A Limb Saving, Intra-medullary Crural Bypass

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Routing a bypass through a bony structure in a transverse direction during femorodistal bypass procedures has been previously reported. This paper describes a patient who needed a crural revascularisation, but a normal passage through a deep or superficial route was not possible because of the circumferential ossification of the lower left leg muscles as a result of trauma 7 years earlier. The long saphenous vein in the left leg had been used for an earlier reconstruction, ruling out an in-situ graft. A limb saving bypass to the distal posterior tibial artery was performed through an intra-medullary tibial route.

Key Words: Limb saving bypass; Intra-medullary; Muscle ossification.

A bypass route through a bony structure in a transverse direction has been described previously. This report describes a patient who had a limb saving bypass to his distal posterior tibial artery through an intra-medullary tibial route.

A 56-year-old man with an ischaemic left foot was admitted to hospital. Physical examination revealed a left leg with multiple scars in both the upper and lower leg, a very rigid skin and soft tissue distally from the level of the knee joint and an equinovarus contracture of the left ankle.

There was no palpable pulse in the dorsalis pedis artery or the posterior tibial artery. The skin and ‘soft tissues’ overlying the popliteal artery as well as the first 20 centimetres down from the knee joint were bone hard. The forefoot showed signs of advanced ischemia, and all the toes except the great toe were gangrenous.

The bad overall state of the left leg was the result of a work accident seven years previously in which the patient sustained a severe degloving and crush injury of the left leg. Even after seven reconstructive surgical procedures (1995–1996) he remained severely incapacitated and could only walk with crutches. A plain x-ray of his left lower leg showed marked calcification of the proximal calf muscles (Fig. 1). Arteriography showed almost complete occlusion at the level of the infrageniculate popliteal artery and the trifurcation (Fig. 2). However, the posterior tibial artery began to fill 10 centimetres above the medial malleolus and appeared to be the only vessel that supplied the foot. Fortunately the skin overlying the vessel at this point was quite healthy.

In order to perform a crural bypass to the posterior tibial artery, the usual tunneling routes were unavailable because of poor skin quality and muscle induration and calcification. The left long saphenous vein had already been used for an earlier reconstruction and this excluded an in-situ attempt. The only possible option was an intra-medullary bypass route through the tibia.

At operation an 8 mm diameter hole was drilled laterally at the level of the tibial plateau and the posterior tibial artery was exposed just above the level of the medial malleolus. The same incision was used to drill an 8 mm hole in the medial aspect of the tibia, in anticipation of the exit of the bypass. An intra-medullary canal was made between the two holes using a 60 cm disposable subcutaneous tunneler (Medtronic PS Medical, CA, USA). This was used to place a guidewire and the intra-medullary route was secured with the aid of a 6 mm flexible drill.

The long saphenous vein (LSV) from the right leg was harvested, reversed and anastomosed proximally to the common femoral artery. It was then tunnelled subcutaneously above the knee, entering the tibia at the lateral tibial plateau following an intra-medullary...
track in the tibia and leaving the tibia approximately 8 centimetres above the ankle joint. At this level the anastomosis with the posterior tibial artery was made as in standard femoro-crural bypass surgery. Amputation of the dead tissue of the lateral forefoot was done at the same time. After the procedure the patient was anticoagulated.

Five days after the initial operation demarcation was stable at the level of the forefoot. Since the ankle had been in a fixed equinovarus position for more than six years, a Symes amputation was carried out. After wound healing the patient started rehabilitation with a prosthesis at six weeks. The patient could walk almost normally at three months.

Duplex ultrasound scanning three, six and nine months after operation showed patent proximal and distal anastomoses. Since it was not possible to perform a Duplex of the intra-medullary part of the bypass a second angiogram was performed at six months that showed a patent bypass with no signs of stenosis (Fig. 3).

The tibial medullary space can be used as a conduit for a distal vein graft in the absence of healthy skin and musculature in the leg.
References


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