Staged hybrid treatment of ascending aorta aneurysm post cardiac surgery

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Abstract

We describe the management of ascending aorta aneurysm following a recurrent sternotomy wound infection in 2 male patients. The patients had undergone cardiac surgery using cardiopulmonary bypass with late complications of chronic sternal wound infection and saccular aneurysm at the aortic cannulation site. In both patients, following a multidisciplinary approach, a customized stent graft was implanted endovascularly into the ascending aorta to seal the aneurysm orifice followed by resternotomy, repair of the aneurysm and omentopexy. Both patients' postoperative course was uneventful.

Keywords: Aortic operation • Aortic aneurysm • Endovascular procedures/stents • Sternotomy wound infection

INTRODUCTION

Cardiac surgery is the commonest cause of ascending aorta aneurysm; this remains a rare complication with a high reoperative mortality [1]. The frequently practiced surgical approach is femoro-femoral cardiopulmonary bypass (CPB) and hypothermic circulatory arrest.

We report two successful repairs of ascending aorta aneurysm, using a hybrid approach involving endovascular stent graft placement followed by surgical repair and omentopexy without CPB.

CASE 1

A 59-year old male underwent quadruple-vessel coronary artery bypass grafting (CABG). He was discharged home after an uneventful postoperative course. He re-presented 3 months later with a superficial sternal wound infection. He was initially managed conservatively using antibiotics and regular wound dressings. Wound culture was negative for microorganisms. The healing process was facilitated by the removal of a few infected wires; however, the infection recurred.

A contrast-enhanced computerized tomographic (CT) scan of thorax demonstrated an aneurysm of the ascending aorta arising from the aortic cannulation site. The aneurysm sac measured 16 mm in diameter, although this increased to 36 mm on a subsequent CT scan.

It was proposed that the aneurysm could be treated with an endovascularly placed stent graft. The vein graft to the right coronary would potentially be at risk during stenting and, therefore, the patient underwent coronary angiography and attempted recannalization of the native right coronary artery, but this was unsuccessful. A custom-made stent graft (Cook Medical, Inc., IN, USA) using two stents measuring 34 mm in diameter and 42 mm in length was obtained.

CASE 2

A 77-year old male underwent aortic valve replacement and CABG. Two weeks later, Enterococcus species were isolated from a superficial sternal wound infection. Ciprofloxacin was commenced. The patient was discharged home with regular wound dressing. After 4 months, the sternal wound infection persisted and a single sternal wire was removed. Six weeks later, the patient collapsed after an episode of minimal bleeding from a new sinus on the sternotomy wound. He fully recovered and remained haemodynamically stable with minimal bloody discharge from the sinus. A contrast CT scan revealed a retrosternal haematoma with a 10-mm diameter aneurysm arising from the cannulation site of the ascending aorta ~ 75 mm distal to the bioprosthetic valve. A customized stent similar to Case 1 measuring 38 and 44 mm in diameter and length, respectively, was obtained.

STAGED MANAGEMENT OF THE PATIENTS

Following a multidisciplinary team discussion, a staged hybrid approach was proposed. For each patient, a customized stent graft was manufactured and became available within 2 weeks. During this period, both patients remained hospitalized under close monitoring with control of blood pressure and...
prophylactic antibiotic therapy. This period is critical as the risk of rupture still exists.

Stage 1

Under general anaesthesia, following a cut down of the right common femoral artery, the custom-made endovascular stent was deployed in the ascending aorta. The stent completely excluded the aneurysm (Fig. 1), avoiding occlusion of the saphenous vein graft (Case 1) and spared the head and neck vessels (Cases 1 and 2).

In Case 1, the stent graft was inserted via a cut down at the right femoral artery into the ascending aorta. There was insufficient lowering of blood pressure and during deployment of the proximal stent, it suffered from the windsock effect. This proximal stent partially everted and everything moved distally. An aortic balloon was advanced into the aortic arch and positioned behind the partially deployed stent graft. The inflated balloon was pushed to reorientate the proximal stent and, simultaneously, the stent graft was advanced and the second stent deployed. It was well placed between the vein graft and innominate artery.

In Case 2, the patient was paced rapidly at a rate of 180 beat per minute to lower the blood pressure to 50 mmHg for stent deployment. Following repeated ballooning, there remained a small leak into the aneurysm of Case 2.

In both cases, the sufficient length of the ascending aorta and a minimum of 10 mm distance between the sealing zone and the important structures (grafts top end or innominate artery origin) allowed us to deploy the stent safely.

Stage 2

Seventy-two hours after stent implantation, both patients underwent resternotomy. Mediastinal toileting was performed and the defect in the aorta exposed (Fig. 2A). In Case 2, there was only a trickle of bleeding, which was easily controlled by single-digit compression. With extension of the wound to the upper part of the abdomen, the greater omentum was dissected off the transverse colon (Fig. 2C) as a pedicled graft supplied by the gastroepiploic vessels. A patch of native pericardium was sutured in place to cover aortic defect (Fig. 2B). Following this, the omentum was positioned securely in the mediastinum around the aorta (Fig. 2D).

Both patients, except for a mild, self-limiting ileus, had an uneventful postoperative course of recovery and were discharged within 3 weeks of the surgery. Both remained well, 5 years and 6 months later.

COMMENT

Traditionally, the management of ascending aorta aneurysm has involved CPB and open surgery; occasionally, endovascular treatment options have been proposed. The short segment of the ascending aorta and the risk of flow obstruction have been major deterrents to endovascular interventions [2]. Endovascular stent grafting has been previously demonstrated with a
significant role of being a stop-gap arrangement prior to surgical repair in high-risk patients [3].

The omentopexy reinforcement of ascending aorta aneurysm has been previously described [4]; however, we planned to surround and wall off the area of the aorta where the foreign material of the stent was exposed.

Although following the resternotomy we did not confront any active infection, the successful deployment of endovascular stents in the infected fields has been reported [5]. It is imperative to be cautious about the risk of stent failure superimposed by infection recurrence.

Prior to surgery, the patient’s general condition needs to be carefully monitored and optimized, while manufacture of the customized stent is in progress. Rapid ventricular pacing and the resultant temporary decrease in cardiac output are essential for safe stent deployment.

In conclusion, in selected patients with ascending aorta aneurysm, the hybrid staged treatment is effective and safe.

REFERENCES

eComment. Endovascular ascending aortic aneurysm repair: an effective alternative to open repair?

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The article by Shaikhrezai et al. [1] raises a very important question: is endovascular repair of ascending aortic aneurysm a safe procedure that should be reserved for high-risk patients?

The authors report on two cases of postoperative saccular aneurysms that were excluded with an endostent before a resternotomy was employed in order to close the defect in the aorta (hybrid two-stage procedure). Both patients did well and the repair has proven durable for years.

Our experience with stents in the ascending aorta has been limited, since we elect to primarily repair all such aneurysms with exclusion of the affected aortic segment and reconstruction with a Dacron graft. Our previous published study showed that surgery on the ascending aorta and root in patients who have had previous cardiac surgery can be performed with low mortality (5.4% postoperative mortality rate). We concluded that advanced age and significant coronary disease may negatively influence surgical results [2].

Placing a foreign material (graft or endostent) in an infected area carries significant risk of re-infection, however both Shaikhrezai et al. [1] and our unpublished data show that the mortality can be low with the appropriate antibiotic coverage and the use of muscle or omental flaps. The endovascular approach can be a good alternative in high-risk or inoperable patients, however the open approach still remains the gold standard for postoperative aneurysms of the ascending aorta.

Conflict of interest: none declared.

References