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Pannus Formation Leads to Valve Malfunction in the Tricuspid Position 19 Years after Triple Valve Replacement

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ABSTRACT

The Medtronic ATS Open Pivot mechanical valve has been successfully used in heart valve surgery for more than two decades. We present the case of a patient who, 19 years following a tricuspid valve replacement with an ATS prosthesis as part of a triple valve operation following infective endocarditis, developed severe tricuspid regurgitation due to pannus formation.

INTRODUCTION

The ATS Medical Open Pivot heart valve was introduced in May 1992. It has three characteristics making it superior to the traditional bileaflet design: a convex spherical hinge mechanism, the absence of projecting pivot guards, and the ability to rotate the prosthesis within its cavity [Emery 2004].

The experience of prosthetic valve replacement in the tricuspid position is limited and the optimal choice of replacement valve is still controversial. Satisfactory results with the bileaflet mechanical valve have been demonstrated, in particular, when a patient already has mechanical prostheses in the aortic and/or mitral positions [Rizzoli 2004].

CASE REPORT

This 66-year-old female presented to the emergency department with a two-month history of progressive abdominal distension and limb swelling. She had clinical features consistent with right heart failure including a raised jugular venous pressure, hepatomegaly, ascites, and peripheral edema. Metallic heart sounds were audible with an ejection systolic murmur over the mid sternum and the precordium and a holosystolic murmur over the right lower sternal edge. Previous medical history comprised triple valve surgery following staphylococcus epidermidis endocarditis in 1994 (ATS 19-mm aortic prosthesis, ATS 24-mm mitral prosthesis, and ATS 29-mm tricuspid prosthesis). During her cardiac assessment it was apparent that the patient had sporadic medical contact for several years when she lived abroad, where INR monitoring was erratic.

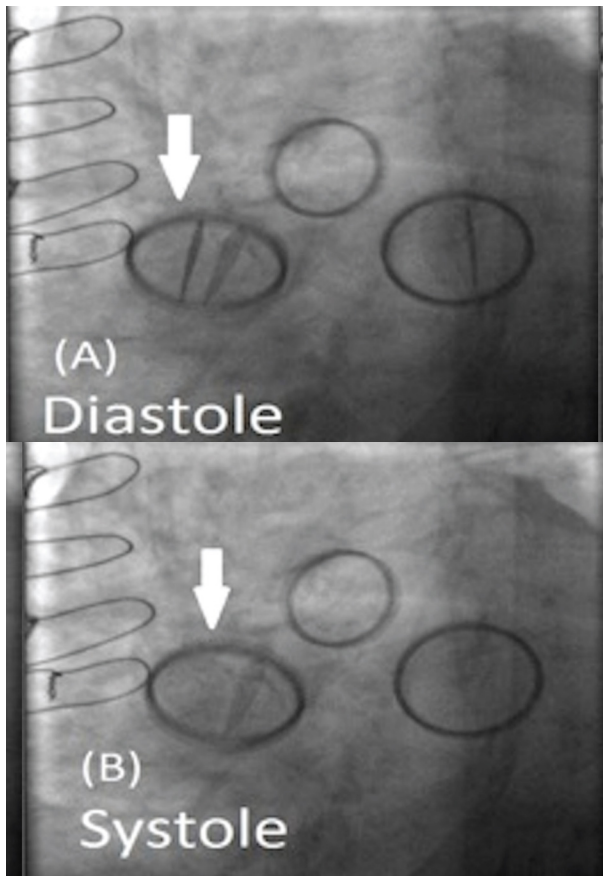

Figure 1. Cine frames showing normally opened TVR in diastole (arrow) (A), and a fixed leaflet in systole (arrow) (B). Note both AVR and MVR leaflets are closed in systole.

A 12-lead electrocardiogram (ECG) was normal and blood tests revealed anemia with raised lactate dehydrogenase (LDH) and conjugated bilirubin levels consistent with hemolysis. A transthoracic echocardiogram confirmed well-functioning aortic and mitral valve prostheses. A bidirectional gradient across the tricuspid valve prosthesis was demonstrated but it was challenging to assess fully due to multiple acoustic shadows. The left ventricular systolic function was

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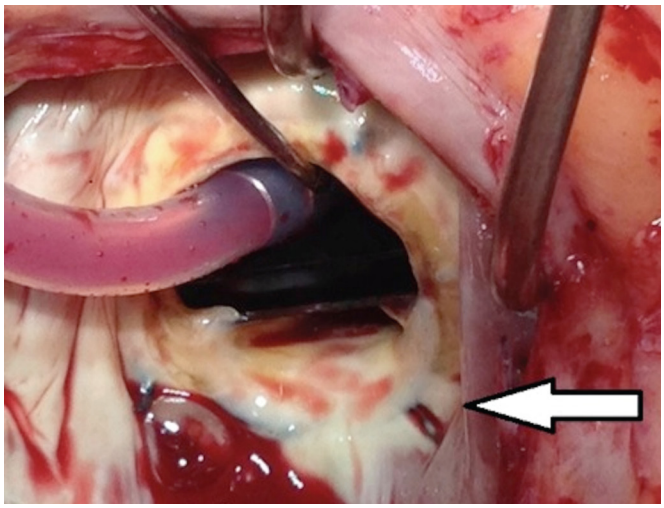

Figure 2. Intraoperative image of the tricuspid valve prosthesis showing pannus formation (arrow) involving the hinges of the septal leaflet of the occluder, resulting in it being stuck in an open position causing severe TR.

impaired with an estimated ejection fraction of 45%. The right ventricle was dilated with severely impaired longitudinal function. Transesophageal echocardiography was performed, revealing severe tricuspid regurgitation with no significant left sided prosthetic valves dysfunction.

Fluoroscopy of the mechanical valve (Figure 1) revealed one faulty leaflet of the tricuspid valve, which was fixed in an open position, and normal bileaflet motion in both the aortic and mitral positions.

The patient underwent an uneventful redo tricuspid valve replacement with a bioprosthetic valve. Intraoperative findings confirmed the diagnosis (Figure 2). Serum LDH and bilirubin levels normalized, and repeat echocardiography demonstrated well-seated prostheses with mild transvalvular gradient across the tricuspid valve only.

DISCUSSION

Pannus formation is a gradual process whereby fibrotic tissue grows at the tissue-valve interface, and tracks along the suture lines and the hinge points, which could subsequently restrict the occluder movement [Biteker 2009]. The incidence of thrombosis of mechanical valves is probably highest in the tricuspid position (up to 20%) due to the low-pressure system; however, there are currently no known predictors of pannus formation either for the type of prosthetic valve, or the site of implantation.

In a study evaluating the surgical findings of 112 obstructed mechanical valves [Deviri 1991], pannus formation was the underlying cause in 10.7% of cases, pannus in combination with thrombus was present in 11.6% of cases, whereas thrombus alone or with little pannus formation was found in 77.7% of cases.

The level of anticoagulation in patients with pannus formation has been investigated, and suboptimal anticoagulation was present in 78% of valve thrombosis and in only 11% of pannus formation, confirming the clinical suspicion that patients with valve obstruction in the setting of therapeutic anticoagulation are more likely to have pannus formation. The minimum time was 12 months to develop occlusion due to a combination of pannus and thrombus, and 78 months in a valve with sole pannus formation [Barbetseas 1998].

Conclusion

This case illustrates a complication of a mechanical tricuspid valve replacement due to pannus formation 19 years post triple valve replacements as a result of the low-pressure system, presented with signs of right heart failure, whereas the same type of valve continued to function well in the mitral and aortic positions. Successful redo tricuspid valve replacement led to resolution of symptoms.

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