CASE REPORT

Leaflet repair and valve sparing (inclusion technique) aortic root repair: reference to the latest principles

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SUMMARY

Up to 150 words summarising the case presentation and outcome (this will be freely available online). A Marfan case with dilated aortic root and prolapsed leaflets underwent aortic repair. The non-coronary leaflet-measured effective height was 7 mm (prolapsing) and was lifted up to 10 mm with a centrally placed plicating sutures. The right coronary leaflet had a geometric height of 17 mm (restricted) and was enlarged up to 21 mm with an autologous pericardial patch. The enlarged root was repaired with an inclusion technique. The final result showed a competent valve. This report outlines the feasibility of aortic repair provided one adheres to the principles of aortic valve repair.

BACKGROUND

Aortic repair is implemented in less than 1.7% of cases of aortic incompetence. We present a case requiring a complex repair of the dilated aortic annulus, sinuses and ascending aorta together with an aortic leaflet prolapse in a Marfan patient.

By discussing the principles of the two components of repair (root and leaflets) we aim to stimulate awareness on the feasibility of the procedure.

CASE PRESENTATION

A 39-year-old man with known Marfan's disease was incidentally found to have aortic root dilation on routine echocardiography with dilation of the sinus of valsalva, with normal cardiac function. Mild aortic valve incompetence with a central and an eccentric jet was noted on his echocardiogram. He was asymptomatic despite the dilation. Other medical history included a dislocated ocular lens, dural ectasia, both classical of Marfan's disease, hip osteoarthritis and hypertension, which was controlled with bisoprolol.

INVESTIGATIONS

A transoesophageal echocardiogram looked at the mechanism of his Aortic Incompetence. A central jet implied lack of coaptation due to annular dilatation but a second eccentric jet on the long-axis view directed towards the anterior leaflet of the mitral valve was deemed to be due to a prolapse of the non-coronary cusp. A CT chest and MRI confirmed annular and coronary sinuses dilation to be 5 cm (figure 1).

TREATMENT

Median sternotomy approach with Cardio-Pulmonary Bypass via the ascending aorta and right atrium.

Findings

Ascending aortic aneurysm 5 cm at the level of the aortic sinuses. Sinotubular junction: 4 cm.

Aortic valve leaflets: non-coronary cusp prolapsed 3–4 mm, right coronary cusp restricted (geometric height: 17 mm, normal should be >20 mm).

Procedure

Excision of aortic sinuses, coronary ostia prepared as buttons. Valve reimplanted as an inclusion technique (two-suture line technique) using a 27 mm gel weave tube graft. Valve leaflets were assessed. Non-coronary cusp was prolapsed and surgically elevated. Right coronary cusp was retracted; with the use of a pericardial patch the leaflet was enlarged. The coronary buttons were reimplanted. The distal tube graft anastomosis was constructed to the ascending aorta with 4.0 polypropylene sutures. Perioperative trans-oesophageal echocardiogram (TOE) showed trivial eccentric jet at the right coronary cusp coaptation line (figures 2 and 3).

The fact that the aortic valve was repaired, no warfarin required postoperatively.

While recovering in the intensive care unit, the patient developed complete heart block, which failed to settle, and he subsequently required the implantation of an internal permanent pacemaker.

OUTCOME AND FOLLOW-UP

Postoperative echocardiogram at 6 weeks showed an aortic root within normal parameters, trivial aortic regurgitation with normal flow velocities. The patient has no ongoing complications and is currently well.

Figure 1 Preoperative coronal-contrast CT image demonstrating a dilated aortic root. Echocardiography confirmed the dilation to be supra-valvular, with a diameter of 5 cm.

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Figure 2 Intraoperative photograph showing the aortic valve cusps. Annular sutures have been placed to 'parachute' the Gelweave graft (inclusion technique).

DISCUSSION

Marfans syndrome is an autosomal-dominant connective tissue disorder with a reported incidence of 1 in 2500, and approximately 20% will require surgery.¹

American heart Association guidelines state that 15% of patients with Marfans can develop dissection at a diameter less than 5 cm.²

Guidelines suggest that repair should be carried out when the aortic root diameter is >4 cm due to the risk of dissection.²

While the Bentall procedure has been the mainstay of treatment for those young patients, the mechanic prosthesis and the need for warfarin is problematic. As per Hammermeister *et al*,³ the incidence of mechanical valve-related complications are more than 50% in 10 years.

Figure 3 The Gelweave graft has been secured in place. The cusps have been repaired and when tested are seen to be coaptating satisfactorily.

Boodhwani and El Khoury⁴ has developed a functional classification of Aortic Incompetence which guides repair strategy.

Three important concepts should be mentioned, when aortic repair is to be considered: the leaflet geometric height (gH), effective height (eH) and aortic diameters. The normal gH in tricuspid valves should be 21 ± 3 mm.⁵ The normal eH should be 9–10 mm. The aortic annulus is considered as dilated if it measures more than 25 mm.

With the Schafers calliper for obtaining those measurements and by using the various leaflet plicating repair techniques, reproducible methods of repair and also incremental risk valve-related factors for failure have been reported.⁶

Lastly remodelling may leave the annulus prone to dilation in the future, and therefore either reimplantation or adding an annular ring to remodelling may well be favourable, especially in Marfans patients.

Learning points

- ▶ This paper outlines and references the principles of aortic repair (leaflet and root). This is a rare case because repair techniques for aortic incompetence are used in less than 2% of cardiothoracic practices.
- ▶ With proper intraoperative trans-oesophageal echocardiogram (TOE) views a segmental analysis of the leaflet pathology (restriction, prolapse, lack of coaptation due to annular dilation) is delineated and this guides repair.
- ▶ With the use of an intraoperative leaflet calliper the geometric height and effective height of the aortic leaflets can be measured and corrected back to the normal values.
- ▶ With this case report we have shown that valve-sparing aortic root replacement is not an art; by using TOE segmental analysis and intraoperative leaflet heights (by using principles of repair that have developed during the last few years) aortic repair becomes a reproducible exercise.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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