

CASE REPORT

A Transcatheter Aortic Valve Implantation Without Aortography Guidance Due To Vascular Access Constraints Or Limitations

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Introduction

Aortic valve replacement (AVR) is an established treatment modality in patients with severe symptomatic aortic stenosis (AS).^{1,2} Given the increased mortality and morbidity of AVR for the high-risk patients and the poor long-term results of balloon aortic valvuloplasty, transcatheter aortic valve implantation (TAVI) is increasingly accepted treatment option who are not candidates for AVR.³ We describe here a case of successfully implanted Edwards SAPIEN XT transcatheter heart valve without aortography guidance due to multiple arterial access problems and complicated by iatrogenic De Bakey type III aortic dissection and severe paravalvular leak.

Case report

A 79-year-old woman was admitted with dyspnea (NYHA III) over a period of 3 months. She had a history of hypertension, diabetes mellitus, hyperlipidemia and chronic renal failure. A grade 3/6 systolic murmur was heard over the aortic area. Rhythm was sinus and electrocardiography fulfilled the criteria of left ventricular hypertrophy. Transthoracic echocardiography showed a severely calcified aortic stenosis with valve area of 0.6 cm², maximum gradient of 92 mmHg, mean gradient of 55 mmHg, left ventricular ejection fraction of 60%, aortic annular diameter of 20 mm, and ascending aorta of 35 mm.

Keywords

Transcatheter Aortic Valve Replacement; Dissection; Aortic Valve Stenosis.

Patient was evaluated by a heart team and deemed to be high risk for AVR (STS:12, euroscore:21) and accordingly decided to proceed to TAVI. Coronary angiography demonstrated the stenosis of LAD by 40%, first diagonal 40%, circumflex 85%, and proximal right coronary artery 50%. A mild to moderate aortic regurgitation was detected by aortography. The distance between left main coronary ostium (LMC) and aortic annulus was 11 mm. Right iliac artery was severely tortuous and no stenotic lesion was detected (Figure 1A, 1B).

We aimed to revascularize critical circumflex lesion before the procedure and percutaneous coronary intervention was performed. One month later, TAVI procedure scheduled. Under general anesthesia a left femoral cutdown was performed because of the severely tortuous right iliac artery. A pacemaker was placed from the right femoral vein. However, left Amplatz catheter over a Terumo and Exchange stiff wire was not got through to arcus aorta and an attempt to cross the aortic valve failed. Accordingly we noticed that the catheter was in the false aortic lumen extending from just below the left subclavian artery (Figure 1C). Soon after, catheter was completely removed and than left femoral artery repaired surgically. We were able to advance the pig-tail catheter to the ascending aorta to show the dissection by aortography via right femoral artery albeit severe tortuosity (Figure 1B, 1D). We decided to perform the TAVI procedure via right femoral artery despite of severe tortuosity. A pig-tail catheter, which is used to guide for the appropriate positioning of the prosthetic valve into aortic annulus thanks to aortography, couldn't moved due to bilateral severe brachial and subclavian artery tortuosity. Upon this, left main ostium and aortic annulus marked by a coloured pen on angiography screen

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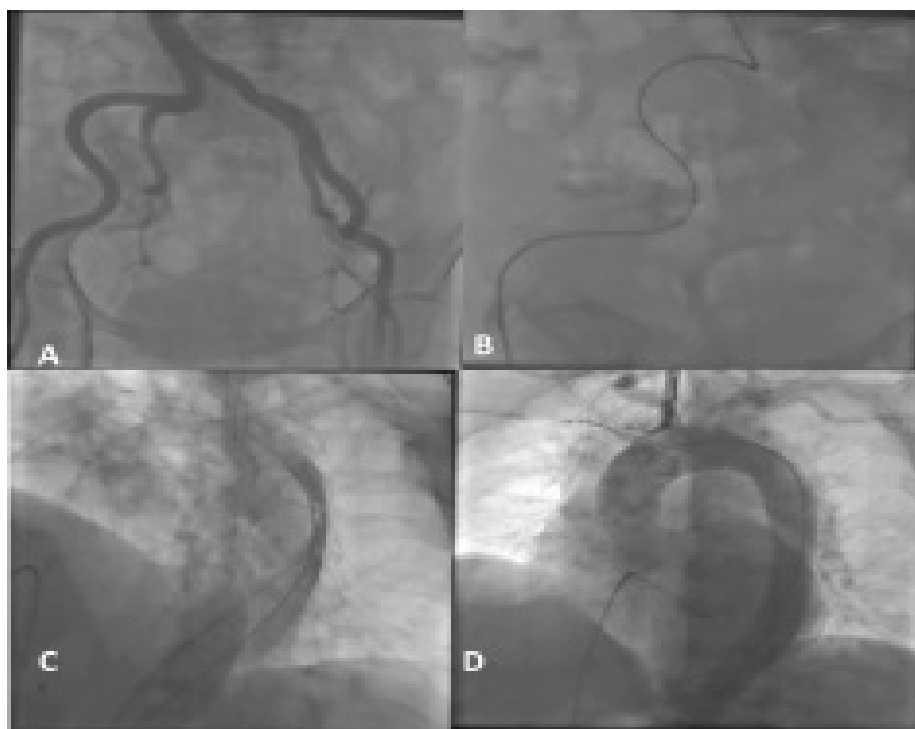


Figure 1 – Angiographic images showing severe tortuous iliac artery (A, B), retrograd aortic dissection (C), and aortography via right femoral artery (D).

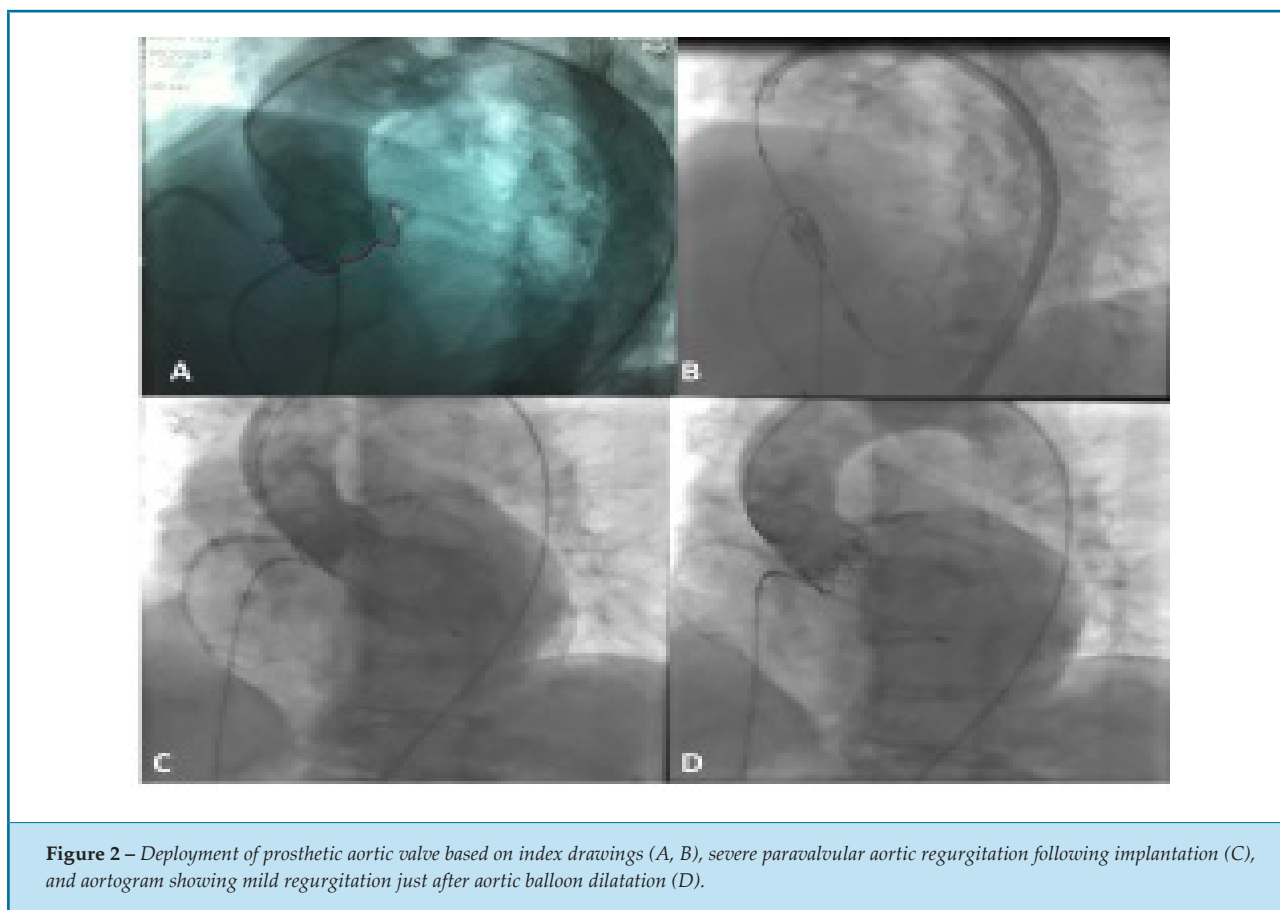
accompanied by rapid ventricular pacing (Figure 2A). Immediately after, X-ray tube's angle and the patient left fixed position, and prosthetic valve was started to implant without aortography. A 23 mm Edwards SAPIEN XT prosthetic aortic valve was deployed with rapid pacing at 180 bpm in accordance with this index drawings without aortography guidance (Figure 2B). But, aortogram following implantation showed severe paravalvular aortic regurgitation (Figure 2C). In order to solve this problem, prosthetic valve was crossed with AL-1 catheter and a straight and stiff wire, and successfully dilated with a 23 mm aortic balloon. Severe aortic regurgitation decreased to mild degree (Figure 2D). Transthoracic echocardiography obtained one day after the procedure revealed a dramatic decrease in aortic valve gradient (20/10 mmHg) and no aortic regurgitation. The patient was discharged from hospital on 6th postoperative day without any complication.

Discussion

TAVI is increasingly becoming an accepted option in the treatment of patients with severe symptomatic

AS who are not eligible for surgery due to prohibitive risks and frailty.⁴ Although TAVI is less invasive than conventional open heart surgery, it has several complications including the occlusion of coronary ostia, annular rupture, ventricular perforation, paravalvular regurgitation, heart block, device malposition or embolisation, stroke, major bleeding, vascular injury, and acute kidney injury.⁴

This case report highlights how to cope with multiple complications during TAVI procedure. Dissection or perforation of the ilio-femoral arteries might occur in the presence of traumatic sheath insertion.⁵ Dissection of the ascending or descending aorta might similarly occur due to catheter trauma or as an unpredictable complication of aortic valvuloplasty.⁶ Nonocclusive retrograde dissections commonly heal once antegrade flow is restored; therefore limited dissections are often best managed conservatively as in our case.⁵ Another issue is to place the valve into appropriate position. Due to arterial access problems we had to use only right femoral artery and we had no extra arterial access for aortography in order to show LMC ostium and aortic annulus. Upon this, first we



marked the LMC ostium and aortic annulus on screen by a colourful pen during aortography accompanying with rapid pacing, then patient and X-ray tube fixed, and immediately after, the prosthesis valve implanted in accordance with this index drawing without aortography guidance. Another possible option could further define the annulus (landing zone) is to perform balloon aortic valvuloplasty (pre-dilatation) and to mark in the screen the waist and use it as a marker.

Mild or moderate aortic regurgitation can be seen after implantation. However hemodynamically severe post-procedural aortic regurgitation is rare.⁴ These are generally caused by inadequate inflation of the balloon or by calcium deposits that prevent the valve unit to properly seat and seal within the annulus.^{3,7,8} Severe paravalvular leak assuming incomplete expansion of prosthetic valve was declined dramatically after balloon dilatation in our patient.

Also in case of thoracoabdominal dissection a different second approach (transapical or transaortic) could be suggested. These approaches give the possibility to do the procedure with pig tail on the right femoral artery and

more important avoid any contact with the new dissected fragile thoracoabdominal aorta/ aortic arch and Novaflex system. Additionally, transesophageal echocardiography could have been used to position the valve.

In conclusion, this case demonstrates that maybe safe to implant percutaneous aortic valve with a single fixed contrast fluoro image after an acute major vascular complication occurred, and transradial approach is an important option during TAVI procedures and can also reduce the bleeding risks as a secondary vascular access site.

Author contributions

Conception and design of the research: Ergene O, Duygu H, Emren V, Kocabas U, Cerit L. Acquisition of data: Ergene O, Duygu H, Emren V, Kocabas U, Cerit L. Analysis and interpretation of the data: Ergene O, Duygu H, Kocabas U. Writing of the manuscript: Ergene O, Duygu H, Emren V, Kocabas U, Cerit L. Critical revision of the manuscript for intellectual content: Ergene O, Duygu H, Emren V, Kocabas U, Cerit L.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any thesis or dissertation work.

References

1. Bonow RO, Carabello BA, Chatterjee K, de Leon AC Jr, Faxon DP, Freed MD, et al; American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2008 focused update incorporated into the ACC/AHA 2006 guidelines for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revisethe 1998 Guidelines for the Management of Patients With Valvular Heart Disease). *J Am Coll Cardiol.* 2008; 52(13):e1-142.
2. Vahanian A, Baumgartner H, Bax J, Butchart E, Dion R, Filippatos G, et al; Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology.; ESC Committee for Practice Guidelines. Guidelines on the management of valvular heart disease: the Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology. *Eur Heart J.* 2007;28(2):230-68.
3. Webb JG, Pasupati S, Humphries K, Thompson C, Altwegg L, Moss R, et al. Percutaneous transarterial aortic valve replacement in selected high-risk patients with aortic stenosis. *Circulation.* 2007;116(7):755-63.
4. Holmes DR Jr, Mack MJ, Kaul S, Agnihotri A, Alexander KP, Bailey SR, et al. 2012 ACCF/AATS/SCAI/STS expert consensus document on transcatheter aortic valve replacement. *J Am Coll Cardiol.* 2012;59(13):1200-54.
5. Masson JB, Kovac J, Schuler G, Ye J, Cheung A, Kapadia S, et al. Transcatheter Aortic valve implantation: review of the nature, management, and avoidance of procedural complications. *JACC Cardiovasc Interv.* 2009;2(9):811-20.
6. Holmes DR Jr, Nishimura RA, Reeder GS. In-hospital mortality after balloon aortic valvuloplasty: frequency and associated factors. *J Am Coll Cardiol.* 1991;17(1):189-92.
7. Chiam PT, Ruiz CE. Percutaneous transcatheter aortic valve implantation: assessing results, judging outcomes, and planning trials: the interventionalist perspective. *JACC Cardiovasc Interv.* 2008;1(4):341-50.
8. Ong SH, Mueller R, Gerckens U. Iatrogenic dissection of the ascending aorta during TAVI sealed with the CoreValve revalving prosthesis. *Catheter Cardiovasc Interv.* 2011;77(6):910-4.