Case Report

**Complete Rupture of Polytetrafluoroethylene-covered Endoprosthesis after Exclusion of a Popliteal Aneurysm**

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Popliteal artery aneurysm (PAA) is the most commonly reported peripheral artery aneurysm. The usual treatment is exclusion bypass with a saphenous vein. However, the availability of medium size covered stent graft is an attractive option. By performing this procedure percutaneously, we can shorten the hospital stay of the patient. Favourable early and long-term results have been reported; however, little is known about the durability of the procedure. Given the mobile location of the stent-graft close to the knee joint, graft damage can be expected. We describe a case of complete rupture of a Viabahn® endoprosthesis which was inserted to exclude a PAA.

**Key words:** viabahn endoprosthesis, type III endoleak, popliteal aneurysm

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**CASE REPORT**

A 60-years-old man with a history of hypertension and hypercholesterolemia and no associated disease complained of knee pain. He had been still working and practicing sports. Vascular investigations revealed a fusiform and subarticular popliteal aneurysm, 37 mm in diameter (Fig. 1A) and 40 mm in length (Fig. 1B), with a mural thrombus and three patent crural vessels (Fig. 1C). Because the patient had refused the bypass procedure, an endovascular treatment was chosen. Under local anaesthesia, a covered Viabahn® stent (8 mm × 100 mm) (W.L. Gore & Associates, Inc., Flagstaff, Arizona, USA) was inserted via an ipsilateral percutaneous femoral puncture. Control colour duplex ultrasound at 1 and 9 months showed no endoleak and confirmed the patency of the stent. At 12 months, the patient had no complaint, but the colour duplex ultrasound and computed tomography (CT)-scan showed a large endoleak with an aneurysm perfusion. The mechanism of the leak was thought to be related to fracture of the stent and complete tear in the polytetrafluoroethylene (PTFE) membrane at the level of the articular interline (Fig. 2). We attempted to provide clear information about this infrequent complication already described in active patients. However, the patient still refused the bypass procedure as he was asymptomatic. A redo stenting was then successfully performed with the same device (Viabahn® stent (8 mm × 100 mm)).

**DISCUSSION**

The Viabahn® endoprosthesis (W.L. Gore & Associates, Inc., Flagstaff, Arizona, USA), which is a modified version of Hemobahn®, is a self-expandable stent; it consists of an ultra-thin lining of PTFE and an external support of nitinol (NiTi = nickel : titanium) extending the length of the PTFE to confer this great flexibility.

Despite its properties, fractures of the nitinol support of Hemobahn/Viabahn endoprostheses have been described, but complete rupture with both the stent fracture and tear of the PTFE is rare. In these two studies, complete rupture was not described as so, even though a leak re-feeding of the aneurysm was reported. Moreover, no imaging evidence has been reported in order to demonstrate the type III leakage. The first case was about an...
endoleak between two stents at the overlapping zone; the second case was supposed to be related to the fracture stent associated with a refilling of the aneurysm but authors have been provided any evidences of a direct injection of the aneurysmal sac from the prosthesis. The incidence of Nitinol fractures is probably underestimated because systematic radiography of the knee is not part of the follow-up protocol. However, this does not apply to complete rupture of the PTFE, because colour duplex ultrasound and/or CT scan are carried out during follow-up in order to detect endoleaks.

Only one case of complete rupture of Hemobahn stent...
has been reported with peroperative visual identification of fabric torn. As described by Koelemay et al., three months after insertion of a single Hemobahn stent to exclude iterative false aneurysm of the distal anastomosis of a subarticular femoropopliteal bypass; it was attributed, in part, to balloon dilation of the proximal end of the stent and to mechanical constraints due to movements of the knee.\textsuperscript{2} In the study of Tielliu et al.,\textsuperscript{1} the rate of fracture and rupture of stents at 5 and 10 years follow-up was 78% and 73%, respectively; risk factors included young age (mean, 61 years) and multiplicity of stents. The most common site of these incidents was the overlapping zone in 93.3% of cases and, more precisely, the supracondylar tubercle in 73.3%.\textsuperscript{1} It is interesting to note that in our 60-year-old patient, the start of the rupture was situated exactly at the level of the supracondylar tubercle (Fig. 2A and 2B).

During flexion of the knee, the point of maximal angulation of the popliteal artery is level with the supraarticular portion of the artery at the superior margin of the femoral condyles. In our patient and in full view of Fig. 1C and 2C, we could speculate that the angulation of the stent already marked will be even more important after knee flexion. This maximal zone constraints are situated 2–3 cm above the articular interline.\textsuperscript{3, 4}

According to Midy et al.\textsuperscript{5} there are two unfavourable anatomic criteria for insertion of a popliteal endoprosthesis: the excessive tortuosity of the artery and distal spread of the aneurismal process, prompting the need for several endoprostheses and then increasing the risk of fracture of the Nitinol at the overlapping zones.

Stent fractures usually occur in young people, probably because they are more active.\textsuperscript{11} Wensing et al.\textsuperscript{6} showed that changes in the morphology of the femoropopliteal artery occur depending on age. In patients < 30 years of age with a bent knee, minor arterial tortuositities have been noted above the adductor hiatus. In contrast, in patients > 45 years of age, one or more tortuositities have been noticed below the hiatus. In patients > 60 years of age, the tortuositities do not disappear on extension of the knee. We could speculate, in those patients, that the angulation of the stent will be marked in extension and will be more important after flexion. Indeed, the range of motion of the knee, which depends on the activity, can favor stent shear stress. This enables the placement of covered stents in young subjects who must then be followed closely due to the increased risk of rupture with age.

**CONCLUSION**

This case highlights the importance of monitoring with colour duplex ultrasound and/or CT scan after using the Viabahn\textsuperscript{®} device. One can speculate that the matrix of the stent and the PTFE of prosthesis are subjected to important mechanical stress especially at the level of popliteal artery.

**REFERENCES**


