Surgical correction of ischaemic mitral regurgitation—still a long way to go

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This editorial refers to ‘Five-year echocardiographic results of combined undersized mitral ring annuloplasty and coronary artery bypass grafting for chronic ischaemic mitral regurgitation’ by S. Gelsomino et al., on page 231

Elegant experimental work has helped in understanding the pathogenesis of chronic ischaemic mitral regurgitation (IMR), which appears to be the consequence of a combination of two distinct anatomical abnormalities.1 Globally, annular dilatation occurs secondary to left ventricular (LV) enlargement, causing incomplete coaptation of the mitral valve despite normal leaflet motion. Locally, inferior wall remodelling produces papillary muscle displacement with restricted motion of the mitral leaflets.

Chronic IMR, an independent predictor of mortality with a reported survival of 40–60% at 5 years,2–5 is a progressive disorder in which MR-related LV volume overload promotes further LV remodelling, leading to worsened MR. Therefore, surgical correction, either by replacement or repair, is recommended for 3+ and 4+ IMR.6 Furthermore, repair, as compared with replacement, appears to benefit most patients with IMR, with the possible exceptions of very high risk group, such as patients in New York Heart Association (NYHA) functional class IV or of those requiring emergency surgery.3

Many divergent approaches to IMR repair have been used, such as undersized flexible ring annuloplasty, selective valve replacement, uniform chordal sparing valve replacement, transection of secondary chordae, suture annuloplasty, posterior leaflet patch extension, annular cinching, and papillary muscle sling.7 For the last decade, however, most authors have pursued the consistent approach of routine rigid ring annuloplasty and complete coronary artery revascularization to treat IMR, with good short-term success.3 However, long-term results are more difficult to obtain and analyse.

Gelsomino et al.8 report 5-year echocardiographic results of combined undersized mitral ring annuloplasty and coronary artery bypass grafting (CABG) in patients with chronic IMR. Among 251 prospectively enrolled patients operated on in a single institution over a 6-year period, 14 patients with significant residual MR, either intraoperatively or at hospital discharge, were excluded from the study. There were two early and 15 late deaths. Serial echocardiograms were performed in 220 survivors at baseline, discharge, and annually thereafter, with a median follow-up of 32.9 months, while 61 patients reached 5-year control. Five-year survival and 5-year freedom from reoperation for failed repair were 83.2 ± 4.4 and 78.2 ± 4.9%, respectively. LV volumes decreased and sphericity indexes improved at discharge and at 1-year follow-up, while MR remained stable, but these values worsened at 3- and 5-year follow-up, while MR reincreased. LV reverse remodelling was observed in 44.2% of patients, while 10% developed further LV dilatation. Predictive echocardiographic factors of recurrent MR were end-systolic volume, sphericity index, myocardial performance index, and wall motion score index. Gelsomino et al.8 report important results that should be placed in perspective with other recent studies, in particular concerning patient population, ring morphology and size, operative results, and long-term recurrence of MR.

The cohort of patients studied by Gelsomino et al.8 is homogenous, with inclusion criteria defined as myocardial infarction >16 days, coronary artery stenosis of at least 75%, corresponding regional wall motion abnormality, and type IIIb leaflet dysfunction according to Carpentier’s classification,9 with or without annular dilatation. Patients with isolated type I (normal leaflet motion with isolated annular dilatation) or type II (excessive leaflet motion) mitral valve disease were excluded.

A Carpentier’s classic (rigid) ring was implanted in 133 patients, and a physio (partly flexible in the posterior part) ring in 118 patients. It should be noted that recent studies have linked flexible posterior bands with significant recurrent MR.5 Patients with IMR can develop dilatation of the anterior annulus between the trigones. Because posterior flexible bands do not correct intertrigonal dilatation, they may not effectively ensure restoration of an adequate leaflet coaptation surface. However, the ring...
used, classic or physio, was not predictive of recurrent MR in this study.

A downsizing of two ring sizes was performed in all patients, while no patient received a ring >30 mm. It is widely accepted that use of an appropriately downsized ring is the current single most important aspect of mitral valve repair for IMR. This is important to overcorrect the septal-lateral dimension and ensure adequate surface of coaptation between tethered leaflets. The fear of systolic anterior motion following downsizing is unnecessary because of the widened aorto-mitral angle in this type of pathology.

Operative mortality for combined mitral valve surgery and CABG, although historically high, is now in the range of 4–7%.7,10 Gelsomino et al.8 report an operative mortality of 0.8%, which is excellent. Therefore, an appropriate long-term follow-up can be obtained and analysed. Furthermore, patients with MR at discharge were excluded from the study. This should be emphasized, as freedom from reoperation, reverse ventricular remodeling, and improvements in quality of life are at least partly dependent on elimination of MR at surgery.

Certainly, significant degrees of residual MR (moderate or severe) should most often trigger a second bypass run and appropriate corrective action, such as further ring downsizing, leaflet patch extension, correction of unrecognized prolapse, or, possibly, valve replacement. It should also be remembered that post-bypass transoesophageal echocardiography underestimates MR because of low aferload during anaesthesia. This need for a second bypass run should probably not exceed 5% with experienced surgeons. Only in exceptional circumstances should patients leave the operating room with significant residual MR, such as when a valve is considered irreparable or non-replacable (i.e. massive calcification) or when the risks of a second bypass run exceed the benefits.

Long-term results of repair for IMR are difficult to obtain, partly because death is an important competing end-point in the evaluation of repair failure. Freedom from operation often overestimates the success of a procedure, because many patients with recurrent MR will not undergo reoperation for several reasons, such as good functional class, advanced age, poor left ventricular ejection fraction (LVEF), co-morbidities, or the patient’s wishes. Therefore, recurrence of MR is a much more precise indicator of procedural success.

Whereas good results have been reported,11 high late recurrence rates of MR after ring annuloplasty have recently been published.5,12,13 McGee et al.5 reported a 28% recurrence rate of 3+ or 4+ MR at 6 months. Furthermore, Serri et al.13 reported a recurrence rate of 36% for 2+ MR and 20% for 3+ to 4+ MR at 28 months, while Tahta et al.12 reported a recurrence rate for 2+ to 4+ MR of 29% at 35 months.

In contrast, Bax et al.11 reported absent or minimal MR at 18 months, with a high proportion of patients experiencing reverse remodelling, with a significant decrease in left ventricular and left atrial diameters, and LVEF increase. Braun et al.14 identified pre-operative LV end-diastolic dimensions as the single best factor in predicting occurrence of reverse remodelling, with a cut-off value of 65 mm, and concluded that reverse LV remodelling occurs in the majority of patients, but is however limited by pre-operative LV dimensions. Therefore, these authors14 encourage the use of additional surgical procedures, such as the application of a CorCap cardiac support device (Acorn Cardiovascular, Inc., St Paul, MN, USA) or LV restoration therapy when LV end-diastolic diameter is >65 or >80 mm, respectively.

In the study of Gelsomino et al.,8 LV volumes decreased and sphericity indexes improved at discharge and at 1-year follow-up, while MR remained stable, but these values worsened at 3- and 5-year follow-up, while MR reincreased. Such results, with patients experiencing late MR, as long as 5 years after the initial surgical procedure, emphasize the importance of long-term follow-up that should include appropriate imaging to evaluate the success of valve repair for IMR, whichever the technique used.

Longitudinal studies including regular echocardiographic follow-up should be the gold standard to define the true efficacy of mitral valve repair techniques. Echocardiographic data are the best surrogate for recurrent MR, as opposed to survival or reoperation rate. Novel surgical techniques, such as ventricular resynchronisation, infarct restraint, ventricular reconstruction, posterior leaflet patch extension, annular cinching, or chordal transection, can only be evaluated in the long term using imaging techniques.

The best hope to improve outcomes in those high-risk patients may be to focus efforts on early intervention to prevent the detrimental myopathic changes consequent to ischaemic remodelling. Survival after mitral valve surgery and CABG, although historically high, is now in the range of 4–7%.7,10 Gelsomino et al.8 report an operative mortality of 0.8%, which is excellent. Therefore, an appropriate long-term follow-up can be obtained and analysed. Furthermore, patients with MR at discharge were excluded from the study. This should be emphasized, as freedom from reoperation, reverse ventricular remodeling, and improvements in quality of life are at least partly dependent on elimination of MR at surgery.

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References


Huge pseudoaneurysm of deep femoral artery without history of catheterization

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A 60-year-old man with a history of stroke had a sudden pain and severe swelling in the left femur (Panel A). Echocardiography of the femoral artery showed a huge pseudoaneurysm of the deep femoral artery. Colour flow imaging shows a huge pseudoaneurysm (Panel B) of the deep femoral artery and the internal flow (90°C 130°C 120 mm). Three-dimensional contrast-enhanced computed tomography showed a projection of the femur bone, but no stenosis of the abdominal and iliac artery (Panel C). Operation was performed and revealed the perforation of the femoral artery by the projection of the thighbone. Microscopically, this cartilaginous tumour permeated trabecular bone. Photomicrograph of the projection of thighbone showed mildly nuclear atypia of tumour cells and increased cellularity (Panel D), suggesting chondrosarcoma (haematoxylin and eosin stain, original magnification 40). The patient was discharged from the hospital in a good condition.

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