Percutaneous Closure of 2 Paravalvular Leaks and a Gerbode Defect after Mitral Valve Replacement for Infective Endocarditis

Surgical valve replacement after infective endocarditis can result in local destructive paravalvular lesions.

A 30-year-old woman with infective endocarditis underwent mitral valve replacement that was complicated postoperatively by 2 paravalvular leaks. During percutaneous closure of the leaks, a Gerbode defect was also found and closed. We discuss our patient’s case and its relation to others in the relevant medical literature. To our knowledge, we are the first to describe the use of a percutaneous approach to close concomitant paravalvular leaks and a Gerbode defect. (Tex Heart Inst J 2017;44(2):153-6)

Paravalvular leak (PVL) can be a severe sequela of surgical cardiac-valve replacement. Other defects and abnormal communications can be caused by manipulation, inflammation, and friability of the surrounding tissue. In patients who are poor surgical candidates, percutaneous closure of PVLs has proved to be feasible. Imaging techniques are helpful in planning the procedure and in navigating repair devices. We present the case of a patient with infective endocarditis in whom we performed percutaneous closure of 2 PVLs and a Gerbode defect after surgical mitral valve replacement.

Case Report

In June 2014, a 30-year-old woman with bacterial endocarditis underwent mitral valve replacement with use of a 27-mm mechanical valve (St. Jude Medical, Inc.; St. Paul, Minn). Postoperatively, she displayed symptoms of heart failure (New York Heart Association functional class III). A transesophageal echocardiogram (TEE) showed severe paraprosthetic valvular regurgitation. Medical management was unsuccessful, so we considered percutaneous closure of the PVL. Repeat TEE showed a semilunar leak in the anteroseptal portion of the mitral commissure, between the left atrial appendage and the aorta (Fig. 1). A cardiac ECG-gated computed tomographic angiogram revealed the defect (diameter, 5.9 × 5.4 mm; cross-sectional area, approximately 0.3 cm²) between the aortic root and the mitral prosthesis (Fig. 2).

The patient was placed under general anesthesia for percutaneous closure of the leak. An intraprocedural TEE revealed a second mild-to-moderate PVL near the ventricular anterior septum (Fig. 3). We attained femoral access and made a transseptal puncture with use of an AGILIS™ NxT Steerable Introducer deflectable-tip sheath (St. Jude Medical). We crossed the newly identified anterior leak, using an angled 0.035-in Glidewire® Hydrophilic Coated Guidewire (Terumo Medical Corporation; Somerset, NJ). A 6 × 6-mm AMPLATZER™ Duct Occluder II (St. Jude Medical) did not fit, so we deployed a 14-mm AMPLATZER™ Vascular Plug (AVP) II (St. Jude Medical). Subsequently, we crossed the anteroseptal PVL with use of an angled 0.035-in STORQ® Steerable Guidewire (Cordis, a Cardinal Health company; Fremont, Calif) and deployed a 12-mm AVP II. Adequate function of both prosthetic valves was confirmed when TEE showed no increase in the transmitral gradients.

Upon further imaging, we identified a significant shunt from the left ventricle into the right atrium—a Gerbode defect (Fig. 4). The patient’s right atrial pressure was 24 mmHg. After we crossed the defect with use of an 0.035-in STORQ guidewire,
we placed a 7-mm AVP IV device (St. Jude Medical), which did not effectively close the shunt. We then introduced a 110-cm Flexor® Shuttle® 6F guiding sheath (Cook Medical, Inc.; Bloomington, Ind) over the STORQ guidewire into the left ventricle and deployed an 8-mm AMPLATZER™ VSD Occluder (St. Jude Medical). This nearly abolished the shunt (Figs. 5 and 6), and the right atrial pressure decreased to 10 mmHg. The patient tolerated the procedure well.

Four days postprocedurally, TEE showed a severely enlarged left atrium (>39 mL/m²) and global depression of right ventricular systolic function; in comparison with previous findings, the mitral regurgitation had decreased in severity. During the patient’s hospital stay, self-resolving hemolysis developed and was managed medically. As of March 2017, she had not had a repeat hemolytic event or been hospitalized.
The reported incidence of PVL after surgical mitral valve replacement is 7% to 17%.1 Most PVLs are small and clinically silent; however, 1% to 5% of patients have significant PVL associated with hemolysis, endocarditis, or heart failure.2 Surgical repair is recommended for PVL, but reoperation is associated with a mortality rate of approximately 16%, which rises upon further surgical attempts.4 In 1992, Hourihan and associates5 reported the first transcatheter percutaneous closures in patients with aortic PVL; since then, this approach has often been a viable alternative for high-risk patients with this sequela. Although reported success rates for percutaneous closure range from 60% to 90%, up to 40% of patients with PVL might need reintervention.3 Device deployment failure, device interference with neighboring structures (such as valve leaflets), residual leaks, and device embolization are reasons for unsuccessful closure.3,5 Various devices approved for other pathophysiologic conditions have been used off-label for treating PVL, and AMPLATZER devices are among those used most frequently.6

In our patient, we also diagnosed a Gerbode defect and closed it percutaneously. This anomaly was first reported by Buhl7 in 1854 and cited by Meyer8 in 1857. Gerbode,9 assisted by colleagues, was first to repair this type of shunt successfully. Surgery is the treatment of choice; however, percutaneous closure with septal occluders has been used as an alternative.10 Sinisalo and colleagues10 and Rothman and associates12 reported using AMPLATZER Duct, VSD, and ASD Occluders that had waist diameters slightly larger than the diameters of their patients’ Gerbode defects. In our patient, closure with use of a 7-mm AVP IV device failed; an 8-mm AMPLATZER VSD Occluder better fit the anatomy of the defect.

**Fig. 6** Intraprocedural transesophageal echocardiogram (color-flow Doppler mode) shows the devices deployed in the corrected paravalvular leaks and Gerbode defect. Supplemental motion image is available for Figure 6.

**Fig. 5** Fluoroscopic images show the Gerbode defect (arrowheads) **A** after failed deployment of a 7-mm AMPLATZER Vascular Plug (AVP) IV device, and **B** upon deployment of an 8-mm AMPLATZER VSD Occluder. Also seen are the 14-mm AVP II used to close the anterolateral leak (black arrows) and the 12-mm AVP II used to close the anteroseptal leak (white arrows). **C** Final image shows the vascular plugs in place and deployment of the VSD occluder. Supplemental motion image is available for Figure 5C.
To our knowledge, this is the first report of using a percutaneous approach to close concomitant PVLs and a Gerbode defect.

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