

Novel Parameters of Global and Regional Mitral Annulus Geometry: A Comparison Study

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Background: The mitral annulus (MA) saddle shape is complex but vital for normal functioning mitral apparatus. While conventional parameters of MA geometry such as area, perimeter and height are helpful, they fall short of describing its complex regional geometry.

Methods: Novel parameters of MA curvature and torsion were derived from 3D echocardiography. These measurements were applied to 15 patients with normal valves and ventricular function (age 53±8 years), and to 15 patients with organic significant mitral regurgitation (MR, age 66±11 years), before and after mitral valve repair. Using 3D transesophageal echocardiography images, the MA was traced and modeled in mid- and end-systole. Curvature and torsion were computed at 500 points across the MA to derive regional and global indices.

Results: Annular area was larger in patients with MR and decreased after repair. All patients showed the maximal MA curvature to be in the anterior horn while the posterior horn had the lowest curvature value. Overall, patients with organic MR presented the smallest global curvature and torsion; this was corrected post mitral valve repair, to higher values, even compared to normal. The regional analysis revealed similar trends. All groups of patients have shown reduction in curvature value from mid to end systole. Interestingly, only patients post mitral valve repair has shown a minimal shift in posterior horn torsion from mid to end systole.

Conclusion: Novel MA parameters of curvature and torsion can be computed from 3D echocardiography and provide measurements of dynamic regional geometry. In patients with organic MR, the reduced regional and global curvatures improve following valve repair. These quantitative parameters may help further refine mitral surgical repair techniques.

