Principles of aortic dissection surgery include intimal flap dissection repair and prevention of malperfusion; however, adequate aortic resection, appropriate graft measurement and tailoring and completely resecting inciting aortic aneurysms are important technical measures to prevent late sequelae. We report the re-operative resecting inciting aortic aneurysms are important technical measures to prevent early and late sequalae, including adequate aortic resection, creating a stable anastamotic suture line, appropriate graft measurement and tailoring and completely resecting inciting aortic aneurysms. Utilizing simultaneous sternotomy and thoracotomy incisions, we report the re-operative management of a patient with an expanding distal aortic arch pseudoaneurysm, extending into the left pleural space, superimposed upon severely kinked proximal ascending aortic grafts and an aneurysmal aortic root only 6 months after initial repair.

Keywords: Aortic root • Aortic arch surgery • Aortic dissection • Graft length • Mini-thoracotomy

CASE REPORT - VASCULAR

Challenging management of a complex distal aortic arch pseudoaneurysm following previous aortic dissection repair

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Abstract

The primary goals of surgery for acute aortic dissection are to resect or control the intimal flap, prevent distal malperfusion, protect the brain and have a viable patient. However, several technical measures are important to prevent early and late sequalae, including adequate aortic resection, creating a stable anastamotic suture line, appropriate graft measurement and tailoring and completely resecting inciting aortic aneurysms. Utilizing simultaneous sternotomy and thoracotomy incisions, we report the re-operative management of a patient with an expanding distal aortic arch pseudoaneurysm, extending into the left pleural space, superimposed upon severely kinked proximal ascending aortic grafts and an aneurysmal aortic root only 6 months after initial repair.

Keywords: Aortic root • Aortic arch surgery • Aortic dissection • Graft length • Mini-thoracotomy

Principles of aortic dissection surgery include intimal flap resection and prevention of malperfusion; however, adequate aortic resection, appropriate graft shortening and completely resecting inciting aortic aneurysms are important technical measures to prevent late sequelae. We report the re-operative management of a patient with an expanding aortic arch pseudoaneurysm, kinked proximal ascending aortic grafts and aneurysmal aortic root, only 6 months after his original dissection repair.

CLINICAL SUMMARY

A 60-year old male with hypertension presented with chest pain and syncope. Six months previously, he had undergone a hemicirculation replacement at another institution for an acute type A dissection, complicated by respiratory failure and mesenteric ischaemia. On this admission, a serial computed tomography demonstrated a rapidly expanding aortic arch pseudoaneurysm extending into the left pleural space, superimposed upon a chronically dissected aortic arch (Fig. 1a–c). The imaging also showed a 50 mm aortic root and severe kinking of the two previous ascending aortic grafts, with significant flow acceleration on echocardiography. As no endovascular hybrid options appeared to be feasible, we contemplated a high-risk re-operative approach with concerns about an adequate surgical exposure.

During the operation, the patient was positioned 30° right lateral decubitus with the left arm above the head. We employed a sternotomy to expose the aortic root, ascending aortic grafts and aortic arch; however, control of the descending aorta, beyond the pseudoaneurysm, required a left anterolateral, third intercostal space thoracotomy (Fig. 2a). Axillary and right femoral arterial cannulation were achieved via 8 mm grafts and separate arterial pumps to allow for simultaneous cerebral and systemic perfusion. After cooling to 25°C, the cerebral and systemic perfusions were lowered to 1 L/min and the pseudoaneurysm was explored. The dissected aortic arch was resected completely and reconstructed using a homemade trifurcated graft (12-, 8- and 8-mm). Then through the thoracotomy, the aneurysmal proximal descending aorta was resected back to behind the hilum where the diameter narrowed to 30 mm and a 26-mm dacron graft was parachuted into the place. The proximal end of this graft was anastomosed to the head vessel graft to allow for antegrade reperfusion and rewarming. We then resected the aneurysmal and heavily distorted aortic root, along with its multifenestrated aortic valve cusps, and replaced it with a homemade 25-mm porcine bioprosthesis within a 26-mm graft. The aortic root graft was shortened just above the left coronary button and the aortic arch graft was carefully bevelled to prevent buckling of the lesser curvature while preserving the greater curvature of the neo-aortic arch. The patient was easily weaned from the cardiopulmonary bypass and had strong femoral pulses and good renal function postoperatively. He was extubated on day 3, transferred to the ward after a week and discharged home 2 weeks following an uneventful recovery. At the 3-month follow-up, he continued to do well and a computed tomography demonstrated an intact neo-aortic root, aortic arch and descending aorta without residual aneurysm, kinking, anastamotic leak or distal malperfusion (Fig. 2b and c).
DISCUSSION

Common complications following aortic dissection repair include bleeding, delirium and distal malperfusion; however, complications such as graft kinking, anastomotic leaks and residual aneurysm growth should not be expected within the first year [1]. It was plausible that the distal anastomotic leak and pseudoaneurysm our patient experienced was caused or at least exacerbated by excessive graft lengths, graft kinking or an unstable anastomotic suture line. Severe graft angulation causes turbulence and can potentially result in haemolysis, endocarditis, anastomotic dehiscence or aortic cuspal malcoaptation [2]. Appropriate graft shortening and tailoring is critical to preserving the laminar flow and the normal aortic geometry [2]. A distal ascending aortic graft should be tailored for account for the significantly shorter and lesser curvature of the aortic arch as well as graft ballooning of 10–20% once the blood flow is re-established [2].

We felt that a total arch replacement was the most appropriate management technique for our patient; therefore, controlling the laterally expanding pseudoaneurysm and the descending aorta was greatly facilitated by the anterolateral thoracotomy without compromising postoperative respiratory dynamics. Other options would have included a clamshell or hemi-clam shell approach, which are associated with higher rates of respiratory complications [3], a conventional two-staged elephant trunk procedure or a single-stage frozen elephant trunk procedure [4]. We felt that the distal aortic arch tissue, especially involving the pseudoaneurysm, was of such poor quality that a two-staged conventional elephant trunk would not have been feasible. However, we did contemplate hybrid options, including various combinations of endovascular stenting of the descending aorta and open arch repair. The hybrid approach to stent the true lumen of the descending aorta would certainly eliminate the need for the thoracotomy, but its success may be limited by the retrograde false lumen blood flow. The frozen elephant trunk technique has demonstrated good results and would have been a good single-stage alternative to secure the descending thoracic aorta endovascularly, while completing the arch repair through the sternotomy [4]. We routinely employ simultaneous upper body perfusion (right axillary sidegraft) and lower body perfusion (femoral arterial sidegraft) during the aortic arch replacement and elephant trunk procedures to provide a complete cerebral, mesenteric, spinal cord and lower body protection. This additive lower body perfusion is particularly important in long, difficult aortic arch reoperations, where prolonged cardiopulmonary bypass times are expected [5].

Finally, in aortic dissection repair, there is a temptation to perform the most expeditious operation. However, it was likely that the aortic root was aneurysmal 6 months previously and, perhaps, was an important predisposing factor for the initial type A dissection. The dissected aorta is inherently diseased and primary resection of inciting ascending and aortic root aneurysms should be an operative imperative. Although tempting to leave the native root in situ because of the already lengthy operation, concerns about aneurysmal expansion and future root complications led us to resect the entire diseased native aortic root.

Conflict of interest: none declared.
REFERENCES


