Early Endocarditis and Delayed Left Ventricular Pseudoaneurysm Complicating a Transapical Transcatheter Mitral Valve-in-Valve Implantation

Percutaneous Closure Under Local Anesthesia and Echocardiographic Guidance

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A 72-year-old man was referred because of suspected infective endocarditis. Fifteen years earlier, he had undergone mitral valve replacement with a 33-mm Hancock valve for severe mitral regurgitation. Three months ago, he presented with a first episode of congestive heart failure caused by severe mitral regurgitation reflecting degeneration of the bioprosthetic valve without sign of endocarditis. Because of a high surgical risk based on an estimated Euroscore I of 42.96% and The Society of Thoracic Surgeons (STS) score of 29% (main comorbidity is an advanced Parkinson disease), valve-in-valve implantation was planned. A 29-mm Edwards Sapien 3 (S3) balloon-expandable valve was successfully implanted through transapical puncture of the left ventricle (LV) after direct surgical exposure by mini thoracotomy. Patient was discharged 10 days after the procedure without complications.

On his admission, the patient was febrile and examination revealed a purulent discharge at the site of thoracotomy. Transthoracic echocardiography (TTE) and transesophageal echocardiography showed a 15-mm mobile vegetation on the leaflet of the S3 (Movie I in the Data Supplement) and a pseudoaneurysm at the apex of the left ventricle (LVPA) flowing by a large apical defect (Figure 1; Movie II in the Data Supplement). Computed tomographic (CT) scanning confirmed the LVPA free from any thrombus and identified the surgical suture tip in its deep (Figures 1 and 2; Movie III in the Data Supplement). ^{18}F positron-emission tomography demonstrated an uptake on the S3 and LVPA (Figure 2). Blood cultures were positive for *Staphylococcus aureus*. Antibiotherapy with co-trimoxazole for 6 weeks and clindamycin for 1 week was started, and a quick clinical and biological improvement was observed.

After 2 weeks, transesophageal echocardiography showed a total regression of the vegetation on the S3 (Figure 1; Movie IV in the Data Supplement) but an increase in the size of the LVPA that had been suspected on examination of the chest revealing an expansive and pulsatile subcutaneous mass at the site of the thoracotomy (Movies V and VI in the Data Supplement). CT confirmed subcutaneous expansion of the LVPA (Figure 1; Movie VII in the Data Supplement).

Transfemoral percutaneous closure of the LVPA was indicated by the Endocarditis Team. The procedure was performed under local anesthesia, light sedation, and dual guidance by fluoroscopy and TTE. A 7F, 110 cm length introducer (Flexor Check-Flo Cook Medical, Bloomington, IN) was easily introduced through right femoral access and pushed in the LVPA on a 0.35-mm wire. The size of the defect was assessed by an integrative method including the use of the previous CT scan and during the procedure with the multimodalities (2D, color Doppler, 3D) of the TTE (Figure 3). The size and the type of the device were selected to cover the entire of the defect, to respect the width of the apical myocardium, and to allow only the minimum of constraint on the LV apex (Figure 3). A 14-mm Amplatzer Septal Occluder (St Jude Medical, Minneapolis, MN) was successfully apposed on the LV wall on each side of the defect with an optimal endocardial position of the proximal disk, a trivial residual flow, and spontaneous contrast into the LVPA (Figure 4; Movie VIII in the Data Supplement).

TTE performed 5-hour after the release of the device showed a total thrombosis of the LVPA (Figure 5; Movie IX in the Data Supplement), confirmed by the 10-day CT scan (Figure 5). Intravenous heparin was administered during the procedure, followed by oral anticoagulation for permanent AF. Patient was discharged 15 days after LVPA closure. One month later, CT did neither show recurrence of LVPA nor residual flow through the Amplatzer device (Figure 5; Movie X in the Data Supplement). Blood test did not show any increase in inflammatory biomarkers, and blood cultures

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were negative. The patient was doing well 4 months after initial presentation.

To our knowledge, this is the first description of an association of early valve-in-valve endocarditis with apical LVPA. LV transapical approach may be used for aortic valve implantation when arterial access is not suitable.[1] It is generally preferred for mitral valve-in-valve procedure in achieving a coaxial alignment between the transcatheter heart valve and the mitral prosthesis. Transapical access is unfrequently associated with LVPA.[2] The reported cause is mainly an early local mechanical defect.[1] However, a late reopening of the ventricular puncture site by an infective trigger has not been described until this case but was clearly suggested in our patient by the clinical presentation and the positive positron-emission tomography CT.[2] Although in the rare series of transcatheter aortic valve implantation endocarditis, the transapical access was not a predictor compared with other access,[3] in our case, the relation of the infection with the transapical access is strong. Currently, the low profile of the S3, the low profile and the higher flexibility of the S3 Commander Delivery catheter, and the use of the fine adjustment wheel should allow to correct alignment difficulties and to boost the use of transseptal route.[4]

Traditional surgical repair of LVPA is recently challenged by percutaneous closure in the high operative risk patients who undergo transcatheter aortic valve implantation.[2] Although a structural reintervention to treat mechanical sequelae of valve-in-valve infective endocarditis is not an optimal treatment, it remains probably a reasonable alternative compared with conservative strategy.[3] We highlight the safety of a simple transfemoral percutaneous procedure under fluoroscopy and TTE guidance without general anesthesia in a frail patient. The risk of infective endocarditis recurrence on the new device is unknown.[3] A careful evaluation by a trained Heart and Endocarditis Team on a case-by-case basis seems necessary. This reported procedure was successfully performed in emergency before LVPA rupture.

Disclosures

None.

References

1. Pasic M, Buz S, Dreysse S, Drews T, Unbehaun A, Klein C, Kukucka M, Mladenow A, Ivanitskaia-Kühn E, Hetzer R. Transapical aortic valve implantation in 194 patients: problems, complications, and solutions. *Ann Thorac Surg*. 2010;90:1463–1469, discussion 1469. doi: 10.1016/j.athoracsur.2010.05.072.
2. Feldman T, Pearson P, Smart SS. Percutaneous closure of post TAVR LV apical pseudoaneurysm. *Catheter Cardiovasc Interv*. 2016;88:479–485. doi: 10.1002/ccd.26157.
3. Amat-Santos IJ, Messika-Zeitoun D, Eltchaninoff H, Kapadia S, Lerakis S, Cheema AN, Gutiérrez-Ibanes E, Munoz-Garcia AJ, Pan M, Webb JG, Herrmann HC, Kodali S, Nombela-Franco L, Tamburino C, Jilaihawi H, Masson JB, de Brito FS, Jr, Ferreira MC, Lima VC, Mangione JA, Iung B, Vahanian A, Durand E, Tuzcu EM, Hayek SS, Angulo-Llanos R, Gómez-Doblas JJ, Castillo JC, Dvir D, Leon MB, Garcia E, Cobiella J, Vilacosta I, Barbanti M, R Makkar R, Ribeiro HB, Urena M, Dumont E, Pibarot P, Lopez J, San Roman A, Rodés-Cabau J. Infective endocarditis after transcatheter aortic valve implantation: results from a large multicenter registry. *Circulation*. 2015;131:1566–1574. doi: 10.1161/CIRCULATIONAHA.114.014089.
4. Dvir D. Transseptal instead of transapical valve implantation: making mitral great again? *JACC Cardiovasc Interv*. 2016;9:1175–1177. doi: 10.1016/j.jcin.2016.04.006.

KEY WORDS: endocarditis ■ left ventricular pseudoaneurysm ■ percutaneous closure ■ valve-in-valve

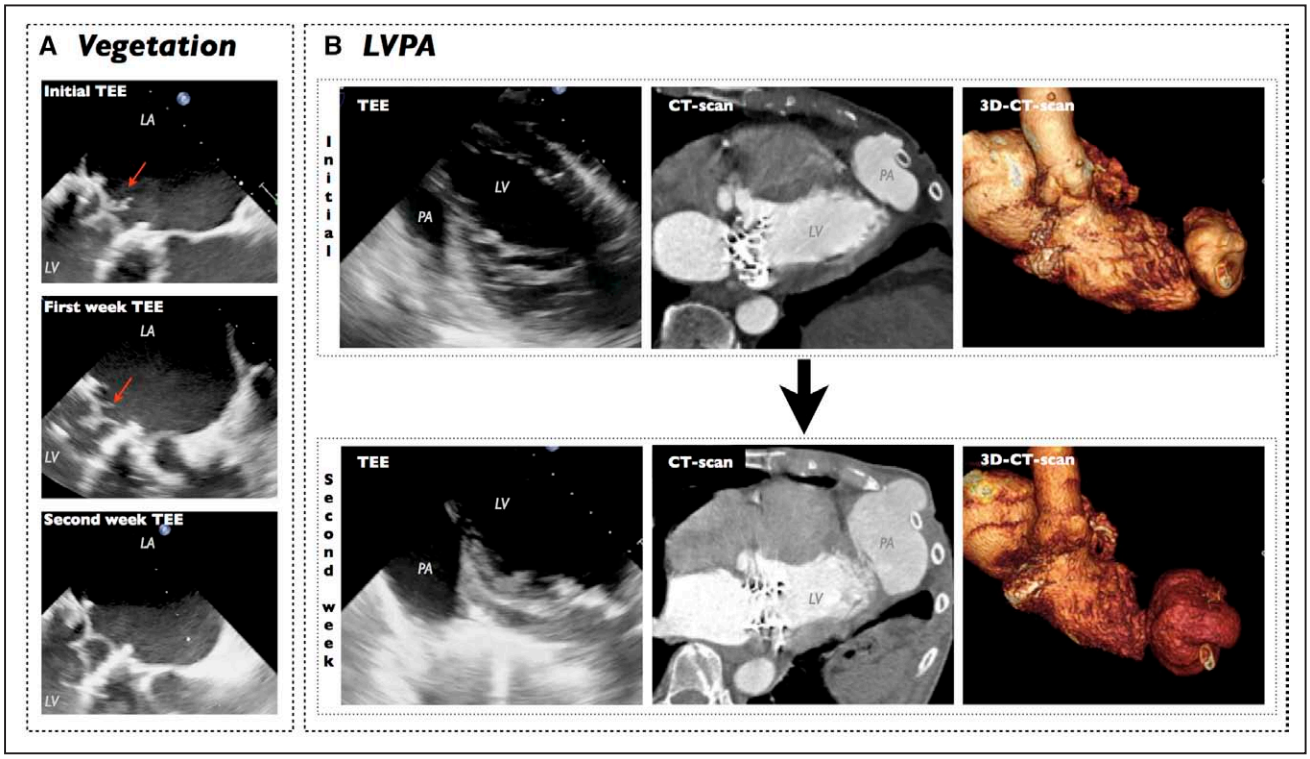

Figure 1. Endocarditis lesions and progression with antibiotherapy. **A**, Vegetation (red arrow) on the leaflet of the S3 during initial TEE, regression with antibiotherapy on the first week TEE control, and disappearance 2 wk ago. **B**, Transgastric TEE view, CT scan, and 3D CT scan with increased left ventricle pseudoaneurysm (LVPA) and subcutaneous expansion. CT indicates computed tomography; LV, left ventricle; PA, pseudoaneurysm; S3, Sapien 3 device; and TEE, transesophageal echocardiography.

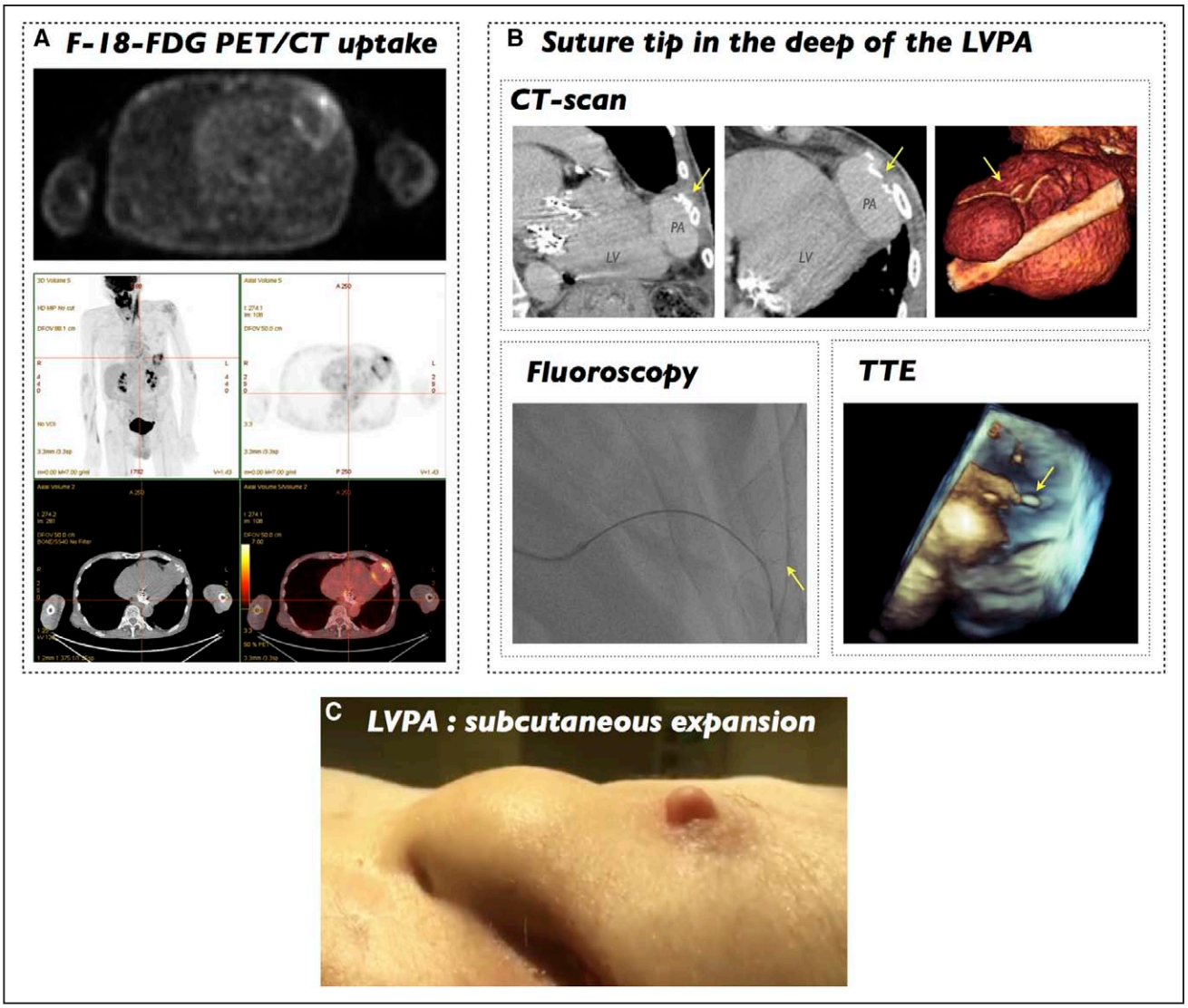

Figure 2. Left ventricle pseudoaneurysm. **A**, F-18-FDG PET/CT with abnormal uptake on the S3 and on the left ventricle pseudoaneurysm (LVPA). **B**, CT scan, fluoroscopy, and TTE showing the suture tip in the deep of the LVPA. **C**, Subcutaneous expansion of the LVPA. CT indicates computed tomography; LV, left ventricle; PA, pseudoaneurysm; PET, positron-emission tomography; and TTE, transthoracic echocardiography.

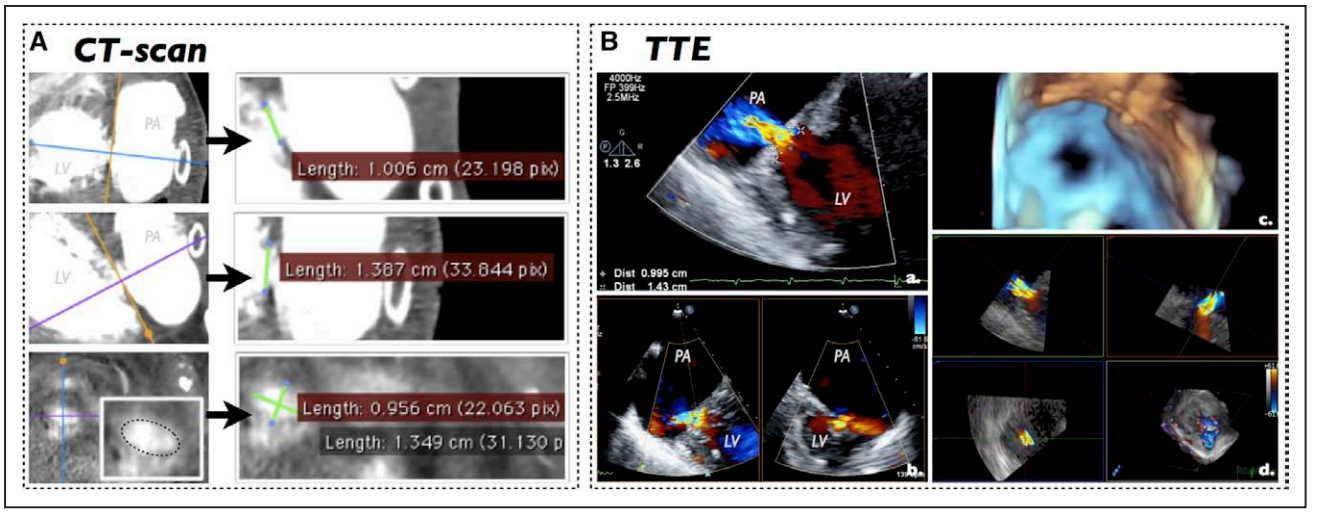

Figure 3. Sizing of the apical defect. **A**, Sizing of the defect was performed by CT scan and during the TTE. A multiplanar approach allowed to size a maximal diameter of the defect close to 14 mm by CT scan. **B**, Multimodality of the TTE were used: a, color Doppler with the measurement of the endocardial defect larger than the epicardial defect; b, X-plane color Doppler; c, real-time 3D view, and d, multiplanar approach with color Doppler. All the modalities of imaging were for a largest diameter of 14 mm. Therefore, a 14-mm Amplatzer Septal Occluder (St Jude Medical, Minneapolis, MN) was selected. CT indicates computed tomography; LV, left ventricle; PA, pseudoaneurysm; and TTE, transthoracic echocardiography.

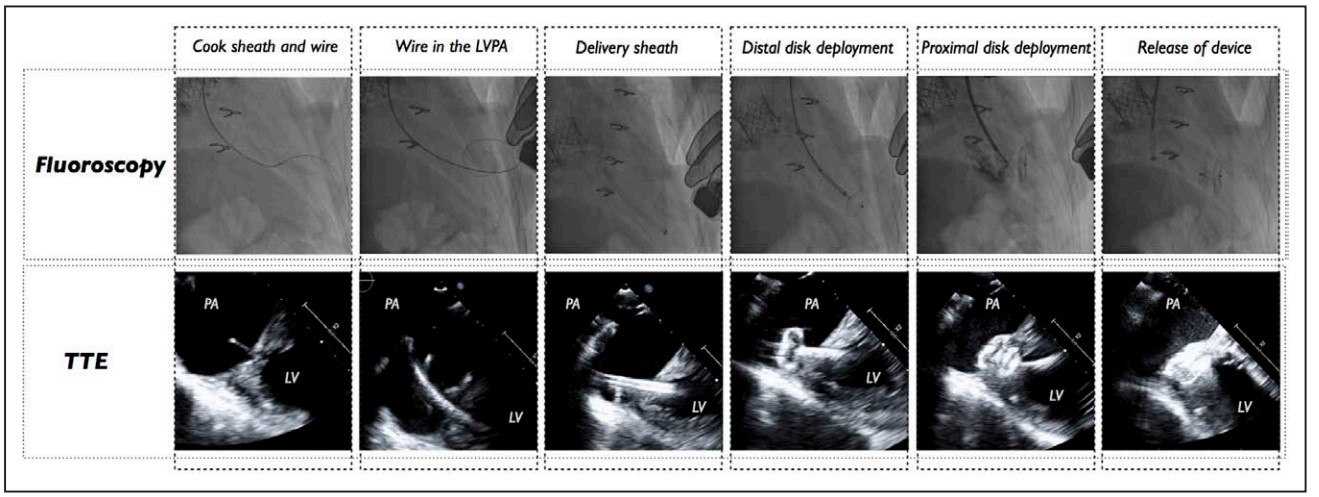

Figure 4. Procedural angiograms and echocardiograms. Introduction of the cook sheath with a 0.35 wire in the pseudoaneurysm through the myocardial defect. Wire is used for placing the delivery sheath into the pseudoaneurysm cavity. A 14-mm Amplatzer Septal Occluder device was extruded into the defect with firstly the deployment of the distal disk and secondarily the optimal deployment of the proximal disk on the endocardial surface. The device was released after the control of well closure of the pseudoaneurysm with limited residual trivial flow. LV indicates left ventricle; LVPA, left ventricle pseudoaneurysm; PA, pseudoaneurysm; and TTE, transthoracic echocardiography.

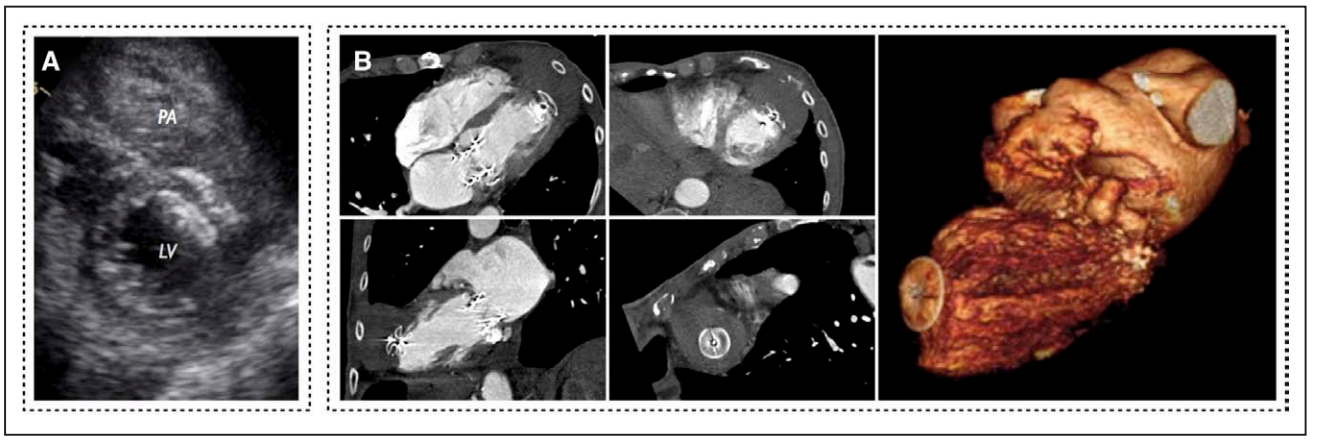

Figure 5. Five-h transthoracic echocardiography (TTE) after the release and 10-d computed tomographic (CT) scan with total thrombosis of the left ventricle (LV) pseudoaneurysm (PA). **A**, Five-h TTE. **B**, 10-d CT scan.

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