

Case Report

Management of Subclavian Aneurysms

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Abstract

Introduction: Subclavian artery aneurysms are rare, they affect less than 1% of the population. Symptoms are caused by thrombosis or embolisation reinforcing the need to repair due to risk for rupture, embolisation and thrombosis, which can cause upper limb ischaemia.

Case presentation: A 44 year old Caucasian male non smoker presented with an aching lump in his right shoulder and numbness to the right side of his face. On examination pulses were palpable in the right arm and right SCA aneurysm above the clavicle.

Initial interposition vein graft from long saphenous vein to subclavian artery was performed but post operatively there was absence of radial pulse secondary to significant distal stenosis. Therefore revision of the thrombosing right subclavian composite vein graft using a 6 mm distafllo was performed to construct a new right subclavian to axillary graft. Despite this theatre exploration was later performed to evacuate symptomatic haematoma as there was thrombosis of the distafllo graft requiring a reverse long saphenous vein graft.

Conclusion: This case demonstrates the need for vigilant post operative observation of vascular perfusion and how when identified early, the long term consequences are minimal. In this patient, neurological deficit was reversed and the patient made full recovery with palpable wrist pulses at out patient follow up after timely salvage of complications.

Keywords: Composite vein graft; Subclavian artery aneurysm; Thrombosis

Introduction

Subclavian Artery Aneurysms (SCA) are extremely rare, affecting less than 1% of the population [1]. Studies show that 30-60% of these are co-existent with aorto-iliac or other peripheral aneurysms [2].

Abnormal dilation of the subclavian artery vessel can be caused most commonly (60%) by atherosclerosis, post thoracic outlet obstruction or congenital causes such as Marfan's, Turner's syndrome in addition to infective causes like tuberculosis and syphilis [1,3].

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Kawasaki also has to be considered in patients since 20% patients developed coronary lesions with 2% developing aneurysms during their life [4] (Figure 1).

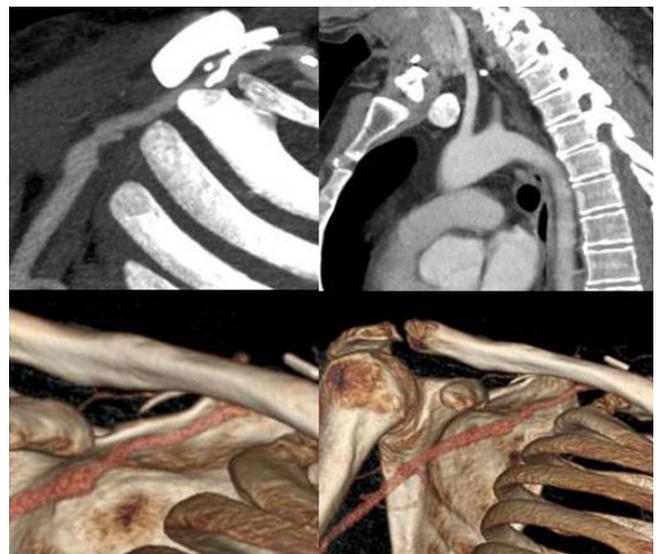


Figure 1: Computed tomography image of right subclavian angiogram 6 weeks post procedure. Revised right subclavian interposition vein graft after graft thromboses appears fully patent with no significant stenoses.

It can manifest in several ways, most commonly as an asymptomatic pulsatile mass. However if symptomatic, it can cause symptoms due to compression against adjacent anatomical structure. This can lead to dysphagia, stridor or numbness and hoarse voice as a result of nerve compression of the brachial plexus or recurrent laryngeal nerve causing sensory and motor function loss; others manifest as painful punctate lesions in the peripheries [1]. Patients may also present with Horner's syndrome secondary to compression of the stellate ganglion [5].

Symptomatic subclavian artery aneurysms are caused by thrombosis or embolisation and this reinforces why regardless of the presentation, this subtype of aneurysm must be repaired as it carries significant risk for rupture, embolisation and thrombosis leading to upper limb extremity ischaemia [1,2]. Rupture carries high risk of developing intra or extra thoracic haemorrhage which can present acutely as haemoptysis from rupture and erosion into the apex of the lungs and compress the recurrent laryngeal leading to hoarse voice [5,6].

Case Presentation

A 44 year old Caucasian non smoker with no previous history of trauma or family history of aneurysm presented with an aching lump in his right shoulder. On examination pulses were palpable in the right arm and a right SCA aneurysm was noted above the clavicle but there was no sign of any neurological deficit suggestive of Horner's syndrome nor were there clinical features of Marfan's syndrome. The patient initially underwent an interposition vein graft to replace his right sided subclavian aneurysm. Due to calibre mismatch a composite graft was used.

During the operation, the upper right long saphenous vein was harvested and the lower end of the right subclavian artery was delivered to the supraclavicular wound. Anastomoses were to the second part of the subclavian artery and first part of the axillary artery. Post operation, the right hand was well perfused and wrist pulses felt. However later on that day, the radial pulse disappeared and an urgent CTA was performed which showed significant distal stenosis but it was unclear whether this was of the graft or the recipient axillary artery (Figure 2).

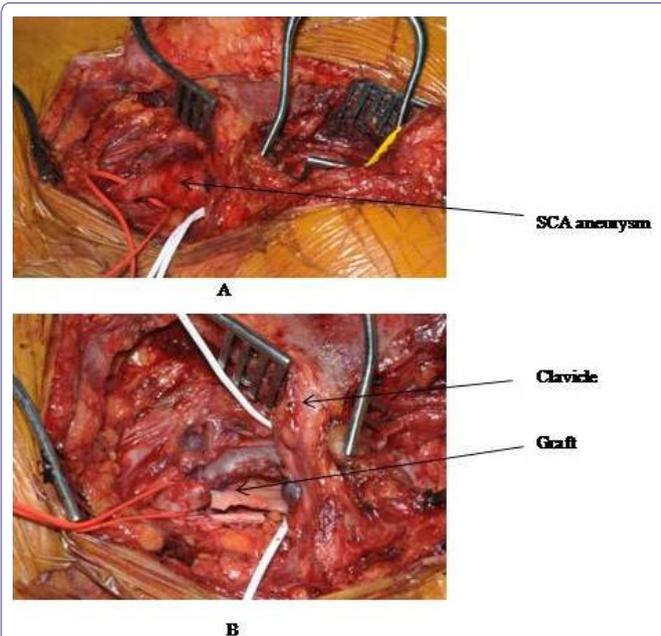


Figure 2: a) Isolation of SCA aneurysm, and b) Input of composite graft.

Note: Operative repair of right subclavian artery aneurysm. Initial isolation of the right subclavian artery aneurysm followed by further images showing the input of the composite vein graft above the right clavicle.

The patient was taken back to theatre for revision of the thrombosing right subclavian composite vein graft despite being asymptomatic as it was likely to occlude and compromise this otherwise young fit right handed patient. The aneurysm sac was excised at re-exploration and was sent for histology. A 6 mm distaflo (CR Bard, Inc. Tempe, AZ 85281, USA) was used to construct a new right subclavian to axillary graft.

On 3rd postoperative day wrist pulses were absent despite the reasonably perfused hand. The patient was commenced on clopidogrel and the heparin infusion was stopped. About 2 hours later, the patient developed a tense haematoma with paraesthesia of the 8th cervical and 1st thoracic dermatomes. A further exploration was performed to evacuate the symptomatic haematoma and no overt active bleed was identified. The distaflo graft was thrombosed so a further reversed left long saphenous vein graft was interposed between the freshened edges of the second part of the subclavian artery and second part of the axillary artery with the return of the radial pulse. Although there was a diameter mismatch between the normal segments of the artery above and below the aneurysm, the non composite narrower vein graft proved to be durable when compared to the initial composite graft with its longitudinal suture lines or the synthetic graft which thrombosed.

The neurological deficit was minimal and he made a rapid recovery from his symptoms. He was discharged 8 days later with a patent graft, palpable radial pulse and a well perfused hand. Subsequent

thrombophilia screen was unremarkable along with coagulation studies reducing the likelihood of heparin induced thrombocytopenia as a cause of stenosis. A Duplex surveillance scan of the vein graft revealed slight reduced blood pressure in the right arm compared to the left but still had triphasic flow with a right brachial: left brachial pressure Index of 120/140. The patient was then maintained on dual oral anti-platelet therapy (aspirin and clopidogrel at 75 mg dosage). The therapeutic enoxaparin discontinued.

Conclusion

In summary this case demonstrates the management of a SCA aneurysm presenting with minimal neurological and no vascular deficit with the presenting complaint being an aching lump in the shoulder. Despite minimal risk factors, complexity of this case escalated due to complications of graft stenosis followed by haematoma formation. Both complications required return to theatre for exploration to optimise limb perfusion in this otherwise fit and healthy patient (Figure 3).



Figure 3: Computed tomography image of angiogram aortic arch and carotid pre surgery. 2.4 cm fusiform right subclavian artery with abnormal incomplete right first rib.

Subclavian artery aneurysms can be diagnosed clinically but routine investigations would include duplex, computed tomography, magnetic resonance angiography or catheter angiogram [1]. Preoperatively duplex ultrasonography and computed tomographic angiography are always mandatory for planning the surgical treatment of extrathoracic aneurysms but in cases of intrathoracic aneurysms, computed tomography or magnetic resonance imaging scans is necessary [5].

Elective surgical repair is mandatory, even when asymptomatic, because they tend to increase in size with increased risk of rupture, thrombosis, embolisation and compression of adjacent structures [7]. However surgery is not without its risks whether it be open or endovascular surgery. Aside from the usual risks associated with surgery and anaesthesia, there is a risk of pneumothorax secondary to first rib resection and lymphatic fistulae formation.

With regards to management, a multidisciplinary approach is required which includes commissioning the services of an orthopaedic surgeon for potential access issues i.e., division and re-fixing of clavicle. An orthopaedic surgeon was present to plan approach in this patient but division of clavicle was not required as we tunnelled the grafts under it.

Generally extrathoracic aneurysms, those in the extrathoracic portion of the subclavian artery are mostly related to iatrogenic causes and thoracic outlet syndrome and present as pulsatile masses in the supraclavicular fossa with vascular murmurs [6,7]. In contrast, intrathoracic or post-stenotic dilated aneurysm patients are those with compressed brachial plexus symptoms and upper limb ischaemia are mainly attributable to atherosclerotic causes [6,7].

There are a variety of options of surgical repair, namely endovascular, open or a combination of both of these techniques, combined endovascular and open approach with graft. Resection of the aneurysm and revascularization is currently the common procedure [1]. Open surgical repair is the standard treatment modality of subclavian artery aneurysms, but when located in the intrathoracic segment, an invasive approach with sternotomy or lateral thoracotomy is required [7]. Recently in order to avoid major thoracic surgery, a combined endovascular and open repair through a supraclavicular incision has been applied as a minimally invasive treatment option [6].

Open surgical repair involves resection and interposition grafting because ligation alone is often associated with postoperative ischaemic symptoms as well as in long lesions [2,5]. Surgical Principles include selecting inflow and outflow tracts, and adequate access to the whole extent of the aneurysm [6]. In the case report of the first right subclavian artery aneurysm in the Bahamas, a single supraclavicular incision by aneurysmorrhaphy was applied combining supra and infraclavicular incisions. As a general rule right-sided intrathoracic aneurysms are approached via median sternotomy in open repairs whereas those of the left can be approached via a posterolateral thoracotomy incision [1].

The most common incisions are posterolateral incision, incision over the third anterior intercostal space to enter thorax, median sternotomy with a transverse incision over second or third intercostal space or a supra-infraclavicular incision [6]. However since this patient presented with an extrathoracic aneurysm, we approached through supra and infra clavicular incisions [5]. The subclavian artery extends from the brachiocephalic trunk on the right and is divided into three parts, and becomes the axillary artery at the outer border of the first rib. This aneurysm was extrathoracic in that it involved the second and third part of the subclavian artery.

Arterial reconstruction options include anatomic reconstruction with interposition graft, primary end-to-end anastomosis, and extra-anatomic reconstruction such as carotid-subclavian bypass grafting [1]. There are indications for the use of each reconstructive option. Interposition graft was opted for in this case due to the large size of the aneurysm and its position over origin of the subclavian artery but with both polymer and allogenic options namely the long saphenous vein there are complications of low long term patency rates or issues of degeneration, calcification or further aneurysmal development respectively [6].

Although conventionally, open repair is the procedure of choice as discussed in this case report, it is now becoming increasingly common to perform endovascular repair through stent graft insertion. This is minimally invasive and has less risk of damaging adjacent structures to the subclavian artery. Primary patency after stent-graft repair of distal subclavian artery aneurysms is high, ranging from 83 to 100% over a mean follow-up of 7-29 months [7]. Studies comparing open repair with stenting show different kinds of complications but a comparable complication rate. However, long-term results show a better patency rate during open repairs.

Overall this case report emphasises the management of a rare aneurysm (1/1000 aneurysms and about 70 published cases in a 70 year period [8]). In addition, true subclavian artery aneurysms in only 0.13% of 1488 patients with other atherosclerotic aneurysms [7]. Subclavian artery aneurysms are extremely rare, but potentially life threatening because of the risk of rupture, distal embolisation and thrombosis. A multidisciplinary approach is fundamental to effective management of these patients. Anatomical variations of the aneurysms mainly extra or intrathoracic will affect decisions regarding whether an open or endovascular approach is optimal. Also the vigilant post operative clinical examination for vascular perfusion is demonstrated and how when identified early, the long term consequences are minimal as in this case where neurological deficit was reversed and the patient made full recovery with palpable wrist pulses at out patient follow up after timely salvage of complications.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Competing Interests

The author(s) declare that they have no competing interests.

Author Contribution

KA initially assessed the patient in clinic and performed the operation. KA was lead clinician in treating this patient prior to and throughout his admission. AKKL participated in the write up of the case report and KA supervised the draft of the manuscript. All authors read and approved the final manuscript.

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