Case 691

Eurorad

Directional atherectomy of an eccentric popliteal artery stenosis

Published on 24.10.2000

DOI: 10.1594/EURORAD/CASE.691
ISSN: 1563-4086
Section: Interventional radiology
Imaging Technique: Digital radiography
Imaging Technique: MR
Case Type: Clinical Cases
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Patient: 56 years, male

Clinical History:

Eccentric tandem stenosis of right popliteal artery not being amenable to PTA
Imaging Findings:

The patient presented with lower limb claudications with a walking distance of 80 m. Pedal and the popliteal pulses were absent. He had undergone balloon angioplasty six months before but no major improvement of his clinical symtoms was achieved then. The patient was scheduled for angiography of his right leg and intervention in the same session. Antegrade puncture of the right common femoral artery was performed followed by digital imaging. The superficial femoral artery was patent as well as the posterior tibial artery which represented the main artery of the lower limb. The anterior tibial artery was small but the interosseal artery was patent. In the popliteal artery at the level of knee joint a tandem stenosis was revealed (Fig. 1) which was calcified and markedly eccentric.
Discussion:

Since angioplasty had already failed using balloon catheters and the eccentric nature of the lesion, directional atherectomy was considered the treatment of choice. For this, a Simpson atherectomy device was used (Atherotrack, 7 F, Mallinckrodt Inc.). The device (Fig. 2) consists of a metallic housing with a cutting window. Opposite to the window an eccentric balloon is located. Inside the device a round cutting blade is placed that rotates by 10.000 rpm and is motor driven. The device is placed over the plaque with the cutting window towards the eccentric material (Fig. 2 a). Then the cutting blade is moved back and the eccentric balloon is inflated (Fig. 2 b) pressing the window towards the plaque so that the plaque protrudes into the housing. Then the rotating blade is slowly advanced forward cutting the material of the wall (Fig. 2 c) and pushes the material into a collecting chamber at the distal end of the device (Fig. 2 d). This maneouver can be repeated unless the chamber is not completely filled which can be felt by the resistance that occurs while advancing the blade. Once the chamber is full or the plaque removed, the system is removed from the body and the chamber cleared from collected plaque fragments. After insertion of an 8 F sheath, and insertion of a 0.018 in stiff guidewire (Platinum Plus, BSIC Inc.), the 7 F atherectomy device was advanced into the popliteal artery (Fig. 3 a) and atherectomy of both stenosing plaques was performed. After atherectomy, major partes of the plaques were removed (Fig. 3 b). Then, additional balloon angioplasty using a 5 mm wide 4 cm long balloon was used to smoothen the surface (Fig. 4). Final result shows major improvement of the popliteal lumen. No distal embolization occurred; both the popliteal pulse and the posterior tibial pulse were palpable afterwards. Directional atherectomy is a technique that is particularly interesting for removal of eccentric and calcified plaques, neointimal hyperplasia from femoral and also sometimes iliac or venous stents. The working diameter of the device is limited compared to balloon angioplasty, so that big devices have to be used even in femoral arteries. Thus, an 8 F sheath should be applicable. As a general concept to treat femoral

arterial stenosis, directional atherectomy is doubtful, since comparison studies did not reveal a benefit of directional atherectomy over balloon angioplasty with regard to long-term follow-up. The device however is much more costly than PTA, so cost-effectiveness is not given in a general population. We therefore consider directional angioplasty as a useful tool in the subtype of eccentric calcified lesions not being amenable to PTA.
Differential Diagnosis List: Directional atherectomy of the eccentric popliteal artery stenosis

Final Diagnosis: Directional atherectomy of the eccentric popliteal artery stenosis

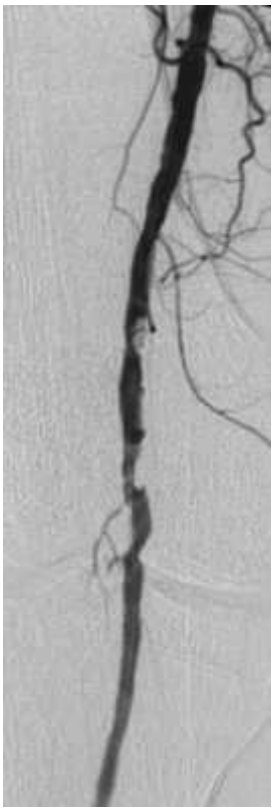
References:

Hofling B, Polnitz AV, Backa D, von Arnim T, Lauterjung L,
Jauch KW, Simpson JB.

Percutaneous removal of atheromatous plaques in peripheral arteries.
Lancet. 1988 Feb 20;1(8582):384-6. (PMID: 2893191)

Figure 1

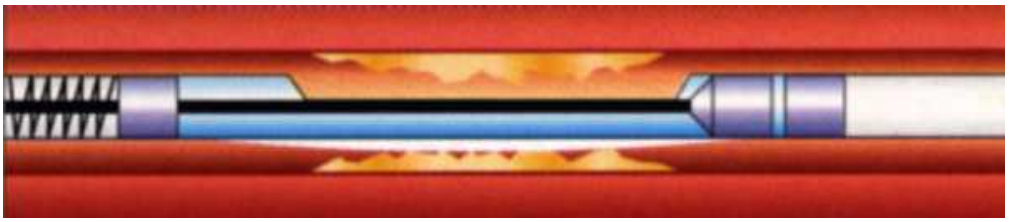
a



Description: DSA shows tandem stenosis of the right popliteal artery with two markedly eccentric plaques **Origin:**

Figure 2

a



Description: The device consists of a metallic housing with a cutting window. Opposite to the window an eccentric balloon is located. Inside the device a round cutting blade is found that rotates by 10.000 rpm and is motor driven. The device is placed over the plaque with the cutting window towards the eccentric material **Origin:**

b

Description: Then the cutting blade is moved back and the eccentric balloon is inflated (Fig. 2 b) pressing the window towards the plaque so that the plaque protrudes into the housing **Origin:**

c

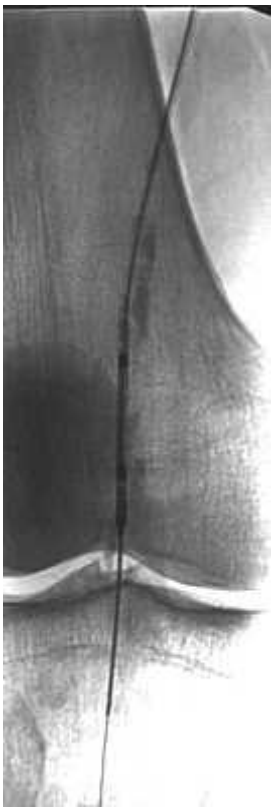
Description: Then the rotating blade is slowly advanced forward cutting the material of the wall **Origin:**

d

Description: The blade pushes the material into al collecting chamber at the distal end of the device. Once the chamber is full or the plaque removed, the system is removed from the body and the chamber cleared from collected plaque fragments. **Origin:**

Figure 3

a



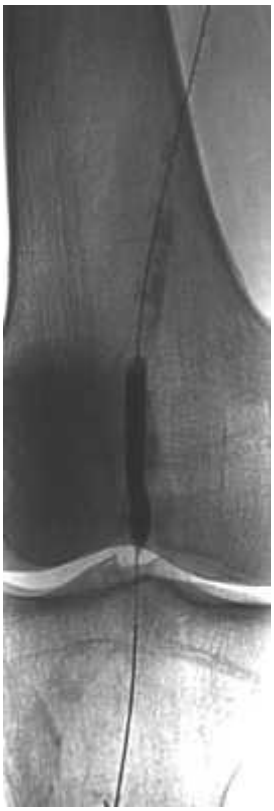
Description: The atherectomy device is placed into the popliteal artery **Origin:**

b

Description: After atherectomy major parts of the plaque have been removed **Origin:**

Figure 4

a



Description: A 5 mm balloon is inflated into the popliteal artery **Origin:**

b

Description: After PTA, the surface is smoothened **Origin:**