Microsurgical Arterialization of Degloving Injuries of the Upper Limb

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The authors describe a technique in which a microsurgical anastomosis between an artery and a vein in an afferent direction (through a vein graft, when necessary) of a degloved flap is used to revascularize or arterialize the flap. In 3 difficult cases, there was substantial salvage of flap tissue. *(J Hand Surg 2012;37A:825–831. Copyright © 2012 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Anastomosis, arterialization, degloving, distal, microvascular.

A LARGE AREA OF degloved, devascularized skin and subcutaneous tissue is a difficult problem for the reconstructive surgeon. The plane of the degloving injury is usually at the level of the investing fascia, and the degloved tissue is devascularized due to an avulsion injury to the multiple small perforating vessels.[1,2] Consequently, direct microvascular anastomosis is not feasible, and there is often an associated crush component.

Treatment has usually involved excision of the devascularized tissue, either immediately or following a wait-and-see period. Vascularity of the degloved tissue is judged on clinical grounds or with the assistance of intravenous dye.[3,4] Modes of skin cover have included the degloved skin as an immediate graft, split skin grafts, and various flaps.[2,5–9]

The procedure we have used to revascularize 3 difficult degloving injuries of the upper limb is to microsurgically provide an arterial input in an antegrade manner, into an afferent vein of the flap, and to rely on the available venous drainage; that is, microsurgical arterialization of the degloved flap.

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CASE REPORTS

Case 1

A 46-year-old man caught his dominant, right upper limb between 2 industrial rollers and presented with a circumferentially, distally based degloving injury. The distal limit of the degloving injury was the volar aspect of the radiocarpal area. Proximally, it extended to the cubital fossa (Fig. 1). The distally based, degloved flap was devascularized. There were associated carpal fractures and clinical features of an acute carpal tunnel syndrome or median nerve contusion.

The plane of the degloving injury was distally deep to the veins, but proximally, it was superficial to them, so that the distal part of the degloved flap contained veins, whereas proximally, the veins were noted in the deep, investing fascia.

Under general anesthetic and following lavage, the degloved tissue was unrolled to a tension-free state. An acute carpal tunnel decompression was done through a longitudinal incision (the skin was noted to be degloved at this level), and the intrinsic muscles were decompressed through 2 separate, longitudinal dorsal incisions. Thirty minutes after the skin was returned to its anatomical position, it was noted to be still devascularized. Revascularization was achieved using the operating microscope to anastomose the dorsal branch of the radial artery, turned proximally through 180°, end to end to a large dorsal vein in the flap. Five centimeters beyond this, the cephalic vein was noted to exit the degloved tissue to continue in fascia. At this point, the vein was ligated to direct the arterial inflow into

FIGURE 1: Case 1. The degloved skin and subcutaneous tissue extended from elbow to midcarpus. When rolled back, tension free, it remained devascularized.

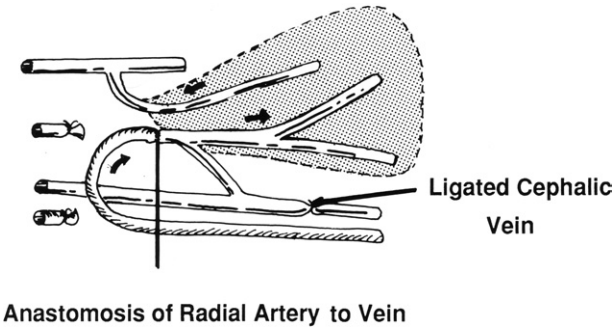

FIGURE 2: Case 1. Scheme of microanastomosis between radial artery and vein of flap in an afferent manner to arterialize the flap (stippled).

FIGURE 3: Case 1. Note the anastomosis between the radial artery and vein adjacent to the snuff box. Other incisions are to decompress the intrinsic muscles.

the venous system of the flap in an afferent manner (Figs. 2, 3).

At the level of the cubital fossa, no veins in the flap were suitable for anastomosis, so that the venous outflow was provided by the remaining intact veins at the wrist, presumably in a retrograde manner. Upon arterialization of the flap, there was immediate evidence of vascularization—the flap immediately became pink, had brisk capillary return (Fig. 4), was warm, and showed evidence of active bleeding from the edge of

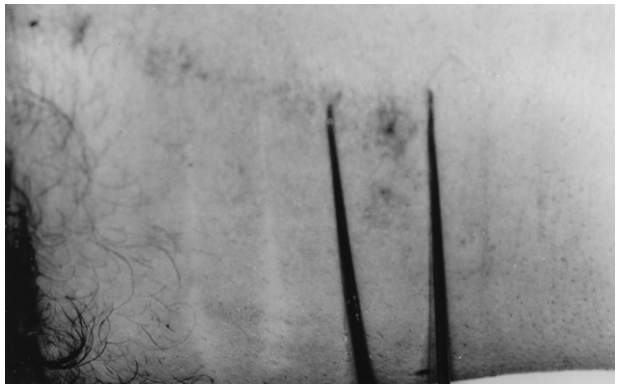

FIGURE 4: Case 1. Demonstration of capillary return after arterialization.

FIGURE 5: Case 1. On postoperative day 10, flexor aspect. Note proximal meshed skin graft where the degloved flap would not reach and the small area of necrosis of the proximal part of the flap.

FIGURE 6: Case 1. On postoperative day 10, extensor aspect. Note some proximal necrosis and the skin grafts over the hand incisions (including over the microanastomosis).

the lacerated flap, where previously there had been none.

The residual 5-cm gap between the returned skin and cubital fossa had an immediate split skin graft applied. Over the ensuing days, the proximal part of the flap developed venous stasis, and 14 days after injury, the nonviable proximal skin of approximately 3 cm in length (Figs. 5, 6) was treated by one further debridement and split skin graft. There was complete take of the skin grafts. Further treatment, after skin vascularity was ensured, included closed reduction and percutane-