

Replantation of a circumferentially degloved ring finger by venous arterializations

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ABSTRACT

Treatment of ring degloving injuries of the finger is one of the most demanding problems in hand surgery. Replantation has been advocated as the best solution if the vessels belonging to the degloved skin are not irreversibly destroyed. We present a case involving a ring finger with circumferentially avulsed skin. Debridement under microscopy showed that the peeled skin did not retain any arteries, but did have various superficial veins of good caliber. The neurovascular bundles of the finger remained *in situ* and did not appear to be disrupted. The degloved finger survived uneventfully by venous arterialization, retaining excellent function and appearance.

Key words: Finger degloving injury, replantation, venous arterialization

INTRODUCTION

Degloving injury of the fingers is one of the most serious hand injuries.¹⁻³ The main problem with replantation of degloved fingers is extensive damage to long segments of vessel.^{1,3} Various studies have focused on vein grafting³ or vessel transfer¹ to revascularize avulsed skin. However, when the artery in the avulsed tissue is absent, those methods are not possible. We present a case of complete degloving injury of the ring finger, wherein the digital arteries were absent in the degloved skin. The digit survived by replantation using venous arterialization and a satisfactory functional result was obtained.

CASE REPORT

A 41-year-old woman sustained a complete degloving injury of her right ring fingers by a roller machine in January 2011. The finger was denuded of skin and subcutaneous tissue from the middle part of the proximal phalanx to as far as

the nail plate, leaving bones, tendons and the nail bed intact [Figure 1a and b]. The degloved skin was preserved except for a 5 cm longitudinal strip on the dorsum of the finger. The nail demonstrated brisk bleeding. The function of flexor and extensor tendon was preserved. The vessels were cautiously located in the subcutaneous layer under microscopy. The neurovascular bundles remained in good condition in the denuded finger. There were numerous good-caliber (one mm diameter or greater) superficial veins in the palmar and dorsal aspects of the peeled skin. Vein arterialization was determined as a blood supply to the avulsed skin. After the digital Allen test to the ring finger was confirmed intact, the ulnar digital artery was transected. The proximal artery was anastomosed with a distal vein in the palmar aspect of the avulsed skin without tension. Two dorsal veins were anastomosed for outflow. The skin was loosely closed with 5/0 nylon. The finger turned pink. Dextran (500 mL daily) was infused for 5 days to enhance microcirculation. Swelling and congestion appeared for 3 days after the operation, but these findings subsided and the finger survived uneventfully. After 3 months, the patient returned to her previous job. At 1 year followup, the active range of motion of at the metacarpalophalangeal joint was 0°-90°, at the proximal interphalangeal joint 0°-110° and at the distal interphalangeal joint 10°-40°. Light-touch sensation of the ring finger was intact and she scored a value of 9 mm on static 2-point discrimination testing. She did not complain of any cold intolerance of the ring finger. She was satisfied with the appearance and function of the digit [Figure 1c-e].

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DISCUSSION

Replantation should be attempted as proposal of choice

for a degloved finger² as the cosmetic and functional characteristics of native finger skin are irreplaceable by any other reconstruction procedures. In our patient, the neurovascular bundle was found not in the degloved skin, but rather intact in the denuded finger. The technique of vein arterialization was chosen, as it has been conducted in hand degloving injuries⁴ and finger replantation.⁵ In our case, the ring finger survived completely and obtained an almost full range of active motion at the metacarpal and proximal interphalangeal joints.

Vein arterialization is a valid approach to re-establish the blood supply of a degloved finger, provided that physiological circulation restoration was not possible and veins in the degloved tissue are not damaged. Mitchell *et al.* discovered in an animal model that veins were prone to injury more easily than arteries because of their thinner walls, hence less stretching occurred.⁶ When there is limited damage to the veins, it is possible to do vein arterialization to salvage degloved skin. Lin *et al.* recently described a case of incomplete avulsion injury of thumb at the dorsal aspect was successfully salvaged by means of vein arterialization.⁷ In our case, we extended this technique to the treatment of complete degloving injury to the ring finger. It is not

technically challenging to perform vein arterialization, owing to the fact that the proximal artery and distal vein are situated close to each other and are of similar diameters.

Traditionally, denuded fingers were resurfaced with local flaps or tubed pedicle flaps,⁸ but the functional and esthetic results have been unsatisfactory. Free great toe wrap-around flap combined with second toe medial flap can lead to more acceptable results for the degloved finger,⁹ but this technique fails to obtain optimal function and good shape as compared with those obtained with replantation. Moreover, the morbidity of the donor site is always a concern. In this case, as the neurovascular bundles and tendinous structures were relatively well-preserved, a skin graft harvested from the peeled skin could be applied to the entire surface of the degloved wound, as Jeng *et al.* advocated.¹⁰ Nevertheless, less favorable result was obtained from skin grafting since the subcutaneous fat is detached off during debridement. Regardless of these methods, completely degloved fingers failed to achieve optimal function and appearance. In the present case, the full length of the finger with an intact nail was preserved after replantation by vein arterialization [Figure 1c and d].



Figure 1: Clinical photographs of right hand showing (a) The right ring finger was completely degloved from the middle part of the proximal phalanx (dorsal aspect). (b) The palm side of the ring finger preoperatively. (c,d,e) Full range of motion (postoperatively at 1 year followup)

In our patient, the digital nerve was preserved in the denuded finger and light touch sensation and static two-point discrimination sensibility were restored well at postoperative 1 year without the need for nerve repair. This may be attributable to the relatively intact nerves having the ability to find their original skin targets. The exact mechanism of tissue perfusion and survival of vein arterialization remain to be clarified. Further study on these issues is needed.

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