DIRECT VEIN GRAFT IN RUPTURE OF POPLITEAL ARTERY

REPORT OF A CASE

BY

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Since the advent of anticoagulants, especially heparin, it has been advised many times in textbooks and in discussions that where there is a gap in the course of a main vessel resulting from trauma, or possibly from the excision of an aneurysm or other operative procedure, and where direct suture is impracticable, reconstitution should be effected by vein-grafting. There are, however, very few such cases reported in the literature in which grafting has been successful. In a subject with healthy arteries it is probably safe to say that the main vessel can be interrupted with impunity, provided that there is not such extensive damage to the soft parts that the collateral vessels themselves are divided and precluded from carrying out their function. Where such damage exists, and where there is other reason to suppose that sufficient collaterals will not function properly, the restoration of blood flow can be secured by means of a vein graft with or without the use of a vitallium tube.

The following case in which a direct vein graft without a tube was used to bridge a gap in the popliteal artery is of interest. The immediate result was successful, but other circumstances led to an amputation six months later.

Case Report

On July 1, 1947, a farm labourer aged 19 was driving a tractor and backing towards an upturned harrow when he fell backwards off the driving-seat on to the spikes of the harrow. He sustained a lateral perforating wound of the left knee, the harrow point passing across the popliteal surface of the femur and grazing it. The wound of entry was considerably lacerated and there was much damage and bruising of the subcutaneous and deep tissues in this area. At the time of examination some two hours later the foot was cold and pulseless and there was a sock anaesthesia. His general condition was good.

Operation was performed with a pneumatic tourniquet *in situ*. The wounds were explored and devitalized tissue was excised. Through an additional posterior midline incision the contents of the popliteal fossa were examined. The popliteal artery was extensively bruised and in spasm over a distance of 2 in. (5 cm.) and the media in one segment was partially divided. The posterior tibial nerve was intact, but the lateral popliteal nerve showed considerable bruising. The affected segment of the popliteal artery was excised and extensive subintimal haemorrhages were found in this part.

As there was much damage to the collaterals, the result of the original trauma, it was felt to be essential to restore the blood flow in the main vessel, and as no vitallium-flanged tubes were available a piece of the internal saphenous vein was excised from the opposite thigh and sutured to the patent cut ends of the popliteal artery. Suture was effected at each end by eight interrupted sutures of silk on the finest needle. The tourniquet was released and, although the graft bulged somewhat, pulsation was immediately apparent, extending into the distal segment of the popliteal artery, and there was no leakage. The wound, owing to its dirty and soiled condition, was lightly packed with petroleum jelly gauze.

A pronounced reactive hyperaemia was immediately apparent in the foot, and both the dorsalis pedis and posterior tibial pulses were full and easily palpable (blood pressure 200/130).

The patient was given heparin, but in spite of the fact that the clotting-time was never above eight minutes severe haemorrhage recurred on the following day and re-exploration and a transfusion were necessary. A tributary of the popliteal vein was found to be bleeding and was tied. The graft was pulsating satisfactorily. Heparin was stopped.

The next day haemorrhage occurred again, and this time was seen to be coming from the popliteal surface of the damaged femur. The graft was still pulsating well and there was no undue bulging; a further transfusion was given. Convalescence proceeded satisfactorily, but from the time of the accident anaesthesia was present over the distribution of the lateral popliteal nerve, and there was similarly a motor paralysis of the lateral and anterior tibial muscles.

On August 25—i.e., almost eight weeks after the injury—an arteriogram (see illustration) showed slight stricture at the site of the anastomosis, but the blood flow was satisfactory and the blood supply of the foot was completely adequate, although the pulses of the affected leg were not quite so good as those in the contralateral limb. Unfortunately a flexion contracture of the knee-joint started and, in spite of treatment, became more pronounced. On January 8, 1948—i.e., six months after the injury—the popliteal area was again explored and was found to be a mass of extremely dense fibrous tissue; in the process of dissecting this out the popliteal artery was irreparably damaged and gangrene of the toes occurred, necessitating amputation of the leg below the knee at the site of election on March 16.

Arteriogram taken eight weeks after injury.

Comment

Experimentally, Murray (1940) has shown that direct vein-grafting of a gap in an artery is completely successful provided the animal is given heparin for about 72 hours, the bleeding-time being maintained at 12 to 20 minutes. He examined the grafts after a four-weeks interval, when patency and hypertrophy of the graft were seen, the latter being confirmed microscopically—in fact, it appeared that the vein had become like an artery.

Certain points of interest arise from my case: (1) The graft was working satisfactorily and was in fact not easy to distinguish from normal popliteal artery when directly inspected 48 hours after the transplantation. (2) The blood pressure following operation was up to 200/130 for some time, and the graft did not bulge significantly. (3) Owing to excessive haemorrhage following operation heparin was not used for more than 24 hours, nor was the clotting-time increased above eight minutes, yet the graft remained patent. I do not suggest that heparin is inadvisable or unnecessary in such cases. (4) Should flanged vitallium tubes not be available, or should they not be considered advisable, it seems that a direct vein graft to bridge the gap in an artery is a rational procedure and has a good chance of success.

REFERENCE

Murray, G. D. W. (1940). *Brit. J. Surg.*, 27, 437.