

Burns sequelae: Surgical management challenge, Our Experience in the department of Plastic and Reconstructive Surgery, University Hospital Center of Tangier

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Abstract

Burn injuries are very frequent in the north region of Morocco, the longer it takes for the burn wound to heal, the more serious are the sequelae leading to physical, functional, aesthetic, psychological and social consequences. The objectives of the present study are to review the epidemiological, clinical and therapeutic aspects of burn patients presenting with post-burn sequelae and treated at the Department of Plastic and Reconstructive Surgery of Tangier, Morocco, from March 2021 until October 2023. This study included 65 patients with burns sequelae. The following variables were considered: age, sex, anatomical location, pathological types, and surgical procedure. There were 45 men (69.2%) and 20 women (30.8%), ranging in age from 2 to 66 years (mean age 18.7 years), most of the patients were children (39 = 60%). Burn contractures were observed in 31 (47.7%) patients, hypertrophic scars in 9 (13.8%), both Burn contractures and hypertrophic scars in 19 cases (29.2 %) keloids in 4 (6.2 %), and alopecia in 2 cases (3.1%). To correct the deformities the most common choice was the release or the excision of postburn scars+ split thickness skin grafting in 36.9 % followed by Z-plasty technique, used in 32.3% of cases, followed by Flaps in 13.9 % (Trident flap in 10.8 % and Advancement flaps in 3.1 %); full thickness skin grafts in 13.8% and direct closure in 3.1%. for optimal outcomes the development of an individual programme for surgical treatment of burns sequelae are crucial in patients with burns.

Keywords: Burns sequelae; Skin grafts; Burn scar; Surgical techniques; Reconstruction.

1. Introduction

Burn scar especially hypertrophic and keloid scars as consequences of burn injuries can be physically, socially and psychologically disabling, and they are a common and under-managed problem. They are highly prevalent in our country and relatively high incidence is most probably due to Morocco being a new developing low-income nation with limited resources. A patient with healed burns may be left with scars resulting in varying degrees of functional and aesthetic deformities.

Although their actual incidence is not known, pathological scars are inversely proportional to the standards of initial care received. Patients who undergo state of the art burn wound care usually fare better than those who receive sub-optimal burn wound management. [1]

An understanding of burn wound healing is fundamental not only for the management of acute burn wounds, but also for the prevention, minimization and treatment of post burn scars and scar contractures. [2] Burn wound healing is accomplished either by restitution (complete epithelialization) or substitution. Restitution is possible only if the skin is burned as deep as the stratum papillae with preserved keratinocytes. If the skin is affected deeper in the zone of the

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reticular dermis, more extensive dermal scarring occurs. Contraction is an active biological process by which an area of skin loss in an open wound is decreased due to concentric reduction in the size of the wound. Wound contraction involves an interaction of fibroblasts, myofibroblasts and collagen deposition and is a satisfactory mechanism when the tissue loss is small, in a non-critical area and surrounded by loose skin. Scar contracture is the result of the process of contraction. [1]

Hypertrophic scarring usually occurs within 8 to 12 weeks following wound closure; it has a growth phase of up to 6 months or longer, and then gradually regresses over a period of a few years. [3, 4], Keloids may develop up to several years after injury, usually persist for long periods of time, and do not regress spontaneously. [5]

The clinical course and physical appearance define keloids and hypertrophic scars as separate entities; however, they are often confused because of an apparent lack of morphologic differences. [6]. By causing pain, pruritus and contractures, excessive scarring significantly affects the patient's quality of life, both physically and psychologically. However, most therapeutic approaches remain clinically unsatisfactory, most likely owing to poor understanding of the complex mechanisms underlying the process of scarring and wound contraction. [7] Surgical excision of postburn scars is often indicated. Surgical treatment includes fusiform scar excision, partial or serial excisions, , skin grafting, and local flap coverage

2. Materials and methods

This study includes all 65 patients with burns sequelae who were treated at the Department of Plastic and Reconstructive Surgery, university hospital center of tangier, Morocco, from March 2021 until October 2023. The following variables were considered: age, sex, anatomical location, pathological types and wound closure procedure. Our patients presented a variety of postburn deformities: hypertrophic scarring, keloids, scar contractures and alopecia.

All patients underwent a variety of surgical procedures specific to the individual post-burn sequelae. In our patients, we usually used the full and split skin grafts, z-plasty technique, and flaps. For reconstruction of defects after excision of post burn scars, we normally used a combination of surgical techniques in each patient in order to achieve an acceptable aesthetic result. Statistical package Microsoft excel 2019 was used for data processing.

3. Results

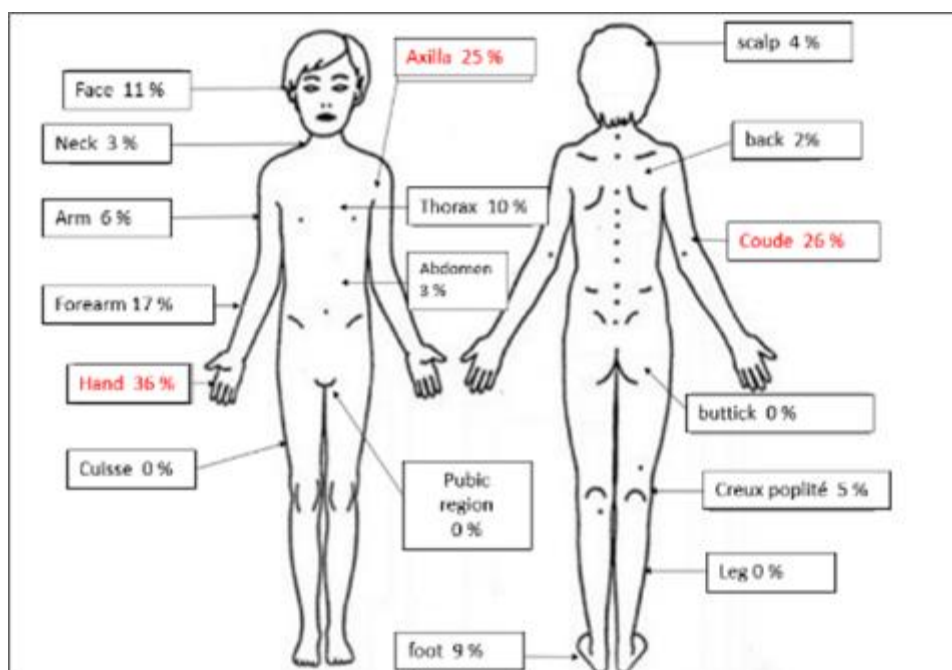


Figure 1 Distribution of anatomical regions involved with burns sequelae



Figure 2 Patient with cervical contracture scar before(a,b) and after(c,d) release with double z plasty

The files of 65 patients who had suffered burns were analysed. There were 45 males (69.2%) and 20 females (30.8%), ranging in age from 2 to 66 years (mean age 18.7 years), most of the patients were children (39 = 60%). Anatomical regions involved with burn sequelae were the hand in 24 cases (36.9%), the head and neck in 7 cases (10.8%), axilla in 16 cases (24.6%), forearm in 16 cases (24.6%), arm in 4 cases (6.2%), elbow in 17 cases (26.2%), trunk in 10 cases (15.4%), and lower limbs in 9 cases (13.8%) (Figure 1)

Burn contractures were observed in 31 (47.7%) patients, hypertrophic scars in 9 (13.8%), both burn contractures and hypertrophic scars in 19 cases (29.2%), keloids in 4 (6.2%), and alopecia in 2 cases (3.1%),

For the majority of patient, the indication for surgical management was burn contractures and hypertrophic scar especially with compromised function. All procedures were carried out under general anaesthesia.



Figure 3 Patient with cervical contracture scar before(a,b,c) and after(h,i,j) release with STSG



Figure 4 Patient with axillar contracture scar before(a,b) and after(f,h) release with trident flap



Figure 3 Patient with dorsal hand contracture scar before(a,b) and after(e,f) release with STSG

After excision or release of postburn scars, to correct the deformities we mostly used split thickness skin grafting in 36.9 %,followed by one Z plasty, as in 18.5 % of cases, followed by Flaps in 13.9 % (Trident flap in 10.8 % and Advancement flaps in 3.1 %); multiple Z-plasty and full thickness skin grafting in 13.8% each, and direct closure in 3.1%, as shown in(Table 2)In most cases more than one surgical technique was used

Table 1 Distribution of post burn deformitie

Post burn deformities	Number of cases	Percentage
burn contractures	31	47,7%
Alopecia	2	3,1%
burn contractures + hypertrophic scar	19	29,2%
hypertrophic scar	9	13,8%
Keloids	4	6,2%

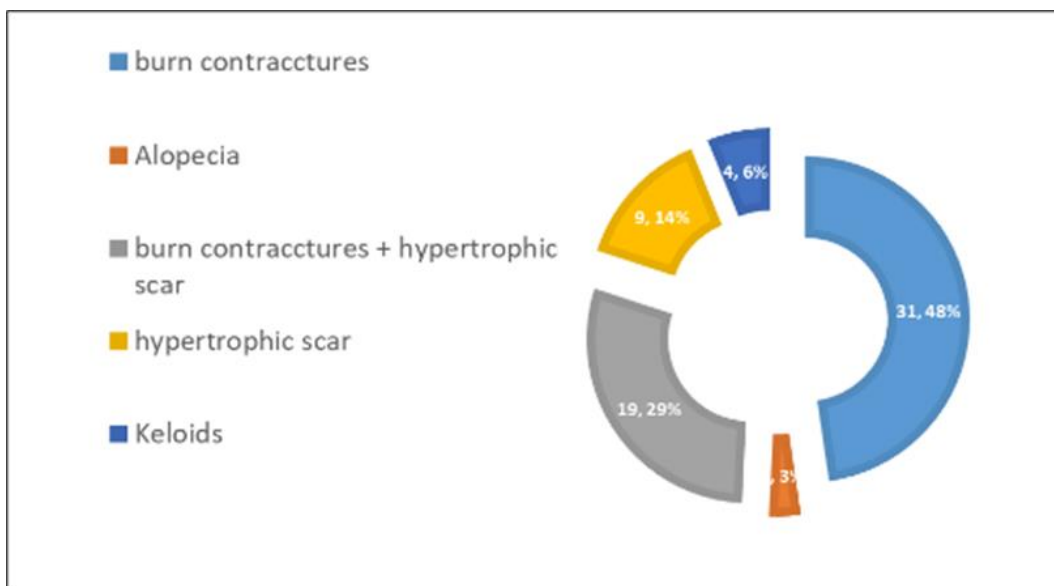


Figure 4 Distribution of post burn deformities

Table 2 Distribution of reconstructive modalités

Reconstructive modalities	Numbers of cases	Percentage
trident flap	7	10,8%
Z-plasty	12	18,5%
Z-plasty series	9	13,8%
Advancement flap	2	3,1%
scar release + FTSG	9	13,8%
scar release + STSG	16	24,6%
scar excision + direct closure	2	3,1%
scar excision + STSG	8	12,3%

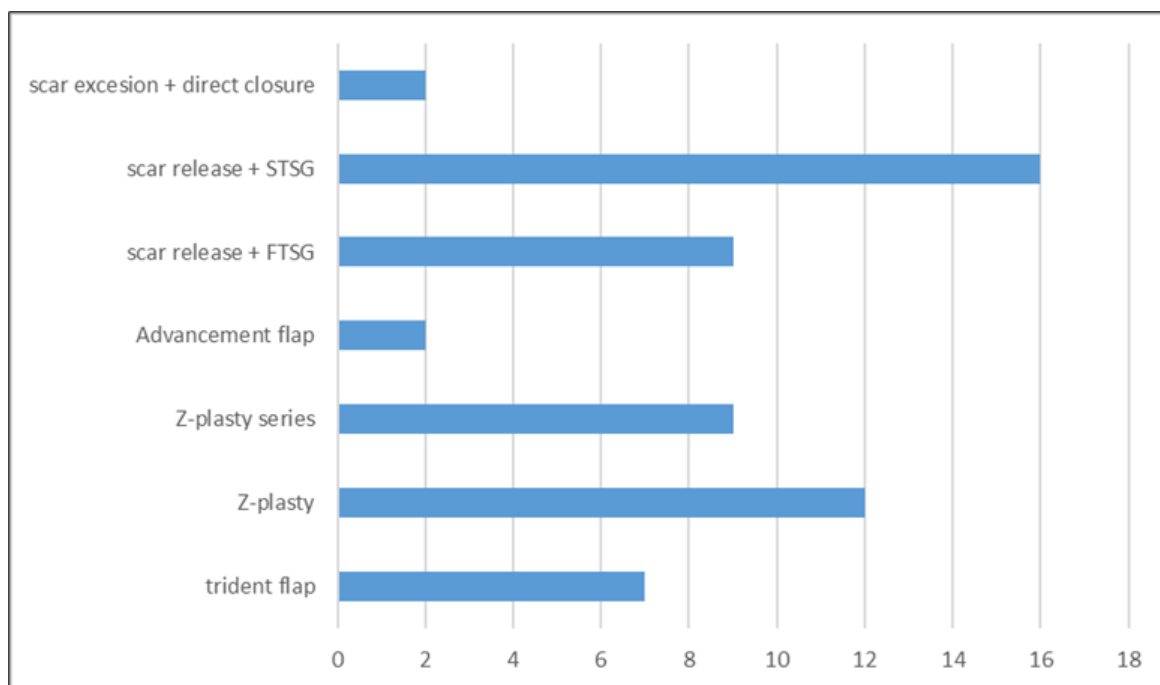


Figure 5 Distribution of reconstructive modalities

We had no infection during the immediate post-operative period, but a partial loss of graft was observed in 5 cases (7.7 %) treated with secondary healing. Longer-term post-operative complications after skin grafts did occur, namely hypertrophic scarring in 12 cases (18.5%), retractions in 8 cases (12;3%) and hard cords in 2 cases (3.1 %) however after Z-plasty. Longer-term, post-operative follow showed no hypertrophic scarring or retraction.

4. Discussion

Burns sequelae are still commonly seen in our practice because we treat a large number of burns which did not receive early wound coverage, early excision and grafting.

This late treatment of burns in our country is the result of a lack of Burns Centers, skin banks, and, in some cases, the patient's refusal of surgical treatment. The objectives of reconstruction after excision of scars include restoration of function, comfort, appearance and good aesthetic results. Adequate aesthetic results can be obtained through skin grafts or flap resurfacing in patients with post burns sequelae, especially when the limits of the aesthetic units or subunits are preserved. There are no set guidelines for scar treatment, which must be individualized depending upon the distribution, size, thickness, consistency of the lesions and any associated inflammation. A combination approach to therapy, surgery and non-surgery, seems to be the best option. [2]

The present study was conducted on 65 patients with burns sequelae, most of whom were children 39 patients (60 %). This is justified by the fact that children in our country are more predisposed to burn injury and constitute the largest number of burn patients. In almost all pediatric cases, surgical procedures were performed for functional purpose, usually for contracture release of the upper and lower limbs, and not for aesthetic purposes. In adult patients, surgical interventions were performed for both functional and aesthetic purposes. [8]

From the analysis of anatomical regions with post burn scars, the hand is the most often involved, in 24 cases (36.9%). Other regions involved are head and neck, the lower limbs, elbow fold, axilla. Rarely scars were found in the trunk and genitals. [9, 10]

Among the patients in our study, scar contractures (31 patients, 47.7%) were more common than hypertrophic scars and keloids. More rarely, patients were treated for alopecia. As our primary objective is to improve function, we tend mostly to operate to correct contractures, which, quite often, are not only multiple in a given patient but also very severe and diffuse. Contracture scars require not only adequate surgical intervention but early initiation of physiotherapy procedure. [1, 11]

As a general “rule”, surgical intervention for post-burn scars should not be undertaken during the active phase of healing and scarring, as long as the scar is immature and highly vascular. This usually takes one year or so as the scar must become mature, soft, supple and “avascular” before undertaking surgery. Recurrence rates of hypertrophic scars after surgical excision are usually low, but after excision of keloids the recurrence rates range between 45% and 100%. [12, 13]

One of the most common surgical procedures performed for the release of scars and wound closure are z-plasty (32.3%). The z-plasty is a simple and elementary surgical procedure without great honor for the surgeon but very helpful for patients [14]

Very often, the z-plasty, for complete release, is combined with full skin grafts and with other local skin flaps.

Tissue expansion is also a useful reconstructive technique, not only for the treatment of alopecia but also for treating other scars in other body parts. Over the past two decades, tissue expansion has developed as an important routine procedure in plastic and reconstructive surgery. [15] It is used progressively in cases of reconstruction treatment for children and adults who do not have enough adjacent tissue for reconstruction of their post burn scars. [16] Unfortunately, due to its cost, tissue expansion has not been used frequently in our practice.

However, various flaps can be used, ranging from local skin flaps that we have used for our patients and fascio-cutaneous flaps to Free flaps that are not used in our department. Flaps are used in special situations, particularly to cover open joints, especially of the hands and feet, or when tendon/nerve surgery is planned at a later date.

5. Conclusions

The surgical treatment of burns sequelae is a difficult process and often requires the application of a combination of surgical techniques, and the development of individual treatment protocols. Reconstructive procedures often need to be repeated and may require a long time to be performed.

In correcting post-burn scar contractures, it is essential to establish a treatment plan based on patient’s priorities, situation and requirements. Reconstruction procedures should be used in sequence, from the simple to the most complex. They involve excision or full release of scar contractures and selection of an appropriate method to cover the resultant defect using skin grafts or flaps.

For a better functional and aesthetic result in treating post-burn deformities, z-plasty combined with full skin grafting is considered as the basic technique, to which complementary reconstructive elements can be added, depending on the depth and damage of anatomical structures.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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