

Combined rotation advancement flap and non-meshed split-thickness skin graft for complex hand injury. A case report

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Case Report

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Background: Deep hand burns may result in complex soft tissue defects with exposure of tendons and other critical structures, posing a significant reconstructive challenge. Although split-thickness skin grafting remains a widely used method for wound coverage, exposed tendons require vascularized tissue to achieve durable coverage and preserve hand function. We present the case of a 22-year-old previously healthy male with a chronic soft tissue defect on the dorsum of the left hand following a deep partial-thickness thermal contact burn caused by a motorcycle exhaust pipe. Despite initial conservative management, the wound failed to heal and progressed to extensor tendon exposure. Reconstruction was performed using a local rotation advancement flap to provide vascularized coverage of the exposed tendons, while the remaining superficial defect was resurfaced with a non-meshed split-thickness skin graft harvested from the right forearm. The postoperative course was uneventful, with complete flap viability and graft integration. At five-month follow-up, the patient demonstrated complete wound healing, stable soft tissue coverage, and full active range of motion of all digits without functional limitation. Although hypertrophic scarring was observed, no graft failure, flap compromise, or other late complications occurred. This case highlights the importance of individualized reconstructive planning and demonstrates that the complementary use of a local rotation advancement flap and a non-meshed split-thickness skin graft can provide stable coverage while preserving hand function when complete reconstruction cannot be achieved using a single technique.

KEYWORDS: Hand burns; Advancement flap; Split-thickness skin graft; Hand reconstruction; Soft tissue reconstruction.

Burn injuries remain a major cause of morbidity worldwide and are frequently associated with significant functional, aesthetic, and psychological sequelae. Although the hand accounts for less than 5% of the total body surface area, it is one of the most functionally important anatomical regions because of its essential role in activities of daily living and fine motor function. Deep thermal burns involving the hand may expose tendons, joints, or neurovascular structures and, if inadequately managed, may result in contractures, stiffness, chronic pain, and permanent functional impairment. Therefore, the primary goals of reconstruction are to achieve durable soft tissue coverage while preserving hand function and optimizing aesthetic outcomes [1,3].

Split-thickness skin grafting (STSG) remains a widely used reconstructive option for burn-related soft tissue defects because it provides reliable wound coverage and promotes wound closure. However, STSG has important limitations, particularly over poorly vascularized wound beds or exposed critical structures, where adequate graft take may not be achieved. In addition, STSG harvesting creates a

secondary wound that may be associated with pain, delayed epithelialization, infection, hypertrophic scarring, pigmentation changes, pruritus, and aesthetic dissatisfaction. A systematic review including 77 studies demonstrated that donor-site morbidity remains a significant and frequently underestimated consequence of STSG, emphasizing the importance of carefully considering donor-site outcomes during reconstructive planning [2,4].

Vascularized flap reconstruction is an essential component in the management of complex hand burns involving exposed critical structures. Unlike skin grafts, local and regional flaps provide vascularized tissue that may offer durable coverage, facilitate tendon gliding, and reduce the risk of secondary scar contracture. In a retrospective study of patients undergoing flap reconstruction for thermal hand burns, Do et al. reported a flap survival rate of 96%, supporting the safety and effectiveness of flap-based reconstruction in appropriately selected patients. Furthermore, flap success appears to depend primarily on the quality of the surrounding tissue and the extent of injury rather than on flap type alone [3].



Figure 1. Traumatic soft tissue defect of the right hand demonstrating exposed extensor tendons with a healthy, well-vascularized granulation tissue bed before reconstruction

We present the case of a young male patient with a deep thermal burn of the hand who underwent reconstruction using a local rotation-advancement flap combined with a non-meshed split-thickness skin graft. This case highlights the importance of individualized reconstructive planning and illustrates the value of combining complementary reconstructive techniques to provide vascularized coverage of exposed critical structures while resurfacing the remaining superficial defect, thereby achieving stable soft tissue coverage and preserving hand function.



Figure 2. Preoperative design and marking of the local rotation advancement flap planned for soft tissue reconstruction of the dorsal hand defect.



Figure 3. Intraoperative view showing elevation and dissection of the local rotation advancement flap prior to transposition.

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A 22-year-old previously healthy male presented with a chronic wound on the dorsum of the



Figure 4. Immediate postoperative appearance following reconstruction with a local rotation advancement flap combined with a non-meshed split-thickness skin graft, demonstrating complete coverage of the soft tissue defect.

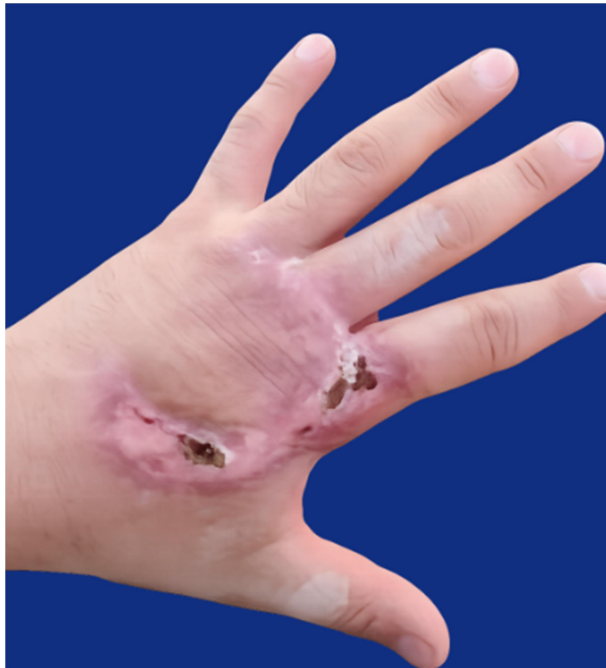


Figure 5. Five-month postoperative follow-up demonstrating complete integration of the flap and split-thickness skin graft. A hypertrophic scar is present; however, the patient achieved satisfactory wound healing with preserved hand mobility and no functional limitation.

left hand following a deep partial-thickness thermal contact burn sustained in February 2026 after accidental contact with a motorcycle exhaust pipe. Despite the relatively limited size of the injury, the wound progressively evolved into a chronic soft tissue defect with exposure of the extensor tendons. Figure 1. The patient was initially managed by a private physician with conservative treatment consisting of local wound care, oral analgesics, and antimicrobial therapy. Despite these measures, the wound failed to heal adequately, with persistent soft tissue loss and extensor tendon exposure. Owing to the lack of clinical improvement, he was referred to the Plastic Surgery Department for further evaluation and definitive treatment.

Physical examination revealed a chronic soft tissue defect over the dorsum of the left hand with exposed extensor tendons and no clinical evidence of active infection. Because the wound lacked an adequate vascularized bed for skin grafting alone, surgical reconstruction was indicated.

The patient underwent reconstruction using a local advancement flap Figure 2. to provide vascularized coverage of the exposed extensor tendons. Figure 3. The remaining defect was resurfaced with a non-meshed split-thickness skin graft harvested from the right forearm. The procedure was completed without intraoperative complications, and meticulous hemostasis was achieved before layered wound closure. Figure 4.

The postoperative course was uneventful. The advancement flap remained completely viable, and the split-thickness skin graft demonstrated complete take without evidence of infection, hematoma, wound dehiscence, or partial flap necrosis. The patient was followed regularly in the outpatient Plastic Surgery clinic, demonstrating progressive wound healing and stable soft tissue coverage throughout follow-up. Figure 5. At the most recent evaluation, complete wound healing had been achieved with preservation of hand contour, full active range of motion of all digits, and excellent functional and aesthetic outcomes. No recurrence, flap compromise, graft failure, or late postoperative complications were observed.

Discussion

Reconstruction of complex hand defects requires the restoration of stable soft tissue coverage while preserving function and aesthetic appearance. Although the reconstructive ladder remains a useful framework for surgical decision-making, contemporary reconstructive principles emphasize selecting the most appropriate technique according to the characteristics of the defect rather than strictly following a stepwise approach. Factors such as defect size and depth, exposure of critical structures, local tissue quality, functional requirements, and donor-site availability should guide reconstructive planning to achieve favorable functional and aesthetic outcomes [7,9].

Soft tissue defects with exposed tendons represent a particular reconstructive challenge because skin grafts alone cannot reliably survive over poorly vascularized structures or provide adequate tissue characteristics for unrestricted tendon excursion. In these situations, vascularized flap coverage is generally preferred because it protects exposed structures, provides durable soft tissue coverage, and contributes to the preservation of hand function. Local flaps are particularly useful for small- and medium-sized defects because they provide tissue with similar color, texture, and thickness while limiting donor-site morbidity. Furthermore, thin and pliable vascularized tissue may facilitate tendon gliding and reduce the risk of secondary scar contracture [3,8].

Despite the advantages of flap reconstruction, residual superficial defects may remain after flap transposition and can be managed with split-thickness skin grafting when an adequate vascularized wound bed is available. STSG remains one of the most widely used reconstructive techniques for soft tissue defects; however, successful graft take depends on adequate recipient-site preparation, meticulous surgical technique, graft immobilization, and patient-related factors that influence wound healing [5]. Reconstructive strategies should therefore be

individualized according to wound size, anatomical location, tissue requirements, and the anticipated functional and aesthetic outcomes. In relatively small defects, non-meshed STSGs may be preferred because they provide a continuous skin surface and may offer improved aesthetic outcomes and reduced secondary contraction compared with meshed grafts [6].

Successful graft incorporation is influenced by several local and perioperative factors, including adequate debridement, close contact between the graft and recipient bed, effective graft immobilization, and prevention of hematoma, seroma, shear forces, and postoperative infection. A recent prospective study identified postoperative infection as an independent predictor of graft failure, underscoring the importance of appropriate recipient-site preparation and close postoperative surveillance [2]. Therefore, optimization of the wound bed and control of local infection are essential before graft placement to promote successful graft take [5].

In the present case, extensor tendon exposure precluded reconstruction with skin grafting alone because the exposed structures required vascularized soft tissue coverage. A local rotation-advancement flap was therefore used to provide durable protection of the extensor tendons. Because a small superficial defect remained after flap transposition, reconstruction was completed using a non-meshed split-thickness skin graft harvested from the right forearm. The favorable postoperative outcome was likely supported by adequate wound bed preparation, the absence of clinical infection, and the selection of complementary reconstructive techniques according to the characteristics of each component of the defect. At the five-month follow-up, the patient demonstrated stable soft tissue coverage, complete wound healing, and full active range of motion without functional limitations. Although hypertrophic scarring developed, no graft loss, flap compromise, or other late complications were observed. These findings illustrate how combining vascularized flap coverage with skin grafting may provide a practical reconstructive solution for complex hand defects involving tissues with different coverage requirements [6,9].

Conclusion

Complex traumatic hand defects with tendon exposure require individualized reconstructive planning to achieve durable soft tissue coverage while preserving hand function. This case demonstrates that combining a local rotation advancement flap with a non-meshed split-thickness skin graft can provide reliable coverage, favorable functional recovery, and satisfactory aesthetic outcomes when complete flap coverage alone is not feasible.

Conflicts of interests

The authors declare no conflicts of interests.

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