



Management of Soft Tissue Defects of the Hand: A Series of 43 Cases

*Experience of the Department of Plastic and Reconstructive Surgery at Ibn Sina University Hospital, Rabat
Department of Plastic and Reconstructive Surgery, Ibn Sina University Hospital, Rabat, Morocco.*

Abstract

Introduction: Soft tissue defects of the hand represent a significant challenge in reconstructive surgery due to their functional, aesthetic, and social consequences. Prompt and appropriate management, tailored to the location and extent of the lesions, is crucial for a favorable outcome.

Objective: To evaluate the management strategies of hand soft tissue defects in a plastic surgery department, as well as the functional outcomes and associated complications.

Materials and Methods: We conducted a retrospective descriptive study including 43 patients treated at the Department of Plastic and Reconstructive Surgery of Ibn Sina University Hospital in Rabat between 2022 and 2024. The variables analyzed included demographic data, etiology and topography of the defects, reconstruction techniques used, and postoperative complications.

Results: The mean patient age was 32 years (range: 18–69 years), with a male predominance (sex ratio = 2.58). The soft tissue defects primarily affected the fingers, followed by the dorsal, palmar, and wrist regions. The main etiology was trauma, followed by burns and tumor excision. Directed wound healing was used in 58% of cases, while 42% of patients were managed with flap coverage, particularly V-Y advancement flaps. Postoperative outcomes were favorable in 90% of cases. Complications (necrosis, infection, stiffness) were reported in 10% of patients.

Conclusion: The choice of reconstruction technique should be guided by the location, depth, and extent of the tissue loss. Mastery of a wide range of techniques, from directed healing to more complex flaps, allows for tailored management and optimizes both functional and aesthetic outcomes.

Keywords: hand soft tissue defects; reconstructive surgery; skin flaps; directed healing; V-Y advancement flaps; hand trauma.

Received 01 July, 2025; Revised 06 July, 2025; Accepted 08 July, 2025 © The author(s) 2025.

Published with open access at www.questjournals.org

I. Introduction

The hand, from the Latin *manus*, represents both a functional and symbolic extension of the human body [1]. It plays a vital role in daily life as a motor, sensory, and relational organ, enabling us to manipulate, perceive, and interact with our environment [1,8]. Its constant visibility and role in social gestures also make it a fundamental element of bodily identity [1].

Soft tissue defects (STDs) of the hand pose a major challenge in reconstructive surgery due to the anatomical and functional complexity of this region [2,4]. These defects may arise in various contexts: traumatic (e.g., road traffic accidents or “car door injuries”), surgical (tumor excision), infectious, or secondary to deep burns or radiotherapy sequelae [2,5,6,8].

Given their frequency—especially in trauma cases—and the functional and aesthetic consequences they entail, such injuries often result in significant disability and impaired quality of life [1,6,8]. Their management is frequently multidisciplinary, involving not only plastic surgeons but also trauma specialists, physiotherapists, and occasionally psychiatrists for comprehensive care [1,5].

The diversity in defect location and tissue loss requires an individualized approach. Over the past decades, the therapeutic arsenal has expanded significantly—from simple wound dressings to microsurgical free flaps—thanks to advances in our understanding of cutaneous vascular anatomy and the development of reverse-flow island flaps [1,3,4,7,9].

Hand surgery, particularly in the field of soft tissue reconstruction, has seen major advancements, now offering viable solutions even for the most complex cases, such as multi-digit defects [6,7,9]. These strategies

must be carefully planned based on the defect's characteristics, the patient's overall condition, and the available technical resources [2,3,7].

It is within this framework that we present our experience in the management of soft tissue defects of the hand in the Department of Plastic and Reconstructive Surgery at Ibn Sina University Hospital in Rabat.

II. Materials and Methods

We conducted a retrospective descriptive study over a two-year period (2022–2024) in the Department of Plastic, Reconstructive and Aesthetic Surgery at Ibn Sina University Hospital in Rabat.

Inclusion criteria:

The study included 43 patients treated for cutaneous soft tissue defects of the hand without associated bone or tendon injuries. Patients with complex lesions exposing deep structures (tendons, bones, joints) or transarticular amputations were excluded from the analysis.

Studied parameters:

For each patient, the following data were collected from medical records:

- **Demographic data:** age and sex;
- **Etiology of the defect:** traumatic, tumoral, or thermal (burn-related);
- **Anatomical location** of the soft tissue defect;
- **Coverage technique used:** directed healing, skin graft, or flap;
- **Postoperative outcome** and potential complications (infection, necrosis, stiffness);
- **Long-term functional and aesthetic outcomes**, assessed during follow-up visits.

The analysis was purely descriptive. Data were presented as means, frequencies, and percentages.

All surgical procedures were performed by the department's surgical team, following current standards, with individualized indication based on the extent and location of the tissue loss.

III. Results

Epidemiological Data

The study included 43 patients treated for soft tissue defects of the hand in our department. The mean age was 32 years (range: 18–69), with a male predominance (sex ratio = 2.58).

Topographic Distribution

Soft tissue defects primarily involved the fingers (n = 31; 72%), followed by the dorsal hand (n = 7; 16%), the palmar region (n = 3; 7%), and the wrist (n = 2; 5%).

Etiologies

Traumatic injuries accounted for the majority of cases (n = 35; 81%), mostly affecting young adults in the context of assaults or work-related accidents. Defects resulting from tumor excision (n = 5; 12%) or deep burns (n = 3; 7%) were less frequent. Burn injuries predominantly affected female patients in domestic settings. Post-tumor defects required coverage adapted to the histological type and excision margins.

Coverage Techniques

Management strategies varied depending on the etiology, location, depth, and extent of the defects. Directed wound healing was chosen in 25 cases (58%) when no deep structures were exposed. Flap coverage was required in 18 cases (42%). The surgical techniques used are detailed in Table 1.

Table 1. Distribution of Flap Types Used (n = 18)

Technique	Number of Cases
V-Y advancement flaps (Atasoy, Kutler, Venkataswami)	28*
Proximally based neurovascular island flap	1
Reverse-flow homodigital island flap	1
Kite flap	1
O'Brien flap	1
Moberg flap	1
Intermetacarpal flap	1
Colson flap	3
Posterior interosseous flap	1
Foucher flap	1
MacGregor inguinal flap	2

*Some patients received multiple combined digital V-Y flaps.

Postoperative Course

The postoperative course was uneventful in the majority of cases. A favorable outcome was observed in 90% of patients, with satisfactory functional recovery after rehabilitation. Complications occurred in 10% of cases, including:

- Partial flap necrosis: 2 cases
- Local infection: 1 case
- Persistent joint stiffness: 1 case

These complications required surgical revision or targeted functional management.

Clinical Illustration

Several clinical cases from our series are presented to illustrate the different therapeutic strategies employed and the outcomes achieved.



Figure 1. An 18-year-old patient presented with a cutaneous soft tissue defect over the distal phalanx of the third digit. Coverage was achieved using a reverse-flow homodigital neurovascular island flap.



Figure 2. Elevation of the flap after dissection to the mid-shaft of the middle phalanx and ligation of the radial homodigital pedicle of the third digit at its base.



Figure 3. Clinical outcome at one week postoperatively (left) and at one year postoperatively (right).

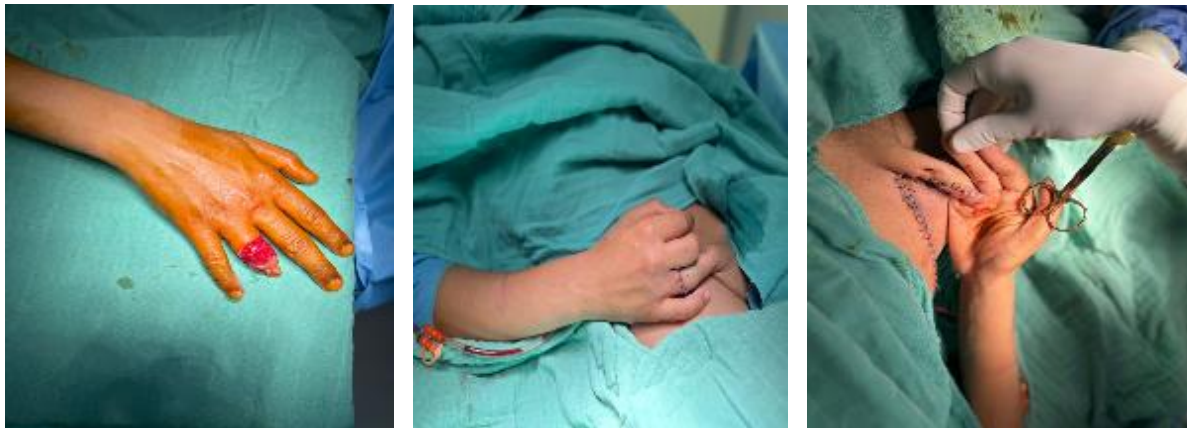


Figure 4. Twenty-year-old patient with a soft tissue defect of the ring finger, reconstructed using a Colson flap.



Figure 5. Outcome at one week postoperatively (left) and after flap division (right).



Figure 6. A 38-year-old patient with exposure of the fifth metacarpal following a stab wound, covered using a posterior interosseous flap.



Figure 7. Pulp defect of the second digit treated with an Atasoy flap.



Figure 8. Pulp defect of the third digit covered by a Kutler flap.

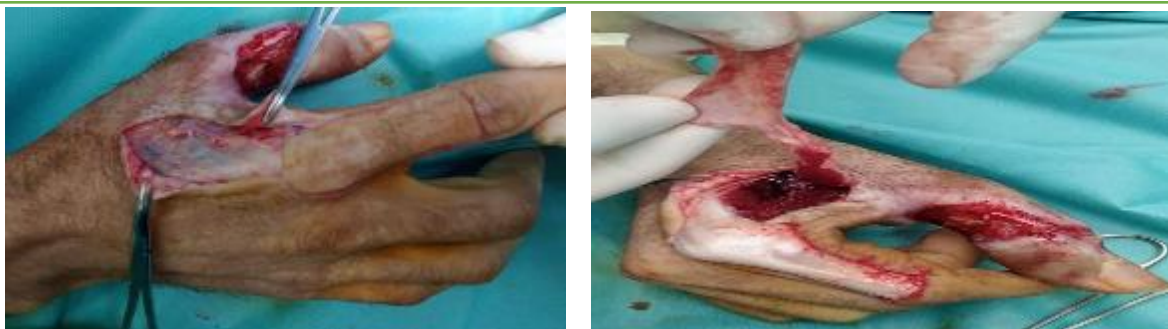


Figure 9. A 50-year-old patient presenting a mid-dorsal thumb soft tissue defect, reconstructed using a Foucher flap.



Figure 10. Immediate postoperative result (left) and at one week postoperatively (right).



Figure 11. Pulp defect of the second digit covered using a proximally based neurovascular island flap.



Figure 12. Soft tissue defect of the dorsal hand and first web space, reconstructed using a MacGregor inguinal flap.

IV. Discussion

The management of soft tissue defects (STDs) of the hand remains a true challenge in plastic and reconstructive surgery. It requires an individualized approach aimed at preserving vital structures, restoring a functional, sensitive, and mobile hand, and enabling early socio-professional reintegration [1]. The urgency of coverage depends on the type of injury—standard wounds require rapid intervention, whereas complex injuries such as blast trauma may require delayed, staged management [1].

Multiple therapeutic options exist for soft tissue coverage, and the choice depends on the defect's location, size, depth, the patient's general condition, and the expected functional outcome [1]. Directed healing can be considered for superficial skin losses without exposure of critical structures, maintaining a moist environment favorable for regeneration. Skin grafting is a simple and effective option when the wound bed is healthy, well vascularized, and infection-free, although thin grafts are prone to contraction and reduced sensitivity [1].

In cases of bone, tendon, or joint exposure, artificial dermis can help generate a functional neodermis, although this technique is costly and often requires a two-stage procedure [1]. When grafting is not feasible, flap coverage becomes necessary. Local flaps (advancement, rotation, or transposition) are preferred when applicable, especially for limited dorsal hand defects [1,2].

For more extensive defects, regional flaps such as the radial forearm flap ("Chinese flap") or the posterior interosseous flap (PIF) offer reliable solutions, each with specific pros and cons (Figure 6) [1,2]. Local digital flaps (Kutler, Atasoy, Moberg, Hueston) are effective for pulp or zone 2 fingertip injuries, with satisfactory functional and sensory results (Figure 7, 8) [3]. For complex or multi-digital injuries, regional flaps such as the cross-finger flap or kite flap provide good sensate coverage, though they typically require a second-stage procedure for flap division [3].

In this context, the Colson flap and MacGregor's inguinal flap represent valuable reconstructive options in the management of hand tissue loss. The Colson flap provides reliable coverage with thin, well-vascularized tissue, suitable for moderate defects. MacGregor's inguinal flap, on the other hand, allows the harvest of a large, thin, and supple skin surface, particularly useful for extensive defects on the dorsum of the hand and wrist. Both flaps have acceptable donor site morbidity and effectively complement the reconstructive arsenal of the hand surgeon, especially when traditional local flaps are insufficient (Figure 4, 5, 12) [7,8].

Flap selection depends on many factors, including patient age, occupation, comorbidities, and the anatomical site of the defect [4]. In young and active patients, priority is given to achieving a stable, durable coverage that allows early mobilization. In our series, regional flaps such as the defatted cross-finger flap and the kite flap were successfully used depending on defect location and quality of tissue loss [4].

Free flaps remain a valuable option for major defects, allowing distant coverage of large areas, but they require microvascular expertise [1]. These include fasciocutaneous flaps (lateral arm, temporoparietal, parascapular), and muscle flaps with skin grafts, which may offer superior aesthetic results in selected cases [7]. The anterolateral thigh (ALT) flap has become a flap of choice for large defects due to its wide surface area, long pedicle, and relatively low donor-site morbidity [7].

Surgical success relies on meticulous preoperative planning, careful intraoperative technique, and early, tailored postoperative rehabilitation [7]. In complex injuries, priority must always be given to limb and life preservation, with prompt identification and repair of vascular injuries [8]. A thorough clinical examination and multidisciplinary approach are essential [8]. The reconstructive ladder helps guide decision-making, from conservative care to free flap reconstruction, based on injury severity [8].

Conservative treatment of fingertip wounds—widely practiced—relies on irrigation, local debridement, and moist dressings, often yielding excellent functional and cosmetic results, with fewer complications and faster recovery than surgical alternatives [9]. This approach is particularly indicated when bone exposure is minimal and the nail matrix is preserved or only slightly injured [9], harnessing the fingertip's exceptional regenerative capacity.

Nail complex injuries require specific repair, including accurate restoration of the nail bed, matrix, and nail folds, to optimize both function and appearance and minimize long-term sequelae like nail dystrophy [9].

For pulp reconstruction, neurovascular advancement flaps (Tranquilli-Leali, Segmüller, modified Moberg) offer reliable, one-stage, non-microsurgical solutions adaptable to various defect types, preserving length and sensibility (Figure 1, 2, 3, 11) [9]. Perforator and free flaps, though technically demanding, are reserved for complex cases where local flaps are inadequate [9].

Finally, rigorous postoperative monitoring—especially in the first 48 hours—combined with early, appropriate rehabilitation, is essential for functional success, helping prevent complications such as contractures, tendon adhesions, or joint stiffness [1].

V. Conclusion

Reconstruction of soft tissue defects of the hand relies on a thorough assessment of the injury and an individualized treatment strategy. The choice of coverage technique must consider the defect's location, size, the exposed underlying structures, and the required functional and aesthetic outcomes. Whether employing conservative management, skin grafts, local, regional, or free flaps, each option has specific indications and limitations.

The hand surgeon must therefore master a broad spectrum of reconstructive techniques, from the simplest procedures to complex microvascular transfers. This versatility is essential to tailor reconstruction to each clinical scenario rather than adapting the patient to the surgeon's preferred method.

The ultimate goal remains the optimal restoration of hand function, sensation, and appearance while minimizing donor-site morbidity and complications. Achieving this requires comprehensive care, meticulous planning, precise execution, and appropriate rehabilitation.

References

- [1]. Anatomie-FMPM. Les pertes de substances de la main [Internet]. Université Cadi Ayyad. Faculté de Médecine et de Pharmacie de Marrakech; 2021 [cité 2025 Jul 1].
- [2]. Roux JL. Chapitre 6 : Chirurgie des pertes de substance cutanée dorsales de la main. *Volume 10, n°3*, Juin 2017. Institut Montpellierain de la Main.
- [3]. Ameziane I, El Manouar M. Le recouvrement des pertes de substance des doigts. *Médecine du Maghreb*. 1997;(64).
- [4]. Bassir RA, Boufettal M, Mahfoud M, Ismael F, Elbardouni A, Berrada MS, Elyaacoubi M. Gestion des pertes de substance cutanées de la main (à propos de dix cas avec revue de la littérature). *Rev Maroc Chir Orthop Traumatol*. 2014;55:30-33.
- [5]. Dehhaze A, Labbaci R, Daghour NI, Taybi O, Diher I, Tazi H, Echmili M, Mai A, Barij H, Bouazza O, Mahioui M. Covering of loss of substance of the dorsal surface of the fingers by abdominal flap: a case report. *Ann Burns Fire Disasters*. 2025;38(1).
- [6]. Yao LB, Hugon S. Traumatic dorsal hand reconstruction through a free anterolateral thigh flap, induced membrane technique, toe joint transfer, and joint prosthesis. *J Orthop Case Rep*. 2021 Oct;11(10):6-8.
- [7]. Horta R, Silva P, Costa-Ferreira A, Amarante JM, Silva A. Microsurgical soft-tissue hand reconstruction: an algorithm for selection of the best procedure. *J Hand Microsurg*. 2011;3(2):73-7.
- [8]. Saied SMA, Abulezz T, Elsherbiny A, Shoeib MA, Abdel Aal M. Soft tissue reconstruction of hand trauma: a 1-year retrospective study of 745 cases. *Sohag Med J*. 2010 Jul;14(2).
- [9]. Calcagni M, Adani R, Carnes S, Dumontier C, Elliot D, Giesen T; IFSSH Scientific Committee on Skin Coverage. Report on skin coverage in hand surgery. Submitted October 2014.

Acknowledgments and Conflicts of Interest

The authors declare that they have no conflicts of interest and received no specific funding for this study.