

Open repair management of a patient with aortic arch saccular aneurysm, penetrating atherosclerotic ulcer, one vessel coronary artery disease and an isolated dissection of the abdominal aorta

SAGE Open Medical Case Reports
Volume 5: 1–4
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DOI: 10.1177/2050313X17744072
journals.sagepub.com/home/sco



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Abstract

Isolated saccular compared to fusiform aneurysm is considered to be a rare entity with challenges of its own. A 62-year-old female was diagnosed with a case of saccular aneurysm and penetrating atherosclerotic ulcer of the aortic arch. Additionally, she also had one vessel coronary artery disease and type B abdominal aortic dissection. She was then managed with open aortic arch repair and coronary artery bypass grafting. If required, elective endovascular repair will be done for the abdominal aorta on a later date.

Keywords

Aortic arch repair, saccular aneurysm, penetrating atherosclerotic ulcer, coronary artery bypass grafting, coronary artery bypass grafting, vascular surgery, endovascular surgery

Date received 29 April 2017; accepted: 1 November 2017

Introduction

Aortic arch aneurysm repair was first reported in 1957 by DeBakey. Since then, morbidity and mortality rates have drastically improved.^{1,2} Most aortic arch aneurysms are part of a more proximal aortic pathology. An isolated non-traumatic aortic arch aneurysm represents a rare entity with challenges of its own.³

Historically, vascular surgeons perceive saccular aneurysm to have a higher risk of rupture compared to its fusiform counterpart.⁴ This mindset is supported by biomechanical studies in this field.⁵ Recently, Nathan et al.⁶ reported that saccular aneurysms is linked to higher wall stress than their opposite number. This resulted in earlier (and at a smaller diameter) repair. However, there is a lack of clinical evidence in this literature to support a more malignant natural history of saccular aortic aneurysms.⁷

In the last decade, thoracic endovascular aortic repair (TEVAR) became an option in managing thoracic aortic aneurysms.⁸ However, when used to tackle aortic arch

diseases TEVAR has several limitations such as, higher risk of stroke and the presence of inadequate landing zones.⁹ Hybrid procedures were created to overcome these obstacles but are also associated with significant morbidity.¹⁰ Thus, the literature has suggested that the management of saccular aneurysms with surgical repair is a more reasonable option,¹¹ while TEVAR may still be a valuable option in inoperable patients.

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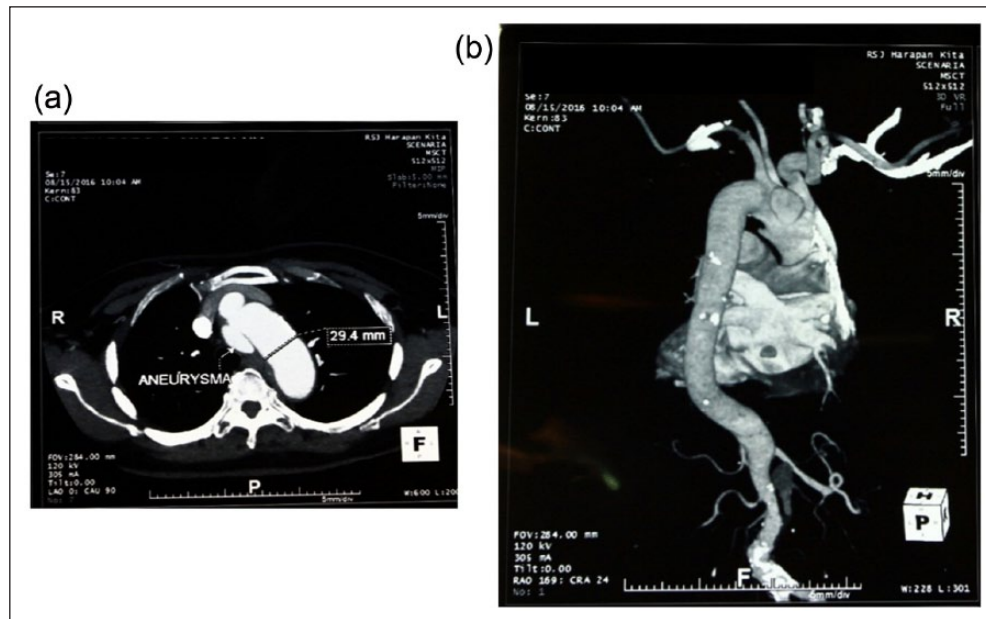


Figure 1. (a) Axial CT scan showing saccular aneurysm posterior of the aortic arch and (b) volume rendering of the same case.

Case report

A 62-year-old female came to our polyclinic. Her chief complaint was unspecific pain at the abdominal region which comes and goes since 3 months ago. There was no known history of chest pain, hypertension, congenital heart disease, trauma or stroke.

We performed a computerized tomography (CT) scan finding an isolated saccular aneurysm with penetrating atherosclerotic ulcer (PAU) at the aortic arch (Figure 1). As there were no specific complaint on her chest, and it is suspected that the saccular aneurysm is a chronic condition, transforming into a PAU more recently. There was also a separate type B fusiform abdominal aortic dissection. The false lumen is noted to be below the renal arteries with involvement until the right iliac artery. The false lumen of the abdominal aortic dissection was already filled with thrombus. We also manage to find a total occlusion of the left anterior descending coronary artery (LAD). Echocardiography showed no regional wall motion abnormalities, normal valve functions and good ejection fraction (75%).

The patient was then decided to undergo open surgery. We used median sternotomy and cannulated the right atrium and ascending aorta. It was followed by administration of antegrade crystalloid cardioplegia. We continued with distal and proximal coronary artery bypass grafting (CABG) using saphenous vein graft (SVG). SVG was chosen in this case instead of internal mammary as there had been unstable hemodynamic during induction. We continued by lowering the body temperature to 20°C and stopping the cardiopulmonary bypass (CPB) machine. Antegrade selective cerebral perfusion (ASCP) was given via brachiocephalic and left

carotid arteries. Cardioplegia was still given via antegrade (proximal aorta) toward the coronary arteries and the SVG graft during the arch repair.

The saccular aneurysm located posterior to the aortic arch with multiple entry tear. The diameter of the saccular aneurysm was approximately 5 cm. We excised the saccular region of the arch and did an aortic repair (Figure 2) using a Vascutek graft, followed by anastomosis of the repaired arch toward the proximal aorta. CPB and aortic cross-clamp (AoX) time were 135 and 99 mins respectively, with ASCP of 34 mins and deep hypothermic circulatory arrest (DHCA) of 43 mins.

Her post-operative care was uneventful and was discharged 6 days after surgery. We plan on evaluating the abdominal aorta with CT scan, continued by endovascular repair if required.

Discussion and conclusion

Management options

An arterial aneurysm is a permanent dilation characterized by 50% greater diameter than the normal vessel in question.¹² Aneurysms can be further categorized into a more common fusiform type, or rarer saccular configuration.⁷ As new technology emerged for treating aortic pathology, new paradigms for aneurysm therapy are being developed, including a variety of open, hybrid and completely endovascular catheter-based techniques.^{3,8,13} To date, however, there have been no large randomized trials to compare the outcomes of these different interventions.¹⁰

Most surgical management studies of the aortic arch focused on fusiform aneurysms. Currently, it is reported that open surgery resulted in 5%–9% mortality, overall stroke incidence of

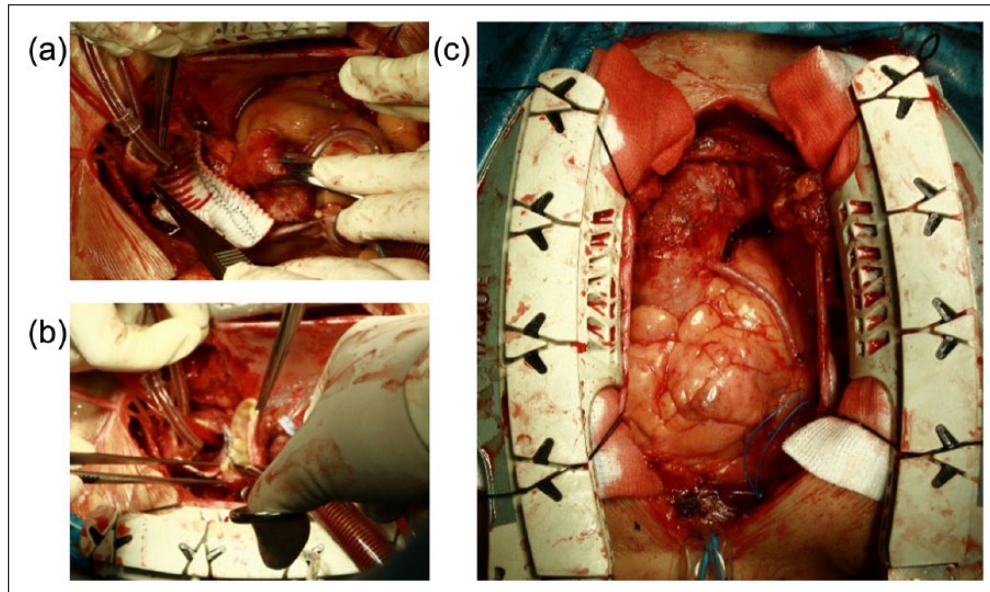


Figure 2. (a) Aortic arch repair was done, first by excision of the saccular aneurysm, continued using Vascutek graft to repair the posterior portion of the arch; (b) anastomosis of the repaired arch toward the proximal aorta; and (c) complete picture of the aortic repair with CABG.

2.8%–4.7% and a temporary neurologic deficit rate of 5.6% are found in centers with high volume of aortic surgery.¹⁴

Timing of surgery

Despite numerous biomechanical studies and the common perception of a more malignant natural history, the true rupture risk of saccular aneurysms remains unknown.^{5–7} Shang et al.⁷ found there is no notable increase in saccular aneurysm growth compared against fusiform aneurysms. This literature also notes that there was no difference in radiographic disease progression between isolated PAUs and PAUs with saccular aneurysms ($p=.227$).¹⁵ While there are well-recognized size-related indications for repair of fusiform aneurysms, there are no well-established indications to operate on saccular aneurysms.¹⁵ However, the presence of aortic dissection (PAU in our case) will result in the false lumen to grow faster and thus the need of urgent repair.¹⁶

Conclusion

Open surgery remains the standard therapy for isolated saccular aortic arch aneurysm. We operatively managed a female patient with isolated aortic arch saccular aneurysm and total occlusion of her LAD. This case required urgent surgery due to the presence of PAU. Intraoperatively, we did CABG first and continued with ASCP and DHCA for the arch repair. She also has a fusiform type B abdominal aortic dissection with thrombus filling all of the false lumen. We decided to evaluate it with CT scan, with consideration of endovascular repair.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

Funding

The author(s) received no financial support for the research, authorship and/or publication of this article.

Informed consent

Written informed consent was obtained from the patient for anonymized information to be published in this article.

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