CASE REPORT

Traumatic right proximal subclavian artery pseudoaneurysm treated with a hybrid procedure: A case report

Ismazizi Zaharudin, MS, Zainal Ariffin Azizi, MS, Naresh Govindarajanthran, MS

Department of General Surgery, Hospital Kuala Lumpur, Jalan Pahang, 50586 Kuala Lumpur

SUMMARY

Blunt trauma to the right proximal subclavian artery is uncommon and tends to be associated with pseudoaneurysm formation. We report a patient with right proximal subclavian artery pseudoaneurysm after blunt chest trauma following a motor vehicle accident. The condition was successfully treated with a combined insertion of a covered stent and carotid-carotid bypass as a hybrid procedure. Duplex scans at 6 month and 1 year follow-up documented good stent-graft positioning and no pseudoaneurysm recurrence.

KEY WORDS:

Subclavian artery pseudoaneurysm, endovascular repair, carotid-carotid bypass, hybrid procedure

INTRODUCTION

Subclavian artery injury is relatively uncommon and only accounts for 1-2% of all acute vascular injuries.[1] However, subclavian artery injuries are associated with high mortality and morbidity. Pseudoaneurysm formation is usually a sequelae of penetrating arterial injury. Direct surgical repair of the subclavian arteries is difficult due to limited and difficult exposure with risk of iatrogenic injury to the brachial plexus and apex of the lung. Endovascular modalities are rapidly emerging as an alternative to traditional surgical management of subclavian artery injuries. We report a patient with right proximal subclavian artery pseudoaneurysm after blunt chest trauma following motor vehicle accident, which was successfully treated with a hybrid procedure.

CASE REPORT

A 53-year-old gentleman was involved in a motor vehicle collision, sustaining sternal and right clavicle fractures associated with a right subclavian artery tear just after its origin from the brachiocephalic artery. A pseudoaneurysm associated with a mediastinal haematoma and lung contusion was seen on contrasted computed tomography (CT) thorax done on admission. A CT angiogram (CTA) confirmed the right subclavian artery tear with pseudoaneurysm formation near the brachiocephalic artery (Fig. 1 & 2).

Under general anaesthesia, a carotid-carotid bypass was constructed with a Gore-Tex 6 mm graft (W.L. Gore and Associates, AZ, USA) after exposure of both common carotid arteries. End to side anastomosis and subsequent sub-platysmal tunnelling of the graft was done. The right common carotid artery proximal to the bypass was ligated to prevent backflow into the pseudoaneurysm. An arch aortogram was performed using a 5F pigtail catheter introduced via the right brachial artery. The aortogram confirmed the pseudoaneurysm position and patency of the bypass. This was followed by the exclusion of the pseudoaneurysm with a balloon-expandable V12 covered stent (Atrium®Medical Corporation, NH,USA) introduced over a 0.035" wire. The stent was placed from the origin of the brachiocephalic artery to the first part of the right subclavian artery just proximal to the right vertebral artery. Post procedure angiography demonstrated complete exclusion of pseudoaneurysm with patency of the bypass graft. Perfusion of the right vertebral artery and right common carotid artery and its branches was intact (Fig 3). He was discharged 5 days later on daily aspirin (150 mg). Duplex scans at 6-month and 1 year post procedure showed a patent bypass and no signs of the pseudoaneurysm or neurological deficits.

DISCUSSION

Subclavian artery injury is uncommon but carries a high morbidity and mortality. Traditional surgical management of these injuries are technically challenging in the presence of associated haematoma and soft tissue injury, requiring a thoracotomy or sternotomy and clavicular resection with extensive dissection to obtain vascular control of the proximal subclavian artery.[1] With the introduction of endovascular techniques to treat vascular injuries, many of the difficulties associated with open surgery are avoided. The most apparent benefit of the endovascular approach is the avoidance of major dissection with reduced risk of significant haemorrhage, shorter operative time and less injury to important adjacent structures such as the subclavian vein and brachial plexus.[2] Only a small percentage of patients fail stenting and require an urgent open conversion. Unwanted exclusion of important adjacent artery branches is a limitation of stent exclusion of pseudoaneursyms. Occlusion of the vertebral artery may lead to posterior fossa infarction

This article was accepted: 11 August 2016

Corresponding Author: Zainal Ariffin Azizi, Consultant General/Vascular Surgeon, Head of Department of General Surgery , Kuala Lumpur Hospital, Jalan Pahang, 50586, Kuala Lumpur Email: mrzainalhkl@gmail.com

Fig. 1: Initial CTA showing a pseudoaneurysm (white arrow) arising from the right subclavian artery.

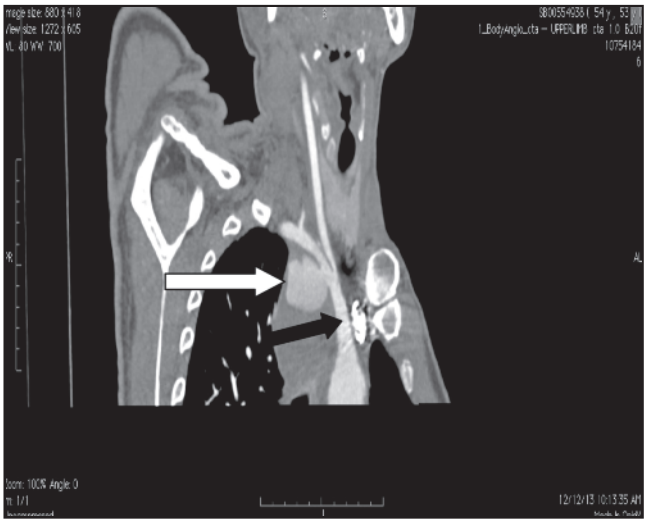

Fig. 2: Reconstructive image showing the pseudoaneurysm (white arrow) arising from proximal subclavian artery near the brachiocephalic artery (black arrow).

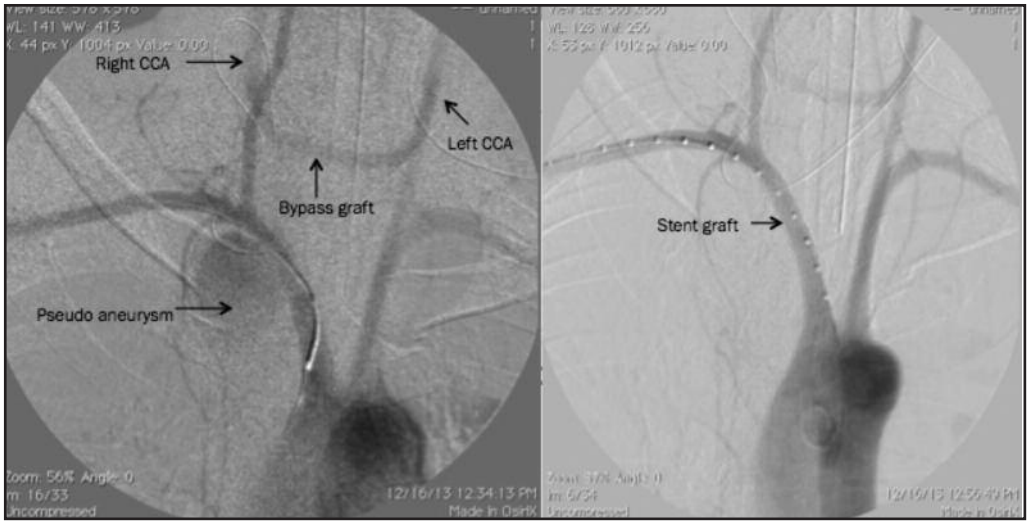

Fig. 3: Angiogram done pre procedure with the pseudoaneurysm and post procedure with stent in-situ and exclusion of the pseudoaneurysm. The carotid-carotid bypass is shown and is patent.

while occlusion of the common carotid artery may lead to hemispheric infarction.[3]

Our decision to over-stent the common carotid artery was made in view of the position of the pseudoaneurysm, which was just adjacent to the brachiocephalic artery. This may lead to partial protrusion of the stent into the lumen of the common carotid artery with the potential for distal cerebral embolism and also occlusion of the common carotid artery post procedure. Over stenting also allows for better coverage of the pseudoaneurysm defect. Carotid–carotid bypass was performed to maintain perfusion to the right common carotid artery and prevent massive hemispheric infarct. Carotid-axillary bypass has been described with good patency rate and minimal risk of ipsilateral recurrent laryngeal nerve injury. However in our patient, the right clavicle fracture would have made tunnelling difficult and may also cause instability of the graft.[4] During carotid-carotid bypass, there is relatively better exposure, greater ease of tunnelling and extensive dissection of the subclavian region can be avoided. This lowers the risk of injury to adjacent structures.

A main concern with autologous arterial donors is the possibility of diminished flow to the distal vascular bed. However, branches of the aortic arch which are relatively free of proximal disease have also been used as donor arteries providing increased blood flow to multiple distal vascular beds without steal occurrence.[5] Manart *et al* highlighted that carotid-carotid bypass grafts have high flow rates, relatively shorter length, and are well protected from injury due to its location.[5] However there are concerns about injury to adjacent structures like the recurrent laryngeal nerve.

Although the risk is minimal, extra precautions during dissection is still central. Even though the injury is transient due to the stretching of the carotid artery during dissection, the resulting focal tissue inflammation and oedema could lead to local compressive effects within the carotid sheath, subsequently causing vagus nerve and recurrent nerve dysfunction. Haematoma formation within the carotid sheath also leads to similar catastrophes.

Our patient would be on life-long anti-platelet therapy in view of the stent and prosthetic graft bypass.

CONCLUSION

This case illustrates the successful role of minimally invasive treatment (endovascular) as an alternative to extensive open surgery in a difficult clinical situation. Long term follow-up to ascertain patency of both stent and bypass is important. Continued use of oral aspirin is also required.

REFERENCES

1. Sobnach S, Nicol AJ, Nathire H, Edu S, Kahn D, Navsaria PH. An analysis of 50 surgically managed penetrating subclavian artery injuries. Eur J Vasc Endovasc Surg 2010; 39: 155-9.
2. Castelli P, Caronno R, Piffaretti G, Tozzi M. Endovascular repair of traumatic injuries of the subclavian and axillary arteries. Int. J Care Injured 2005; 36: 778-82.
3. Demirel S, Winter C, Weigand H, Gamstatter G. Stent-graft repair of iatrogenic subclavian artery pseudoaneurysm with planned exculsion of the vertebral artery. EJVES Extra 2008; 16: 16-8.
4. Frank. J, Luis.A, Queral. Carotid-axillary bypass: A ten year experience. J Vasc Surg 1995; 22: 717-23.
5. Manart FD, Kempczinski RF. The carotid-carotid bypass graft. Arch Surg 1980; 115: 669-71.