Prosthetic Systolic Anterior Motion Following Mitral Valve Replacement

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Introduction

Transesophageal echocardiography (TEE) is an essential tool for the cardiothoracic anesthesiologist, particularly in the setting of valve replacement surgery. Appropriate analysis requires an understanding of the valve design, the proximal anatomy and relevant pathologies. Prosthetic valves are an imperfect solution to a structural abnormality and while they can improve the hemodynamic capabilities, it is vital for clinicians to assess their subsequent function as well as their effect on proximate anatomic peculiarities as relevant to the patient.

Case Presentation

The patient is a 47-year-old male with a complex past medical history who was admitted to the hospital with a 6-month history of worsening dyspnea on exertion and recent hemoptysis. The patient then underwent a transthoracic echocardiographic (TTE) exam which showed severe aortic stenosis, severe mitral regurgitation, moderate-severe mitral stenosis, and severe mitral annular calcification.

The patient underwent aortic and mitral valve replacement. The intraoperative TEE demonstrated aortic valve peak and mean gradients of 62 and 36 mmHg (Fig. 1 and 2). The surgery was notable for severe calcification of the mitral valve. In particular, the posterior leaflet and annulus requiring extensive decalcification. Bioprostheses were inserted without complication and the patient was weaned from cardiopulmonary bypass after 188 minutes without issue.

While the post-operative TEE showed a well seated aortic valve prosthesis which opened well (Fig. 3), there was significant turbulent flow distal to the aortic valve (Fig. 4) and gradients across were noted to be 58 and 31 mmHg peak and mean respectively (Fig. 5). While the etiology of this increased gradient was not readily apparent on 2-D imaging, 3-D evaluation clearly demonstrated that one of the mitral valve prosthesis struts was seen in the left ventricular outflow tract (LVOT) area causing flow acceleration (Fig. 6).

Discussion

This case highlights several important considerations in cardiac anesthesiology. Firstly, it is important to understand the effect of the mitral valve prosthesis on the LVOT Obstruction of the LVOT is an uncommon, but well reported, complication of prosthetic valve placement[1]. Of particular importance is the orientation and height of the struts of the mitral valve. These are usually positioned such that the LVOT is unaffected1 however in cases of significant calcification of the mitral annulus, as in this case, the strut position may vary and result in obstruction of which the anesthesiologist must be aware.

Secondly, this case highlights the importance of the various modalities of TEE and their importance for the anesthesiologist. An accurate assessment of prosthetic valves requires an understanding of the peculiarities of the prosthetic valve utilized, its design, location, and

proximate anatomical peculiarities[2]. As discussed above, in this case we were able to identify an elevated gradient in imaging (Fig. 5), but we were not able to visualize the obstruction (Fig. 4). Only upon viewing the LVOT in 3-D was the SAM caused by the strut apparent (Fig. 6). The practicing anesthesiologist must be aware of the various modalities of TEE and their utility in complex cases.

References

Left ventricular outflow tract obstruction following mitral valve replacement: effect of strut height and orientation. Jett et al. Annals of Thoracic Surgery. 1986 Sep; 42(3): 299-303.

Intraoperative Assessment of Prosthetic Valve: A Practical Approach. Mahmood et al. Journal of Cardiothoracic and Vascular Anesthesia. 2017 April; 32(2): 823-837

Images

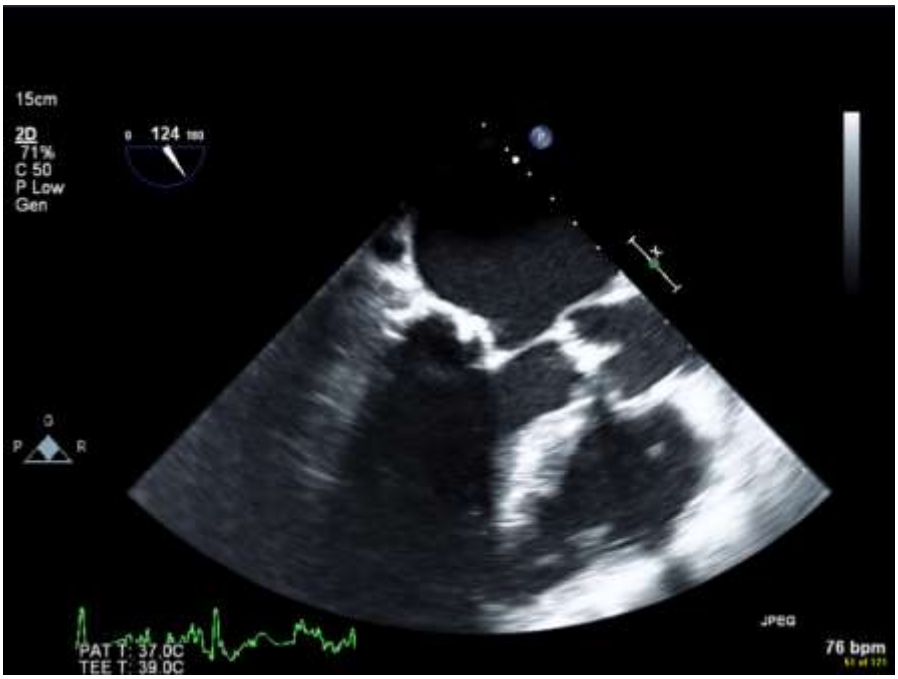

Figure 1: Intraoperative TEE showing significant calcification of mitral annulus and aortic leaflets.

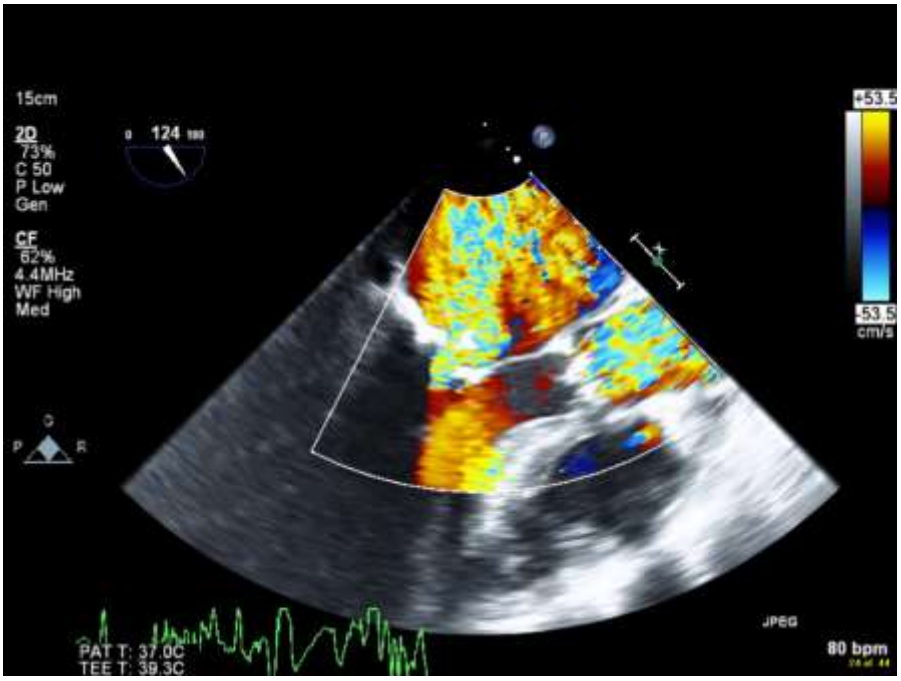

Figure 2: Intraoperative TEE showing turbulent flow through aortic valve and significant MR.

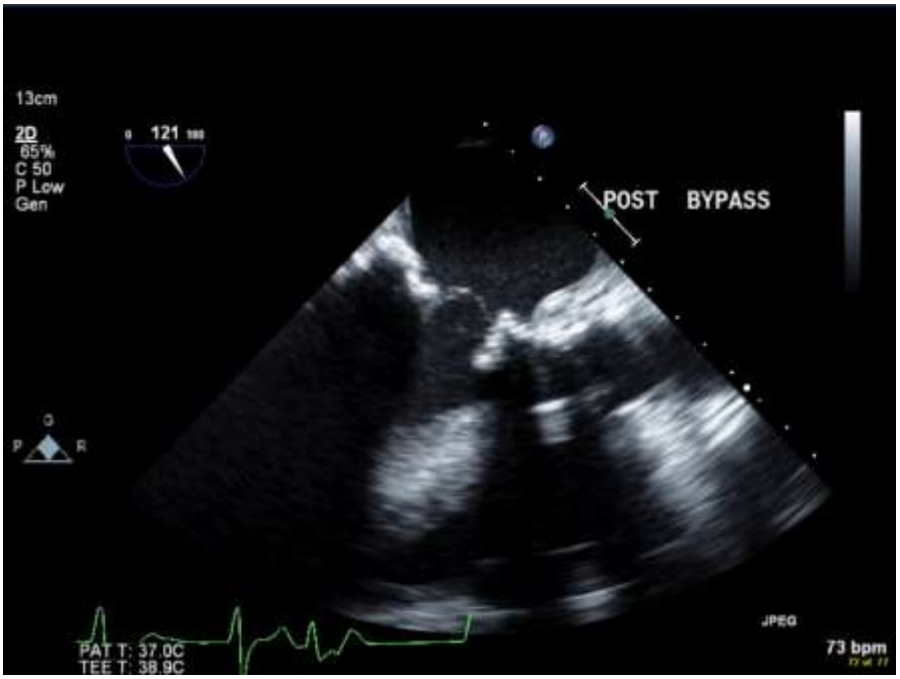

Figure 3: Post-bypass TEE showing ***

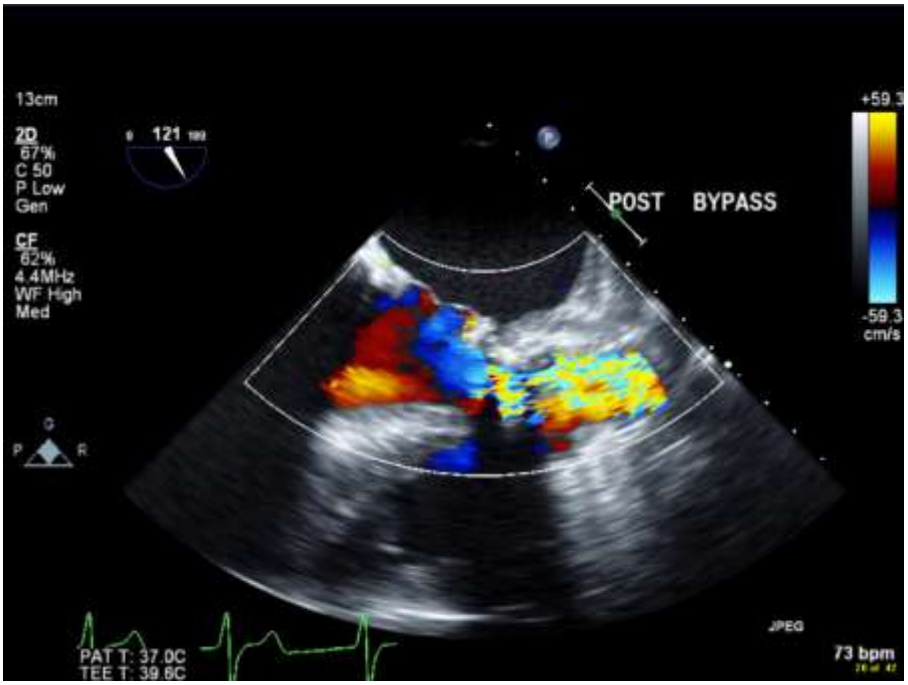

Figure 4: Post bypass TEE showing turbulent flow through the aortic valve.

Figure 5: Post bypass TEE showing max and mean gradients through aortic valve.

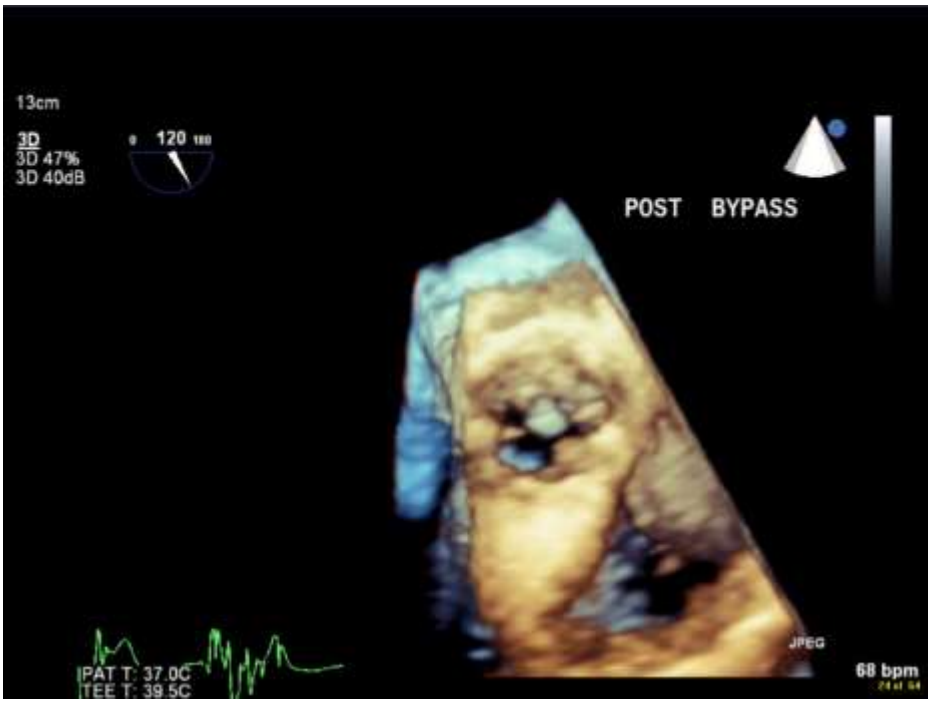

Figure 6: 3-D TEE showing struts of mitral valve causing obstruction of the LVOT.