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SHORT REPORT

Hybrid Repair of an Aberrant Right Subclavian Artery with Kommerell's Diverticulum

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KEYWORDS

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Abstract This publication describes a hybrid endovascular and open surgical approach to treating a large aneurysm of an aberrant right subclavian artery (Kommerell's diverticulum). A 76-year old man presented with dysphagia lusoria due to a 3.5 × 3.0 cm aneurysm involving an aberrant right subclavian artery. The patient was treated by a thoracic aortic endograft, left subclavian artery de-branching (by its transposition to the left common carotid artery) and right subclavian artery revascularisation. This approach avoids the requirement for a thoracotomy or sternotomy needed with open surgical repair. At a 6 months follow-up assessment the aneurysm was shown to be thrombosed with no evidence of endoleak.

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Introduction

An aberrant right subclavian artery (arteria lusoria) is a rare anomaly, however, it is the most common intrathoracic abnormality of the aortic arch, with an incidence of 1–2%.¹ It is caused by the involution of the right fourth vascular arch and proximal right dorsal aorta and persistence of the seventh intersegmental artery. The first description of an aberrant right subclavian artery was reported to be in 1735,

although, David Bayford gave the first description of the clinical syndrome² of dysphagia lusoria (“lusoria” Latin for “freak of nature”). Kommerell's diverticulum (KD) is a saccular outpouching of the aorta and based on the original description, it is actually a remnant of the primitive right dorsal aorta.² This anatomical variant is present in about 60% of patients with an aberrant right subclavian artery.³ The aberrant right subclavian artery may cause dyspnea, arterioesophageal fistulae or may present as a vascular emergency after aneurysm rupture. Most of the time, however, it is asymptomatic.² Indications for intervention are a matter of discussion but an aneurysmal aberrant right subclavian artery should probably be treated due to a high incidence of rupture (22.6%) and 100% mortality associate with rupture.¹

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Case Report

A 76-year old male presented with a history of mild dysphagia lasting several months. His past medical history was unremarkable. A computed tomographic (CT) scan demonstrated a bilobed aneurysm of a right aberrant subclavian artery with a maximum diameter of 35 mm located posterior to the oesophagus.

Due to his age and the high surgical mortality associated with open repair in the literature the decision was made to repair the aneurysm by a hybrid extrathoracic open and endovascular approach. On angiogram, the distance between the origin of the right aberrant subclavian artery and that of the left subclavian artery was 10 mm. The distance between the origin of the right aberrant subclavian artery and that of the left common carotid artery was

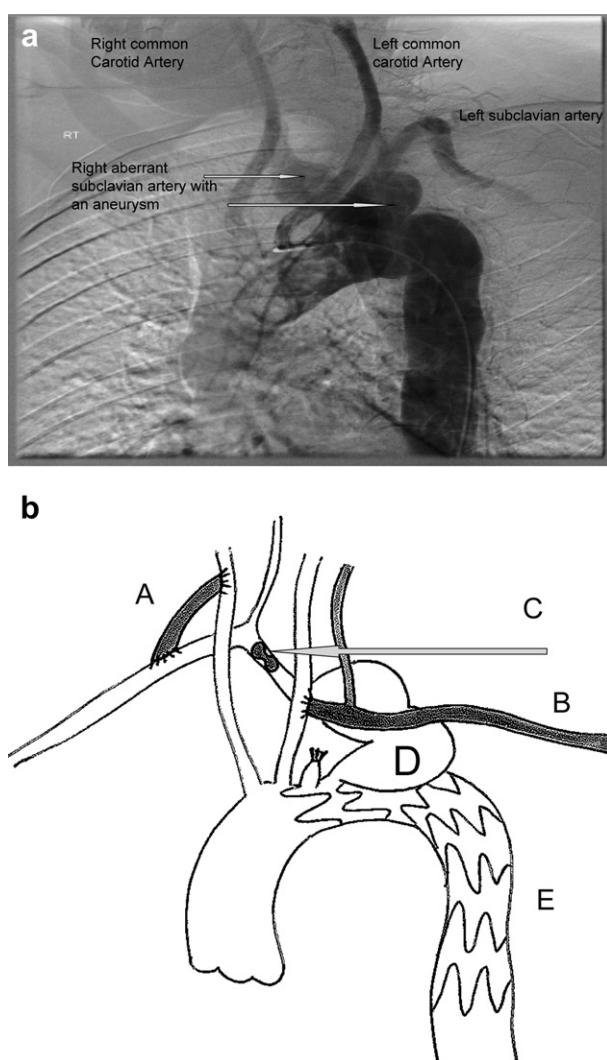


Figure 1 (a) Image from the pre-operative angiogram demonstrating the aneurysm of the aberrant right subclavian artery. (b) A schematic drawing of aortic arch and aberrant right subclavian artery illustrating the planned operation. A right subclavian to carotid prosthetic bypass, B- left subclavian to carotid artery transposition, C- Amplatzer plug, D- subclavian artery aneurysm, E- thoracic endograft.

24 mm (Fig. 1a). In order to cover the origin of the aberrant right subclavian artery it was therefore felt necessary to cover the origin of the left subclavian artery in order to provide an appropriate sealing zone. A two stage procedure was therefore planned (de-branching of the subclavian arteries in the operating theatre and placement of a thoracic stentgraft in the angiography suite). The proximal left subclavian artery was transposed to the left common carotid artery and a right carotid-subclavian bypass (6 mm PTFE graft, W.L.Gore & Associates, Inc., Arizona) was performed under general anaesthesia. One week later thoracic endografting using the Valiant thoracic tapered stentgraft (proximal diameter 36 mm, distal diameter 32 mm, length 150 mm, Medtronic Inc., Minneapolis) was performed via the right common femoral artery also under general anaesthesia (Figs. 1b and 2a). Proximal right subclavian artery occlusion was performed with an Amplatzer Vascular Plug 14 × 8 mm (AGA Medical Corporation, Minnesota) via the right brachial artery. The post-operative course was uneventful except for the development of a small (3 × 2 cm) lymphocele in the left supraclavicular fossa. This was treated conservatively.

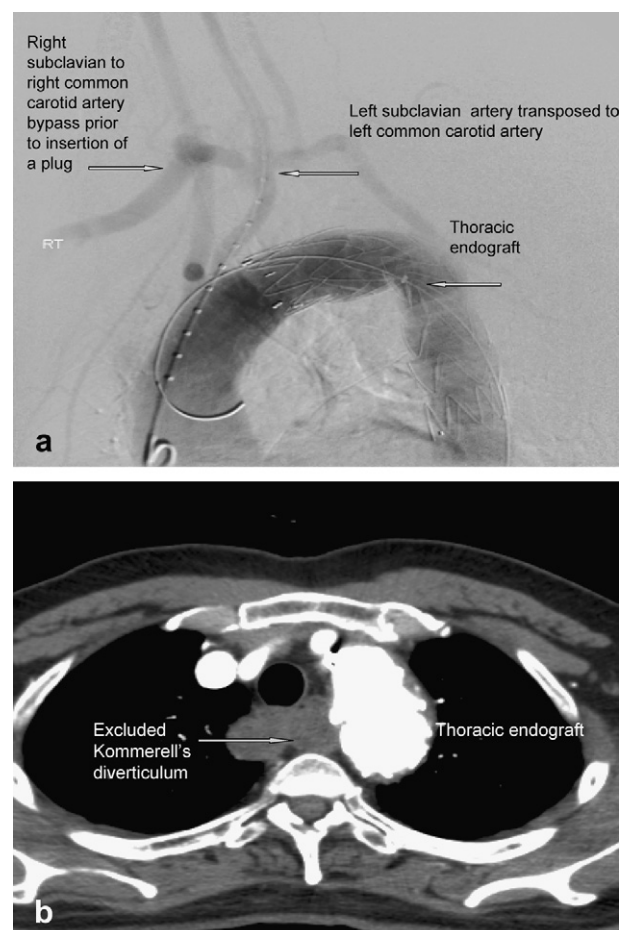


Figure 2 (a) Intra-operative angiogram image demonstrating placement of the thoracic endograft. (b) Axial image from a contrast-enhanced CT scan performed 6 months after the hybrid procedure.

CT angiograms performed at 6 weeks and 6 months postoperatively showed complete exclusion of the aneurysm and no evidence of endoleak (Fig. 2b). The patient's symptoms of dysphagia resolved after the operation.

Discussion

The largest single-center series of 33 patients with symptomatic or aneurysmal aberrant right subclavian arteries was published by Keiffer and colleagues in 1994. The authors reported a 26.9% perioperative mortality rate.⁴ There are several different ways previously described to treat aberrant right subclavian artery aneurysm. Therapy approaches include totally open surgery, completely endovascular or hybrid. Open surgery can involve a thoracotomy, a median sternotomy, a cervical incision and even cardiopulmonary bypass in some cases. Open surgery is associated with significant morbidity and mortality, especially in elderly patients. A total endovascular treatment includes deployment of a covered stent in the subclavian artery or a stentgraft in the thoracic aorta. In both situations an adequate landing zone is required to achieve sufficient sealing of the graft. Hybrid operations for an aneurysm of an aberrant right subclavian artery have previously been described by several authors including Attmann *et al.*⁶ Lacroix *et al.*⁷ or Shennib *et al.*⁸ and might be used in a situation where the landing zone is inadequate. This approach has not previously been associated with perioperative mortality in published cases. Long-term results are not known.

In our case, an endovascular technique combined with an extrathoracic open surgical procedure was chosen due to the patient's age and the surgeon's preference. An "off-the-shelf" thoracic endograft was chosen based on CT findings and formal angiogram measurements. Debranching of left subclavian artery was necessary due to short proximal landing zone (less than 15 mm). Revascularisation of the right subclavian and vertebral arteries was also performed, in line with previous publications.⁵ The first part of the hybrid procedure was performed in the operating theatre due to better facilities available for open

surgery, such as lighting and operating table. The endovascular part of the procedure was performed in the angiography suite one week later due to the better imaging available. A one stage hybrid procedure could have been performed. The latter approach would have avoided two general anaesthetics but would have required transfer of the patient and staff from the operating to the angiography suite in our institute. Perhaps a hybrid theatre would suit this procedure best. Patients should be followed up annually due to late development of an endoleak.

Conflict of Interest/Funding

None.

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