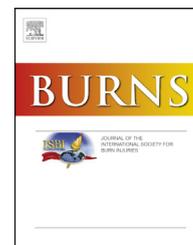


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The scourge of burn contractures: Who will bell the cat?

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ABSTRACT

Introduction: Majority of burn injuries occur in developing world. There have been many advances in burn care management. But this advance comes at a price of ever increasing burn sequel of scarring. Burn scar contractures, in spite of being preventable, continue to be a common reality in our world. This paper aims to evaluate the lacunae in burn care leading to formation of contractures, to evaluate common sites of contractures, practice of advising splintage and anti-deformity positioning.

Procedure: This retrospective observational study was conducted over a period of six years (January 2010–December 2015) at a tertiary Burn unit in Mumbai (India). The records of burn contracture patients were scrutinized to obtain the data regarding patient's socio-demographic profile, details of burn injury, splinting and exercises advised and details of surgeries required. Data was tabulated and analysed.

Results: There was a significantly lower prevalence of advice regarding splinting, mobilization exercises and pressure garments. The prevalence of early surgery was also found to be low.

Conclusions: Attempt has been made to identify the factors affecting the prevalence of burn scar contractures. Authors recommend that efforts be made for improving the knowledge of the treating doctors. Also, efforts should be made to increase awareness of burn prevention and emergent management.

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1. Introduction

Recent advances in burn care management have made it possible for higher percentage burn patients to be salvaged. But this advance comes at a price of ever increasing burn sequelae of scarring [1]. Though scarring is inevitable, contractures are not. Just as most burns are preventable, contractures also are preventable. So why is it that we see so

many patients of contractures in our country? In the developing countries, the inevitable sequel of burn scarring is compounded with added contractures of single or multiple joints [2].

The patient pays a steep price for the post burn contractures in terms of prolonged treatment of the contractures in form of multiple staged surgical procedures, lost working hours and delayed return of the patient to society as a productive member. The economic burden of this disease for our society is high [3,4]. Despite advances in the overall management of burn injuries across the world, severe burn scar contractures are seen routinely by every plastic surgery unit in university hospitals in our country. So not only is our burn burden high [5], we also have a very high number of patients with

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burn scar contractures. If we are to reduce the burden of contractures, we need to know the reasons for it.

Our study aims to evaluate the lacunae in burn care leading to formation of contractures, to evaluate common sites of contractures, practice of advising splintage and anti-deformity positioning. Thereafter the authors propose to suggest a few recommendations which may be helpful in reducing the burn scar contracture burden in our country.

2. Methodology

This retrospective observational study was conducted over a period of six years (January 2010-December 2015) at a tertiary Burn unit in Mumbai (India) after taking clearance from the Institutional Ethics Committee [Letter No: IEC(I)/OUT/215/15]. The study included the data of all patients of either gender and all ages who were admitted to our ward for burn scar contractures following management of their acute burn injuries elsewhere.

The records of these patients were scrutinized to obtain the following data: patient's socio- demographic profile, type of burn injury, total body surface area (TBSA) burnt, details of health care facility where acute burn care was provided, whether range of motion (ROM) exercises and use of anti-deformity positioning and splintage was done in acute management as well as after healing, and use of pressure garments in the scar maturation phase. Patient's compliance to treatment and therapy was noted along with period of follow up. Details regarding operative intervention if performed during the acute management in the form of early tangential excision and grafting or delayed grafting were recorded in a proforma. The time between injury and presentation with contractures to us, and the site of the contractures were also recorded.

Data were subjected to statistical analysis using SPSS version 22 and various descriptive statistics were used to calculate frequencies and percentages, means and standard deviations. Numerical data such as age were expressed as mean and categorical data were expressed as frequencies and percentages.

3. Results

During this period we operated upon a total of 486 patients with contracture, of which 195 (40.19%) were males and 291 (59.81%) were females. Ages ranged from 1 year to 75 years. There were 70 children up to the age of 12 years (14.40%). The mean age of the adults was 27.94 years and of the children, 7.45 years (Fig. 1). The TBSA burnt in the initial burn injury ranged from 1% to 72%. The smallest TBSA involved was found in cases of isolated burns of the hands or digits secondary to electrical or flame burns while the largest TBSA involved was found in patients with a history of flame burns.

Types of initial burn insults comprised flame burns in 386 cases (79.42%), electrical burns in 29 (6.11%), scalds in 71 (14.6%). Of the total, 381 were non-intentional cases, 82 were suicidal cases and 23 were homicidal cases. The time between the initial injury and presentation for contracture release ranged from 1 month to 29.5 years. Though it is true that contractures form when the scar tissue remodels to cause limitation of movements and restricting mobility, the tightness and some restriction of movement may start when the scar is still immature and in very early phase of remodelling. Such scars when present in areas like hand or face have frequently lead to emerging contractures. Our patient, a one year old child who presented with a contracture like condition of the palm at 1 month after burn underwent serial splints and did not need surgery later.

Majority of patients (57%, n=486) were treated for acute burn management in primary health care centres as compared to only 16% treated in tertiary centres (Fig. 2). Among the body areas affected, the commonest contracture was of the Hand (49.8%), followed by Neck (26.7%) (Fig. 3). The commonest combination of contractures was- bilateral hand (43 patients), followed by neck and axilla (23 patients). As shown in Fig. 4, 31% (151) patients had undergone surgical intervention in the form of skin grafting for raw area (early tangential excision in 12 patients and late grafting in 139 patients).

90 patients (18.51%) were advised physiotherapy of which 20 (4.12%, n=486) were compliant with follow up ranging from 3 months to 4 years (Fig. 5). Splintage was given to 68 patients (14%), of whom 28 (5.76%) were compliant (Fig. 6). Early mobilization was advised to 66 (13.58%) patients (Fig. 7) while

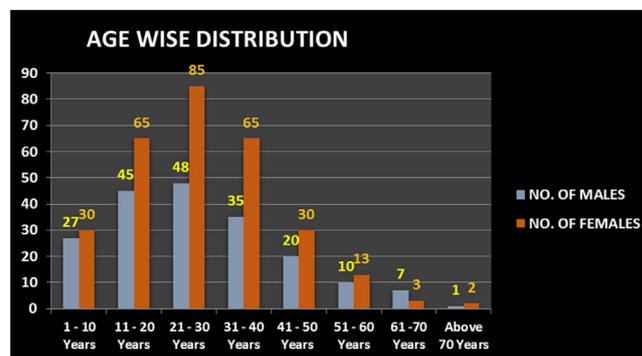


Fig. 1 – Age wise distribution of patients.

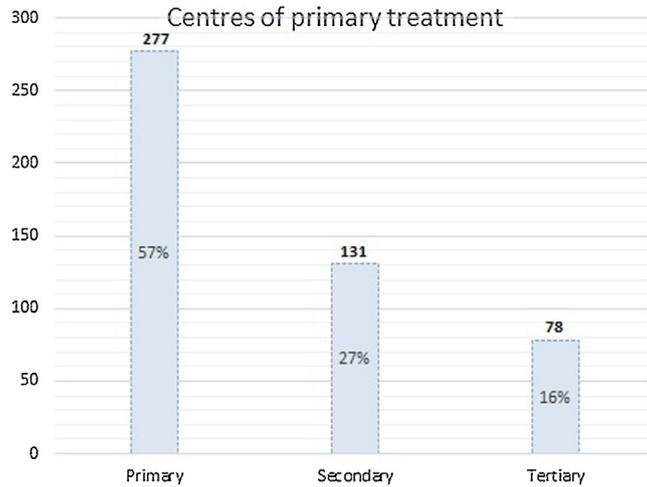


Fig. 2 – Distribution of centres where patients were primarily treated for burn injury.

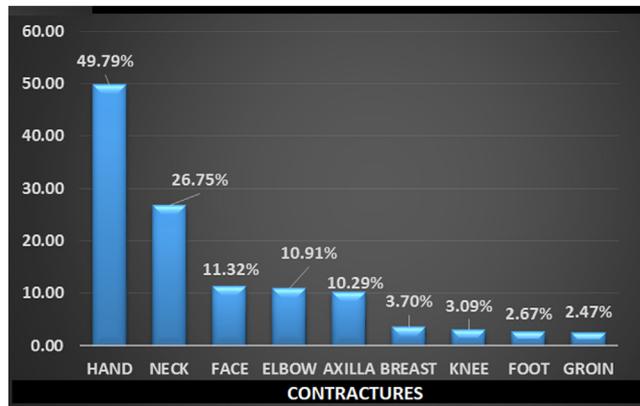


Fig. 3 – Body areas involved in contractures.

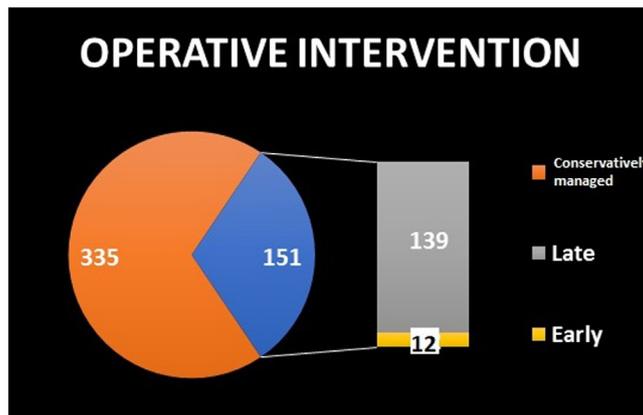


Fig. 4 – Surgical intervention done for wound coverage at the time of primary burn injury.

pressure garments were advised to 32 (6.58%) patients of whom only 12 (2.46%) used it regularly (Fig. 8).

4. Discussion

Burn scar contractures (PBC) may be regarded as the single most important avoidable source of morbidity and loss of

wages for the burn survivors and their families. In this study, a high percentage of patients were in the young reproductive age group when the loss of wages is an important factor, incidence was higher in female patients, which corroborates with similar findings by few other authors [6,7].

Majority (79%) of the patients with PBCs had a history of flame burns. This might be owing to the fact that as compared to scalds, flame burns are deeper and therefore lead to more

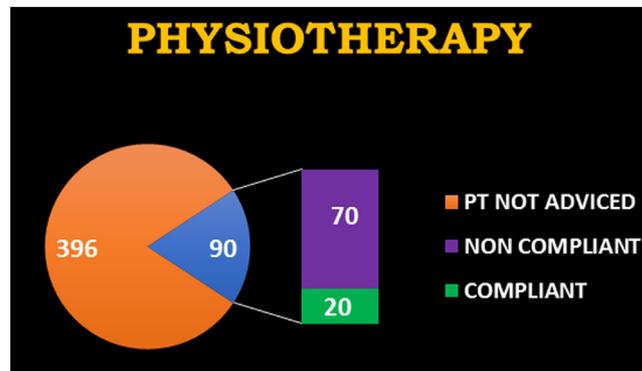


Fig. 5 – Post burn advice regarding physiotherapy and mobilisation exercises.

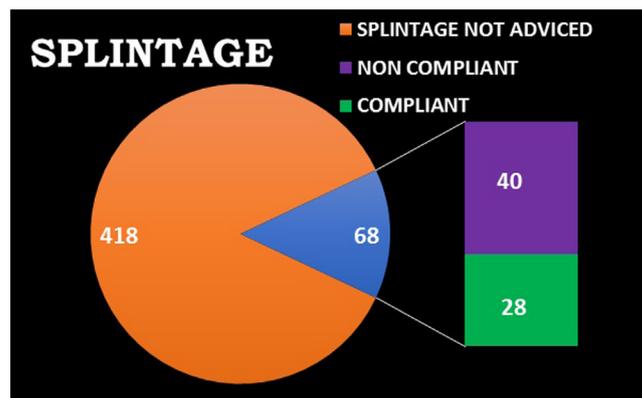


Fig. 6 – Advice regarding use of splints at the time of primary burn injury.

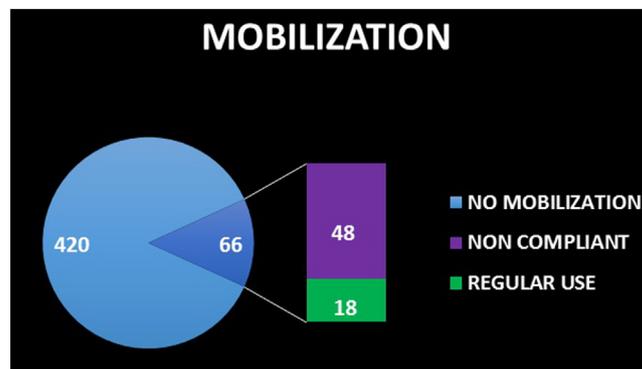


Fig. 7 – Advice regarding mobilization exercises at the time of primary burn injury.

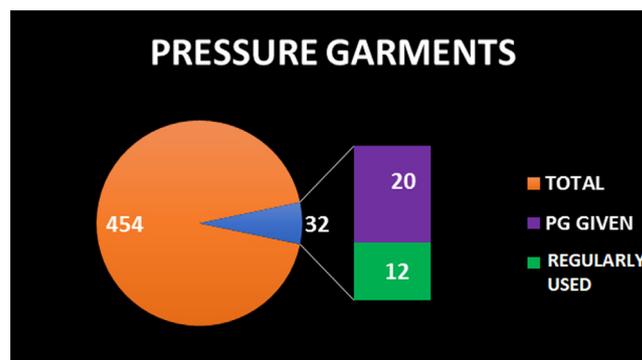


Fig. 8 – Advice regarding the use of pressure garments at the time of primary burn injury.

severe scarring and eventually, a higher incidence of contractures [8].

An improved initial care in burns has been shown to reduce morbidity in developed countries [9]. Majority of the patients (56.91%) in our series were managed at primary care centres without referral to tertiary centres. In most of these cases, patients were discharged with wounds and the wounds healed secondarily with daily dressings. In our study high incidence of post burn hand deformities can be attributed to isolated hand burns being probably considered as 'small' burns by the primary treating physician. Most of these patients were seen by local village doctor and then advised daily dressings. All of them gave a history of long healing period, with no splints and gradual development of contractures during and after healing process. There were some patients who described their fingers being kept in flexion during the dressing. This finding again brings to the fore lack of knowledge among the treating physicians. Owing to post burn hand contractures and requirement of complicated procedures later, the presence of hand burns requires specialist care and this should be impressed on the primary care physician. All these observations warrant emphasising the need for early referral to specialised burn care centres when multidisciplinary care including positioning and therapy is not available at the places treating the burn patients.

In any country, general practitioners (GPs) form the backbone of the healthcare system and are often the first doctors to see the burn patients. By virtue of being the first line of medical responders, the treatment and advice that they provide makes a significant difference in the eventual outcome of the patient. This underlines the utmost need of awareness about burn care management amongst this cohort of healthcare professionals.

Timely coverage of wounds using skin grafts has been shown to reduce the amount and severity of the inflammatory process in the wound and consequently instrumental in preventing scar hypertrophy and contracture [10,11]. Cubison et al. have also shown that burn wounds which do not heal by 21 days have a tendency to hypertrophy and form contractures, therefore should be grafted [12]. In our study, we found that only 31% of patients had undergone surgical intervention in the form of early excision or delayed grafting (done after a period of 3 weeks post burns after eschar has separated and the wound is clean and

granulating). In spite of being a standard of care for deep burns [13], wound coverage with skin grafts or early excision was not offered to majority of the patients, consequently leading to the sequel of contractures which could otherwise have been avoided.

Early initiation of limb positioning, mobilization and splintage has been shown to prevent subsequent development of contractures in burn patients [14,15]. Also, in post healing phase, the physiotherapy and pressure garments have long been considered the cornerstones of management of post burn scars to soften scars and improve pliability. In this study, the authors noted that very few patients had been advised regarding physiotherapy, splintage, mobilization and pressure garments in the post healing phase (18.51%, 14%, 13.58% and 6.58% respectively). A similar result was seen in few other studies [16-18]. To compound the situation, compliance was poor. Hence a combination of lack of advice by treating physician and lack of compliance by the patient in post discharge phase lead us to have the abysmal figures of 4.12%, 5.76% and 2.46% respectively for physiotherapy, splintage and pressure garments. Therapy in the early phases of burn management would have gone a long way in preventing early contractures and ensuring patient acceptance and involvement in the healing process, thereby possibly avoiding the contractures [9]. The prime reasons responsible for this situation may be lack of resources, lack of therapists and lack of knowledge on the part of treating physicians or surgeons. The low compliance by the patients in post healing phase was due to the lack of understanding of the importance of these modalities, compounded by untenable economic conditions. Our protocol for prevention of contractures emphasising the key steps is shown in Fig. 9.

Establishment of regional burn centres and development of centre of excellence for burns, which is the backbone of the present burn programme was first proposed 25 years back [19]. The initiation of the national burn programme in 2010 as a part of the 11th five year plan (NPPBI—National Programme for Prevention of Burn Injuries) is an important step in the direction of preventing death and disability due to burn injury [5]. Continued efforts for implementation of this programme will be required to improving the burn scenario in our country. Corrective reforms are required at various levels of the health care system if we want to defeat the Goliath named post burn contractures.

PREVENTIVE STRATEGIES FOR POST BURN CONTRACTURES

- 1) Early referral to tertiary care centre
- 2) Early excision and grafting in deep burns to achieve stable skin cover
- 3) Proper positioning: Total body and site specific positioning
- 4) Early mobilization and physiotherapy.
- 5) Anti deformity splintage.
- 6) Post healing scar management: Use of pressure garments, silicon sheet, scar massage.
- 7) Patient education and motivation with emphasis on adherence to post healing management.

Fig. 9 – Preventive strategies for post burn contractures.

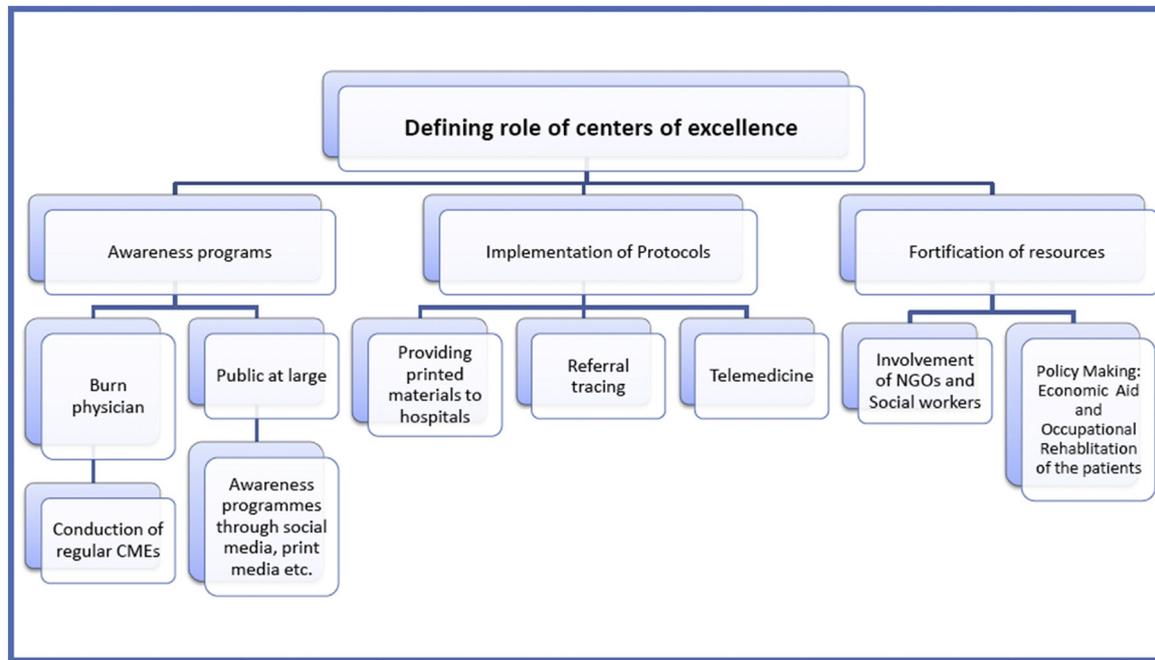


Fig. 10 – Defining role of Centers of Excellence.

The authors recommend that the centres of excellence in burn care at regional level all over the country should take up leadership roles in educating physicians and surgeons regarding the management of burn injuries as well as the referral criteria of burn patients and the vital role of wound coverage, positioning and therapy in the management of burns. These centres should also take lead for implementation of the protocol for prevention of post burn contractures, conduction of social awareness programmes for public, CMEs for general practitioners and burn physicians, whilst continuing to provide multidisciplinary care (Fig. 10). The advent of Tele- medicine has proved to be a great resource for spread of knowledge and skills to health care providers (HCPs) located even in the far flung areas and geographically difficult terrains. It enables the HCPs to gain the necessary knowledge upgrades without having to travel or compromise on their practice, thereby enabling the penetration of the CME programmes to the very grass root levels.

In the present day scenario where the omnipresent mass media influences the popular opinions and practices to a great extent, there is a desperate need for harnessing this excellent resource for increasing public awareness in various aspects of burn injuries [20]. Burn today needs a brand ambassador with a long reach into the popular psyche.

A major limitation of this study is that the data recorded in the indoor papers was sourced from the information provided by the patients based on their memory while the time between the initial burn injury and presentation to us for contracture release ranged from few months to few years. Though this might have led to some error in the data, the authors believe that such an error would have been offset by the large sample size and would not make much of a difference to the points raised and conclusions made.

5. Conclusion

We have discussed few of the contributory reasons for the high prevalence of post burn contractures in our country. The problem of burn contractures in developing world is multifactorial and akin to the fabled 'marauding cat' in the den of mice. Not only do we need to prepare and strategize in this battle against contractures, we need to allocate responsibilities. Being at the vanguard of the burn care team, the burn surgeons should assume the mantle of leadership in the society for training of other healthcare professionals, burn prevention and burn awareness. If only we attempt to improve on these underlying factors can we hope to reduce the scourge of post burn contractures and bell the proverbial 'cat'. The authors' recommendations are as follows:

1. Improve the knowledge of doctors regarding morbidity related to burns and the fact that it is preventable
2. Make referral criteria more visible and stringent
3. Empower the treating doctor with simple measures to avoid contractures- positioning, locally made splints etc.
4. Empower the general practitioners with knowledge about the first 24h burn care as well as the referral criteria through regular CME (continuing medical education)
5. Have a slogan which will be remembered
6. Champion for the cause for Burn: Have a popular public figure from the field of movies or sports, who will champion the cause of burn prevention and post burn morbidity prevention
7. Catch them young: Have a focussed module on burn care during the undergraduate medical curriculum that stresses adequately on the first aid aspects as well as the importance of positioning and splintage to avoid the morbidity of contractures.

Conflict of interest

None.

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