

## Cardiac Imaging

# Understanding Mitral Valve Pathology: Three-Dimensional Transesophageal Echocardiography Parametric Maps

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**T**he mitral valve is a complex structure that consists of different components: the leaflets, the annulus, the *chordae tendineae*, the papillary muscles. The optimal function of the valve depends on its intact structure and its interaction with the left ventricle and the left atrium. The description of mitral valve anatomy, the precise localization of the valve pathology and the identification of the mechanism of severe mitral regurgitation with transesophageal echocardiography, are all important elements in deciding the feasibility of surgical repair and also guiding the surgery. Mitral valve repair is the operation of choice for severe mitral regurgitation, since preservation of the valve apparatus leads to better survival rates.<sup>1</sup> Real time 3-dimensional transesophageal echocardiography (TEE) data acquired during the standard 2D TEE procedure have the advantage of evaluating the mitral valve morphology from both the atrial and the left ventricular side. 3D images offer better delineation of the spatial relationships between the mitral valve components. They also provide precise localization of the different segments of the mitral valve leaflets, thus facilitating the identification of pathologic features.<sup>2</sup>

More recently, reconstructed parametric maps of the mitral valve offer additional information and various measurements of the valve's anatomic features.<sup>3</sup> This model of the mitral valve in end-systole is constructed from 3D data acquired during the standard TEE procedure with a 3D TEE probe (Philips Medical Systems, Andover MA, USA) and it requires the use of commercial software (MVQ, QLAB, Philips Medical Systems). The interpretation of mitral valve parametric maps facilitates the identification of the scallops involved in the genesis of mitral valve pathology.<sup>3</sup>

Here we present the 3D images and the corresponding parametric maps from three different patients. The parametric maps were reconstructed using 3D data acquired with either the wide sector focused technique (3D zoom, 85° × 85°) or the narrow sector (live 3D, 30° × 60°). The first patient has a normal mitral valve (Figures 1 & 2). The parametric map shows the normal mitral valve in an end-systolic frame with a normal annulus shape and coaptation line. The second patient has severe mitral regurgitation due to prolapse of the P1 and P2 segments (Figures 3-5). The 3D image shows the prolapsing P1-P2 scallop



Figure 1.

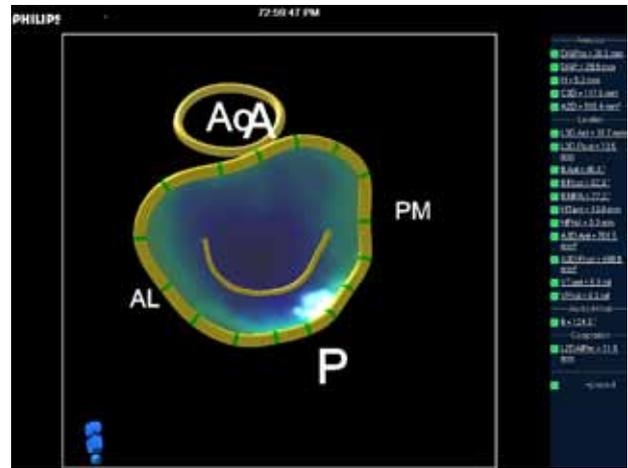


Figure 2.

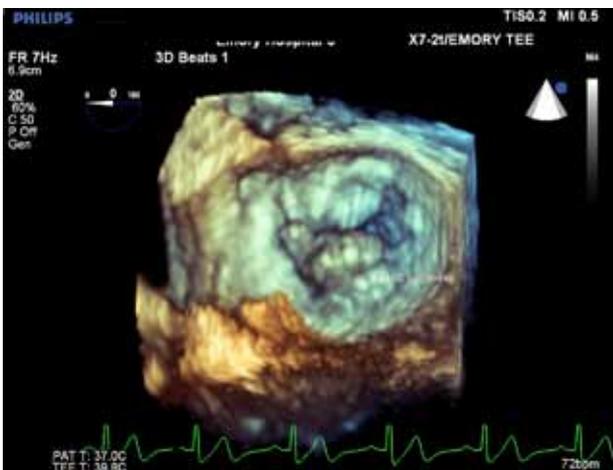


Figure 3.

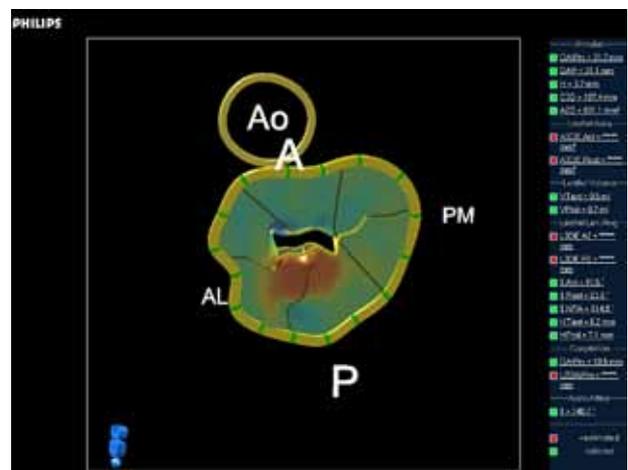


Figure 4.

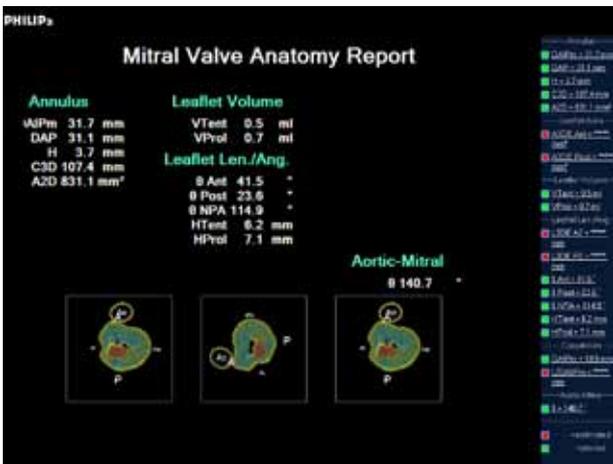


Figure 5.

of the posterior leaflet. The parametric map clearly shows P1 and P2 prolapse, with loss of coaptation and billowing of the prolapsing segments represented by color degradation accompanied by several measurements of the valve's geometric shape. The third patient has severe mitral regurgitation due to Barlow disease (Figures 6 & 7). The parametric model shows prolapse of multiple anterior and posterior leaflet scallops and loss of coaptation. To conclude, the use of the parametric maps easily recognizes the prolapsing segments and offers additional measurements of various anatomic and geometric features of the mitral valve. Therefore, this model should be used in the evaluation of mitral valve anatomy.



Figure 6.

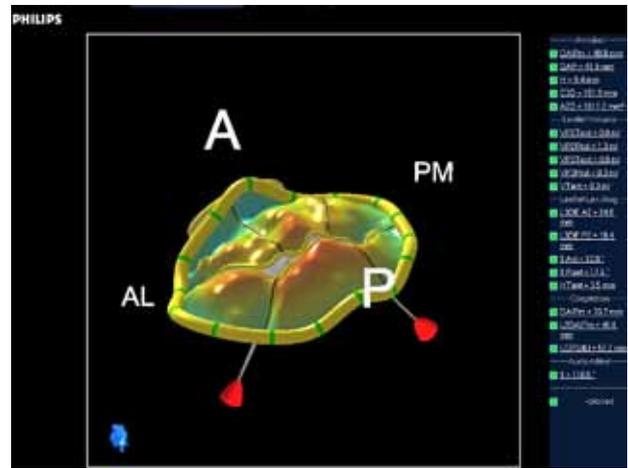


Figure 7.

## References

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