SHORT REPORT

The Feasibility of a Percutaneous Temporary Pedal Bypass

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A technique is described in which by subintimal recanalization it is possible to create a percutaneous distal bypass to the foot. This technique might offer new opportunities for patients with non-healing ulcers which are technically and/or medically inoperable.

Keywords: Pedal bypass; Critical lower limb ischemia; Subintimal angioplasty; Endovascular.

Introduction

In recent years endovascular techniques have gained a more prominent place in the treatment armamentarium for peripheral vascular disease. The rational behind this are good data that limb-salvage is equivalent after bypass surgery or endovascular treatment in critical ischemia.1 Using the principle of subintimal recanalisation we examined the feasibility of percutaneous pedal bypass.

Report

A 74 years old man with a 20 year history of type 2 diabetes presented with an infected necrotic ulcer on the stump of an amputated third digit of his right foot. The patient had a long history of previous surgical bypasses and endovascular interventions both on the left and the right leg for critical ischemia and non-healing ulcers. He had previously received several minor toe amputations both left and right. The blood pressure in the right dorsal pedal artery was 0 and in the posterior tibial artery 39 mmHG with an ankle-brachial index of 0.23. After antegrade puncture an angiography was performed. The superficial femoral artery showed no significant of stenosis.

There was an abrupt occlusion in the distal popliteal artery. Through collaterals there was distal filling of a very small proximal peroneal artery with outflow to a collateral (Figs. 1 and 2). This artery was revascularised with the subintimal technique with good result. The outflow was however poor and was judged insufficient to obtain good revascularization of the foot. There were no other distal arteries detected (Fig. 2). Nevertheless the anterior tibial artery was also recanalised with the subintimal technique and this recanalization was extended all the way to the distal part of the dorsal pedal artery. No reentry was obtained. Angiography demonstrated that the subintimal channel had good outflow to many collaterals and even filled the plantar artery (Figs. 3–5). No further action was undertaken. A review 3 days later showed an arterial pressure in the dorsal pedal artery of 113 mmHg with an index of 0.72 and a pressure of 85 in the posterior tibial artery with an index of 0.54. The patient was discharged receiving warfarin and aspirin. At 6 weeks follow-up there was a good and rapid ulcer healing.

Discussion

Endovascular techniques for peripheral vascular disease have for a longtime been judged as a second best solution. It is only in the last decade, that these techniques have gained much popularity among the surgical community.
Fig. 1. Shows occlusion of the distal popliteal artery and a small proximal peroneal artery refilled through collaterals.

Fig. 2. The outflow of the peroneal artery is a small collateral. No other distal arteries are seen on the angiography.

Fig. 3. End of the new subintimal channel at the site of the dorsal pedal artery with good collateral filling.

Fig. 4. This shows the new subintimal channel.
One of the new innovations, subintimal angioplasty, has for many years been surrounded by skepticism and disbelief. Now this technique is more accepted. Subintimal angioplasty is based on a few facts. In arteries that are occluded, sometimes even for years, the vessel wall, in particular the media, can be used as a new conduit to overcome occlusions. Patency of the subintimal recanalisation is often durable enough to obtain sufficient rise in arterial pressure and flow to establish ulcer healing and limb salvage. This has been described before as a percutaneous temporary bypass. This technique would not be considered in patients with intermittent claudication because of the unpredictable long term haemodynamic patency. The technique is minimal invasive, low risk and has no contraindications except maybe for severe obesity. Surgical inoperability due to absence of venous material or poor medical condition is not applicable to a percutaneous procedure. Even lesion or occlusion length is not a real contraindication if one aims for limb salvage and not for haemodynamic patency. In most patients with critical ischemia and a non-healing ulcer, the limb is still vital and not dead, despite the minimal blood supply, suggesting the presence of a distal low flow arterial system, not detected on angiography. This low flow arterial system is either a remaining part of the main arteries or only collaterals. We have shown that it is possible to recruit this system and to use it as the outflow for a new subintimal channel. Whether this will always provide sufficient improvement in flow to obtain limb salvage needs further investigation. This report however shows that we are still not at the end of the endovascular possibilities, even regarding endovascular treatment of very distal peripheral disease.

Fig. 5. Situation at the end of the procedure. Flow through the peroneal artery and the anterior tibial artery.

References

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