POLISH HEART JOURNAL

Kardiologia Polska
The Official Peer-reviewed Journal of the Polish Cardiac Society since 1957

Online first
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ISSN 0022–9032 e-ISSN 1897–4279

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Article type: Clinical vignette

Received: June 3, 2024

Accepted: August 26, 2024

Early publication date: August 26, 2024

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

Short title: Simultaneous carotid artery disease and aortic stenosis treatment

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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 may 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 risk for surgical

carotid endarterectomy [4]. However, CAS procedure itself may induce blood pressure drop with bradycardia and if accompanied by severe AS, that may lead to rapid hemodynamic decompensation. Thus, 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 are limited. Here we present a 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 revealed 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 revealed 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 the 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 next step.

After obtaining large bore access secured with two Prostyles (Abbott, US) and iSleeve sheath (Boston Scientific, US), successful LICA stenting with distal neuroprotection including 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 arotic valve with Osypka VACS III balloon 24/40 mm (Osypka, Germany) was performed followed by Acurate neo2 L (Boston Scientific, US) implantation (Figure 1F). Postprocedural transthoracic echocardiography revealed preserved aortic bioprosthesis function with mean gradient of 6 mm Hg, without aortic regurgitation (Supplementary material, *Video S4*, *Figure S1*). Two days after the procedure, the patient was discharged home in good general condition, without neurological deficits.

In conclusion, syncope may 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.

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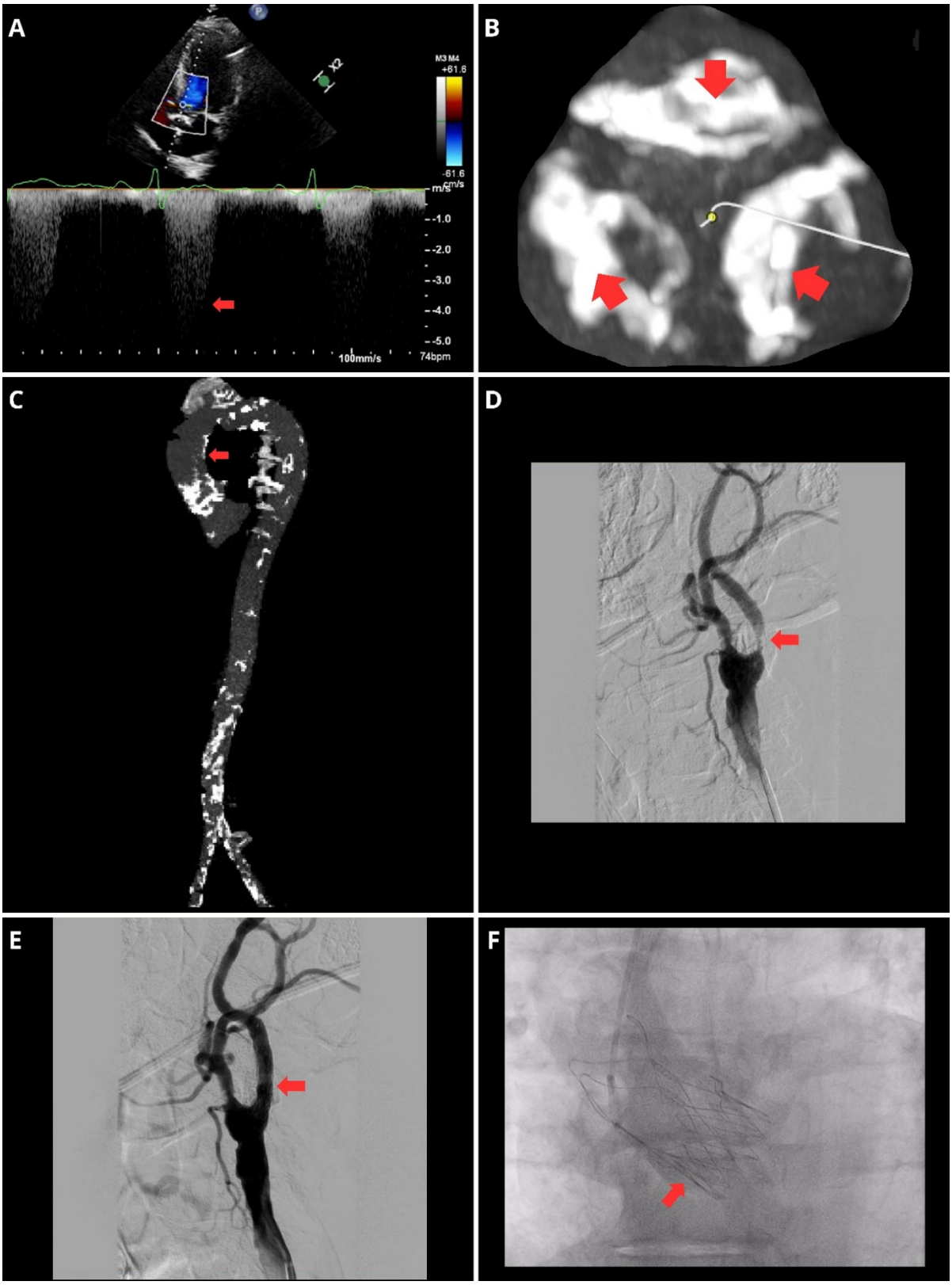

Figure 1. A. Transthoracic echocardiography before the hemodynamic procedure, apical 5-chamber view. The red arrow indicates abnormal continuous-wave Doppler spectrum through the stenotic aortic valve. **B.** Severely calcified aortic valve on computed tomography (calcium indicated by the arrows). **C.** Porcelain aorta on computed tomography (calcium indicated by

the arrow). **D.** Pre-procedural angiography of the left carotid artery. The red arrow indicates left internal carotid artery (LICA) stenosis. **E.** Intraprocedural angiography of the left carotid artery. The red arrow indicates contrast flow through LICA after stent implantation. **F.** Transcatheter heart valve on fluoroscopy indicated by the red arrow