Transapical closure of mitral paravalvular leakage

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INTRODUCTION

Paravalvular leakage after mitral valve replacement surgery is a rare complication and approximately observed in 5% of cases [1]. Although it may be asymptomatic, serious haemodynamic changes, heart failure and even death may be observed. Surgical treatment modalities have considerable morbidity rates. Over the last few years, new treatment strategies for paravalvular leakage have been described and recommended, particularly in patients with high surgical risk. We present the successful mitral paravalvular leakage closure by an Amplatzer duct occluder using the transapical approach in this article.

CASE REPORT

A 53-year-old male patient with chronic obstructive pulmonary disease, chronic renal failure and hypertension was admitted to our department with severe dyspnoea (NYHA III) and lack of appetite. He had undergone mitral valve replacement surgery in 1997 with a St Jude Medical mechanical valve. Transthoracic echocardiography revealed serious mitral insufficiency with left atrial dilatation (LA dimension: 120 mm). A large, ~5 mm width paravalvular leakage was confirmed with three-dimensional transesophageal echocardiography (3D-TEE) examination. The leakage was at the 11 o’clock position in the surgical view, and at the 1 o’clock position in the 3D-TEE view which is the mirror image of the surgical view (Fig. 1). The anterolateral hinge point was at 9 o’clock position, and the posteromedial hinge point was at 3 o’clock position. Therefore, both hinge mechanisms were not relevant to the region of the paravalvular leakage (Fig. 1A and B, black arrow). Laboratory findings were consistent with haemolysis (haemoglobin:11.6 g/dL; reticulocyte count: 3.4%; lactate dehydrogenase: 1100 U/l). Due to the high surgical risk for reoperation (EuroSCORE was 8, matching with high risk group) and the expected high morbidity, it was decided to close the defect with an Amplatzer duct occluder with the transapical approach. The patient was informed in detail about the procedure and informed consent was obtained.

This procedure was performed under general anaesthesia in the operating room. The most appropriate site for catheter-based intervention for the left ventricle is the apex because it can be easily accessed via left anterolateral thoracotomy. Therefore, after left anterolateral small thoracotomy, the apex was visualized and isolated with a pledgeted purse string suture. Then, it was punctured with a six-French sheath to introduce a guide wire to cross the paravalvular leakage. Although the leakage was identified on TEE examination, it was crossed under 3D-TEE and fluoroscopic guidance. After heparinization, activated clotting time was maintained at 300 ms. An Amplatzer duct occluder II device (waist size 6 mm, disc diameter 12 mm) was sent through the catheter and deployed after confirmation of its proper position under 3D-TEE and fluoroscopic guidance. Mechanical valve functions were quite good because the deployed Amplatzer duct occluder was not relevant with hinge mechanisms. The catheter was then removed and purse string sutures tied. The puncture was secured with additional sutures and the thoracotomy was closed in the usual manner. The postoperative course was uneventful and the patient was discharged on the fifth postoperative day with no paravalvular leakage. A well-functioning mechanical valve without any paravalvular leakage was confirmed on the 30th day after discharge.

DISCUSSION

Paravalvular leakage is a complication of prosthetic valves, and is especially observed in mechanical valves. [4]. Although surgical repair or replacement is usually advised in severely symptomatic...
patients and in those requiring blood transfusions for persistent haemolysis, high operative morbidity and mortality rates are of major concern [2, 3]. In patients with excessively high surgical risk, percutaneous closure is an alternative method with different devices and techniques [2, 3]. It reduces the need for repeat surgery, and decreases morbidity and mortality rates.

The 3D-TEE provides valuable information on improving spatial orientation for the guide wire, especially when deploying

![Figure 1: (A) Three-dimensional transesophageal echocardiogram shows the paravalvular defect (white arrow). (B and C) Three-dimensional transesophageal echocardiogram shows that an Amplatzer duct occluder II device (waist size 6 mm, disc diameter 12 mm) was sent through the catheter and was positioned properly before deploying (B, white arrow) and after deploying (C, white arrow), respectively, under TEE and fluoroscopy guidance (Note that black arrows show the direction of hinge axis in figure (A and B)).](image-url)
the device, and it additionally allows online monitoring during
the intervention [4].

There are a few technical issues. The paravalvular leakage must
not be in close relation to the hinge system; otherwise, the tech-
nique may result in the deterioration of valve function. In addition,
Amplatzer occluder must not occupy any area within the inflow
portion of prosthesis. Otherwise, it may result in reduced but
residual haemolysis.

In conclusion, according to our study, the transapical ap-
proach for mitral paravalvular leakage is a new strategy, especial-
ly in patients with high operative risk and unfavourable anatomy
for transfemoral approach.

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