

Experience in the Management of Finger Tip Injuries at a Tertiary Care Hospital in Karachi

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ABSTRACT

Objective: To analyze the pattern of fingertip injuries in patients presenting to the emergency department in terms of management options in accordance with the severity of injury.

Study Design: Descriptive case series study.

Place and Duration of Study: This study was conducted at the Plastic and Reconstructive Surgery Department, Liaquat National Hospital, Karachi from July 2014 to June 2015.

Materials and Methods: A study was undertaken on records of 261 patients who were presented with fingertip injuries to the Emergency Department of Liaquat national hospital, Karachi during the years 2014-2015. Data was subjected to both descriptive and inferential analysis. Variables like patient's age, gender, place of injury, mechanism and type of injury, amputation level and treatment options were defined by using descriptive analysis. Inferential analysis was applied for evaluating the most commonly affected age group, the most frequent mechanism of injury and the relationship of severity of injury to the choice of treatment option.

Results: The frequency of injuries was highest among young population (< 10 years) and in boys. Majority of injuries occurred due to finger trapped in doors, crush injuries were the most common type. Amputation injuries are mostly of type 1 and type 2 allen's type. Primary repair is the mode of treatment that is frequently used followed by conservative management, revision amputation and local flaps.

Conclusion: Children below 10 years of age were involved in fingertip injuries in a large number. Door trap injuries are frequently common and safety measures should be devised to prevent fingertip injuries. Treatment should be individualized according to the type and characteristics of injuries and should be carefully planned.

Key Words: Finger tip injuries, Hand trauma, Management options.

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INTRODUCTION

Hand injuries accounts for a significant proportion of patient presenting to emergency department in acute trauma setting. Among them, fingertips are involved in nearly 40% of cases.^{1,2} Anatomically, fingertip is that part of the finger that is located distal to the insertion of flexor and extensor tendons on the distal phalanx.³ It constitutes skin, soft tissues, nail and bone. A normal fingertip having both sensory and motor function is an integral part of the hand both functionally and cosmetically.^{4,5} Fingertip injuries are a limitations to the routine life activities, loss of work hours and may end up in long term functional or aesthetical disabilities and even change of profession in case of improper management.

Commonly affected population group is young children resulting mostly due to crushing by doors.^{Error! Bookmark not defined.,6} Though many of these injuries are trivial in nature and need a simple treatment by ER physician and do not need referral to hand surgeon, some of the cases need specialized treatment by hand surgeon.

Injuries involving fingertips may presents in a number of ways like crush injuries, sharp cuts or lacerations, de-gloving or avulsion and amputations.^{7,8}

A number of classifications are present to describe the injuries including PNB classification, Lister's classification, Pulvertaft hand centre classification and Allen's classification. Allen's classification is proposed for amputation injuries. Type I injuries are those that involves only the pulp. Type II is the injury to the pulp and the nail bed. Type III injuries consists of distal phalangeal fracture with associated pulp and nail loss. Type IV injuries are amputations proximal to the lunule.^{Error! Bookmark not defined.,9} Treating the fingertip injuries is a complex and controversial matter due to availability of vast variety of treatment options for most injuries.

The management algorithm depends on a several factors including, age, hand dominance, digit involvement, sex, preexisting medical conditions,

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mechanism of injury, occupation, and anatomy of fingertip defect.¹⁰ Therefore, treatment of fingertip injuries must be individualized. The goals of surgery are Preservation of functional length, Durable coverage, Preservation of useful sensibility, Prevention of neuromas, Prevention of adjacent joint contracture, Early recovery & return to work, play, and activities of daily living. This study is conducted to analyze the pattern of fingertip injuries in patients presenting to the emergency department in terms of management options in accordance with the severity of injury.

MATERIALS AND METHODS

This descriptive case series study was conducted at the Plastic and Reconstructive Surgery Department, Liaquat National Hospital, Karachi from July 2014 to June 2015.

Inclusion Criteria:

1. All patient with isolated finger tip injuries presenting to emergency department within 24 hours of trauma
2. All ages and both genders

Exclusion Criteria:

1. Patients with Injuries that occurred more than 24 hours ago
2. Patients with other limb or life threatening injuries that can affect the management plan
3. Patient with unsalvageable proximal injuries

We conducted a retrospective observational study and data of all the patients with fingertip injuries presented to the emergency department from July 2014 to June 2015 was collected from patient's data base. The records of 261 patients were reviewed. Data was subjected to percentage based analysis and categorized on the basis of age and gender. Nature and mechanism along with the setting (indoor/outdoor) of injury were recorded. Allen's classification was used to describe the amputation injuries. This study also reviewed the various treatment options employed in the management of fingertip injuries and correlated them with the type of injuries. For data entry and analysis Microsoft excel and SPSS version 20 was used.

RESULTS

In this study, data of 261 patients was reviewed retrospectively. Mean age of the study population was 14 years (17.96 years for male and 5.6 years for females) with minimum age of 01 year and maximum age of 67 years. It included 69% (n=180) males and 31% (n=81) females. The males are in general at more risk of experiencing fingertip injuries (p-value = .015) as compared to the females.

55.6% of study population was children below 10 years of age. The place of injury was recorded and Indoor injuries were 51.7% (n=135) versus 48.3% (n=126) of outdoor injuries. There was no significant difference found in place of occurrence of injury (p-value=0.676).

Most common cause of fingertip injuries was found to be Door trap injuries i.e. 46.4% (n=121). Other Causes included RTA (24.1 %, n=63), occupational (22.2%, n=58) and others (7.3%, n=19). Door trap injuries were significantly more common in children (p-value=0.000) with mean age of 10 years (CI=4.26) and occupational injuries were the most common cause in adult population, mean age 25.6 years (CI=6.03). The mechanism of injury had a significant relation with the gender (p-value=0.002), the occupational injuries being more common in males than in females. (Figure 1)

Crushing was the most common type of injury i.e. 56.3% (n=14), 26.1% (n=68) of injuries caused amputation of the fingertip while lacerations and degloving injuries were present in 13% (n=34) and 4.6% (n=12) of the patients respectively. A significant relationship was observed between age and nature of injury (p-value=0.000), with crush injuries ranking highest as the cause of injury in children with mean age of 10.53 years & CI=3.58 (Figure 2). The statistical difference between males and females with regards to the nature of injury was insignificant (p-value=0.694).

Most of the amputation injuries were Allen class 1 (37.2%, n=97) while class 2, 3 and 4 comprising 29.9% (n=78), 21.1% (n=55) and 11.9 % (n=31) of the injuries respectively. The relationship between allen's classification and age was statistically significant (p-value=0.000), with the allen's type 1 injuries being commonest in younger population (mean age 12.72 years, CI=4.47). The allen's injury type distribution among males and females was statistically insignificant (p-value=0.391).

Table No.1: Management of fingertip injuries

Procedure	Frequency(n)	Percent
Conservative	24	9.2
Primary	105	40.2
Local flap	52	19.9
Replantation	11	4.2
Terminalization	58	22.2
SSG	11	4.2
Total	261	100

Table No.2: Local flaps

Local flaps	Frequency(n)	Percent
Atosoy-kleinert	26	50
Kutler	9	17.3
Cross finger	9	17.3
Dmca flap	4	7.6
Littler flap	4	7.6
Total	52	100

Most of the injuries (Table 1) were managed successfully by primary repair (40.2%, n=105). No statistical significant difference was recorded between age (p-value=0.037), gender (p-value=0.229) and the treatment option. However, the statistical difference between allen's injury type and the treatment option

was significant (p -value=0.000). Most of the type 1 and type 2 injuries were managed with primary repair, while type 4 injuries were equally treated with primary repair and local flaps. (Figure 3) Approximately half of the injuries requiring flaps were managed by utilizing Atasoy-KleinertFlap. (Table 2)

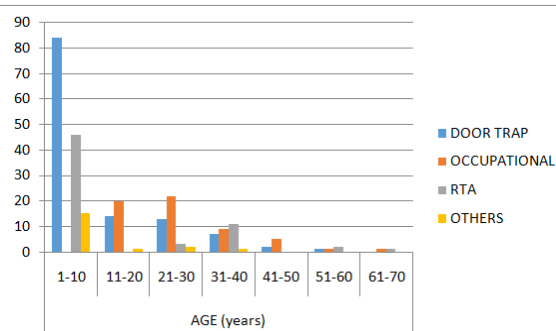


Figure No.1: Mechanism of figure tip injuries.

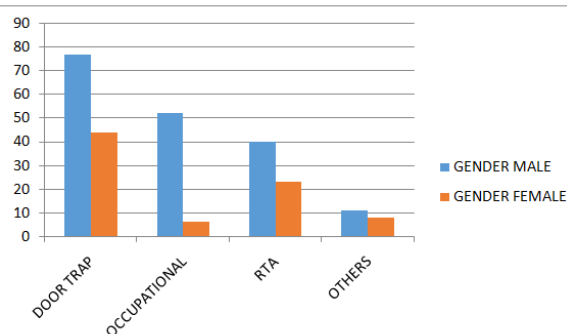


Figure No.2: Mechanism of fingertip injuries in relation to the age (above) and gender (below).

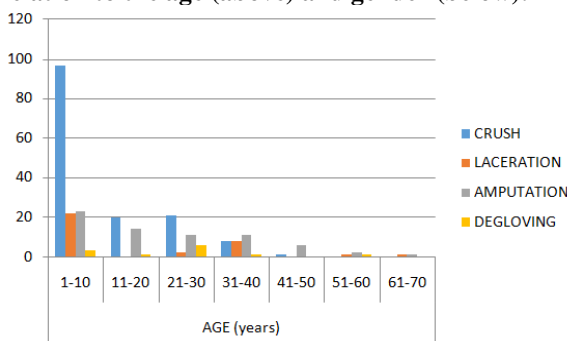


Figure No.3: Distribution of nature of injuries in age groups

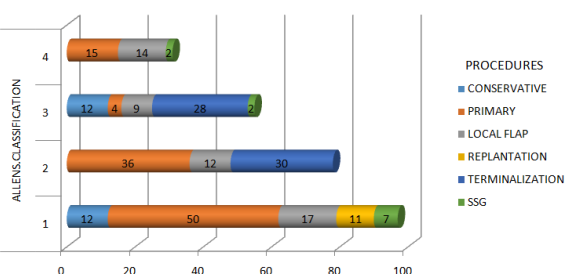


Figure No.4: Management according to Allen's classification

DISCUSSION

As it has been documented in a number of previous studies^{Error! Bookmark not defined., Error! Bookmark not defined., 11} Fingertip injuries occur most commonly in younger population, 55.9% of the affected patient in our study were below 10 years of age. It is clearly evident from our study that the incidence of these injuries is higher in male as compare to female. Though there is no absolute answer for the male dominance but it is postulated that males are usually more involved in physical games/adventures and outdoor activities, they are likely to have a higher incidence of fingertip trauma. Numerous studies have also confirmed this finding.^{Error! Bookmark not defined., Error! Bookmark not defined., 12}

There is not much difference in the place of occurrence of injury i.e. indoor versus outdoor. This is in contrast to the observation by N.V. Doraiswamy (1999)⁶ and N.V. Doraiswamy & H. baig (2000)¹ that reported the indoor injuries as a commonest place of occurrence. In one of the study by Alexandra fetter, outdoor injuries are reported to be the common cause. Of all the injuries, the mechanism with higher frequency is door trap injuries, the finger being caught between the doors (slamming or jamming door).^{Error! Bookmark not defined., 13} Door trap injuries may present as crush injuries, subungual hematoma, nail bed laceration and/or amputation resulting in restriction to the daily life activities and sometimes permanent disfigurement or disability. Therefore understanding this mechanism of injury is important to device safety measures for prevention of this kind of injuries. N V Doraiswamy has done a detailed study on door trap injury mechanism and described the mechanism and impact.^{Error! Bookmark not defined.} Injuries acquired during road traffic accidents or work place injuries were the other frequent causes.

It was observed in our study that crush injuries were the most frequent type of injuries and this is consistent with finding by Alexandra (2002) study who reported crush injuries as the most common type involving approximately half of the cases. Though we found amputation injuries as the second most common cause in contradiction to the Alexandra who observed laceration as the other common cause.^{Error! Bookmark not defined.} Allen's classification was used to describe the amputation injuries and it was found that type 1 and types 2 injuries occur more frequently accounting for nearly two third of cases collectively.

The objectives of treatment are covering of the tissue defect, preservation of the motor abilities of the hand and finger length, reduction of discomfort, and possibly quick return to daily activities.¹⁴ A detailed and thorough clinical examination is necessary before jumping to the treatment. Reviewing the treatment option used for fingertip injuries, they were designed according to the type and geometry of the defect. As it has already been discussed that most common injuries are crush types, the most frequently applied mode of treatment is primary repair of resultant pathology that is nail bed and laceration repair. Conservative management is used in few of the patient with regular

dressings especially in patients with type 1 Allen's amputations. This has been described in previous studies as an effective method of treatment for small tip defect (1.5 cm²) without exposed bone with excellent results.^{15,16} Skin grafting is not among the favorite options as it has some unpleasing sequel like pointed palpable nail or bone, contour deformity of pulp and impaired sensation at graft site. Nevertheless it is considered when there is large area of soft tissue loss without exposed bone and patient is unwilling to go through prolonged dressing for secondary intention healing.^{Error! Bookmark not defined.} Local flaps to cover the soft tissue is very well known and used when there is soft tissue loss with exposed bone. The type of flap depends on the size and site of defect, the available undamaged tissues and the surgeon's experience. These flaps include Atasoy-kleinert flap, Kutler flap, cross finger flap, dorsal metacarpal artery flap and littler flap.^{Error! Bookmark not defined.} Among these, Atasoy-Kleinert is the one that is more commonly employed. Local flaps are generally used in patients with type 3 and type 4 amputation injuries.

Revision amputation is sometimes needed in patient with soft tissue loss and exposed bone where other options of reconstruction are not favorable. When applicable, digital replantation is an excellent treatment to maintain the finger length, cosmesis and functionality of fingertip. Replantation is attempted when the amputee is available with preserved tissues and structures that can be reconstructed, mostly performed in amputation at the level of or distal to the distal interphalangeal joint.^{Error! Bookmark not defined.}^{Error! Bookmark not defined.}⁵ Replantation facilitate functional and aesthetical restoration while maintaining length of the finger.¹⁷

CONCLUSION

Fingertip injuries are among the most common injuries in patient presenting to emergency department with hand trauma. They occur in children frequently and mostly due to fingers trapped in doors. Education and guidance should be provided to both the children and adults about the mechanism to prevent these injuries by employing safety measures. A number of treatment modalities are available for the management of fingertip injuries based on the characteristics of injury and geometry of defect. Well and carefully planned treatment strategy is essential to preserve the function and aesthetics of fingertip as much as possible.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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