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CASE REPORT
Hand

Long-term Follow-up of Hand-degloving Injury Treated by Conventional Methods

Hana Ishii, MD*†
Koji Moriya, MD, PhD†
Hiroko Narisawa, MD, PhD†
Naoto Tsubokawa, MD, PhD†
Yutaka Maki, MD, PhD†
Kenichi Shimada, MD, PhD*

Summary: Despite medical advances, degloving injury remains one of the most difficult traumatic injuries to treat. The conventional method for treating degloving injury of the hand is reconstruction with a groin flap. However, few reports have described the mid- or long-term functional and aesthetic outcomes after a hand reconstruction with a groin flap. This case report describes a 68-year-old woman with no specific medical history who presented with a severe degloving injury of the right hand, caused by a roller machine. The area of skin loss was covered with a pedicled groin flap that was separated after 3 weeks. Five years after the reconstruction, she had poor functional and aesthetic outcomes. The Japanese Society for Surgery of the Hand version of the Quick Disabilities of the Arm, Shoulder and Hand score was 57.5; the Hand20 score was 60; and the Michigan Hand Outcomes Questionnaire score was 37.5. The static two-point discrimination of the index and middle fingers was more than 15 mm, and Semmes-Weinstein monofilament examination showed that the sensation thresholds of these fingers were purple and blue. The range of motion was 10-degree angle of extension and 60-degree angle of flexion for the metacarpophalangeal joints of the index and middle fingers. Grip strength was 0.0 kg; pulp pinch strength of the index and middle fingers was 1.1 and 0.8 kg, respectively; and side pinch of the index and middle fingers was 0.1 and 0.7 kg, respectively.
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The ideal treatment for degloving hand injuries is replantation and revascularization of the avulsed skin (Fig. 1).[1] However, such treatment is often unsuccessful because degloved skin is frequently damaged or contused. In particular, the pulling nature of such injuries may cause the vascular intima to be seriously contused, often severe damage to the digital vasculature.[2] A groin flap is easily accessed and often used for the reconstruction of degloved skin. However, good functional and cosmetic outcomes may not be achieved because of the poor sensory function and bulkiness of the groin flap.[3,4] Few reports have focused on the mid- to long-term results of hand-degloving injury reconstruction with a groin flap. This report describes the mid-term functional and subjective results of a hand-degloving injury reconstructed with a conventional groin flap.

*From the *Department of Plastic and Reconstructive Surgery, Kanazawa Medical University Hospital, Ishikawa, Japan; and †Niigata Hand Surgery Foundation, Niigata, Japan.*

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CASE PRESENTATION

A 68-year-old right-handed woman sustained degloving injuries of her right index, middle, ring, and small fingers caused by withdrawal of her hand from a knife-sharpening roller machine in which it was trapped (Fig. 2). The index and middle fingers had circumferential skin loss to the distal metacarpophalangeal (MP) joints. The ring finger had dorsal skin loss from the MP to the proximal interphalangeal (PIP) joint, and the small finger had skin loss to the dorsal proximal phalanx. Emergency surgery was performed under a brachial plexus block with a tourniquet. The index and middle fingers were amputated at the PIP joints because of the severe crush injuries. A 1-mm Kirschner wire was used to temporarily fix the MP joints of the index, middle, ring, and small fingers in the flexed position to prevent contracture. The exposed areas were covered with avulsed (without vascular anastomosis) and artificial dermal skin. (**See figure, Supplemental Digital**

Disclosure statements are at the end of this article, following the correspondence information.

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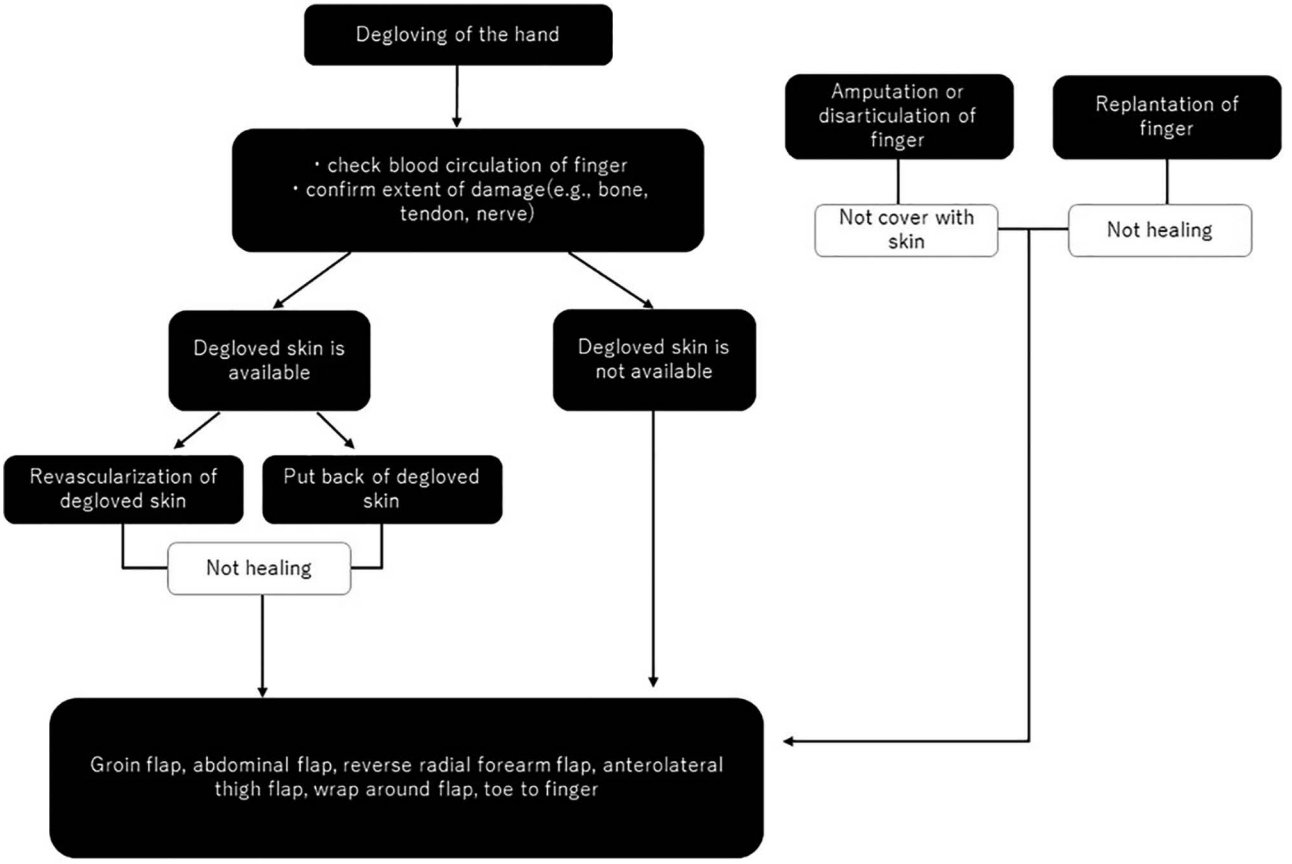

Fig. 1. Algorithm of treatment of degloving injuries of the hand. Revascularization and re-implantation of the avulsed skin are the ideal options; however, there are many alternative treatments available when such treatment is unsuccessful.

Content 1, which displays the results after the first surgery. http://links.lww.com/PRSGO/D181.)

After 10 days, the wound was debrided, and a pedicled groin flap from the ipsilateral side was used to cover the entire circumference of the index and middle fingers and areas dorsal to the MP joints. (**See figure, Supplemental Digital Content 2,** which displays the pedicled groin flap from the ipsilateral side. http://links.lww.com/PRSGO/D182.) Kirshner wires were removed simultaneously. Three weeks later, the flap pedicle was separated to achieve skin coverage. Early active and passive training of all finger joints was started the day of flap separation. Three months later, we created a second web space in the right hand. At 6 and 10 months after surgery, the flap was thinned.

Five years after reconstruction, a goniometer showed that the active range of motion of the index and middle finger MP joints was −10°of extension and 60° of flexion. (Fig. 3) Grip strength was 0.0 kg; pulp pinch strength of the index and middle fingers was 1.1 and 0.8 kg, respectively, while the side pinch strengths of the index and middle fingers were 0.1 and 0.7 kg, respectively. The visual analog score for pain was 3–4 when an object touched the patient's fingers. Semmes-Weinstein monofilament examination showed that the sensation threshold was purple for the dorsal and palmar aspects of the index finger and dorsal aspect of the middle finger, and blue for the palmar aspect of the middle finger. The static two-point discrimination of the index and middle fingers was greater than or equal to 15 mm. The Japanese Society for Surgery of the Hand version of the Quick Disabilities of the Arm, Shoulder, and Hand score was 57.5 (moderate disability). The mean Hand20 scores were 60. The patient had difficulty picking up coins, rolling and squeezing a towel, using a knife, hanging wet clothes on a hanger, and turning pages. She also hid her hand for cosmetic reasons and had difficulty performing recreational activities.[4] The Michigan Hand Outcome Questionnaire[5] score was 37.5 for the appearance of the reconstructed finger, and the patient used a prosthetic finger when she went out. Radiography of the ring finger showed mild osteoarthritis of the PIP joint and marked bone atrophy of the phalanges.

DISCUSSION

Although the thumb remained intact, the thumb-to-index and middle finger pulp and side pinch strengths were reduced because sensory function was not restored. Although the patient was originally right-handed, the injured right hand was used only to support the left hand. She could no longer use a sewing machine, and her injured

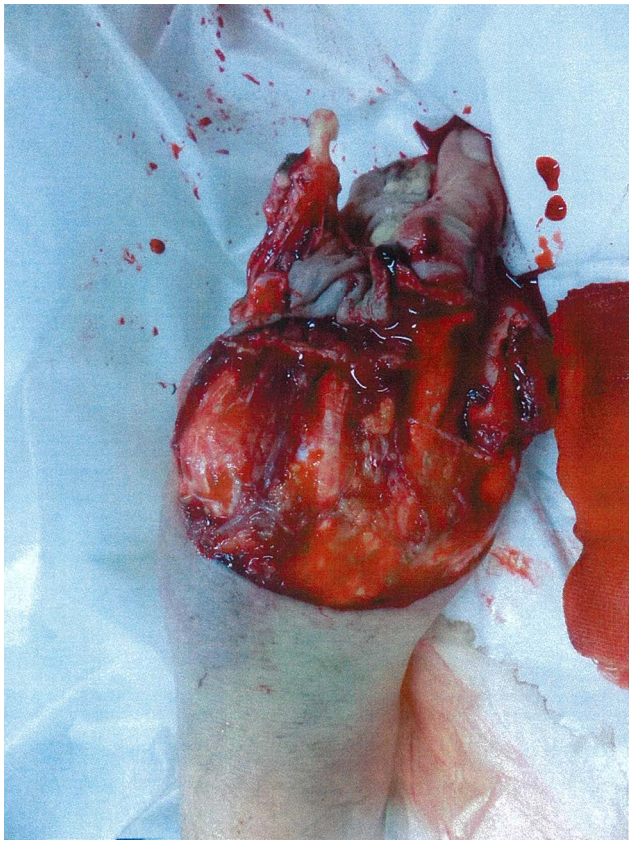

Fig. 2. Photograph at the time of injury.

Fig. 3. The hand is shown 5 years after the surgery.

right hand interfered with daily life because of sensory issues with her index and middle fingers. Additionally, the injured hand has a strong negative impact on cosmetic and social activities. We believe that in many cases, the mid-term functional and subjective results of hand-degloving injuries reconstructed using conventional methods are poor.

Soft tissue defects should be covered with vascularized tissue within 72 hours to prevent infection.[6,7] The first-line treatment for degloving injuries is replantation and revascularization of the avulsed skin; however, a flap is used when replantation is impossible. Donor flap sites include the groin, abdomen, radial forearm, and anterolateral thigh.[3] Although these flaps are easy to harvest and reliable, they cannot reconstruct the sensation or grip and pinch functions, which are important to prevent poor functional and subjective results of hand reconstruction.[8]

Sensory reconstruction is crucial for the thumb and the opposing fingers.[9] If sensory reconstruction of the index and middle finger had been performed, patient satisfaction might have been higher. The cosmetic outcome of hand reconstruction is also important. Toe-to-finger transfer or wrap-around flaps are effective for sensory acquisition; however, we hesitated to use these flaps because of the patient's age. Immediate toe transfer is reportedly very effective and results in a shorter hospital stay and an early return to work.[10] Because many patients have difficulty accepting a toe-to-finger transfer or wrap-around flap immediately after the injury, we considered that covering the degloved hand with a groin flap was the next best option. In retrospect, however, toe transfer should have been proposed regardless of patient age. Future studies with large sample sizes are required to fully examine this issue.

In conclusion, a pedicled groin flap achieved unsatisfactory functional and aesthetic outcomes for reconstructing our patient's hand-degloving injury. Reconstruction of sensory function of the hand is important. Short-term results are poor, and the long-term results can also be poor without sensory reconstruction.

Hana Ishii, MD
Department of Plastic and Reconstructive Surgery
Kanazawa Medical University Hospital
1-1 Daigaku, Uchinada-machi, Kahoku-gun
Ishikawa 920-0293, Japan.
E-mail: hanamed12@gmail.com

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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