Mitral valve repair for functional regurgitation: Do not miss the last piece of the puzzle!

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Mitral valve repair puzzle for functional regurgitation: the last piece is still missing.

To see what is in front of one's nose needs a constant struggle.

—George Orwell

The complicated bundle of mitral valve, so clearly described from the time of Leonardo da Vinci,¹ still represents a big challenge for any surgeon, particularly when the treatment of myocardial infarction-related valve dysfunction is concerned.

Thanks to the pioneering works by the Mayo Clinic group, which provided us with a great amount of new insights into anatomic and functional changes occurring in functional mitral regurgitation (FMR)² and triggered a plethora of literature on the matter during the last 2 decades, cardiac surgeons and cardiologists worldwide are now well aware that FMR is not a primary organic valve disease but rather is secondary to continued left ventricular remodeling, leading to posterior papillary muscle displacement and tethered leaflets.³ Papillary muscle displacement relative to the mitral annulus (more than its dysfunction) and related to regional wall motion abnormality in the region of its attachment is therefore the FMR key pathophysiologic factor,⁴ finally leading to displacement of the coaptation point toward the left ventricular apex referred as to “tenting.” Unfortunately, the intricate conundrum is further complicated by complex 3-dimensional dynamic changes occurring in the mitral annulus in patients affected by FMR.⁵

For all these reasons, nobody could really harbor any illusions that a surgical intervention addressing only the annular end and not the tethering by the remodeled ventricle, such as restrictive mitral annuloplasty, would have been the panacea for resolving such a complex disease. In more recent years, several adjunctive subvalvular procedures (papillary relocation, approximation, sling, chordal cutting, etc) have therefore been developed as adjuncts to annuloplasty; however, these techniques are still difficult to standardize and apply. Finally, chordae-sparing mitral valve replacement is back on the stage of FMR treatment

as a reliable alternative to repair for at least some subgroups of patients.^{6,7}

In this intricate scenario, Obase and colleagues⁸ propose in their article in this issue of the *Journal* a triple repair (3R) approach addressing annulus stabilization, coaptation surface augmentation, and papillary muscle resuspension and provide some clues by comparing, in a few cases, 1- and 5-year freedoms from recurrent mitral regurgitation between standard and 3R approaches, with the latter performing significantly better. The article emphasizes the well-known fundamental role of echocardiography as an invaluable tool for diagnosis, guide to repair, and follow-up,⁹ although this procedure has gained even greater importance for accurate patient selection and guide to a patient-tailored approach.¹⁰

Data presented appear promising, although the “ventricular problem” is again only indirectly addressed by the 3R approach, which does not effectively treat the primary ventricular component of FMR. The impression is that we are once more missing the actual last piece of the FMR puzzle. This may be true especially for critically ill patients (more enlarged and spherical ventricles, severe tethering, etc), for whom a surgical strategy addressing the annular dilatation and the concomitant subvalvular dysfunction may not be sufficient. In contrast, patients with limited left ventricular remodeling and dilatation and preserved mitral valve apparatus geometry seem to benefit from isolated mitral ring annuloplasty.⁹

Central Message

Multimodal reparative approach for functional mitral insufficiency has been reported. Only prospective, randomized studies will confirm efficacy and the appropriate imaging and visualization tool.

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The questions are therefore as follows: Is the 3R approach sufficient for patients in advanced stage of the disease? Instead of such a complex repair, should we not consider a simpler chordae-sparing valve replacement?⁷ This is actually very hard to say, and a multicenter study would provide more meaningful data and objective evidence.

We congratulate the Japanese group, and we look with hope and interest future information from them, eagerly waiting for someone to find the last piece of the puzzle.

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