

# Salvage replantation: free composite transfer from a non-replantable arm

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**Summary**—Free transfer of two undamaged fingers from a non-replantable left arm to a mutilated right hand in a 16-month-old boy is reported.

The first successful cross-replant was carried out in China in March 1971 (American Replantation Mission, 1973). Since then, several reports of salvage of useful parts in multiple digital or extremity amputations, to improve prehension or achieve a more functional amputation, have been published (Alpert and Buncke, 1978; Jupiter *et al.*, 1982; Colen *et al.*, 1983).

## Case Report

On August 5th, 1981, a 16-month-old boy was knocked down by his family garden tractor which carried three rotary blades which were running at the time and resulted in mid-humeral amputation of the *left* arm and multiple digital amputations of the *right* hand. The amputated limb was mutilated and the major nerves were avulsed from the distal segment. The right little and ring fingers

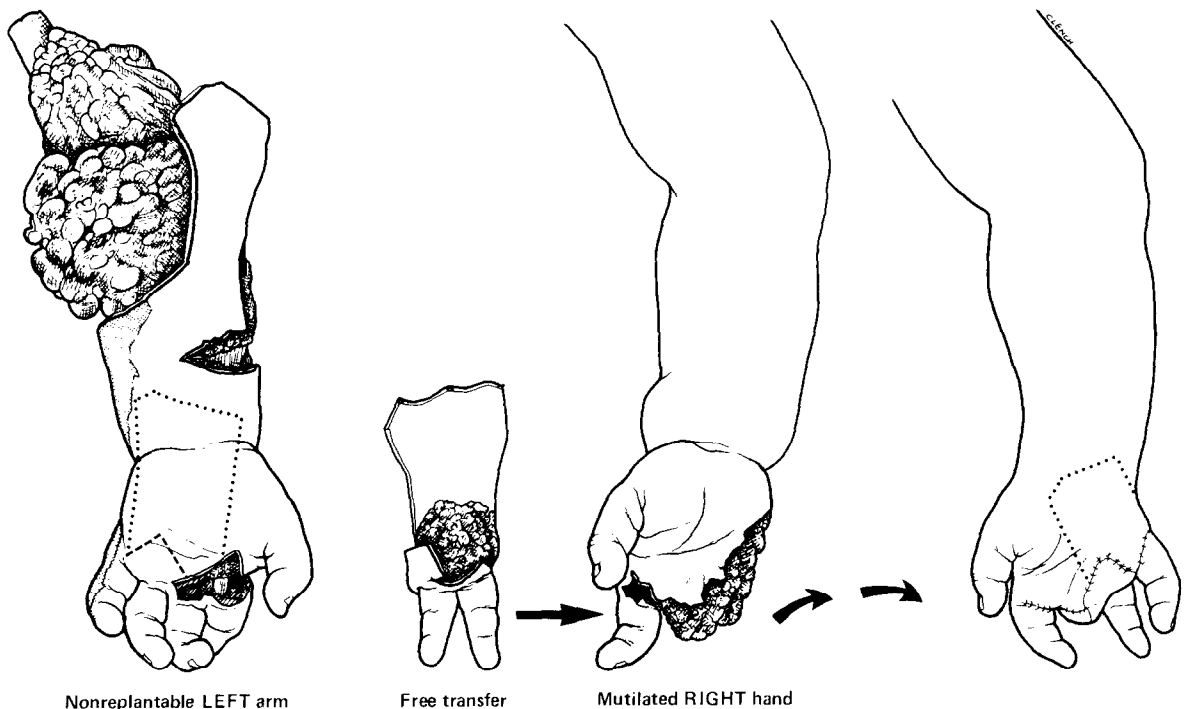


Fig. 1

Figure 1—The left arm, amputated at the mid-humeral level, was mangled. The amputated fingers of the right hand were non-replantable. The diagram illustrates the transfer of the left middle and ring fingers to the metacarpal stumps of the right little and ring fingers, respectively.

were amputated proximal to the MCP joint and the middle finger was amputated through the PIP joint. Left arm replantation was not considered in view of the extent of damage. The amputated right fingers were also non-replantable. One reconstructive option was to transfer fingers from the relatively undamaged left hand to the right (Fig. 1). The left middle and ring fingers were harvested for microvascular transfer; the superficial palmar arch and the common digital nerves were isolated and traced proximally to the ulnar artery and median nerve, respectively. K-wires were used for bone fixation and only the flexor digitorum profundus tendons were repaired. The ulnar artery of the transfer was anastomosed end-to-side to the right ulnar artery and the median nerve, innervating most of the transferred digits, was coapted in an epineural fashion to the stump of the superficial branch of the ulnar nerve. A single dorsal venous anastomosis completed the transfer. Secondary procedures included bone grafting for non-union, flexor tenolysis and transfer of the extensor tendon of the middle finger stump to the transferred fingers. Four years following transfer (Fig. 2) growth of the fingers have progressed in line with that of the index. The range of active movements and sensation are satisfactory. The patient has been using the transferred digits for most manual activities and especially for holding large objects.

The parents, aware that a middle finger stump ray amputation can improve the appearance of the hand, have opted to postpone further surgery.

### Discussion

Amputated parts not replantable to their primary anatomic site can be utilised in reconstructing multiple injuries in various ways. Primary finger transfer as recommended by Yoshizu *et al.* (1978) and Biemer (1981) has become an accepted practice in the management of untidy multiple digital amputations; replantable digits may be transferred to the more important digital rays, restoring the thumb and at least one finger whenever possible. Revascularised flaps dissected from non-replantable amputated parts have been used for better closure of stumps (Alpert and Buncke, 1978; May and Gordon, 1980; Jupiter *et al.*, 1982; Waterhouse *et al.*, 1984). Cross-replantation is the most dramatic way of salvaging parts not replantable to their primary anatomic site. Cross-foot (American Replantation Mission, 1973), cross-hand and "thumb-

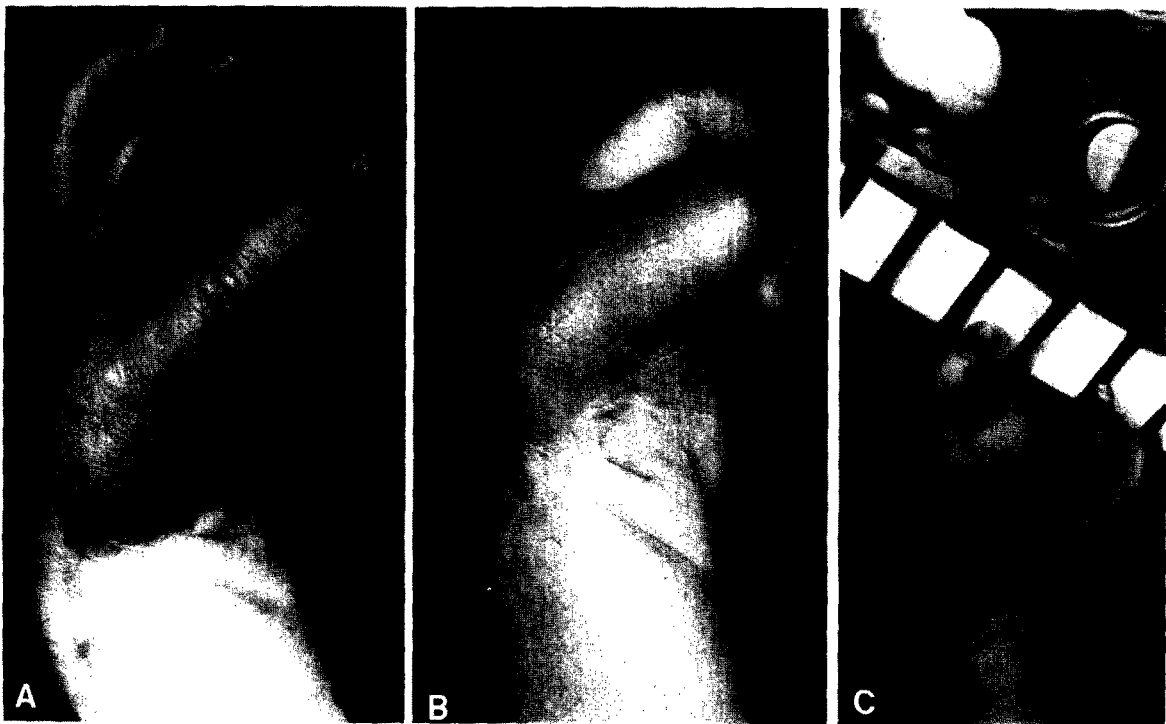


Fig. 2

Figure 2—Appearance 4 years following transfer. The patient has a good grip and can use the fingers independently.

switch" procedures (Wang *et al.*, 1981; Colen *et al.*, 1983) have been reported.

In our case, transfer of three fingers would have been ideal but, unfortunately, only two of the left hand fingers escaped significant damage; neither of them was transferred to the middle finger ray to avoid sacrifice of the proximal phalanx and the MCP joint which would have been unacceptable should the transfer prove unsuccessful. The appearance of the hand can be readily improved by ray amputation and this may be considered in the future. The proximal part of a long dorsal flap included in the transfer could not be maintained by back flow from the digital circulation and this suggests an independent skin territory.

### Conclusion

Parts not replantable to their primary anatomical site should not be discarded before the overall reconstructive needs of the stumps or other associated injuries are considered. Grafts, vascularised flaps or "replants" may be harvested to effect closure or reconstructions either primarily or as a delayed planned procedure. The presence of a reconstructive surgeon during the initial management of patients with multiple limb injuries would decrease the need for secondary reconstructions and donor site morbidity. The transfer in our patient has added immeasurably to the function of the boy's remaining hand.

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