

# Successful Transfemoral Edwards Sapien Aortic Valve Implantation in a Patient with Previous Mitral Valve Replacement

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### Abstract

Transcatheter aortic valve implantation (TAVI) is a new method for patients with severe aortic stenosis at high surgical risk, such as previous cardiac surgery. The presence of mechanical mitral prosthesis might complicate TAVI because of possible interference between the both prosthesis. Some reports have already demonstrated the feasibility of TAVI in such patients.

We report our experience with TAVI in a patient with severe symptomatic aortic stenosis who has had two previous cardiac surgeries with two mitral valve replacement due to recurrent endocarditis. The Edwards Sapien (Edwards Lifesciences, Inc., Irvine, California) valve via transfemoral approach was successfully implanted. We observed no deformation or dysfunction of the both prosthesis. Balloon valvuloplasty prior to implantation helps to observe the mutual effect of the new aortic valve and pre-existent mitral prosthesis.

We conclude that TAVI can be safely and successfully performed in patients with mechanical mitral prosthesis carefully considering the altered anatomical conditions.

**Keywords:** aortic stenosis, mitral valve replacement, balloon aortic valvuloplasty, TAVR

### INTRODUCTION

Transcatheter aortic valve implantation (TAVI) is a new option for the treatment of severe symptomatic aortic stenosis in high-risk patients not being considered for surgery because of significant comorbidities (6). Using the percutaneous approach the procedural risk can be significantly reduced also in a cohort of patients who have had previous cardiac surgery. On the other hand, TAVI can be complicated in patients with previous mitral valve surgery due to possible interference between the mechanical mitral and percutaneous aortic valve prosthesis. Therefore the presence of mitral valve prosthesis is considered a contraindication for TAVI in the currently ongoing Placement of AoRTic TraNscathetER Valve (PARTNER I) Trial, which compares TAVI, surgical aortic valve replacement and medical therapy (4). In spite of this, some case reports have emerged in the last three years showing the feasibility of TAVI via transfemoral approach with both broad used percutaneous aortic valve prosthesis (Edwards Sapien, Edwards Lifesciences, Inc., Irvine, California and CorveValve, Inc., Irvine, California) in patients with artificial mitral valve (1-3,5). As all the authors pointed out, TAVI in a patient with pre-existent mechanical mitral valve should be considered with caution due to proximity of natural aortic and mitral annuli (1-3,5). There are several concerns that should be kept in mind: 1) the risk of the aortic valve under-expansion in relation to the noncompliant mechanical mitral prosthesis and due to significant reduction of the mitro-aortic space limiting the accommodation especially of the balloon-expandable valve, 2) the risk of embolization of the device and 3) the risk of post procedural dysfunction of the mitral prosthesis due to its damage

during percutaneous manipulation or interference between the prosthesis and distal edge of the aortic valve. The authors reported the importance of various methods for guidance: balloon aortic valvuloplasty of a similar balloon size to the valve stent for assessing the expansion and stability of the balloon and no interference with the mitral prosthesis, fluoroscopy and trans esophageal echocardiography (TEE) to observe the correct position of the device in relation to the mitral prosthesis and pre-procedural cardiac computed tomographic angiography (CTA) for the assessment of the distance between both annuli and amount of excursion available for stented valve (1-3,5).

Some of published cases showed (1-3) that considering aforementioned conditions TAVI is a feasible option in such patients. In this paper we present a case from our centre that is gaining experiences in percutaneous structural heart interventions, which demonstrates a successful TAVI in a patient with previous two mitral valve operations due to recurrent endocarditis.

## **CASE REPORT**

A 77-year-old woman with a history of arterial hypertension, diabetes, chronic renal disease and atrial fibrillation was admitted to the Department of Cardiology, University Medical Centre Ljubljana, with progressive shortness of breath and recurrent syncope. Six years ago she underwent a mitral valve replacement with a St.Jude bileaflets mechanical prosthesis (St. Jude Medical, Inc., St. Paul, Minnesota) due to mitral valve endocarditis. One year after surgery the endocarditis reoccurred on the mitral prosthesis and she required reoperation. Mitral prosthesis was replaced with another St.Jude bileaflets mechanical prosthesis. On admission echocardiography showed severe calcific aortic stenosis with aortic valve area (AVA) of 0.6 cm<sup>2</sup> and a mean gradient of 43 mmHg, mild aortic regurgitation, left ventricular ejection fraction of 60%, normal function of the mechanical mitral prosthesis with a mean gradient of 6 mmHg and sings of moderate pulmonary hypertension (Fig 1.). Coronary angiography showed no significant coronary artery disease (Fig. 2a,2b). The operative mortality risk for conventional surgery was 16.1% according to the logistic EuroScore. Despite of the higher risk surgical aortic valve replacement was considered, but the patient refused the third cardiac surgery. Since TAVI was not available in our institution at that time we decided to perform balloon aortic valvuloplasty (BAV) in attempt to relief her symptoms. Two inflations of the 4.0 x 22 mm balloon were done with a final drop of invasively measured transvalvular pressure gradient of 35 mmHg. After the procedure the patient felt some improvement only for a short period of time, since a month later progressive shortness of breath and syncope reappeared. Six months later she was readmitted to our department. The evaluation for TAVI was done, since it was then accessible in our institution. TEE showed an aortic annulus of 21 mm (Fig.1). Femoral and iliac arteries evaluated by angiography and CTA showed mild atherosclerotic changes, which suggested the femoral approach would be feasible. The procedure was performed in our cardiac catheterization laboratory in local anesthesia and mild sedation by a team of cardiologists, cardiac surgeon and anes-

siologist. BAV with the 3.0 x 23 mm balloon showed a good expansion and stability of the balloon. Via the femoral approach a 23-mm Edwards Sapien (Edwards Lifesciences, Inc., Irvine, California) valve was introduced and after careful positioning under fluoroscopy and TEE guidance the valve was implanted (Fig. 3). Subsequently, fluoroscopy and TEE showed good positioning of the aortic prosthesis with mild paravalvular leak and normal function of the mitral prosthesis with no interference between the both prosthesis. Echocardiographic assessment after the procedure showed mean aortic gradient of 13 mmHg, calculated AVA of 1.2 cm<sup>2</sup>, Doppler velocity index (DVI) of 0.4, trivial aortic regurgitation and normal function of the mechanical mitral prosthesis. We performed CT scan which showed close relation between TAV and mitral prosthesis (Fig. 4) without any anatomic overlapping. There were no complications related to the procedure and 10 days after TAVI she was discharged home. During the 6 months follow up we still observe symptomatic improvement without a need for hospitalizations for cardiovascular causes and a good function of both valve prosthesis on transthoracic echocardiography. Careful follow up is needed in our patient especially regarding the predisposition to the valve endocarditis.

## **DISCUSSION**

The present case demonstrated that TAVI can be successfully performed in patients with previous mitral valve surgery. There have already been some reports published showing the feasibility of this treatment option in such situations, even though the mitral prosthesis was initially considered an exclusion criteria for TAVI (1-3,5). Special caution is needed to achieve a good position and proper expansion of the aortic valve without interference and damage of the existent mitral prosthesis. In order to assess properly the altered anatomical conditions related to reduced aorto-mitral space and loss of fibrous tissue limiting the valve stent expansion some authors suggested CTA preoperatively and not only relying on periprocedural fluoroscopy and TEE (2). Balloon valvuloplasty as a part of the TAVI procedure for pre-dilation of the native aortic valve is a very useful method. In this setting BAV allowed the assessment of aortic valve diameter, ability of the valve dilatation. It also tested possible interaction of TAVI balloon expansion with mitral valve function. The stability of TAVI might not be completely predicted. The existent mitral prosthesis might cause later TAV displacement in case to intimated interaction after aortic valve implantation. In our case we did measurements of aortic valve and mitral ring distance and estimated the risk of valve interactions. One year follow up proved proper function of both aortic valve and mitral valve (2,5).

In our center we successfully performed over 350 BAV procedures in high risk patients with severe symptomatic aortic stenosis as a palliative measure. The experience with BAV, which is usually part of patients preparation for TAVI, helped us to start the TAVI program with more confidence.

In case of TAVI in patients after mitral valve replacement the operator skills and TAVI experiences are important. We have performed 108 TAVR procedures since october 2009.

The presented case was performed as our 20<sup>th</sup> Edwards-Sapien case. Although there are no special technical tips besides precise positioning of the valve prosthesis, such a procedure it should not be performed among first ten TAVI cases, in a certain center.

## REFERENCES

1. G. Bruschi, F. De Marco, J. Oreglia, P. Colombo, P. Fratto et al. Percutaneous implantation of CoreValve aortic prostheses in patients with a mechanical mitral valve, *Ann Thorac Surg*, 88 (2009), e50-52.
2. V.T. Chao, P.T. Chiam, S.Y. Tan. Transcatheter aortic valve implantation with preexisting mechanical mitral prosthesis - use of CT angiography, *J Invasive Cardiol*, 22(2010), 339-340.
3. N. Dumonteil, B. Marcheix, P. Berthoumieu, P. Massabuau, E. Dieye et al. Transfemoral aortic valve implantation with pre-existent mechanical mitral prosthesis: evidence of feasibility, *JACC Cardiovasc Interv*, 2(2009), 897-898.
4. R.R. Makkar , G.P. Fontana , H. Jilaihawi, S. Kapadia et al. PARTNER Trial Investigators. Transcatheter aortic-valve replacement for inoperable severe aortic stenosis, *N Engl J Med*, 366(2012), 1696-1704.
5. J. Rodés-Cabau, E. Dumont, S. Miró, D. Doyle, R. De Larochelière, M.A. Clavel et al. Apical aortic valve implantation in a patient with a mechanical valve prosthesis in mitral position, *Circ Cardiovasc Interv*, 1(2008), 233-234.
6. J.G. Webb, L. Altwegg, R.H. Boone, A. Cheung, J. Ye , S. Lichtenstein S et al. Transcatheter aortic valve implantation: impact on clinical and valve-related outcomes, *Circulation*, 119(2009), 3009-3016.

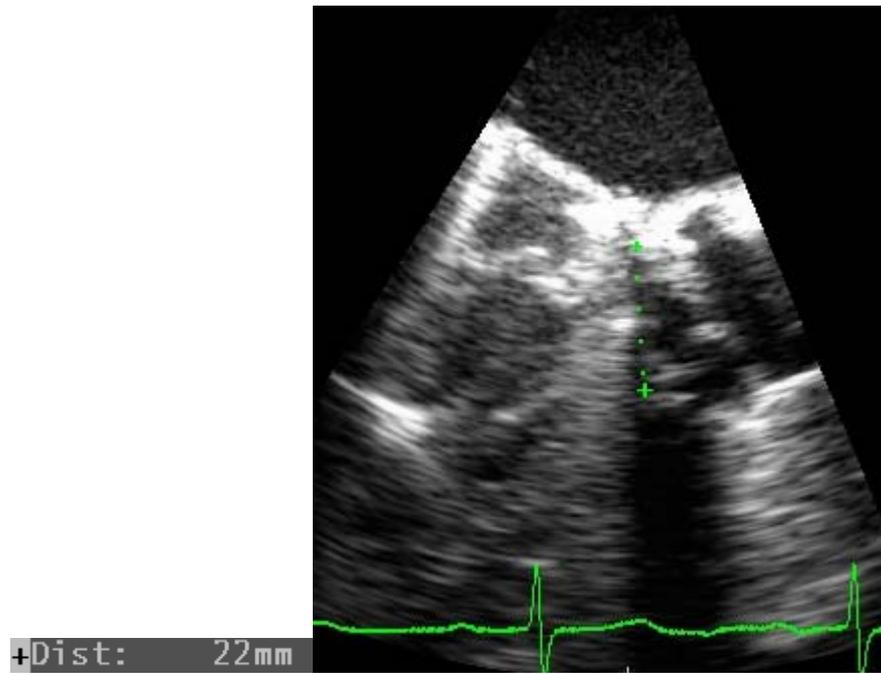


Fig 1.  
TEE of aortic valve and its relation to artificial mitral valve.

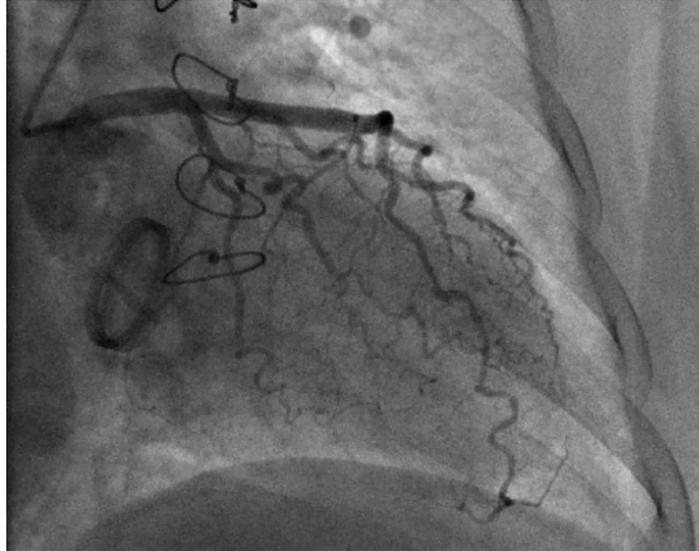


Fig 2a. No important coronary disease on LM, LAD, LCX.



Fig 2b: RCA

Fig 2. Coronary angiography did not revealed any important coronary disease.

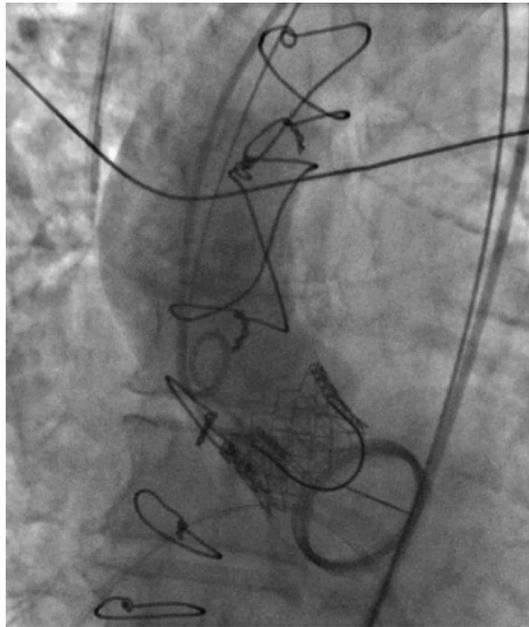


Fig 3. Aortic angiography after successful implantation of Edwards-Sapien valve. Aortic angiography after TAVR, Note the proximity of TAV and mitral valve (St. Jude bileaflets mechanical prosthesis (St. Jude Medical, Inc., St. Paul, Minnesota)).

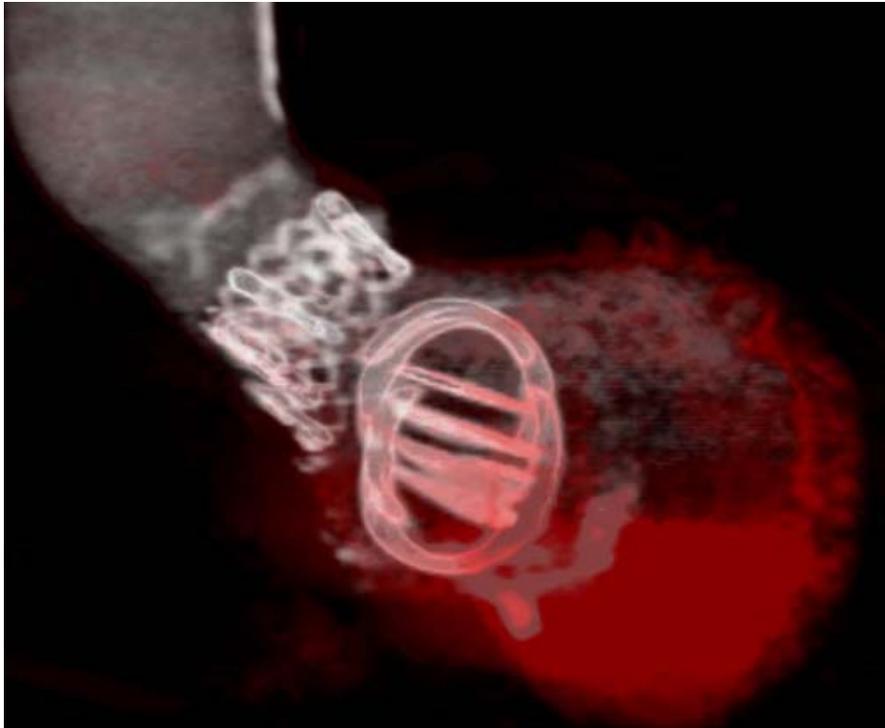


Fig 4. 3D CT: 1 year after TAVI: the position of Edwards-Sapien valve and its relation to artificial mitral valve (St. Jude bileaflets mechanical prosthesis (St. Jude Medical, Inc., St. Paul, Minnesota)) is nicely seen.

**Received: December 1, 2013**