Degenerative Mitral Valve Repair

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INTRODUCTION

Degenerative mitral regurgitation (MR) is a rather common pathology. If untreated, severe MR leads to left ventricular failure, pulmonary hypertension, atrial fibrillation and death. Correction of MR can be associated with a life expectancy and a quality of life similar to those of the normal healthy population, when performed appropriately and timely.

In many patients, degenerative MR is characterised by an excess of valve tissue with elongated or ruptured chordae (Barlow’s disease), while in others, the leaflets are thinner and translucent and chordae are very fragile (fibroelastic deficiency). Mitral valve prolapse is the consequence of these anatomical alterations affecting primarily the leaflets and the subvalvular apparatus.

American and European guidelines for the treatment of heart valve disease indicate the criteria for appropriate management of patients with degenerative MR.

The aim of this editorial is to briefly explore the optimal management of patients affected by degenerative MR.

Natural history

The 5-year incidence of cardiac death and major cardiac events in asymptomatic severe degenerative MR with medical management is high (14±3% and 33±3%, respectively). Major predictors of poor outcome are advanced age, symptoms of heart failure, pulmonary hypertension, atrial fibrillation, severity of MR, left atrial (LA) and left ventricular (LV) dilatation and depressed LV systolic function.

In patients requiring surgical correction for severe degenerative MR, mitral valve repair is the standard of care. The goal of the modern reconstructive mitral surgery should be the ‘neutralisation’ of the disease. To neutralise the disease means that the intervention should be performed in a timely manner and effectively enough to ensure postoperative normal cardiac function, in absence of rhythm disturbances, possibly without medical therapy, leading to patients’ survival and quality of life similar to the age-matched population. The crucial issue in order to prevent the occurrence of irreversible changes in the LA and LV chambers, is an “early repair approach”.

The concept of total neutralisation of the disease entails also the surgical incision, which should be minimally invasive whenever possible. For instance, if in a young female patient the operation is performed through a median sternotomy, the persistence of a long visible scar will partially invalidate the initial goal of “disease neutralisation”.

Timing for correction of degenerative MR

According to the latest guidelines of the American College of Cardiology/American Heart Association, patients with severe MR with symptoms or left ventricular dysfunction (LVEF < 60% and/or LVESD > 40 mm) must be referred for surgery. Surgery should also be offered to patients with severe MR in cases of new onset atrial fibrillation or pulmonary hypertension. Finally, surgery should be considered despite the absence of the above reported condition if the likelihood of valve repair is very high (> 90%). Asymptomatic patients with non severe MR should be subject to close clinical and instrumental monitoring and treated surgically in case of the onset of symptoms or a worsening of MR.
Recent studies have also reported an increased incidence of adverse events in patients with increased left atrial dimension (Left Atrium Index > 60 ml/m2), thus indicating that atrial dimension should also be assessed on a routine basis and considered for the timing of surgery.

In the individual patient, however, the decision-making regarding the optimal time for surgery may be difficult. Asymptomatic patients may be candidates for early repair, before the occurrence of structural and functional changes in the LA and LV chambers which are predictors of poor outcome. Other patients, with advanced age or heavy comorbidities, particularly in case of complex valve anatomy, with low chances of mitral repair, may be conservatively followed with regular follow-up (“watchful waiting approach”), in order to safely postpone surgery.

**Surgical techniques of mitral repair in degenerative MR**

Patients with degenerative MR should be referred to high-volume centres with extensive experience in this field (more than 90% of degenerative mitral lesions can be repaired successfully in expert centres with low hospital mortality). New surgical techniques, like artificial chordae and the edge-to-edge approach, have been added to the traditional methods of repair described by Carpentier. Nowadays, according to the lesions identified preoperatively and intraoperatively, repair for degenerative MR includes several valvular, subvalvular and annular procedures.

**Posterior leaflet prolapse**

In the majority of patients with degenerative MR the most frequently observed lesion is an isolated prolapse of the middle scallop of the posterior leaflet (P2). The repair usually involves quadrangular resection of this scallop. Annular plication may be performed in correspondence to the resected segment. In the current surgical practice, annular plication tends to be avoided by using techniques like the sliding plasty or the folding plasty, which are adopted in patients with a high risk of postoperative dynamic obstruction of the left ventricular outflow tract (systolic anterior motion, SAM). Folding and sliding plasty techniques reduce the height of the posterior leaflet (ideally less than 15 mm), so that the coaptation point of the two valve leaflets is moved posteriorly.

In cases of posterior leaflet prolapse without redundant leaflet tissue, limited resection or artificial chordal replacement with Gore-Tex expanded polytetrafluoroethylene sutures may be appropriate (“respect rather then resect” approach).

**Anterior leaflet prolapse**

Repairs of the anterior leaflet, either isolate or with concomitant posterior leaflet repair, are more complex procedures. Various techniques may be used, the most common of which will be briefly discussed.

**Implantation of artificial chordae**

The use of artificial chordae tendineae (neochordae) is probably the most used technique to treat anterior leaflet prolapse. Artificial chordae (PTFE neochordae - Suture Gore-Tex, WL Gore & Associates, Flagstaff, AZ, USA) are fastened to the head of the papillary muscle on one end and to the free margin of the prolapsing portion of the anterior leaflet on the other. Determining the correct length of the neochordae is the main technical difficulty of this technique. Modified artificial chordae with a premeasured loop have recently been introduced.

**Edge-to-edge technique**

The Edge to edge (E-to-E) approach is based on the concept that the competence of a regurgitant mitral valve can be effectively corrected with the restoration of the “function” rather than the “anatomy”. The free edge of one leaflet is sutured to the corresponding edge of the opposing leaflet exactly at the point where the regurgitant jet is located, thereby eliminating the incompetence of the mitral valve. The E-to-E technique is very versatile and reproducible and excellent results have been reported even in complex settings, like anterior leaflet, commissural, and bileaflet prolapse. Other techniques used for the correction of anterior prolapse are triangular resection, chordal transfer, chordal transposition and papillary muscle repositioning.

**Mitral annuloplasty**

The application of a prosthetic ring should always complete the mitral repair procedure. Ring annuloplasty is aimed at restoring normal annular size and geometry, increasing the coaptation surface of the leaflets and preventing further dilatation. Patients should not leave the operating theatre with more than 1+ mitral regurgitation on transesophageal echocardiography.

**Results of surgery**

Hospital mortality after isolated mitral repair for degenerative MR in high-volume centres is low (less than 1%) despite the absence of randomised comparison, it is widely accepted that valve repair is the optimal surgical treatment in patients with severe degenerative MR, due to the well-documented advantages over valve replacement in terms of perioperative and long-term mortality and preservation of postoperative left ventricular function.

Long-term survival after mitral repair is reduced if the procedure is carried out in patients with symptoms of congestive heart failure and in presence of reduced LVEF. Surgery should be performed before the onset of heart failure symptoms and LV dysfunction in order to achieve patient survival and quality of life comparable to those of the general population of the same age.

The durability of the valve repair is of crucial importance. Patients with complex lesions should be referred to experienced high-volume centres.
The failure rate of mitral repair, defined by the recurrence of moderate or severe MR or need for reoperation for MR, is strictly related to the mechanism of mitral insufficiency, the techniques of repair and the experience of the centre. Recent studies have documented a risk of recurrence of moderate or severe MR after repair of 1–2% per year, particularly in patients with anterior or bi-leaflet prolapse.40,41

The best long-term results have been obtained in patients with isolated prolapse of the posterior leaflet treated with quadrangular resection and annuloplasty (freedom from reoperation at 20 years of 97%)42,43,44. With the introduction of adjunctive techniques, like the artificial chordae and the edge-to-edge, comparable long-term results have been reported in patients with posterior, anterior and bileaflet prolapse.42,43 (15,28).

REFERENCES
REFERENCES (Continued)


