Peripheral Angiography of the Arms and Legs as an Aid to Planning Shunt and Fistula Operations

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A few patients present particular difficulty in planning shunt and fistula operations. Such problems have been encountered in patients when vessels are small or have been damaged by previous transfusion or utilised for previous shunt and fistula operations. Demonstration of all the available vasculature by a single radiological investigation enables the surgeon to plan future access sites and removes much of the anxiety surrounding continued treatment.

TECHNIQUE

A suitably shaped 7 gauge radio-opaque catheter is introduced by the percutaneous technique into a femoral artery. Each subclavian artery is selectively catheterised in turn under television control. The arm is placed in the anatomical position (artero-posterior) and 15 ml of meglumine iothalamate 60% is injected by hand and 10 films are taken, 4 at one per second intervals followed by 6 at 2 second intervals. The films should demonstrate the bifurcation of the brachial artery and the radial and ulnar arteries in the forearm, together with the draining veins.

The catheter is then changed to a straight 7 gauge end and side opening catheter and the tip placed at the bifurcation of the aorta. The feet are internally rotated to separate the images of the tibia and fibula so that these do not obscure the vascular tree; 60 ml of meglumine iothalamate 60% is injected at a rate of 15 ml per second with a pressure injector. A series of films is taken from the aortic bifurcation to the ankles using an AOT film changer with a programmed table top movement. Three films are taken at 1 per second in 4 positions to show the arterial system as far as the ankles. To demonstrate the venous phase repeat injections may be necessary taking films from the knee at 1 per second for 3 seconds followed by 1 every 2 seconds.

With test injections and repeat runs at different timings, the total dose of contrast required for the examination may amount to 150-200 ml.
RESULTS

Three patients have been investigated by this technique. In each case available arteries and veins (including those previously used) were demonstrated. The immediate problem of an access site was solved and long term alternative sites were planned. The anatomy of the pelvic arteries with lumina adequate for transplantation purposes was also demonstrated.

One patient, who was receiving oral anticoagulants, bled approximately 200 ml from the femoral puncture; otherwise we encountered no complications.

ILLUSTRATIVE CASE

Mrs M C was aged 34 at commencement of RDT on 3.11.69. She had chronic glomerulonephritis with secondary hyperparathyroidism and extensive arterial calcification. Unusual difficulty was experienced in establishing an adequate fistula and shunt survivals were short. During the first 15 months of her treatment 10 operations were carried out. Peripheral angiography was performed on 7.2.71 and the findings are illustrated in Figure 1 - 4.

The vasculature of the right forearm is shown in Figure 1. A fistula between the radial artery and cephalic vein had been formed five months previously, but had functioned for a few days only. The angiogram showed that the radial artery did not fill, but the cephalic vein was shown during the venous phase. A good artery and vein, suitable for further fistula formation, were demonstrated on the medial side of the forearm. The presence of a satisfactory anterior interosseous artery indicated that a second fistula operation would be unlikely to jeopardise the blood supply to the hand.

The vasculature of the left forearm is shown in Figure 2. Two fistula operations between the radial artery and the cephalic vein had been done 4 and 3 months previously. Following the second operation, the fistula had been used with difficulty for two months before it thrombosed. The angiogram showed that the narrow radial artery ended in a small aneurysm. The ulnar artery and medial veins appeared adequate for a further fistula operation.

The vasculature of both legs is shown in Figures 3 and 4. At the start of RDT a shunt had been inserted in the right posterior tibial artery and long saphenous vein, but had required repositioning of the venous cannula after two months and had thrombosed completely two months later. A similar shunt in the left leg had required repositioning of the venous cannula after two and four months' use. The overlying skin had become infected and sloughed and the shunt had to be removed after a total of eight months' use. The angiogram, taken two months after removal of the shunt, showed adequate anterior tibial arteries and long saphenous veins in both legs.

On the day after the investigation a shunt was inserted into the right anterior tibial artery and long saphenous vein. This has functioned very well to date. A further fistula operation is planned using the ulnar artery and medial forearm veins. The pelvic arteries appear adequate for transplantation.