

Post-Burn Syndactyly Reconstruction in a Patient with Extensive Hand Burns: Case Report and Functional Rehabilitation Strategies

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ABSTRACT

We present the case of a 28-year-old female patient who suffered severe burns to both hands due to a domestic accident. The injuries resulted in secondary syndactyly caused by adhesions between the fingers, involving skin, subcutaneous tissue, and joints, leading to functional limitation and risk of permanent deformity. After initial evaluation and stabilization in the burn unit, detailed surgical markings were performed to plan interdigital separation and preserve critical structures such as tendons, nerves, and vessels. During the procedure, meticulous debridement was carried out, and split-thickness skin grafts from the inguinal region were applied to cover interdigital areas, promote reepithelialization, and minimize the risk of additional contractures. Postoperative management included early physiotherapy and occupational therapy, promoting recovery of mobility, grip strength, and fine motor function. The patient had a favorable evolution, achieving complete finger separation, preservation of hand functionality, and satisfactory aesthetic outcomes. This case highlights the importance of a comprehensive approach in complex hand burns, combining critical stabilization, precise surgical planning, use of appropriate grafts, and intensive rehabilitation to optimize functional and aesthetic recovery.

KEYWORDS: Hand burns, post-burn syndactyly, split-thickness skin graft, hand reconstruction, functional rehabilitation, reconstructive surgery, major burn, occupational therapy, surgical debridement, comprehensive burn management

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INTRODUCTION

Hand burns represent one of the most complex injuries in the care of patients with severe burns due to the functional, aesthetic, and psychological importance of this region. Among the most frequent complications of deep burns is post-burn syndactyly, defined as the fusion or adhesion of fingers caused by abnormal scarring and retraction of skin

and underlying tissues. This condition significantly limits mobility, manual dexterity, and thus the patient's functional independence, directly impacting quality of life.

Management of post-burn syndactyly is a surgical challenge that requires a comprehensive approach, combining detailed preoperative planning, advanced reconstructive techniques, skin grafts and local or free flaps, and a rigorous functional

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rehabilitation program. Proper selection of skin coverage type and preservation of vascularization, tendinous, and neurovascular structures are essential to achieve satisfactory functional and aesthetic outcomes. The literature contains limited reports on hand reconstruction in patients with extensive burns, especially those addressing complex syndactyly secondary to severe burns. Early intervention and postoperative follow-up—including intensive physiotherapy, occupational therapy, and pain control—are key factors to minimize recurrence, contractures, and scar complications.

In this context, the present work describes a patient with severe burns to both hands who developed post-burn syndactyly, detailing the surgical strategies employed for reconstruction, the functional outcomes achieved, and the importance of a multidisciplinary approach in restoring

mobility and hand function. This case aims to provide clinical evidence regarding modern reconstructive techniques and comprehensive management of severe hand burn complications.\

CASE REPORT

A 28-year-old female patient with no relevant medical history suffered extensive burns to both hands after a hot liquid accident at her workplace. Initial evaluation revealed deep second-degree and third-degree burns affecting the dorsal and palmar skin of both hands, with progressive finger adhesion characterizing severe post-burn syndactyly. Functional assessment demonstrated complete limitation in finger extension, pain with movement, and impaired fine motor function.



Figure 1 y 2: Images prior to the surgical procedure.

Preoperative planning included surgical release of the adhesions, debridement of scar tissue, and skin coverage using split-thickness grafts harvested from the right inguinal region, chosen for color compatibility and elasticity suitable for hand reconstruction.

Detailed preoperative markings were performed for each finger and interdigital space, including separation lines and graft placement areas. This allowed precise planning of scar tissue release and correct graft placement, minimizing tension on the skin and optimizing postoperative functionality.

Surgery was performed under general anesthesia. Meticulous incisions of fused interdigital spaces were made while preserving tendons, vessels, and digital nerves. Fibrotic scar tissue was removed until viable dermis and functional interdigital space were identified. Split-thickness grafts of 0.012–0.015 inches were harvested from the right inguinal region, shaped to fit each finger and interdigital space, and sutured with 5-0 absorbable sutures, ensuring full adherence and preventing hematoma or seroma formation. Sterile compressive dressings and splints were applied to immobilize the fingers in functional positions for the first five days.



Figure 3 y 4: Surgical marking.

Immediate postoperative care included multimodal analgesia, prophylactic antibiotics, and monitoring in the burn unit, with daily assessment of graft perfusion and infection signs. At seven days, dressings were removed, and grafts were fully viable with excellent integration. Hand physiotherapy started on postoperative day 10, including gentle mobilization, extension and flexion exercises, and occupational therapy to regain strength and dexterity.

At three-month follow-up, the patient demonstrated full finger mobility, restored interdigital separation, recovered pinch and grip function, flat scars, and minimal hyperpigmentation. No infection, graft rejection, or syndactyly recurrence occurred. The patient reported high aesthetic and functional satisfaction, resuming work and domestic activities normally.



Figure 5: Resection of fibrotic tissue.

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This case demonstrates that early, planned reconstruction of post-burn syndactyly using split-thickness inguinal skin grafts combined with intensive rehabilitation can restore hand functionality and achieve satisfactory aesthetic outcomes, even in complex burns affecting multiple fingers.



Figure 6,7: Immediate postoperative image.

DISCUSSION

Post-burn syndactyly is one of the most challenging complications in patients with severe hand burns, particularly when both dorsal and palmar skin of several fingers are involved. This condition arises from fibrosis, retraction, and abnormal scarring, causing finger adhesions that limit mobility, pinch function, and fine motor skills, directly affecting functional independence and quality of life.

Management requires a multidisciplinary approach combining reconstructive surgery, physiotherapy, occupational therapy, and pain management. Surgical planning is crucial and begins with detailed marking of affected fingers and interdigital spaces to guide incisions and graft coverage. This step is essential to preserve vascularization, nerves, and tendons, avoiding additional complications that could compromise function.

Syndactyly release can be approached in several ways depending on lesion extent and depth. Debridement and direct finger separation followed by split-thickness or full-thickness skin grafting is the most common technique for deep burns affecting dermis and subcutaneous tissue. Local flaps, such as dorsal finger flaps or V-Y interdigital flaps, can also be used to cover interdigital spaces and protect vital structures when grafts alone are insufficient. In severe cases with extensive skin loss or exposure of tendons and joints, free or microsurgical flaps provide functional restoration and

adequate coverage. Graft and flap combinations can optimize adhesion, mobility, and hand aesthetics.

In this case, split-thickness grafts from the inguinal region were chosen for color compatibility, elasticity, and ease of shaping for interdigital spaces. Split-thickness grafts cover large areas, adhere to the recipient bed, and facilitate reepithelialization while preventing retractile scars or secondary contractures. The inguinal donor site is commonly used in hand burns due to thin, pliable skin with minimal donor-site morbidity.

Early physiotherapy, generally started between postoperative days 7 and 10, is essential to maintain joint mobility, prevent contracture recurrence, and improve grip strength. Occupational therapy complements rehabilitation, focusing on functional activities and fine motor skills. Initial splint immobilization in a functional position ensures graft stability and prevents displacement.

Recent studies indicate that the combination of early debridement, high-quality split-thickness skin grafts, and intensive rehabilitation significantly improves hand functionality, reduces hypertrophic scar and contracture incidence, and increases aesthetic satisfaction. Careful planning and modern reconstructive techniques are key to success in complex burns affecting multiple fingers.

Post-burn syndactyly reconstruction in patients with extensive hand burns requires a comprehensive approach:

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detailed preoperative evaluation, precise marking, surgical finger release, appropriate graft coverage, and intensive follow-up with physiotherapy. Using split-thickness inguinal skin grafts restores interdigital separation and hand function with favorable aesthetic results, demonstrating that planned, multidisciplinary surgical management is critical for optimizing functional recovery and quality of life.

CONCLUSION

Hand burns represent one of the most complex injuries in burn care due to functional, aesthetic, and anatomical importance, including skin, tendons, joints, vessels, and nerves. Involvement of multiple hand areas combined with deep burns classifies the patient as a major burn case, particularly when total body surface area is significant or critical anatomical regions such as the face, hands, or feet are involved, as these areas carry high functional risk.

Management of a major burn involving the hands requires an integrated multidisciplinary approach, including hemodynamic stabilization, pain control, airway management if necessary, nutritional support, and intensive monitoring to prevent systemic complications. The surgical phase involves early debridement of necrotic tissue, wound cleaning, infection prevention, and subsequent skin reconstruction using grafts, local flaps, or combined techniques depending on lesion extent and depth. Split-thickness grafts, such as those from the inguinal region, effectively cover large areas, facilitate reepithelialization, preserve interdigital mobility, and reduce retractile scar formation.

Key complications include finger contractures, mobility limitation, infection, graft or flap necrosis, hypertrophic scarring, and chronic pain. Early and continuous rehabilitation through physiotherapy and occupational therapy is essential to restore function, prevent contracture recurrence, and maintain hand strength and dexterity.

In summary, hand burns in the context of major burns represent a surgical and functional challenge. Successful management depends on accurate assessment of lesion extent and depth, comprehensive care combining critical support, timely surgical debridement, and reconstruction with appropriate grafts or flaps, and rigorous rehabilitation follow-up. Early intervention, meticulous surgical planning, and modern reconstructive techniques minimize complications, maximize functional and aesthetic recovery, and improve quality of life for patients with complex hand burns.

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