Case report

Surgical aortic-valve replacement with a transcatheter implant

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Abstract

We describe a bailout procedure when surgical aortic-valve replacement was not possible due to severe calcification of the ascending aorta and the root and a very small annulus. A 21-mm CoreValve Revalving prosthesis was inserted via the aortotomy in the presence of a mitral prosthesis.

1. Case report

A 69-year-old woman was admitted for elective aortic and mitral-valve replacement and coronary artery bypass graft surgery. Her main complaint was angina and shortness of breath (New York Heart Association (NYHA) functional class III). At age 15 years, she had undergone an end-to-end resection anastomosis for coarctation of aorta. She had had a subarachnoid hemorrhage and was on antiepileptic medication. She was a smoker, of 20 cigarettes per day with moderate pulmonary dysfunction. She had had surgery for varicose veins and only had one to two possible lengths of vein suitable for harvesting. Transthoracic and peroperative transesophageal echocardiography showed severe aortic stenosis with a peak gradient of 71 mm Hg, valve area of 0.6 cm², significant mitral stenosis, aortic annulus diameter of 21 mm, left-ventricular ejection fraction of 30%, and satisfactory right ventricular function. Computed tomography (CT) scan of the aorta showed severe calcification of most part of the descending aorta and some calcification of the ascending aorta, particularly in the area of the root and proximal ascending (Fig. 1). Coronary angiography showed disease in left anterior descending (LAD), normal co-dominant circumflex, blocked right coronary artery (RCA) with no obvious posterior descending artery (PDA). She was discussed at a multidisciplinary meeting and it was felt that, although high-risk, surgery was the only option.

The operation was performed through median sternotomy, cannulation of the ascending aorta after identification of a non-calcific part of the distal ascending aorta, and bicaval cannulation at 32 °C. Cannulation of the femoral and axillary arteries were considered and attempted. All vessels were severely calcific and of small lumen. In addition, the arterial monitoring line had to be inserted into one of the femoral arteries due to difficulty with insertion into the radial artery. The internal mammary artery was harvested. It was extremely calcific and not usable. Due to this and difficulty encountered by the anesthetist to insert a radial line, the radial arteries were not harvested. When the aortotomy was performed, it became obvious that the aortic root was heavily calcified, with a smaller annulus than measured by echocardiography. Following excision of the aortic-valve leaflets, it proved impossible to insert even a 19-mm valve. The coronary ostia could not be identified. Complete root replacement could not be performed due to lack of conduits, impossibility of reimplanting the coronary ostia, and annular size of <19 mm. Mitral valve replacement with a 25-mm Mosaic (Medtronic Inc.) tissue valve and reversed vein graft anastomosis to the LAD were performed. There was no PDA.

A CoreValve prosthesis was then inserted and an attempt was made to implant the valve without its delivery system. This proved difficult. Therefore, the valve was mounted on its delivery system as prepared for transcatheter implantation and then delivered through the aortotomy and inserted successfully, its proximal section in contact with mitral prosthesis. No further suturing was required to transfix the implant. The distal part of the valve did not interfere with the aortotomy and the aortotomy was closed with a 4/0 Prolene suture and strengthened with Teflon strips. Cross-clamp and cardiopulmonary bypass times were 155 and 186 min, respectively. Cardiopulmonary bypass was discontinued on moderate inotropic support. Transesophageal echocardiography at completion of the operation showed...
satisfactory function of CoreValve with no paravalvular or central regurgitation (Fig. 2, Videos 1 and 2). Subsequent imaging on intensive care showed satisfactory valve function of both the CoreValve and mitral prostheses.

On postoperative day 5, the patient developed rapidly deteriorating gas exchange with poor oxygenation and CO2 retention and features of adult respiratory distress syndrome. She had a rapid deterioration of her gas exchange, which did not respond to any respiratory support measures. Regrettably, the patient died a day later due to severe poor oxygenation, which did not improve.

2. Discussion

We describe insertion of a CoreValve prosthesis via the open method in the presence of a mitral prosthesis. There are several technical issues of note, including the difficulty in inserting the valve without its delivery device. We found the experience gained by the surgical group in inserting transcatheter valves in the catheter laboratory useful, in that mounting and inserting the valve in an emergency situation in the operating room was possible. This avoided a significant increase in cross-clamp and bypass times. However, additional times of obtaining the valve from the catheter laboratory and its preparation contribute to cross-clamp time. This scenario is akin to some of the evolving sutureless valves where, although time is saved in not suturing the valve, the preparation of the valve following sizing can increase cross-clamp time. It was possible to insert the CoreValve implant in the presence of the mitral prosthesis. The proximal part of the CoreValve abutted one of the struts of the mitral prosthesis. However, this did not distort the function of the mitral valve. We found it unnecessary to apply extra sutures to fix the CoreValve in its distal part. Olsen and colleagues have described a similar case [1] for an isolated aortic-valve replacement (AVR) where they found it necessary to anchor the distal end of the prosthesis. Others have described and suggested insertion of a sutureless valve in this scenario [2].

References


Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.ejcts.2010.07.044.