Percutaneous Edge-to-Edge Repair of Recurrent Severe Mitral Regurgitation After Surgical Mitral Valve Repair

Recurrent moderate or severe mitral regurgitation (MR) after surgical mitral valve repair (sMVR) has been reported to occur in 15% to 59% of patients originally treated for primary (PMR) or secondary MR (SMR), respectively, and is associated with adverse outcome (1). This multicenter registry was conducted to assess the feasibility and safety of percutaneous edge-to-edge repair in patients with recurrent MR at high surgical risk.

Retrospectively collected data of 57 patients treated in 11 centers from 2010 to 2016 were analyzed. Eligibility was at the discretion of the treating heart team; however, the following anatomic criteria were usually respected: 1) mitral valve area ≥2.5 cm²; 2) visible mobile length of mitral leaflets ≥5 mm; 3) flail height ≥10 mm; 4) flail width ≥15 mm; and 5) central or adjacent jet origins.

Mean patient age was 76 ± 9 years with a Society of Thoracic Surgeons score of 6 ± 5. The underlying etiology leading to sMVR was SMR in 52%, PMR in 39%, and mixed etiology in 9% of patients. Ring annuloplasty was present in 45 patients (79%). Among these, 5 patients were treated with an Alfieri stitch, which was intact in 4 patients. Twelve patients underwent sMVR using reconstruction techniques without ring implantation such as sMVR according to Hetzer or Paneth suture annuloplasty. The etiology of recurrent MR in patients initially treated for PMR was recurrent prolapse or flail in 50% of patients, leaflet tethering in 27% of patients, and partial ring dehiscence leading to a coaptation gap in 23% of patients whereas in patients treated for SMR leaflet tethering was the predominant reason for recurrent MR (53%).
The MR jet origin was primarily located centrally in patients with PMR (73%) and SMR (80%).

Acute procedural success (post-procedural MR ≥2) was achieved in 84% of all patients (p < 0.001) (Figure 1A). Acute procedural success did not significantly differ in patients originally treated for SMR (90%) compared with patients treated for PMR (77%; p = 0.26). Acute procedural success did not differ in patients originally treated with an annuloplasty ring (84%) compared with patients without an annuloplasty ring (83%; p = 0.64). In 5 of 9 patients with procedural failure (post-procedural MR ≥3) a clip was not placed to avoid mitral stenosis (all patients were treated for FMR with a downsized annuloplasty ring). A modest increase in inflow gradient from 3.1 ± 1.4 mm Hg to 4.3 ± 1.5 mm Hg (p < 0.001) and a decrease in mitral valve area from 3.5 ± 1.2 cm² to 2.4 ± 1.0 cm² were observed after the procedures (p < 0.001). During in-hospital stay no major adverse cardiac or cardiovascular events were observed. Follow-up data (echocardiography or New York Heart Association functional class) of ≥1 month were available in 47 patients (82%) with a mean follow-up of 15.9 ± 15.5 months. Ten patients were lost to follow-up including 4 deceased patients (18%). Further, 6 patients died after having a clinical follow-up. The rate of patients suffering from MR ≥3 was reduced from 100% to 18% at follow-up (p < 0.001) (Figure 1A). Three patients with failed clipping procedures subsequently underwent surgical mitral valve replacement, and another patient with failed clipping procedure was treated by a transapical valve-in-ring procedure. The rate of patients in New York Heart Association functional class ≥III was reduced from 87% to 34% at follow-up (p < 0.001) (Figure 1B). This study demonstrates the feasibility and safety of the edge-to-edge repair technique in selected high-risk patients with recurrent MR after sMVR with a procedural success rate slightly lower compared with previously reported real-world data with more favorable valve morphologies (2).

Most patients had a surgical annuloplasty ring, which may interfere with edge-to-edge repair. First, visualization of the leaflets may be impaired by echo shadowing of the annuloplasty ring, and second, downsizing of the mitral annulus by the ring may prevent clip placement due to the development of mitral stenosis. Consequently, this may explain the procedural success rate of 84%. However, the presence of an annuloplasty ring may help to overcome the limitations of edge-to-edge repair by addressing and preventing subsequent annular dilation.

The numerically higher acute procedural success rate in patients originally treated for SMR compared with patients treated for PMR did not reach statistical significance. However, an advantage of patients treated for SMR is conceivable because sMVR for SMR is focused on the reduction of ring dilation whereas the focus of sMVR for PMR is repair of leaflet and chordal dysfunction, which may impair leaflet motion and subsequently proper grasping in edge-to-edge repair.

The retrospective nature and the incomplete follow-up are limitations of this study. However, based on the described promising results, edge-to-edge repair may be considered as an alternative treatment option in selected patients at high risk for cardiac surgery, especially if valve-in-ring procedures are not an option.

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