Case Report

David Procedure for Aortic Root Aneurysm in a Post-Mitral Valve Repair patient with Marfan's Syndrome – a Case Report

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Abstract:

Marfan's syndrome is a multisystem connective tissue disorder caused by mutation of FBN1 gene, frequently affects the human cardiac valves. These patients commonly die due to cardiovascular diseases. David procedure has been recognized as a durable treatment option in younger adults for aortic root replacement in aortic aneurysm. But performing a David re-implantation for aortic root replacement in a post cardiac (mitral valve repair/MVR) surgery patient is not an easy task. We hereby present a case of successful David re-implantation of aortic root in a young post MVR patient.

Keywords: *David procedure; Valve sparing aortic root replacement; David re-implantation; Aortic valve repair/ root replacement; Aortic aneurysm.*

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Introduction:

Marfan's syndrome is a connective tissue disorder usually caused by mutation of the FBN1 genes. Along with many other complications (ocular, skeletal, skin or pulmonary) these patients often suffer from severe cardiovascular diseases.[1] The atrioventricular valves are commonly affected leading to variable degree of regurgitation, whereas aortic valve dysfunction occurs in late years of life. Aortic aneurysm or dissection are the most fatal expression of this disease.

Patient with Marfan's syndrome having aortic root aneurysm, usually dies due to proximal aortic dissection and rupture. Surgical correction by means of aortic root replacement along with ascending aortic replacement prevents aortic dissection thus increasing their lifespan.[2-4] In Marfan's syndrome, patients with aortic root aneurysm, surgery is recommended if the transverse aortic diameter reaches 50mm or even 45mm in case patient have a family history of aortic dissection, or willing to bear a child.[2] Conservation of the Aortic valve is of vital importance whenever possible in these patients. We report a young male in whom aortic valve was conserved during a redo sternotomy. The challenges faced during dissecting the Aortic root has been enumerated.

Case report:

A 32-year-old male presented with the complaints of exertional breathlessness (New York Heart Association - Class III). Patient did not have history of chest pain, syncope or palpitation. He has a history of minimal invasive mitral valve repair (with 36 mm CG Future annuloplasty ring) done three years back in an overseas cardiac center, for severe mitral regurgitation due to mitral valve prolapse. At the time of first surgery, his ascending aortic diameter was 4.4 cm with a normal functioning aortic valve.

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His biochemical investigations were essentially normal. His serum creatinine was 0.9mg/dl and EUROScore II for in-hospital mortality was 3.42%.

Color Doppler echocardiography showed ascending aortic aneurysm with possible dissection flap in the ascending aorta. His aortic valve annulus was 22-24mm, aortic valve was tri-leaflet. The sino-tubular junction was 44mm leading severe type-I aortic regurgitation. Mitral valve was normally functioning, along with a normal bi-ventricular functions. Computed tomography scan (CT scan) of aorta revealed a dilatation of aortic root (annulus-24mm, sinus of Valsalva- 56mm, sino-tubular junction-44mm). The ascending aorta was dilated (51 mm), Infra-renal segment of the abdominal aorta shows mild fusiform dilatation (38mm) and length of involved segment was 9.5 cm.

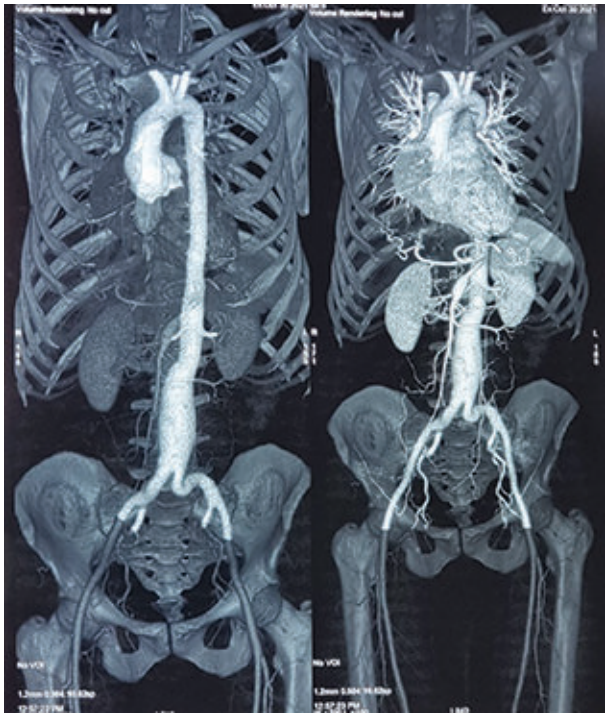

Figure 1: *Pre-operative contrast CT aortogram showing ascending aortic aneurysm along with mild fusiform dilatation of infra-renal segment of abdominal aorta,*

Surgery:

On December, 2021 he was taken to the OR for surgery. After establishment of all essential lines' sternotomy was done. Careful dissection was done to enter pericardial cavity as there was mild to moderate adhesion between the heart, great vessels and pericardium. CPB (cardiopulmonary Bypass) was established with distal aortic arch and two stage single venous cannula. Patient was cooled down to 28°C, and after applying aortic cross clamp a horizontal aortotomy was done one cm above the STJ. Antegrade selective del-Nido blood cardioplegia was delivered and heart was arrested at diastole. Aortic valve was found tricuspid and grossly incompetent. Careful dissection of aortic root was done as low as possible giving special emphasis not to injure main pulmonary artery, both coronary arteries with branches and LV outflow tract. Both coronary buttons were then created and suspended with stay silk suture. Sizing of the tube graft was done with regular valve sizer (the size of valve sizer corresponded with annulus was 25, we prefer to use 5 size larger tube graft). Proximal anastomosis was done with 30 mm straight tube graft with 12 interrupted pledgeted polyester sutures (inside out) first keeping the Hagger's dilator inside the aortic annulus, and later re-implantation was completed with running polypropylene sutures after fixation of the three

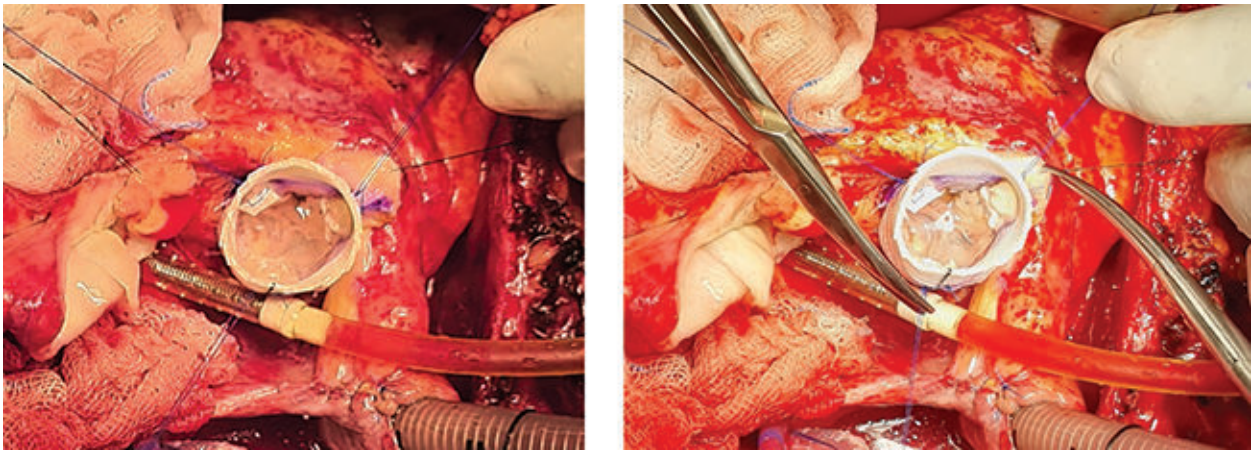

Figure 2 a, b: *Per-operative picture showing excellent competent aortic valve manifested by saline test*

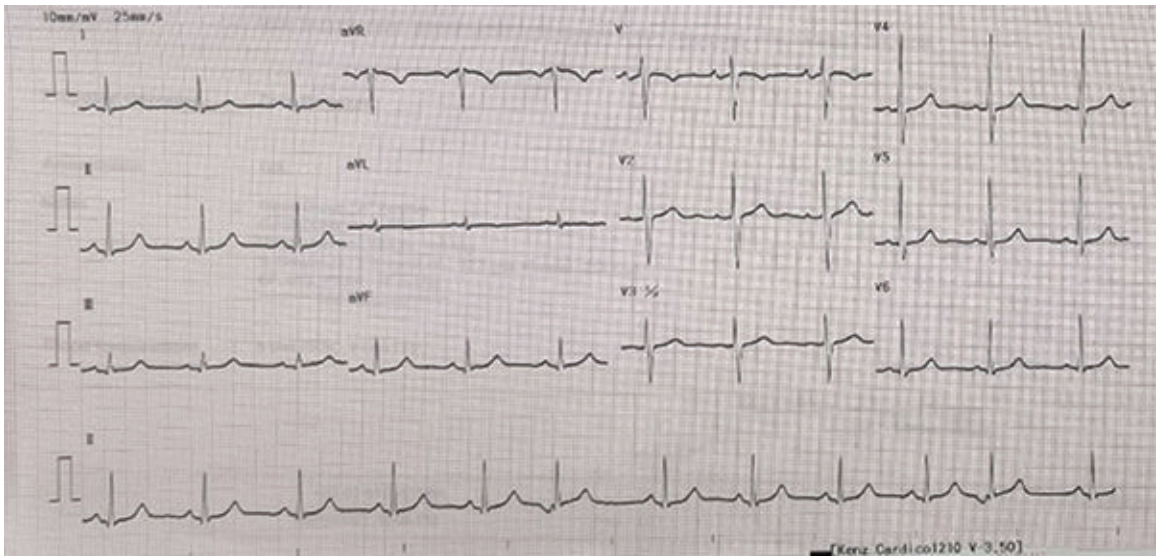

Figure 3: *Post-operative ECG of the patient,*

commissures. Suture lines were checked for bleeding using foley catheter and after satisfactory hemostasis coronary buttons were re-implanted in the tube graft. Tisseel-lyo (tissue-glue) was then applied at the proximal suture line and coronary anastomosis line. The distal aortic anastomosis was then completed with running 4-0 and 5-0 polypropylene sutures. The cross clamp was released after proper de-airing, and heart was weaned to normal sinus rhythm. Total CPB and cross-clamp time was 205 min and 150 min respectively. Per-operative TEE showed normally functioning aortic valve.

Patient was later on shifted to ICU and subsequently extubated on the next morning. The patient spent an eventless in-hospital course. Post-operative color Doppler echo on 6th post-op day showed laminar flow across the aortic conduit and trace eccentric aortic regurgitation along with normal mitral valve function. Normal bi-ventricular functions were also seen. Patient was discharged on 7th post-op day with oral Metoprolol, Aspirin, Clopidogrel, and Frusemide.

Discussion:

Aortic root re-implantation is challenging especially in redo cardiac surgery. Redo cardiac surgeries are associated with bleeding, structural injury and even death, as intra-pericardial adhesions make sternotomy pretty difficult. Moreover, as in our case performing David re-implantation is technically difficult in the background of previous mitral valve surgery, because this procedure necessitates extensive meticulous dissection. During the creation of coronary buttons caution must be taken not to injure the coronary arteries, pulmonary arterial wall or the ventricular wall. Some author reported the need of an interposition cabrol's technique for injured coronary artery anastomosis[4] In our patient careful dissection and meticulous hemostasis caused the patient minimum (350ml) blood loss on the 1st postop day. Burgstaller et al, [6] at a review showed patients with Marfan's syndrome treated with David aortic root reimplantation were clearly having superior in-hospital, mid- and long-term survival rates compared to Bentall's composite valved graft group. Although the David group requires longer cross-clamp time, CPB time as well as longer circulatory arrest time, it showed superior in-hospital survival rate in aortic root reimplantation patients. The reimplantation group showed superior outcome in terms of mortality rate.[6]

Recent studies showed that both Bentall and David procedure are associated with admirable early and long-term results.[7] Studies showed 5- and 10-years survival rates were 85% and 70% respectively, whereas freedom from valve replacement at 5 and 10 years were 91% and 87%.[8] Moreover, the David procedure is associated with less bleeding than Bentall procedure and with a less frequent re-opening rate for bleeding. As a result, to avoid bleeding risk and other prosthesis related adversaries David re-implantation is preferred wherever indicated.

At 1 month, 3 months, 6 months and 1year and 2 year follow-up patient showed excellent exercise tolerability and no sign of exertional dyspnea. Patient is now waiting for EVAR for his abdominal aortic aneurysm.

Conclusion:

David's re-implantation technique of aortic root replacement has been established as an excellent choice for the treatment of young patients with aortic root aneurysm. From our limited experience we think performing valve sparing root replacement in the younger active adults will spare the patient from unnecessary valve related anticoagulation and thrombotic complications. Then again performing David procedure is not everyone's cup of tea. It requires extraordinary training and exceptional experience to complete a procedure like this, and in a re-do scenario it becomes a strenuous job.

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Ethical approval:

Ethical approval was taken from the institutional ethics review committee for publication of this case report.

Informed consent:

Informed consent was taken from the patient about the possible publication, and the importance of such publication was described to the patient.

Human and animal rights:

Not applicable.

Conflict of Interest: None

Fundings: None

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