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# Editorial

## Ischemic mitral regurgitation: more knowledge, less fear, better care

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*This is not the end.  
It is not even the beginning of the end.  
But it is, perhaps, the end of the beginning.*  
Winston Churchill  
(*Lord Mayor's Luncheon, Mansion House,  
London, November 10, 1942*)

Ischemic mitral regurgitation (MR) is a functional disorder that occurs in the setting of structurally normal valve components but abnormal left ventricular function and geometry. It affects about 20% of patients after myocardial infarction and carries a poor prognosis<sup>1</sup>. Surgical treatment has traditionally been associated with sub-optimal results<sup>2</sup>.

Until recent past, only severe MR has been treated by surgery due to discouraging operative risk. Surgeons were bewildered to deal with an enigma like this: "the entire valve appears structurally normal ... there is little to fix, yet the valve leaks ...; it needs not to be replaced, but we do not know how to fix it"<sup>3</sup>.

In the last decade the cardiac surgeon, encouraged by better knowledge of the pathophysiological mechanisms, has undertaken more liberally the repair of ischemic MR. A decrement of surgical mortality has been already recorded, getting a figure of < 5% in recent series<sup>4-6</sup>. Catheter-based techniques are also under investigation and interventional cardiologists share efforts to find out a solution<sup>7,8</sup>. Nevertheless the vicious cycle that links the mitral valve and left ventricle is hard to interrupt.

Now research, clinical studies and surgical experience advance, but significant aspects of the everyday clinical practice need to be discussed.

### Need of more uniform reporting

Ischemic MR is a heterogeneous and dynamic entity associated with a wide spectrum of ventricular abnormalities caused by coronary artery disease. An open issue is the lack of an accepted classification able to sum up functional mechanisms of MR and left ventricular alterations ranging from local to global dysfunction. Therefore, bias in inclusion criteria plagued most retrospective studies and may explain some conflicting results observed in surgical reports. Classifications have been proposed since 1989, but there is not yet a wide consensus<sup>9-13</sup>. Adoption of a common language is urgent to implement the clinical practice and to plan multicenter studies.

### Assessing mitral regurgitation and left ventricular abnormalities

In most reports patients are stratified and results evaluated according to standard MR grading and the role of left ventricular changes is often understated<sup>14</sup>.

Evaluation of MR in the setting of ischemic disease is more accurate with effective orifice area and regurgitant volume assessment<sup>15</sup>. A wide use of these parameters is advisable to better characterize regurgitation severity and prognosis.

In the literature, left ventricular dysfunction is most often assessed taking into account symptoms (NYHA class), ejection fraction, seldom pulmonary artery pressure, while left ventricular volumes and geometry are rarely considered. The prog-

nostic value of the left ventricular end-systolic volume (LVESV) has been estimated since 1987, when it was identified as a predictor of outcome, after myocardial infarction, more powerful than ejection fraction or other variables<sup>16</sup>. Indexed LVESV of  $> 40 \text{ ml/m}^2$  is considered a threshold with strong predictive power for cardiac mortality<sup>17</sup>. Also in surgical series, indexed LVESV is a strong prognostic factor for postoperative outcome<sup>6,18-20</sup>. Moreover indexed LVESV is a useful tool for evaluation of ventricular restoration eligibility,  $60 \text{ ml/m}^2$  according to the STICH trial<sup>21</sup>.

Another useful parameter is left ventricular sphericity index (left ventricular short-to-long-axis dimension). It is closely related to functional MR<sup>22</sup> and it was found to be an independent predictor of postoperative survival after coronary artery bypass grafting (CABG) and mitral valve replacement<sup>23</sup>. Both LVESV and sphericity indexes should be entered in the routine echocardiography reports, clinical charts, surgical notes, and database files.

### Choosing the best treatment

All the variables above discussed result in a variety of clinical presentations and make the choice of the best treatment difficult. Planning revascularization, the finding of a regurgitant mitral valve should never be considered an incidental disease before complete evaluation of the left ventricle (contractility, viability, geometry). Actually, ventricular alterations should be considered dealing with mitral valve disease.

For mild-to-moderate MR with a normal left ventricle, revascularization alone is obviously the most appropriate treatment. In case of a moderately dysfunctional left ventricle, revascularization is again the best option in case of reversible ischemia. When strategy is uncertain, intraoperative transesophageal echocardiography needs to be associated with load modifications to correctly judge the valve dysfunction because anesthetic drugs reduce valve tethering and obscure MR<sup>24</sup>.

In the setting of advanced cardiomyopathy, a mild-to-moderate MR needs to be addressed. Exercise echocardiography can unmask the true severity of MR<sup>25</sup>. Indeed, after isolated CABG, adverse outcome (mortality and congestive heart failure) has been related to abstention from the correction of MR<sup>4</sup> and to the ongoing left ventricular remodeling<sup>26-28</sup>. Moreover valve surgery, performed lately after CABG, carries operative risks near to 10%<sup>29</sup>.

The addition of ring annuloplasty to CABG improved results, but it was ineffective in a not negligible number of patients<sup>30</sup>. A valuable step forward was made undersizing the prosthetic ring (Bolling operation), but it still looks like an incomplete treatment in case of severe outward displacement of papillary muscles and valve tethering<sup>6,10</sup>. Therefore alternative reparative techniques need to be elaborated<sup>31-33</sup>.

Ring annuloplasty can be reconsidered in a “pre-ventive” strategy for a trivial MR associated with an advanced left ventricular dysfunction (severe dilation, papillary displacement, increased left ventricular sphericity and annular enlargement)<sup>10</sup>. The aim of such a surgical approach is stabilization of the annulus to prevent further left ventricular dilation and MR. Left ventricular containment devices are other promising options for these cases.

When all the three components of the disease are involved, i.e. coronary artery disease-mitral incompetence-left ventricular remodeling, an aggressive surgical treatment has been advocated (CABG-mitral valve repair-left ventricular reshaping)<sup>34,35</sup>. The aim is the “complete cure”. This is an ambitious goal and it needs to be compared with the results of transplantation.

### Last but not least

In a brief paper from the Cleveland Clinic, Ellis et al.<sup>36</sup> stated that “the presence of MR in patients undergoing coronary angioplasty significantly and rather dramatically decreases survival over 3 years ... especially for patients with ejection fraction  $< 40\%$ ”. The authors’ conclusion was that for patients in need for elective coronary revascularization, the presence of moderate-to-severe MR should be considered a “relative contraindication” to coronary angioplasty. This is a very impressive message, but it did not obtain great echo at the moment of publication. On the contrary, we deem that both the cardiologist and the surgeon should carefully meditate and incorporate these principles in the clinical practice.

Main objectives of surgery for ischemic cardiomyopathy are to stop (or at least to slow) the progression of left ventricular remodeling. In this strategy, treatment of MR has a central role addressing the actual valve dysfunction, preventing late regurgitation onset, and promoting left ventricular reverse remodeling. Mitral valve repair adds only a small surgical risk, but it has the potential to give our patients significant late benefits.

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