Single-stage procedure of carotid artery stenting and transcatheter aortic valve implantation

Krystian Mróz[1], Michał Okarski[1], Piotr Pieniążek[1, 2], Piotr Paluszek[2], Jarosław Trębacz[1], Janusz Konstanty-Kalandyk[3, 4], Robert Sobczyński[3], Maciej Stąpór[1], Jacek Legutko[1, 5], Paweł Kleczyński[1, 5]

[1]Clinical Department of Interventional Cardiology, St. John Paul II Hospital, Kraków, Poland
[2]Department of Vascular and Endovascular Surgery, St. John Paul II Hospital, Kraków, Poland
[3]Clinical Department of Cardiac Surgery and Transplantation, St. John Paul II Hospital, Kraków, Poland
[4]Jagiellonian University Medical College, Institute of Cardiology, Department of Cardiac Surgery and Transplantation, Kraków, Poland
[5]Department of Interventional Cardiology, Institute of Cardiology, Jagiellonian University Medical College, Kraków, Poland

Correspondence to:
Paweł Kleczyński, MD, PhD, FESC, Department of Interventional Cardiology, Jagiellonian University Medical College, St. John Paul II Hospital, Prądnicka 80, 31–202 Kraków, Poland,
phone: +48 12 614 35 01,
e-mail: kleczu@interia.pl

DOI: 10.33963/v.phj.102267

Received:
June 3, 2024

Accepted:
August 26, 2024

Early publication date:
August 26, 2024

The co-occurrence of aortic stenosis (AS) and carotid artery disease has been reported in more than 22% of patients qualified for transcatheter aortic valve implantation (TAVI) [1]. Symptoms of these conditions can overlap, necessitating comprehensive diagnostics to guide the selection of an appropriate treatment strategy. In recent years, the number of indications for TAVI has gradually increased [2, 3]. Carotid artery stenting (CAS) should be considered in symptomatic patients with 50%–99% carotid artery stenosis who are at too high a risk for surgical carotid endarterectomy [4]. However, the CAS procedure itself can induce a blood pressure drop with bradycardia, and if accompanied by severe AS this can lead to rapid hemodynamic decompensation. Thus, a simultaneous TAVI-CAS procedure may decrease the risk of circulatory deterioration. To date, the effectiveness of hybrid treatment strategies has been reported [5], but data on the simultaneous use of both percutaneous techniques is limited. Here we present the case of a single-stage, endovascular treatment for critical carotid artery stenosis and severe AS.

A 64-year-old male with a history of type 2 diabetes, hypertension and previous percutaneous coronary intervention of the right coronary artery (RCA) was admitted to the neurology department due to recurrent syncope. Computed tomography angiography of the head and neck region showed 95% stenosis in the proximal segment of the left internal carotid artery (LICA). The patient was initially qualified for carotid endarterectomy. Before the surgery, a transthoracic echocardiography was performed and showed severe AS (mean gradient: 58 mm Hg, peak velocity: 4.8 m/s, aortic valve area: 0.8 cm^2) (Figure 1A). Carotid ultrasound confirmed significant LICA stenosis. Coronary angiography showed a significant stenosis in RCA and calcified thoracic aorta (Supplementary material, *Videos S1–S3*), while computed tomography showed an aortic valve calcium score of 5933 Agatson units and was indicative of a porcelain aorta (Figure 1B–C). Following a local heart team consultation, the patient was deemed unsuitable for a surgical approach and, due to severe AS and LICA stenosis, was instead qualified for simultaneous CAS and TAVI in the first stage, and percutaneous coronary intervention of the RCA in the second stage.

After obtaining large bore access secured with two Prostyles (Abbott, US) and an iSleeve sheath (Boston Scientific, US), successful LICA stenting with distal neuroprotection including a Spider FX filter (Medtronic, US) and a self-expandable stent (Roadsaver 10 × 20 mm) was performed (Figure 1 D–E). Subsequently, a predilatation of the aortic valve with an Osypka VACS III balloon 24/40 mm (Osypka, Germany) was performed, followed by an Acurate neo2 L (Boston Scientific, US) implantation (Figure 1F). Postprocedural transthoracic echocardiography showed a preserved aortic bioprosthesis function with mean gradient of 6 mm Hg, without aortic regurgitation (Supplementary material, *Video S4, Figure S1*). Two

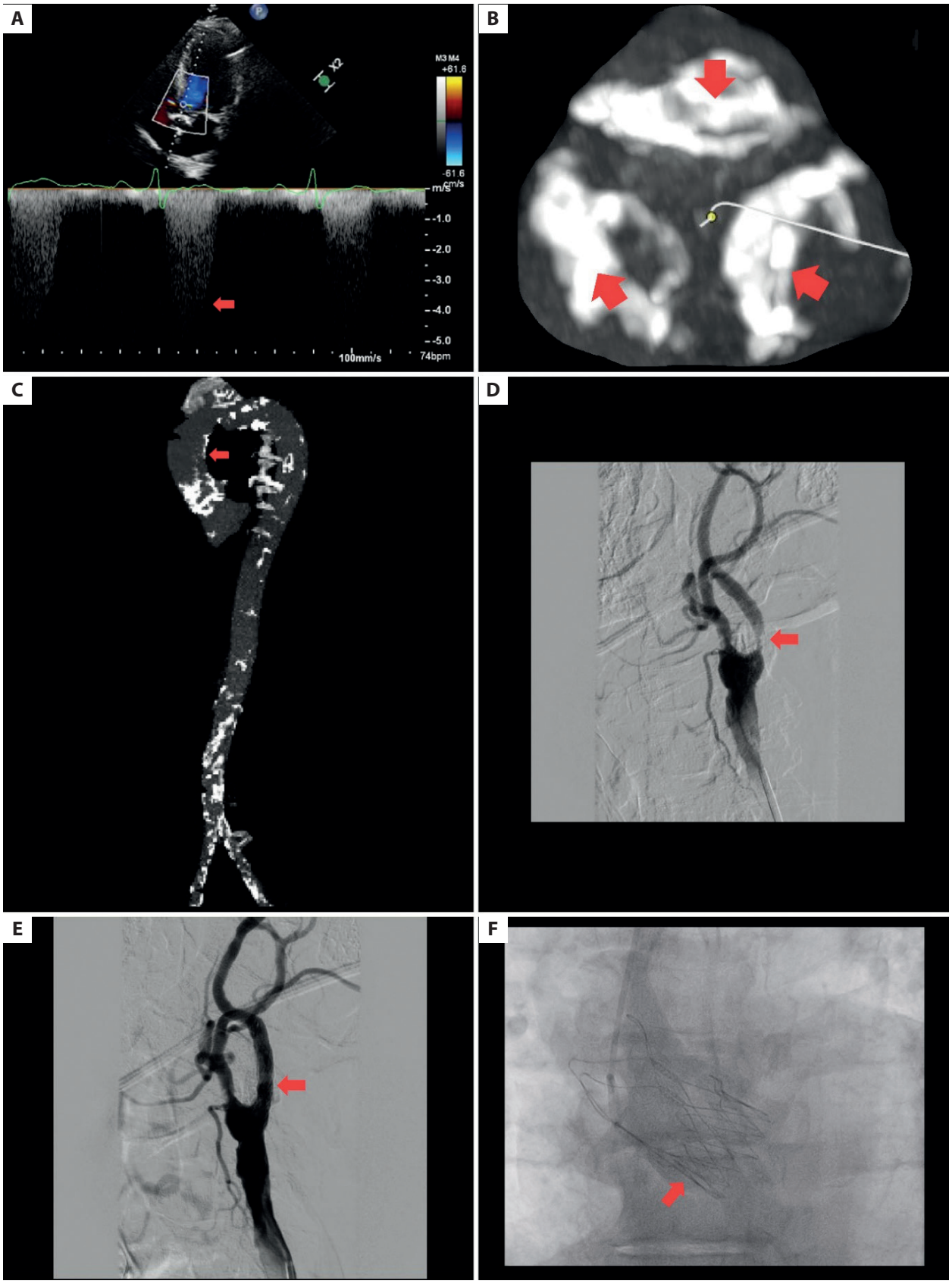

Figure 1. A. Transthoracic echocardiography before hemodynamic procedure, apical 5-chamber view. Red arrow indicates abnormal continuous-wave Doppler spectrum through stenotic aortic valve. **B.** Severely calcified aortic valve on computed tomography (calcium indicated by arrows). **C.** Porcelain aorta on computed tomography (calcium indicated by arrow). **D.** Pre-procedural angiography of the left carotid artery. Red arrow indicates left internal carotid artery (LICA) stenosis. **E.** Intraprocedural angiography of the left carotid artery. Red arrow indicates contrast flow through LICA after stent implantation. **F.** Transcatheter heart valve on fluoroscopy indicated by red arrow

days after the procedure, the patient was discharged home in good general condition, without neurological deficits.

In conclusion, syncope can result from carotid artery disease and severe AS. Thus, it is important to perform diagnostic evaluations for both conditions. In cases of their co-occurrence, a combined endovascular treatment involving CAS and TAVI, preventing hemodynamic decompensation and performed in a center with appropriate expertise, may represent a safe treatment strategy for high-risk patients.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/polish_heart_journal.

Article information

Conflict of interest: None declared.

Funding: None.

REFERENCES

1. Vella A, Roux O, Antiochos P, et al. Meta-analysis of the prognostic significance of carotid artery stenosis in patients who underwent transcatheter aortic valve implantation. Am J Cardiol. 2023; 200: 225–231, doi: 10.1016/j.amjcard.2023.04.031, indexed in Pubmed: 37355356.
2. Mazur P, Marin-Cuartas M, Arghami A, et al. Operative management after transcatheter aortic valve replacement. Kardiol Pol. 2023; 81(2): 107–114, doi: 10.33963/KP.a2023.0026, indexed in Pubmed: 36706263.
3. Vahanian A, Beyersdorf F, Praz F, et al. 2021 ESC/EACTS Guidelines for the management of valvular heart disease. Eur Heart J. 2021; 43(7): 561–632, doi: 10.1093/eurheartj/ehab395, indexed in Pubmed: 34453165.
4. Aboyans V, Ricco JB, Bartelink MLEL, et al. 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS): Document covering atherosclerotic disease of extracranial carotid and vertebral, mesenteric, renal, upper and lower extremity arteriesEndorsed by: the European Stroke Organization (ESO)The Task Force for the Diagnosis and Treatment of Peripheral Arterial Diseases of the European Society of Cardiology (ESC) and of the European Society for Vascular Surgery (ESVS). Eur Heart J. 2018; 39(9): 763–816, doi: 10.1093/eurheartj/ehx095, indexed in Pubmed: 28886620.
5. Moraca RJ, Shah AA, Bailey SH, et al. Combined carotid endarterectomy and transcatheter aortic valve replacement: Technique and outcomes. J Card Surg. 2018; 33(5): 265–269, doi: 10.1111/jocs.13601, indexed in Pubmed: 29663514.