Mitral Paravalvular Leak Closure

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KEYWORDS

• Paravalvular • Leak closure • Regurgitation • Mitral

KEY POINTS

- With appropriate patient selection and operator expertise, percutaneous repair is an established therapy for patients with paravalvular mitral prosthetic regurgitation.
- Percutaneous repair can improve symptoms of heart failure and hemolysis while avoiding the need for repeat sternotomy.
- The procedure should be performed as part of a comprehensive, multidisciplinary valve program with close collaboration between experienced operators and imaging specialists.

Paravalvular regurgitation frequently affects surgical valves in the mitral position, occurring in 5% to 15% of these patients.[1] These patients represent the most common type of paravalvular regurgitation that requires repair, either for treatment of symptoms of heart failure or hemolytic anemia. Although the traditional treatment has been open surgery, percutaneous treatment is the preferred therapy for symptomatic patients.[2] Open surgery carries the risk of reoperation and may not be successful because of poor quality of the underlying tissue. Moreover, the reversible nature of the catheter-based techniques, in the event of an unsuccessful outcome, permits a subsequent surgical attempt if desired. Thus, percutaneous therapy is inherently attractive as a relatively less invasive option for many patients with paravalvular mitral prosthetic regurgitation.

CLINICAL EVALUATION AND PATIENT SELECTION

Patients who may be considered for percutaneous repair require a comprehensive, multidisciplinary evaluation with a heart team approach, whereby there is close collaboration between the cardiologist, interventionalist, cardiac surgeon, and imaging specialists.[2] Assessment of surgical risk with stratification tools and consultation should be considered, as repeat surgery will not be prohibitive in many patients even though the reoperative risk will be increased relative to the initial surgery.[2–4] All patients with paravalvular prosthetic regurgitation should be evaluated for both hemolytic anemia and active endocarditis, even when there are not suspicious clinical findings. Hemolytic anemia, when present, necessitates a high degree of closure (ideally complete) and should be known when discussing therapeutic options. Active endocarditis is a contraindication to placement of device occluders.

Echocardiography is the primary imaging modality for the evaluation of paravalvular mitral regurgitation. Although 2-dimensional echocardiography is widely used as the initial screening tool, 3-dimensional studies are essential in these patients. Three-dimensional echocardiography provides detailed morphology that is used to plan percutaneous repair, including location, size, and shape of the defects (Fig. 1).[5] In some patients, acoustic shadowing can pose significant challenges for visualizing paravalvular regurgitation. As an additional noninvasive imaging method, cardiac computed tomography

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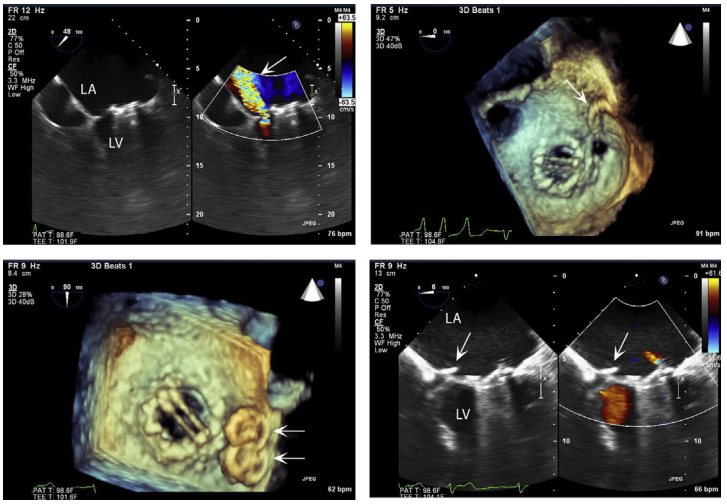

Fig. 1. Echocardiographic imaging of paravalvular regurgitation. Transesophageal echocardiography is essential for assessment of mitral paravalvular regurgitation. Top left: Medial, paravalvular regurgitation of a bileaflet mechanical prosthesis (*arrow*). Top right: Three-dimensional imaging showing the defect and guidance of the steerable catheter (*arrow*). Bottom left: Placement of 2 AVP-vascular plugs (*arrows*). Bottom right: Resolution of the paravalvular regurgitation (*arrow*). LA, left atrium; LV, left ventricle.

(CT) can be useful, as the spatial resolution is not limited by imaging planes. Cardiac CT with contrast can provide information not only on the diagnosis of paravalvular leaks but also their size, orientation, and surrounding calcification. These imaging studies also provide information regarding camera setup in the catheterization laboratory. In some laboratories, cardiac CT is used with fusion imaging to guide the procedure and enhance the success of percutaneous closure (see Computed Tomography Guidance section later).

The imaging examination is performed to determine the location and severity of the paravalvular regurgitation (including size and distance of the defect from the prosthesis annulus), the state of the left and right ventricles, presence of indications for open surgery, and to exclude significant valvular insufficiency. Of note, although echocardiographic quantitation of valvular regurgitation is established, the criteria for severity of paravalvular prosthetic regurgitation are much less studied.[6–8] Moreover, patients with paravalvular mitral regurgitation often have symptoms out of proportion to conventional standards for severity of valvular regurgitation. For symptomatic patients with inconclusive noninvasive studies, strong consideration should be given to evaluation in the cardiac catheterization laboratory with a detailed invasive hemodynamic assessment and left ventriculography (Fig. 2). It is important to note that defects that are not echocardiographically severe can still be hemodynamically significant and may benefit from therapy; thus, direct examination of dynamic filling pressures may be beneficial. Nonetheless, clinical judgment regarding the severity of these lesions and the likelihood of associated symptoms must be exercised, with the decision to pursue such treatment individualized for all patients.

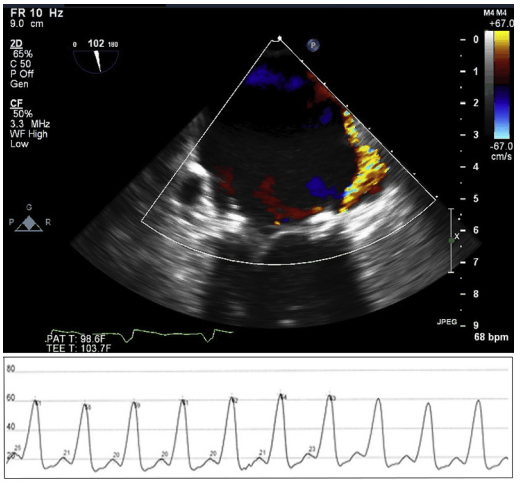

Fig. 2. Invasive hemodynamics of paravalvular mitral prosthetic regurgitation. In this patient, transesophageal imaging shows paravalvular mitral regurgitation that does not fulfill conventional criteria for severity (*top*). However, direct measurement of left atrial pressure shows a mean gradient of 38 mm Hg. Following closure of the paravalvular lesion, there was resolution of the patient's symptoms.