Repairing the mitral subvalvular apparatus: The new frontier

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The surgical management of severe ischemic mitral regurgitation (MR) is evolving. Repairing the mitral valve (MV) with restrictive annuloplasty was the preferred operative treatment for many years.¹ However, in a recent randomized trial, the Cardiothoracic Surgical Trials Network found no difference in left ventricular end-systolic volume index or survival at 1 and 2 years after MV repair compared with chordal-sparing replacement.^{2,3} Although no difference was identified in the primary end point (left ventricular end-systolic volume index), repair was associated with a higher rate of recurrence (1 year: 32.6% vs 2.3%, $P < .001$, 2 years: 58.8% vs 3.8%, $P < .001$). These results beg the question as to which patients will benefit from MV repair and not go on to develop recurrent MR. The technique of reduction annuloplasty alone does not address the subvalvular apparatus. We have previously described a technique to deal with this issue in a small case series.⁴

The present study by Nappi and colleagues⁵ attempts to improve our understanding of the factors associated with success after repair for severe MR. The authors present the findings of a post hoc analysis of a randomized trial comparing restrictive annuloplasty plus papillary muscle approximation with restrictive annuloplasty alone. All patients enrolled in this study received myocardial revascularization with coronary artery bypass grafting. The parent trial identified a benefit with the addition of papillary muscle approximation in terms of decreased left ventricular remodeling, improved ejection fraction, and lower rates of moderate-to-severe MR recurrence, but there was no improvement in quality of life or overall mortality.⁶

Considering these findings, Nappi and colleagues sought to identify which patients would benefit the most from subvalvular surgery on the basis of the symmetry of MV tethering and the presence of left ventricular wall motion abnormalities. They concluded that papillary

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Central Message

Leaflet tethering drives recurrence after MV repair for severe regurgitation. Addressing the subvalvular apparatus with papillary muscle manipulation is the new frontier in management.

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muscle approximation improved ejection fraction and decreased remodeling in cases of both symmetric and asymmetric tethering and in cases with preoperative inferior wall motion abnormalities. Rates of moderate-to-severe MR recurrence decreased in patients with asymmetric tethering and in those with inferior wall dyskinesia. These findings are an important addition to the discussion surrounding optimal surgical management for patients with severe MR and support the findings of a post hoc analysis of patients who underwent MV repair during the Cardiothoracic Surgical Trials Network severe MR trial.⁷ That analysis identified MV leaflet tethering as the driving force behind the high rate of recurrent MR after restrictive annuloplasty and found a strong association between MR recurrence and preoperative basal aneurysms and dyskinesia. Patients who underwent repair and did not have MR recurrence did better than those with moderate or severe recurrence or patients who underwent replacement.

Taken collectively, it seems as though MV repair with papillary muscle manipulation to correct leaflet tethering may be the best approach. Addressing the subvalvular apparatus is the new frontier for the surgical management of severe MR, but it requires a strong understanding of the heterogeneity in presentation associated with ischemic MR. Although we focus mostly on the ring itself, it seems

as the though the real story is unfolding underneath the valve.

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