An 87-year-old woman with critical aortic stenosis and preserved left ventricular (LV) systolic function (ejection fraction 50%) was admitted with pulmonary edema. She stabilized with medical therapy, and a decision was made to perform balloon aortic valvuloplasty as a bridge to potential transcatheter aortic valve implantation.

Initially, a temporary pacemaker was inserted from the right femoral vein to the right ventricle to allow rapid pacing during aortic valvuloplasty. The heavily calcified aortic valve was crossed with an Amplatz left 1 6F catheter and a straight Amplatz 0.035-inch Super Stiff wire (Boston Scientific Corp, Natick, MA), but difficulties were experienced gaining a stable wire position at the LV apex. The patient complained of chest pain, with rapid hemodynamic deterioration, and a clinical diagnosis of pericardial tamponade was confirmed with transthoracic echocardiography (Figure 1A; online-only Data Supplement Movie I). On color Doppler imaging, a jet from the lateral wall of the LV into the pericardial space could be identified (Figure 1B; online-only Data Supplement Movie II). A pericardial drain was inserted, and approximately 600 mL of fresh blood was aspirated, with immediate normalization of blood pressure and clinical status.

Balloon aortic valvuloplasty was undertaken with a 20-mm Nucleus balloon (NuMED Inc, Hopkinton, NY) under rapid ventricular pacing (Figure 2A) with good results (peak gradient reduced from 125 to 64 mm Hg). Echocardiography showed persistent pericardial effusion despite continued drainage and reversal of heparin. Under adrenaline support and volume replacement, a second drain was positioned posteriorly, which enabled aspiration of a further 300 mL of blood. Further transient improvement was achieved when the drain was replaced with a 12F sheath, but further aspiration ultimately proved impossible.

Update echocardiography demonstrated evidence of accumulated thrombotic material in the pericardial space (Figure 2B), and it was agreed to perform immediate emergency thoracotomy in the catheterization laboratory. At surgery, large amounts of thrombotic material were retrieved from the pericardial space (Figure 3A), and a small defect in the lateral LV wall (Figure 3B) was identified and sutured. The patient recovered well and was discharged 10 days later.

Balloon aortic valvuloplasty was introduced in 19861 and still plays an important role for purely palliative procedures or as a bridge/preparation for transcatheter aortic valve implantation. Cardiac perforation that results in pericardial effusion/tamponade is a recognized complication of balloon aortic valvuloplasty/transcatheter aortic valve implantation and can be the consequence of wire perforation of the LV or right ventricle perforation by temporary transvenous pacemakers.2 Immediate pericardiocentesis usually relieves the tamponade, but cardiac surgery can eventually become necessary. In a study of 88 patients who underwent echocardiography-guided pericardiocentesis for acute pericardial tamponade that occurred during catheter-based procedures at the...
Mayo Clinic, 18% of the patients needed cardiac surgery. Removal of clots (5 of 16 patients) and repair of a perforated cardiac chamber (5 of 16 patients) were common findings at cardiac surgery in this study.

In the reported case, echocardiographic monitoring was essential for many reasons: It confirmed the clinical diagnosis of pericardial tamponade (Figure 1A), identified the site of perforation (Figure 1B), and impressively demonstrated formation of clots around the right ventricle (Figure 2B) that explained the therapy resistance. We believe that efforts should be undertaken to identify the site of perforation, because further management of the tamponade after initial pericardiocentesis can vary considerably. Although right ventricle perforation is likely to seal after a drain has been inserted and heparin has been stopped or reversed, perforation of the LV in the setting of severe aortic stenosis and markedly elevated intraventricular pressure can be expected to be challenging to manage.

After initial stabilization was achieved with pericardiocentesis in this patient, successful balloon aortic valvuloplasty was performed, and the peak gradient was halved from 125 to 64 mm Hg. It is possible that this procedure was life saving, because even emergency cardiac surgery takes a considerable amount of time for preparation and team activation. Echocardiographic demonstration of thrombus material in the pericardial space (Figure 2B) reduces the chances that the patient can be managed solely by pericardiocentesis, and surgery for removal of clot material (Figure 3A) and suture of the laceration (Figure 3B) becomes a likely scenario.

Disclosures
None.

References
Resistant Pericardial Tamponade
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