

IMAGES IN INTERVENTION

Acute Obstructive Thrombosis of Sapien 3 Valve After Valve-in-Valve Transcatheter Aortic Valve Replacement for Degenerated Mosaic 21 Valve



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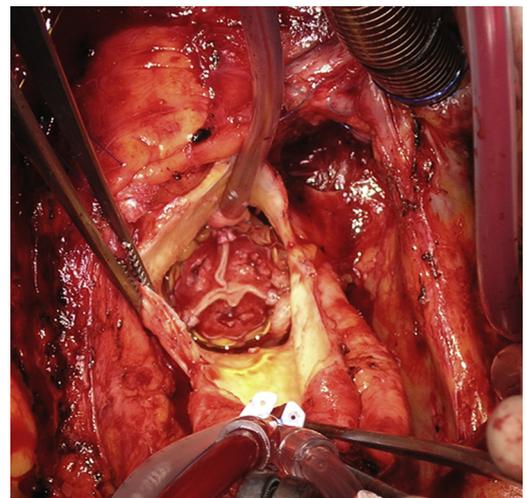
An 86-year-old man was referred because of increasing dyspnea caused by severe stenosis of a bioprosthetic aortic valve (Mosaic R 21 mm, Medtronic Minneapolis, Minnesota), implanted in 2009. He had history of hypertension and ischemic stroke. The patient underwent valve-in-valve (ViV) transcatheter aortic valve replacement (TAVR) with a Sapien 3 20 mm valve (Edwards Lifesciences, Irvine, California) deployed without pre-dilatation (Online Videos 1 and 2).

The Mosaic valve 21-mm size has a true internal diameter of 16.5 mm. The availability of a 20-mm Sapien 3 valve allows implantation in smaller surgical bioprostheses with significantly improved hemodynamics than achieved with the previous smallest available 23-mm Sapien valve and with reduced risk of size mismatch compared with the Evolut 23 (Medtronic), whose diameter is 23.3 mm. Moreover, the predictable result with the Sapien 3 valve particularly in terms of precise valve positioning is crucial in this challenging type of surgical valve without radiopaque marker at the level of the sewing ring. Immediate result was excellent. The starting mean gradient was 58 mm Hg and the ending gradient was 12 mm Hg.

We implanted the Sapien 3 valve following what is recommended by the ViV aortic guidance application (1). However, recent in vitro studies suggest that a

supra-annular deployment between 3 and 6 mm can result in superior hemodynamics for a balloon-expandable valve in a small bioprosthesis than in the deployment location recommended by the

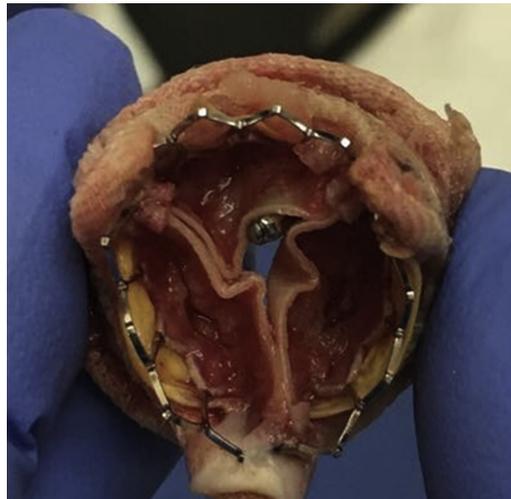
FIGURE 1 Surgical View



Intraoperative view of the Sapien 3 aortic prosthesis showing thrombotic vegetations on all 3 leaflets.

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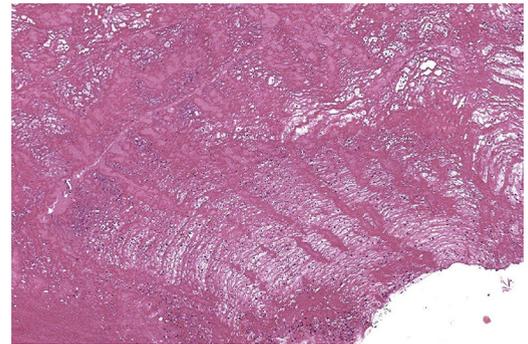
FIGURE 2 Sapien 3 Aortic Prosthesis After Explantation

Extensive thrombus present in the cusps on the aortic side of the bioprosthesis blocking the valve leaflets.

existing guidelines (2,3). However, supra-annular deployment could increase the risk for coronary obstruction, leaflet thrombosis from flow stagnation within the sinus region, and transcatheter heart valve (THV) migration. In addition, it is unknown what effect the SAPIEN 3 skirt may have on forces resisting migration, and inflow resistance in a high implantation ViV scenario (3). Furthermore, the design

FIGURE 3 Results of Transcatheter Aortic Valve-in-Valve Implantation

The Sapien 3 was well seated inside the Mosaic 21 valve. The Sapien top margins were just below the eyelets on the stent post tips.

FIGURE 4 Histological Examination

Microscopic view of the wave-shaped thrombus, with bundles of fibrin and platelets and interposed blood cells.

features of the Mosaic valve without marker at the level of the sewing ring may pose additional challenges to be overcome in the pursuit of an optimal ViV supra-annular deployment. The patient received oral aspirin and clopidogrel in a loading dose of 300 mg the day before the procedure. Rivaroxaban was started 12 hours after TAVR. Although there are no data available to date, the aim of the triple antithrombotic therapy was to reduce the high risk of thrombosis associated with Mosaic/Hancock ViV especially without anticoagulation (4).

Twenty-four hours later, the patient's hemodynamic status suddenly deteriorated. Transthoracic echocardiography showed an acute severe reduction of the left ventricular function and an impairment of the leaflets motion of the Sapien 3 valve with severe stenosis and a mean gradient of 51 mm Hg. Given the severe hemodynamic instability and the suspicion of acute obstructive valve thrombosis, the heart team decision was for emergency surgical reoperation considering the thrombolysis contraindicated for extremely high bleeding risk. The intraoperative findings revealed Sapien 3 well seated inside the Mosaic 21 valve with all 3 leaflets blocked by thrombi on the aortic side (Figures 1 to 3). A Perimount 21-mm valve (Edwards Lifesciences, Irvine, California) was implanted with excellent result. On histological examination, the thrombotic material was composed of an admixture of fibrin, platelets aggregates, and interposed blood cells (Figure 4). The subsequent course was uneventful and the patient was discharged after 10 days with recovery of normal left ventricular function.

THV thrombosis remains a poorly characterized phenomenon (5). Josè *et al.* (4) reported a 2.8% incidence of valve thrombosis after TAVR. Of interest, all

cases of thrombosis after ViV TAVR involved either Hancock II or Mosaic valve. It was postulated that the “rail” design in the sinus portions of these porcine valves can create pockets of stasis leading to valve thrombosis. It is likely that recesses may form between the TAVR and surgical valve that extend into these rail pockets during a ViV procedure. A careful THV oversizing could allow better leaflet folding without excessively increasing the stress levels that could lead to decreased leaflet durability (3). Conversely, an extreme oversizing of the THV leads to incomplete expansion in the semirigid

bioprosthesis, which can contribute to improper functioning and/or higher residual gradients (4).

This case of hyperacute life-threatening obstructive ViV thrombosis seems significant enough to warrant a careful follow-up especially after ViV procedures of certain types of failed surgical valve.

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KEY WORDS acute valve thrombosis, Edwards S3, ViV TAVR

 **APPENDIX** For supplemental videos, please see the online version of this paper.