Research Letter

**Intraoperative detection of stuck leaflet of prosthetic mitral valve**

Bileaflet prosthesis valves are the most commonly used mechanical valves. Dysfunction of bileaflet prosthesis valve is rarely observed. Pannus and thrombus can obstruct prosthesis valve in postoperative period over a period of time. Here we present a rare case of intraoperatively diagnosed prosthesis valve dysfunction along with review of different mechanism causing such complication.

50 years male presented with severe shortness of breath at rest and fever since 15 days. He was already on antibiotics when he was referred to our center for further management. He was thoroughly evaluated and echocardiography showed severe mitral regurgitation with vegetation on posterior mitral leaflet bouncing in left atrium. Considering high embolic potential of the lesion, patient was urgently scheduled for open heart surgery for removal of lesion and correction of mitral regurgitation. After smooth anaesthesia induction, transesophageal echocardiography (TEE) was performed and it revealed 1.2 square cm mobile mass on the posterior mitral leaflet. (Fig. 1, clip 1) Severe mitral regurgitation was observed due to non-coaptation of mitral leaflets. (Fig. 2, clip 2) After instituting cardiopulmonary bypass, mass with mitral leaflets were resected and sent for bacterial and fungal cultures. OnX 25 mm bileaflet prosthetic mechanical mitral valve was inserted. While weaning from bypass, TEE revealed one stuck leaflet of prosthetic mitral valve in semiclosed position, where as other leaflet was moving normally. (Fig. 3, Clip 3,4) As the cardiac output was low even after optimizing loading conditions, it was decided to reinstitute cardiopulmonary bypass again. After achieving cardioplegic arrest of the heart, prosthetic valve was examined. Both leaflets could be easily opened with cotton tipped swab. We assume that subvalvular tissue might be obstructing the movement of one leaflet. So, prosthetic valve was rotated by 90° with the rotator. TEE showed normal movements of both leaflets of prosthetic valve. (Fig. 4, Clip 5) Hemodynamics were stable and patient was easily weaned from bypass. Postoperative course of the patient was uneventful.

Bileaflet prosthetic valves are most commonly used mechanical valves due to their good hemodynamic performance and low incidence of valve complications.1 Thrombosis and pannus can cause prosthetic valve dysfunction in postoperative period over a due course of time.2-4 However, Intraoperative mechanical valve dysfunction is rare event with potentially fatal complication.5-8

Such complication has been reported more commonly with metallic prosthetic valves than bioprosthetic valves. Obstruction causing stuck valve can be intrinsic or extrinsic. Intrinsic obstruction is caused by inherent defects in manufacturing of the valve or defects due to wear.9 Manufacturing defect in Bjork-Shiley valve resulting in sticking of the occluder disc in the closed position has been reported.10 However with continuous improvement in prosthetic designs and materials, incidences of intrinsic failure have decreased over a period of time. Extrinsic obstruction is caused by mitral subvalvular apparatus or suboptimal orientation and mechanical obstruction by suture.1

Prosthetic mitral valve dysfunction can result in failure to wean from CPB and hemodynamic worsening. There are some reported
cases of Intraoperative and early postoperative detection of stuck leaflet of prosthesis valve [Table 1]. It is essential to know the mechanism of stuck leaflet Intraoperatively so that the issue can be addressed effectively with proper management and future precautions.

Intraoperative Transesophageal echocardiography plays significant role in evaluating prosthetic valve function and early diagnosis and the management of the stuck valve. Acutely obstructed valve in early postoperative period can be recognized by the combination of no perceptible blood pressure even in presence of normal electrical activity of the heart, markedly raised left atrial pressure and absence of valvular prosthetic sounds. Donald B. Williams emphasized meticulous removal of all chordal tissue, even the most thin strand. Knots or tied sutures should be kept at an adequate distance from valve orifice. Leaflets motion should be checked before closing left atrium.

Stuck prosthetic valve leaflet is uncommon but dangerous complication. Knowledge of such cases makes us prudent to prevent and manage such events.

### Table 1

| Reported incidents | Mechanism of Stuck prosthetic Valve | Management |
|--------------------|-------------------------------------|------------|
| Murugesan C. et al | Tertiary chord in between disc and ring was obstructing movement of disc. | free excursion of the disc was observed after removal of chordal element |
| Hiroshi Kumano et al | Subvalvular obstruction leaflet on the side of the anterolateral commissure was stuck in the closed position because of residual tissue in proximity of leaflet. | 90° rotation of the prosthesis |
| Actis Dato GM. et al | Unravelled suture immobilising leaflet | Mechanism was revealed in autopsy. |
| James Jaggers et al | Loop of suture along the strut of bioprosthetic valve restricting mobility of one leaflet. | Replacement of mitral prosthetic valve. |
| Goel S. et al | Severe regurgitation caused by immobilization of a valve leaflet in the open position. | Problem was corrected on CPB, postoperative course was smooth. |
| Daniel Bolliger et al | A structure responsible for obstructing leaflet motion could not be identified. | Normal valve prosthesis function was achieved by a 90° rotation of the prosthesis. |
| Chun-Lin Chu et al | Remnant of the native posterior leaflet was entrapped between the sewing ring and the prosthetic leaflet. | Total resection of the redundant posterior mitral leaflet (mainly P3 portion) was performed, followed by reimplantation of the prosthesis. |
| Jorge Almeida et al | Discrete subvalvular tissue could be interfering with the prosthetic mechanism | Occluding device was rotated to anatomic position. |

![Fig. 3](image1.png) Midesophageal 4 chamber transesophageal echocardiographic view showing one stuck leaflet in semiclosed position in systole and diastole.

![Fig. 4](image2.png) Midesophageal transesophageal echocardiographic view showing both leaflets in opened position.
Consent

Written informed consent was obtained from the patient relative for publication of this Case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Competing interests

None

Appendix A. Supplementary data

Supplementary data associated with this article can be found in the online version, at http://dx.doi.org/10.1016/j.ihj.2017.05.029.

| Case | Condition / Action |
|------|-------------------|
| Case 1 | Disc impacted by chordal debris |
| Case 2 | Disc impacted by chordal debris |
| Case 3 | Impending LV myocardium |
| Case 4 | Disc movement impeded either by calcified plaque of supraannular aorta or by interventricular septum |
| Case 5 | Disc impacted in closed Position by unraveled suture |

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