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CARPAL TUNNEL RELEASE IN HAND BURN-A NOVEL APPROACH TO PRESERVE HAND FUNCTION

Plastic Surgery

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ABSTRACT

The present prospective comparative study has been conducted in the 15 patients of thermal, scald and electrical burn with hand involvement who were evaluated and managed in the emergency burn care unit. The 6 cases with edematous hand and wrists were managed with emergency fasciotomy and carpal tunnel release with splintage in safe hand position. Patients were observed for the clinical improvement like regression of edema and preservation of sensory and motor activity. The results observed in cases were compared with the 9 controls in which the emergency fasciotomy alone with splintage in safe hand position was performed. The patients were on follow up examination for the period of six months after discharge from the burn unit. There was significant edema reduction in cases within 3-4 days as compared to the control (4-6 days).The muscle power of grade 5 was observed in all cases as compared to that of 4 in control group. There was no nerve compression symptoms observed in any cases. We concluded that there was significant improvement in cases with carpal tunnel release along with fasciotomy. This improvement was significant in both short term as well as long term outcome.

KEYWORDS

Hand.Burn, Carpal tunnel syndrome, Fasciotomy.

Introduction

Burn injuries are a major cause for hospitalisation and are associated with significant morbidity and mortality. The hand serves the manipulatory and exploratory functions, and thus the upper limb is one of the most frequently injured part of the human anatomy as a result of burn injury. Hand involvement is found in approximately 75-80% of severely burnt patients. In two series of burn patients which included electrical burns, the proportion of hand involvement was reported as 72% and 85%[1,2]. Even if involvement of hand, do not cause significant mortality, but they are important factors for a successful reintegration into society and professional life after discharge from hospital.

In order to maximize the final functional results it is very important that the management of severe burns of the hands and upper extremities should be done by experts with specific knowledge of burn managements, reconstruction and rehabilitation[1,3,4].Otherwise, delay in intervention will led to impaired function and unsatisfactory outcomes[5,6] . Treatment of hand is often overlooked in emergency department.

During management of hand burn, if basic principles are kept in mind to eliminate edema by mobilization, it will prevent compartment syndrome hence reducing the morbidity due to nerve and vascular compromise.

Deep structures injured at the time of burning, or ignored during the phase of acute management, may give rise to chronic problems which are a challenge in reconstruction, such as joint subluxations or deviations resulting from imbalance in ligaments and muscular forces. Unfortunately, not all patients present to a plastic surgeon immediately after they have suffered a hand burn. Many are seen in the acute phase by health operators who do not give high priority to hand function, while some patients have such severe total body surface area burns that appropriate care for the hands comes too late to prevent deformity. Hand burn deformities are usually difficult cases for reconstruction. If deep structures such as tendons, ligaments and joints have been affected directly by the bum, or if secondary infection and joint stiffness develop as a result of improper initial therapy, the reacquisition of a full range of motion after it can therefore be concluded that the correct initial treatment of hand burns is a matter of great importance for the avoidance of secondary deformities, as it guarantees hand function more surely than reconstruction.

Carpal tunnel syndrome (CTS) occurs when there is compression of median nerve in the carpal tunnel boundary at wrist and it is considered among the most common entrapment neuropathy in the upper extremity. The flexor retinaculum is a strong, fibrous band that arches over the carpus. It includes the distal deep fascia of the forearm, transverse carpal ligament, and aponeurosis between the thenar and hypothenar muscles[8]. A successful carpal tunnel release usually requires division of all of the structures.The first open release was performed by Herbert Galloway in 1924[9]. The first endoscopic release was described by Okutsu et al[10]. in 1989.

The most important causes of Carpal tunnel syndrome are congenital predisposition, stressful work, trauma, endocrine disorders, joint deformities, fluid retention, space occupying lesions in the tunnel etc[11,12,13]. The reported causes of Carpal tunnel syndrome in burnt cases are due to increased volume of carpal tunnel contents which occurs as a result of edema, synovitis, wrist hyperextension, tight dressing, fibrosis, and direct burn to the nerve.

In hand burnt cases involvent of median nerve is more than the ulnar nerve[14]. The incidence of Carpal tunnel syndrome following burns is found to be very common and it is usually due to thermal burns. The various causes of Carpal tunnel syndrome are excessive edema in circumferential burns, extensive metabolic and inflammatory changes occurring in response to burns.

We performed carpal tunnel release as an additional procedure to fasciotomy of hand and wrist in burnt upper extremity cases with the idea of preventing the median nerve compression and consequences. The carpal tunnel release can be done by The standard carpal tunnel release by giving 5-7 cm long incision from the palm toward the wrist and across the wrist creases[15]. Endoscopic releases can also be performed through one or two small incisions, each 1 to 1.5 cm long[16]. The objective of this study is to signify the better outcome in carpal tunnel release with fasciotomy as compared to only fasciotomy in patients of hand and wrist burn.

Materials and Method

The present prospective study has been conducted from 1st August 2014 to 20th May 2016 in the division of burn, plastic and reconstructive surgery of our institution and has been approved by the

departmental ethical committee. The 15 patients of thermal, scald and electrical burn with hand involvement were evaluated and managed in the emergency burn care unit. The 6 cases with edematous hand and wrists were managed with emergency fasciotomy and carpal tunnel release with splintage in safe hand position. Patients were observed for the clinical improvement like regression of edema and preservation of sensory and motor activity. The results observed in cases were compared with the 9 controls in whom the emergency fasciotomy alone with splintage in safe hand position was performed. The patients were on follow up examination for the period of six months after discharge from the burn unit. The results were tabulated and statistical analysis was done by chi square (χ^2) and p value estimation using SPSS 22 statistical analysis software.

Results

The 15 patients of thermal, scald and electrical burn with hand involvement were evaluated and managed in the emergency burn care unit. The 6 cases with edematous hand and wrists were managed with emergency fasciotomy and carpal tunnel release with splintage in safe hand position (Figure 1) and 9 controls in whom the emergency fasciotomy alone with splintage in safe hand position was performed. The summary of results are shown in (table 1,2,3). There was significant edema reduction in cases in 3-4 days as compared to the control (4-6 days). The muscle power of grade 5 was observed in all cases as compared to that of 4 in controls (Figure 2 and 3). There was no nerve compression symptoms observed in our cases.

Table 1: Summary of clinical features and outcome of cases

Cases	Age(Years)	Sex	Etiology	Significant Edema regression (Days)	Sensory (TPD in mm)	Motor activity(power)
1	20	F	Thermal	4	7	5/5
2	19	M	Thermal	3	6	5/5
3	26	M	Thermal	4	7	5/5
4	30	M	Thermal	4	7	5/5
5	23	F	Scald	3	6	5/5
6	34	M	Thermal	4	8	5/5

Table 2 : Summary of clinical features and outcome of controls

Cases	Age(Years)	Sex	Etiology	Significant Edema regression (Days)	Sensory(TPD in mm)	Motor activity(power)
1	17	F	Scald	4	8	4/5
2	22	F	Thermal	5	8	3/5
3	24	M	Thermal	5	9	4/5
4	18	M	Thermal	4	8	4/5
5	33	M	Thermal	5	9	3/5
6	22	M	Thermal	5	8	4/5
7	39	F	Scald	6	9	3/5
8	21	M	Thermal	5	7	4/5
9	28	M	Thermal	5	8	4/5

Table 3: Statistical analysis and outcome of cases versus controls

Parameters	Cases	controls	P value
Mean age(Years)	25.33±5.85	24.89±7.22	0.4804
Sex ratio(M:F)	2:1	2:1	
Thermal burn	5	7	
Scald burn	1	2	
Significant Edema regression(mean days)	3.60±0.55	4.89±0.60	0.0409
Mean TPD(mm)	6.83±0.75	7.40±2.67	0.0172
Mean power	5.00±0.00/5	3.67±0.50/5	0.0046

Fig.1. Intraoperative photograph of case showing carpal tunnel release with median nerve decompression.

Fig.2. Post operative photograph of case showing complete fist formation after carpal tunnel release (3 months).

Fig.3. Follow up photograph of control showing failure of formation of fist with hypothenar and thenar waisting

Discussion

Varying degrees of burn injuries lead to damage of skin and underlying Structures. The reported prevalence of carpal tunnel syndrome in general population is approximately 10%[17,18]. The occurance of carpal tunnel syndrome has also been cited in various studies[19-21] but very few attention has been paid with regards to its management.

In our study, thermal burn was the commonest etiological findings observed and most of the hand deformities occurred as a result of thermal burns(80%) , followed by scalds. Hassan Z et. al., in their study of 36 carpal tunnel syndrome patient following burn injuries, found thermal burn to be the commonest etiological factor with incidence of about 56%[7]. They also report that apart from the direct effect of trauma, there was greater chances of entrapment of nerves of hand, especially of median nerve in carpel tunnel owing to excessive oedema in circumferential burns. Inadequate and Improper measures taken at the time of presentation to health care centre may lead to various deformities that could have been avoided otherwise. In emergency care centre, if adequate attention is paid to basic principle of preventing edema and compartment syndrome in hand burnt patient, various

secondary deformities can be prevented. Unfortunately, most of the times these patients presents to health workers who do give much priority to salvage of hand function, only some patients present to a plastic surgeon immediately after they have suffered a hand burn.

It was observed that in circumferential burn, apart from direct burn effect, there occurred greater chances of carpal tunnel syndrome leading to entrapment of nerves of hand especially median nerve. This entrapment is due to edema which occurred as a results of extensive metabolic and inflammatory response to burn injury.

In our study, mean age of cases was 25.33±5.85 and control was 24.89±7.22. We also found that approximately 66.67% of patients were male with sex ration of 2:1 in both cases and control groups. This observational findings of our study was similar to previous observation reported by Hassan et. al[7]. where most of the burn patients with carpal tunnel syndrome were male(79%) with sex distribution of four times than female.

In cases it was found that significant edema regression occurred in 3.60±0.55 days in comparison to control group in which significant edema regression occurred in 4.89±0.60 days. This value was found to be statically significant(P value 0.0409).

Other parameters of this study like mean two point discrimination test and mean power were found to be significantly better in cases were carpal tunnel release was done.

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