# Patterns of Hand Injuries and Reconstruction Modalities

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**Background:** To assess the age groups involved, mechanism and extent of injury and treatment methods being utilized for the patients of hand trauma.
**Methods:** Seventy-six cases of hand trauma treated at The Department of Plastic Surgery Services Hospital Lahore during a period of two years were included in the study.
**Results:** Twenty five percent of cases resulted from mechanical trauma, which was the most common etiology in this series. Different burn injuries and post burn complications were responsible for soft tissue defects of various magnitudes in forty-four percent cases. Forty percent of the cases were in teenage at time of injury. Fifteen percent either lost their thumb or it was affected badly and in five percent of patients all four fingers were amputated or badly injured.
**Conclusion:** It is stressed that most of these injuries are predictable and hence avoidable and certain simple precautions may decrease the number of sufferers.
**Key words:** Hand injury, soft tissue defects of hand

## Introduction

Hand is involved in almost every physical activity and hence exposed to injury from a number of different etiologies including mechanical trauma, road traffic accidents, electrical, fireworks or burn injuries. Magnitude of trauma varies considerably with different etiologies and so is the use of different treatment options.

Injuries to the hand are common in every part of the world. Approximately 30% of all emergency room injuries are to the upper extremity, amounting to 16 million hand injuries per year seen in the United States.1 We do not have exact statistics regarding hand trauma in our country but a fair percentage of the cases presenting in out door clinic report with different hand injuries.

Trauma to hand may be devastating as it may affect ones' life style, occupation and personality. Hence, it becomes necessary to look into various etiologies in our set up and suggest measures to reduce the tragic incidents. Most of the upper limb injuries have been found to be preventable in a separate study.2 This study, however, focused on various with different etiologies and reconstructive options being utilized at a tertiary care center.

## Material and Methods

The study was conducted at the Department of Plastic Surgery, Services Hospital, Lahore. Patients treated for soft tissue defects of hand, during January 2004 to December 2005, were included in this study. Patients who got registered at out door clinic but did not get treatment at this department were not part of this study. Bio data of the patients was obtained from the hospital record and included registration number, age, sex, etiology of the soft tissue defect, extent of the injury, and operative procedure performed were recorded in a profoma.

Cases were managed surgically as per nature and extent of the injury. Acute injuries, chronic wounds, mechanical or fireworks trauma needed debridement and healthy granulating wound before provision of soft tissue cover. Longstanding contractures were released and soft tissue defects repaired at the same stage. While choosing amongst various options for soft tissue coverage, principle of reconstruction ladder was followed which simply means utilization of simplest reconstruction option first.

## Results

A total of 76 cases of hand trauma were dealt during a period of two years. It included 61 males and 15 females. Majority of the patients, i.e., 30 (40%) patients, were in second decade of their life while 22 (29%) patients were in the first decade of life **(Table-1).**

**Table 1:** Age Distribution

| S# | Age | Male | Female | Total |
|---|---|---|---|---|
| 1. | 01-10 | 20 | 2 | 22 (29 %) |
| 2. | 11-20 | 21 | 9 | 30 (40 %) |
| 3. | 21-30 | 12 | 3 | 15 (20 %) |
| 4. | 31-40 | 03 | - | 03 (04 %) |
| 5. | 41-50 | 04 | - | 04 (05 %) |
| 6. | 51-60 | 04 | 1 | 02 (02 %) |
| 7. | Total | 61 | 51 | 76 (100%) |

Most common etiology of hand rtauma in this series was mechanical trauma in 19 (25%) cases followed by post burn complications in 17 (22%) and fireworks injuries in 10 (13%) cases. Electric burns resulted in hand trauma in 7 (9%) cases **(Table 2).**

**Table 2:** Different Etiologies

| S# | Editology | Total |
|---|---|---|
| 1. | Mechanical trauma | 19 (25%) |
| 2. | Post burn complications | 17 (22%) |
| 3. | Fireworks trauma | 10 (13%) |
| 4. | Electric burns | 07 (09%) |
| 5. | House hold trauma | 08 (11%) |
| 6. | Congenital anomalies | 05 (07%) |
| 7. | Others | 10 (13%) |
| 8. | Total | 76 (100%) |

Extent of damage was also very high in fireworks trauma. Five of the patients got their thumbs affected, with complete loss of thumb in three cases. There was loss of all four fingers in 2 cases and two other cases had three fingers amputated each.

Mechanical trauma resulted in amputation of thumb in two cases. In other two cases all four fingers were lost in the accident while in one case three fingers were affected **(Table-3).**

**Table 3:** Severity of injury

| S# | Editology | Rt. | Lt. | Total |
|---|---|---|---|---|
| 1. | Mechanical | Thumb | 1 | 1 2 |
| | | All four fingers | 1 | 1 2 |
| | | Three fingers | - | 1 1 |
| | | Two fingers | - | 1 1 |
| 2. | Fireworks Inj. | Thumb | 3 | 2 5 |
| | | All four fingers | 2 | - 2 |
| | | Three fingers | 1 | 1 2 |
| | | Two fingers | 2 | - 2 |
| 3. | Elect.burns | Ampu. of limb | 2 | - 2 |
| | | Thumb | 4 | - 4 |
| | | Four fingers | | |
| | | Three fingers | | |

Severity of the injury changed with the etiologies. Patients with electrical burn injuries had worst soft tissue defects. Two of the cases lost their one upper limb each. In both of the cases the only surviving hand was also badly damaged. In other four patients the thumb was affected.

Debridements, conservative treatment, skin grafting, and procedures like various z plasties were sufficient enough to deal the soft tissue defects in 38 cases. In remaining 38 cases various local and distant flaps were utilized. Reverse radial artery flap was most commonly utilized flap and it was used in 15 cases. Cross finger flap covered the defects in 7 cases. Rest of the flaps used in this series included abdominal flap in 6 cases, reverse metacarpal artery flap in 5 cases, posterior interosseous flap in 3 cases, and reverse ulnar in 2cases **(Table 4).**

**Table-4:** Utilization of different flaps.

| S# | Flap | Cases |
|---|---|---|
| 1. | Reverse radial artery flap | 15 |
| 2. | Cross finger flap | 07 |
| 3. | Abdominal flap | 05 |
| 4. | Metacarpal artery flap | 06 |
| 5. | Posterior interosseous artery flap | 03 |
| 6. | Reverse ulnar flap | 02 |

## Discussion

Hand is very crucial part of body and mandatory for interaction with environment. It is because of its involvement in almost every physical activity that hand trauma is very common.

Number of cases presenting with hand trauma at our out door clinics is quite higher. However, this study recorded only those cases that were treated for various soft tissue defects at the department.

More important is the fact that in fifty percent of the cases soft tissue defects were of such a magnitude that they required utilization of various flaps for their soft tissue defects. Percentage of the patients loosing their limb, thumb or multiple digits was quite high. It were these facts that a study was undertaken to see the different patterns of hand trauma.

Majority of the cases were in their teen age at time of injury. (Table-1) This simple fact has a very important implication. Many of the cases in this age group were found working in different industries like press, textile, agriculture etc. A check must be placed on this age group by the parents, or employers. Teachers have got a very important role to play by educating the youth about prevention of the common hand injuries. Role of parents is even more important. A fair number of injuries occurred due to fire works carried

out at marriage ceremonies and religious celebrations on shab-e-braat. It is also very important that proper legislation is enforced to reduce the use of fireworks by innocent children. Law enforcing agencies must then play their role to control this act.

Most common etiology in this series was mechanical trauma. Majority of these injuries occurred at press industry or during agricultural work. Generally, sharp injuries do much better than crush or avulsion injuries, 3 as simple, tidy, superficial hand lacerations can be readily closed.4 However, mechanical injuries are more severe as they usually combine the elements of cutting, crushing and avulsion.5,6 It was noted that in most of the mechanical injuries simple precautionary measures and providing a safe guard at the crushing inlet might have prevented the trauma. Usually this step does not require a major change in the design of machine and rather a simple addition of a safe guard is required. On the other hand, cost that one has to pay in these accidents is quite high, as we have seen amputation of all four fingers and thumb in cases of agricultural injuries. This series also agrees that usually carelessness was the most common cause given by farmers for their injuries.7 It is not uncommon that these severely mangled hands may require amputation or evascularization.8

This series also shows that this injury was common in the teen age. As another preventive measure, teenagers may not be allowed to work on press machinery or level of safety might be raised.

Hand trauma due to fireworks injury is the third most common etiology in this series. It causes some of the worst trauma seen in our emergencies. Open wounds, massive levels of contamination, and thermal injuries often complicate crush injuries.9,10 In this series half of the cases either lost their one thumb each or it was badly damaged. Keeping in view the damage caused by this useless habit of fireworks at marriages and shab-a-braat it must be banned or only professional people must be allowed to handle it. As majority of these patients are in their teen age, cooperation of teachers, parents must be sought through media. Strict legislation is required to bring an end to this social carefree behavior.

Electric burn injuries inflict some of the most severe damage and this is reflected in this series as well. Two of the cases lost their one upper limb and got their second limb badly injured. In four of the cases thumb was lost or badly damaged.

Series witnessed some of the severe forms of soft tissue defect and use of distant flaps for reconstruction was quite common. As it has been seen in previous series11,12 reverse radial artery flap was quite useful option in cases of severe soft tissue defects. In this series it was used in15 cases. It provided cover for defects both at dorsum as well palmar aspect and was frequently used for reconstruction of thumb as well. In two of the cases reverse ulnar flap was used for soft tissue defects on ulnar side of palmar aspect of hand because a shorter arc of rotation was required for flap to reach defect site. Similarly, posterior interosseous flap was quite useful option where integrity of palmar carpal arterial arch was in doubt and use of both radial and ulnar flaps was not possible.13 This flap was utilized in three cases. Cross finger flap remains the first option among local flaps on finger area and it was used in seven cases. Reverse metacarpal artery flaps were utilized in 5 cases to cover the defects in web spaces or proximal phalanges.

It is quite obvious that injuries in mechanical, electric and fireworks trauma are quite preventable. These injuries along with common burn accidents, mostly the result of carefree behavior, made about seventy percent of the cases in present series. Strict legislative measures, cooperation of teachers and parents in cases of fireworks, raising the level of safety for workers in press and agriculture industry, more precautionary measures for teenagers in various industries, n awareness campaigns by WAPDA and media to reduce the electric burn injuries may help the nation to bring the number of cases of hand trauma to a lower level.

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