Evolving Technology

Surgical aortic valve replacement after percutaneous aortic valve implantation: What have we learned?

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Objective: We report the first case description of surgical aortic valve replacement after percutaneous valve implantation.

Methods: An 87-year-old man with severe aortic stenosis who was rejected for surgical intervention underwent percutaneous valve implantation through a retrograde femoral approach. The procedure was complicated by cardiogenic shock caused by severe aortic insufficiency, leading to emergency surgical aortic valve replacement.

Results: The operative findings revealed the presence of commissural paravalvular leaks and centrally malapposed leaflets. Surgical replacement was uneventful, and the patient was discharged on day 30, despite a challenging postoperative course. His follow-up at 1 year has been uneventful. This case illustrates that overdilatation of the stent is not recommended because it might worsen central aortic insufficiency. Moreover, the transapical route should be considered when the appropriately sized prosthesis is unable to be inserted because of inappropriate vascular access. However, despite an initial "prohibitive" surgical risk, surgical aortic valvular replacement after percutaneous valve implantation could be easily performed.

Conclusion: Percutaneous heart valve implantation, which provides a larger surface area than balloon valvotomy, can be offered to patients with cardiogenic shock and severe comorbidities to improve their hemodynamic state and reduce their surgical risk.

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Percutaneous strategies for the treatment of severe aortic stenosis in nonsurgical patients evolved over 20 years from balloon valvuloplasty to percutaneous heart valve (PHV) implantation.[1] Despite encouraging results, this technique is still evolving, and each case provides a source of procedural improvement. We report the first case description of a surgical aortic valve replacement after percutaneous aortic valve implantation and discuss the findings revealed by this intervention.

Clinical Summary

An 87-year-old man with severe symptomatic aortic stenosis and in New York Heart Association functional class 3 or 4 was transferred to our institution in October 2006 for aortic PHV implantation. He was deemed a nonsurgical candidate by 2 independent surgeons because of his age and multiple comorbidities, which included previous stroke, ischemic cardiomyopathy with a left ventricular ejection fraction (LVEF) of 24%, proximal occlusion of the left circumflex artery, atrial fibrillation with

Abbreviations and Acronyms
LVEF = left ventricular ejection fraction
PHC = percutaneous heart valve

pacemaker dependency, and a prior right hemicolectomy for colon cancer. His logistic EuroSCORE was 22.78%. A successful balloon aortic valvuloplasty had been performed 8 months prior, but his symptoms had recently recurred.

On admission, transthoracic echocardiographic analysis revealed a severely calcified aortic valve with a valve area of 0.4 cm^2, a mean aortic pressure gradient of 46 mm Hg, an aortic annulus diameter of 20 mm, a pulmonary artery systolic pressure of 60 mm Hg, and an LVEF of 25%. Aortic angiographic analysis with iliofemoral runoff and computed tomographic scanning revealed severe calcification of the distal aorta and proximal iliac arteries. The diameter of the iliofemoral vessels did not exceed 8 mm. The patient was included in the Registry of EndoVascular Implantation of Valves in Europe (REVIVE) trial and was scheduled to receive a 23-mm Cribier–Edwards PHV (Percutaneous Valve Technologies; Edwards LifeScience, Irvine, Calif) by using a 22F delivery system through the right femoral artery.

The incision of the groin was performed after achievement of local anesthesia, and the right femoral artery was catheterized. Uneventful aortic valve predilatation with a 23-mm Z-Med II (Numed, Cornwall, Canada) balloon through a 14F sheath was performed. After progressive dilatation of the right femoroiliac arteries with 16F to 22F dilators, the 23-mm Cribier–Edwards prosthesis was advanced to the aortic valve and placed under rapid cardiac stimulation (200 beats/min). After this procedure, recovery of a satisfactory blood pressure was only obtained with the use of inotropes and vasopressors. Supra-aortic angiographic analysis subsequently showed severe aortic regurgitation (Figure 1). Postdilatation of the PHV with a 23-mm balloon was performed, leading to a period of cardiac arrest requiring several minutes of chest compressions. The patient was intubated, mechanically ventilated, and transferred to the intensive care unit with escalating vasopressor requirements. Although he was extubated 6 hours later, he persisted with hemodynamic instability characterized by a diastolic blood pressure of 35 mm Hg and oliguria. Repeat echocardiographic analysis confirmed the presence of severe paravalvular insufficiency with 2 distinct jets and a smaller area of mild central aortic insufficiency. The aortic valve area was measured at 1.7 cm^2 with a minimal transvalvular gradient and an LVEF of 60% with inotropes.

Because of his poor prognosis and frank improvement of cardiac function, after obtaining consent from the patient and his family, surgical aortic valve replacement was attempted.

After a median sternotomy, the patient was started on cardiopulmonary bypass. Anterograde and retrograde continuous hot blood cardioplegia was used for myocardial protection. Incision of the ascending aorta revealed a PHV in perfect position on the aortic annulus with the coronary ostia free from occlusion (see video, online). Analysis of the native valve showed a major gap between the stent and the commissure between the left and right coronary cusps and a minor one between the stent and the commissure between the left and noncoronary cusps (Figure 2). There was a small central leak on the PHV caused by leaflet malapposition, leading to central dehiscence. Nevertheless, the circular

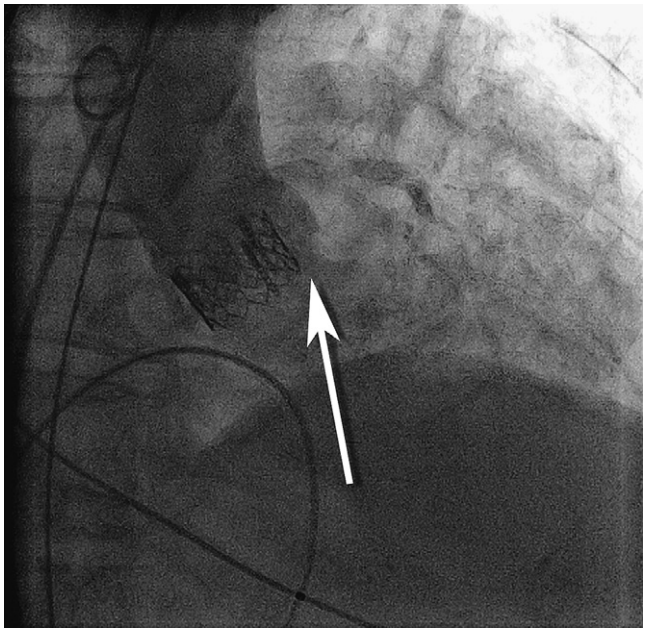

Figure 1. Supra-aortic angiogram showing commissural paravalvular leak *(arrow)*.

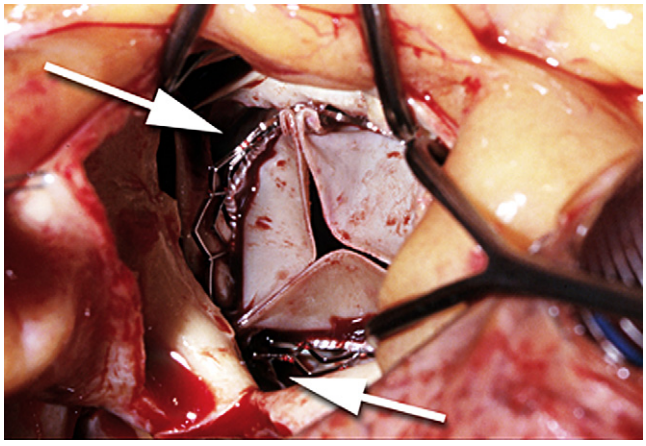

Figure 2. Operative view demonstrating the presence of paravalvular leaks on the commissures between the left and right coronary cusps and between the left and noncoronary cusps *(arrows)*. The valve presents a geometric asymmetry of the 3 cusps, leading to a dehisced prosthesis with a small central incompetence.