



Management Options of Fingertip Injuries in the Emergency Unit in Zagazig University Hospitals

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ABSTRACT

Background: Chronic deformity can result from inadequately repaired fingertip injuries, and correcting these abnormalities typically necessitates a more challenging secondary reconstructive treatment with less consistent results compared to a well-managed initially repaired. The present work aimed to evaluate different methods of treatment of fingertip injuries in the Emergency Department at Zagazig University Hospitals.

Methods: Twenty-seven patients (with 35 injured fingertips) with different types of fingertip injuries who were admitted to the emergency unit of the Plastic and Reconstructive Surgery Department in Zagazig University Hospitals were enrolled in this prospective case series study. After the debridement of dead tissues, re-exploration of the injury was done to determine the management plan according to Allen's classification of the fingertip injury. During follow up visits, outcomes were assessed utilizing the fingertip injuries outcome score based on nail aesthetics, pulp pad, aesthetic outcome, sensation, grip strength, and return to work.

Results: Most cases returned to regular work, with high grip strength, preserved sensations, and a well-padded pulp. The nail was normal in 65.7% of cases, small in 22.9% of cases, split in 0% of cases, hooked in 5.7% of cases, and absent in 14.3% of cases. There was high patient and doctor satisfaction.

Conclusions: The choice of the most suitable management option depends on surgeon factors like experience as well as the skills, and patient factors like age, sex, as well as occupation in addition to the defect analysis (injured finger, type of injury and bone exposure).

Keywords: Fingertip injuries; Emergency Unit; Management

INTRODUCTION

The most susceptible area to injury of the hand is the fingertip, which is the part of

the finger that is furthest from where the flexor and extensor tendons attach [1]. Injury to the fingertip is a common reason people

visit the emergency room. As a result of its direct effect on employment, this injury type is crucial; in extreme cases, it might even spell the end of a career [2].

For fingertip injuries in particular, Allen's [3,4] established a taxonomy that divides amputation injuries into four categories according to the tissue implicated in the amputation.

Even though 45% of all hand injuries involve the fingers, specialists who know how to treat these injuries aren't always easy to come by. Inadequate or poorly managed repairs can cause chronic abnormalities, which necessitate a more invasive secondary reconstructive procedure with less predictable results than the first, properly managed repair [5].

Functions such as sense, grasping, and delicate handling rely on the fingertip's distinctive anatomy and specific structure. Therefore, in order to give patients a good functional and cosmetic result, it is crucial to be knowledgeable with the treatment choices for these types of injuries [6]. Primary closure is one surgical option, while other methods include skin grafting, local soft tissue flaps (such as V-Y flaps) or distant soft tissue flaps (such as cross-finger flaps) to replace missing tissues via microvascular repair [7-9]. So, we aimed in this study to evaluate the different methods of treatment of fingertip injuries in the Emergency Department at Zagazig University Hospitals.

METHODS

This prospective case series study was conducted on 27 patients with fingertip injuries. During the study period (between April 2023 till April 2024), consent was collected from all patients. The approval for

the study was obtained from Zagazig University Hospitals after obtaining approval from the Institutional Review Board (10699) and the research was conducted in accordance with the Helsinki Declaration.

We included patients between 12 and 50 years of age from both sexes with any type of fingertip injuries. We excluded all patients who had any of the following conditions, patients with diabetes mellitus (DM) and any other systemic diseases that may affect the outcome, patients with peripheral vascular disease, as well as patients of extremes of age. All patients were subjected to the following: entire history taking, history about the trauma was carefully taken. Patients were asked about the mode and time of trauma. General examination: included assessment of the vital signs as well as the neurological condition. Local examination included: Assessment of extent of injury by clinical examination, X-ray was done preoperatively for the patients. Laboratory investigations were done e.g. complete blood count (CBC), Coagulation Profile, liver and kidney functions and virology tests. Preoperative Antibiotic + prophylactic anti-tetanic serum was administered.

Operative Treatment

Anesthesia: The patient was in a supine position. General or regional anesthesia was given to the patient. Choice of the method was determined by the anesthesiologist. Tourniquet was used in all cases in this study. After debridement of dead tissues, re-exploration of the injury was done to determine the management plan according to Allen's classification of the injury. In this study we adopted Jerome & Malshikare 2022

algorithm [10] for management of fingertip injuries.

Post Operative Protocol

During the first 2 weeks of the post-operative period, patients were asked to attend twice weekly in the OPD for dressing and to assess the viability of the flap or graft when it was the option of choice and the healing process. Stitches removal on day 14 and follow up for 2 months in regular visits to assess patient's relief, satisfaction, hand function and complications. On the 8th week, the patients became totally independent while doing their daily activities.

Study Outcome Evaluation

During follow up visits, outcomes were evaluated using the Fingertip Injuries Outcome Score (FIOS) based on nail aesthetics, pulp pad, aesthetic outcome, sensation, grip strength, finger length and return to work [11].

Statistical Analysis

Data was analyzed statistically using SPSS version 28 (IBM Co., Armonk, NY, USA). Mean, standard deviation, and range were used to display quantitative parametric data. A Chi-square test or independent t-test was used to assess categorical variables, which were shown as percentages and frequencies; a P-value less than 0.05 was deemed statistically significant.

RESULTS

This study included 27 cases with 35 injured fingers. Their ages ranged between 12-50 years with mean age 30.85 ± 10.45 years with male predominance (92.6%). The dominance was nearly equal between the affected hands. The most commonly affected finger was the thumb, followed by index and middle fingers, then ring, and lastly the little finger. Allen

classification II was found in 16 cases, Allen classification III was found in 10 cases, Allen classification IV was found in 5 cases and Allen classification I was found in 4 cases (Table 1).

There was high patient and doctor satisfactions and most of cases returned to regular work, with high grip strength, preserved sensations and well-padded pulp. The nail was normal in 65.7% of cases, small in 22.9% of cases, split in 0% of cases, hooked in 5.7% of cases, and absent in 14.3% of cases. There was high patient and doctor satisfaction. Most cases underwent surgery without complications (71.4%). (Table 2).

A 21-year-old male patient, manual worker, came to the E.R of Zagazig University Hospitals complaining of hit by sharp object, resulted in Allen type 2 injury on the index finger of the left non-dominant hand. The final follow up visit showed excellent aesthetic outcome (Figure 2).

A case presented to the E.R of Zagazig University Hospitals complaining of crush injury which resulted in amputation of the distal 2/3 of the distal phalanx of the left thumb, middle and ring finger, in addition to injury of the pulp of the little finger.

Age: 35 years old

Sex: male

Job: manual worker

Handedness: RT dominant

Classification: Allen type 4+ Allen type 1

TTT Plan: Moberg flap for thumb, reattaching middle and ring fingers with wire fixation (intact bundles) and FTSG for little finger (Figure 3).

Table1: Baseline characteristics and Characteristics of injury of the studied patients (n=27 cases)

Items	Values (no=27)	
Age		
mean±SD	30.85±10.45	
median (min-max)	31.0(12-50)	
Sex	No.	%
Male	25	92.6
Female	2	7.4
Affected hand		
Right	15	55.6
Left	12	44.4
Dominance of the affected hand		
Not dominant	14	51.9
Dominant	13	48.1
Items	Values (n=35 fingers)	
Affected finger		
Little	3	8.5
Ring	6	17.1
Middle	8	22.9
Index	8	22.9
Thumb	10	28.6
Allen classification		
I	4	11.4
II	16	45.7
III	10	28.6
IV	5	14.3
Follow the algorithm		
No	5	14.3
Yes	30	85.7

Table 2: Outcomes of the study (n=27 cases)

Items	Values (no=27)	
	No.	%
Return to work		
Regular	23	85.2
Restricted	4	14.8
Unable to do work	0	0
Grip strength		
75%–100%	22	81.5
50%–74%	5	18.5
≤49%	0	0.0
Items	Values(n=35fingers)	
	No.	%
sensation		
≤6 mm	10	28.6
7–10 mm	20	57.1
Cold intolerance	3	8.6
Absent sensation/ hyperalgesia	2	5.7

Items	Values (no=27)	
	No.	%
Pain		
No pain	30	85.7
Mild	3	8.6
Moderate	2	5.0
Severe	0	0.0
Pulp		
Well padded	31	88.6
Pulp atrophy	4	11.4
Nail		
Normal	20	65.7
Small	8	22.9
Split	0	0
Hook	2	5.7
Absent	5	14.3
Finger length		
Distal third	20	57.1
Middle third	10	28.6
Proximal third	5	14.3
Final score		
Excellent (8-12)	20	57.1
Good (13-17)	12	34.3
Fair (18-22)	3	8.6
Poor (23-26)	0	0
Items	Values (no=27)	
	No.	%
Patient Satisfaction		
Not satisfied	3	11.1
Satisfied	24	88.9
Doctor 1 Satisfaction		
Not satisfied	2	7.4
Satisfied	25	92.6
Doctor 2 Satisfaction		
Not satisfied	3	11.1
Satisfied	24	88.9
Doctor 3 Satisfaction		
Not satisfied	2	7.4
Satisfied	25	92.6
Complications	Values (no=35)	
No	25	71.4
Yes	10	28.6

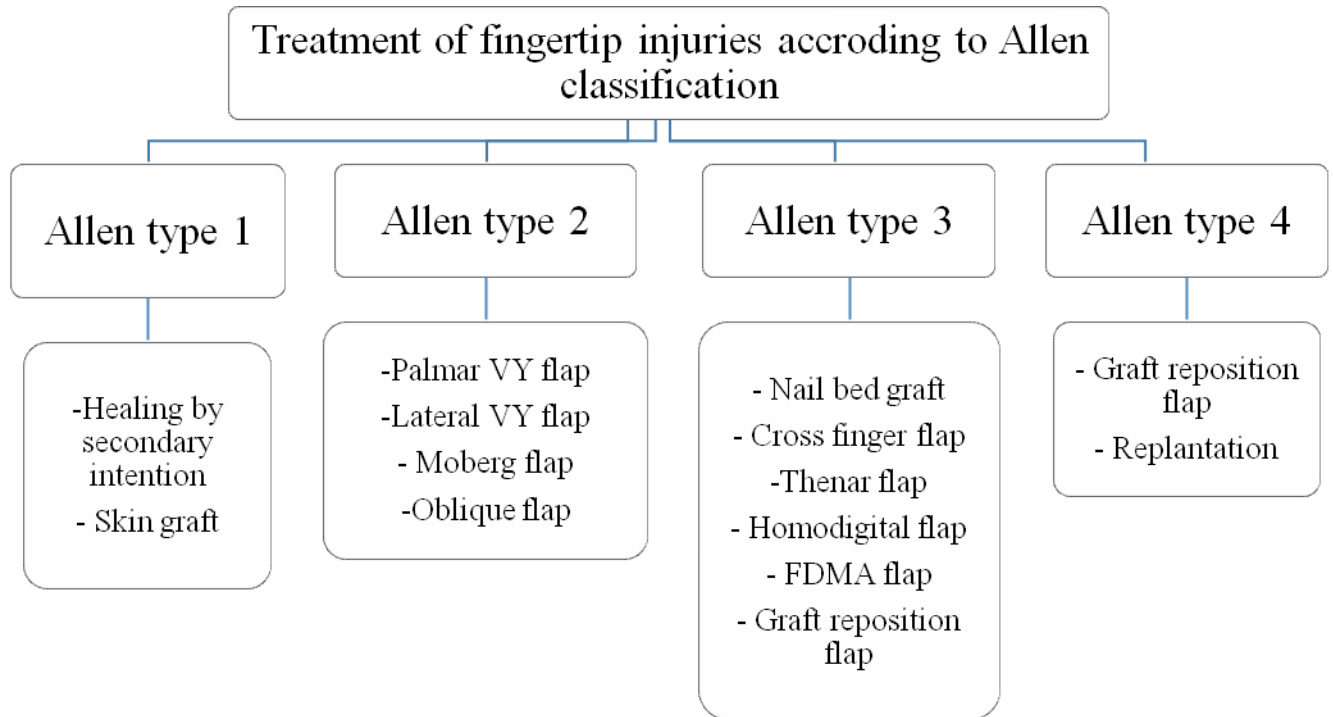
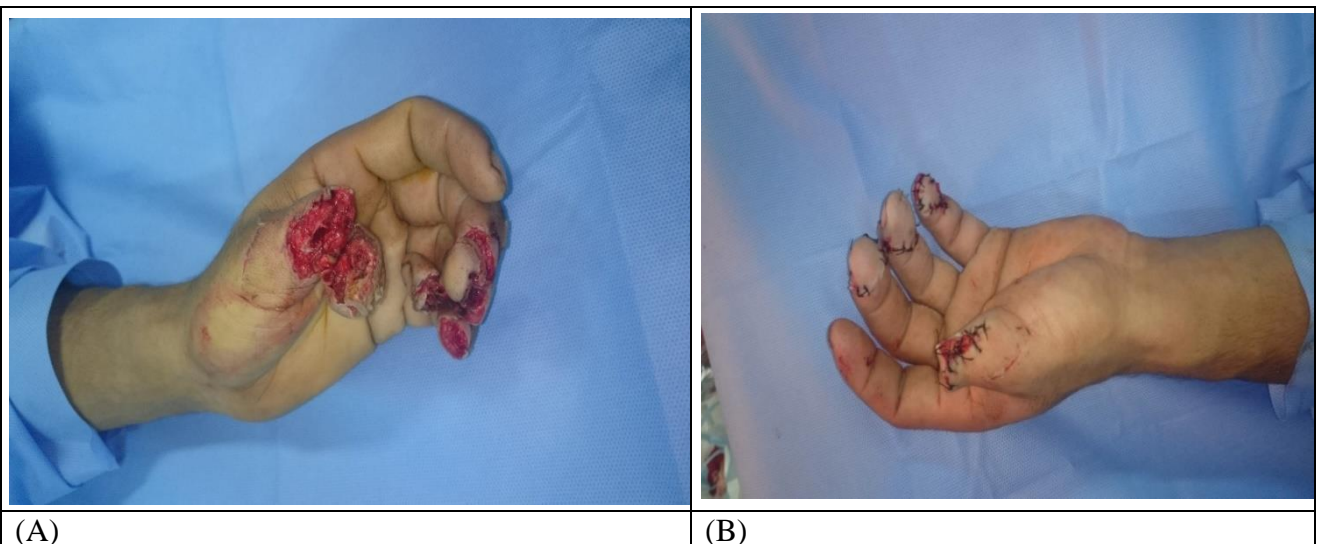


Figure 1: Jerome & Malshikare 2022 algorithm for management of fingertip injuries [10].



Figure 2: (A) showing fingertip injury of Allen type 2 (B) An X ray of AP view and lateral view of the left index showing no fracture (C) showing immediate post-operative VY-flap, (D) showing clinical photos of the patient at final follow up visit showing excellent aesthetic outcome



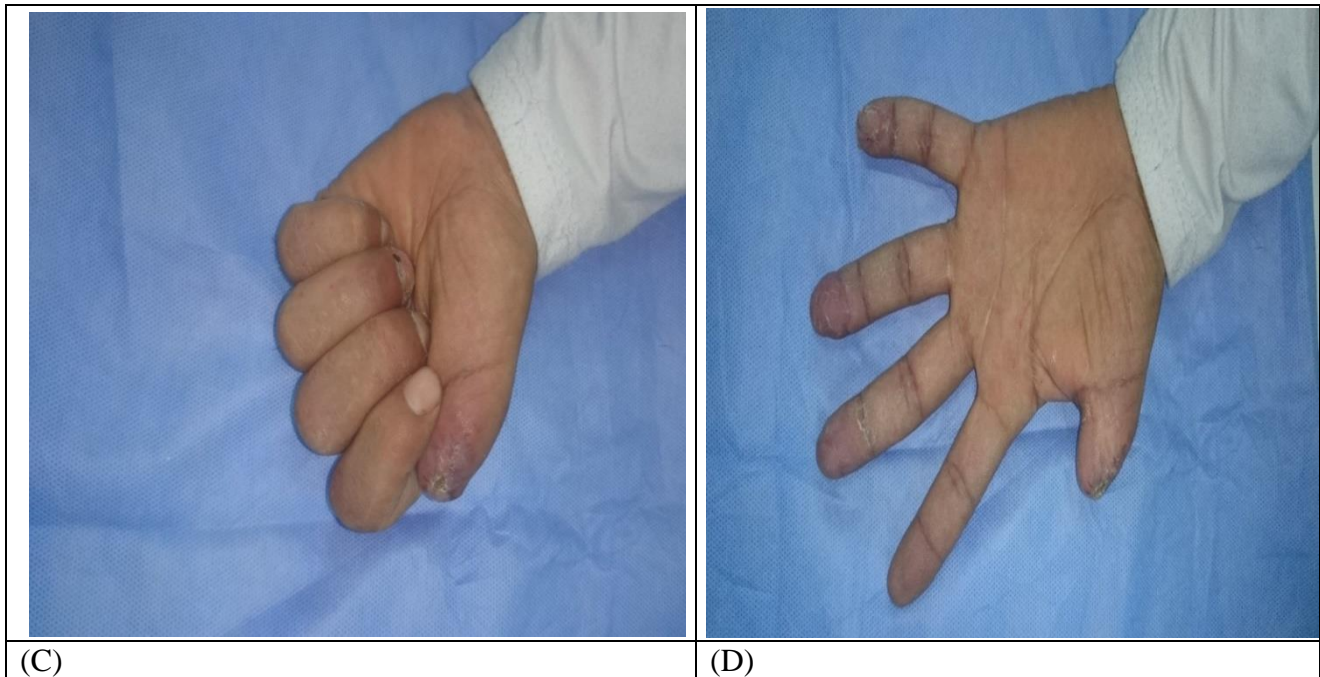


Figure 3: (A) showing fingertip injury of Allen type 4+ Allen type 1 (B) showing operations made for each affected finger (C, D) showing clinical photos of the patient at final follow up visit after 2 months

DISCUSSION

In addition to its functional role in fine motor control and tactile sensibility, the little but aesthetically significant fingertip is a specialized structure. The most vulnerable parts of the upper limb are the tips of the fingers. Because of their distant position, mobility, and absence of protective structures, they are vulnerable to accidents. The United States reports more than 3 million cases every year [10].

A patient's life is not in danger after experiencing a fingertip injury, however, proper diagnosis and treatment are required to prevent the onset of psychological stress, social and occupational limitations, neuromas, hook nail deformity, chronic pain, and cold sensitivity [11].

The main goals of treatment are the restoration of sensation and durability of the tip and assuring proper bone support to allow for nail growth. The fingertip has a high concentration of sensory receptors; hence, restoration of sensation is the preeminent

focus of the treatment. Moreover, the durability of the tip is essential for finger motion as well as hand action and finally, the allotment of nail growth is a key factor in maintaining appearance [12].

Efficacious methods for treating fingertip injuries remain a matter of contention. Primarily consisting of retrospective, non-comparative research, international literature offers a diverse array of suggestions, spanning from super-microsurgical replantation to covering with semi-occlusive dressings. A number of treatment approaches fail to take into account the different economic capacities and social and cultural norms of developing nations since the majority of the published research originates from developed nations [13].

From April 2023 to April 2024, 27 patients (with 35 fingertip injuries) of both sexes who had fingertip amputations at or above the level of the distal interphalangeal joint and who met the inclusion criteria were included

in this prospective cohort study. At least 2 months of follow-up were completed.

The current study group's age ranged from 12 to 50 years, with a mean age standard deviation of 30.85 ± 10.54 . There were 2 females (7.4%) and 25 males (92.6%) in the group. 15 people (55.6%) were right-handed, whereas 12 participants (44.4%) were left-handed.

Our results were supported by the study of Tanveer Ahmed. [14] as they stated that the average age was 30.15 years, with ages ranging from 19 to 59. Male participants (70%) undergo more operations than female patients (30%).

Our results were supported by the study of Lemsanni et al.[15] as they reported that injuries to the right hand were recorded in 20 (62.5%) of the patients, while injuries to the left hand were detected in 12 (37.5%) of the patients. In 56% of the cases, the dominant hand was injured.

Furthermore, Regmi et al. [16] noticed that the average duration to return to work was 7 weeks in 207 patients with fingertip defects treated surgically, and this was similar to our study.

In the Foucher et al. [17] study, the use of local flaps for the reconstruction of fingertip injuries in 41 patients was assessed at a 3-year follow-up. They noted that the typical absence from work was 6 weeks.

Contrary to our work, Lok, Chan and Lau.[18], in their study on 13 cases with fingertip defects managed surgically, they reported that the approximate time it takes to get back to work was 18.5 weeks.

In this study, we noticed that the degree of post-operative sensation recovery was not significantly correlated with gender, occupation, dominant hand, trauma type or injured digit. 2PTD was ranging from 7-

10mm in 57.1% of cases and <6mm in 28.6% of cases

In the study of Tanveer Ahmed. [14], In terms of age variation and sex differences, there were no statistically significant differences observed during the recovery of 2PTD.

Fifteen cases of fingertip injuries treated surgically with local flaps were evaluated by Pelissier et al. [19] They discovered that the two-point discrimination had an average of 8 mm, which is like our findings.

The two-point discrimination is between 3 and 6 mm in two case series by Takeishi, Shinoda and Sugiyama [20]and Tuncali et al [21] using island flaps for fingertip reconstruction, and this was unlike our study. Krishnan[22] observed that sensation recovery occurred with near-normal levels compared with uninvolved digits within 3 months after they studied 29 fingertip injuries managed surgically with the V-Y advancement flap.

In our study, we noticed high patient and doctor satisfaction and most of the cases returned to regular work within 8weeks with high grip strengths, preserved sensation and well-padded pulp. The nail was normal in 65.7% of cases, small in 22.9% of cases, split in 0%of cases, hooked in 5.7% of cases, and absent in 14.3% of cases. Moreover, most of the cases underwent surgery without complications (71.4%).

Li et al. [23] evaluated the medical data of 25 individuals who underwent surgery between 2015 and 2018 and had both a soft tissue defect and nailbed damage. All patients' flaps and nails survived. Following surgery, there were no side effects noted. Additionally, the nail plate look was nearly normal and there were no abnormalities. All patients were able to pinch, grip, and grasp normally. Three out of eight patients showed 2-point

discrimination of 6 mm or less a year after surgery. According to the Michigan Hand Outcomes Questionnaire, all patients were satisfied with their hands' function.

In the study by Lemsanni et al.[15], there were no complaints of pain when using the finger or at rest and the mean VAS score was 0.4 (with a range of 0-2). Patients rated their overall satisfaction as 8.5/10, gave a score of 7/10 for appearance, and gave a score of 7/10 for function.

In our study, we found that healing by secondary intention was the most common procedure for management of Allen's type I injuries, while V-Y flap was the most prevalent technique for management of Allen's type II injuries. Moberg flap, cross finger flap, and thenar flap were frequently used for the management of Allen's type III injuries, while direct closure (1ry approximation), FDMA flap, and homodigital flap were used for management of Allen's type IV injuries.

In similar research, Miller et al. [13] conducted a survey study among the United States and international hand surgeons for the most common six procedures for management of fingertip injuries based on Allen's classification. They found that conservative treatment, V-Y flap and skin graft were commonly used for management of Allen's type II injuries, while V-Y flap and bone shortening and direct closure were the most common procedures for management of Allen's type III injuries. Bone shortening and direct closure, V-Y flap and homodigital island flap were used frequently for management of Allen's type IV injuries.

On the other hand, Lemmon et al. [24] concluded an algorithmic approach for fingertip injuries management based on defect

size and injury geometry and this was unlike our work.

Our study shows that all cases were managed by various surgical options which are simple, reliable, and can be performed by most surgeons in rural and urban hospitals. Since the replantation of the distal phalanx is very challenging and needs resources that may not be found in each institution, the graft repositioning flap proposed by the algorithm wasn't feasible in the presented cases who had crushed injury with no stump to use its bone or nail bed.

Sindhu et al. [12] found that, in the United States, up to 90% of fingertip amputations were treated with non-replant techniques. Treatment options for accidents resulting in amputation of the tip included irrigation and the use of a sterile dressing, complicated repair, or local debridement.

The current study was limited by a small sample size, being a single center study, and the relatively short follow up period with lack of patient inclusion across a large period, however these were the exact results we have found.

Conclusions

The fingertip is a crucial part of the hand so a professional approach to fingertip injuries is essential to limit morbidity. The choice of the most suitable management option depends on surgeon factors like experience as well as skills, and patient factors like age, sex, and occupation in addition to the defect analysis (injured finger, type of injury and bone exposure).

Conflict of interest

The authors declared that they have no conflicts of interest with respect to authorship and/or publication of this article.

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