

## Surgery for hypertrophic obstructive cardiomyopathy (HOCM): what to do with concomitant mitral insufficiency?

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Mitral insufficiency is frequently associated with HOCM and generally results from systolic anterior motion (SAM) of the septal leaflet hindering early closure and correct coaptation of the valve.

In a recent survey Joon Hwa Hong and colleagues from the Mayo Clinic in Rochester, Minnesota investigated in a retrospective study the need for concomitant mitral valve surgery in adult patients operated upon for HOCM between 1993 and May 2014 (1). Among 2,004 patients with subaortic and midventricular septal hypertrophy the authors found intrinsic mitral valve disease prior to HOCM surgery in 99 patients and during surgery in another 75 pts. Therefore a total of 174 had had either repair or replacement of the mitral valve because of intrinsic mitral disease.

Of utmost interest are, however, the remaining 1,830 patients who underwent isolated septal myectomy. In this group preoperative transthoracic Doppler echocardiography demonstrated significant mitral regurgitation of grade  $\geq 3$  in 54.3% of the patients. After surgery and prior to hospital discharge the number decreased to 1.7%. This impressive series demonstrates clearly that transaortic extended septal myectomy as published by us with similar results in 1995 (2-4) is sufficient to correct concomitant mitral regurgitation provided there is no intrinsic mitral valve disease.

The role of the mitral valve in HOCM was first detected when M-mode echocardiography was introduced and the SAM became evident. Over years and unfortunately sometimes still today this phenomenon is attributed to a Venturi effect. It is, however, due to an initial systolic flow

deviation by the bulging septum towards the mitral valve pushing the septal leaflet anteriorly. It makes therefore sense that concomitant mitral insufficiency will disappear once the septal bulge is resected. To achieve complete resection is not easy and surgery should be performed in specialized centers by experienced surgeons. The transaortic access is standard nowadays but visibility to the lower end of the septal bulge is highly restricted. We therefore started already in 1979 to use a small sharp triple hook (i.e., Senn-Miller Baby Triple Hook) that marks inside the heart not only the deepest point for the resection but also serves as a guideline for the knife.

Extended myectomy applies not only to the septal hypertrophy but also to subvalvular mitral apparatus. In most cases both papillary muscles are hypertrophic and laterally attached to the ventricular wall either directly or by hypertrophic trabeculae. In addition interpapillary muscle bridges may be present. All these abnormal structures must be resected to guarantee free mobility of the papillary muscles and the mitral leaflets, respectively. For better view in the depth of the left ventricle a small flexible fiber optic light source can be helpful. A detailed and illustrated description of the technique has been reported earlier (2,5).

In spite of convincing results of extended myectomy on relieve of SAM mediated mitral insufficiency a simultaneous direct approach to the mitral valve has been discussed and performed by several teams. Plication or retention (6,7) as well as extension of the anterior leaflet (8) and even mitral valve replacement (9,10) has been done. Plication might be helpful

in patients with a redundant but otherwise normal septal leaflet and annuloplasty may be indicated in those rare cases with isolated annular dilatation. Most of the proposed reduction or extension plastics are unnecessary provided that the septal bulge is completely removed, the papillary muscles mobilized and there is no intrinsic disease of the leaflets. Mitral valve replacement, however, is too radical unless in cases with severe intrinsic leaflet changes not amenable to repair.

In their paper Hong *et al.* (1) indicate on table 3 that postoperative heart block requiring permanent pacemaker had no influence on overall mortality. This view might be a little bit too undifferentiated. Induction of a complete heart block is indeed a problem even when the first longitudinal cut into the septum is done at the level of the right coronary ostium and therefore well away from the AV-node. More common is postoperative left bundle branch block (LBBB) that also may result in complete AV-block in combination with a pre-existing right bundle branch block (RBBB). Unfortunately the information on heart block is restricted to the hazard rate for late mortality in the group of 174 patients who underwent concomitant intervention on the mitral valve. It would be worthwhile to know the absolute numbers not only for this group but also for the group with extended myectomy only. In our own initial series primary pacemaker implantation was necessary in 4% of the patients and pre-existing RBBB was a risk factor. The number rose to 14% during an average follow-up of 12.5 years. In a more recent unpublished study by Schöndube (11) from Göttingen with 108 patients, eight patients (7.4%) all with pre-existing RBBB needed postoperative pacemaker implantation.

In spite of the fact that we meanwhile know that extended myectomy in patients with HOCM relieves not only the pressure gradient but also SAM-mediated mitral regurgitation many question about the fate of these patients over time are still not answered. How will diastolic function of the left ventricle develop after pressure relieve? Can dangerous arrhythmias and sudden cardiac death be prevented by the operation? Which patients should receive an ICD and when? Can alcohol ablation in a long range compete with surgery and under what circumstances? For all these questions we have many speculations but no definite answers.

The group from the Mayo Clinic has conclusively demonstrated that extended septal myectomy reverses also SAM-mediated concomitant mitral regurgitation provided that there is no intrinsic leaflet deformation. One can only hope that the same group with their huge experience will be

able to answer some of the other pending questions. From our side I would add that extended myectomy incorporates not only a complete resection of the protruding muscle bulge but also mobilization of both papillary muscles to guarantee optimal coaptation of the leaflets.

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### Footnote

*Conflicts of Interest:* The author has no conflicts of interest to declare.

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