Case report

Percutaneous aortic valve implantation (TAVI) in a patient with severe peripheral arterial disease:A case report

Abstract

Background: Trans-Aortic-Valve-Implantation (TAVI) is an innovative technique for the management of patients with symptomatic aortic stenosis (Rao). However, it is still associated with a non-negligible rate of vascular complications. In this articl we discuss the difficulties of the vascular approach of TAVI

Case presentation:

We report a case of a 72 years old male, hypertensive, chronic smoker, known coronary carrier for 4 years of stenting on the IVA and circumflex with severe aortic stenosis. Admitted for TAVI implantation because of the high surgical risk according to EuroScoreII. Clinical examination note a systolic murmur of aortic stenosis radiating to the neck vessels without signs of heart failure (HF). TTE shows a serrated aortic stenosis (area 0.7cm², mean gradient 58mmHg, Vmax 6m/s). Pre-TAVI arteriography reveals very tight stenosis at the origin of the left primitive iliac artery and tight truncal stenosis of the right primitive iliac artery. Catheterization of the right primitive iliac arterywas performed with satisfactory angiographic control. After surgical approach of the right femoral artery and balloon dilatation of the right common iliac artery, crossing of the calcified aortic stenosis with a Terumo guide and AL1 probe, placement of an intra-GV Pitail probe with pressure recording, placement of the SAPIEN 3 prosthesis (23mm), agiographic control showed no para-valvular aortic insufficiency. The postoperative course was straightforward, with no complications noted and a good result on postoperative echocardiography.

Conclusion:Peripheral arterial disease is common in patients undergoing TAVI and is associated with unfavorable early and late clinical outcomes. Assessment of peripheral arterial

disease prior to TAVI is crucial not only to determine pathways, but also to prepare for potential vascular complications.

Key words: TAVI, aortic stenosis, iliac stenosis, femoral approach difficulty

Background

Trans-Aortic-Valve-Implantation (TAVI) is an innovative technique for managing patients with symptomatic narrowing of the aorta [1]. The indications for TAVI are currently being increasingly broadened. Puncturing the femoral artery is the first stage of the procedure, but also one of the most technically challenging. Vascular complications are the most serious, as they can be associated with significant morbidity and mortality. Arterial calcifications and iliac tortuosities are among the most predictive factors of vascular complications [2,12,13,14] . In this article, we report on a case of TAVI in a polyarterialwho carries coronary artery disease and peripheral arteries disease patient with very tight bilateral iliac stenoses and discuss the difficulties of the vascular approach through this observation.

Case presentation:

A 72 years old, hypertensive, chronic smoker, known coronary carrier for 4 years of stenting on the IVA and circumflex with subocclusive stenosis of the ostium of the posterior interventricular requiring medical treatment, carrier of a tight aortic narrowing at the surgical stage, he is also followed for sleep apnea syndrome under continuous positive pressure and diffuse interstitial pneumopathy complicating a COVID19 infection. Admitted for TAVI implantation, the indication of which was retained in view of the high surgical risk according to EuroScoreIIand STS score that were higher than 8% after a medical-surgical staff meeting. Clinical examination revealed a conscious patient with hemodynamic and respiratory stability.

Blood pressure (BP) 120/80mmHg, heart rate (HR) 70B/min, SaO2 97% on room air, systolic murmur of aortic stenosis radiating to the neck vessels without signs of heart failure (HF). The ECG showed sinus tachycardia at 100bpm, left axis, incomplete left bundle branch block (LBBB) and left ventricular hypertrophy (LVH) according to the Cornell index. Biological work-up was without abnormalities. Transthoracic echocardiography showed a serrated aortic stenosis (area 0.7cm², mean gradient 58mmHg, Vmax 6m/s). Pre-TAVI arteriography of the aorta and lower limbs was performed after ultrasound-guided puncture, revealing very tight stenosis at the origin of the left primitive iliac artery and tight truncal stenosis of the right primitive iliac artery. Catheterization of the right primitive iliac artery was performed using a 0.035/260cm stiff guide with dilatation of the stenosis using an 8mm/4cm/80cm balloon and placement of an 8mm/37mm/135cm stent with satisfactory angiographic control. Immediately afterwards and under general anaesthesia, after surgical approach of the right femoral artery and balloon dilatation of the right common iliac artery, crossing of the calcified aortic stenosis with a Terumo guide and AL1 probe, placement of an intra-GV Pitail probe with pressure recording, placement of the SAPIEN 3 prosthesis (23mm) that was available at hospital, agiographic control showed no para-valvular aortic insufficiency. The postoperative course was straightforward, with no complications noted and a good result on postoperative echocardiography.

DISCUSSION

Aortic stenosis is the most common type of valve disease in industrialized countries. Percutaneous aortic valve replacement has become the most widely used technique for treating this condition. The femoral approach is the most widely used because of its simplicity and efficacy. However, in 10-15% of cases, stenoses in the iliofemoral arterial pathways preclude the use of this approach.Alternative routes have been developed, including the

transapical route, which is associated with a high complication rate, the carotid ,transcavaland axillary route [3].

Prior to any TAVI procedure, an injected thin-section CT scan with acquisition extending from the aortic root to the femoral common/superficial bifurcation must be performed. The protocol has recently been standardized by European recommendations [4] and should include acquisition with cardiac synchronization centered on the aortic valve, and without

synchronization for exploration of the approaches.

The risk factors for aortic stenosis have been shown to be similar to those for atherosclerosis. Consequently, ischemic heart disease as well as peripheral arterial disease affecting mainly the iliac, femoral, renal, abdominal and carotid arteries are often present in elderly aortic stenosis patients undergoing TAVI [5].Also in the FRANCE 2 (French Aortic National Core Valve and Edwards 2) registry, one of the largest published multicenter studies involving 3195 TAVI patients, 48% of patients suffered from ischemic heart disease, which is in line with our data [6].

A higher prevalence of carotid artery disease (CI: 40.4% vs. No CI: 26.1%, p = 0.011) and femoral artery stenosis (CI: 27.0% vs. No CI: 16.8%, p = 0.035) was found in patients with ischemic heart disease. In contrast, no association between coronary disease and iliac artery stenosis was found [7]. In our observation, we note the association of ischemic heart disease and iliac artery stenosis.

According to the literature [8], periprocedural complications occurred, the most frequent of which were aortic dissection, cardiac tamponade, stroke, coronary occlusion, peripheral vascular complications and death. No complications were noted in our patient.

In one study [9], 16.7% of patients in the peripheral arterial disease group underwent percutaneous transluminal angioplasty using a conventional or cutting balloon in the iliac arteries for passage of the TAVI valve delivery system via a trans-femoral approach [10]. In the present study, bilateral diffuse atherosclerotic stenosis of the iliac arteries with severe calcification or previously implanted stents with moderate restenosis in both iliac arteries influenced the change in approach strategies to non-trans-femoral routes in three patients.In a further six patients with focal stenosis, angioplasty was performed prior to TAVI to obtain sufficient lumen diameter for the transfemoral approach.

As previous reports have shown, transapical, transaortic or transsubclavian access may be an alternative approach when the anatomy of the transfemoral route is not suitable [11].

CONCLUSION

Peripheral arterial disease is common in patients undergoing TAVI and is associated with unfavorable early and late clinical outcomes. Assessment of peripheral arterial disease prior to TAVI is crucial not only to determine pathways, but also to prepare for potential vascular complications. Various preventive strategies aimed at reducing adverse clinical events in these patients should be considered.

List of Abbreviations : Not applicable in this section**.**

Disclaimer (Artificial intelligence)

We declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing this manuscript.

Images

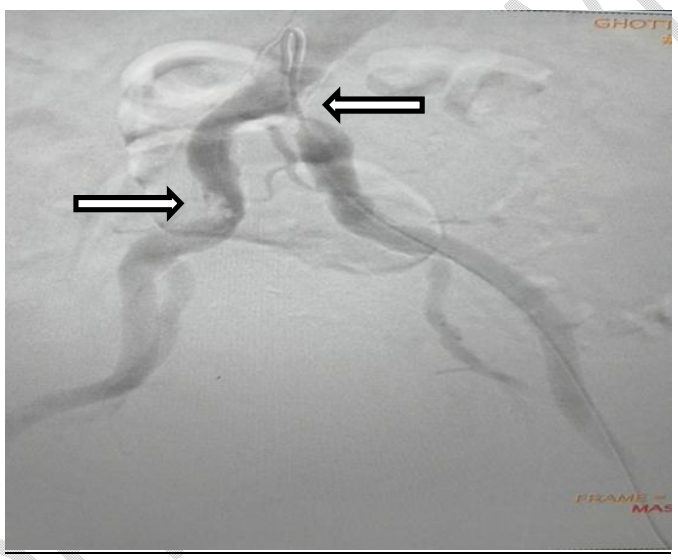

Fig1. pre-TAVI arteriography of the aorta and lower limbs showing very tight stenosis at the origin of the left primitive iliac artery and tight truncal stenosis of the right primitive iliac artery

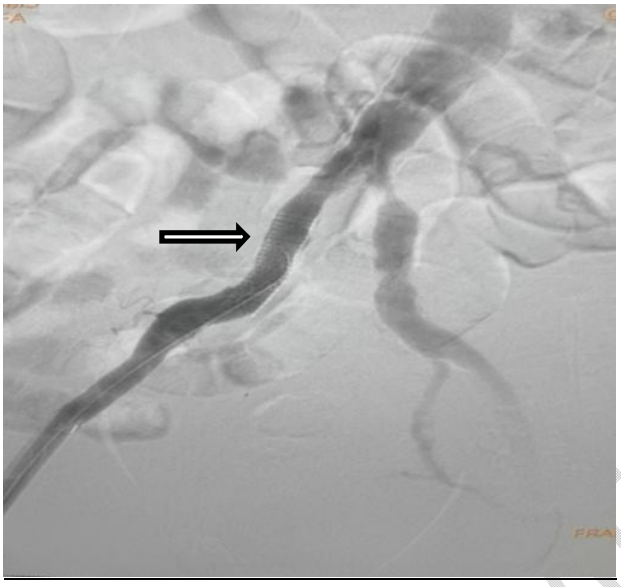

Fig2. catheterization of the right primitive iliac artery using a 0.035/260cm stiff guidewire with dilatation of the stenosis using an 8mm/4cm/80cm balloon and placement of an 8mm/37mm/135mm stent

Fig3. placement of TAVI SAPIEN 3 prosthesis (23mm)

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