Echocardiography in mitral valve disease: A review

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Summary

Echocardiographic evaluation of the mitral valve has attracted much attention and generated much discussion since its beginnings, some thirty years ago. Echocardiography affords the physician a detailed assessment of mitral valve integrity unequalled by any other non-invasive test. Aside from the normal appearance of the valve, a variety of pathological conditions have been studied in detail; mitral stenosis was the first and over the years the state-of-the-art has evolved from simply looking at the EF slope as an indicator of severity to the accurate quantification utilizing planimetry and ‘pressure half-time.’ Mitral regurgitation, although not as well quantified as mitral stenosis, can be detected and its etiology usually determined. Mitral valve prolapse may easily be overdiagnosed by echocardiography, however together with auscultation, ultrasound remains the best way to evaluate this common condition. Echocardiography is also invaluable in the evaluation of endocarditis and prosthetic mitral valves.

Echocardiography of the mitral valve

The mitral valve is a structure that has been studied extensively by echocardiography. The first description of echocardiographic images generated by the mitral valve was by Edler et al. (1–4). Interestingly, the cardiac structure initially thought to generate these echocardiograms was the left atrial wall. Since then, much work has been done to study the mitral apparatus. What follows is an overview of information that is currently available.

Mitral stenosis

Since its earliest use in the evaluation of mitral valve disease, echocardiography has been an essential non-invasive method for diagnosing mitral stenosis. The anatomic features of rheumatic mitral stenosis include thickening of the leaflets, fusion of the commissures and shortening and fusion of the chordae tendineae. Thickening and calcification of the leaflets usually begins at the free margins and spreads upwards toward the annulus, unlike that seen in mitral annular calcification [16]. The corresponding echocardiographic features may include a thickened leaflet structure, decreased leaflet excursion, (6, 10) a reduction of the EF slope, decreased or absent A wave and anterior motion of the posterior mitral leaflet during diastole (5, 11, 14, 15) (Fig. 1). As a consequence of leaflet thickening
and commisural fusion, the mitral leaflets are noted to dome during diastole (6, 7, 9) on two-dimensional echocardiography. Other associated findings are large left atrium and mitral regurgitation (see below), and occasionally left atrial thrombi (Fig. 2). If there is significant stenosis and the gradient remains throughout diastole, the stenotic, fused leaflets may remain in a taught, maximally-opened ‘domed’ position during all of diastole, reflected by a flattened EF slope. If, on the other hand, the degree of stenosis is not as great, the leaflets may float to a more closed position in mid-to-late-diastole only to be opened again with atrial contraction (if effective atrial contraction is present). Thus an A wave suggests mild mitral stenosis.

The first attempt to quantify the degree of mitral stenosis was by Edler, who measured the EF slope (2–4). Intuitively, the severity of mitral stenosis would appear to correlate with the degree of fit-

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**Fig. 1.** M-mode echocardiogram from a 42 year old patient with severe mitral stenosis. Note that both the anterior mitral leaflet (al) and posterior mitral leaflet (pl) are thickened, that there is a decreased diastolic slope, and that the posterior leaflet moves anteriorly in early diastole.

**Fig. 2.** Upper panel: Apical 4-chamber view from a patient with rheumatic mitral stenosis and doming of the mitral valve. Stop-frame in diastole. Note giant left atrium (LA) and thrombus (TH) in the left atrium. Lower panel: Stop-frame from the parasternal short axis view in the same patient. Note again the giant LA and TH. Other abbreviations: Ao: aorta; LV: left ventricle; RA: right atrium; RV: right ventricle.