Successful Replantation of Severed Limbs

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ABSTRACT

Two cases of successful limb replantation are reported. The advantages of a team approach and the basic requirements for beginning a replant programme are outlined.

INTRODUCTION

Successful replantation of the severed arm of a 12-year-old boy by Malt and McKhann in 1964 stimulated worldwide interest in limb replantation. The first successful digit replant was achieved 3 years later when Komatsu and Tamai replanted the completely severed thumb of a 28-year-old man (Komatsu and Tamai, 1968). Since then, numerous cases of successful limb and digit replantations have been reported.

Following are the first two cases of successful limb replantation in the West Indies.

CASE REPORTS

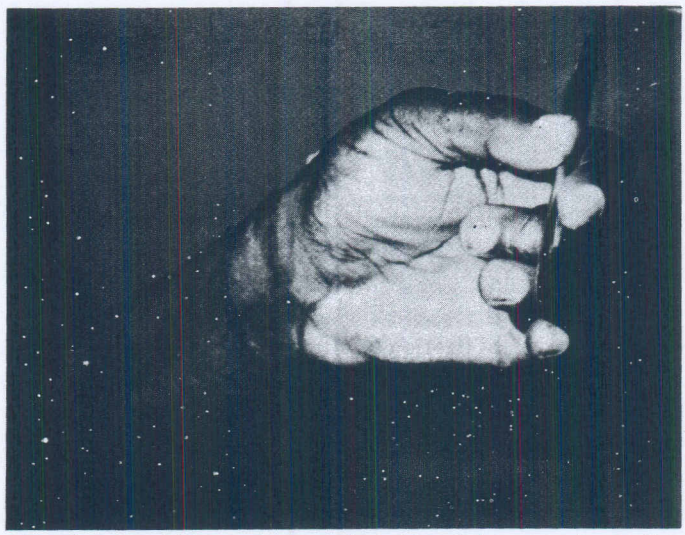
Case 1

A 39-year-old man came to hospital 65 minutes after his left hand was completely severed by a chop across the wrist. The hand was brought in a plastic bag along with the patient. Soon after arrival in hospital, the hand was placed in a clean plastic bag and then immersed in a bowl of ice-cold water. Surgery began about four hours after the injury. The limb was shortened by removal of one row of carpal bones, and the hand was fixed to the forearm using an external fixation (Hoffman's) device. Bone shortening permitted tension-free vascular anastomoses; continuity of the cephalic vein as well as a vein on the dorsum of the hand was restored, using 7–0 prolene. Divided ends of both radial and ulnar arteries were then anastomosed. Good pulsations were noted in the arteries and venous drainage in the veins. The severed ends of the median and ulnar nerves were then carefully apposed. The skin was then approximated. The hand was kept elevated, maintained a good bloodsupply and showed minimal swelling over the following week. Two weeks post-operatively, the wound was reopened and the flexor and extensor tendons were repaired. He recovered uneventfully. After regular physiotherapy, the hand was restored to good function with adequate power and precision grips (Figs. 1 & 2). At 1 year post-op, he still has diminished sensation in the distribution of the radial nerve.

Case 2

A 21-year-old man was admitted 2 hours after a severe chop injury to the left wrist. The chop traversed the entire carpus from ulnar to radial side; the only intact structure was a 2 cm bridge of skin on the radial side with the cephalic vein. The patient was rushed to the operating theatre where the rigid bony fixation was ensured, using two intramedullary rods after shortening the hand by removal of a row of carpal bones. Continuity of both radial and ulnar arteries was restored and one vein on the dorsum anastomosed, using 7–0 prolene. Proximal and distal divided ends of the median and ulnar nerves were approximated, and the flexor and extensor tendons were repaired.

Circulation to the hand was restored 7 hours after the injury, and the patient recovered uneventfully. He is still having physiotherapy four months after surgery, and has good power and precision grips though there is some stiffness of the fingers.



Figs. 1 and 2: Photographs of replanted hand 1 year post-operation showing good power and precision grips

DISCUSSION

Over the past 20 years, results with limb replantation have improved steadily. As experience with this problem increased, indications for surgery, methods of preserving the severed part, the technique of replantation and the principles of post-operative care have evolved. These are already well outlined in the literature (Malt and Smith, 1977; Zhong-Wei and Yueh Se, 1980; Biemer, 1981).

Replantation should be considered for all cases of severance of a limb if the condition of the patient permits. The severed part must be relatively well preserved since those that are severely crushed or avulsed might not return to useful function. The duration since injury should be less than 10 hours though successful replants have been achieved after 36 hours; the survival rate of the replanted part diminishes rapidly if more than 10 hours have elapsed (Zhong-Wei and Yueh Se, 1980). This seems to be directly related to the metabolic changes which take place in the severed part. These can cause irreversible cell damage or may lead to the accumulation of metabolites in the tissues.

In these circumstances, revascularisation can lead to metabolic acidosis and hyperkalaemia while kinin release may result in swelling due to increased capillary permeability in the tissues. The magnitude of these disturbances is related to the duration of ischaemia, volume of the severed part and the technique of its preservation (Tamai, 1980).

In our setting, however, the other critical factors relating to successful limb replantation would be (i) rapid mobilisation of a replant team skilled in micro-surgical techniques and (ii) facilities for micro-surgery.

Ideally, the replant team should have, at minimum, an orthopaedic, a plastic and a vascular surgeon who are interested in replant surgery and who have a clear well-defined plan of action for the patient presenting with a severed limb.

There is no doubt that the single most significant factor contributing to improved results in replant surgery is the advance in microvascular surgical technique (Tamai, 1980). A small range of microvascular instruments (including scissors, needle holders, forceps and clamps), vascular sutures (7–0 to 11–0 polypropylene or nylon) and facilities for working with magnification, are enough to begin a replant programme. Because replants are few and the interval between them likely to be long, the team should be doing microvascular work regularly, either in the laboratory or clinical setting, so that a replant would summon very familiar surgical techniques.

Because the requirements, both in personnel and equipment, are available in the West Indies, it should be relatively simple to begin a programme in situations where increasing trauma might demand these services from the surgeon.

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