

## Retrograde pedal artery access for below-the-knee percutaneous revascularisation

Massimiliano Fusaro<sup>a,b</sup>, Abdulkafi Tashani<sup>b</sup>, Nadia Mollichelli<sup>b</sup>,  
Massimo Medda<sup>b</sup>, Luigi Inglese<sup>b</sup> and Giuseppe G.L. Biondi-Zoccai<sup>b</sup>

*Journal of Cardiovascular Medicine* 2007; 8:216–218

<sup>a</sup>Catheterisation Service, Casa di Cura, Abano Terme (PD), Italy and  
<sup>b</sup>Catheterisation and Cardiovascular Radiology Service, Policlinico San Donato,  
San Donato Milanese (MI), Italy

Correspondence to Dr Giuseppe G.L. Biondi-Zoccai, Via Aurelia 5, 18014  
Ospedaletti (IM), Italy  
Tel: +39 3408 626829; fax: +39 0184 502244;  
e-mail: gbiondizoccai@gmail.com

Received 7 February 2006 Accepted 16 March 2006

Since its introduction in clinical practice, percutaneous transluminal angioplasty (PTA) has commonly been employed for the treatment of peripheral arterial disease. Thanks to major technical advances, such as the development of subintimal angioplasty [1], PTA has recently been employed in the most challenging settings, including below-the-knee (BTK) atherosclerotic disease symptomatic for critical limb ischaemia (CLI) [2].

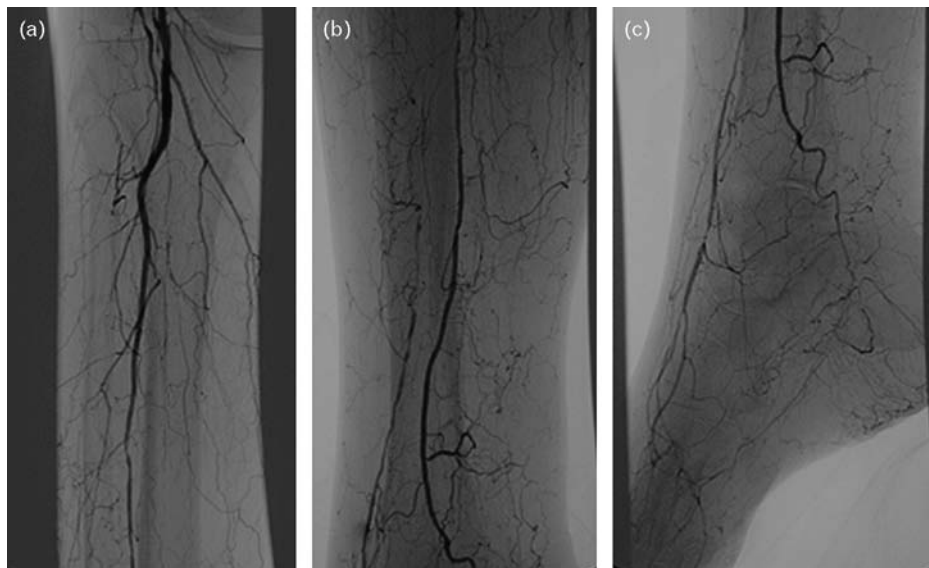
While the most common arterial access sites for PTA of CLI are the cross-over contralateral access and the antegrade ipsilateral femoral site, recanalisation of BTK occlusions can be unsuccessful in up to 20% of patients with CLI [3]. We hereby report the use of a novel arterial access, the retrograde dorsalis pedis artery, to successfully recanalise a total occlusion of the anterior tibial artery.

A 73-year-old diabetic female symptomatic for rest leg pain and non-healing ulcers on the dorsum of the right foot was referred to our service for peripheral arteriography and potential percutaneous revascularisation. Antegrade common femoral artery puncture was performed using a 19G needle (Cordis, Milan, Italy), and a slow flow injection was performed through the needle to confirm the good position in the common femoral artery and favour wiring of the superficial femoral artery. A 6F sheath (Terumo, Rome, Italy) was then inserted and diagnostic angiography was carried out using the side arm of the introducer sheath. Right lower limb arteriography disclosed long total occlusions of the anterior tibial, peroneal, and posterior tibial arteries, extending from the below the knee to the foot (Fig. 1).

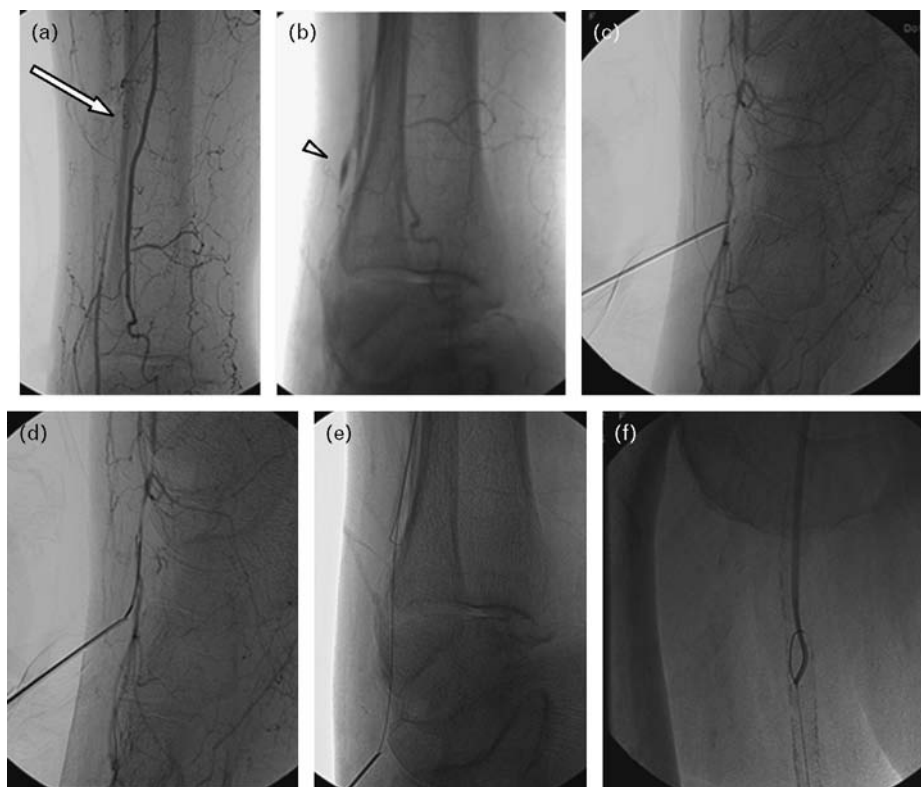
We attempted percutaneous recanalisation of the anterior tibial artery, approaching the lesion at first with a 0.014" hydrophilic guidewire (PT Graphix Super Support, Boston Scientific, Genoa, Italy) according to the subinti-

mal angioplasty technique [1] (Fig. 2a). Unfortunately, this caused vessel perforation with contrast extravasation in the absence of successful distal lumen re-entry (Fig. 2b). Instead of interrupting the procedure, we chose to attempt retrograde dorsalis pedis artery access. Given the lack of a dorsalis pedis pulse, arterial puncture was performed under fluoroscopic guidance, using a 21G needle (Terumo) and a 0.018" V18 Control wire (Boston Scientific) (Figs 2c and d). The long total occlusion of the anterior tibial artery was crossed successfully with a subintimal technique, leaving the 0.014" wire deployed from the femoral sheath as a landmark (Fig. 2e). A goose neck loop snare (Microvena, St Paul, Minnesota, USA) was inserted through the femoral sheath inside a 4F Berenstein catheter (Cordis) and enabled the snaring of the V18 wire at the superficial femoral artery level (Fig. 2f). The V18 wire was then retrieved through the femoral sheath and pulled out. An over-the-wire balloon (Bijou, Boston Scientific) was delivered from the femoral sheath over the V18 wire up to the foot, and we pulled back from the dorsalis pedis artery the V18 wire and wired again the artery from above using the balloon as tracking device. Haemostasis at the dorsalis pedis level was achieved by prolonged balloon inflations, without external compression. Recanalisation of the anterior tibial artery was achieved by extensive PTA of all significantly diseased lesions, and finally revascularisation was completed by means of PTA of the peroneal artery. After documentation of a satisfactory final angiographic result (Fig. 3), femoral haemostasis was achieved with a 6F Angioseal (St Jude, Milan, Italy) and the patient was sent to the ward. The subsequent hospital stay was uneventful, with persistence of dorsalis pedis pulse, subjective improvement in limb pain, and increase in skin oxygen tension.

Percutaneous recanalisation has recently been shown equivalent to bypass surgery in the management of patients with CLI, although standard percutaneous approaches and techniques are still inadequate, as procedural failure can occur in 20% of cases even in experienced hands [3]. While the contralateral retrograde femoral approach was the first access site to be proposed and is still the most commonly used, the ipsilateral antegrade femoral approach can increase procedural success rates, albeit at the price of a small increase in

**Fig. 1**

Baseline angiography of the right lower limb, disclosing long and total occlusions of the anterior tibial, peroneal and posterior tibial arteries, involving the leg (a), ankle (b), and foot levels (c).

**Fig. 2**

Anterior tibial artery recanalisation was attempted unsuccessfully with an antegrade femoral approach and subintimal angioplasty (a) (the 0.014" guidewire tip is indicated by the arrow), but this was terminated because of vessel perforation with contrast extravasation (b) (arrowhead). Retrograde dorsalis pedis artery access was then attempted with a sheathless approach. After puncture with a 21G needle (c) and wiring of the dorsalis pedis artery with a 0.018" V18 Control wire (d), the anterior tibial artery occlusion was crossed by means of subintimal angioplasty (e), using the wire positioned from the femoral artery as a landmark. A goose neck was then employed with a 4F Berenstein catheter to retrieve the V18 wire (f) at the femoral artery level. Finally, sequential balloon dilations with 2.5 and 3.0 balloons (Bijou) were performed at the anterior tibial artery level to recanalise the total occlusion and achieve haemostasis in the dorsalis pedis artery.

Fig. 3



Angiography after percutaneous transluminal angioplasty of the anterior tibial artery and completion of revascularisation with percutaneous transluminal angioplasty of the peroneal artery demonstrated a good final angiographic result in the absence of critical stenoses or flow-limiting dissections. (a) Proximal tract. (b) Distal tract.

local access site complications [2]. Nonetheless, even the antegrade femoral approach may fail to provide a successful means to cross and recanalise challenging BTK lesions. In the present article, we report the use of a novel and hitherto incompletely characterised access site for BTK PTA, the retrograde dorsalis pedis artery. Such an approach, performed limiting the risk of local artery trauma by means of the sheathless technique, appears promising, effective and safe, as testified by the single centre experience reported by the SAFARI investigators [4] and by a recent case series [5].

Specific technical tips for a successful retrograde dorsalis pedis access, which should be taken into consideration by operators interested in this access site, include the use of fluoroscopic and angiographic guidance, small bore needles, 0.018" wires, sheathless approach, externalisation of the wire at the superficial femoral level after snaring, and foot haemostasis by means of balloon inflation without external compression. While other operators performing this technique elect to deploy small sized sheaths in the dorsalis pedis artery, in our opinion this strategy is fraught by an increased risk of local vessel injury and post-procedural thrombosis. This explains our choice for a hydrophilic yet supportive 0.018" wire, with a stainless steel core resistant to the needle sharpness.

In conclusion, the retrograde pedal approach for percutaneous recanalisation of BTK arterial disease appears to be a promising new tool in the interventionist's armamentarium, especially when antegrade revascularisation from the femoral route fails or is deemed unfeasible.

## References

- 1 Bolia A, Brennan J, Bell PR. Recanalisation of femoro-popliteal occlusions: improving success rate by subintimal recanalisation [letter]. *Clin Radiol* 1989; **40**:325.
- 2 Faglia E, Dalla Paola L, Clerici G, Clerissi J, Graziani L, Fusaro M, *et al.* Peripheral angioplasty as the first-choice revascularization procedure in diabetic patients with critical limb ischemia: prospective study of 993 consecutive patients hospitalized and followed between 1999 and 2003. *Eur J Vasc Endovasc Surg* 2005; **29**:620–627.
- 3 Adam DJ, Beard JD, Cleveland T, Bell J, Bradbury AW, Forbes JF, *et al.*, for the BASIL Trial Participants. Bypass versus angioplasty in severe ischaemia of the leg (BASIL): multicentre, randomised controlled trial. *Lancet* 2005; **366**:1925–1934.
- 4 Spinosa DJ, Harthun NL, Bissonette EA, Cage D, Leung DA, Angle JF, *et al.* Subintimal arterial flossing with antegrade-retrograde intervention (SAFARI) for subintimal recanalization to treat chronic critical limb ischemia. *J Vasc Interv Radiol* 2005; **16**:37–44.
- 5 Awasthi A, Almanaseer Y, LaLonde T, Davis T. Percutaneous retrograde revascularization of lower extremity vessels by using the dorsalis pedis artery: two case reports. *J Invasive Cardiol* 2006; **18**:76–78.