Section: Miscellaneous

Original Research Article

A CLINICAL STUDY ON RECONSTRUCTION OF FINGERTIP INJURIES

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ABSTRACT

Background: The most frequent hand injuries are those to the finger tips due to the anatomical exposure and functional importance of the fingertips. These injuries require individualized surgical management to optimize functional and aesthetic outcomes. **Aim:** To evaluate the incidence, etiology, anatomical distribution, surgical management, and outcomes of fingertip injuries in a tertiary care setting. **Materials and Methods:** A prospective clinical study was conducted for 18 months, from December 2023 to May 2025, involving 30 patients with fingertip injuries. Patient demographics, injury characteristics, and management modalities were documented. Surgical interventions included primary closure, stump revision, split and full-thickness skin grafts, and local/distant flap reconstructions. Patients were followed up for a median period of 3 months. **Result:** The majority of patients were young adult males (mean age: 28.4 years; 73.3% male). The index finger was the most frequently injured (30%). Road traffic accidents were the predominant cause (46.7%). Primary/stump closure was performed in 36% of cases, followed by skin grafting (16.7%) and flap reconstructions including V-Y advancement, cross-finger, and thenar flaps. Postoperative complications were minimal (6.7%), with most patients achieving satisfactory functional and cosmetic outcomes. **Conclusion:** A tailored approach to fingertip reconstruction based on injury pattern, digit involved, and patient factors results in high rates of successful outcomes with minimal complications. Local and regional flaps remain the cornerstone in fingertip salvage and reconstruction when grafting or primary closure is not feasible.

INTRODUCTION

The fingertip is defined as the part of the digit distal to the insertion of the flexor and extensor tendons on the distal phalanx and the inter phalangeal joint when referring to the thumb.[1]

The fingertip is made up of skeletal elements (distal phalanx, tendons, and ligamentous structures), the nail complex or perionychium (germinal and sterile matrices, nail plate, sheaths, and skin folds), a fibrous connective tissue network with subcutaneous tissues, a vascular network, nerves that connect to end organs, and non-perionychial skin.

The fingertip is the most distal portion of the finger providing tactile and sensory functions.[2]

The nail plays an important role in the normal function of the hand by protecting the fingertip. Injury to the fingertip and nail bed is the most common injury of the hand because of their prominent and exposed position.[3] The most often damaged digit is the long middle finger, which is followed equally frequently on both sides by the thumb, ring, index, and tiny fingers. Males account for 75% of injuries, which often happen between the ages of 4 and 30. Two thirds of all hand injuries in children are fingertip injuries, and the most frequent mechanism of harm is a collision between a door and its frame.[4]

The ultimate goal of treatment 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.

Surgical options in treating the fingertip injuries are customised to each patient considering the injury pattern, age, hand dominance and occupation and includes primary closure, split skin grafting, full thickness skin grafting and Local/Distant flap reconstruction.[5]

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

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MATERIALS AND METHODS

The present study was conducted between December 2023 to May 2025 for a period of 18 months. 30 patients were included in this study.

All patients reported with fingertip injuries of varying etiology.

Preoperatively, Patient demographics, age, hand and finger involved, mode of injury and comorbidities were documented.

Every selected patient underwent thorough preoperative workup and radiographic evaluation of the affected and normal hands.

Based on the nature of injury, type of presentation and exposed vital structures, the patient was managed surgically with either Primary closure, stump revision and closure, Split skin or full thickness grafting, local flaps or distant flaps.

All the patients were monitored post operatively for complications and maintained on follow up for a median period of 3 months.

Surgical Anatomy

The fingertip is a complex structure containing all major tissue types: skin, bone, joint, tendons, ligaments, arteries, veins, lymphatics, and nerves. It comprises three main components: the **distal phalanx**, **soft tissue of the nail bed**, and **nail plate**.

Nail & Perionychium

The nail fold, paronychium, hyponychium, germinal matrix, sterile matrix, and nail plate are all components of the perionychium. Through parakeratosis, the germinal matrix (behind the proximal nail fold) creates around 90% of the nail.

The sterile matrix thickens and anchors the nail by adding cells to the underside of the nail.

Average nail growth is ~0.1 mm/day; full replacement takes 70–140 days.

Vascular Anatomy

The fingertip is supplied by the radial and ulnar proper digital arteries (PDAs), with various arcades formed by the dorsal and volar branches:

Superficial arcade (SA) → dorsal skin and nail complex

Proximal and distal subungual arcades (PSA and DSA) → fingertip and nail bed

Volar pulp and tip via cruciate anastomosis (CA) and distal transverse arch (DTA).

Extensive anastomoses ensure robust perfusion and explain profuse bleeding in fingertip injuries.

Venous Anatomy

Venous return is mainly via a **superficial dorsal system**, with some **deep venae comitantes**.

Numerous **arteriovenous shunts** and **glomus bodies** in the nail bed regulate temperature and can be pain sources when injured.

Neural Anatomy

Near the DIP joint, each proper digital nerve trifurcates, innervating the dorsal skin, nail bed, and pulp.

Superficial radial and dorsal ulnar nerves provide further dorsal innervation.

Among the sensory structures are Merkel cells (fine touch), Pacinian corpuscles (vibration), and Meissner's corpuscles (touch).

RESULTS

A total of 30 cases were studied, with the age range being 1-60 years. The mean age was 28.4 years. Most of the patients were young adults in the age range of 22-35 years. 22 cases were male (73.3%) and 8 cases were Female (26.7%). The site of the injury was the Right hand in 17 cases (56%) and the Left hand in 13 cases (44%). The Index finger was most commonly injured with 9 cases (30%), followed by the Ring finger with 7 cases (23%). Multiple fingers were involved in 8 cases (26%). Road Traffic Accidents were found to be the commonest etiology with 14 cases (46.7%) followed by Gate Crush Injuries at 9 cases (30%) and Machine Cut Injuries at 7 cases (23.3%).

A total of 3 patients (10%) had co-morbidities. 2 were Hypertensive and 1 was Diabetic.

Patients underwent a spectrum of procedures ranging from Primary closure, stump closure, Split and full thickness skin grafting and local flaps. Stump closure and Primary closure were done in a combined 11 cases (36%). Split skin grafting was done in 4 cases, while full thickness graft was placed for 1 case. Volar V-Y and Oblique V-Y Advancement flaps were done in a combined 5 cases. Cross finger flap was done for 4 cases and Thenar flap in 2 cases.

The majority of our patients did not have any significant post operative complications (93.3%). 2 patients encountered complications, out of which 1 patient had a major complication of flap auto-division in the follow up period prior to planned flap division which resulted in total flap loss. 1 patient had partial split thickness skin graft loss which was managed conservatively.

All patients were followed up for a median period of 3 months.

Table 1: Demographic Distribution of Study Participants

S.No	Age	Sex	Finger involved	Side	Mode of Injury	Procedure performed	Co-morbidities	Post-op Complications
1	39	Female	Index Finger	Right	Gate Crush Injury	Cross Finger flap	None	None
2	3	Male	Little and Ring Finger	Left	Gate Crush Injury	Stump closure	None	None
3	33	Male	Little Finger	Left	Road Traffic Accident	Stump closure	None	None

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4	35	Male	Index and Middle Finger	Left	Road Traffic Accident	Stump closure	Diabetic	None
5	3	Female	Ring Finger	Right	Gate Crush Injury	Stump closure	None	None
6	27	Male	Little Finger	Right	Road Traffic Accident	Volar V-Y Advancement Flap	None	None
7	35	Male	Middle Finger	Left	Machine cut Injury	Primary Closure	None	None
8	48	Male	Ring and Middle Finger	Right	Road Traffic Accident	Volar V-Y Advancement Flap	Hypertensive	None
9	36	Female	Index Finger	Right	Road Traffic Accident	Volar V-Y Advancement Flap	None	None
10	24	Female	Ring Finger	Left	Gate Crush Injury	Split Skin Grafting	None	None
11	7	Male	Index Finger	Right	Gate Crush Injury	Stump closure	None	None
12	22	Male	Middle Finger	Right	Road Traffic Accident	Oblique V-Y Advancement Flap	None	None
13	30	Male	Ring Finger	Left	Road Traffic Accident	Thenar Flap	None	Accidental Flap Auto-division
14	33	Male	Ring Finger	Right	Machine cut Injury	Thenar Flap	None	None
15	48	Male	Index Finger	Left	Road Traffic Accident	Volar V-Y Advancement Flap	None	None
16	28	Male	Ring Finger	Left	Road Traffic Accident	Stump closure	None	None
17	30	Female	Index and Middle Finger	Left	Gate Crush Injury		None	None
18	60	Male	Middle and Ring Finger	Right	Machine cut Injury	Split Skin Grafting	None	None
19	1	Female	Ring Finger	Left	Gate Crush Injury	Primary Closure	None	None
20	21	Male	Little and Ring Finger	Right	Machine cut Injury	Split Skin Grafting	None	None
21	20	Male	Index Finger	Right	Road Traffic Accident	Volar V-Y Advancement Flap	None	None
22	24	Male	Middle Finger	Right	Road Traffic Accident	Cross Finger flap	None	None
23	34	Male	Index Finger	Right	Machine cut Injury	Cross Finger flap	None	Partial graft Loss
24	28	Female	Ring Finger	Left	Gate Crush Injury	Split Skin Grafting	None	None
25	44	Female	Index Finger	Right	Road Traffic Accident	Volar V-Y Advancement Flap	None	None
26	23	Male	Index Finger	Right	Road Traffic Accident	Full thickness skin grafting	None	None
27	18	Male	Index and Middle Finger	Left	Road Traffic Accident	Primary Closure	None	None
28	45	Male	Index and Middle Finger	Right	Machine cut Injury	Stump closure	Diabetic	None
29	25	Male	Thumb	Right	Machine cut Injury	Cross Finger flap	None	None
30	28	Male	Index Finger	Left	Gate Crush Injury	Stump closure	None	None

Figure 1: (From Top left clockwise) Preoperative Right Index fingertip crush injury with subsequent dry gangrene, Postoperative Cross finger flap and Follow up images showing settled Flap

Figure 2: (From left) Preoperative Left Middle fingertip injury with exposed bone, Postoperative Thenar flap and Follow up image showing settled Flap

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Figure 3: (From left to right) Preoperative Right Index fingertip crush injury, Postoperative Volar V-Y Advancement flap and Follow up images showing settled Flap

DISCUSSION

As per a study by Saraf.S et al, in their study in a series of 150 cases of fingertip injuries, the most common mechanism of injury was noted to be crush injuries (52 cases, 33%). Door crush injury was noted to be the commonest cause in the pediatric population, and similar findings were reflected in the present study.[6]

Owing to the location of the study area in a predominantly industrial zone, we noted other causes contributing to Fingertip injuries such as Machine cut injuries as well.

The various local flaps used to reconstruct fingertips include volar V-Y, bilateral V-Y flaps, cross-finger flap, thenar flap and island flaps. Flap choice depends on the orientation and configuration of the wound, injured digit and sex of the patient.[7]

The volar V-Y flap (Atasoy) works well for minor wounds involving fingers with transverse amputations beyond the mid-nail level and dorsal oblique amputations beyond the proximal nail fold. When there is surplus lateral skin, bilateral V-Y (Kutler) flaps work best for transverse avulsions and volar avulsions with exposed bone.[8]

The cross-finger flap is preferable if the wound is volar-directed without sufficient volar pulp to facilitate V-Y flap. However, if local flap is not possible, a regional flap like thenar, cross-finger flap or neurovascular island flap may have to be considered.[9]

The thenar flap is frequently used for females because it does not leave apparent dorsal scars and may be utilized for volar, transverse, and dorsal injuries, particularly for index and long fingers.[10-11]

Only partial graft loss and unintentional flap loss as a result of the patient's noncompliance with maintaining posture were among the few problems that occurred throughout the current study. Other injury-related symptoms, such hypoaesthesia, were seen to be self-limiting and resolving with time. None of the patients needed any revision procedures and were satisfied with the outcomes on follow up.

CONCLUSION

Fingertip injuries, though commonly encountered, require careful assessment and a personalized surgical strategy to restore both function and form. This study emphasizes that simple injuries may be effectively managed with primary or stump closure, while more complex defects necessitate the use of local or regional flaps. Among the various reconstructive techniques, V-Y advancement, cross-finger, and thenar flaps provided reliable coverage and satisfactory outcomes with minimal complications. Patient compliance and appropriate flap selection are critical to avoid failure. Overall, prompt intervention, appropriate technique selection, and structured follow-up contribute significantly to successful fingertip reconstruction.

Conflicts of interest statement: None declared

REFERENCES

1. Lister G. The hand: Diagnosis and indications. 3rd ed. Edinburgh: Churchill Livingstone; 1993. pp. 121–5.
2. Rosenthal EA. Treatment of fingertip and nail bed injuries. Orthop Clin North Am. 1983;14:675–97.
3. Evans DM, Bernadis C. A new classification for fingertip injuries. J Hand Surg Br. 2000;25:58–60. doi: 10.1054/jhsb.1999.0305.
4. Allen MJ. Conservative management of finger tip injuries. Hand. 1980;12:257–65. doi: 10.1016/s0072-968x(80)80049-0.
5. Chow SP, Ho E. Open treatment of fingertip injuries in adults. J Hand Surg. 1982;7:470–6. doi: 10.1016/s0363-5023(82)80042-7.
6. Saraf S, Tiwari V. Fingertip injuries. Indian J Orthop. 2007 Apr;41(2):163-8. doi: 10.4103/0019-5413.32051. PMID: 21139772; PMCID: PMC2989143.
7. Atasoy E, Ioakimidis E, Kasdan ML, Kutz JE, Kleinert HE. Reconstruction of the amputated finger tip with a triangular volar flap. A new surgical procedure. J Bone Joint Surg Am. 1970;52:921–6.
8. Kutler W. A new method for finger tip amputation. JAMA. 1947;133:29–30. doi: 10.1001/jama.1947.62880010007007.
9. Gurdin M, Pangman WJ. The repair of surface defects of finger by transdigital flaps. Plast Reconstr Surg. 1950;5:368–71. doi: 10.1097/00006534-195004000-00011.
10. Johnson RK, Iverson RE. Cross-finger pedicle flaps in the hand. J Bone Joint Surg Am. 1971;53:913–9.
11. Littler JW. Neurovascular pedicle transfer of tissue in reconstructive surgery of the hand. J Bone Joint Surg Am. 1956;38:917.

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