

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

ABSTRACT

Aims: We herein report the case of a patient with severe aortic stenosis and a single coronary artery arising from the right sinus of valsalva, 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.

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 approximately 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.

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 (DDD pacing mode). 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 atrial sensed ventricular paced 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 (On admission 147 ng/l, which peaked at 544 ng/l), and estimated GFR on admission was 45 ml/min/1.73 m². Transthoracic echocardiogram

42 showed severe aortic valve stenosis (indexed aortic valve area of 0,49 cm²/m²; mean aortic gradient
43 of 84 mmHg; peak velocity of 5,52 m/s), with concentric left ventricular hypertrophy, preserved left
44 ventricular systolic function, and estimated systolic pulmonary artery pressure of 34 mmHg (Fig. 1).
45 Coronary angiography revealed a single coronary artery arising from the right sinus of valsalva
46 bifurcating into a right coronary artery within a normal course, and a less developed left coronary
47 artery with an intra-septal proximal course (Fig. 2). There was no significant coronary artery stenosis,
48 excluding a type 1 myocardial infarction. On day 3 of hospitalization, the patient developed acute
49 heart failure with worsening renal function, that improved with a course of intravenous diuretics guided
50 cautiously. Since the logistic EuroScore and STS score were 29.95% and 12.1% respectively, TAVI
51 with a transfemoral approach was decided by the heart team based on the high risk profile of the
52 patient. Multi-slice computed tomography confirmed previous angiographic findings, aortic annulus
53 diameter of 22,5 mm, and distance between aortic annulus and single coronary ostium of 15,5 mm.
54 Heart team not considered this exceptional anatomy a contraindication to the TAVI procedure
55 because the single coronary ostium was far enough from the aortic annulus to deploy the prosthesis
56 without compromising the origin of the single coronary artery. Valvuloplasty with aortography was
57 performed prior to the implantation of the valve, confirming an unobstructed coronary artery. The
58 implantation of a 26 mm Edwards SAPIEN XT valve was successfully carried out, and immediate post
59 procedural aortogram showed good position of the valve, with mild aortic regurgitation (Fig. 3). At 6-
60 month follow up, the patient showed improvement in NYHA functional class (II), and repeated
61 echocardiogram showed a well-functioning prosthetic valve, and only mild aortic regurgitation.

62 3. DISCUSSION

63 First described by Thebesius in 1716 [4], single coronary artery is a rare congenital coronary artery
64 anomaly. Since most patients are asymptomatic, diagnosis is usually an incidental finding on
65 noninvasive imaging. Nonetheless, it can cause angina, myocardial infarction, or even sudden death
66 [5]. Our patient, an octogenarian female with no history of coronary artery disease, presented with
67 non-ST-elevation myocardial infarction and coronary angiography clinched the diagnosis.
68 Furthermore, echocardiographic examination revealed a severe aortic valve stenosis. The prevalence
69 of aortic stenosis increases with age, reaching 9,8% at ages 80 to 89 years [6]. This combination
70 (single coronary artery and severe aortic valve stenosis) is extremely rare in clinical practice, and
71 management of this highly complex patients should be based on individual assessment.

72 TAVI is a proven therapeutic option for patients with symptomatic aortic valve stenosis and very high
73 surgical risk. The incidence of coronary artery anomalies in this subgroup of patients remains
74 unknown, and there is currently scarce evidence about feasibility and safety of the procedure in cases
75 of single coronary artery. Coronary obstruction occurs in ~ 1% of procedures, but it could be life
76 threatening in the setting of a single coronary ostium. The main risk factors include bulky calcified
77 leaflets, shallow sinus of valsalva, and low origin of coronary arteries. There are only 4 cases
78 collected in the literature of TAVI in patients with a single coronary artery [7-9]. Sorbets et al. safely
79 performed two of these procedures, and implanted an Edwards SAPIEN XT valve and a Medtronic
80 Corevalve prosthesis respectively. They anticipated the risk of coronary obstruction, performing
81 balloon valvuloplasty angiography. Giri et al. implanted the Edwards SAPIEN XT valve, and placed a
82 coronary guidewire in the left coronary artery as a preventive technique prior to prosthesis
83 implantation. Finally, Dursun et al. closely monitored hemodynamic status of the patient and
84 performed aortography in each step of the procedure. In TAVI, accuracy is one of the key aspects to
85 help avoid complications, and aortography is a critical step for reliable delivery of the prosthesis. In
86 our case, balloon valvuloplasty angiography prior to prosthesis deployment was crucial to anticipate
87 the risk of coronary obstruction. To the best of our knowledge, this is the fifth case reported in the
88 literature of TAVI in a patient with single coronary artery, and the third of Edward Sapien XT valve
89 implantation in such a patient. Available evidence is scarce, and consensus is impossible to achieve
90 on the use of aortic bioprosthesis in this highly complex situation. In our opinion, one device does not
91 appear advantageous over the other. Careful selection of the patient based on individual assessment,

92 and meticulous aortic evaluation using multi-slice computed tomography, allow us to define who are
93 appropriate candidates for TAVI. Balloon valvuloplasty angiography is a critical step of the procedure
94 to avoid complications, and other preventive techniques would have to be considered by the heart
95 team prior to the procedure.

96

97 **4. CONCLUSION**

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

101 **CONSENT**

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

104 **ETHICAL APPROVAL**

105 It is not applicable.

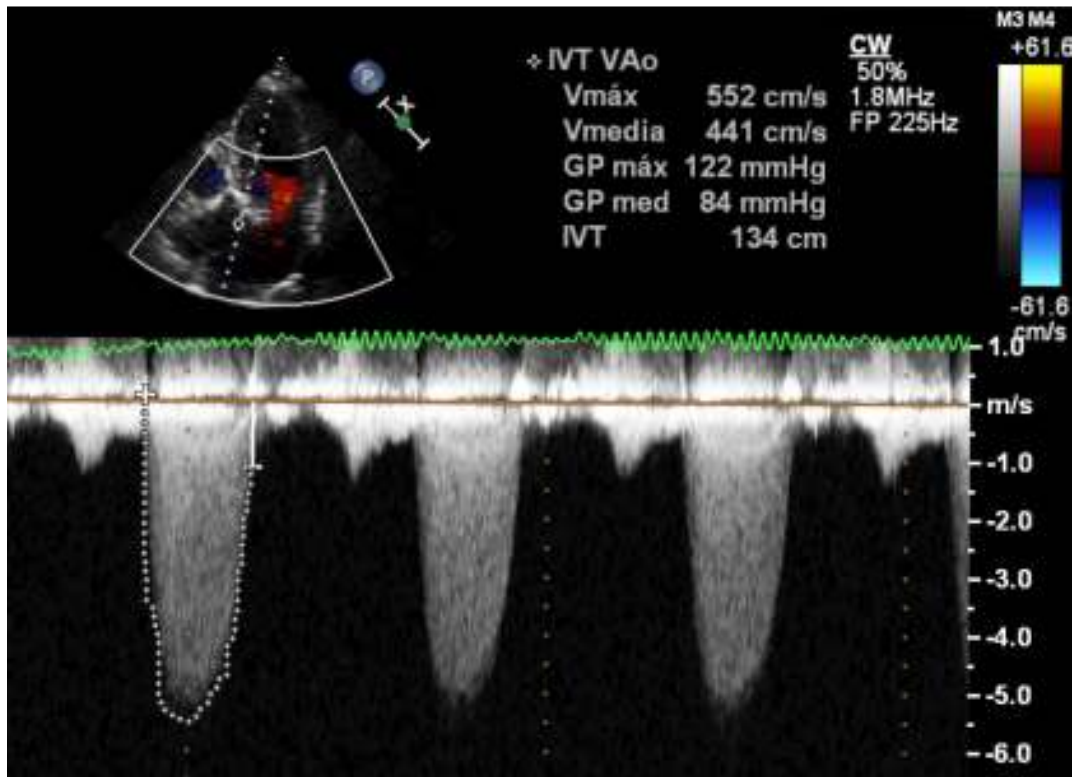
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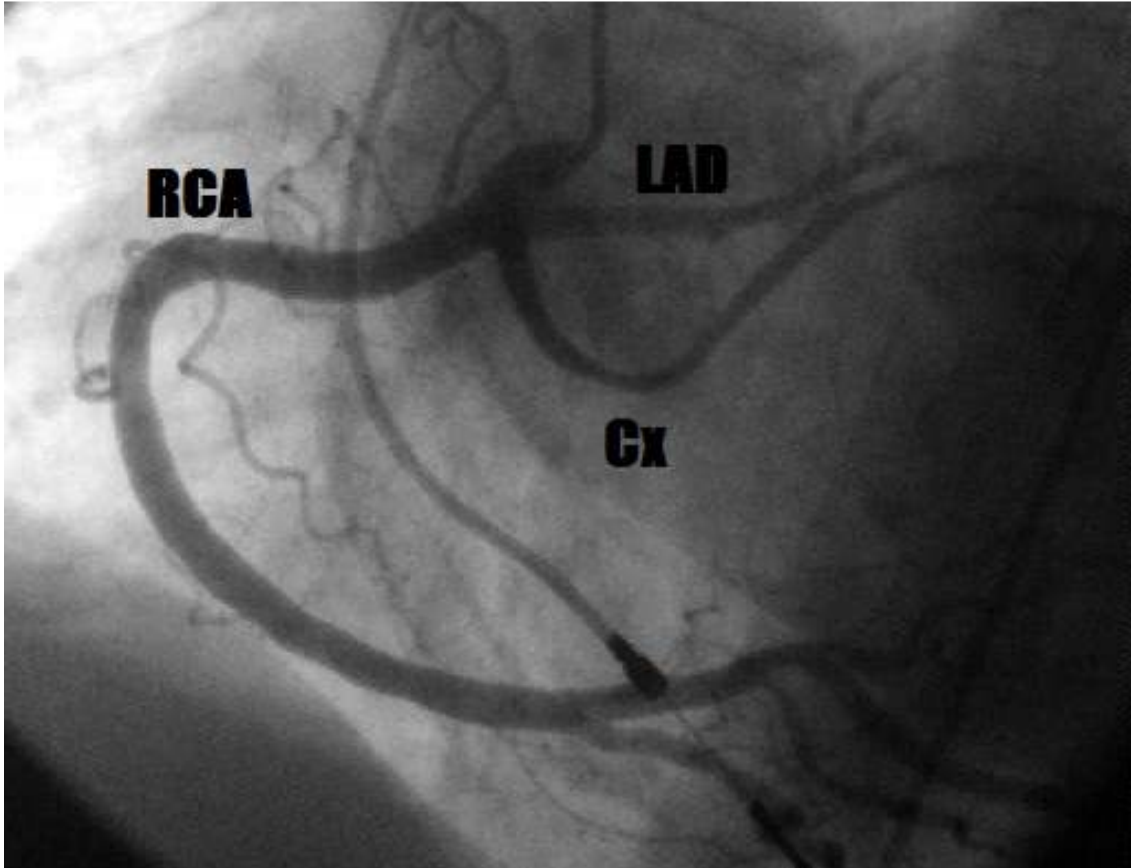
136 Fig. 1. Continuous-wave Doppler of severe aortic stenosis jet.

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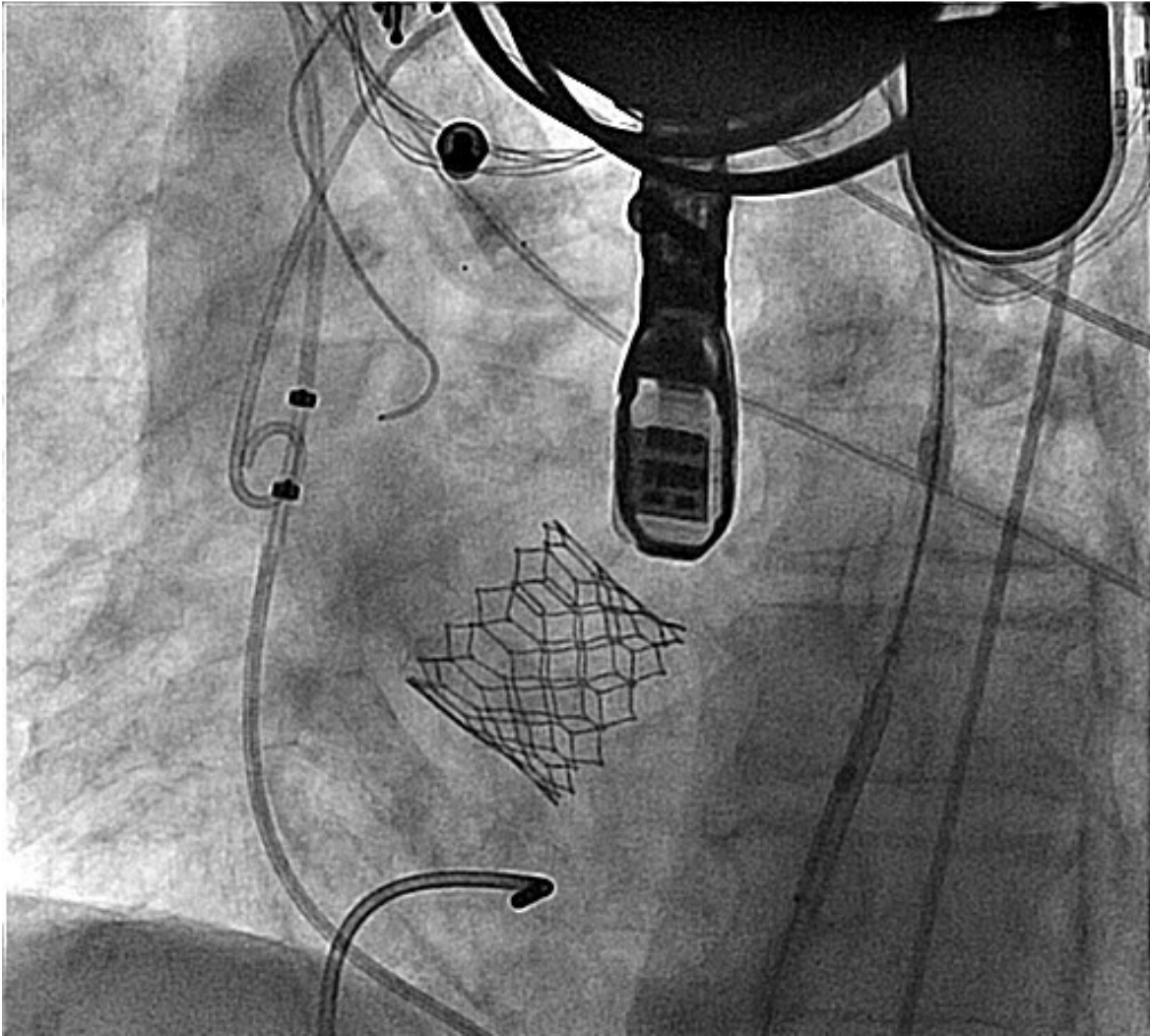


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143 Fig. 2. Coronary angiogram showing single coronary artery arising from the right sinus of valsalva.

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