

Transcatheter aortic valve implantation in degenerated aortic bioprosthesis complicated by a “frozen” leaflet

Anna Ołasińska-Wiśniewska¹, Marek Grygier¹, Aleksander Araszkiwicz¹,
Mateusz Puślecki², Marcin Misterski², Anna Komosa¹, Marek Jemielity², Maciej Lesiak¹

1 1st Department of Cardiology, Poznan University of Medical Sciences, Poznań, Poland

2 Department of Cardiac Surgery and Transplantology, Poznan University of Medical Sciences, Poznań, Poland

The outcomes of transcatheter aortic valve implantation (TAVI) have improved over the years with rapid technological advances and a growing experience of operators. However, several unexpected problems may still occur during the procedure.¹⁻³ We present a case of a patient with a “frozen leaflet” phenomenon.

A 66-year-old man with a history of atrial fibrillation, hypertension, and chronic kidney disease presented with recurrent episodes of heart failure decompensation 8 years after surgical aortic valve replacement (20-mm Sorin Soprano bioprosthesis; Sorin BiomedicaCardio SpA, Saluggia, Italy) and concomitant coronary artery bypass grafting. Echocardiography showed degenerated bioprosthesis with the mean and maximum gradients of 74 mm Hg and 127 mm Hg, respectively, mild regurgitation, and a left ventricular ejection fraction of 50%. The patient underwent valvuloplasty of the bioprosthesis 2 years earlier, with a temporary clinical improvement. After careful evaluation, he was deemed to be at high surgical risk (European System for Cardiac Operative Risk Evaluation [EuroSCORE II] score, 7.6%), and TAVI was recommended.

According to computed tomography results (FIGURE 1A and Supplementary material, Figure S1), the aortic annulus was 18.9 mm, and using the valve-in-valve application, a 23-mm Core Valve Evolut R prosthesis (Medtronic, Minneapolis, Minnesota, United States) was selected. The procedure was performed under general anesthesia. Transfemoral access was obtained. After inserting a guidewire (Confidia; Medtronic,

Minneapolis, Minnesota, United States) into the left ventricle, ventricular fibrillation occurred, which was successfully treated with defibrillation. A 23-mm Core Valve Evolut R prosthesis (Medtronic) was implanted with a significant decrease in

transvalvular gradient and trivial paravalvular leak (FIGURE 1B). A super-stiff guidewire was removed. A few minutes later, a sudden drop in blood pressure was observed, followed by recurrent persistent ventricular fibrillation. Resuscitation was initiated. Echocardiography excluded cardiac tamponade, and coronary angiography revealed no coronary obstruction (FIGURE 1C and 1D). However, a severe transvalvular insufficiency was observed on echocardiography and fluoroscopy. A frozen leaflet was considered to be a causative factor, and 6F-pigtail catheter probing of the implanted prosthesis was performed, which resulted in an immediate hemodynamic stability. Echocardiography after TAVI revealed a mild paravalvular leak, and the mean and maximum transvalvular gradients were 35 mm Hg and 64 mm Hg, respectively. The prosthesis-patient mismatch resulted from implantation of the prosthesis into the small diameter of the first bioprosthesis. The mismatch may be observed in up to 30% of patients undergoing valve-in-valve TAVI. After clinical stabilization, the patient was discharged home 10 days after TAVI.

The so-called frozen leaflet is a rare but potentially life-threatening complication presenting with severe intraprosthesis leak and sudden hypotension. Several hypotheses have been

Correspondence to:

Anna Ołasińska-Wiśniewska, MD,
PhD, 1st Department of Cardiology,
Poznan University of Medical
Sciences, ul. Długa 1/2, Poznań,
Poland, phone: +48 61 854 9146,
email: annaolasinska@ump.edu.pl

Received: July 10, 2019.

Revision accepted:
September 19, 2019.

Published online:
September 20, 2019.

Kardiologia Pol. 2019; 77 (11):
1089-1091

doi:10.33963/KP.14980

Copyright by the Author(s), 2019

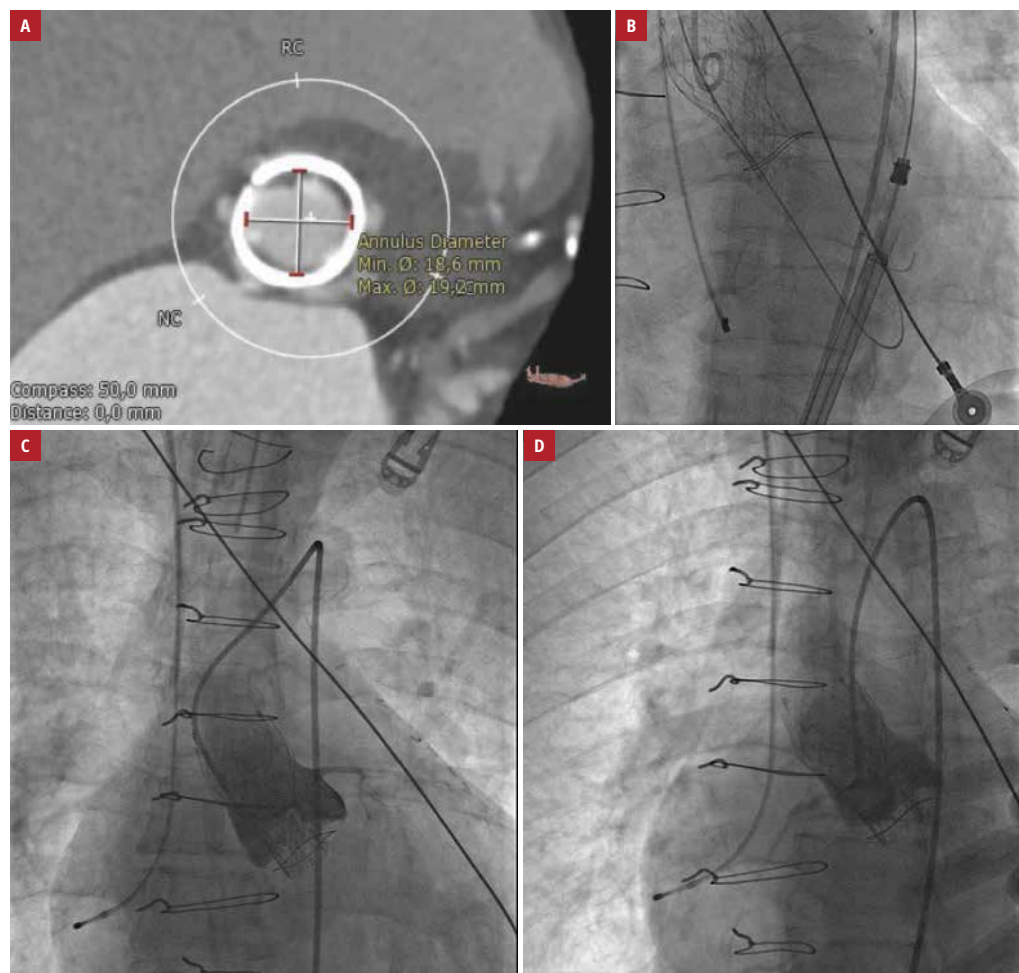


FIGURE 1 A – computed tomography; B – transcatheter aortic valve implantation; C, D – coronary angiography

proposed to explain this phenomenon, the most likely being the anchoring of the prosthetic leaflet on the stent during crimping.

Ferrari⁴ suggested 2 ways of treatment depending on the patient's hemodynamics. In a stable patient, the approach is to control the position of a stiff guidewire, verify the valve shape and re-balloon in the case of distortion, as well as increase blood pressure to mobilize the frozen leaflet from the stent. In hemodynamic instability, a second prosthesis should be implanted and extracorporeal membrane oxygenation or femorofemoral cardiopulmonary bypass should be considered to stabilize the patient.

There have only been single reports of the frozen leaflet in the literature.⁵⁻⁷ They all described the implantation of the second prosthesis as a final rescue treatment. Eggebrecht et al⁸ presented 2 cases of severe regurgitation during a valve-in-valve procedure, one of which was with central flow through the prosthesis, also treated with the second prosthesis implantation (valve-in-valve-in-valve).

The frozen leaflet in our patient was probably caused by anchoring of the prosthetic leaflet by the degenerated bioprosthesis. However,

in the presence of the 2 already implanted narrow prostheses, another implantation was considered harmful. The mobilization of the frozen leaflet with a pigtail occurred to be a rescue maneuver. We recommend such a simple approach in similar cases before a decision is made to implant the second valve.

Finally, the problem of the prosthesis-patient mismatch after valve-in-valve TAVI in our patient should be emphasized. Recently, a novel technique, namely, bioprosthesis valve fracture, has been developed to address this complication. Before or after the implantation of the transcatheter prosthesis, a high-pressure balloon inflation is performed to fracture the surgical sewing ring of the bioprosthesis. This procedure enables expansion of both prostheses, thus increasing the effective orifice area and improving the final outcome.

SUPPLEMENTARY MATERIAL

Supplementary material is available at www.mp.pl/kardiologiaipolska.

ARTICLE INFORMATION

CONFLICT OF INTEREST MG is a proctor for Medtronic and Boston Scientific, and an Advisory Board Member for Boston Scientific, and received research

grants from Medtronic, Boston Scientific, and Abbott. Other authors declare no conflict of interest.

OPEN ACCESS This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License (CC BY-NC-ND 4.0), allowing third parties to download articles and share them with others, provided the original work is properly cited, not changed in any way, distributed under the same license, and used for non-commercial purposes only. For commercial use, please contact the journal office at kardiologiapolska@ptkardio.pl.

HOW TO CITE Ołasińska-Wisniewska A, Grygier M, Araszkiwicz A, et al. Transcatheter aortic valve implantation in degenerated aortic bioprosthesis complicated by a “frozen” leaflet. *Kardiol Pol.* 2019; 77: 1089-1091. doi:10.33963/KP.14980

REFERENCES

- 1 Parma R, Zembala MO, Dąbrowski M, et al. Transcatheter aortic valve implantation. Expert Consensus of the Association of Cardiovascular Interventions of the Polish Cardiac Society and the Polish Society of Cardio-Thoracic Surgeons, approved by the Board of the Polish Cardiac Society. *Kardiol Pol.* 2017; 75: 937-964.
- 2 Kochman J, Kołtowski Ł, Huczek Z, et al. Complete percutaneous approach versus surgical access in transfemoral transcatheter aortic valve implantation: results from a multicentre registry. *Kardiol Pol.* 2018; 76: 202-208.
- 3 Kleczyński P, Dziewierz A, Daniec M, et al. Impact of post-dilatation on the reduction of paravalvular leak and mortality after transcatheter aortic valve implantation. *Kardiol Pol.* 2017; 75: 742-748.
- 4 Ferrari E. Severe intraprosthesis regurgitation following trans-catheter aortic valve implantation-to crimp or not to crimp? This might be the problem. *Eur J Cardiothorac Surg.* 2011; 39: 593-594.
- 5 Agostoni P, Buijsrogge MP, Stella PR. “Frozen” leaflet: a dreadful complication of transcatheter aortic valve implantation. *Circ Cardiovasc Interv.* 2012; 5: 321-323.
- 6 Ben-Dor J, Satler LF, Pichard AD, Waksman R. Severe intraprosthesis regurgitation and valve embolization after transcatheter aortic valve implantation. *Catheter Cardiovasc Interv.* 2013; 81: 392-396.
- 7 Al-Attar N, Himbert D, Vahanian A, Nataf P. Severe intraprosthesis regurgitation by immobile leaflet after trans-catheter aortic valve implantation. *Eur J Cardiothorac Surg.* 2011; 39: 591-592.
- 8 Eggebrecht H, Schäfer U, Treede H, et al. Valve-in-valve transcatheter aortic valve implantation for degenerated bioprosthetic heart valves. *JACC Cardiovasc Interv.* 2011; 4: 1218-1227.