

Cardiac Imaging

Three-Dimensional Echocardiography for Transcatheter Mitral Valve Paravalvular Leak Closure

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Paravalvular leak (PVL) is a rare but serious complication after surgical mitral valve replacement. Although most PVLs are small, remain asymptomatic, and follow a benign clinical course, larger PVLs with serious clinical consequences, such as heart failure, endocarditis, or severe anemia due to hemolysis, occur in 1% to 5% of patients who have undergone surgical valve replacement. Surgical intervention is recommended in adult patients with symptomatic PVLs, though reoperation is associated with mortality rates approaching 16%. Percutaneous transcatheter closure procedures, which are routinely applied in the management of various intracardiac defects and vascular communications, have been applied to the treatment of PVLs using a variety of techniques. Experience with transcatheter mitral PVL closure has achieved variable success, with reported initial technical success rates of 60% to 90% and a need for repeat intervention in up to 40% of cases. In most cases, technical failure results from either the inability to deliver a closure device, or device interference with surrounding structures after deployment, and repeat procedures were performed for either the presence of residual leaks or unanticipated device embolization.

We describe a case of a 62-year-old female patient with a complicated history,

starting with endocarditis in a thrice-operated prosthetic mitral valve complicated by PVL, causing severe symptoms of heart failure and anemia due to hemolysis. The patient underwent her first mitral valve replacement after being treated for endocarditis. This was complicated by severe mitral regurgitation, leading to mitral valve redo surgery. She later developed a PVL and underwent a second redo mitral valve replacement with a bioprosthetic porcine valve (St. Jude #27). She had a complicated postoperative course following her last surgery, including severe PVL and hemolytic anemia requiring frequent blood transfusions.

Despite her critically ill situation, a successful percutaneous transcatheter PVL closure was performed. In summary, the procedure included: left heart catheterization via a transseptal puncture, right heart catheterization, PVL closure with Amplatzer devices for severe mitral regurgitation around a surgically placed valve, and an intra-procedure three dimensional transesophageal echocardiogram (3-D TEE).

Preprocedural catheterization findings included severely elevated left atrial pressure, as witnessed by a mean atrial pressure of 25 mmHg. Preprocedural echocardiography findings (Figures 1 & 2) included severe mitral regurgitation due to PVL (PVL jet width measured 0.53 cm).

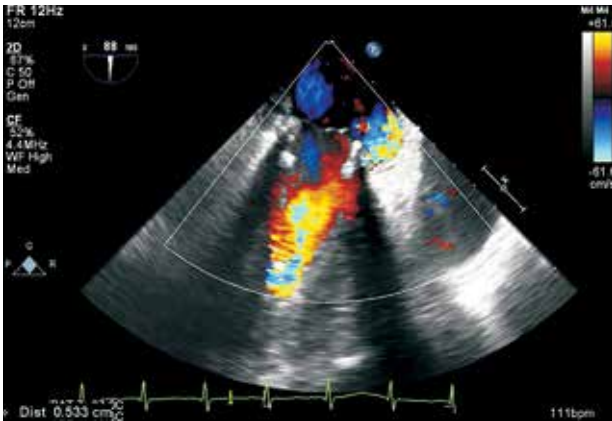


Figure 1. Preoperative two-dimensional color flow transesophageal echocardiogram, showing severe mitral paravalvular leak (PVL; jet width measured around 0.5 cm).

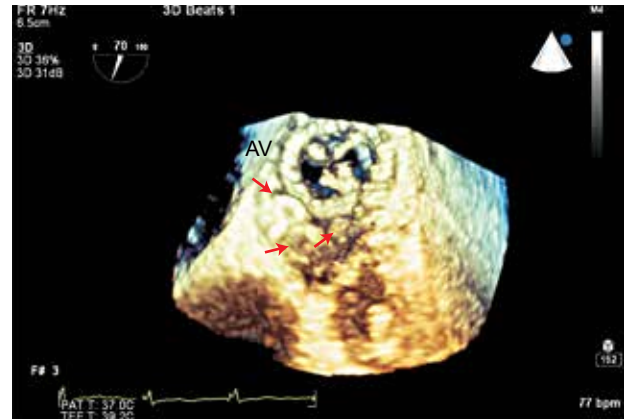


Figure 3. Three-dimensional transesophageal echocardiogram post operation, showing the successful emplacement of three Amplatzer plugs (arrows).



Figure 2. Three-dimensional transesophageal echocardiogram pre operation, showing the mitral paravalvular leak spots (arrows).

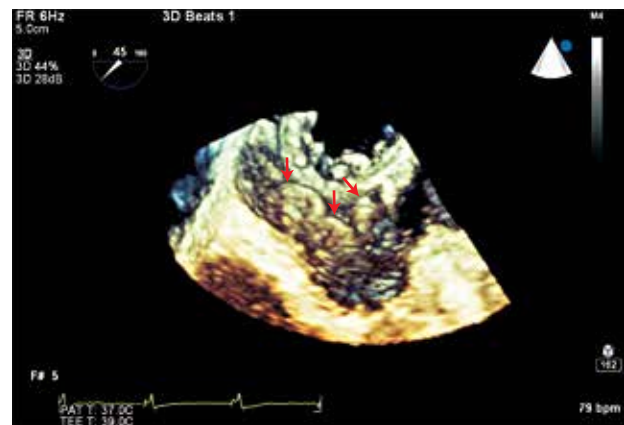


Figure 4. Three-dimensional transesophageal echocardiography image of mitral paravalvular leak closure, zooming on the three Amplatzer plugs (arrows).

The leak appeared to be anterolateral and was oriented in the general direction of the left atrial appendage (LAA). It was seen in direct communication with the LAA from 50° to approximately 120°. No thrombus was seen in the LAA or the left atrial cavity. Successful PVL closure was performed under the guidance of 3-D TEE, using three Amplatzer plugs in total. A 10 mm vascular plug #2, a 10 mm vascular plug #2, and a 6 mm vascular plug #2 were used. Three-D TEE offers additive value in the placement of the Amplatzer devices, since stereotactic guidance is needed.¹⁻⁵

Postprocedural findings included a decreased mean left atrial pressure of 12 mmHg and no signs of PVL on the echocardiogram, on either two- or three-dimensional images or color flow images (Figures 3-5).



Figure 5. Two-dimensional color-flow transesophageal echocardiogram, showing the absence of paravalvular leak after the procedure.

References

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