Case Reports

Minimally Invasive Repair of Left Ventricular Pseudoaneurysm

after Transapical Transcatheter Aortic Valve Replacement

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Transcatheter aortic valve replacement is becoming a routine procedure to treat severe symptomatic aortic stenosis. At most transcatheter aortic valve replacement centers, transapical access is a frequent alternative for use in patients whose ileofemoral access is inadequate. Transapical access is increasingly applied to a variety of other structural heart and aortic procedures as well.

There is a caveat, however. When performed in elderly patients with friable myocardium, transapical access is associated with such serious sequelae as bleeding and left ventricular apical pseudoaneurysmal formation.

Here, we describe the case of a 70-year-old woman who developed a left ventricular apical pseudoaneurysm 3 weeks after transapical transcatheter aortic valve replacement. Our successful repair took a minimally invasive left lateral approach that involved peripheral cardiopulmonary bypass cannulation, Foley catheter occlusion and primary defect closure, and BioGlue reinforcement. ***(Tex Heart Inst J 2016;43(1):75-7)***

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Transapical (TA) access for cardiac procedures involves cannulation of the left ventricular (LV) apex. The TA alternate-access approach has been widely adopted for use in transcatheter aortic valve replacement (TAVR) patients who have inadequate ileofemoral vessels. It is also being increasingly adopted during procedures such as transcatheter mitral valve replacement, defect closure with plugs, and thoracic endovascular aortic repair.

Patients who need these TA access procedures tend to be elderly and frail, with multiple comorbidities and fragile myocardium. Bleeding, myocardial infarction, and localized tissue weakness can all predispose these patients to the formation of LV apical pseudoaneurysms—a rare complication after TA-TAVR.[1] Timely repair of this defect can be performed via a number of techniques, including standard median sternotomy, minimally invasive left lateral approach, or endovascular plug closure in selected patients. Strict blood pressure management and complete closure are essential for optimal outcomes.

Case Report

We report the case of a 70-year-old woman who had a formidable medical history of hypertension, atrial fibrillation, and rheumatic heart disease, for which she had undergone multiple aortic and mitral valve surgeries, including aortic valve replacement with an allograft. The patient most recently had been deemed a high-risk surgical candidate and had undergone TA-TAVR at another institution. Three weeks postoperatively, she presented at our hospital, reporting severe chest pain and worsening dyspnea. Further investigation, including the use of transthoracic echocardiography and contrast computed tomography (CT), showed a 2.1 × 5.2 × 2.2-cm outpouching of the LV wall, consistent with a pseudoaneurysm (Fig. 1). Cardiac magnetic resonance (CMR) imaging was performed to determine more precisely the location of the pseudoaneurysm and the strength of cardiac function. The CMR confirmed the preservation of LV and valvular function but revealed a narrow 1.3-cm defect in the LV apical "neck," which gave rise to a larger pseudoaneurysmal sac (Fig. 2).

Initial Management and Surgical Technique

Upon diagnosis, the patient was immediately admitted to the cardiovascular intensive care unit for strict invasive blood pressure monitoring and control before surgical repair. We decided to perform prompt open surgical primary repair of the LV pseudoaneurysm via a minimally invasive left lateral approach. Once in the operating room, we placed the patient in a supine position with her left chest mildly elevated, in order to provide complete access to the LV apex, sternum, and groins. For cardiopulmonary bypass (CPB), inflow cannulation was performed peripherally via the standard right-axillary-artery approach (through an 8-mm Dacron graft), and for CPB outflow we gained percutaneous femoral venous access. The previous 12-cm thoracotomy incision was opened, and the adhesions were carefully dissected away from the ribs. We opened the incision up to the level of the intercostal space. Exposure was achieved through a non-rib-spreading thoracotomy.

The pseudoaneurysmal sac was opened, and hemostasis was achieved initially by manual compression, then by inflating a 30-cc Foley catheter that had been inserted into the LV cavity (Fig. 3). This enabled complete hemostasis and best viewing of the operative field while full-thickness pledgeted 3-0 Prolene purse-string sutures were used to close the 1.3-cm apical defect. The LV was then pressurized to ensure adequate hemostasis, and BioGlue® (CryoLife Inc.; Kennesaw, Ga) was placed over the epicardial repair site in the false aneurysm before the sac was oversewn. Postoperatively, the patient did well and was discharged from the hospital on postoperative day 5. A computed tomographic scan at 4 postoperative weeks confirmed complete resolution of the apical defect (Fig. 4).

Fig. 1 *Preoperative computed tomogram with contrast medium shows the 2.1 × 5.2 × 2.2-cm pseudoaneurysm.*

Discussion

The reported sequelae of transapical access surgery have included bleeding with and without tamponade, stroke, mitral and aortic insufficiencies, and septal hematoma. False aneurysms of the LV have been reported, but infrequently.[2,3] Friable tissue and poor operative visibility can

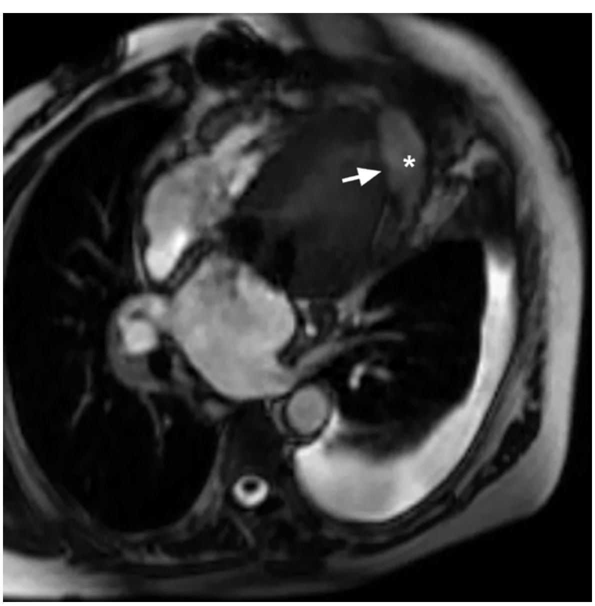

Fig. 2 *Magnetic resonance image shows the defect in the apical neck (arrow) and the larger pseudoaneurysmal sac (asterisk).*

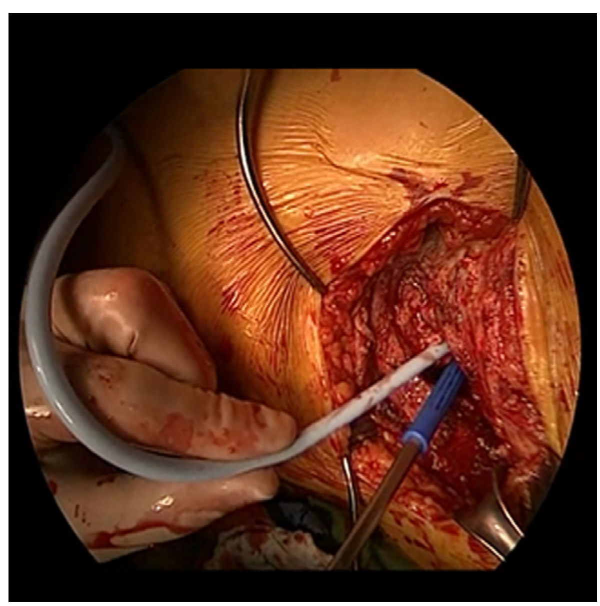

Fig. 3 *Intraoperative photograph shows a Foley catheter inserted within the left ventricular cavity to maintain hemostasis.*

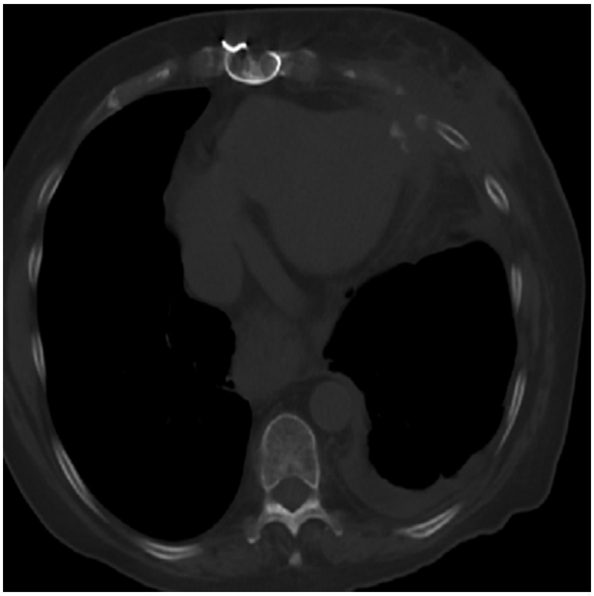

Fig. 4 *Computed tomogram without contrast medium shows no evidence of the aneurysm at 4 postoperative weeks.*

predispose this patient population to the development of this sequela. As with our patient, the indications for surgery are enlargement and impending rupture.

Surgical repair of false aneurysm after TAVI (transcatheter aortic valve implantation) has met with mixed success. Wong and colleagues[3] reported on 4 patients (6.6% of their series). Two patients were treated surgically, and one of those died. Two were treated medically and currently are stable. Al-Attar and co-authors[2] reported the case of one patient who developed LV false aneurysm after TAVI and was successfully treated with surgical repair, under CPB. Our case also clearly illustrates the need for hemostasis, which we achieved initially with manual compression, then by inflating a Foley catheter inserted into the LV cavity. Decompression facilitates visibility of the problem and enables closure without tension. Use of the pericardial patch also is a viable way to facilitate the latter. Use of a vent at the repair site might have aided decompression of the heart, but might also have increased the risk of air embolism, given that the procedure was performed on a beating heart. Decompression and excellent visibility are necessary to ensure that the problem is clearly identified and dealt with in a controlled manner. Endovascular plug closure can also be an option, when ventricular septal defect closure devices (such as AMPLATZER® plugs) are used. This approach, however, is generally limited to inoperable patients and presents substantial technical challenges, such as device embolization, persistent leak, and inadequate tissue rim for device anchoring. As part of our evaluation, we performed follow-up imaging, which included a cardiac CT scan 4 weeks after the surgical resection; and there was no evidence of the pseudoaneurysm.

We suggest that minimally invasive, open primary repair of LV apical pseudoaneurysm after TA-TAVR—with the aid of peripheral CPB cannulation, LV decompression, Foley-catheter occlusion of the defect, primary defect closure, and BioGlue reinforcement—can be performed on a beating heart safely and with good short-term outcomes.

References

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