with mostly pseudoaneurysms, carotid blow out syndromes and carotidjugular fistulae. Technical success rate was 98.2%, and immediate complications (9.1%) including stroke (4.9%), dissection (1.8%), acute thrombosis (1.2%) and others. Stent occlusion rate was 8.3% with a follow up period ranging from 2 to 23 months. The overall success rate of stent graft ranged from 76.1% to 100%, stroke risk 0–4.9%, mortality 0–4.1% and long-term patency rate 79.6%–93.2%. Facial nerve injury was extremely rare. Results were at least comparable if not better than open operation.

There was still no consensus on adjuvant anti-coagulation/antiplatelet after endovascular treatment. Preoperative anticoagulation/antiplatelet is usually unnecessary, but we recommended a period of dual antiplatelets and life-long clopidogrel after stent graft placement.

In conclusion, delayed presentation of carotid pseudoaneurysm after self-inflicted penetrating injury is extremely rare. Endovascular stenting is a feasible and less invasive treatment option with good long-term results.

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Contributors: Law Y and Chan YC wrote the paper. All authors read and approved the final version of the manuscript.

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