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Plastic Surgery

# CHALLENGES IN THE MANAGEMENT OF FIRE CRACKER BURNS OF HANDS IN A TERTIARY BURN CARE CENTER

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**ABSTRACT** Fireworks related burns are one of the causes of recurring incidences of burn injuries every year during festivals. Sporadic events are reported in family and communal celebrations / temple festivals and in funerals.

These burns are different from other burns as the burn percentage is not the major burden, but the increasing number of patients with cracker burn injuries with loss of hand function, loss of vision and at times blast injury of the face with major tissue loss and multiple fractures (shattered tissues), which are challenging for the reconstructive surgeon, are major concern.

These fire cracker burn wounds are to be classified separately as the wounds are more like traumatic wounds than burn wounds. They are also associated with more morbidity than mortality.

Upper limbs, mainly the hands are the most common site of injury in case of cracker burns. Blast injury while lighting crackers causes severe damage to the tissues, and along with the added contamination of the wound, makes repair and reconstruction of such limbs a herculean task. (1,2,3)

**KEYWORDS :** Firework injuries, cracker burns, cracker blast hand

## INTRODUCTION:

Firecrackers are extensively used in India during various festivals, ceremonies and social events, as is true the world over. However, it is a well-known fact that whenever firecrackers are used, there is always a risk of burns and injuries. They can cause various types of burn wounds and blast injuries involving different parts of the body, commonly, face and hand which may lead to total or partial loss of hand with its function / loss of vision.

Kilpauk Medical College & Hospital has one of the largest burn care facilities in India. This facility receives the largest number of firecracker-related injury patients throughout the year. However, it almost takes the form of an epidemic during festivals like Diwali. This study aimed to evaluate the management of the patients presenting with cracker burns involving upper limbs, and the challenges faced in the reconstruction.

## METHODOLOGY:

**STUDY GROUP:** Patients presenting with burns due to crackers involving upper limbs in the Department of Burns, Plastic and Reconstructive surgery, Government Kilpauk Medical College and Hospital, Chennai, India.

**STUDY DESIGN:** Retrospective study

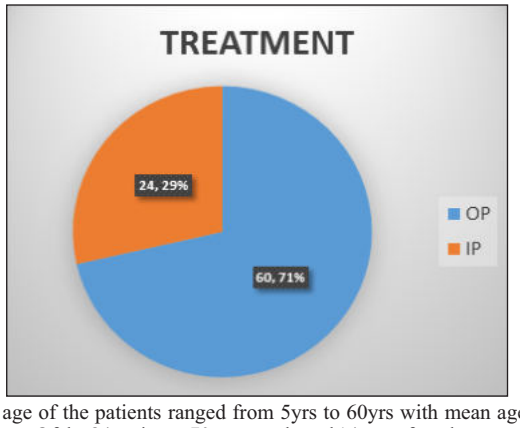
**STUDY PERIOD:** The study period was from Oct 2019 to March 2021(18 months).

The patients were managed either as in-patients (IP) or on out-patient (OP) basis depending on the severity of burns. For all IP patients, fluid resuscitation was started immediately followed by initiation of antibiotic coverage, analgesia and primary wound care. Patients were subsequently taken up for appropriate surgical management. All OP patients were given thorough primary wound care followed by surgical intervention wherever necessary. Patients were regularly followed up either in person or via tele-consultation till complete recovery from the injury.

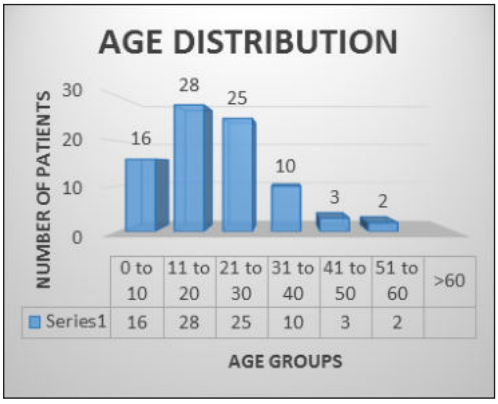
The outcome of all the surgical interventions was assessed in terms of patient satisfaction as well as objectively using DASH score. The main aim of the study was to identify the challenges encountered during the management of the patients with cracker burns of the hands. The study also helped to identify factors like age and sex distribution, dexterity, types of burns sustained and the various management options put to use.

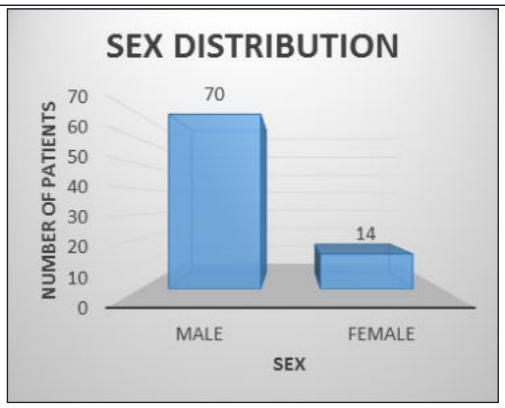
## RESULTS:

A total of 84 patients were included in the study. (n=84). Of these, 24 patients were treated as indoor patients, while 60 patients were treated on OP basis.

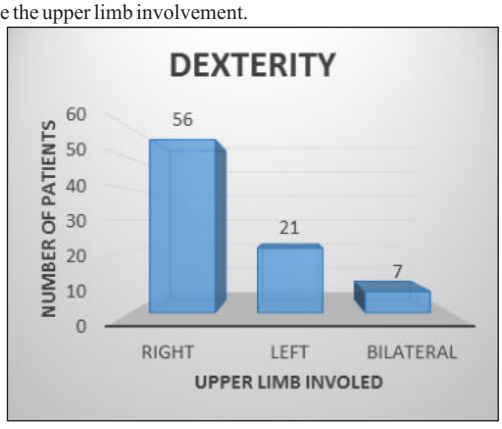


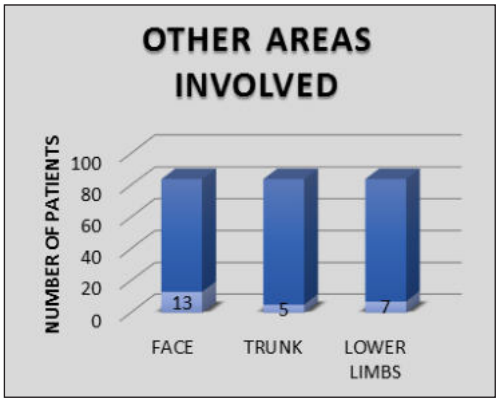

The age of the patients ranged from 5yrs to 60yrs with mean age of 21.5yrs. Of the 84 patients, 70 were male and 14 were female.





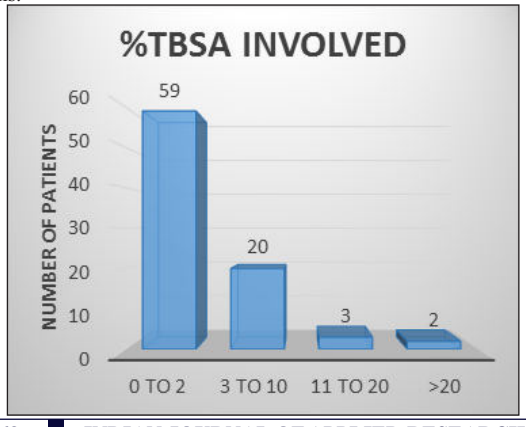

56 patients had involvement of right hand, 21 had left while 7 had involvement of bilateral hands. 13 patients had facial involvement, 5 had trunk involved while 7 patients had burns in lower limbs over and above the upper limb involvement.

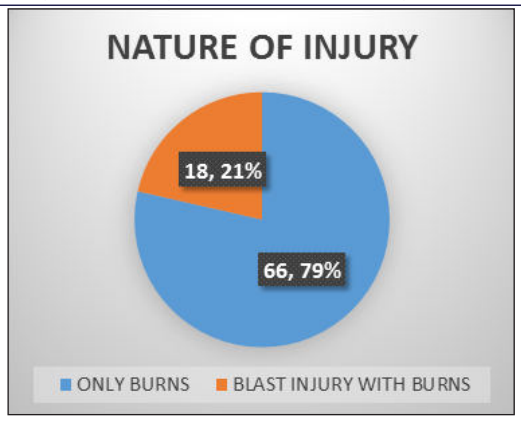



The total body surface area (%TBSA) burned was <2% in 59 patients, 20 patients had 2-10%, while 5 patients had more than 10% TBSA involved.

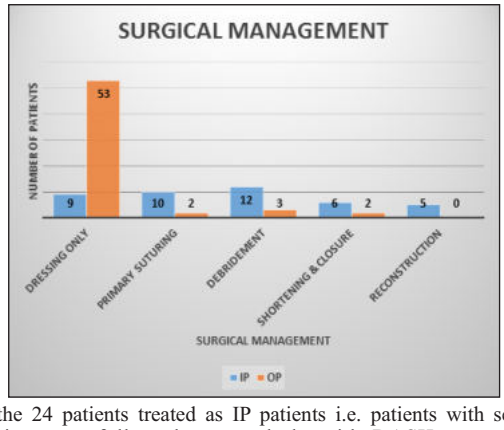
66 patients had only burns while 18 patients sustained blasts along with burns.



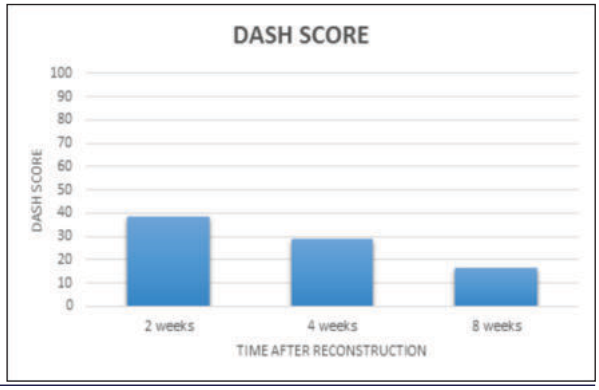




The surgical management was broadly divided into:

- Only dressing / wound care : 9/24 IP, 53/60 OP patients
- Primary suturing : 10/24 IP, 2/60 OP patients
- Debridement : 12/24 IP, 3/60 OP patients
- Shortening & Closure : 6/24 IP, 2/60 OP patients
- Reconstruction: 5/24 IP, No OP patients underwent any reconstruction.
- Of the IP patients, 9 underwent multiple procedures in one or more stages.
- Of the 5 patients who underwent reconstruction, 2 underwent abdominal flap, 1 underwent K-wire fixation of all digits along with abdominal flap cover, 2 patients had SSG application for residual raw areas.
- 5 out of 24 IP patients had delayed presentation (>48hrs) while 11 out of 60 OP patients had delayed presentation.
- 2 out of 24 IP patients and 19/60 OP patients had some form of local application on the wound including ink mainly, and in few cases oil, toothpaste or turmeric.
- Patients who underwent PSS followed by limb immobilization, shortening and closure or reconstruction, 9 patients had some limitations of activity due to poor compliance to post-op care or physiotherapy.
- Of all the patients who underwent some form of surgical intervention, a total of 22 cases, 8 patients were lost to follow-up.




All the 24 patients treated as IP patients i.e. patients with severe injuries were followed up regularly with DASH score after reconstruction. Mean DASH score of these patients at the end of 2 weeks, 4 weeks and 8 weeks was 38.3, 29.2 and 16.7.



## DISCUSSION:

### TYPES OF CRACKER CAUSING INJURY:

Among the commonly used crackers, flower pot causes majority of burn wounds. The unburned flower pots, which burst at the second attempt of lighting the cracker is the main cause of hand burns and blasts.

Children play with the cracker powder, the chemical packed inside the crackers. They peel crackers and the powder is collected in a paper and lighted. Blowing into the fire for inducing fire glow causes burns over face, as face is closer to the fire. While doing so even the bystanders sustain injuries. The blasts are generally avoided by the sudden, reflex with drawl away from the fire. The facial blasts may happen due to unexpected explosion of the flower pot cracker, due to faulty manufacturing and poor quality. (4)

### MECHANISM OF FIRECRACKER INJURIES:

### HEAT:

The heat produced from ignited fire crackers may exceed 6500C. This rise in temperature cause burns on the exposed parts of the body. The parts of the body commonly subjected to burn injuries are the face, hands and feet.

### BLAST:

Because of sudden displacement of air, there may be an increase in pressure causing blast effect. This pressure of the blast may cause injuries to the different parts of the body, by varying mechanisms. (5,6,7)

### HAND:

(8) The pressure built up by blast passes through the tissues of least resistance in hand ie., through the inter osseous, musculo-tendinous soft tissue compartment and disrupts the tissues leaving the bone bare. Aim in reconstruction of such injuries of the hand should not only be in restoring anatomical continuity of structures, but also in obtaining good functional results. Major efforts are required to reconstruct the anatomy and to rehabilitate the hand.

## CONCLUSION:

The main challenges faced in the management of patients with cracker burns of hands include :

**SEVERITY OF BLAST INJURY** – disrupts the tissues to an extent where in immediate primary repair is not possible in majority of cases.

**DELAYED PRESENTATION** – patients presenting after 24hrs of injury usually have grossly contaminated wounds which increases the chances of surgical site infection.

**INAPPROPRIATE PRIMARY WOUND CARE** – patients using native remedies like ink or turmeric precludes thorough initial wound assessment, thus hampering prompt management.

**POOR COMPLIANCE** – patients not complying with prescribed post-operative care and physiotherapy usually land up with restricted functional outcome.

**LOSS TO FOLLOW UP** – patients, due to varied reasons, fail to follow up after primary care or reconstruction.

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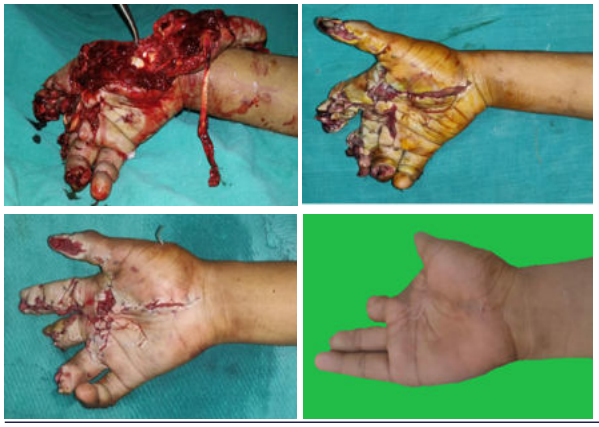

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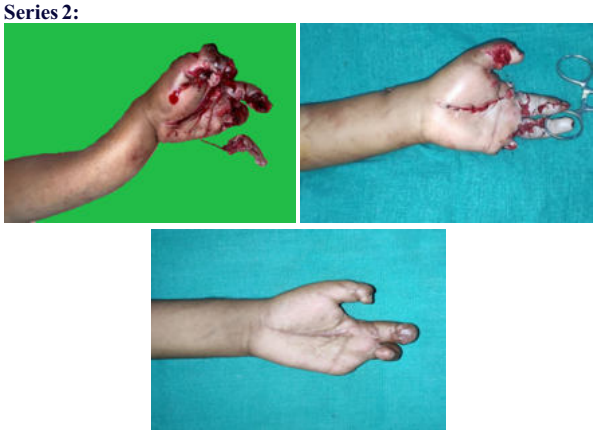

**Series 3:**

**Series 4**

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