CASE REPORT

Multi-digit contracture release using medial sural artery perforator flap with syndactylization-desyndactylization method

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Abstract

Background: The medial sural artery perforator flap, with a long pedicle, has tremendous potential for applications in a variety of soft tissue defects. It can be used for reconstruction of multi-digit contractures of the palmar region.

Materials and Methods: We present herein the key features of the management of postburn multi-digit volar contractures, using medial sural artery perforator flaps with the syndactylization and desyndactylization method. We describe the use of the free medial sural artery perforator flap in two patients, to reconstruct complex composite hand defects including the second, third, fourth and fifth digits following thermal burns.

Results: Both flaps healed uneventfully. In both patients, the hand contractures released completely and adequate joint motion was achieved after a 3-month period of physiotherapy.

Conclusions: The thin medial sural artery perforator flap permits high accuracy of soft tissue reconstruction of the hand and reduces the morbidity at the donor site. The MSAPF is a useful flap in areas such as the hands, in the case of soft tissue deficiency and tendon exposition. Hippokratia 2015; 19 (4): 366-368.

Keywords: Burns, medial sural artery, perforator flap, syndactylization-desyndactylization, volar contracture

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Introduction

The posterior leg area is an excellent source of flaps for specific injuries in which thin skin is needed for repair, such as injuries to the hands. The medial sural artery perforator flap (MSAPF) was first performed by Cavadas et al in 2001 as a modification of the classic gastrocnemius myocutaneous flap[1]. Many studies on flap vascularization and its clinical use were subsequently published[2-3].

In this study, we aimed to demonstrate the use of MSAPF for the repair of volar defects after contracture release in the hand. The defects were affecting more than one finger with flexor tendon exposition.

First case

A 21-year-old man presented with an 18-year long multi-digit contracture following a flame-induced thermal burn. A free MSAPF (4.5 × 6.0 cm) was used to cover the volar defect created after contracture release of the third, fourth and fifth fingers of his right hand. The donor site was closed with a split-thickness skin graft. The length of the pedicle was 8.3 cm. Three months after the initial operation, desyndactylization with removal of excess fat tissue was performed under local anesthesia to achieve better volar alignment. The follow-up period was six months, during which the flap survived completely (Figure 1).

Second case

A 22-year-old man presented with a multidigit palmar contracture of his right hand caused after contact with a convection heater when he was four years old. At that

Figure 1: Images of the first reported patient with multi-digit contracture that was released using the medial sural artery perforator flap with the syndactylization-desyndactylization method. **a)** Volar contracture, preoperative view. **b)** Volar skin, excision defect. **c)** Syndactylization of the third, fourth, and fifth fingers. **d)** Desyndactylization of the third, fourth, and fifth fingers.

time, the burn was treated conservatively. Second, third, fourth and fifth digits of his right hand were affected. The digital contracture was released. Free MSAPF (4.5 x 6.5 cm) was used to cover the volar area of the digits. The donor site was closed with a split-thickness skin graft. The length of the pedicle was 8.8 cm. Three months after the flap coverage, desyndactylization with removal of excess fat tissue was performed under local anesthesia. The follow-up period was six months, and no recurrence was observed (Figure 2).

Operative Technique

The medial sural artery branch was prominent on the lateral side in the first patient; the second patient had conjoined perforator flaps[4] (Figure 3). For both flaps, the radial artery in the anatomical snuff box was used as the recipient artery for the hand (Figure 4). By excising the borders of the volar contracture on the fingers, the fingers were syndactylized to ensure complete contact between the raw surfaces of the flap and the defect. After three months, the fingers were separated from each other by a second procedure. The released flaps on each finger were thinned through desyndactylization incisions by excising the subcutaneous fat tissue (Figure 5).

The hand was immobilized in a neutral position using a dorsal splint for seven days. A 3-month-period of physiotherapy followed the operation. Massage and passive stretching exercises were advised until the scar softened. Neither day nor night splints were used. The postoperative rehabilitation program began on the day of suture removal following the desyndactylization operation and ended when the hand had healed and regained its full range of motion. The patients were advised to perform only massage and passive stretching exercises throughout the free flap coverage period until the desyndactylization procedure. In both patients, the hand contractures

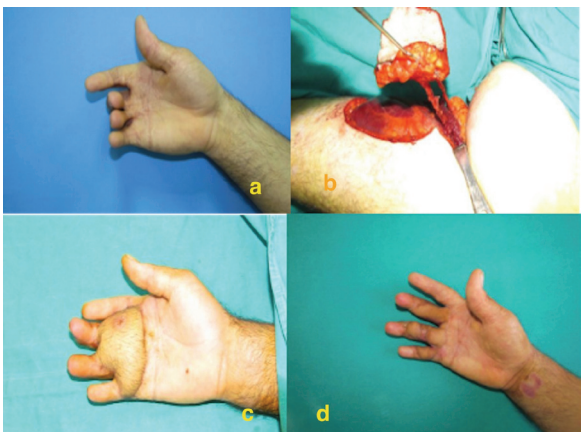

Figure 2: Images of the second reported patient with multidigit contracture that was released using the medial sural artery perforator flap with the syndactylization-desyndactylization method. **a)** Volar contracture, preoperative view. **b)** Conjoined pedicle. **c)** Syndactylization of the second, third, fourth, and fifth fingers. **d)** Desyndactylization of the third, fourth, and fifth fingers.

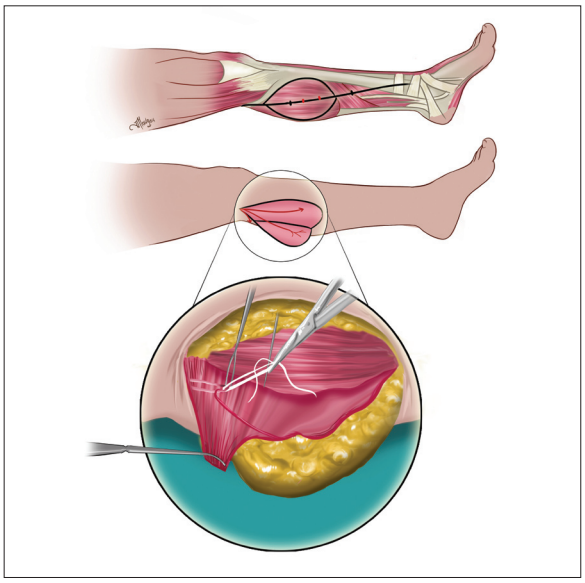

Figure 3: Surgical illustration demonstrating harvesting of the medial sural artery perforator flap.

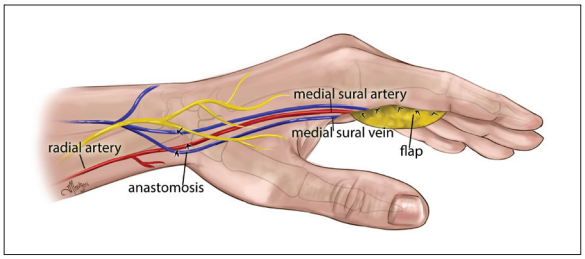

Figure 4: Intraoperative illustration of the medial sural artery perforator flap, using as recipient artery the radial artery in the anatomical snuff box.

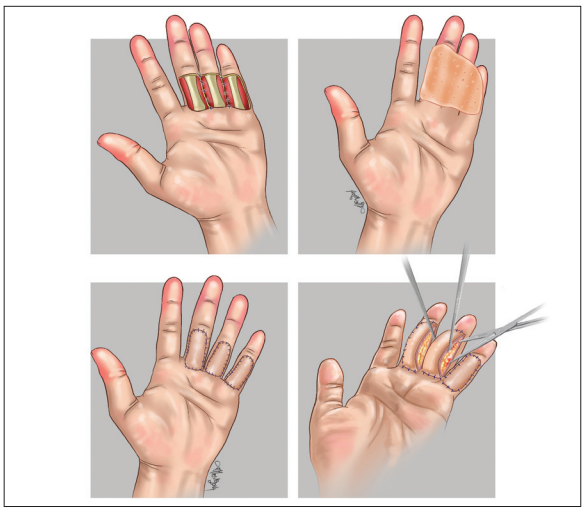

Figure 5: Illustration showing the steps of the syndactylization–desyndactylization method. Excising the borders of the volar contracture on the fingers, the fingers were syndactylized to ensure complete contact between the raw surfaces of the flap and the defect. After three months, the fingers were separated from each other by a second procedure. The released flaps on each finger were thinned through desyndactylization incisions by excising the subcutaneous fat tissue.

were released completely, and adequate joint motion was achieved.

Discussion

In the present report, we transplanted two free flaps to the hand to syndactylize the fingers with larger flaps to adjacent fingers by targeting the vessels at the anatomical snuff box. Both reported flaps survived. The donor sites required split-thickness skin grafts. Although many flaps have been described for the repair of hand and feet defects, each has its own specific drawbacks. Although radial forearm and anterolateral thigh flaps are the most commonly used, morbidity of the donor area and sacrifice of the main artery constitute significant problems[5]. Moreover, the anterolateral thigh flap contains a thick layer of subcutaneous fat tissue and thus requires processing. Another choice for soft tissue reconstruction of the hand is the arterialized venous flap. The main advantage of this flap is the ease of harvesting a thin and pliable flap without the need to sacrifice a major artery at the donor side. The arterialized venous flap can be harvested from all anatomic regions, including venous networks[6]. The ideal flap for multiple finger resurfacing should be thin and amenable to molding, have a long pedicle for microsurgical anastomosis, and induce minimal donor site morbidity[7].

The vessels of the sural flap are repaired at the anatomical snuff box because the pedicle is long and the vessel diameter is greater than the vessels at the level of the common digital arteries. This is in contrast to the venous flap, the pedicle length, and diameter of which allow the flap vessel to be specifically sutured to the digital arteries. However, the surgeon must weigh all the risks and benefits of potential flaps, including the difficulty of harvesting, reliability of the flap and morbidity of the donor site.

The MSAPF has the following advantages: lower donor area morbidity, no muscle sacrifice, variability in the flap design, and reliability of the harvest and survival of the flap[8-9]. The MSAPF can be harvested with the vascularized fascia, thus providing a gliding surface that acts like tendon sheet fascia[10-11].

The major drawback of the MSAPF is the widening of the donor area. Skin graft closure of the donor area may be unsatisfactory to the patient. Additionally, when the flap harvest area is wider than 5 cm, closure of the donor area requires skin grafting.

Conclusion

The ideal flap for multiple fingers resurfacing should be thin and amenable to molding, have a long pedicle for microsurgical anastomosis, and induce minimal donor site morbidity. The MSAPF is a useful flap in areas such as the hands, where thin skin is required, and the tendons are exposed. Besides the leg function is preserved because the major vessels and gastrocnemius muscle are left intact.

Conflict of Interest

Authors report no conflict of interest.

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