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Surgical Outcomes of Management of Finger Tip Injuries- A Hospital Based Study

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Abstract

Background: Fingertip injuries involving the pulp, nail unit, and/or distal phalanx can cause disproportionate functional and cosmetic morbidity. ***Aim and objectives:*** To describe injury patterns and operative management, and to assess healing and the complication profile in a hospital-based cohort. ***Methods:*** This observational study included 90 fingertip injuries managed in a General Surgery department from August 2024 to December 2025. Injury characteristics and procedure categories were recorded, with outcomes documented as healing status and specific complications. ***Results:*** Crush injuries were the most common mechanism (53.3%), and the middle finger was the most frequently involved digit (32.2%). Bone exposure was present in 46.7% of cases. Flap reconstruction predominated in injuries with bone exposure (22/42), while primary closure (26/48) was most common in non-exposed injuries. The most frequent morbidities were hypersensitivity/cold intolerance (n = 11) and nail deformity (n = 8). ***Conclusion:*** Nearly half of the cohort presented with bone exposure, necessitating higher use of flap reconstruction. Long-term morbidity is primarily driven by sensory symptoms and nail deformity, emphasizing the need for structured post-operative counseling.

Keywords: Fingertip Injury, Nail Bed Injury, Distal Phalanx Fracture, Bone Exposure, Local Flap Reconstruction, Surgical Outcomes.

INTRODUCTION

Fingertip injuries are common in day-to-day surgical casualty, especially after workplace accidents and household sharp trauma. They look small, but the disability can be out of proportion: persistent tip pain, altered sensation, cold intolerance, stiffness, and nail deformity. Patients usually return with these complaints rather than the original wound itself.[1] At the fingertip, the pulp, nail bed and bone act as a single functional area. If the pulp is inadequate or the nail bed scars irregularly, patients end up with a painful tip or a deformed nail even after the wound has “healed”.[2] So we try to give a well-padded tip, keep length when we can, and avoid a nail problem that keeps bringing them back.

In our cohort, crush injuries formed the largest group, and the middle and index fingers were most frequently involved. Nearly half of the injuries had bone exposure, and more than one-third had distal phalanx fractures, which explains why a sizeable proportion required reconstructive options rather than simple closure. This pattern is typical of mixed domestic and occupational trauma where tissue viability and bony support at the tip are often compromised. Management is selected by the injury pattern. Simple lacerations with nail bed disruption need careful nail bed repair; crush injuries may require staged debridement because tissue viability is often unclear at first; and avulsions or amputations with exposed bone demand decisions on bone shortening, grafting, or flap coverage. Practical reconstructive approaches emphasise matching the method to tissue loss and nail unit involvement to achieve dependable healing and acceptable sensibility.[3] When revision procedures are required, published outcome reviews show that function can still be satisfactory, but complications and patient satisfaction vary with the extent of loss and technique used.[4] In our setting, delayed presentation, contamination, and irregular follow-up are frequent realities and they influence what is feasible and reliable. A hospital-based outcome assessment is therefore useful to understand which approaches give consistent

healing with manageable complications in routine practice.

MATERIALS AND METHODS

This hospital-based observational study was conducted in the Department of General Surgery and included 90 consecutive patients with fingertip injuries managed between August 2024 and December 2025. After history and examination, injury details were documented, including digit involved, mechanism (sharp/crush/avulsion/other), nail bed involvement, and bone exposure; radiographs were obtained where clinically indicated for suspected distal phalanx fracture. Following irrigation and debridement, procedures were selected based on defect characteristics: primary closure/repair, nail bed repair ± nail plate splinting, bone shortening with closure, local flap reconstruction for tissue loss (particularly in bone-exposed defects), skin grafting where appropriate, and revision procedures for non-salvageable tips. Tetanus prophylaxis, antibiotics as per contamination status, splintage and standard dressings were provided. Patients were followed in the outpatient setting until healing and for late sequelae where feasible. Outcomes were recorded as healing without complication versus any complication, and specific morbidities including infection, wound dehiscence, partial/total graft or flap loss, nail deformity, hypersensitivity/cold intolerance and stiffness affecting function; multiple complications per patient were allowed to capture morbidity spectrum. Data were analysed using descriptive statistics and appropriate comparative tests (chi-square/Fisher's exact; t-test/Mann–Whitney), with $p < 0.05$ considered statistically significant.

RESULTS

A total of 90 patients with fingertip injuries were managed during the study period. The case profile, injury pattern, operative approach, and early outcomes are summarised below.

Patient Profile and Injury Characteristics

The cohort predominantly represented acute trauma presentations, with injuries clustering around workplace and household accidents. The study population was primarily male (n = 74, 82.2%), and the dominant hand was involved in 68.9% of cases (**Table 1**). The distribution of mechanism of injury and digit involvement is shown in **Figure 1** and **Figure 2**, while consolidated injury descriptors are presented in **Table 2**.

Variable	Category	n	%
Age group (years)	0–20	18	20.0%
	21–40	52	57.8%
	>40	20	22.2%
Sex	Male	74	82.2%
	Female	16	17.8%
Hand involved	Right	65	72.2%
	Left	25	27.8%
Dominant hand injured	Yes	62	68.9%
	No	28	31.1%
Table 1. Baseline characteristics of study participants (n = 90)			
Percentages are calculated out of total sample (n = 90)			

Crush injuries formed the largest mechanism category (53.3%), followed by sharp cuts (27.8%) (**Table 2**, **Figure 1**). The middle finger was most frequently involved (n = 29, 32.2%), followed by index finger (n = 24, 26.7%) (**Figure 2**). Bone exposure was documented in 46.7% of cases, and distal phalanx fracture in 37.8% (**Table 2**), indicating that a substantial subset represented complex distal injuries rather than superficial lacerations alone.

Variable	Category	n	%
Mechanism	Sharp cut	25	27.8%
	Crush	48	53.3%
	Avulsion/traction	12	13.3%
	Other	5	5.6%
Nail bed involvement	Present	38	42.2%
	Absent	52	57.8%
Bone exposure	Present	42	46.7%
	Absent	48	53.3%
Distal phalanx fracture	Present	34	37.8%
	Absent	56	62.2%
Table 2. Injury pattern and clinical features (n = 90)			
Radiographs were obtained where clinically indicated for suspected bony injury			

Operative Procedures and Outcomes

Procedure selection varied with bone exposure and the extent of pulp loss. Local flap reconstruction (predominantly V–Y advancement in routine practice) formed the mainstay for bone-exposed defects where length preservation was prioritised (**Table 3**). The contrast in procedure mix between bone-exposed and non-exposed injuries is displayed in **Figure 3**.

Overall procedure distribution and outcome summary are shown in **Table 3**. In this cohort, healing without recorded complications was highest in the bone shortening group (91.7%) and primary closure group (85.7%), while flap and graft groups had higher complication proportions, consistent with the greater baseline severity and tissue loss typically prompting these procedures (**Table 3**).

Procedure Category	n	%	Healed without Complication (n, %)	Any Complication (n, %)
Primary closure/repair	28	31.1%	24 (85.7%)	4 (14.3%)
Nail bed repair ± splinting	12	13.3%	9 (75.0%)	3 (25.0%)
Bone shortening + closure	12	13.3%	11 (91.7%)	1 (8.3%)
Local flap reconstruction	25	27.8%	18 (72.0%)	7 (28.0%)
Skin grafting	11	12.2%	8 (72.7%)	3 (27.3%)
Revision procedure	2	2.2%	2 (100%)	0 (0.0%)

Table 3. Procedures performed and observed outcomes (n = 90)

"Any complication" includes infection, dehiscence, partial/total graft or flap loss, nail deformity, hypersensitivity/cold intolerance, and stiffness affecting function

Complication profile

Postoperative morbidity was captured using a multiple-complications-per-patient rule to reflect the full burden of symptoms and clinical events. The most frequently recorded issues were hypersensitivity/cold intolerance (n = 11) and nail deformity (n = 8), followed by infection (n = 6) and stiffness limiting function (n = 5). The distribution of complications is shown in **Figure 4**.

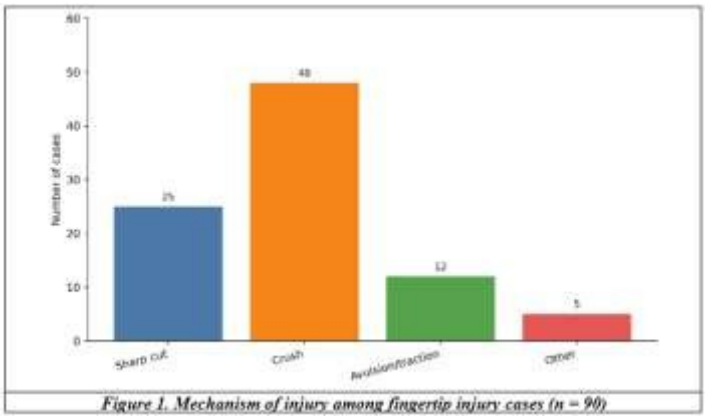

Figure 1. Mechanism of injury among fingertip injury cases (n = 90)

Values above bars represent absolute counts; percentages are out of 90.

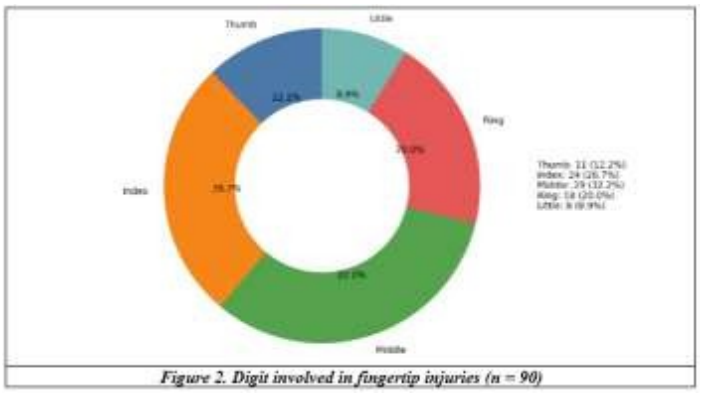

Figure 2. Digit involved in fingertip injuries (n = 90)

Segment labels show percentages; counts with percentages are listed alongside.

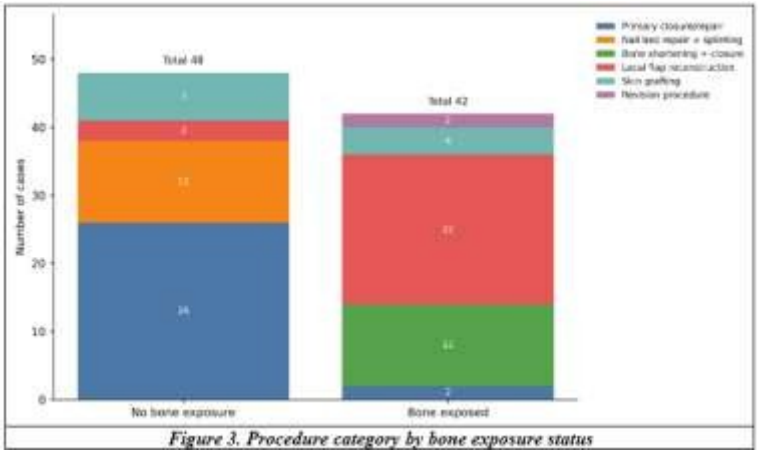

Figure 3. Procedure category by bone exposure status

Stacked bars show procedure mix within each exposure group; values inside segments are counts and totals are shown above each bar.

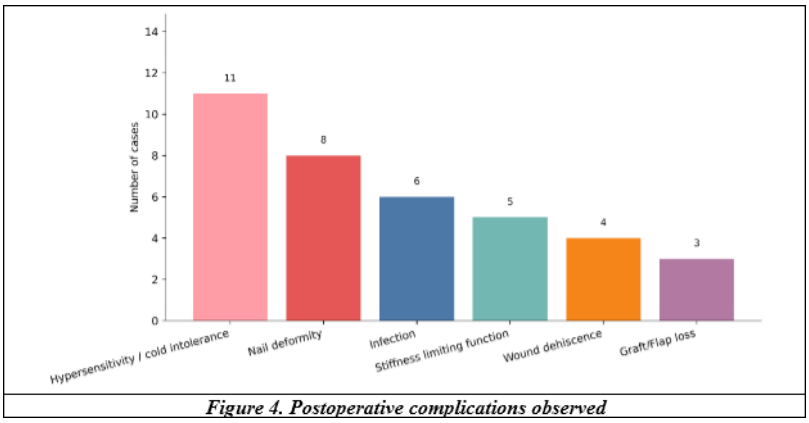

Figure 4. Postoperative complications observed

Counts are not mutually exclusive because multiple complications could occur in the same patient.

DISCUSSION

This hospital-based series captures a pattern that feels familiar in routine practice: crush injury dominated (53.3%), with middle and index fingers taking the main burden, and a substantial proportion presenting with bone exposure (46.7%) and distal phalanx fracture (37.8%). The predominance of crush mechanisms aligns with prior clinical epidemiology of fingertip trauma, where crush-related injuries commonly lead the distribution and often carry more tissue devitalisation than clean cuts.[5] In practical terms, this matters because crush injuries are the ones that "declare themselves late", oedema, questionable pulp viability, and nail bed damage become clearer after the first debridement, and the initial plan sometimes needs revision.

A key operational finding in the present cohort is the way bone exposure drove procedure selection. When bone was exposed, local flap reconstruction (22/42) and bone shortening with closure (12/42) were the dominant strategies, whereas injuries without exposure were largely managed with primary closure (26/48) and nail bed repair (12/48). That split is clinically logical. Bone exposure narrows choices quickly: either shorten bone to allow tension-free closure, or provide vascularised soft tissue cover.[6] In many Indian hospitals, flap options that are quick, reproducible and don't demand microsurgical infrastructure naturally become the backbone for these cases. That the flap group forms the largest category within the exposed-bone subset is therefore less a "preference" and more a reflection of anatomy and feasibility.

Even with acceptable healing, fingertip injuries have a long memory. In this study, the commonest recorded morbidity was hypersensitivity/cold intolerance (n = 11), followed by nail deformity (n = 8). This pattern is consistent with what patients report after distal digit trauma: sensory symptoms often persist beyond wound closure and can be more function-limiting than a small loss of length. Larger outcome studies after hand trauma have shown a high burden of cold sensitivity in

the early months after injury, reinforcing that this symptom cluster is not rare and should be counselled proactively.[7] Similarly, nail deformity tends to surface later and is frequently linked to the original injury level and the way the nail bed and distal phalanx support heal.[8] Long-term, patient-reported outcome data after advancement flap reconstruction also highlights that hook nail deformity, cold intolerance and hypersensitivity remain important late issues, even when coverage is durable.[9]

The flap and graft groups in the present cohort showed a higher proportion of "any complication" compared to primary closure and bone shortening. That direction is not surprising because these groups usually represent the more severe end of the spectrum: greater tissue loss, more contamination, and more bone exposure. What matters clinically is the type of complication. In most settings, partial flap/graft loss and infection are early threats, while nail deformity and sensory symptoms represent later morbidity. Systematic synthesis of V–Y advancement flap outcomes has also drawn attention to complication patterns such as hook nail and pain, emphasising that "survival of the flap" is not the only endpoint patients care about.[10] In your dataset, the prominence of sensory symptoms and nail deformity suggests that follow-up protocols should explicitly include structured symptom checks (cold intolerance, hypersensitivity, tip tenderness), not just wound inspection.

One additional point sits quietly behind these numbers. A sizeable subset of injuries in this cohort had no bone exposure (53.3%), yet surgical intervention was still common (primary closure and nail bed repair together formed a large share of the non-exposed group). Classic adult series on secondary healing demonstrate that, in carefully selected non-exposed injuries, conservative care can deliver reliable closure and acceptable function.[11] Contemporary comparative studies on semi-occlusive dressings further suggest that conservative pathways can achieve high healing rates and patient satisfaction with fewer complications than surgery in many contexts.[12] This does not mean surgery was "wrong" here, contamination, occupational urgency, nail bed disruption, and patient expectations often push decisions toward operative management. But it does suggest an opportunity: where patient factors permit, the department may consider formalising selection criteria for conservative care in non-exposed injuries, while reserving operative resources for complex patterns.

LIMITATIONS

This was a single-centre, hospital-based cohort, and the analysis is primarily descriptive. Outcome reporting depended on follow-up availability and documentation quality, and some late symptoms (especially cold intolerance and mild nail deformity) may be under-reported if follow-up was short or inconsistent. Complication counts were not mutually exclusive, which is clinically appropriate but limits simple "overall complication rate" interpretation without patient-level clustering.

Clinical take-home

In this cohort, the burden of crush injury and the high frequency of bone exposure explain the prominent use of flap reconstruction and bone shortening. The dominant morbidity spectrum, sensory symptoms and nail deformity, highlights that fingertip care should be framed to patients as functional recovery + symptom control, not only wound closure. Structured counselling and symptom-focused follow-up can reduce dissatisfaction even when primary healing is successful.

CONCLUSION

Among 90 fingertip injuries managed in our unit, crush trauma was the commonest mechanism and the middle finger was most often involved. Bone exposure was seen in nearly half the cases and this largely guided the operative plan: exposed-bone injuries were usually managed with flap cover or bone shortening, while non-exposed injuries were more often treated with primary repair or nail bed repair. On follow-up, hypersensitivity/cold intolerance and nail deformity were the main problems noted, so counselling and review should focus on these issues in addition to wound healing.

Statements and Declaration

There is no financial interest.

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