SCIENTIFIC LETTER

TRANSCAROTID TAVI WITH LEFT CAROTID-SUBCLAVIAN BYPASS FOR THE MANAGEMENT OF REFRACTORY ANGINA

ABSTRACT

New transcatheter and endovascular techniques have transformed cardiac surgery operating rooms into collaborative spaces where multidisciplinary teams address complex cases.

In the patient we present, surgical revascularization was performed; the patient then developed progressive angina with electrocardiographic changes in the anterior wall. Coronary angiography showed patent grafts and no progression of native coronary artery disease. Computed tomography revealed a calcified plaque at the origin of the left subclavian artery.

Endovascular treatment was performed using a covered stent proximal to the mammary artery. Despite this, refractory angina persisted, and further angioplasties were necessary, with no improvement in the vascular lumen. Additionally, echocardiography showed worsening of a preexisting aortic stenosis.

A multidisciplinary approach was chosen, involving a left transcarotid self-expanding transcatheter aortic valve implantation (TAVI) and concomitant carotid-subclavian bypass, using an alternative technique to achieve optimal annular alignment via a contralateral support balloon.

Keywords: *Heart Team, transcatheter aortic valve implantation, alternative access routes, subclavian stent restenosis, carotid-subclavian bypass, comprehensive approach.*

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CLINICAL CASE

A 69-year-old patient with coronary artery disease who underwent surgical revascularization in 1995 via a triple bypass: left internal mammary artery (LIMA) to the anterior descending artery (ADA) and sequential saphenous vein grafts to the first marginal artery (OM1) and the posterior descending artery (PDA).

Angina recurred despite patent bypass grafts; coronary angiography showed no progression of native disease. A chest CT scan revealed severe stenosis at the origin of the left subclavian artery (*Figure 1A*), which was treated with angioplasty and coated stent implantation in 2011. Moderate aortic stenosis was detected.

Symptoms recurred in 2014 and 2023, with stent restenosis (*Figure 1B*), which was treated with balloon angioplasties. Aortic valve disease progressed to a severe form. In 2024, the patient was admitted for non-ST-elevation myocardial infarction, severe aortic stenosis, and subclavian stent restenosis.

Echocardiography revealed moderate ventricular dysfunction (ejection fraction of 45%) with global hypokinesis and a severely calcified tricuspid valve. SPECT-MRI demonstrated anterior ischemia, despite the AMI-DA bypass being patent, with viability in all territories. CT scanning revealed a porcelain ascending aorta, stent restenosis, severe bilateral peripheral vascular disease with iliac arteries <4 mm, normal-caliber carotid arteries, and a patent circle of Willis.

A comprehensive treatment plan was decided upon, consisting of a left transcarotid transcatheter aortic valve implantation (TAVI) self-expanding, and a homolateral carotid-subclavian bypass.

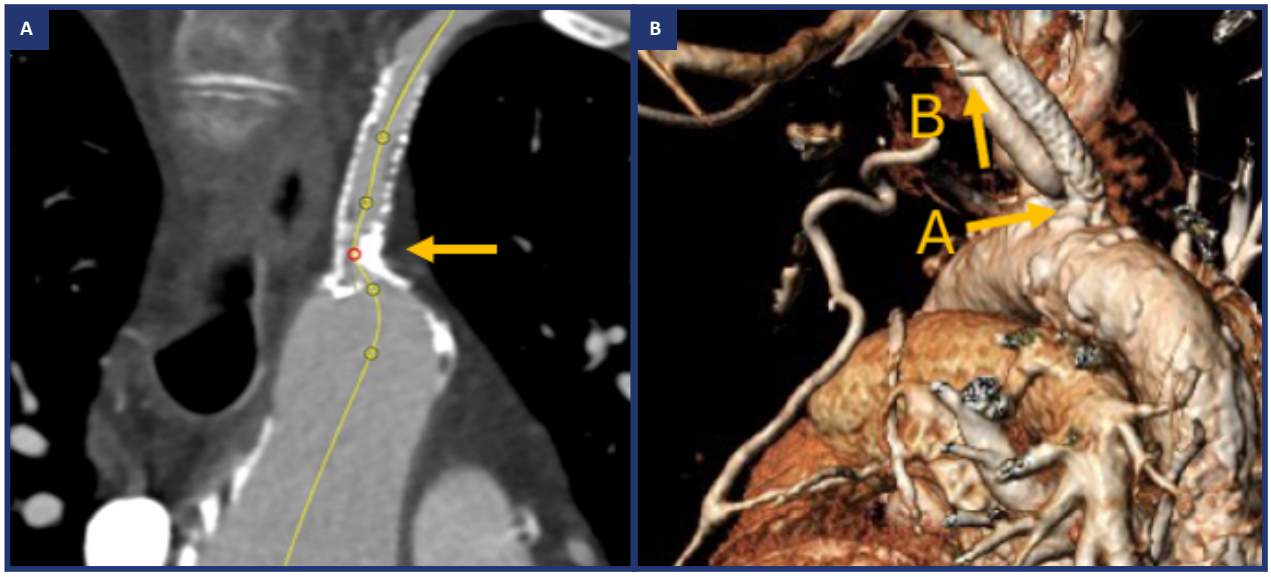

FIGURE 1. A: Calcified stenosis at the origin of the left subclavian artery involving the implanted stent. **B:** 3D view of the calcified stenosis (a). Origin of the left internal mammary artery (b).

Surgical procedure

The left carotid and subclavian arteries were dissected (*Figure 2A*), and the aortic annulus was predilated with a 22-mm balloon. An Acurate neo2™(Boston) self-expanding bioprosthesis was implanted via left transcarotid TAVI. Commissural alignment was correct, but coaxiality was poor; this was corrected by contralateral traction using a 20-mm balloon via the right radial artery (*Figure 2B*).

Finally, an extra-anatomical left carotid-subclavian bypass was performed using a 6-mm Gore-Tex™ graft (*Figure 2C*). The patient had an uneventful postoperative course and was discharged on the fourth day. A follow-up echocardiogram showed a normally functioning prosthesis and improved LVEF. On the CT angiography performed three months later, the bypass was patent (*Figure 2D*).

DISCUSSION

A multidisciplinary approach is key to managing complex cardiovascular disease, as it focuses on the patient and integrates diagnostic and therapeutic perspectives. Advances in TAVI have expanded treatment options and improved clinical outcomes.[1,2] Discussion within the Heart Team is essential for evaluating the clinical, anatomical, and technical characteristics of each patient to select the most appropriate strategy.[2]

Although the transfemoral approach remains the first choice, alternative access routes are required in patients with significant peripheral vascular disease. Individualized selection is crucial in patients with unfavorable anatomies.[3] Recent data suggest that alternative access routes, including the subclavian and carotid approaches, are safe and effective when

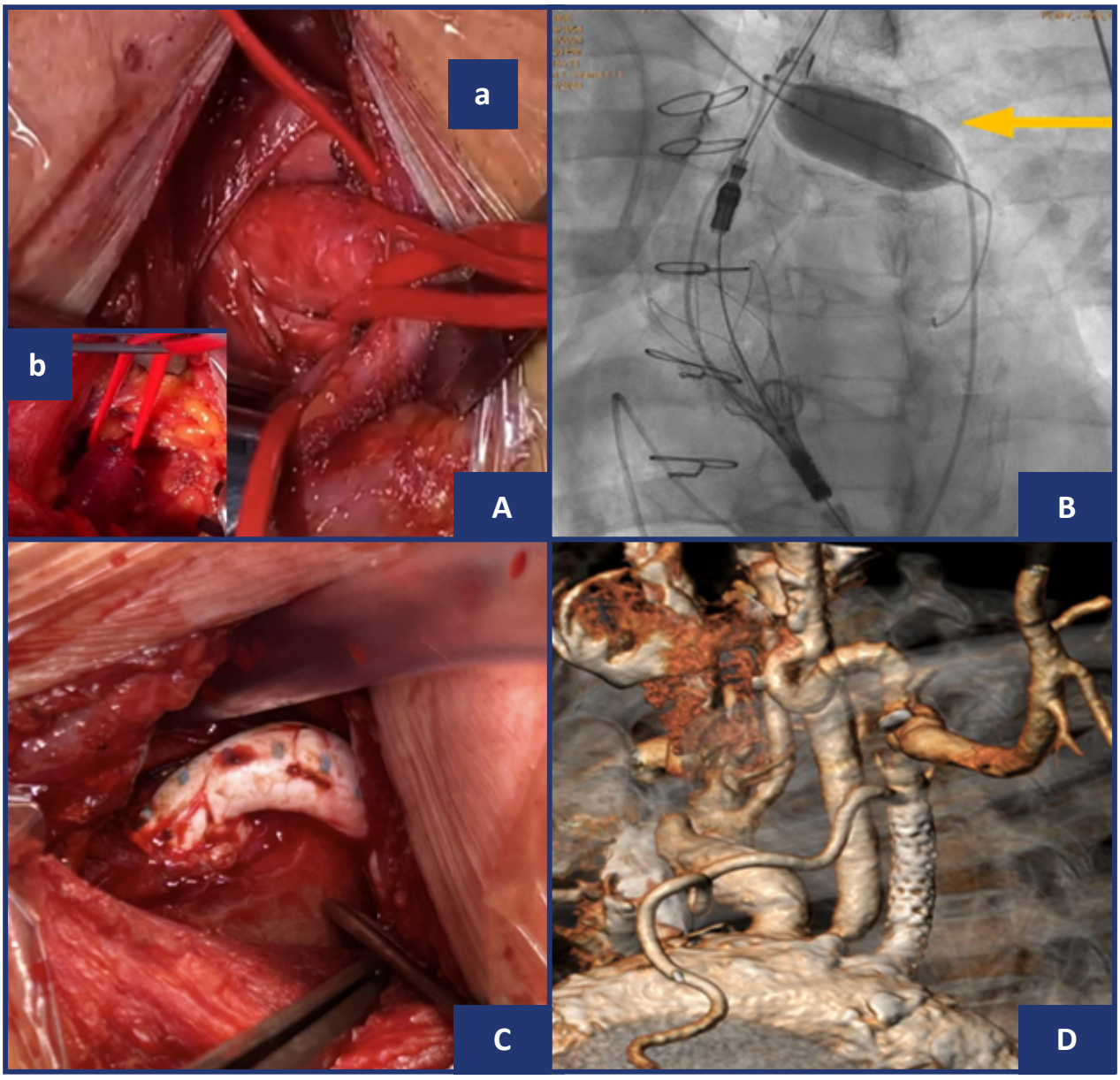

FIGURE 2. A: Dissection of the left common carotid artery (a) and the left middle subclavian artery, posterior to the left mammary artery (b). **B:** Contralateral balloon traction to position the prosthesis in the aortic ring. **C:** Proximal anastomosis of the left carotid-subclavian bypass. **D:** 3D reconstruction of the bypass based on a CT scan performed three months later.

performed at experienced centers.[4] Transcarotid access has shown favorable results in series and multicenter studies,[5] and constitutes a valid alternative when transfemoral access is not possible.[6]

The case we present demonstrates how a multidisciplinary approach integrates structural and vascular techniques to address multiple pathologies in a single procedure.

CONCLUSIONS

A multidisciplinary approach is essential for the effective management of complex cardiovascular conditions and improves care and outcomes.

This case illustrates the application of a comprehensive strategy in a complex scenario. Alternative TAVI pathways pose a technical challenge due to their annular alignment, necessitating innovative solutions to optimize implant placement.

Declaration

The authors declare no conflicts of interest.

Ethical considerations

This study complies with the standards of the center's Ethics Committee.

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