

Replantation of Subtotal and Total Amputated Hands, Long Term Follow-up after Return of Sensory and Motor Functions

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ABSTRACT

Two cases of amputated hands (subtotal and total) salvaged by immediate replantation are reported. In both cases repair done for all severed structures after stabilization of the bony skeleton. Pre-operative general examination of both patients and local examination of the amputated hand and the proximal stumps included plain X-ray. Patients were followed up for a period ranged from 1-2 years. Both cases survived without any vascular compromise and followed by a long physiotherapy course. The post-operative outcome of the motor functions was satisfactory in case (2) and limited in case (1) and both patients were satisfied with their results.

INTRODUCTION

Replantation surgery has become one of the clinically common procedures in surgical practice nowadays. Successful replantation can be performed when the amputation stump and the amputated part are suitable for microvascular repair [1,2].

Malt and McKhann in 1962 reported the first successful replantation of completely amputated arm of a 12 year old boy [3]. Since this early report replantation of severed extremities has become an accepted procedure [4].

With the rapid advancement of microsurgical technique and related knowledge, the major emphasis has now shifted to the functional recovery of the restored part rather than mere survival [5].

There are several factors that contribute to the success rate of replantation: Severity of injury, lapse of time from amputation to replantation, level of amputation and number of anastomosed vessels [8,9].

We report successful replantation of two cases of subtotal and total amputated hands.

CASES REPORTS

Case 1:

A male patient 27 years old, suffered from subtotal amputation of the left hand at the thenar-hypothenar level just distal to the wrist caused by electric saw, all the hand structures severed except the dorsal skin with the underlying dorsal veins and extensor tendons.

Ischaemia time was 2 hours.

General examination of the patient and local examination of the hand done, then plain X-ray of the injured left hand to assess the level of the severed bone.

Rapid routine investigations and immediate resuscitation of the patient.

Surgical technique:

Under pneumatic tourniquet, fixation of bones with k-wires then identification of all volar structures under loop magnification. Repair of flexor pollicis longus tendon and the four flexor digitorum profundus tendons. Repair of neurovascular structures by the use of surgical microscope: Ulnar artery, ulnar nerve, both lateral and medial branches of the median nerve just after the bifurcation of the trunk and also, the recurrent motor branch just before entering the thenar muscles, the princeps pollicis artery of the thumb anastomosed to the deep palmar arch.

Repair of the thenar and hypothenar muscles and then closure of the wounds with rubber drains, loose dressing with posterior slap for support.

Post-operative period:

Proper hydration of the patient and Heparin 1000IU/hour continuous infusion.

Closed monitoring for 10 days after surgery both clinically and by Doppler. The patient discharged from the hospital after 2 weeks and followed up for 1 year after the procedure.

The K-wires removed after 6 weeks after healing of the bones.

Case 2:

A male patient 25 years old, suffered a total amputation of the right hand just proximal to the wrist joint due to falling of heavy steel plate over the hand.

Ischaemic time was one hour.

The patient was immediately resuscitated and given blood transfusion, then examination of the hand clinically, by X-ray and rapid routine investigation done.

Surgical technique:

General anaesthesia. Under pneumatic tourniquet, debridment of the soft tissues, tagging of the important structures with clamping of the vessels in the proximal stump under loop magnification, then minimal shortening of both radius and ulna. Fixation of the ulna by rush pin and the radius by plate and screws then release of the tourniquet.

Stabilisation of the wrist by repair of both flexor carpi radialis and ulnaris tendons.

Perfusion of the hand started by anastomosis of the radial artery and cephalic vein, then repair of the flexor pollicis longus and the four flexor digitorum profundus tendons. Repair of the ulnar artery & nerve and then the median nerve.

Lastly we turn the hand to prone position in which repair of the extensor tendon and the basilic vein.

Closure of the wounds directly with a small piece of split-thickness skin graft in the volar aspect of the forearm, loose dressing and posterior slap.

Post-operative period:

Proper hydration of the patient,
heparin 1000IU/h continuous IV infusion.

Closed monitoring for 10 days after surgery clinically and by Doppler.

Physiotherapy:

Started from the 5th day after surgery.

The patient discharged from the hospital after 3 weeks and followed regularly for 2 years after the procedure.

RESULTS

Both cases survived without any vascular compromise after surgery. Passive physiotherapy started during the first post-operative week, four weeks post-operatively both cases began active range of exercises.

The patients were followed up for one year in case (1) and for 2 years in case (2).

Objective testing at 6 months post-operatively showed satisfactory range of active wrist and fingers motion in case (2) and limited unsatisfactory motion in case (1). The intrinsic muscle function was weak in case (2) and absent in case (1).

Patient satisfaction:

Both patients were satisfied with their results.

DISCUSSION

Hand replantation is the most satisfying and enduring because no prosthesis can replace its functions specially the return of sensibility, the most important step of the procedure is the vascular repair. Bone shortening is very crucial because it allows a relaxed repair of all structures [6,12].

Also in cases of amputation from crushing, the ability to anastomose the vessels is relatively difficult than in sharp injuries with lower success rate [10].

In replantation proximal to the metacarpal level, immediate arterial inflow is necessary to prevent or diminish myonecrosis, therefore after initial debridment and rapid bone stabilization, at least one artery must be anastomosed and then surgical sequence is continued as usual [3].

Debridment of the ends of the vessels until reaching a healthy zone with the use of vein graft is better than anastomosis of unhealthy ends or under tension [11].

The decision to replant an amputated part is not always easy. Factors that must be considered includes: the predicted morbidity to the patient, the expected chance of survival and functional outcome of the replanted part [3].

Understanding of the patient's personality and motivation, along with a clear explanation of the difficulties in resuming a limited functional recovery of the replanted extremity, may help to improve a patient's satisfaction even in the face of an objectively functional failure [7].



Fig. (1-A,B): Subtotal amputation of the left hand at the thenar-hypothenar level.

Fig. (1-C): Immediate post-operative picture after replantation.



Fig. (1-D,E): Outcome of the procedure after one year.



Fig. (2-A,B): Total amputation of the right hand just proximal to the wrist joint.



Fig. (2-C): Pre-operative X-ray shows the level of amputation.



Fig. (2-D): Immediate post-operative view after full replantation.



Fig. (2-E): Early post-operative X-ray, shows the fixation of bones.



(F)



(G)



(H)

Fig. (2-F,G,H): Functional outcome, 2 years after replantation.

In conclusion, hand replantation is tedious, time consuming procedure, needs microsurgical experience. So, proper selection of the case is very important and also long term post-operative physiotherapy has an important role in the final outcome of the procedure.

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