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Editorial

Left ventricular assist device after percutaneous mitral valve repair: Can we go there?

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Secondary mitral regurgitation (MR) in patients with left ventricular (LV) dysfunction is associated with poor outcome. In the failing ventricle, increased subvalvular tethering forces and decreased closing forces disturb normal leaflet coaptation, creating a characteristically dynamic mitral valve lesion [1]. It has long been debated if secondary MR is solely a marker of advanced LV disease, or an independent cause of symptoms and mortality. Until recently, no single intervention to reduce the regurgitant volume had shown any outcome benefit above optimal guideline-directed medication and cardiac resynchronization therapy. The COAPT trial (Cardiovascular Outcomes Assessment of MitraClip Percutaneous Therapy for Heart Failure Patients With Functional Mitral Regurgitation), as a first, demonstrated that targeting secondary MR with percutaneous mitral valve repair (MitraClip, Abbott Vascular, Santa Clara, CA) significantly reduces heart failure hospitalizations and mortality at 2 years in symptomatic patients on optimized HF treatment [2]. As a result, the U.S. Food and Drug Administration (FDA) has now expanded the approval for the use of MitraClip therapy to secondary MR patients. A growing number of symptomatic HF patients are therefore expected to have access to MitraClip therapy in the U.S. and across the world.

Importantly, patients with end-stage HF (stage D) were not included in the COAPT trial and should be considered for left ventricular assist device (LVAD) therapy or heart transplantation instead. Nonetheless, ongoing disease progression towards end-stage HF can occur in patients initially treated with MitraClip, and LVAD therapy might be considered at a later stage. In the COAPT trial, this occurred in 3 of the 293 patients with previously attempted MitraClip implantation (1.2%) [2]. With the expanding indication for percutaneous valve repair in HF, questions regarding feasibility of LVAD implantation after prior MitraClip implantation will increasingly arise. Particularly relevant is the reduction in mitral valve area that is inherent to the "double-orifice" created after MitraClip repair. An average mitral valve area reduction of 50–60% is generally observed after a MitraClip procedure [3]. Although this is not commonly associated with severely increased pressure gradients in HF patients (low flow state), the reduced valve area in combination with increased flow rates after LVAD might result in significantly increased transmitral pressure gradients. Optimizing flow settings in LVAD patients could therefore be particularly challenging post MitraClip, necessitating careful balancing of flow speed (output) and transmitral gradient (and hence, left atrial and pulmonary pressure and right ventricular afterload).

In a short communication in this issue of the Journal, Ammirati and colleagues present a retrospective case series of 6 severe HF patients previously treated with MitraClip that underwent continuous-flow LVAD implantation at median of 282 days after valve repair [4]. In these 6 patients, there were no LVAD complications caused by the presence of the clip(s) at median follow-up of 401 days. No patient required additional mitral valve intervention at time of LVAD implantation or during follow-up. These data provide some reassurance on the feasibility of LVAD therapy after prior MitraClip procedure. The small sample size, heterogeneous population (4 patients with 2 clips, 2 patients only 1 clip), and larger than expected mitral valve area after MitraClip limit the ability to generalize results. Yet, prior experience using the surgical Alfieri stitch through transapical access in patients with significant MR prior to LVAD implantation corroborates the feasibility of a double-orifice repair in this particular population [5].

These findings however should not provoke a more liberal approach to MitraClip therapy in end-stage HF. Apart from anecdotal experience, there is no evidence in support of MitraClip as a bridge-to-LVAD or bridge-to-transplant. If anything, when reconciling the results of the COAPT and MITRA-FR trials, the patients with the most dilated LV relative to the degree of MR appear to have the least benefit of MitraClip therapy [6,7]. Furthermore, correction of secondary MR prior to LVAD therapy is traditionally not indicated, as the changes in loading conditions after LVAD typically result in decreased subvalvular tethering and hence MR. Even in primary/organic MR it remains debated whether the regurgitation should be corrected prior to LVAD implantation, since pump speed can be adjusted to minimize the severity and hemodynamic impact of the MR [8]. Finally, no data on post-LVAD hemodynamics are reported in this series, nor is the longer-term impact on functional status and outcome elucidated. In patients following restrictive mitral

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annuloplasty for secondary MR, a smaller mitral valve area during exercise (high flow rate), is associated with worse functional capacity and prognosis [9].

Additional points to consider include the risks of increased hardware upstream of the LVAD, which might pose a source of thrombus, infection or debris (there was partial detachment of clips in 2 of the 6 cases reported by Ammirati et al. [4], albeit before LVAD implantation). Furthermore, the presence of inter-atrial shunting which increases right ventricular volume would be a concern were shunts not closed (only half the cases in the series underwent surgical trans-septal defect closure).

The preliminary series by Ammirati et al. [4] is an important first step, but clearly more data (hemodynamic, imaging and clinical) are required. What is presently clear however, is that the decision to pursue percutaneous mitral valve repair for secondary MR should only occur in the setting of careful optimization of medical therapy, including consideration of resynchronization [1,2]. Timing advanced heart failure therapy (LVAD or transplantation) initiation should also weigh into the discussion before percutaneous mitral repair options are sought in HF patients, particularly when one compares mortality rates in COAPT [2] and MITRA-FR [6] with data from the INTERMACS registry [10]. Combining expertise from imaging, interventional and heart failure physicians will help us choose optimal therapies for patients with heart failure and secondary MR. For now, in their short communication, Ammirati et al. have shown us a glimpse of what is possible.

Disclosures

No conflicts of interest to disclose.

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