

Comprehensive Repair of Chronic Ischemic MR Provides Best Long-Term Results with Least Remodeling

Szymanski, Catherine¹; Bel, Alain¹; Cohen, Iris¹; Touchot, Bernard¹; Handschumacher, Mark²; Desnos, Michel¹; Carpentier, Alain¹; Menasche, Philippe¹; Hagege, Alain¹; Levine, Robert²; Messas, Emmanuel¹

¹Hopital Europeen Georges Pompidou, Faculte de Medecine Paris Descartes; INSERM U 633, Cardiology and Cardiovascular Surgery, Paris, France; ²Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA

Background: In ischemic mitral regurgitation (IMR), leaflet tethering is caused by post-MI LV and annular remodeling. Severing second-order mitral chordae significantly decreases tethering and MR. We tested whether undersized ring annuloplasty can improve chordal cutting efficacy by reducing annulus-related tethering.

Methods: Posterolateral MI created chronic remodeling and MR in 28 sheep. At 3 months, sheep were randomized to sham surgery vs isolated annuloplasty undersized by 2 sizes vs isolated bileaflet chordal cutting vs at the combined therapy (n=7 each). At baseline, chronic MI (3 months) and sacrifice (6.6 months) we measured LV volumes and ejection fraction (EF), wall motion score index (WMSi), MR Regurgitation fraction (MRRF) and vena contracta (VC), Mitral annulus area (MAA) and posterior leaflet (PL) restriction angle (PL to MAA) by 2D and 3D echo.

Results: All groups were comparable at baseline and chronic MI, with mild- moderate MR (MRVC 4.6 ± 0.1 mm, MRRF $24.2 \pm 2.9\%$) and MA dilatation ($p < 0.01$). At sacrifice, LV end-systolic volume (ESV) increased by 108% in controls vs 28% with ring + chordal cutting, less than with each intervention alone ($p < 0.01$). Also, MR progressed to moderate-severe in controls but decreased to trace with ring + chordal cutting vs mild-moderate with ring alone and trace-mild with chordal cutting alone (MRVC 5.9 ± 1.1 mm in controls, 2.0 ± 0.7 with ring, 1.0 ± 0.9 with chordal cutting, 0.5 ± 0.08 with both, $p < 0.01$). Ring alone did not improve PL mobility, but chordal cutting did alone or with ring (PL restriction angle $54 \pm 5.0^\circ$ vs. $45 \pm 2.3^\circ$ with ring, $p = \text{NS}$). In multivariate analysis, LVESV and MAA most strongly predicted MR ($r^2 = 0.82$, $p < 0.01$).

Conclusions: Comprehensive annular and subvalvular repair provides the most effective long-term reduction of both chronic ischemic MR and LV remodeling.