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DOI: 10.1016/j.athoracsur.2009.04.078

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Successful Transapical Aortic Valve Replacement in a Patient With a Previous Mechanical Mitral Valve Replacement

Maximilian Scherner, MD, Justus T. Strauch, MD, Peter L. Haldenwang, MD, Frank Baer, MD, and Thorsten Wahlers, MD

Departments of Cardiothoracic Surgery and Cardiology, University Hospital of Cologne, Cologne, Germany

In this case we illustrate our experience with transapical minimal invasive aortic valve replacement in a patient who previously underwent mitral valve replacement. The implantation did not interfere with the existing prosthesis and could even be used as a further landmark, helping height positioning of the aortic valve.


The treatment of choice for patients with symptomatic severe degenerative aortic stenosis, which is the most frequently acquired heart valve lesion, is the surgical aortic valve replacement with cardiopulmonary bypass [1]. Due to the increasing number of patients who are older in age with severe comorbidities, a new technique has been developed to avoid cardiopulmonary bypass and median sternotomy using a transapical approach with implantation of the aortic valve through the left ventricular apex by using a lateral mini-thoracotomy on a stent-based system [2]. In the present case, transapical minimally invasive aortic valve implantation (TAPAVI) has been performed in a patient previously operated on with mitral valve prosthesis.

An 84-year-old woman presented to an outside hospital with symptoms of repetitive syncope, shortness of breath, palpitations, and general weakness. Her history consisted of strumectomy, atrial fibrillation, and a mitral valve replacement performed in 1996 using a 29-mm bi-leaflet prosthesis. Echocardiography revealed a severe aortic stenosis with a continuity equation that was calculated with an aortic valve orifice of 0.5 cm² and a mean pressure gradient of 67 mm Hg. Left ventricular function was considerably reduced with a measured fractional percentage shortening of 14% and an ejection fraction of 30%. Analysis of the mitral valve prosthesis showed a proper function with a mean pressure gradient of 2 mm Hg and a Vmax of 170 cm/s. Preoperative risk analysis resulted in a EUROscore of 35% and a Society of Thoracic Surgeons’ score of 24% (high risk). Thus, the patient was assigned to our department for aortic valve replacement. Due to the patient’s risk, especially concerning the previously performed median sternotomy, we decided (after detailed analysis of the anatomic conditions) to perform TAPAVI on this patient, which we believe to be the first time worldwide.

In an operating room equipped with a fluoroscopy system (ie, the hybrid operating room), a small anterolateral mini-thoracotomy was performed entering the fifth intercostals space. Preparation showed extensive adhesions with the circumjacent tissue, thus an anew aditus and preparation of the apex had to be done choosing the sixth intercostals space. After placement of apical pursestring sutures with Teflon reinforcements (2-0 Prolene; Ethicon, Summerville, NJ) and positioning of epicardial ventricular pacing wires, aortic root angiography was done through a pigtail catheter brought in to the right femoral artery (Fig 1). The apex was punctured and after correct placement of the guidewire in the descending aorta, balloon aortic valvuloplasty was performed under rapid ventricular pacing with a frequency of 180/min (Fig 2). After removal of the balloon, the loader with the 26-mm prosthetic valve (Edwards Sapien; Edwards Lifesciences, Irvine, CA) was introduced across the previously used guidewire. The prosthetic valve was positioned in the aortic annulus under fluoroscopic guidance and the unfolding of the valve was accomplished under rapid ventricular pacing. While using fluoroscopy to verify correct placement of the guidewire, the balloon for valvuloplasty, or the loader for the prosthetic valve, the mitral valve prosthesis could be clearly visualized but...
did not interfere with any of the described processes (Fig 3).

After ensuring the correct placement of the valve, the tightness for leakage of the aortic annulus, the coronary arteries, and the mitral valve prosthesis by supravalvular angiography and by transesophageal echocardiography, the valve sheath and the guidewire were removed, and the chest wall was closed routinely after insertion of a chest tube. The patient’s postoperative course continued without complication and echocardiographic reassessments were made at 4 days and also at 2 months after surgery, which showed excellent results with a Vmax of 2.3 m/s, a maximum pressure gradient of 21 mm Hg, a mean pressure gradient of 11 mm Hg, and an ejection fraction of 60%.

Comment

Transapical minimally invasive aortic valve implantation seems to be a feasible procedure, especially in patients classified as high risk. In this case report we detail our experience of TAPAVI in a patient who underwent mitral valve replacement 12 years ago. Due to the close anatomic relation of the previously replaced valve and the aortic annulus, in combination with this relatively new developed technique using balloon aortic valvuloplasty and deflation of the aortic valve by only using fluoroscopy guidance, the procedure had to be planned carefully under assessment of potential risks and benefits for the patient. After the decision to perform TAPAVI, it became clear intraoperatively that instead of the mitral valve prosthesis being an obstacle, it was a clearly delimitable structure helping to define the described positioning in addition to the information we already knew from the left ventricular outflow tract. On the other hand, it should be mentioned that the well-known risk of adhesions in patients who previously underwent sternotomy [3–5] is an additional risk factor not only in cardiac surgery using the conventional approach, but also in TAPAVI. In conclusion TAPAVI can be done in patients who have a mitral valve prosthesis in position, and this method provides a further reliable anatomic landmark in addition to the routinely used aortic annulus calcifications and the coronary ostia.

References

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