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## Case Report

# Ectopic multiple digit replantation salvage of hand torsion injury following anterolateral thigh perforator flap coverage

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## ARTICLE INFO

### Article history:

Received 10 August 2023

Accepted 10 October 2023

Available online 14 October 2023

### Keywords:

Ectopic replantation

Free flap

Mini ex fixator

Finger implantation

Crush injury

## ABSTRACT

Retrieval of four finger injury at proximal stump amputation with segmental injury along with soft tissue defect and impending compartment syndrome continues to be challenge for the surgeon. Immediate transplant considering temporary ectopic foster as a practical option in special case. We describe temporary ectopic finger implant for crush injury at Metacarpophalangeal (MCP level) with hand torsion along with forearm compartment was fostered to Dorsum of the foot. The torsion fingers was temporary fixed with mini external fixator for stabilization as salvage, ALT free flap was used to cover soft tissue defect of the hand. Replantation of survived figure was performed using the long pedicle to anatomical site without crushing the MCP joint to allow for later tendon transfer for finger. Satisfactory function regained with no foster site (foot) complication like pain or disability. The author validated ectopic foster for amputee as and procedure of choice for salvage of extremity under special circumstances.

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## Introduction

With introduction of microsurgery methods and modernization, replantation is a frequently performed procedure, after careful medical consideration.<sup>1,2</sup> Re-implantation of upper or lower extremity is redoubtable surgical procedure carrying severe and life-threatening complications, if not treated promptly.<sup>3</sup>

This case report presents our clinical experience of managing a unique ectopic finger re-implant with free anterolateral thigh (ALTP) flap and compartment release using dorsum of foot as ectopic foster which were temporary fixed with mini external fixator.

## Case report

In 2014, a 50-year-old male sustained a right-hand injury, the hand was strangled by wire rope. Metacarpophalangeal joint of patients middle, ring, and little figure was completely cut-off and index finger was crushed and hinged by flexor attachment with degloving injury to dorsal surface of hand and flail thumb with crushing of soft tissue underneath (Figure 1). Patient's consent was taken for ectopic care of finger using right dorsum of foot as foster for few weeks to re-assure viability of fingers and also to prepare re-implantation infection free.

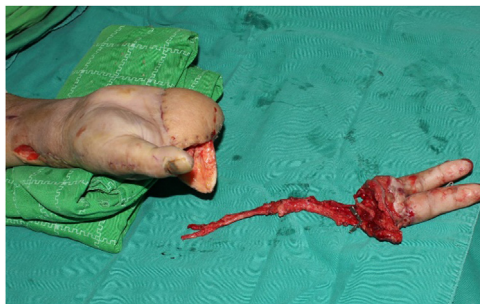
- Stage 1 (Ectopic Fostering): The right hand was debrided under emergency general anesthesia. The middle, ring, and little fingers were fostered to the left foot using dorsal foot vessel (Dorsalis Pedis Artery) as anastomosis, as it was looking fairly good and viable for re-implant. Fracture of the thumb was fixed and all other fractures were stabilized with K wire (1.2 mm). The middle finger was fixed to the foot tarsal bone with a mini ex fix for stability and the remaining fingers were held in place after stay suture with each other. Postoperative nursing fingers were treated according to the routine care after replantation. In a day little finger showed sign of avascular necrosis and was excised, but middle and ring finger showed positive sign of survival (Figure 2). Three days after fostering the patient was able to walk with full weight bearing and was discharged.
- Stage 2 (ALTP Flap): After 21 days, An ALTP long perforator flap was harvested and anastomosed with the vessel of forearm. The recipient vessels were radial artery and radial vein, and the arterial anastomosis was performed using the flowthrough technique. Donor site was primarily sutured without tension.



**Figure 1.** Amputee fingers with defect of soft tissue and exposed tendons of flexors and extensors.



**Figure 2.** Fingers replanted to dorsal surface of the foot after anastomosis with dorsal digital vessels.



**Figure 3.** ALTP flap and re-implantation.

- Stage 3 (Finger Re-implantation): Middle and ring finger along with long pedicle of the foot (Dorsalis pedis Artery and its accompanying vein, the great saphenous vein) was harvested and re-implanted after 6-week from trauma and 3 week post ALTP flap into 3rd and 4th metacarpal head (Figure 3). Long pedicle anastomosed to radial artery and cephalic vein. Extensor was sutured to Extensor Digitorum Communis the secondary defect of the foot was covered with split thickness skin graft. Three weeks after re-implantation patient was allowed to mobilize thumb passively and weekly progression was noted and within 6-week thumb was mobilized actively. Finger re-implant showed pseudo arthrosis was scheduled for monitored physiotherapy after 2 weeks.

The patient was advised for routine finger mobilization under physiotherapy care followed by holding, lifting and gripping objects, and pen for 4 to 8 week after re-implantation. Thumb showed good opposition and grip strength (Figure 4).

## Discussion

Hand torsion and avulsion injury has always been a challenge in hand surgery. In our case, re-implantation in situ was a complicated surgical option, considering the fact that the severed fingers had to be significantly shortened and the expected success rate was low. As per our clinical judgement and other available literature,<sup>4-7</sup> we used ectopic replantation combined with free thigh ALTP flap to repair a right hand crush injury. We considered designing a 3-phase repair plan.

- Stage 1 (Ectopic Fostering): To preserve the severed fingers to the maximum extent, and uses the blood vessels of the foster donor area (left feet). The common palmar artery of the detached middle ring little finger was found to have a relatively complete lumen and an anastomosis condition after exploration. Its caliber matched the caliber of the first and second dorsal



**Figure 4.** Postoperative recovery of the case. Good opposition and grip strength.

metatarsal arteries, and there were multiple venous returns on the back of the foot, which could match the back of the finger. Venous anastomosis solves the problem of compound tissue valve return. The consideration was based on our understanding that ectopic fostering will create a good anatomical basis for the smooth replantation. The common palmar artery of the detached middle ring little finger was found to have a relatively complete lumen and an anastomosis condition after exploration. The arteries of the severed body were anastomosed end-to-end without tension. When replanting in foster care, we follow the sequence of retrograde finger replantation.

- Stage 2 (ALTP Flap): The ALTP flap was used to repair the skin and soft tissue defect wounds of the distal palm, retaining the palm length to the greatest extent, and creating sufficient soft tissue conditions for the hand receiving area for the subsequent replantation.
- Stage 3 (Finger Replantation): It is quite controversial about when to perform the replantation of the foster limbs. We chose to replant at sixth weeks, as the wound healed well, there was no active infection, and the foster limbs restricted social and activities. The fingers which established sufficient blood circulation in the foster donor area were removed and replanted to completed the restoration and reconstructions with the nutrient vessels. Functional rehabilitation training was started 2 weeks after the operation.

Patient complaint and was an important factor in getting good functional outcome. Patients Visual Analog Scale scored improved significantly from 8 after fostering fingers to toes to 2 after re-implantation, insensate but protective sensation recovered.

## Conclusion

Ectopic replantation is a special type of replantation of severed fingers and limbs, with strict indications and contraindications. It must be considered when there are clear indications. Such patients often have complicated and serious injuries, long warm ischemia time, and special ectopic replantation procedures that require professionals and units to implement. Therefore, strictly observe the preservation of the limbs and the control of warm ischemia time, and implement damage control when necessary. In fact, in our opinion, easy and quick vascular anastomosis of ectopic replantation was itself a special type of traumatic controlled surgery. According to our experience, the dorsum of the foot is a better place for foster care. There are many choices of arteries and veins and longer vascular pedicles, which will cause little trauma and impact on the donor site of the foot.

## Conflict of interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the results of this article. LongBiao Yu and other co-authors have no conflict of interest.

## Ethics approval

All surgical procedures were performed following the instructions approved by the Ethics Committee of Peking University Shenzhen Hospital.

## Funding

This research was supported by grants from [National Natural Science Foundation of China](#) (No. [82102568](#)), [Shenzhen Key Medical Discipline Construction Fund](#) (No. [SZXK023](#)), [Shenzhen “San-Ming” Project of Medicine](#) (No. [SZSM201612092](#)), [Guangdong Basic and Applied Basic Research Foundation](#) (No. [2022A1515220111](#); No. [2021A1515012586](#)) and [The Scientific Research Foundation of Peking University Shenzhen Hospital](#) (No. [KYQD2021099](#)).

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