Section: Plastic and Reconstructive Surgery

Original Research Article

MANAGEMENT OF FINGER TIP INJURIES- A HOSPITAL BASED RETROSPECTIVE STUDY

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ABSTRACT

Background: The fingertip is defined as the part of the digit distal to the insertion of the extensor and flexor tendons on the distal phalanx and the inter phalangeal joint when referring to the thumb. The fingertip is the most distal portion of the finger providing the tactile and sensory functions. **Materials and Methods:** The study was conducted in Department of Plastic and Reconstructive Surgery, from June 2023 to June 2025.A total of 17 (11 males and 6 females) patients were included in the study. **Result:** The patients were in the age range of 3years to 45 years. Six were females 11 were males of the total of patients, nine patients had at work place machine trap crush injuries, four patients had house hold door trap injury, two patients had crush injury due to stone fall. Three patients were school going children who had door trap crushing injury. **Conclusion:** Patient treated by primary suture gave good subjective result, faster wound healing, good pulp contour, restored finger length, less cold sensitivity and near normal static two point discrimination.

INTRODUCTION

The fingertip is defined as the part of the digit distal to the insertion of the extensor and flexor tendons on the distal phalanx and the inter phalangeal joint when referring to the thumb.[1] The fingertip is composed of skeletal elements (distal phalanx, tendons, and ligamentous structures), the nail complex or perionychium (germinal and sterile matrices, nail plate, sheaths, and skin folds), fibrous connective tissue network with the subcutaneous tissues, vascular network, nerves with end organs, and the non perionychial skin.

The fingertip is the most distal portion of the finger providing the tactile and sensory functions.

The volar pulp robust, yet deformable so as to enable stimulation population of sensory of the dense specialized end-organs Pacinian, Meissner corpuscles, and Merkel cells which provide detailed discrimination of touch and feel sensations.

The nail itself plays an important role in the normal function of the hand by protecting the fingertip, providing counterforce to assist with picking up small objects, Augments sensation of touch, and protection.

Injury to the fingertip and nail bed is the most common injury of the hand because of their prominent position.[2] The long finger is the most commonly injured, followed by the ring, index, and small fingers and the thumb with equal frequency bilaterally. The majority of injuries occur between the ages of 4 and 30 years; 75% occur in males. In the paediatric population fingertip injuries account for two thirds of all hand injuries with the most common mechanism of injury being a crush between a door and its frame.

The most common mechanisms seen include the following:

Crush injury -Due to deforming force, which compresses the nail bed between the nail and the distal phalanx.

Ex; A door closing on the finger, injury with a hammer, and objects being dropped
on fingers.

Simple Laceration -The most common injury to the nail bed.[2]

Ex; secondary to a household instrument (knife, scissors, and cans) or works tools (rotatory saw) involving pulp or nail and/or the nail bed complex.

Amputations involve both soft tissue loss and partial or complete distal phalanx,Such injuries can cause cosmetic and functional defects.

Avulsion injuries- The least common type of injury,[3] can be associated with working with machinery due to sudden flexion or extension forces.

Goals of treatment should include minimization of pain, optimization of healing time, preservation of sensibility and length, prevention of painful neuromas, avoidance or limiting of nail deformity, minimization of time lost from work, and provision of an acceptable cosmetic appearance.

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Surgical options in treating the fingertip injuries are individualized to each patient considering the injury pattern, age, hand dominance and occupation and includes primary closure, split skin grafting, full thickness skin grafting, flap reconstruction.

Post operative complications, includes delayed wound healing, nail deformities with poor aesthetics, hypersensitivity, residual pain, cold intolerance, scar retraction, flexion contractures, chronic ulceration, infection, and flap loss.

The present study is conducted to evaluate incidence, mode of injury, distribution pattern,various management methods and outcome of fingertip injuries.

Aim of the study: The purpose of this study is to study the incidence, mode of injury and management and the outcome of the fingertip injuries of hand.

Objectives of the study:

1. To study the incidence and etiology (mechanism) of fingertip injuries.
2. To study the mode of injury, types of injury, distribution of incidence in different age groups, gender, and different occupations.
3. To study the management modalities and outcome of the management.

MATERIALS AND METHODS

The study was conducted in Department of Plastic and Reconstructive Surgery, from June 2023 to June 2025.A total of 17 (11 males and 6 females) patients were included in the study.

Inclusion Criteria

Isolated fingertip injuries and multiple fingertip injuries of all age group admitted in the Department of Plastic Surgery during the study period.

Exclusion Criteria

Patients with poly trauma.

Method of Collection of Data: All the study subjects admitted due to fingertip injuries under the Department of Plastic Surgery were studied in a period of 2 years.

All routine investigations like complete blood count, Random blood sugar, Viral Markers, Blood Group and Type, X Ray hand lateral and AP view were done.

Ascertained the following information when gathering patient history: Patient demographics, mechanism of injury, hand dominance, occupation, duration since injury, tetanus immunization status and co-morbidities were recorded.

Informed consent was taken from all the patients for inclusion in the study.

Detailed analysis of these17 cases with fingertip injuries was performed.

The injuries were evaluated in a careful and systematic manner for finger involvement, crush versus sharp injuries, location, depth, angle of the defect, nail bed involvement and status of the remaining soft tissue and the configuration of the fingertip defect. Standardized radiographs of the finger and photographs were obtained to assess the extent of bone injury.

Allens classification of fingertip was applied zone I- Distal to the nail bed, pulp only involved, zone ll - distal half of the nail bed,no loss of distal phalanx. zone III - proximal half of the nail bed, loss of distal phalanx. zone IV- proximal to lunula.

If more than one option is available, the advantages and disadvantages of each discussed with the patient, and the simplest method that accomplishes the desired result was selected.

Operative procedures

Anaesthesia

The operative procedures in children were performed under general anaesthesia while in most of the adults, we used digital or wrist block.

A digital block placed at the level of the metacarpal head for obtaining analgesia. A wrist block was used when more than one digit was injured.

Procedures Performed

Primary suturing

All the nail bed lacerations were repaired under loupe magnification (4.5 X) with 4-0 prolene. In partial nail avulsion, the edges of the nail were trimmed, and nail repositioned back into the nail fold, taking care to prevent complete avulsion.

In complete nail avulsion, the nail plate was stabilized with a figure of 8 suture over it. The suture was removed after two weeks.

Split thickness skin grafting(STSG)

Split thickness skin grafting(STSG) was performed in volar oblique wounds larger than 1cm surface area without exposed bone or tendon.

Local flaps

A local flap was considered in cases where bone, tendon or both were exposed. Atasoy flaps (volar V-Y) preferred in transverse amputations beyond the mid-nail level and dorsal oblique amputations beyond the proximal nail level. In fingertip wounds with volar and transverse avulsions with exposed bone with excess lateral skin, Kutler flaps(lateral V-Y) were considered.

Revision amputation

Revision amputation with stump closure was performed in 45 year elderly patient, labourer by occupation with co-morbid conditions, with total crush amputations below the level of the nail matrix.

Post operative care

Patients with pulp laceration who underwent primary repair, and flap cover daily simple non adherent dressing using paraffin impregnated gauze was done. Sutures removed between 10-14days.

For patients treated with ssg primary dressing done on 3rd day.

Complications.

In one patient marginal necrosis of the flap occurred after v-y plasty,which was managed conservatively and regular dressings.

Follow-up.

At the follow-up examination the patients have been thoroughly questioned as to any subjective

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complaints.The physical examination has been concentrated on the condition of the scar, the trophic condition, sensibility, deformities, function of the DIP joint. All the cases treated by primary closure achieved primary wound healing at the end of 2 weeks. Deformed nail was noticed after 6 months in 33% patient treated with v-y plasty. Cold intolerance was observed in 67% patients treated with flap cover and revision amputation,Paraesthesia in 25% patients treated with split skin grafting.

[Figure 1] A 3years old Female baby, crush injury (Door trap), Presented with in 4 hours of injury primary suturing was done.

Figure 1: Results after primary suturing

RESULTS

The patients were in the age range of 3years to 45 years. Six were females 11 were males of the total of patients, nine patients had at work place machine trap crush injuries, four patients had house hold door trap injury, two patients had crush injury due to stone fall. Three patients were school going children who had door trap crushing injury.

In 17 patients right hand index finger was involved two patient, ring finger in three patients, middle finger in nine patients, little finger in two patients, thumb in one patient. Lt hand index finger involved in one patient, middle in three patients, ring in three patietns, little in two patients, and thumb finger in one patient.

Sex Distribution

Out of 17cases of study 11 were men while 6were women.

The ratio of male: female is 11:6.

Table 1: Sex distribution

Gender	No of Patients	Percentage
Male	11	65
Female	6	35

Age distribution:

- In our study the youngest patient who was treated is 3 year old and the oldest patient was 45 years old.
- Majority of the patients belong to age group 0-10 and 11to 20 years

Table 2: Age distribution

Age in years	No of patients	Percentage
0-10	5	29.4
11-20	5	29.4
21-30	5	29.4
41-50	2	11.8

Table 3: Hand involved

Hand	No of patients	Percentage
Right	12	70.6
Left	5	29.4

Majority of the patients were right hand dominant, -% sustained injury to right hand fingers.

Middle finger is the most common finger involved

Zone Involvement (ALLENS)

Integrity of Nail Bed, Flexor and Extensor tendon function assessed.

In distal amputation –the level and size of the defect and the angle of injury considered

Table 4: Zone involved

ZONE	No of patients	Percentage
Zone-I	5	29.4
Zone-II	11	64.7
Zone -III	1	5.9

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Table 5: Type of surgical procedure

Procedure	No of patients
PRIMARY REPAIR	10
SSG	4
VOLAR V-Y ADVANCEMENT	3
LATERAL KUTLER FLAP	1
REVISION AMPUTATION	1

Most common surgical procedure done was primary suturing for simple lacerations involving zone-II.

In our study 3 patients treated with split skin grafting developed paraesthesia, cold intolerance was there in patients treated with flapcover. Hook nail deformity seen in little finger treated by lateral v-y flap.

Functional Outcome: Patients were followed up with evaluation of Sensitivity of finger tip.

The Static two-point discrimination test was performed using a simple hand-operated device, i.e., by drawing compass with blunt or sharp-pointed tip.

The interval between the two metal tips of this simple instrument was continuously adjustable and was measured in mm. The two-point test was performed by applying the two tips of the device to the finger tips.

This discrimination was virtually identical to contralateral digits in 11 of the cases.

DISCUSSION

Fingertip injuries are extremely common and comprise the most common hand injuries. Fingertip injuries lead to significant morbidity affecting the occupational as well social activities.

They account for approximately 10% of all accidents reported in the casualty and two-thirds of hand injuries in children. The finger tip injury in children described as door smashed finger since closing door is the most common cause of these trauma. In adults major cause is in occupational injury i.e industrial machine workers, consistent with our study.

Goals of treatment in fingertip injuries include preservation of useful sensation, restoration of functional length, providing satisfactory appearance and avoiding donor site disfigurement (in case of reconstructive flaps) and functional loss.

This present study was done over a period of 2 years (August 2018- February-2021), during which 17 patients presented with exclusive fingertip injuries of hand to our department.

Comparision of no of patients in each study

Study	No of patients
Present Study	17
Karthi Sundar et al,[3]	95
Sanjay Saraf et al,[4]	100
Ravinder Singh et al[5]	30
Fattah JH et al,[6]	130
Katie Weichman et al,[7]	100

Comparision of sex distribution of patients in each study

Study	No of Male Patients	No of Female Patients
Present study	11(65.3%)	6(35%)
Karthi Sundar et al,[3]	79 (83%)	16(17%)
Sanjay Saraf et al,[4]	60(60%)	40(40%)
Ravinder Singh et al,[8]	23(77%)	7(23%)

This study included 11 (65.3%) male patients and 6(34.7%) female patients which was similar to Above studies. Number of male patients are more compared of female patients which showed male preponderance due to the hard nature of activities that male patients participate more in.

Comparision of mode of injury in each study

Study	Cause Of Injury
Present Study	Crush
Karthi Sundar et al,[3]	Crush
Sanjay Saraf et al,[4]	Industrial
Ravinder Singh et al,[8]	Crush
Fattah JH et al,[6]	Agriculture
Katie Weichman et al,[7]	Crush

Most common mode injuries in present study crush injury (64.7%) (door trap, Sugar cane and other machine crush injuries) is similar to studies conducted by Karthi Sundar et al Ravinder Singh et al, Kubus M et al.

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Comparision of study period in each study

Study	Study period
Present study	2 yrs
Karthi Sundar et al,[3]	3 yrs
Sanjay Saraf et al,[4]	2 yrs
Ravinder Singh et al,[8]	3 yrs
Fattah JH et al,[6]	3 yrs
Katie Weichman et al,[7]	5 months

In this study majority of the patient (64.7%) were industrial laborers by occupation the same was seen in other studies conducted by Karthi Sunder et al, Sanjay Saraf et al, Ravinder Singh Et al.The incidence is high in laborers as they are vulnerable by their everyday exposure.

Among all the fingers, middle finger is commonly involved and the studies conducted by Karthi Sundar et al,Sanjay Saraf et al, Kyle Ebertin et al had similar results . The studies conducted by Ravinder et al and Kubus m et al shows high incidence of index fingertip injuries.

Comparision of management methods

Method	Present Study	Karthik,[3] Sunder	Sanjay Saraf,[4]	Fattah JH,[5]
Primary Closure	10 (59%)	Nil	Nil	19
Skin Graft	4(23.5%)	13(68%)	20(29%)	26(51%)
V-Y Advancement	3(17.5%)	6(32%)	49(71%)	25(49%)

In this study, most common procedure used was primary closure followed by skin grafting and most common flap used was v-y advancement flap. Similar results were found in sanjay sarag and et all, where as Fattah jh and et all had done skin grafting.

CONCLUSION

In our study total 17 patients were included. Males being more involved than the females. The middle-aged group 20-30 years industrial workers who presented with workplace injuries were more followed by children below 10 years.

Most common mode of injury in adult patients was machine crush injury and in children door trap injury.

Most of the patients had injury of dominant hand middle finger followed by ring and index.

Ten patients had pulp laceration in zone II, six patients had an avulsion injury involving zone I and zone II. One carpenter worker had amputation at zone III level of finger tip.

All patients with pulp laceration in zone I presented early were amenable to primary closure as there was not much pulp loss.

Patients with volarly directed wound larger than one centimeter without bone and tendon exposed split thickness grafting was considered.

Patient treated by primary suture gave good subjective result, faster wound healing, good pulp contour, restored finger length, less cold sensitivity and near normal static two point discrimination.

Three patient with zone II injury with exposed bone was considered for local flap cover, i.e., V-Y advancement of middle, ring finger and lateral V-Y advancement of little finger.

Aesthetic appearance of finger tip following V-Y advancement flap was superior compared to split skin grafting and less donor site morbidity in flap cover.

The highest reported incidents of cold intolerance were at two months but showed decreasing incidents with time.

In our study average period of recovery to normal work is four weeks. The work in capacity time was less in patients treated with primary closure and revision amputation and ensured that the functionality of finger is maintained.

The above patients could return to their routine pre injury work earlier than the patients who treated with split skin graft and local flap cover.

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