Three-Dimensional Mitral Annular Tracking Demonstrates Important Structural and Functional Annular Differences depending on the Etiology of Mitral Regurgitation

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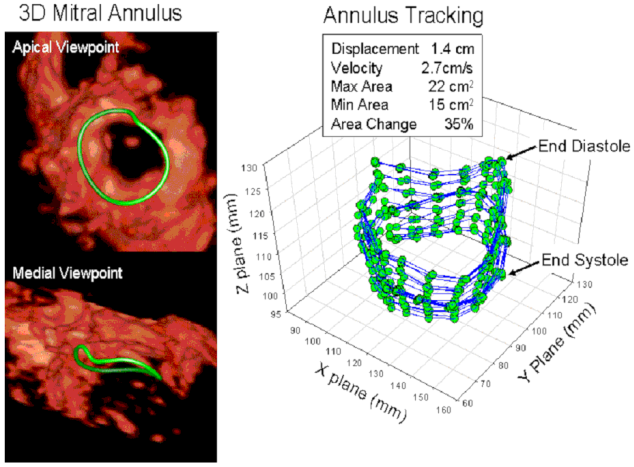
Background: Real-time 3D echocardiography and unique software permit mitral annulus (MA) tracking throughout systole to assess MA remodeling and function. Whether mitral annulus structure and function are altered differently, depending on the etiology of mitral regurgitation (MR), is currently not well known.

Methods: We evaluated dynamic MA characteristics in patients with significant MR secondary to mitral valve prolapse (MVP-MR) and functional MR (F-MR) and compared them to normal controls. Novel 3D tracking software (based on 3D optical flow combined with block matching) was used to identify 16 circumferential equidistant MA points and to track changes in MA area and apical descent from end-diastole to end-systole (see figure-patient example). Patients with at least moderate MR underwent a complete transthoracic 2D and quantitative Doppler study with 3D full volume MA imaging from the apical 4 chamber view.

	Normal (N=15)	Prolapse MR (N=15)	Functional MR (N=13)
End-Diastolic Volume (ml)	133 ± 21	148 ± 62	229 ± 68*§
LV Ejection Fraction (%)	61 ± 5	63 ± 19 §	31 ± 9*§
Maximum MA Descent (mm)	11 ± 2	9 ± 3 * §	6 ± 2*§
Largest MA Area (cm^2)	13 ± 3	23 ± 5 *§	16 ± 4*§
MA Area Change (%)	26 ± 8	22 ± 5 §	15 ± 5 *§



*** p<0.05 vs control; § p<0.5 vs PMR or FMR**

Results: For each group studied, LV size, function and dynamic MA characteristics are shown in the table. Compared to normals, the F-MR patients demonstrated end-diastolic MA area enlargement with reduced systolic area change and reduced apical decent. In comparison, MVP-MR patients demonstrated the largest end-diastolic MA area with preserved annular area change and only mild reduction of apical decent. This finding suggests that MVP-MR may involve significant MA remodeling without deterioration of MA systolic function.

Conclusion: Patients with MR have significant mitral annular enlargement, irrespective of MR etiology. However, in contrast to functional MR, patients with MR secondary to MVP have the largest annular remodeling—almost twice normal—and yet have preserved annular function and dynamicity.