Case report

Transcatheter aortic valve implantation in an octogenarian patient with single coronary artery.

ABSTRACT

Aims: We herein report one of the few patients with the combination of a single coronary artery and severe aortic stenosis, who successfully underwent transcatheter aortic valve implantation (TAVI).

Case Presentation: A 86-year-old Caucasian woman was admitted with acute coronary syndrome. Coronary angiography and transthoracic echocardiography revealed the coexistence of single coronary artery and severe aortic stenosis. The patient underwent successful TAVI with Edwards SAPIEN XT valve (Edwards Lifesciences).

Discussion: Single coronary artery is a rare congenital coronary artery anomaly. Its coexistence with severe aortic stenosis in the context of acute coronary syndrome is even rarer. Knowledge is scarce about feasibility and safety of TAVI in patients with coronary artery anomalies. This procedure is associated with a very low incidence of coronary obstruction, a catastrophic complication in the setting of a single coronary ostium.

Conclusion: This case highlights that TAVI can be safely performed in carefully selected patients with single coronary artery.

Keywords: acute coronary syndrome, single coronary artery, aortic valve stenosis, transcatheter aortic valve replacement.

1. INTRODUCTION

Single coronary artery arising from the right sinus of valsalva is a rare congenital coronary artery anomaly with an estimated prevalence of aproximately 0,047% [1]. Its coexistence with severe aortic stenosis in the context of acute coronary syndrome is even rarer [2]. TAVI, a therapeutic option for patients with symptomatic severe aortic stenosis and a high risk for conventional surgery, is associated with a very low incidence of coronary obstruction [3], a potentially catastrophic complication in the setting of a single coronary ostium. We present an octogenarian female admitted with acute coronary syndrome, and the combination of single coronary artery and severe aortic stenosis, who underwent successful TAVI with Edwards SAPIEN XT valve (Edwards Lifesciences).

2. PRESENTATION OF CASE

A 86-year-old Caucasian female presented to the hospital with intense anginal chest pain and diaphoresis. Her past medical history was relevant for hypertension, diabetes, hypercholesterolemia, and dual chamber pacing for complete atrio-ventricular block. On admission, her blood pressure was 157/89 mmHg, heart rate was regular with 70 beats per minute, breath sounds were normal, and cardiac auscultation was relevant for a grade IV/VI systolic murmur, best heard over primary aortic area and radiated to carotid arteries, with rough quality and absence of second heart sound. Electrocardiogram showed normal pacemaker rhythm at 70 beats per minute. Chest X-ray revealed mild cardiomegaly and correct position of pacemaker leads, without pulmonary congestion. High-sensitive cardiac troponin T was elevated (Peak value of 544 ng/l). Transthoracic echocardiogram showed severe aortic valve stenosis (indexed aortic valve area of 0,49 cm^2/m^2; mean aortic gradient of 84 mmHg; peak velocity of 5,52 m/s), with concentric left ventricular hypertrophy and preserved left

ventricular systolic function (Fig. 1). Coronary angiography revealed a single coronary artery arising from the right sinus of valsalva bifurcating into a right coronary artery within a normal course, and a less developed left coronary artery with an intra-septal proximal course (Fig. 2). There was no significant coronary artery stenosis. Since the logistic EuroScore and STS score were 29.95% and 12.1% respectively, TAVI with a transfemoral approach was decided by the heart team based on the high risk profile of the patient. Multi-slice computed tomography confirmed previous angiographic findings, aortic annulus diameter of 22,5 mm, and distance between aortic annulus and single coronary ostium of 15,5 mm. Heart team not considered this exceptional anatomy a contraindication to the TAVI procedure because the single coronary ostium was far enough from the aortic annulus to deploy the prosthesis without compromising the origin of the single coronary artery. Valvuloplasty with aortography was performed prior to the implantation of the valve, confirming an unobstructed coronary artery. The implantation of a 26 mm Edwards SAPIEN XT valve was successfuly carried out without significant paravalvular leakage or coronary obstruction (Fig. 3). At 6-month follow up examination, the patient was in NYHA class II without any clinical events, with a normally functioning prosthetic valve.

3. DISCUSSION

First described by Thebesius in 1716 [4], single coronary artery is a rare congenital coronary artery anomaly. Since most patients are asymptomatic, diagnosis is usually an incidental finding on noninvasive imaging. Nonetheless, it can cause angina, myocardial infarction, or even sudden death. Our patient, an octogenarian female with no history of coronary artery disease, presented with non-ST-elevation myocardial infarction and coronary angiography clinched the diagnosis. Furthermore, echocardiographic examination revealed a severe aortic valve stenosis. The prevalence of aortic stenosis increases with age, reaching 9,8% at ages 80 to 89 years [5]. This combination (single coronary artery and severe aortic valve stenosis) is extremely rare in clinical practice, and management of this highly complex patients should be based on individual assessment.

TAVI is a proven therapeutic option for patients with symptomatic aortic valve stenosis and unassumable surgical risk. The incidence of coronary artery anomalies in this subgroup of patients remains unknown, and there is currently scarce evidence about feasibility and safety of the procedure in cases of single coronary artery. Coronary obstruction occurs in ~ 1% of procedures, but it could be highly lethal in the setting of a single coronary ostium. The main risk factors include bulky calcified leaflets, shallow sinus of valsalva, low origin of coronary arteries, coronary embolization, and valve misplacement. There are only 4 cases collected in the literature of TAVI in patients with a single coronary artery [6-8]. Sorbets et al. safely performed two of these procedures, and implanted and Edwards SAPIEN XT valve and a Medtronic Corevalve prosthesis respectively. They anticipated the risk of coronary obstruction, performing balloon valvuloplasty angiography. Giri et al. implanted the Edwards SAPIEN XT valve, and placed a coronary guidewire in the left coronary artery as a preventive technique prior to prosthesis implantation. Finally, Dursun et al. closely monitored hemodynamic status of the patient and performed aortography in each step of the procedure. In our case, we also performed balloon valvuloplasty angiography prior to prosthesis deployment to anticipate the risk of coronary obstruction. To the best of our knowledge, this is the fifth case reported in the literature of TAVI in a patient with single coronary artery, and the third of Edward Sapien XT valve implantation in such a patient. Available evidence is scarce, and consensus is imposible to achieve on the use of aortic bioprosthesis in this highly complex situation. In our opinion, one device does not appear advantageous over the other. Careful selection of the patient based on individual assessment, and meticulous aortic evaluation using multi-slice computed tomography, allow us to define who are appropiate candidates for TAVI. Balloon valvuloplasty angiography and other preventive techniques would have to be considered by the heart team prior to the procedure.

4. CONCLUSION

This case highlights that TAVI with Edwards SAPIEN XT valve can be safely performed in carefully selected patients with single coronary artery arising from the right sinus of valsalva. To anticipate the potential risk of coronary obstruction, accurate aortic imaging is paramount.

CONSENT

All authors declare that written informed consent was obtained from the patient for publication of this case report and accompanying images.

ETHICAL APPROVAL

It is not applicable.

REFERENCES

1. Yamanaka O, Hobbs RE. Coronary artery anomalies in 126.595 patients undergoing coronary arteriography. *Cath Cardiovasc Diagn* 1990; 21:28.
2. Desmet W, Vanhaecke J, Vrolix M, Van de Werf F, Piessens J, Willems J, et al. Isolated single coronary artery: a review of 50,000 consecutive coronary angiographies. *Eur Heart J* 1992;13:1637-40.
3. Ribeiro HB, Nombela-Franco L, Urena M, Mok M, Pasian S, Doyle D, et al. Coronary obstruction following transcatheter aortic valve implantation: a systematic review. *JACC Cardiovasc Interv* 2013;6:452-61.
4. Thebesius A. Dissertatio Medica de Circulo Sanguinis in Cordo. Ludg Batav, JA: Langerak; 1716.
5. Eveborn GW, Schirmer H, Heggelund G, Lunde P, Rasmussen K. The evolving epidemiology of valvular aortic stenosis. the Tromsø study. *Heart* 2013; 99:396.
6. Sorbets E, Choby M, Tchetche D. Transcatheter aortic valve implantation with either CoreValve or SAPIEN XT devices in patients with a single coronary artery. *J Invasive Cardiol* 2012;24:342-4.
7. Giri J, Szeto WY, Bavaria J, Herrmann HC. Transcatheter aortic valve replacement with coronary artery protection performed in a patient with an anomalous left main coronary artery. *J Am Coll Cardiol* 2012;7:60.
8. Dursun H, Gönençer JZ, Karabay O, Erdal AC, Kaya D. TAVI in a patient with single coronary artery: the choice of self-expandable valve may be reasonable. *Balkan Med J* 2016 May;33(3):357-9.

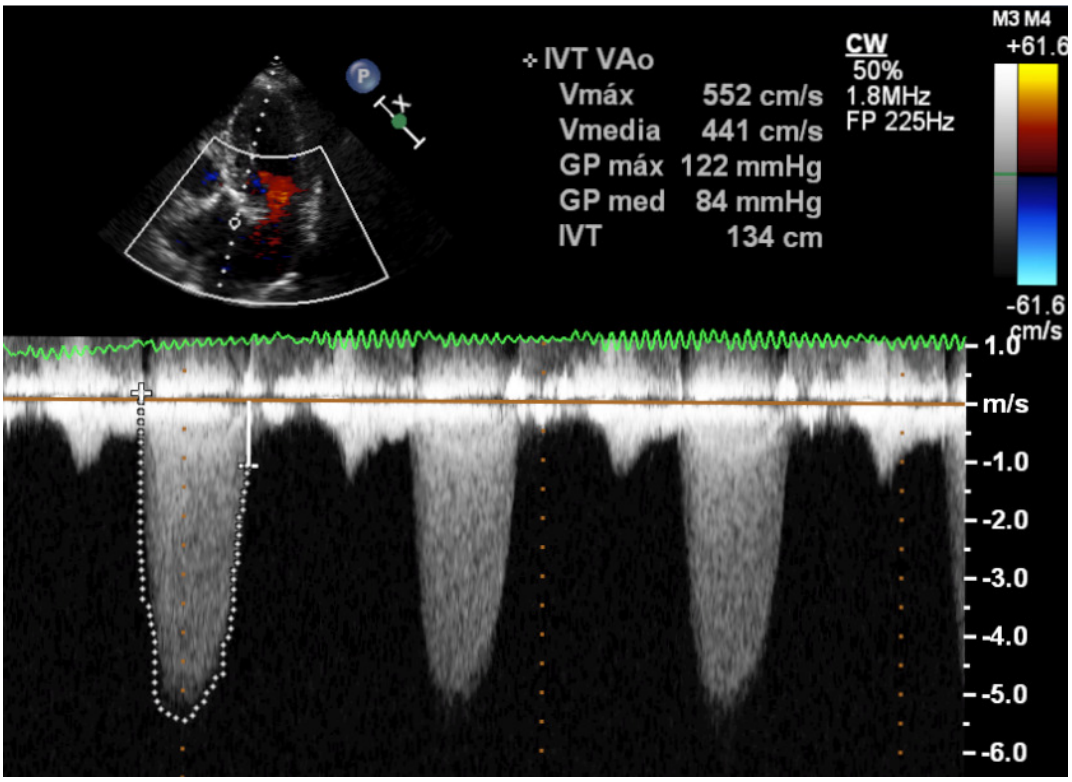

Fig. 1. Continuous-wave Doppler of severe aortic stenosis jet.

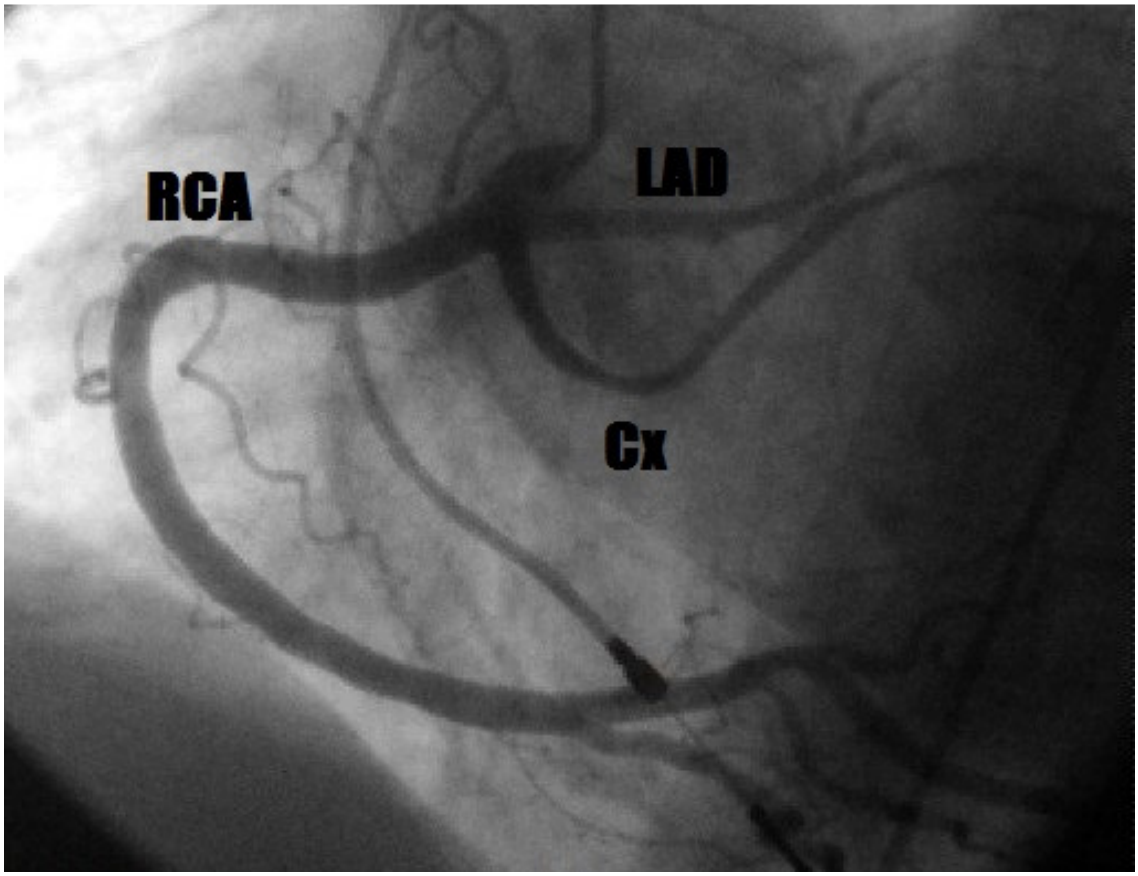

Fig. 2. Coronary angiogram showing single coronary artery arising from the right sinus of valsalva.

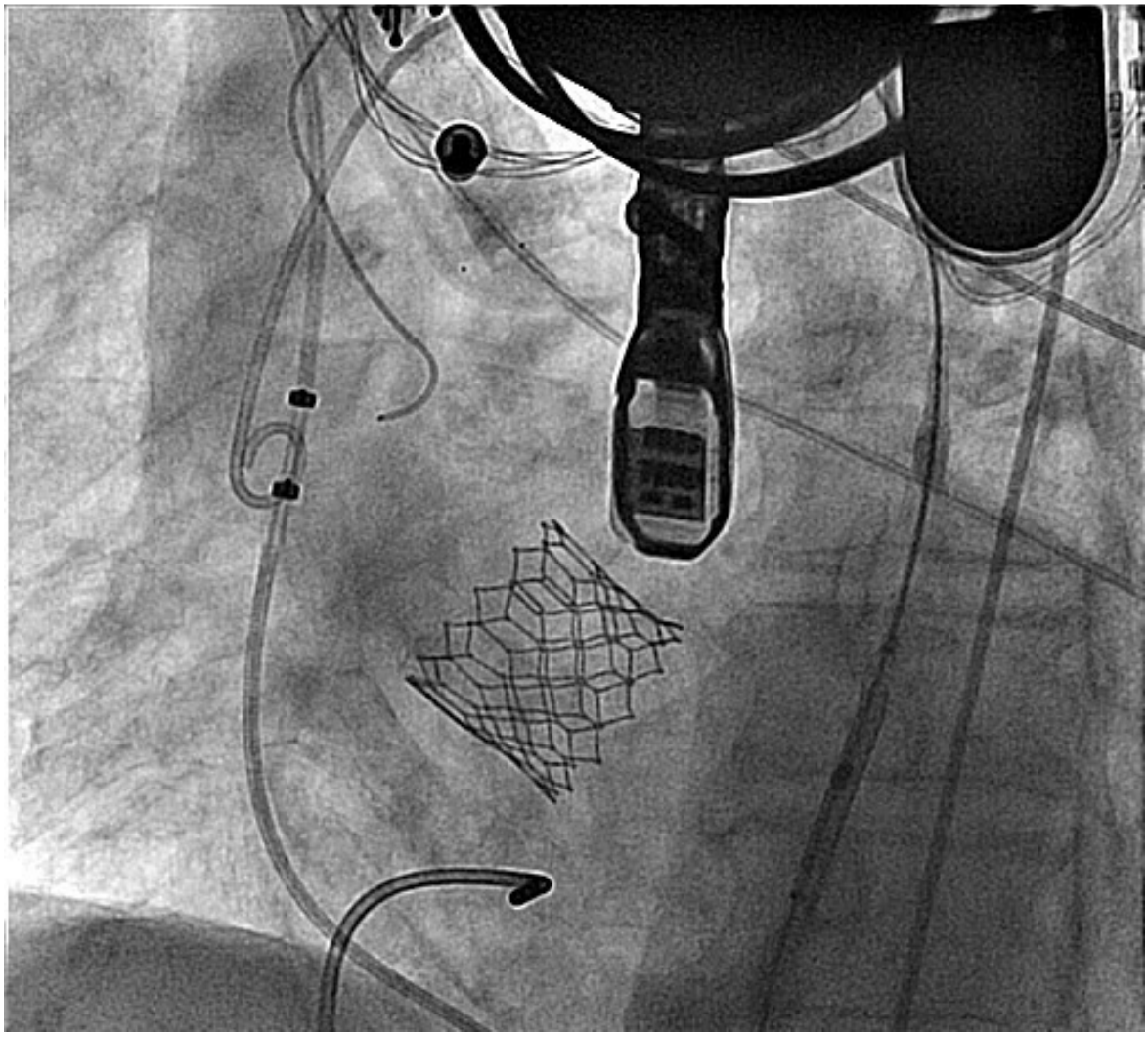

Fig. 3. Fluoroscopic image after Edwards SAPIEN XT valve deployment.