

Original Article

A retrospective study of 572 patients with hand burns treated at the Department of Plastic Surgery Kosovo during the period 2000-2010

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Abstract: Hands participate in everyday human activities and they are the most vulnerable parts of a human body. The objective of this study is to understand the common causes of hand burns, the methods of surgical interventions, duration of hospitalization and distribution of hand burns in 11 year period regarding the age. This is a retrospective study that included 572 patients with hand burns treated at the Department of Plastic Surgery Kosovo during the period 2000-2010. The data were collected and analyzed from the archives and protocols of the University Clinical Center of Kosovo. Data processing was done with the statistical package InStat 3. From statistical parameters were calculated structural index, arithmetic median and standard deviation. Data testing is done with χ^2 test and the difference is significant if $P < 0.05$. The Ministry of Health of our country should make efforts to organize training for health workers about treatment for minor burns in order to reduce the number of referral patients from other primary (Familiar Medicine) and secondary centers (regional Hospitals).

Keywords: Hand burns, human activities, thermal injuries

Introduction

Hands participate in everyday human activities and they are the most vulnerable parts of a human body. They are often injured because of being closest to dangerous facilities [1, 2]. Hands are often injured trying to cover other parts of a body from the fire or other destructive factors [1]. Hand burns occur commonly both as part or larger burn injuries as well as isolated injuries and are leading cause of impairment after burn injury [3, 4]. Primary involvement of the bones and joints, or exposure of partly destroyed tendons, constitutes a rare but serious clinical form of deep thermal injuries to the hand. The estimated frequency is 5% of all hand burns treated in burn centers [5, 6]. Even though the hands constitute only 5% of the total body surface area (TBSA), thermal injury in the hands is not only one of the com-

monest burns but also one of the most difficult pathologies to burn surgeons to treat [7, 8]. The most important objective in treating wounds of the hand is the preservation of proximal interphalangeal joint motion [9, 10]. There have been a number of studies that have examined the optimal management and outcomes of patients with both partial-thickness and full-thickness burns of the hand. Sheridan studied 305 hands with partial-thickness tissue loss that did not require surgery and found that 97% of patients had a good functional outcome defined as normal or near normal based on staff impression. Many of the studies on surgical management of hand burns have focused on the timing of excision and the techniques of skin grafting. Full-thickness hand burns have been described as having mostly good outcomes [3, 11]. Among patients surviving large burns, morbidity always includes scarring and

Table 1. General characteristics of patients with hand burns

	N	%
Gender		
Male	456	79.7*
Female	116	20.3
Age groups (year)		
0-9	62	10.8
10-19	34	5.9
20-29	95	16.6
30-39	157	27.4
40-49	95	16.6
50-59	58	10.1
60-69	45	7.8
70+	26	4.5
Mean ± SD	26.0 ± 10.0 yr	
Range	1-72 years	

*P<0.001 (significant by gender).

frequently includes infections, loss of bone and muscle mass, poor wound healing, hormonal imbalance, and pulmonary, hepatic, or renal failure. Loss of skin appendages makes heat regulation and skin care more difficult. Even small burns can cause significant morbidity, such as loss of hand function or facial deformity. There are often psychological sequelae in burned patients, including post-traumatic stress disorder and depression [12-14].

The objective of this study is to understand the common causes of hand burns in our population, localization (unilateral or bilateral), gender, depth of hand burns, methods of surgical interventions, distribution of deep hand burns in 11 year period regarding the age.

Materials and methods

This is a retrospective study that included a 853 patients with burns localized in upper limbs treated at the Department of Plastic Surgery Kosovo during the period 2000-2010, from which in 572 cases the burns were localized in hands. The data were collected and analyzed from the archives and protocols of the University Clinical Center of Kosovo. Data processing was done with the statistical package InStat 3. From statistical parameters were calculated structural index, arithmetic median and standard deviation. Data testing is done with χ^2 test and the difference is significant if $P<0.05$.

Results

In our retrospective study we analyzed the records of 572 patients with hand burns treated at the Department of Plastic and Reconstructive Surgery Kosovo during the period from 1 December 2000 to 1 December 2010. We found that the most common cause of hand burns in our population were flame (from explosion of gas and derivatives of gasoline) with 295 cases or 51.6%, while in 210 cases or 36.7% the cause of hand burns were low voltage electrical burns (flash or arch burns), in 61 cases or 10.7% the cause of hand burns were scald and in 6 cases or 1% the cause were other agents (radiation and chemical substances) (Table 2). Out of 572 cases with hand burns 261 cases or 45.6% had unilateral localization while 311 cases or 54.4% had bilateral localization (Table 2). The hand burns in our study dominates in male gender with 456 cases or 79.7% while 116 or 20.3% were female (Table 1). The average age of our patients in this study with hand burns was 26 years. Depending on the depth of the burns 381 cases or 66.6% were with partial thickness burns while 191 cases or 33.4% were with full thickness burn (Figures 2, 3). One hundred one patients with full thickness burns of the hand were treated surgically, in most of the cases with full thickness burns 168 cases or 88% after necrectomy the defects are covered with split thickness skin graft (STGS), while in 11 cases or 5.8% after necrectomy were exposed tendons and joints in hands and this cases are covered with abdominal distant flap (Figures 2-7), 7 cases or 3.7% after finger amputations at different levels of the joint because of necrosis and gangrene (with electrical burns) were covered by a radial island flap, in 5 cases or 2.6% full thickness burns were localized in fingers, in this cases were applied cross finger flaps (Table 2).

Duration of hospitalization ranged from 7-123 days. The mean hospitalization was 44 days. Regarding the age group dominates the age group from 30-39 with 157 cases, followed by the age group from 20-29, 40-49 years 95 cases, 0-9 years 62 cases, 50-59 years 58 cases, 60-69 years 45 cases, 10-19 years 34 cases and 70+ years 26 cases. The youngest patient was 8 months and the oldest was 72 years old. Distribution of hand burns in years had the following features: the 2001 is the year

Clinical management of hand burns

Table 2. Localization, cause and methods of surgical interventions

	N	%
	572	100
Localization		
Unilateral	261	45.6
Bilateral	311	54.4
Cause		
Flame	295	51.6
Electric flame	210	36.7
Scald	61	10.7
Other (radiation and chemical substances)	6	1.0
Surgical interventions		
Yes	191	33.4
No	381	66.6
Surgical methods n=191		
STSG	168	88.0
Abdominal flap	11	5.8
Island radial flap	7	3.7
Cross finger flaps	5	2.6

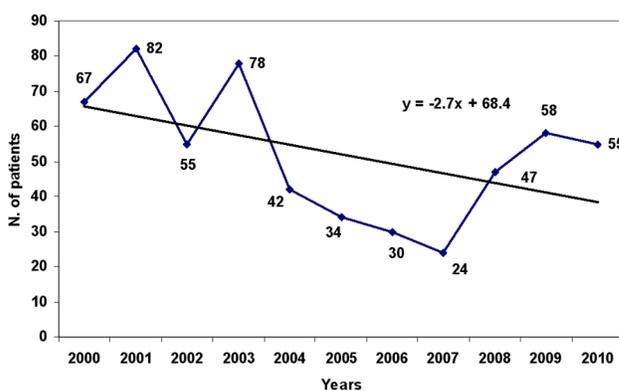


Figure 1. Number of patients by years.

were the incidence of burns was the highest with 82 cases followed by 2003 with 78 cases, 2000 with 67 cases, 2009 with 58 cases, 2010 and 2002 with 55 cases, 2008 with 47 cases, 2004 with 42 cases, 2005 with 34 cases, 2006 with 30 cases, and 2007 with 24 cases (**Table 1** and **Figure 1**).

Discussion

Superficial dermal burns are always treated conservatively, full-thickness burns always require surgery. However, more than 50% of burn wounds are deep second degree or deep dermal burn wounds. The treatment of choice

for these intermediate thickness burns is still much debated and controversial [15-19]. In our retrospective study we analyzed the records of 572 patients with hand burns treated at the Department of Plastic and Reconstructive Surgery Kosovo during the period from 1 December 2000 to 1 December 2010. We found that the most common cause of hand burns in our population were flame due to explosion of gas and derivatives of gasoline with 295 cases or 51.6%. This finding in our study may be explained by the postwar period in our country. After 1999 reduction of electricity in the household of our country was up to 12 hours and more, so citizens of our country forced to use other alternatives of electricity sources: such as aggregates with fuel for production of electricity, canisters with gas for preparation of food, therefore injuries of this nature have been quite frequent in our population.

Another dominant cause of hand burns in our population are flash or arch burns with 210 cases or 36.7%, this can be explained by postwar period in our country. After 1999 our country emerged from war and our population confronted with frequent reductions of electricity especially during winter season due to overload of electricity network. Electrical burns have usually been more frequent in undeveloped countries with an inefficient electric energy system and a low social and economic level, as in our country, Kosovo. The consequences of the Kosovo war included the destruction of the country's production infrastructures and the disruption of the electricity supply system. With the deterioration of the electricity supply system in Kosovo, the number of patients with electrical injuries increased, with the highest rate in Europe. In Kosovo the electricity supply system consists of two old power stations that are unable to satisfy all needs for electric current. This is linked with the low social and economic level of the population, the inefficiency of the electricity network, the amortization of electricity network dispersions, the misuse of electric current, and repair work on the electricity network done by non-professionals had this consequence [20].

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Clinical management of hand burns



Figure 2. Deep dermal hand burn.

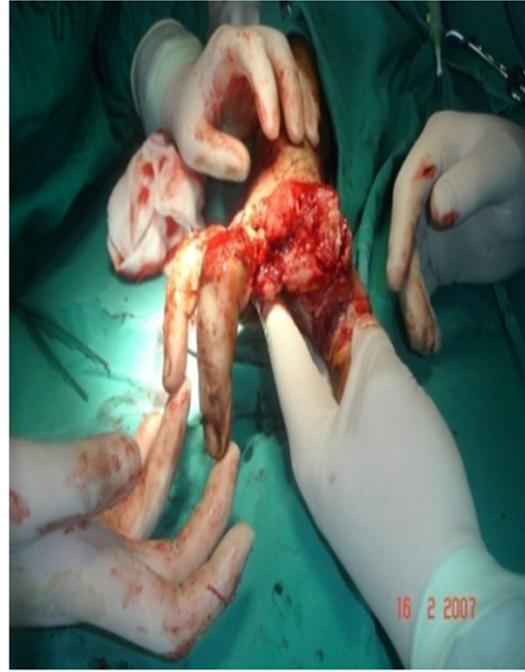


Figure 4. Deep dermal hand burn after necrectomy.



Figure 3. Deep dermal hand burn in same patient.

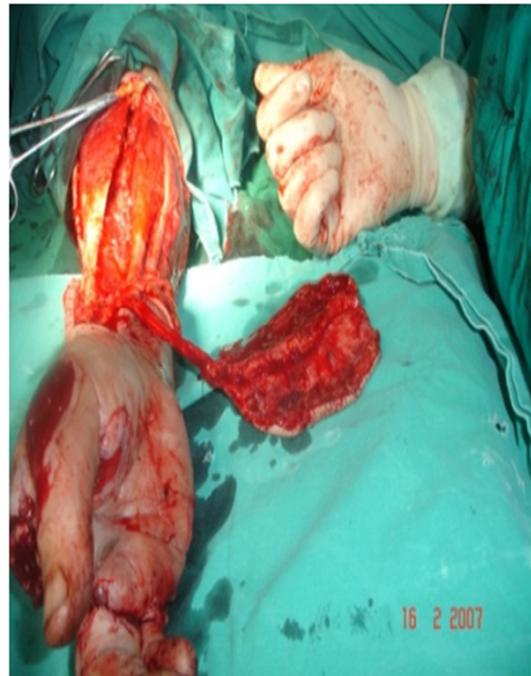


Figure 5. The raise of radial forearm flap.

cases or 54.4% had bilateral localization. The hand burns in our study dominates in male gender with 456 or 79.7%, while 116 cases or 20.3% were female. The average age of our patients with hand burns was 26 years. In other similar studies conducted by Enver Ilhan et al. in 449 patients the most affected area was

hands with 159 cases, the mean age of this patients was 33.2 [21]. This dominance of the male gender and young age in our population is related to socio-economical and cultural conditions in our country, young age and males in our

Clinical management of hand burns



Figure 6. The defect after necrectomy covered by radial forearm flap.



Figure 7. The same defect covered by radial forearm flap.

country are the main carriers of heavy physical works also our families in our country are dependent from the financial aspects of this age and sex, while women in our country especially in rural areas are mainly housewives.

Patients with superficial burn wounds in our Department involving the epidermis and outer dermal skin layers are carefully cleansed and dressed with topical antimicrobial agents daily (sulfadiazine ointment). Patients receive adequate pain medication and are instructed by the physical therapist in an active ROM program and self-care from the time of admission. Transient edema in this patient in our Department is best handled through moderate limb elevation and active ROM exercises without splinting.

Out of 191 patients with full thickness hand burns is indicated surgical treatment, in most of the cases 168 or 88% after necrectomy this defects were covered with STSG, because in this cases we don't have the exposed tendons and joints. Deep dermal and full-thickness hand burns without tendon or skeletal involvement in our Department are splinted at the patient admission. Splints provide the optimal resting hand position with flexion of the MCP joint and extension of the PIP and DIP joints. The patient's wrist is dorsi flexed 20 to 40

degrees, and the thumb is placed in palmar abduction and extension. The physical therapist of our Department directs patients in ROM exercises and activities of daily living as tolerated. The splint remains on the injured hand when the patient is resting or not engaged in physical therapy.

In Twenty three cases with deep dermal hand burns were exposed tendons and joints, in 11 cases or 5.8% this exposed tendons and joints were covered with abdominal distant flap, 7 cases or 3.7% after finger amputations at different levels of joints were covered by radial island flap. In 5 cases or 2.6% full thickness burns were localized in fingers, in this cases were indicated cross finger flaps.

Full-thickness burns with probable tendon involvement or joint-space disruption are positioned in resting splints.

The Department of Plastic Surgery University Clinical Center of Kosovo treated 572 burns involving one or both hands from 2000 to 2010. One hundred ninety one patients had deep dermal or full-thickness hand burns that required operative therapy. All patients received physical therapy burn management as described in this study report. We successfully treated 176 burns without acute or chronic complications. Seven burns had acute and

chronic complications: 1 boutonniere deformity of an index finger that resolved with splinting, 6 single-digit amputations because of severe burn injury with resultant tissue necrosis, and 8 web-space contracture releases treated with skin grafts. All complications occurred in patients with the most severely injured hands and resulted from burn injury.

Duration of hospitalization ranged from 7-123 days. The mean length of hospitalization was 44 days. In other similar studies conducted by H. Onarheim et al. the mean length of hospitalization was 19.5 ± 19.8 in 1294 patients included hand burns and other body localization [22]. This discrepancy in our study probably results because our Department of Plastic and Reconstructive Surgery is the only department in our country where are treated patients with burns starting from initial evaluation of burns, reanimation and surgical interventions of this kind of thermal trauma. Regarding the age group dominates the age group from 30-39 with 157 cases. The youngest patient was 8 months and the oldest was 72 years old. Distribution of burned hands in years had the following features: the 2001 is the years were the incidence of burns was the highest with 82.

Conclusion

On the basis of the results from our study we can conclude that: Department of Plastic Surgery is the only referral center in our country with about 2 million inhabitants where are treated minor and major burns and complications after burns injury. The Ministry of Health of our country should make efforts to organize training for health workers about treatment for minor burns in order to reduce the number of referral patients from other primary (Familiar Medicine) and secondary centers (regional Hospitals).

Increasing of electrical burns is a consequence of the war in Kosovo, this is linked with the low social and economic level of the population, the inefficiency of the electricity network, the amortization of electricity network dispersions, repair work on the electricity network done by non-professionals. Our Ministry of Health should make every effort to inform the population about the consequences of repaired electrical network done by non-professionals and complications of deep burns (especially hand

burns) through the media and poster presentations in various public spaces.

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Disclosure of conflict of interest

None.

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Clinical management of hand burns

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