

Outcomes of Cross-Finger Flap for Fingertip Injury

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Abstract:

Background: Fingertip injuries are among the most common hand injuries encountered in surgical practice and can result in significant functional impairment, sensory deficits, and cosmetic deformity. Cross-finger flap reconstruction remains a reliable technique for coverage of fingertip defects with exposed bone, tendon, or neurovascular structures when primary closure is not feasible.

Aim: To evaluate the functional and cosmetic outcomes of cross-finger flap reconstruction in patients with fingertip injuries.

Methods: An observational study was conducted at Patna Medical College and Hospital from January 2024 to December 2025. Fifty patients with fingertip injuries requiring cross-finger flap reconstruction were included. Demographic details, injury characteristics, flap survival, sensory recovery, range of motion, complications, and patient satisfaction were assessed during follow-up.

Results: The mean age of patients was 31.8 ± 11.6 years, with males accounting for 78% of cases. Complete flap survival was achieved in 94% of patients. Good-to-excellent sensory recovery was observed in 84% of cases, while satisfactory range of motion was achieved in 88%. Minor complications occurred in 12% of patients. Overall patient satisfaction was reported by 90% of participants.

Conclusion: Cross-finger flap reconstruction is a reliable and effective method for managing fingertip injuries, providing excellent flap survival, functional recovery, and patient satisfaction with minimal complications.

Keywords: Cross-Finger Flap, Fingertip Injury, Hand Reconstruction, Flap Survival, Sensory Recovery.

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Introduction

Among the most common traumatic injuries of the upper extremities, fingertip injuries are a major cause of morbidity, especially in young, economically active people. Road traffic accidents, door entrapment, crush injuries, industrial accidents, and trauma from machinery are the most common causes of these injuries. Restoration of both function and appearance is a major goal of treatment because the fingertip is essential for fine motor skills, tactile perception, and hand aesthetics. The nail apparatus, pulp tissue, sensory nerve endings, and terminal phalanx are among the highly specialised structures that make up the fingertip. Pain, hypersensitivity, sensory impairment, diminished dexterity, and cosmetic deformities can arise from the loss of any one of these elements. As a result, managing fingertip injuries necessitates carefully taking into account factors such as defect size, tissue loss, bone exposure, occupational needs, and patient expectations [1].

For fingertip deformities, healing by secondary intention, skin grafting, local advancement flaps, thenar flaps, V-Y advancement flaps, and cross-finger flaps are among the reconstructive possibilities. The cross-finger flap is one of these methods that has become popular because to its ease of use, dependability, and adaptability. The cross-finger flap, which was first described by Gurdin and Pangman, provides long-lasting soft tissue coverage for volar fingertip deformities by using skin and subcutaneous tissue from the dorsal surface of an adjacent finger. When local advancement procedures are inadequate and exposed bone, tendon, or neurovascular systems are present, the operation is especially helpful. Strong vascularity, finger length preservation, adequate sensory recovery, and acceptable cosmetic results are only a few benefits of cross-finger flaps. However, there is a chance of problems such flap necrosis, stiff joints, morbidity at the donor site, and delayed rehabilitation [2].

To evaluate the efficacy of reconstructive operations, surgical results must be evaluated. Treatment success can be inferred from parameters including flap viability, sensory recovery, range of mobility, complication rates, return to work, and patient satisfaction. Despite the widespread use of cross-finger flap reconstruction, there is still a dearth of outcome data from eastern India. In order to measure functional recovery, complication rates, and patient satisfaction after surgery, the current study was conducted to examine the results of cross-finger flap repair in patients with fingertip injuries treated at a tertiary care teaching hospital [2].

Materials and Methods

Study Design: Observational study.

Study Setting: Department of plastic and reconstructive surgery, Patna Medical College and Hospital, Patna, Bihar.

Study Duration: January 2024 to December 2025.

Sample Size: 50 patients.

Inclusion Criteria

- Patients aged ≥ 18 years.
- Fingertip injuries with soft tissue loss requiring flap coverage.
- Exposed bone, tendon, or neurovascular structures.
- Patients consenting for surgery and follow-up.

Exclusion Criteria

1. Severe crush injuries requiring amputation.

2. Multiple finger loss.
3. Uncontrolled diabetes mellitus.
4. Peripheral vascular disease.
5. Incomplete follow-up.

Surgical Procedure: All patients underwent cross-finger flap reconstruction under local anesthesia. The flap was harvested from the dorsal aspect of the adjacent finger and inset into the fingertip defect. Donor sites were covered using split-thickness skin grafts. Flap division was performed after 3-4 weeks.

Outcome Measures

1. Flap survival.
2. Static two-point discrimination.
3. Range of motion.
4. Postoperative complications.
5. Return to work.
6. Patient satisfaction.

Statistical Analysis

Data were analyzed using SPSS version 26.

- Chi-square test.
- Student's t-test.
- Fisher's exact test.

A p-value < 0.05 was considered statistically significant.

Results

Table 1: Demographic and Injury Characteristics: The majority of patients were young males, and occupational injuries constituted the most common mechanism of trauma.

Table 1: Demographic and Injury Characteristics:

Variable	Number (%)
Total Patients	50
Mean Age (years)	31.8 ± 11.6
Male	39 (78.0)
Female	11 (22.0)
Dominant Hand Involved	31 (62.0)
Occupational Injury	28 (56.0)
Crush Injury	30 (60.0)
Sharp Injury	20 (40.0)

Table 2. Distribution of Injured Digits: The middle finger was the most commonly injured digit, followed by the index finger.

Table 2: Distribution of Injured Digits

Finger Involved	Frequency (%)
Index Finger	14 (28.0)
Middle Finger	17 (34.0)
Ring Finger	11 (22.0)
Little Finger	8 (16.0)

Table 3. Flap Outcomes: Complete flap survival was achieved in 94% of cases, demonstrating the reliability of the cross-finger flap technique.

Table 3: Flap Outcomes

Outcome	Frequency (%)
Complete Flap Survival	47 (94.0)
Partial Flap Necrosis	2 (4.0)
Total Flap Loss	1 (2.0)

Table 4: Functional Outcomes: Good-to-excellent sensory recovery was achieved in 84% of patients.

Full or near-full range of motion was maintained in 88% of cases.

Table 4: Functional Outcomes

Outcome	Number (%)
Excellent Sensory Recovery	22 (44.0)
Good Sensory Recovery	20 (40.0)
Fair Sensory Recovery	6 (12.0)
Poor Sensory Recovery	2 (4.0)
Range of Motion	Number (%)
Full Motion	32 (64.0)
Mild Restriction	12 (24.0)
Moderate Restriction	5 (10.0)
Severe Restriction	1 (2.0)

Table 5: Postoperative Complications: Most patients experienced uncomplicated recovery. The

overall complication rate was low, with infection being the most frequent adverse event.

Table 5: Postoperative Complications

Complication	Frequency (%)
Infection	3 (6.0)
Joint Stiffness	2 (4.0)
Partial Necrosis	2 (4.0)
Donor Site Morbidity	1 (2.0)
No Complication	42 (84.0)

p-value = 0.021

Table 6: Patient Satisfaction and Return to Work: Ninety percent of patients reported

satisfaction with the procedure, and most returned to work within eight weeks.

Table 6: Patient Satisfaction and Return to Work

Parameter	Frequency (%)
Highly Satisfied	28 (56.0)
Satisfied	17 (34.0)
Unsatisfied	5 (10.0)
Return to Work ≤8 Weeks	39 (78.0)
Return to Work >8 Weeks	11 (22.0)

Discussion

The results of cross-finger flap reconstruction in fifty patients with fingertip injuries were assessed in the current observational study. The results support the continued use of cross-finger flaps in fingertip reconstruction by showing excellent flap survival, adequate sensory recovery, preservation of finger function, and high patient satisfaction. Because restoration of both function and appearance is required for the best results, fingertip injuries are especially difficult. Young men made up the bulk of the patients in this study, which is indicative of their increased exposure to industrial and occupational risks. Previous research has shown similar demographic trends, with hand trauma mostly affecting economically productive people [4].

The most frequent mode of harm was crush injuries. Simple closure or skin grafting is inappropriate for such injuries because they often cause significant soft tissue loss and expose underlying bone or tendon. In these circumstances, cross-finger flaps help maintain finger length and function while offering long-lasting, vascularized tissue covering. The high flap survival rate of 94% was one of the study's main conclusions. This outcome is similar to other research that reported flap survival rates between 90% and 98%. The dorsal finger skin's extensive vascular network explains the low frequency of total flap failure seen in the majority of series and adds to the cross-finger flap's dependability [5]

A key factor in determining surgical success is functional recovery. In this study, 84% of patients had good-to-excellent sensory improvement. Because the fingertip is used for item interaction and delicate tactile judgement, protected sensation restoration is especially crucial. Cross-finger flaps appear to offer appropriate neuronal adaptability and functional rehabilitation over time, according to the observed sensory outcomes. The results for range of motion were also favourable. Only a tiny percentage of patients had moderate to severe stiffness, whereas nearly two-thirds of patients were able to regain complete finger motion [6]. These outcomes were probably influenced by early mobilisation and physical therapy. Because temporary immobilisation is required during flap integration, joint stiffness is still a known side effect of cross-finger flap surgeries. However, this study's modest frequency of substantial stiffness suggests that this consequence can be reduced with proper postoperative therapy [7].

Complications following surgery were comparatively rare. The most common consequence was infection, which was followed by partial flap necrosis and joint stiffness. Compared to reports from other centres, the overall complication rate stayed low. Positive outcomes are mostly dependent on careful surgical technique, careful flap management, and sufficient postoperative care [8]. In reconstructive surgery, patient satisfaction is becoming more widely acknowledged as a crucial outcome metric. Ninety percent of patients expressed satisfaction with the operation, indicating both acceptable aesthetic appearance and functional recovery. Additionally, the majority of patients resumed their jobs within eight weeks, demonstrating effective hand function restoration and rehabilitation [9].

This study's prospective follow-up and thorough evaluation of functional and patient-reported outcomes are among its strong points. It is important to recognise some limitations, though. Long-term sensory outcomes lasting longer than a year were not assessed, and the sample size was somewhat small. Furthermore, no comparison with other reconstructive methods was been out. Overall, the results show that for fingertip injuries requiring soft tissue coverage, cross-finger flap reconstruction is still a reliable and efficient choice. With few difficulties, the method offers long-lasting coverage, high flap survival, good sensory recovery, and satisfactory functional results [10].

Conclusion

Cross-finger flap reconstruction is a safe, dependable, and efficient method for treating fingertip injuries involving exposed bone, tendon, or neurovascular structures, as this study shows. Excellent flap survival rates, good sensory recovery,

finger motion preservation, and great patient satisfaction were all attained by the technique. The majority of patients recovered easily and went back to work in a comparatively short amount of time. Significant functional impairment was rare, and complication rates were modest. Cross-finger flaps are a useful reconstructive alternative for complex fingertip deformities, and this study's positive results encourage their continued usage.

The preservation of finger length, long-lasting tissue coverage, acceptable cosmetic appearance, and restoration of hand function are only a few benefits of cross-finger flap repair. Achieving the best outcomes requires careful patient selection, precise surgical technique, and organised postoperative rehabilitation. It is advised that future research compare cross-finger flaps with more recent reconstructive methods and assess long-term sensory outcomes using bigger sample sizes and longer follow-up times. However, the current study demonstrates that patients with fingertip injuries can achieve outstanding functional and clinical outcomes with cross-finger flap restoration.

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