

Extra-Aortic Annuloplasty Using Dacron Ring for Ross Procedure

Objective: We present our technique for extra-aortic annuloplasty during the Ross procedure. Our patient was a 27-year-old male with a history of bicuspid aortic valve, who presented with symptomatic severe aortic regurgitation (AR) and moderate aortic stenosis. Pre-operative echocardiography showed a unicuspid aortic valve, vena contracta width of 0.79cm, aortic valve (AV) peak velocity of 3.1m/s, AV mean gradient of 21mmHg, and AV area of 1.4cm². Magnetic resonance angiography demonstrated a dilated aortic root of 43mm and a dilated mid-ascending aorta of 40mm. Given that an autograft would offer improved durability without the need for lifelong anticoagulation, the patient chose to undergo the Ross procedure.

Case Video Summary: The Ross procedure was performed using full root implantation technique. Patient was placed on cardiopulmonary bypass and cooled to 18°C. The aortic valve was excised, revealing a unicuspid valve with raphe at the left-right and right-non position, along with a dilated aortic annulus measuring 29mm in diameter. The pulmonary artery was opened, revealing a suitable 23mm autograft that was then excised. Hypothermic circulatory arrest with retrograde cerebral perfusion was initiated, allowing anastomosis of a 24mm Dacron graft to the proximal transverse arch using hemiarch technique. Bypass was then reinitiated. An extra-aortic annuloplasty ring approximately 5mm in height was cut from the bottom of a 32mm Dacron graft. The expected location of the commissures were marked for orientation. The ring was placed externally on the aortic annulus and secured with six horizontal mattress sutures in the virtual basal ring. This immediately reduced the annulus to 25mm intra-operatively. The autograft was implanted into the left ventricular outflow tract (LVOT), then a 28mm decellularized pulmonary homograft was implanted into the right ventricular outflow tract. The ascending Dacron graft was anastomosed to the sinotubular junction of the autograft. The patient was rewarmed and weaned off bypass. Remnants of the aortic root sinuses were attached to the ascending Dacron graft, providing external autologous reinforcement. Completion echocardiography showed trace AR. The patient's post-operative course was uncomplicated. Pre-discharge echocardiography showed trivial AR, with a decreased LVOT diameter (used here as an approximation of aortic annulus diameter) compared to pre-operative echocardiography. The patient was discharged after five days. Follow-up echocardiography at 7 months continued to show trivial AR, with a stable mean gradient and a stable LVOT diameter.

Conclusions: Annular dilatation is a common complication among young adults undergoing the Ross procedure. Patients with a pre-operative annulus >26mm have been shown to be at increased risk. This video demonstrates that extra-aortic annuloplasty with a Dacron ring offers an effective and straightforward approach to annular stabilization.

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