Leaflet resection versus leaflet preservation for repair of degenerative mitral regurgitation: Does it matter how the mitral valve is repaired?

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Mitral valve repair is the standard of care for the treatment of degenerative mitral regurgitation (MR).^{1,2} Leaflet resection techniques used in mitral repair were initially popularized by Carpentier several decades ago; however, the advent of polytetrafluoroethylene neochordae has resulted in a shift away from leaflet resection toward repair techniques that employ more leaflet preservation.¹⁻⁶ The relative ease of using artificial neochordae has resulted in its application in minimally invasive mitral repair.⁴⁻⁶ Favorable survival and freedom from mitral valve reoperation have been described with mitral repair using either a leaflet resection or a preservation strategy.¹⁻⁶

Although these mitral repair techniques have been widely used, little surgical data exist comparing their outcomes. Lange and colleagues⁶ previously reported their retrospective cohort study comparing 205 quadrangular resection patients with 192 patients who received a leaflet preservation repair strategy with artificial neochordae. There was no difference in midterm overall survival, freedom from recurrent 3 to 4+ MR, or freedom from reoperation. In another large cohort of 670 patients who underwent leaflet resection (n = 353) or leaflet preservation with the loop technique (n = 317), Seeburger and colleagues⁴ also found no difference in mid-term survival, although reoperation was less likely following a leaflet preservation strategy with artificial chordae. In early postoperative echocardiographic assessments, they also found that the mitral orifice area was greater and mean mitral valve gradients were lower following a leaflet preservation approach.⁴ The same group also performed a randomized study comparing leaflet resection and preservation in 129 patients.⁵ The mean mitral orifice area trended to be larger following leaflet preservation compared with resection 6 months after surgery (2.96 ± 1.01 vs 3.27 ± 1.32 ; $P =$ not significant); however, the differences were less pronounced at 1 year.⁵

In this recent study, Imasaka and colleagues⁷ performed echocardiographic calculations on patients who underwent repair of MR due to posterior leaflet prolapse over an 8-year period. This study had a small number of patients and used equations for left ventricle volumes based on linear

Mitral valve gradients and pulmonary pressures following mitral repair.

Central Message

It remains unclear if differences exist between leaflet resection and preservation techniques in the repair of degenerative MR.

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left ventricle dimension measurements that are currently not recommended by the American Society of Echocardiography.⁸ Furthermore, the postoperative echocardiograms were performed approximately 1 month after surgery when ventricular remodeling is not complete.⁹ In fact the early differences in mitral orifice area and mitral gradient between resection and nonresection groups in the Leipzig randomized study⁵ disappeared when assessed 6 months and 1 year after repair. Notably, patients in the study by Imasaka and colleagues⁷ who underwent mitral repair with neochordae were more likely to undergo annuloplasty with the Cosgrove-Edwards Annuloplasty System (Edwards Life-Sciences LLC, Irvine, Calif) versus the Carpentier-Edwards Physio heart valve repair (annuloplasty) ring. Could the differences in ventricular efficiency and contractility be influenced by the annuloplasty used?

We previously found that functional mitral stenosis was more likely to occur in patients who underwent mitral repair with a complete ring versus a partial band.^{10,11} Functional mitral stenosis relates to the observation that gradients across a repaired mitral valve may increase significantly following exercise and results in functional limitation. In our study, 107 patients were subjected to stress echocardiography via bicycle ergometry, serum brain natriuretic peptide analysis, 6-minute walk test, and Short Form-36 health survey assessment at a median of 4.3 years after surgery.¹¹

Although the labeled band and ring sizes used for repair were similar between groups (30.7 ± 2.8 mm vs 30.4 ± 2.1 mm; $P = .6$, respectively), the mitral valve

FIGURE 1. Mitral valve gradients and pulmonary pressures at rest and at peak exercise following mitral valve repair. *RVSP*, Right ventricle systolic pressure. Adapted from reference 10.

area was larger for patients who received a partial band annuloplasty ($2.3 \pm 0.6 \text{ cm}^2$ vs $1.8 \pm 0.5 \text{ cm}^2$; $P < .001$).

Importantly, the mean mitral gradient and right ventricle systolic pressure were lower following repair with a partial band as opposed to a complete ring (Figure 1). At peak exercise, the mean mitral gradient was $15.3 \pm 8.2 \text{ mm Hg}$ in the ring group versus $10.6 \pm 4.8 \text{ mm Hg}$ in the band group ($P < .001$), whereas the stress right ventricle systolic pressure was $52.6 \pm 14.2 \text{ mm Hg}$ in the ring group versus $45.8 \pm 9.5 \text{ mm Hg}$ in the band group ($P = .004$) (Figure 1). The differences in mitral gradients and pulmonary pressures were associated with adverse clinical events. Patients who received a complete ring annuloplasty had a higher incidence of permanent atrial fibrillation and also reported lower levels of energy and worse general health on Short Form-36 health assessment compared with patients who received a partial band.¹¹

Nevertheless, the literature comparing mitral repair techniques using leaflet resection versus leaflet preservation is evolving. As yet, differences between these repair techniques in regard to left ventricle function and mitral valve dynamics remain incompletely understood.

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