Section: Cardiovascular and Thoracic Surgery

Case Series

PROSTHETIC VALVE NON-STRUCTURAL DYSFUNCTION - PANNUS EXCISION WITH OR WITHOUT VALVE REPLACEMENT - A CASE SERIES

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Abstract

Prosthetic valve-related complications, including thrombosis, embolism, and pannus formation, can result in significant morbidity. Pannus formation, which leads to valve dysfunction, results from factors such as infection, thrombus organisation, and inadequate anticoagulation. This case series describes five patients (three men and two women) who presented with prosthetic valve pannus between October 2022 and November 2023. The symptoms included dyspnoea, palpitations, and chest pain. Initial stabilisation was achieved with inotropes, oxygen, and anti-failure medications. Diagnostic imaging included transthoracic echocardiography (TTE), fluoroscopy, multidetector CT (MDCT), and 3D transoesophageal echocardiography (TEE). All patients underwent redo sternotomy with pannus excision; one required valve replacement. Postoperative echocardiography confirmed well-functioning prosthetic valves with minimal gradients (<5 mmHg), normal left ventricular systolic function, and no thrombi or pericardial effusion. The surgical approach was well tolerated, and no significant postoperative complications were observed. Early recognition and timely intervention are crucial for managing prosthetic valve pannus to optimise patient outcomes.

INTRODUCTION

Prosthetic valve malfunction secondary to pannus formation is a serious condition that results in severe valve obstruction, deterioration in haemodynamics, and even life-threatening consequences. Histories of preceding valve operation, poor anticoagulation, chronic inflammation, and organisation of thrombus determine pannus formation.[1,2] Early diagnosis and early intervention are the keys to avoiding irreversible damage and enhancing patient outcomes. It was reported that all patients received urgent surgical intervention. Where the valve was preserved, there was marked improvement in postoperative hemodynamic indices such as transvalvular mean pressure gradient (TMPG) and pulmonary artery systolic pressure (PASP).[3] Left ventricular ejection fraction postoperatively was markedly improved in all groups in their study.[4]

This case series aimed to assess the surgical treatment of prosthetic valve pannus, compare the results of pannus excision with and without valve replacement, and determine short-term postoperative results.

CASE PRESENTATION

This is a case series of five patients (three males and two females) with prosthetic valve pannus formation and dysfunction who were admitted to the emergency department between October 2022 to November 2023. All were post-prosthetic valve implant patients with severe symptoms like dyspnoea, palpitations, restlessness, and chest pain. Stabilisation was initially obtained with inotropes, oxygen, and anti-failure drugs. Diagnostic imaging modalities used were TTE, fluoroscopy, MDCT, and 3D TEE. Surgical treatment was redo sternotomy pannus excision, and valve replacement in a single patient with extensive pannus growth.

Case 1

A 34-year-old man presented with breathlessness (NYHA III) and chest pain. The patient presented with a history of AVR. Preoperative echocardiography showed limited mobility of the prosthetic aortic valve with a gradient of 35 mmHg. Redo sternotomy with pannus excision was performed in the patient, and intraoperative exploration showed pannus overlying the aortic valve impairing the leaflet mobility [Figure 1].

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Postoperative echocardiogram was within normal limits with working prosthetic aortic valve and improved gradient of 25 mmHg and left ventricular function. The patient had an uneventful recovery and was discharged on postoperative day 12.

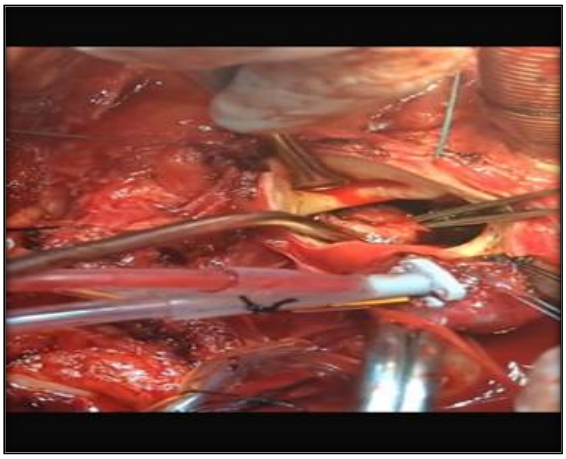

Figure 1: Figure 1: Pannus in aortic valve

Case 2

A 62-year-old man presented with breathlessness (NYHA III) and a history of aortic valve replacement (AVR) in 2012. Preoperative echocardiography revealed restricted mobility of the aortic prosthetic valve with a gradient of 30 mmHg. He underwent redo sternotomy with pannus excision, and intraoperative findings confirmed pannus formation, which restricted valve mobility. Both leaflets were mobile after excision [Figure 2]. Postoperative echocardiography revealed a normally functioning prosthetic aortic valve with a 6-mmHg gradient. The patient recovered uneventfully and was discharged on postoperative day 13.

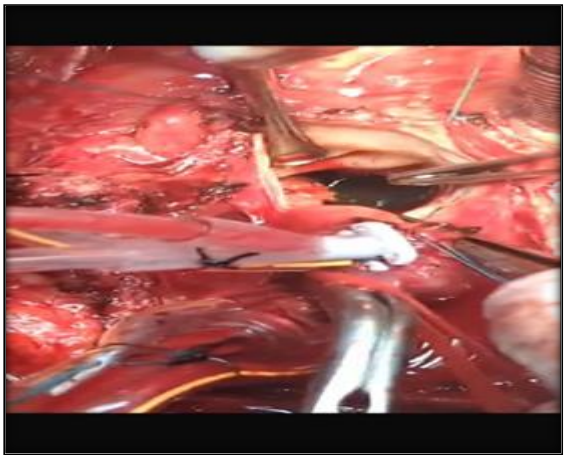

Figure 2: Figure 2: Pannus in aortic valve

Case 3

A 43-year-old man presented with breathlessness (NYHA functional class III) and palpitations. He had a history of closed mitral commissurotomy (CMC) in 1992 and mitral valve replacement (MVR) in 2013. Preoperative echocardiography revealed prosthetic mitral valve calcification with a 15-mmHg gradient. The patient underwent redo sternotomy with left atrial and pannus excision. Following this procedure, both leaflets were mobile [Figure 3]. Postoperative echocardiography revealed a normally functioning prosthetic mitral valve with a 5-mmHg gradient. The patient recovered uneventfully and was discharged on postoperative day 11.

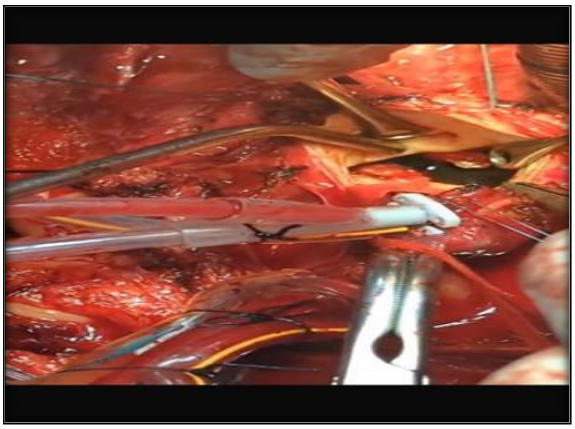

Figure 3: Pannus in aortic valve

Case 4

A 50-year-old woman presented with breathlessness (NYHA functional class III) and palpitations. She had a history of mitral valve replacement (MVR) in 2010. Preoperative echocardiography revealed severe prosthetic mitral valve regurgitation. The patient underwent redo sternotomy with mitral valve replacement using a St. Jude's mechanical prosthetic mitral valve due to a defect noted in the centre of the valve disc (TTK Chitra). Postoperative echocardiography revealed a normally functioning prosthetic mitral valve with a 5-mmHg gradient [Figure 4]. The patient recovered uneventfully and was discharged on postoperative day 11.

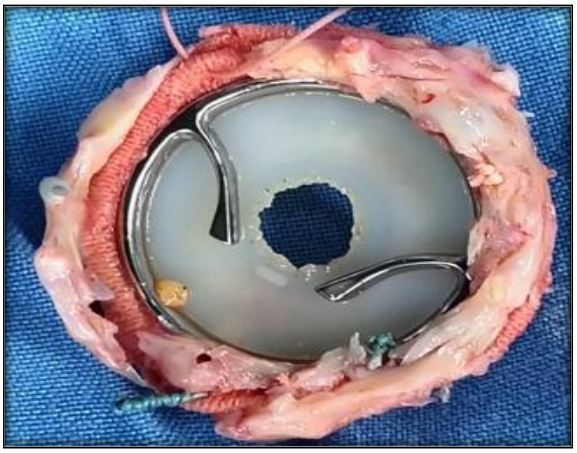

Figure 4: Removed pannus struck valve in mitral position

Case 5

A 41-year-old woman presented with breathlessness (NYHA III) and a history of percutaneous transvenous mitral commissurotomy (PTMC) in 2012 and mitral valve replacement (MVR) in 2019.

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Preoperative echocardiography suggested a stuck prosthetic mitral valve, possibly due to prosthetic valve thrombosis, with a 15-mmHg gradient. The patient underwent redo sternotomy with thrombus excision. Postoperative echocardiography revealed a normally functioning prosthetic mitral valve with a 5-mmHg gradient [Figure 5]. The patient recovered uneventfully and was discharged on postoperative day 12.

Figure 5: Post-op echo PLAX view

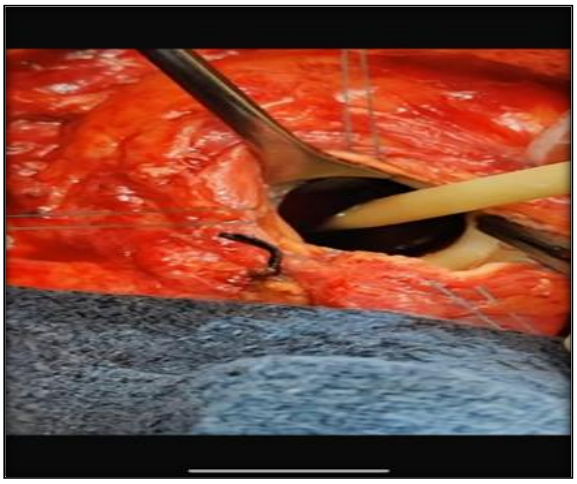

Figure 6: Valve opening after pannus excision

DISCUSSION

The formation of a pannus around prosthetic valves can significantly impair valve function, leading to symptoms such as heart failure and shock. Timely diagnosis and intervention are crucial, as non-structural prosthetic valve dysfunction due to pannus is a recognised cause of obstructive valve dysfunction, often necessitating surgical intervention. However, the optimal management strategy of pannus excision alone versus excision with valve replacement remains a subject of debate, particularly regarding the long-term outcomes.

Our findings support the feasibility of pannus excision alone, consistent with studies by Song et al. and Cui et al., which demonstrated haemodynamic improvement following excision in mitral and aortic prostheses without the need for valve replacement. This approach was associated with reduced cardiopulmonary bypass (CPB) and aortic cross-clamp times, as well as lower postoperative inflammation.[3,5] The extent of pannus formation, as noted by Park et al., correlates with transvalvular gradients and prosthetic leaflet restriction, underscoring the importance of timely intervention.[6]

Accurate differentiation between pannus and thrombi is essential for optimal management. Gündüz et al. demonstrated the utility of 64-slice multidetector computed tomography (MDCT) in distinguishing pannus based on Hounsfield Unit thresholds.[7] Our study emphasises the role of MDCT as an adjunct to echocardiography in evaluating prosthetic valve dysfunction. Li et al. identified pannus formation as the leading indication (42.5%) for reoperation in patients with mechanical aortic prostheses, with redo surgery yielding 5- and 10-year survival rates of 87.8% and 76.4%, respectively. Their findings indicate that long-term outcomes are comparable across different indications.[8] In our series, pannus excision was feasible in most cases without valve replacement, leading to favourable early outcomes.

Ma et al. reported pannus in 25% of cases of mechanical valve dysfunction, with combined pannus and thrombosis in 22.9% of cases. Their study highlighted a 14.6% early mortality rate, emphasising the need for timely intervention. Our experience supports vigilant postoperative surveillance to prevent complications.[9] Ellensen et al. identified younger patients and females as higher-risk groups for pannus formation, with a median onset of 11.1 years post-implantation.[10] Our cases shows that individualised follow-up strategies may be necessary to improve outcomes in these populations.

The choice between pannus excision and valve replacement remains a key surgical consideration. Li et al. reported that pannus debridement was performed in 17.1% of cases, supporting the feasibility of prosthesis preservation in select patients.8 Our series similarly demonstrated successful pannus excision with reduced transvalvular gradients, reinforcing its role as a possible treatment option in select patients. Imaging plays an important role in distinguishing between pannus and thrombus. Multimodal imaging, including echocardiography and MDCT, aids surgical planning. In one of our cases, intraoperative assessment confirmed the absence of thrombosis, indicating the importance of comprehensive preoperative imaging in guiding surgical decision making.

CONCLUSION

Pannus formation around prosthetic valves is a significant cause of valve dysfunction, which can lead to life-threatening complications. Timely emergency pannus excision can result in favourable

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outcomes, particularly in patients with localised pannus. However, recurrence remains a concern, and close postoperative monitoring is essential to prevent this. Further research on long-term consequences and recurrence prevention is warranted.

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