# Sapien XT implantation under direct vision as a bail-out procedure in case of hostile aortic root: A reasonable alternative for stentless bioprosthesis reoperation

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Reoperations for stentless bioprostheses structural dysfunction are quite common. These procedures represent a surgical challenge because complete aortic root replacement might be required due to severe root calcification.[1] Valve-in-valve transcatheter aortic valve replacement (ViV-TAVR) has been proposed as an alternative treatment in high-risk patients requiring aortic valve reoperations.[2] However, ViV-TAVR in bioprostheses has raised some concern related to the risk of coronary ostia occlusion by prosthetic leaflets.[3] We present a case of a patient with a stentless valve dysfunction who was scheduled for conventional reoperation but who finally underwent ViV-TAVR for the presence of massive calcification of the aortic root and particularly of the coronary ostia, which made isolated valve replacement as well as Bentall operation technically impossible.

## CLINICAL SUMMARY

A 65-year-old man was admitted to Padua University Hospital Cardiac Surgery Division for congestive heart failure (New York Heart Association functional class IV). In 2001 the patient underwent aortic valve replacement with a 25 mm Biocor Porcine Stentless Valve (St Jude Medical, Inc, St Paul, Minn) (Figure 1) and closure of a fistula between the left ventricle and the right atrium due to active aortic valve destructive bacterial endocarditis that caused rupture of the aortoventricular junction. The pericardial sheath wrapping the stentless valve was used to reconstruct the aortic root suturing the lower margin deep into the left ventricular outflow tract (LVOT) and the upper margin beneath the coronary ostia. At the time of admission in 2012, Doppler echocardiography showed severe aortic regurgitation due to rupture and prolapse of the bioprosthesis left coronary leaflet, left ventricle end diastolic volume 103 mL/m$^2$, left ventricle ejection fraction 35%, and moderate pulmonary hypertension (46 mm Hg). The patient's body mass index and body surface area were 23.05 and 1.82 m$^2$, respectively. EuroSCORE I was 8.63%, EuroSCORE II was 4.86%, and Society of Thoracic Surgeons mortality score 6.3%.

Due to relatively young age and to the absence of severe comorbidities, the patient was scheduled for conventional replacement of the aortic bioprosthesis.

According to the operative strategy the patient underwent full resternotomy and cardiopulmonary bypass was instituted with the cannulation of the ascending aorta and the right atrium. After aortic crossclamping, the ascending aorta was opening and cold blood cardioplegia was administered with selective coronary ostia cannulation. The degenerated aortic bioprosthesis was inspected confirming the echocardiographic findings, in particular a fracture of the left coronary leaflet causing leaflet prolapse into the LVOT was observed. The pericardial sheath, which is part of the Biocor stentless bioprosthesis, appeared extremely calcified (Figure 2, *A*) either in the subvalvular portion of the LVOT and in proximity of the coronary ostia, which made coronary ostia isolation for a Bentall procedure technically impossible. Valve leaflets were excised but removal of the pericardial sheath would carry a very high risk of damage to the aortoventricular junction, to the aortic root, and to the LVOT. A conventional aortic valve replacement was not feasible due to the impossibility of passing any needle across the calcified annulus. Even a sutureless bioprosthesis was not implantable because the 3 guiding sutures were too difficult to pass due to the extremely hard calcifications. Thus, after measuring the annulus with a 24 mm Hegar, a 26 mm Sapien XT valve (Edwards Lifesciences, Irvine, Calif) was implanted under direct vision through the aortotomy. The bioprosthesis was partially crimped on the Ascendra 2 delivery system (Edwards Lifesciences, Irvine, Calif) and it was deployed without complications (Figure 3). Valve positioning was visually assessed: coronary ostia were free from obstructions and there were no visible paravalvular leaks. At the end of the operation intraoperative transesophageal echocardiography showed a well functioning Sapien valve without paravalvular leaks (Figure 2, *B*). CPB time was 117 minutes and aortic crossclamp time was 60 minutes. The patient had an

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**FIGURE 1.** Biocor porcine stentless valve.

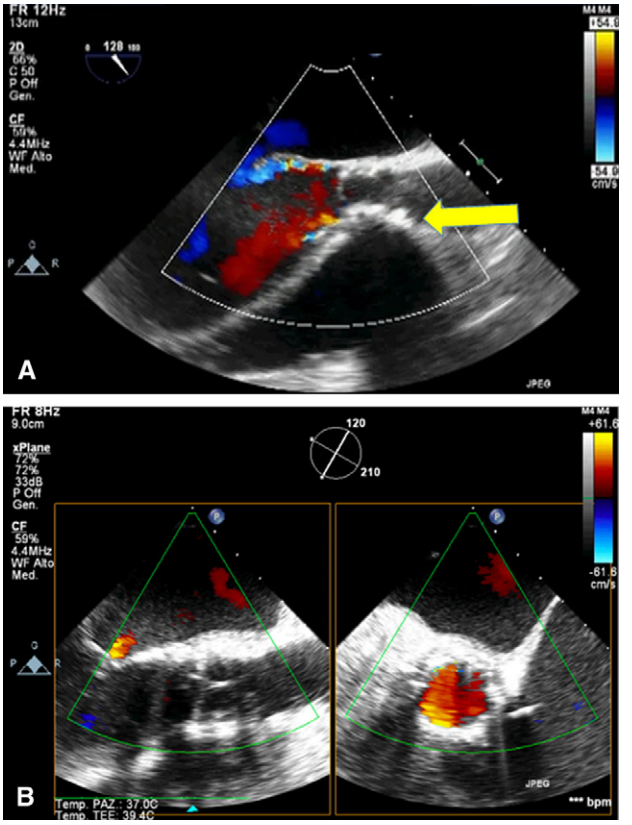


**FIGURE 2.** Intraoperative transesophageal images. A, Intraoperative transesophageal echocardiographic image showing the calcified aortic root (*arrow*). B, Intraoperative transesophageal echocardiographic image showing good positioning of the Sapien XT valve (Edwards Lifesciences, Irvine, Calif) without aortic regurgitation.

uneventful hospital stay and was successfully discharged. Predischarge echocardiography showed a well-functioning aortic bioprosthesis and no paravalvular nor intravalvular leaks. Peak and mean transprosthetic gradients were 23 and 12.5 mm Hg, respectively. Effective orifice area was 1.86 $cm^2$.

## DISCUSSION

This case describes a bail-out implantation of a Sapien XT transcatheter valve under direct vision during conventional surgery for stentless valve dysfunction with a hostile aortic root due to massive calcifications. Although conventional aortic valve replacement is still the treatment of choice for patients with severe symptomatic aortic valve stenosis, new treatment options like sutureless aortic valve implantation and TAVR have been proposed in high-risk or inoperable patients. In particular, ViV-TAVR has shown to be safe and effective in case of failure of aortic bioprostheses, both stented and stentless.[4] Concerns still remain with respect to TAVR-related vascular injury, stroke, paravalvular leak, and valve durability. All these issues limit TAVR use in young and/or low-risk patients.[5] However, direct-vision implantation of a sutureless valve could significantly reduce all the above-mentioned TAVR-related complications because there are no extra vascular accesses needed, there is no catheter manipulation of the aortic arch and the aortic wall, there is no balloon valvuloplasty, and there is the possibility to visually assess the correct position of the valve with respect to coronary ostia. Additionally, the incidence of paravalvular leaks can be reduced because the diseased aortic valve can be partially decalcified. The use of sutureless aortic bioprostheses is now rapidly increasing, but the experience is still limited. In our case the use of a sutureless aortic valve bioprosthesis was not feasible due to the impossibility to cross the calcified pericardium with the guiding sutures. We therefore decided to use as a bail-out procedure the Sapien XT valve. The TAVR has all the benefits of a sutureless valve without requiring positioning of the guiding sutures. Furthermore, during ViV-TAVR, there is no need for complete crimping of the valve with potential benefits in terms of valve durability due to reduced stress of the leaflets.

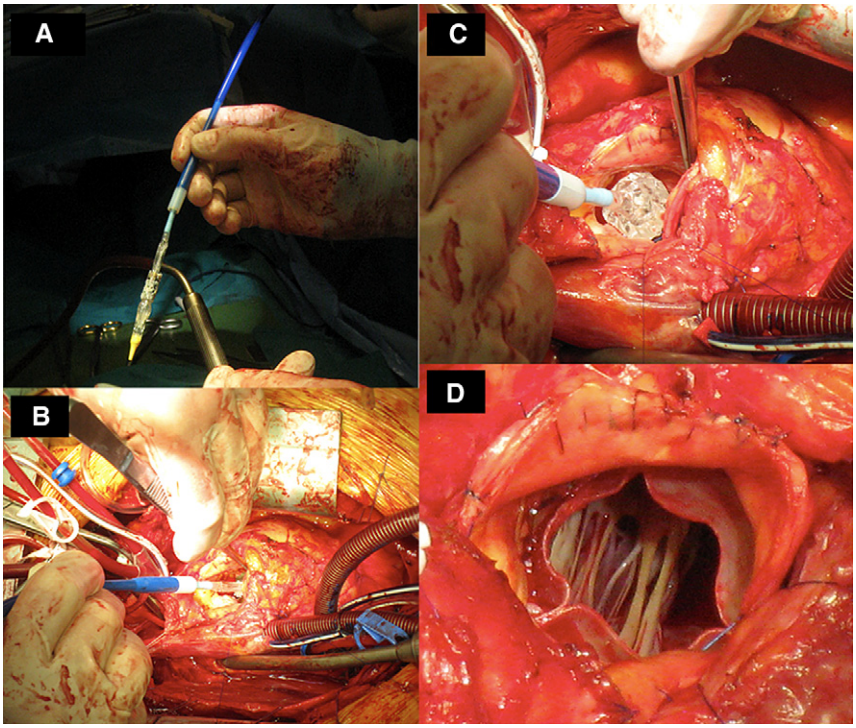


**FIGURE 3.** Intraoperative view. A, The Sapien XT valve (Edwards Lifesciences, Irvine, Calif) is partially crimped on the Ascendra 2 System (Edwards Lifesciences, Irvine, Calif). B, The valve on the delivery system is placed in its correct position under direct vision through the aortotomy. C, The balloon is inflated and the bioprosthesis is deployed. D, The valve is in its final position with the leaflets open.

## CONCLUSIONS

Direct-vision ViV-TAVR is a reasonable option in case of hostile aortic root during aortic valve re-replacement procedures.

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