Combined microsurgical and thrombolytic salvage of an ischaemic lower limb in a 1079 gram preterm neonate

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SUMMARY. A 1079 gram preterm neonate suffered complete avulsion of the common and external iliac arteries during aortic balloon valvotomy resulting in complete ischaemia of the lower limb. Salvage by microsurgical extra-anatomic vascular bypass was unsuccessful but additional thrombolytic therapy allowed restoration of blood supply. The limb was then seen to be dependent upon the microvascular bypass. In this case salvage depended upon combined medical and surgical treatment, and the case points to benefits from such a combined approach to therapy.

Advances in cardiology mean that some life-threatening congenital valvar abnormalities may now be corrected using percutaneous trans-luminal balloon catheters to effect valvotomy. Success is achieved in smaller and smaller neonates, but the trans-arterial catheters, by virtue of their size, may themselves cause damage to the peripheral artery through which access is gained (Wessel et al., 1986).

Where such injuries produce vascular occlusion, they may be treated surgically (Davison and Sully, 1988) or by thrombolytic therapy (Wessel et al., 1986), and there is debate as to the relative indications and merits of the two methods (Davison and Sully, 1988; Kirk et al., 1988; Kirk and Qureshi, 1988; Wessel et al., 1986). We present a case that is, to the best of our knowledge, the smallest and youngest case of limb salvage reported, and which illustrates the importance of both approaches in a case in which neither alone could succeed in salvaging an extensive vascular injury.

Case report

An 8-day-old neonate weighing 1079 grams at birth and with a gestational age of 28 weeks, was referred urgently from another hospital following a balloon valvotomy to correct critical aortic stenosis. Vascular access for the balloon catheter had been via the right femoral artery, and upon withdrawal of the catheter a segment of proximal artery had been avulsed and was hanging from the wound. The valvotomy had succeeded in correcting the pressure gradient across the aortic valve and was thought to be successful from the cardiological point of view.

On arrival, 2 hours following the procedure, the groin wound was being tamponaded by digital pressure, and some 3 cm of avulsed vessel were found hanging from the puncture site. On release of the tamponade the entire limb remained totally ischaemic as judged by pallor, lack of capillary return on pressure, absent pulses at all sites on examination with a 10 MHz doppler and absence of bleeding to pin-prick.

Under general anaesthesia surgical exploration from the level of the profunda femoris artery to the aortic bifurcation was undertaken via a retroperitoneal approach splitting the inguinal ligament. The avulsed arterial segment was found to include the common iliac artery (from the level of the aortic bifurcation) in continuity with the external iliac artery and the common femoral artery, and this arterial segment had been avulsed from the origins of the internal iliac artery and the profund femoris artery, and remained attached distally to the superficial femoral artery. Hence all effective collateral supply to the limb was destroyed.

Revascularisation from the aorta was felt to carry the morbidity of transperitoneal access and the risk of catastrophic haemorrhage from the site of avulsion and the ipsilateral long saphenous vein was therefore harvested with a view to undertaking an extra-anatomic femoro-femoral arterial bypass.

The reversed vein graft was tunnelled suprapublically, and, using 11/0 nylon, an end-to-side microvascular anastomosis was performed to the left common femoral artery which had a lumen diameter of approximately 0.4 mm. End-to-end anastomosis was then performed to the right superficial femoral artery distal to the site of trauma. The absence of any back bleeding from the distal femoral stump again confirmed the complete avascularity of the limb.

Initially the graft supported flow, but the proximal anastomosis became occluded. The anastomosis was taken down and found to be full of platelet thrombus. The anastomosis was revised and again flow was briefly established before occlusion recurred. After a further revision the procedure was abandoned when the vein graft again occluded, and the wounds were closed, having concluded that the limb could not be salvaged. It was thought likely the child would succumb from the limb damage.

On return to the cardiology ward however, at the instigation of the cardiologist, a thrombolytic infusion of Streptokinase was started and continued for 48 hours. No problem with wound bleeding was encountered. Over this time circulation to the right lower limb slowly improved and it became clearly visible (Fig. 1).

At 1 and 4 weeks postoperatively the limb was examined clinically. The circulation remained intact with good colour and capillary return. Doppler ultrasound confirmed that the vein graft was patent, and occlusion of the graft against the pubis obliterated the signal in the right femoral artery distally and in the right leg below the knee. This is seen as evidence that the graft was now patent and supplying blood to the limb.

The only postoperative complication related to vascular salvage was an inguinal hernia due to poor repair of the
Salvage of an Ischaemic Lower Limb in a Pre-Term Neonate

Fig. 1

Figure 1—The neonate 48 hours post surgery with a viable right leg and thrombolytic infusion running.

ligament when the prognosis was felt to be hopeless. Regrettably the aortic stenosis recurred and at 5½ months of life the child underwent open cardiac surgery, but eventually died at 6 months of age. At that time the graft was still patent and by the above criteria was the main conduit for blood supply to the lower limb.

Discussion

The role of surgery in preserving an ischaemic limb in the newborn child is well documented (Braly, 1965; Davison and Sully, 1988; Fee et al., 1977; Stavorovsky et al., 1975; Wiseman et al., 1977) and satisfactory results have also been reported following the use of thrombolytic therapy alone (Kirk et al., 1988; Kirk and Qureshi, 1988; Wessel et al., 1986).

We believe there are theoretically three possible situations in the vascular tree of a neonate after such an injury.

In the first situation, arterial continuity is preserved but the artery is occluded, and here either thrombolytic therapy or surgery might be expected to be of benefit.

In the second theoretical situation, the vessel continuity is disrupted or occluded but adequate collaterals exist, so that possibly either technique will appear to be successful as the alternative circulation becomes established.

In the third situation, however, suitable collaterals have been destroyed or did not exist, and the axial limb vessel is irreversibly damaged. Surgical restoration is needed to revascularise the limb.

We believe the existence of these three postulated situations following vascular damage is at the root of conflicting reports about the efficacy of either treatment. In the case reported here the third theoretical situation pertained (i.e., the axial vessel of the limb was destroyed as were any collaterals), and surgery converted it to the first theoretical situation (i.e., the axial vessel was in continuity but occluded and no collaterals existed). Thrombolytic therapy was then able to salvage the limb.

References


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