Multiplane Imaging: A Quick Way to Assess Prosthetic Aortic Valve

Aortic stenosis is commonly encountered in the developing world and surgical replacement of native aortic valve (AV) with mechanical prosthetic valve is still performed widely in these patients. Currently, bileaflet mechanical valves are most frequently implanted surgically. Comprehensive assessment of mechanical prosthetic AV function is an integral part of intraoperative transesophageal echocardiography (TEE). The American Society of Echocardiography (ASE) and Society of Cardiovascular Anesthesiologists recommended it as a class 1 indication during valve replacement surgery.[1] Optimal assessment of the mechanical prosthetic AV is performed to determine the appropriate motion of valve leaflets, presence of paravalvular leaks, and evaluation of the gradient across it. However, the TEE of prosthetic AV is more challenging because of its farther location from the TEE probe in addition to the acoustic shadowing and reverberation artifacts arising from the prosthetic material.[2] In cases of double valve replacement surgery, imaging and assessment become more cumbersome due to enhanced artifacts from the multiple prostheses. When compared, prosthetic mitral valve leaflet movement is better evaluated since opening and closing angles can be identified in 77 and 100% of the patients by transthoracic echocardiography (TTE) and TEE, respectively. On the contrary, in the aortic position, the opening angles of bileaflet mechanical prostheses are identified in only 13 and 35% of the patients by TTE and TEE, respectively.[3]

ASE has recommended a deep transgastric view (at 0–20°) for color and spectral Doppler interrogation of AV with TEE.[4] However, in certain cases, following prosthetic bileaflet mechanical valve implantation, the full range of leaflet motion and all the three orifices (one central and two peripheral) may not be visible in this view. This may be due to variations in the orientation of the leaflets while implanting them surgically (as there are no standard surgical recommendations for the alignment of a bileaflet mechanical valve at aortic position). In such cases, we suggest a *quick off-axis* TEE imaging using a 3D matrix array probe to visualize the full range of prosthetic AV leaflet motion and proper spectral Doppler interrogation.

In a deep transgastric view (at 0–20°) with a 3D matrix array probe, obtain an orthogonal plane image using the x-Plane mode (EPIQ7/iE33 Philips, Andover, MA). The cursor in the x-Plane mode is aligned along the center of the left ventricular outflow tract and the AV. This will simultaneously display the long axis images of the prosthetic AV at orthogonal planes. Thereafter, the full range of movements of the mechanical AV leaflets can be visualized in the second image [Figures 1 and 2, Video 1]. Color Doppler examination for the assessment of paravalvular leak can then be performed [Video 2]. Furthermore, spectral Doppler interrogation, through the

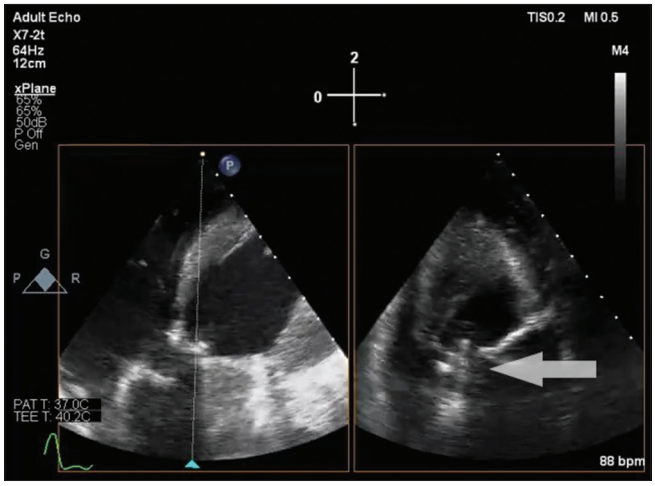

Figure 1: 2D TEE image in a deep transgastric five-chamber view with x-Plane mode showing bileaflet prosthetic aortic valve (AV) in an open position (arrow)

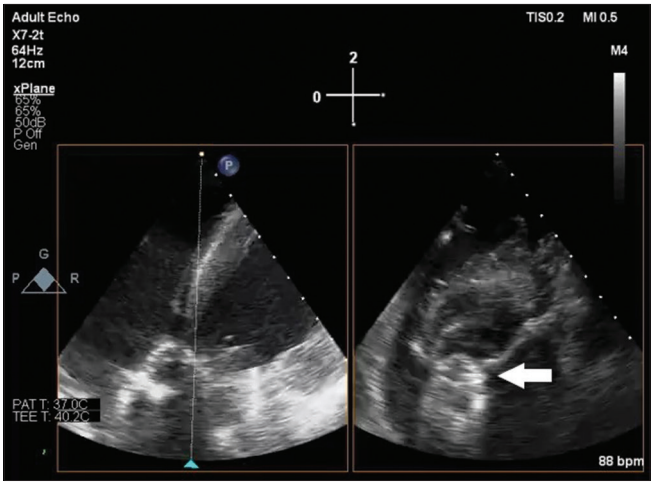

Figure 2: Double valve replacement surgery with 2D TEE image in a deep transgastric five-chamber view with the x-Plane mode showing bileaflet prosthetic aortic valve (AV) in a closed position (arrow)

larger peripheral orifice of bileaflet metallic valve, can also be carried out in the same orthogonal image. This image can be obtained separately with slight probe manipulations at 90° to the interrogation angle which images conventional deep transgastric five-chamber view.

The advantages of biplane imaging mode lie in its quick imaging ability with minimal probe manipulation and simultaneous visualization of the prosthesis in orthogonal planes. This method is particularly useful in the presence of enhanced artifacts in double valve replacement surgery.

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Conflicts of interest
There are no conflicts of interest.

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