CASE REPORT

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The Medial Sural Artery Perforator Free Flap: Dorsal Hand Defect Reconstruction

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ABSTRACT Having good compatibility to the surrounding tissue and low donor site morbidity, the medial sural artery perforator (MSAP) is a good alternative for the reconstruction of small-to-medium sized defects notably in the hand dorsum following hand burns. This case report describes MSAP flap for the reconstruction of a dorsal hand defect in 3rd degree electrical burn. Twenty year-old female patient attended to our clinic with a 3rd degree electrical burn wound of 20 days old, due to non-healing skin defect on the dorsal hand. Considering the form, the function, and the aesthetic rules, which are the basic principles of reconstructive surgery, and the patient's type of injury, defect was reconstructed with MSAP free flap.

Keywords: Burns, electric; free tissue flaps; perforator flap

The medial sural artery perforator (MSAP) flap was first introduced in 2001 by Cavadas et al. and has been used in the reconstruction of the lower extremities.[1] It has been a valuable option for surgeons in the reconstruction of miscellaneous body parts.[2] Moreover, it has been also used for hand reconstruction purposes due to the fact that as compared to the other fascio-cutaneous flaps; it is thin, has sufficient pedicle length, has a low donor site morbidity, and finally demonstrates more similarities to the hand tissue in terms of thickness and other characteristics.[1-5]

In this paper, we aim to present our case study in which we used the MSAP flap for the reconstruction of a dorsal hand defect in 3rd degree electrical burn.

CASE REPORT

Twenty year-old female patient attended to our clinic with an electrical burn wound of 20 days old. The first examination of the patient showed a 4×6 cm of open wound exposing the 2nd common digital extensor (EDC2) and extensor indicis proprius (EIP) tendons starting from the 1st web to the midline of hand dorsum (Figure 1). The flexion of 2nd finger metacarpophalangeal joint was limited (60°). The patient's defect was reconstructed with a MSAP free flap. The patient encountered no wound recovery problems and was given a 2-month postoperative physical treatment. At the postoperative 3rd month, the motor examination of the 2nd metacarpal joint was normal. However the patient complained about the bulkiness of the flap. Since the flap tissue was thicker from the surrounding tissue, flap thinning process was performed with liposuction. No postoperative wound recovery problem was encountered on 2 months follow up (Figure 2) and final result was satisfactory for patient.

Patient permission for clinical information and images was obtained.

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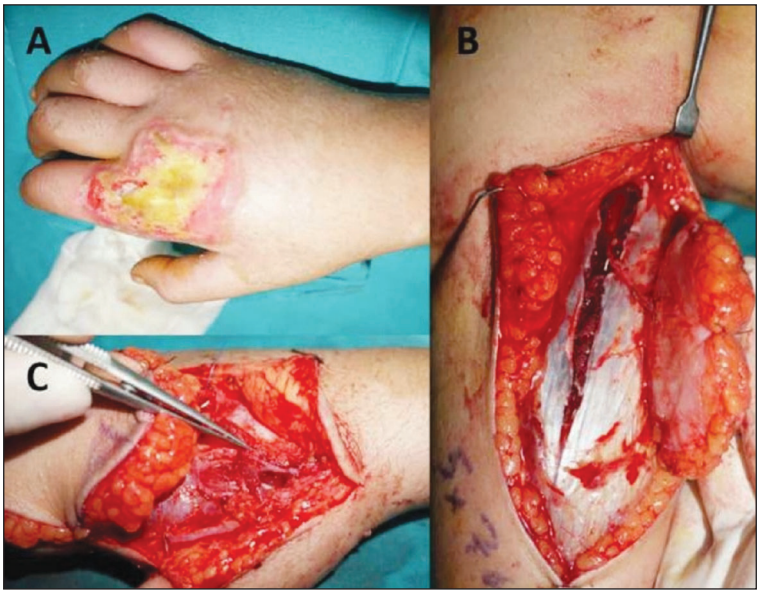

FIGURE 1: A) Perioperative image of wound at right hand dorsum before debridement. **B)** Perioperative image of harvested medial sural artery perforator flap. **C)** End-to-end anastomosis of the medial sural artery to the dorsal branch of radial artery, and the concomitant vein to the cephalic vein.

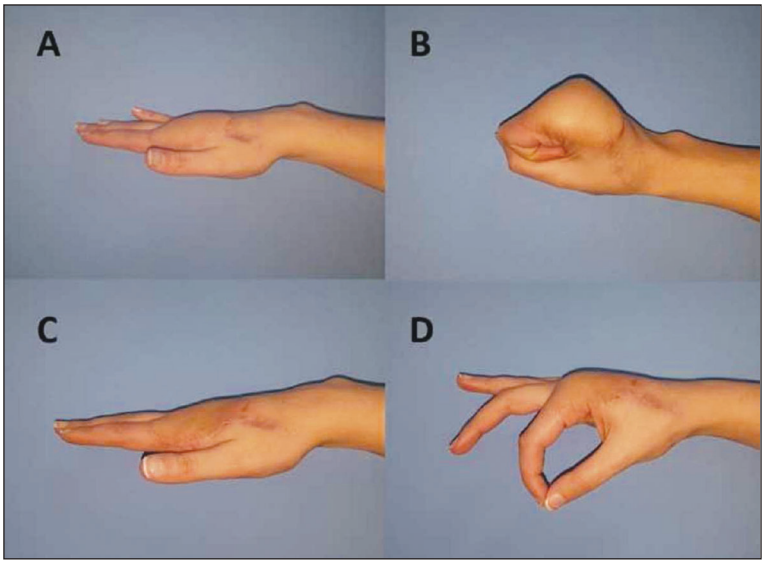

FIGURE 2: A, B) Postoperative 3rd month images following reconstruction with medial sural artery perforator flap. **C, D)** Postoperative 2nd month image after liposuction procedure.

DISCUSSION

The tissue defects on hands can be reconstructed with skin grafts, local flaps, or free tissue transplants. In our case, the EIP and EDC2 tendons were exposed in the open wound of the right hand dorsum, and the tendon sheets were necrotic. As a result, the reconstruction with skin grafting was not considered suitable. Following electrical burns, media and endothelium layers of vessels might become damaged, and thrombosis might be seen.[3] This prevented us from resorting to the reconstruction via local flap in our case. Taking into account the condition of the wound, our desire from the patient was to start early motion as quickly as possible. Therefore, we decided that the reconstruction with the MSAP flap would be appropriate.

In the reconstruction of hand defects thin and pliable flaps should be preferred. In case of the MSAP flap, the muscle is not incorporated to flap. By this way, the donor site morbidity is decreased, and unnecessary tissue excess in the recipient area can be prevented. In comparison with the other fascio-cutaneous flaps, the MSAP flap is thin, and yields better color compatibility.[4]

The radial forearm flap shows similarities to the MSAP flap in terms of thinness and pliability; however, that one of the major vessels to the hand is to be sacrificed. In order to close the donor site, most of the time we need split-thickness skin graft, but as a consequence, the postoperative scar in the donor site becomes more conspicuous.[3] Also there are tendon exposure and functional deficit risks at donor site when free radial forearm flap is used. On the other hand, in case of the MSAP flap, there is no risk for tendon exposure and functional deficit. In terms of donor site complication, the MSAP flap is better than the radial forearm flap.[6] These features of the MSAP flap make it a good candidate as a workhorse flap for hand reconstruction.

In their research in 2018, Akdeniz Doğan et al. demonstrated that the MSAP flap was thinner than the anterolateral thigh flap (ALT), correlated well with the body mass index, and was a good alternative to the ALT flap in the reconstruction of superficial tissue defects.[7] Although the defatting process when applied to ALT flap will yield a thinner and pliable flap, this is a difficult method, and may lead to partial flap necrosis. For those reasons, we preferred the MSAP flap for our case. Multidirectional flap design ability as well as less hair formation as compared to the other flaps are other advantages of the MSAP flap.[2]

Though not required for our case, the MSAP flap can be taken as a chimeric flap in appropriate cases. Some other advantages of the MSAP flaps are that they enable the taking of a vein graft from the lesser saphenous vein, a nerve graft from the sural or saphenous nerve branches, and a tendon graft from the plantaris tendon.[4]

Medial sural artery pedicle anatomy is reliable; however, the perforator branching displays disparity from patient to patient. This may oblige inexperienced surgeons to take out the MSAP flap from their preference list. In the study done by Sue et al. in 2019, the maximum flap dimension and average flap dimension was measured 20×10 cm and 5.2×11.8 cm, respectively.[2] Similarly, Lin et al. found that harvesting of a flap wider than 6 cm made the primary closure impracticable, necessitating the reconstruction of flap donor area with a skin graft.[4] This may pose a problem where the aesthetic look is of importance, and may restrict the use of the MSAP flap especially for young ladies who wear skirts in particular. Since the MSAP flaps of large dimensions cannot be elevated, they are convenient for the reconstruction of small to medium sized defects. In our case, a primary closure was applied to the donor area, and the resulting donor area scar was at an acceptable level by the patient. Lin et al. indicated in their study that the use of the anterolateral thigh flap was more convenient for large defects where more tissue was required and where the scar in the donor area was not conspicuous.

The superficial circumflex iliac artery perforator flap can be harvested with adequate size and thickness. After the free superficial circumflex iliac artery perforator flap harvesting, defatting procedure can be done to obtain a thinner flap. But this procedure can lead to a flap necrosis. It remains as a difficult alternative due to the variabilities in vascular anatomy and difficulties in surgical technique.[2,8]

Having good compatibility to the surrounding tissue and low donor site morbidity, The MSAP flap is a good alternative for the reconstruction of small-to-medium sized defects notably in the hand dorsum following hand

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Koray Temiz, Anıl Demiröz;* ***Design:*** *Koray Temiz, Anıl Demiröz;* ***Control/Supervision:*** *Koray Temiz, Anıl Demiröz;* ***Data Collection and/or Processing:*** *Koray Temiz;* ***Analysis and/or Interpretation:*** *Koray Temiz, Anıl Demiröz;* ***Literature Review:*** *Koray Temiz;* ***Writing the Article:*** *Koray Temiz, Anıl Demiröz;* ***Critical Review:*** *Koray Temiz, Anıl Demiröz;* ***References and Fundings:*** *Koray Temiz, Anıl Demiröz;* ***Materials:*** *Koray Temiz, Anıl Demiröz.*

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