SURGICAL TREATMENT OF BURNS SEQUELAE. OUR EXPERIENCE IN THE DEPARTMENT OF PLASTIC AND RECONSTRUCTIVE SURGERY, PRISTINA, KOSOVO

TRAITEMENT CHIRURGICAL DES SEQUELLES DE BRULURES: L'EXPÉRIENCE DE NOTRE DÉPARTEMENT DE CHIRURGIE PLASTIQUE ET RECONSTRUCTIVE, PRISTINA, KOSOVO

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SUMMARY. Burn injuries are very frequent in Kosovo, leading to long-lasting physical, functional, aesthetic, psychological and social consequences directly proportional to the time of healing; the longer it takes for the burn wound to heal, the more serious are the sequelae. 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, Pristina, Kosovo, from January 2005 until December 2011. This study included 188 patients with burns sequelae. The following variables were considered: age, sex, anatomical location, pathological types, and surgical procedure. There were 82 men (43.6%) and 106 women (56.4%), ranging in age from 0 to 67 years (mean age 33.5 years), most of the patients were children (139 = 73.9%). Burn contractures were observed in 135 (71.8%) patients, hypertrophic scars in 32 (17%), keloids in 10 (5.3%), alopecia in 6 (3.2%), syndactyly in 12 (6.4%), ectropion in 4 (2.1%) and ear deformity in 1 (0.53%) cases. To correct the deformities the most common choice was the Z-plasty technique, used in 31.4% of cases, followed by Z-plasty+full thickness skin grafts in 21.8%, full thickness skin grafts in 18.1%, tissue expansion in 8%, Z-plasty+local flaps in 4.8%, flaps (local, fascio-cutaneous, radial forearm) in 6.9% and direct closure in 6.4%. Timely wound closure and the development of an individual programme for surgical treatment of burns sequelae are crucial for optimal outcomes in patients with burns.

Keywords: burns sequelae, surgical techniques, reconstruction

RÉSUMÉ. *Les brûlures sont très fréquentes au Kosovo: elles sont à l'origine de séquelles fonctionnelles, esthétiques, psychologiques et sociales qui sont directement proportionnelles à la durée de la cicatrisation. Les objectifs de cette étude sont d'examiner les aspects épidémiologiques, cliniques et thérapeutiques chez les patients présentant des séquelles de brûlures dans notre département de chirurgie plastique et reconstructive de Pristina de Janvier 2005 à Décembre 2011. Cette étude réunit 188 patients. Les facteurs suivants ont été examinés: âge, sexe, localisation anatomique, profondeur de la brûlure, et technique chirurgicale. On dénombre 82 hommes (43.6%) et 106 femmes (56.4%), âgés de 0 à 67 ans (âge moyen: 33.5 années), la plupart des patients étaient des enfants (139 = 73.9%). Les rétractions ont été observées chez 135 patients (71.8%), les cicatrices hypertrophiques dans 32 cas (17%), les chéloïdes dans 10 cas (5.3%), l'alopécie dans 6 cas (3.2%), la syndactylie dans 12 cas (6.4%), l'ectropion dans 4 cas (2.1 %) et une seule déformation de l'oreille (0.53%). Pour les corriger, la méthode la plus fréquente était la plastie en Z utilisée dans 31.4% des cas, suivie par la plastie en Z +greffe de peau totale (21.8%), greffe de peau totale seule (18.1%), expansion (8%), plastie en Z +lambeau local (4.8%), lambeau [de voisinage, fascio-cutané, anti brachial] (6.9%) et suture directe (6.4%). La fermeture de la plaie dans les meilleurs délais et la mise au point d'un programme chirurgical individuel permettent d'obtenir des résultats optimaux dans les séquelles de brûlures.*

Mots-clés: *séquelles de brûlures, les techniques chirurgicales, de reconstruction*

Introduction

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

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are frequently encountered in our department. This relatively high incidence is most probably due to Kosovo 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 reepithelialization) 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 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 end 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 post-burn scars is often indicated. Surgical treatment includes fusiform scar excision, partial or serial excisions, local flap coverage, skin grafting, pedicled or free flaps, and tissue expanders.

Materials and methods

This study includes all 188 patients with burns sequelae who were treated at the Department of Plastic and Reconstructive Surgery, Pristina, Kosovo, from January 2005 until December 2011. During this period of study we also treated 964 patients with fresh burns, suggesting the incidence of post-burn sequelae in our country is about 20%.

The following variables were considered: age, sex, anatomical location, pathological types and wound closure procedure. Our patients presented a variety of post-burn deformities: hypertrophic scarring, keloids, scar contractures, alopecia, syndactily, ectropion and ear deformity. All patients underwent a variety of surgical procedures specific to the individual post-burn sequelae. In our patients, we usually used the z-plasty technique, full and split skin grafts, tissue expansion 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 In Stat 3 was used for data processing.

Results

There were 82 males (43.6%) and 106 females (56.4%), ranging in age from 0 to 67 years (mean age 33.5 years), most of the patients were children (139 = 73.9%). Anatomical regions involved with burns sequelae were: the hand in 82 cases (43.6%), the head and neck in 27 cases (14.4%), lower limbs in 23 cases (12.2%), cubital region in 22 cases (11.7%), trunk in 16 cases (8.5%), axilla in 14 cases (7.4%) and genitals in two cases (1%) (*Table I*). Burn contractures were observed in 135 (71.8%) patients, hypertrophic scars in 32 (17%), keloids in 10 (5.3%), alopecia in 6 (3.2%), syndactily in 12 (6.4%), ec-

Table I - Distribution of patients in relation to gender, age and anatomical regions with burns sequelae

	Cases N=188	%
Gender		
Male	82	43.6
Female	106	56.4
Age		
Children	139	73.9
Adults	49	26.1
Anatomical regions		
Head and neck	27	14.4
Trunk	16	8.5
Axilla	14	7.4
Cubital region	22	11.7
Hand	82	43.6
Lower limbs	23	12.2
Genitals	2	1

Table II - Presentation of post-burn deformities

Post burn deformities	Number of cases	Percentage
Hypertrophic scars	32	17
Contracture scars	135	71.8
Keloids	10	5.3
Alopecia	6	3.2
Syndactily	12	6.4
Ectropion	4	2.1
Ear deformity	1	0.5

Table III - Presentation of various surgical modalities

Reconstructive modalities	Number	Percentage
Z-plasty	59	31.4
Z-plasty+FTSG	41	21.8
Z-plasty+local flap	9	4.8
Flaps	12	6.9
Skin expander	15	8
FTSG+STSG	40	21.3
Direct closure	12	6.4

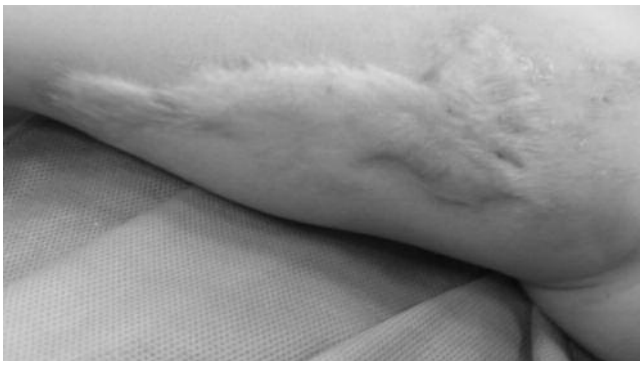

Fig. 1 - Clinical appearance of hypertrophic scar.

Fig. 2 - Clinical appearance of scar contracture.

Fig. 3 - Release of post-burn finger contracture with Z-plasty.

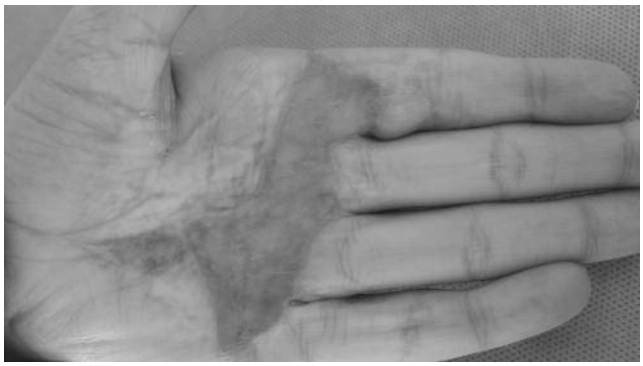

Fig. 4 - Release of post-burn hand contracture with Full Skin Graft.

tropion in 4 (2.1%) and ear deformity in 1 (0.53%) case. The pathological types are shown in *Table II*. It should be noted that some patients had more than one burn sequelae (*Figs. 1 and 2*). After excision or release of post-burn scars, to correct the deformities we mostly used Z-plasty alone, as in 31.4% of cases (*Fig. 3*), followed by Z-plasty+full thickness skin grafting in 21.8%, full and split thickness skin grafting in 21.3% (*Fig. 4*), tissue expansion in 8%, Z-plasty+local flap in 4.8%, flaps (local skin flaps, fascio-cutaneous) in 6.9% and direct closure in 6.4%, as shown in *Table III*. In most cases more than one surgical technique was used.

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 Kosovo 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 188 patients with burns sequelae, most of whom were children – 139 patients (73.9%). 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 82 cases (43.6%). Other regions involved are: head and neck, the lower limbs, elbow fold. Rarely scars were found in the trunk, axilla and genitals.[9-11]

Among the patients in our study, scar contractures (135 patients, 71.8%) were more common than hypertrophic scars, syndactyly and keloids. More rarely, patients were treated for alopecia, ectropion and ear deformity. 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.[1,10]

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%. The most common surgical procedures performed for the release of scars and wound closure are z-plasties (31.4%). The z-plasty is a simple and elementary surgical procedure without great honor for the surgeon but very helpful for patients.[12] 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. 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 (*Fig. 3*).[13] Unfortunately, due to its cost, tissue expansion has not been used frequently in our practice. However, we have used various flaps, ranging from local skin flaps and fascio-cutaneous flaps. 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. Free flaps are not used in our department due to a lack of operating microscopes and other necessary instruments.

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. Despite Kosovo's low socio-economic development, absence of a modern Burn Center and limited or no availability of dermal substitutes, pressure therapy etc., we are motivated to use all at our disposal to offer as advanced treatment as possible to our patients with burn injuries. In correcting post-burn scar contractures, it is essential to establish a treatment plan based on patients' 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.

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Author Declaration. We declare that we have made a significant contribution to the conception and design of this scientific study. We also carried out the data collection of our patients, as well as the analysis and careful interpretation of these data. Drafting and review of this research paper was conducted with due care to ensure that this paper contained relevant scientific content. We further declare that, after careful review and analysis, our approved scientific paper was submitted for publication in your journal. We confirm that this study, manuscript, including the data, tables and figures has not been published in another journal. Also this manuscript is not under consideration elsewhere.