

Combination Latissimus Dorsi and Groin Free Flap with Double Microvascular Transfer

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A combined free tissue transfer using the skin and muscle supplied by the thoracodorsal artery and the superficial circumflex iliac artery (groin flap) was transferred to reconstruct a large lower extremity soft-tissue defect. The combination of these two flaps allowed coverage of a large tissue defect, more reliable coverage than either of these flaps alone, and direct donor site closure.

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Patient Report

A 30-year-old motorcyclist was hit by an automobile while traveling at a high rate of speed. He was transported by helicopter to the trauma center. He had sustained a brief period of loss of consciousness, but on arrival at the emergency room he was alert and conscious. A massive degloving injury of the right lower extremity with loss of skin and muscle extending from the midhigh down to the ankle was sustained. The midshaft of the femur was fractured, and the bone was visible through the wound. An open right ankle fracture, an open right ulna fracture and multiple open metacarpal fractures on the right hand, and a left pubic ramus fracture were also present.

After hemodynamic stabilization the patient was transferred to surgery. Internal fixation was performed on the open ulnar fracture and the right femur and tibia fractures. Nonviable skin and muscle were debrided from the leg wound. Two days later he was brought back to the operating room for a second debridement. Plastic

surgery consultation was obtained because of exposed hardware over the distal femur and an exposed patella. Devitalized rectus femoris, vastus intermedius, vastus lateralis, and tibialis anterior muscles were present in the open wound and debrided. Medial and lateral gastrocnemius muscle flaps were used to provide satisfactory coverage of the patella and fixation plate. However, further necrosis of the lower extremity skin and muscles occurred.

After complete debridement, the proximal tibia, extensor digitorum longus tendons at the ankle, and femoral hardware proximal to the gastrocnemius flap remained exposed (Fig A, C). Sensation was normal on the plantar surface of the foot despite the large amount of soft-tissue damage to the extremity.

Reconstruction options were discussed with the patient and his family, including amputation. The patient refused amputation. Reconstruction of the extremity was planned. Because of the length of exposed femur and tibia, a single microvascular transfer would not be adequate to cover the defect. A combined flap using the latissimus dorsi musculocutaneous flap and groin flap was planned.

The combined flap design was based on the left thoracodorsal artery, the superficial circumflex iliac artery, and the watershed area between these two flaps. A skin paddle 10 cm in width was raised as a groin flap and in the cutaneous portion of the latissimus dorsi flap. This flap was of suitable size to cover the tibia, and direct closure of the groin and back defects was possible. The cutaneous portion of the flap was 54 × 10 cm. Including the latissimus dorsi muscle, the flap was 64 cm long (Fig E).

Two surgical teams were used for the flap and recipient site dissection. The dissection began over the latissimus dorsi muscle. The musculo-



A



B



C



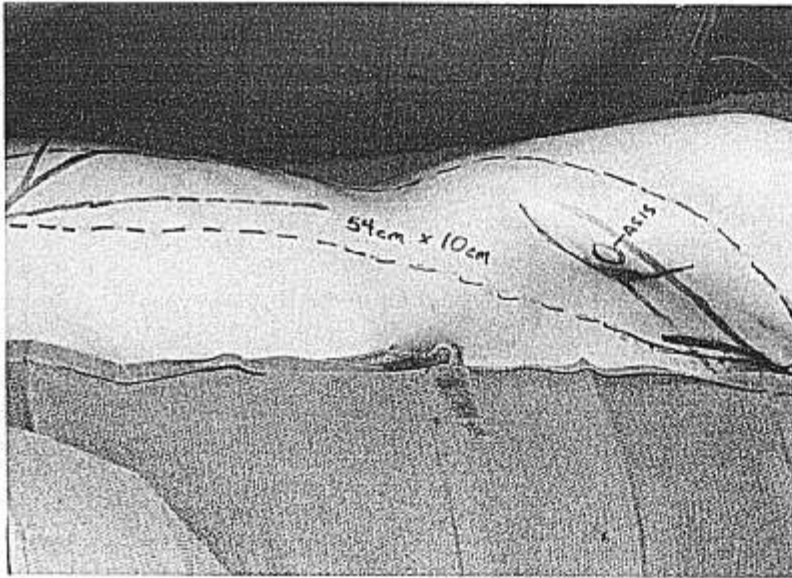
D

(A, C) Defect from degloving wound right leg. The medial gastrocnemius flap covers the exposed knee, the tibia is exposed below the knee; the extensor digitorum longus tendons and the femoral fixation plate are exposed. (B, D) Sixteen months post-operatively, patient has good range of motion of knee and stable skin coverage. All fracture sites are healed. (E) Design of combination latissimus dorsi and superficial circumflex iliac artery flap. (ASIS = anterior superior iliac spine.) (F) Donor-site scar removed 16 months postoperatively. (G) Flap raised in situ still attached to its vascular pedicle. Total flap length is 64 cm. (H) Flap is set into place; the latissimus dorsi muscle covers the distal femur. The skin pedicle covers the exposed tibia and tendon.

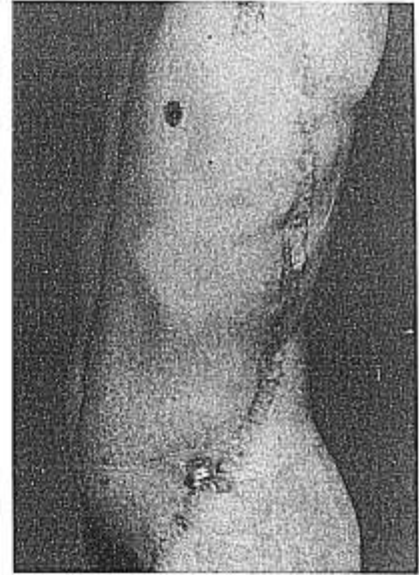
cutaneous flap was elevated in the standard fashion. The thoracodorsalis vessels were identified and followed to the subscapular vessels. Before the distal dissection of the latissimus dorsi flap was completed, the superficial circumflex iliac artery was identified by Doppler signal. The vessel was marked, and the groin flap was designed 5 cm above and below the vessel. The proximal dissection was started on the groin flap. As the dissection continued distally, the flap was transilluminated to visualize the superficial circumflex iliac vessels. These vessels were followed to

where they joined the distal aspect of the latissimus dorsi flap. The skin paddles between the two vascular territories were confluent at this point, and the remainder of the flap was elevated (Fig G).

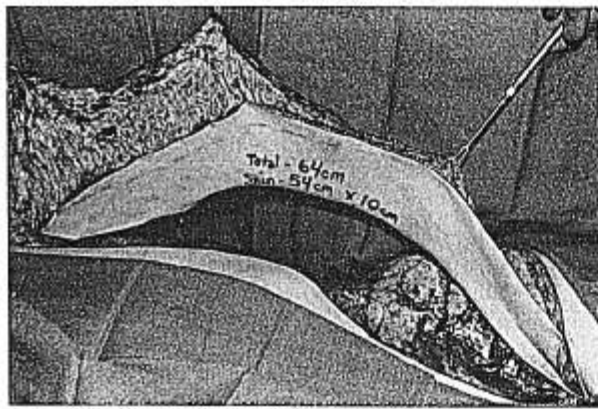
The second surgical team dissected recipient vessels, the posterior tibial vessels at the level of the ankle, and the superficial femoral vessels above the knee. The flap was inset on the leg (Fig H). The subscapular artery was anastomosed end to end to a muscular branch of the superficial femoral artery above the knee. The subscapular



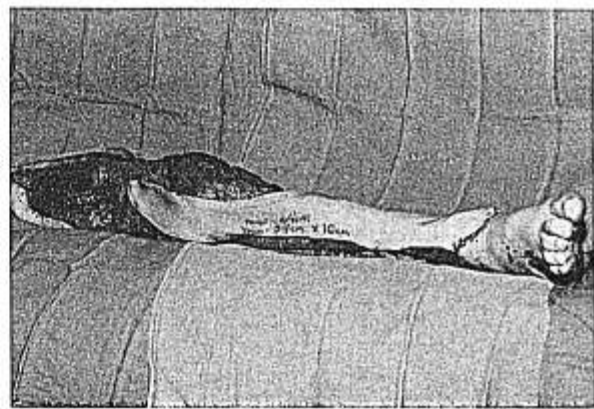
E



F



G



H

Fig (continued).

vein was anastomosed end to end to a tributary of the superficial femoral vein. Flow to the entire flap was re-established. There was bleeding from the edges of the skin paddle and good outflow through the vein.

The distal arterial anastomosis was performed between the superficial circumflex iliac artery and the posterior tibial artery in an end-to-side fashion using 10-0 nylon suture. An end-to-side anastomosis was performed between the venae comitantes of the superficial epigastric circumflex artery and the posterior tibial vein. There was excellent pulsatile flow and good bleeding

through the groin skin edge. The flap was inset with the latissimus dorsi muscle covering the exposed knee joint and femoral fixation plate. The donor site was closed primarily (Fig F). The groin flap covered the exposed tibia and extensor digitorum longus tendons. Split-thickness skin grafts covered the remaining areas of the leg.

The patient's postoperative course was uneventful. He was discharged home on postoperative day 10. While in the hospital the patient was started on a physical therapy program, which was continued on an outpatient basis. Flexion of the knees was present to 100 degrees, and active

extension of 15 degrees is present. He has 30 degrees of ankle range of motion. He is able to walk without use of a cane (Fig B, D).

Discussion

Harii and colleagues [1] introduced the combined latissimus dorsi musculocutaneous and groin flap in 1981, combining the muscle and skin supplied by the thoracodorsal artery and the skin supplied by the superficial circumflex iliac artery as well as the skin between these flaps. This large flap was used with one undisturbed pedicle of either the groin vessels or the vessels of the latissimus dorsi muscle. The second set of flap vessels was anastomosed to vessels at the recipient site to ensure adequate blood supply to the distal portion of the combined flap. Harii [1] and later Katsaros [2] and their associates also used the combined flap as a bipedicle flap to cover adjacent soft-tissue defect.

Two [3–5] or more [6] simultaneous microvascular free flaps have been used to reconstruct composite defects of bone, muscle, and skin. In these combined free flaps, either one dominant blood vessel with two separate flaps was used [7], such as the combination of a latissimus dorsi flap and a parascapular flap using the subscapular artery as a single microvascular pedicle, or two free flaps were combined with separate microvascular anastomoses in series connection [8] or in parallel [5]. Belousov and colleagues, in 1993, investigated, both in the laboratory and clinically, transfer of combined flaps with dual vascular pedicles. In the Belousov classification, this would be considered a true megaflap because of the complex nature in dual vascular pedicles [9].

In our patient we used a composite flap first described by Harii as a combination pedicle and microvascular flap as a true free flap by performing two sets of microvascular anastomoses. When used as a free flap, the flap can be inset to fit the defect best because it is not limited by the arc of rotation around the intact pedicle. The second microvascular anastomosis adds a mini-

mal amount to the total surgical time. Although the flap can be theoretically based on a single pedicle, with the distal most portion being supplied by the interconnecting “choke” vessels [10], the reliability of the combined flap is ensured by anastomosing both pedicles.

Salvage of the lower extremity after extensive bone and soft-tissue injuries remains controversial [11]; the combined latissimus dorsi and groin flap, when used as a double free flap, can be used to reconstruct massive defects of the lower extremity when a large volume of tissue is required. This combined flap can be performed with low morbidity to the patient.

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