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Case Report

Deformation of A Femoral Stent Covered by Extrinsic Compression Post TAVI

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Abstract

We report the case of an 85-year-old patient who underwent ***TAVI*** via femoral access. The procedure was complicated by a perforation of the right common femoral artery, which will be treated by the setting-up of a covered stent carried by a balloon through ipsilateral retrograde way (failure of the cross over process). In the immediate aftermath, we performed manual compression followed by a compression bandage.

The compression distorted the stent and caused low-noise bleeding responsible for a hemorrhagic shock after 48 hours; surgically managed with the removal of the compressed stent, the resection of the pseudoaneurysm and the surgical suture of the common femoral artery. To our knowledge, there are no warnings regarding manual compression of a balloon-supported covered stent.

Keywords: TAVR; Femoral artery; Vascular covered stent (stent graft); Manual compression; Hemorrhage

Introduction

TAVI has revolutionized the treatment of aortic stenosis. The evolution of techniques and equipment has made it possible to reduce peripheral vascular complications during procedures. These vascular complications of the access artery have been well described as well as their management [1-3].

We report the case of a right common femoral perforation after ***TAVI*** treated by setting-up of a balloon-supported covered stent, with unfavorable evolution requiring surgical management.

This case report follows CARE guidelines [4].

Case Report

We report the case of an 85-year-old patient whose cardiovascular risk factors were former smoking habits and dyslipidemia; he suffered from NYHA II/III dyspnea with evidence of severe aortic stenosis.

Echocardiography showed a preserved LVEF (62%) with a medium range transvalvular aortic gradient of 45 mmHg; aortic surface 0.7 cm 2, permeability index 0.2 for a SBP < 120 mmHg.

After Heart Team, it was decided to perform a ***TAVI*** procedure via the right femoral access (diameter of the right common femoral artery 9 mm, tortuous, slightly calcified) with setting-up of a CoreValve™ Evolut™ R 34 self-expanding Medtronic prothesis.

The procedure took place under local anesthesia via the right femoral access with setting-up of a **PROSTAR** system through preclosing. Pre-dilation of the common femoral artery with a 9F terumo desilet followed by a Cook 16Fx30 cm straight Performer introducer. A complementary 5 French left femoral access was also performed to allow control injections. Implantation without pre-dilation of a 34 mm **COREVALVE EVOLUT PRO** prosthesis with satisfactory angiographic and hemodynamic results (no

periprosthetic leak, optimal positioning). The advent of post-implantation bradycardia with de novo left bundle branch block led us set-up an electro systolic driving probe.

At the end of the procedure, after closure of the artery using the **PROSTAR** system, manifestation of a perforation in the right common femoral artery, with persistence of significant blush despite 10-minute compressions repeated twice and administration of protamine sulfate. It was decided to perform a crossover in order to set up an occlusion balloon in the right common iliac artery, but the crookedness of the iliac arteries made this solution impossible. A puncture of the ultrasound-guided superficial femoral artery downstream of the TAVI puncture point will finally allowed the implantation of a covered stent carried by balloon (**LIFESTREAM** Bard 12 x 58 mm) through retrograde approach and the need for post dilation (Figure 1). At the end of the procedure, a compression bandage was set up and the downstream ipsilateral femoral puncture point was closed using an **ANGIOSEAL** Terumo closure system.

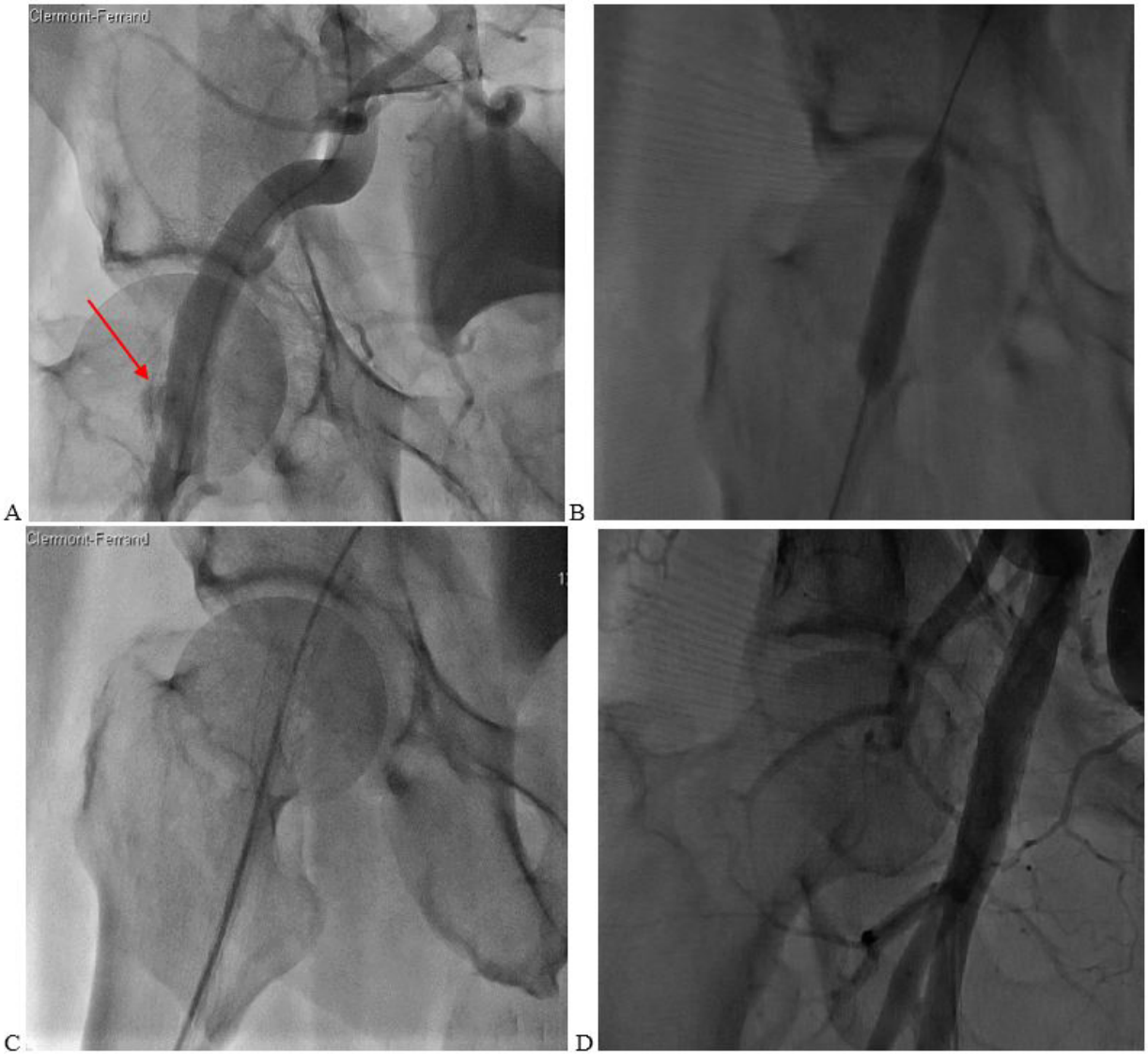

Figure 1: **A**: Active bleeding from the common femoral artery (Arrow); **B**: Balloon inflation; **C**: Covered stent of the common femoral artery; **D**: Stopping bleeding.

During monitoring in the cardiological intensive care unit, a gradual decrease of red blood cells, combined with the appearance of a right femoral hematoma, led us to perform a Scarpa Doppler that found a false aneurysm at the level of the right common femoral artery.

CT angiography confirmed the presence of a false aneurysm located upstream of the right femoral bifurcation, measuring 25 x 19 mm (Figure 2).

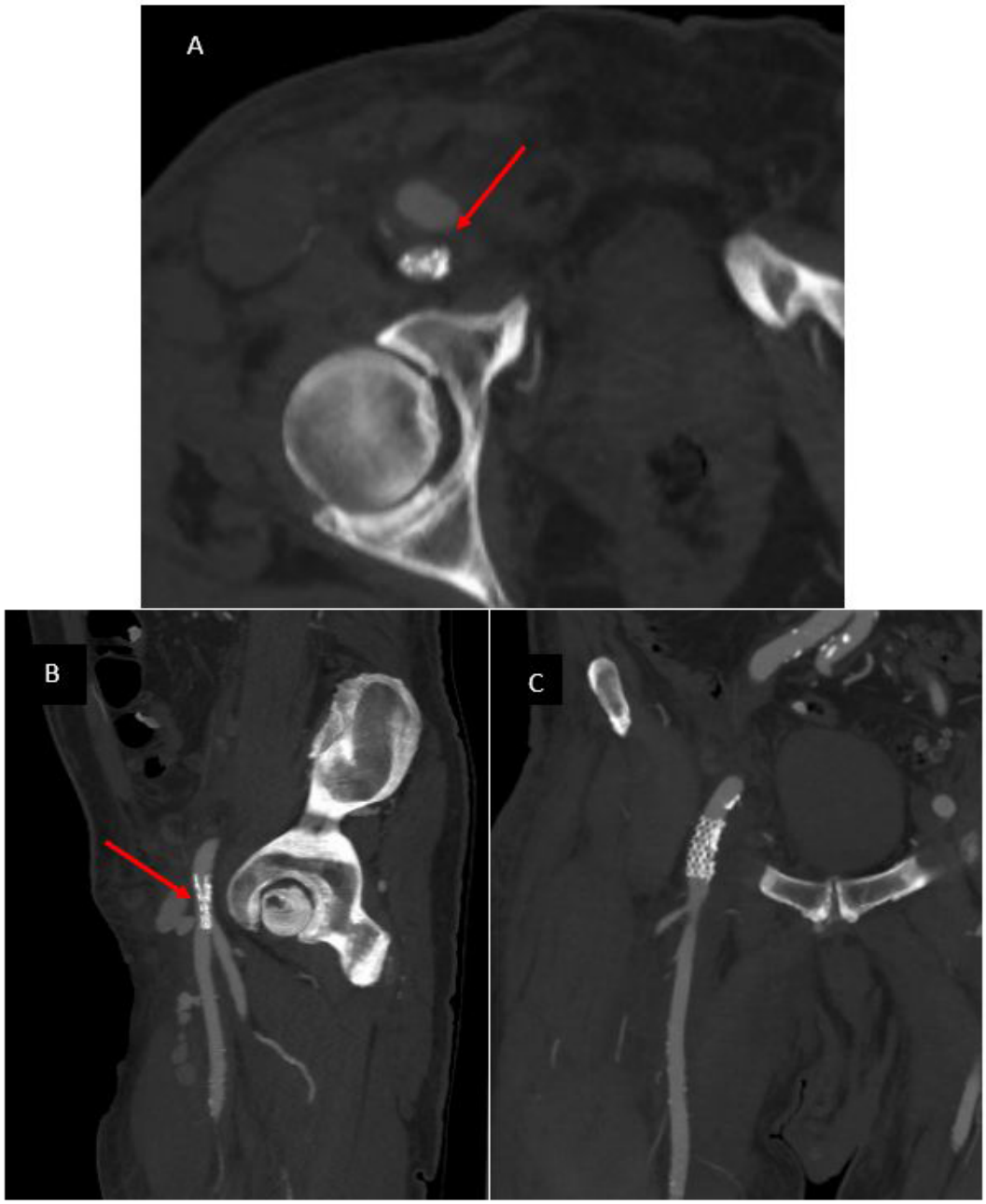

Figure 2: **(A)** CT section showing compression of the stent (arrow). **(B)** The deformation seems better visualized in axial and saggital **(C)** Incidence than in frontal.

The covered stent showed signs of compression with a failure of expansion causing a flow between the wall of the artery and the stent, leaving the opening of the pseudo aneurysm permeable.

The surgical repair consisted in gaining access to the right scarpa in order to remove the crushed covered stent, followed by the resection of the pseudo aneurysm then by the repair of the right common femoral artery by means of separate stitches of Prolene 5.0.

The patient was seen again one month later for his post-***TAVI*** evaluation. The parameters of the bio prosthesis were excellent with a transvalvular gradient of 8 mmHg in the absence of any peri or intraprosthetic leaks as well as with a marked improvement of his respiratory state. His femoral wound healed with difficulty.

Discussion

The covered stent, as well as manual or ultrasound-guided compression, have demonstrated they are effective in the management of vascular complications of the access routes [3,5-8]. There are other less studied alternatives such as ultrasound-guided injection of thrombin during false aneurysms or of saline solutions for extrinsic compression of the incision. [9] Surgical management of femoral complications remains the solution to resort to in the event of failure of the techniques mentioned above (Figure 3).

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In the field of vascular angioplasty, expandable and self-expanding balloon stents made of nitinol have a lower radial force than steel stents but are more resistant to compression thanks to their shape retention memory.

Nitinol self-expanding stents are generally preferred over balloon-expanding stents because they are more resistant to external compression (Stiffness) and to bending stresses due to their low elasticity for an identical design [10].

This difference is difficult to quantify due to the non-linear relationship of the stress-strain curve of nitinol, but for the same design, the BX will be 3x as stiff. They also show a lower restenosis rate [11, 12].

The interest of this case was to show that manual compression on a covered stent must be contraindicated in the case of an expandable balloon-borne stent. (Figure 3).

An alternative to our management would have been the setting-up of a second covered stent, or immediate surgical management, especially in the event of difficulties in setting-up an occlusion balloon, as it was the case here.

The patient gave his informed consent for the publication of this case study.

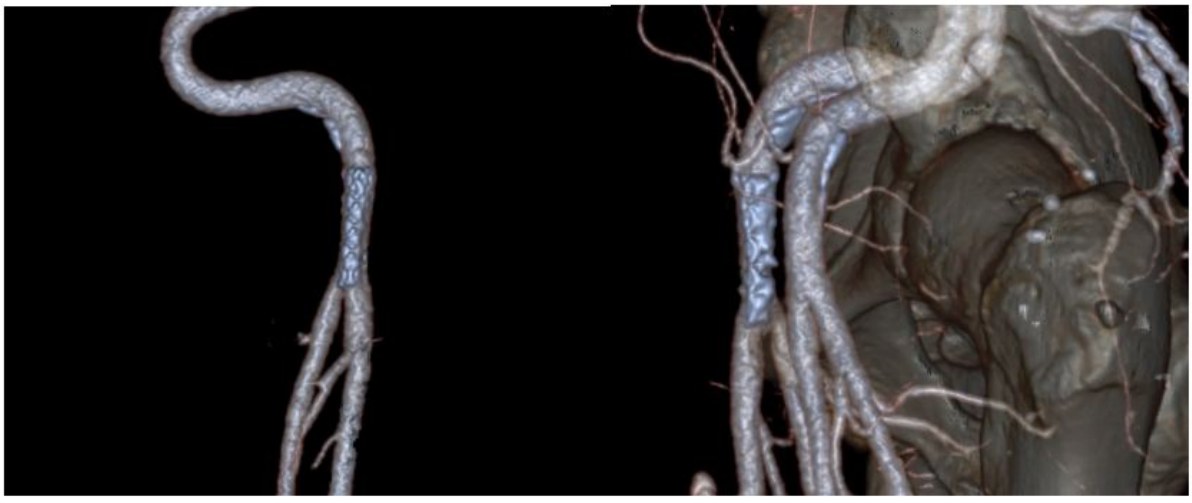

Figure 3*:* 3D reconstruction of the deformation to covered stent following manual compression.

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