RESEARCH ARTICLE

Results of vertical figure-of-eight tension band suture for fingernail disruption with fractures of distal phalanx

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Abstract

Objective: To give painless and stable fingertips to patients by means of vertical figure-of-eight tension sutures.

Method: The longitudinal study was carried out from May to October 2019 at the Dow University of Health Science, Civil Hospital, Karachi, and comprised individuals of either gender aged 10-60 years. All patients were surgically managed and were assessed clinically and with radiological films for finger stability and fracture healing during 3-month follow-up. Data was collected using a proforma and was analysed using SPSS 21.

Results: Of the 74 patients, 58(78.4%) were males and 16(21.6%) were females. The overall mean age was 28.9±13.23 years. Of the total, 65(88%) were operated under local anaesthesia, while 9(12%) were given general anaesthesia. All 74(100%) patients on early visits had pain and discomfort, 5(6.8%) had infection and none had ischaemic insult.

Conclusion: Using vertical figure-of-eight tension sutures was found to be a simple technique which helped in proper healing of distal phalanx fractures and a non-deformed fingertip.

Keywords: Fingernail disruption, Fracture of distal phalanx, Vertical figure-of-eight suture. (JPMA 71: 893; 2021)

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Introduction

The nails among human beings are ectodermal skin appendages that develop from the sole plate at 10th week of intra-uterine life and regularly emerge on the dorsal part of fingertips.[1,2] A fully developed nail of the foetus at birth indicates maturity of the foetus.[3] Growth of nail occurs at the rate of approximately 0.5mm per week, depending upon gender, age and habits of the individual. Nail has a pivotal role in the function of hands, like scratching, pinching minor stuffs and providing sensible fingertip, and it also serves as a native splint to the distal phalanx.[4,5] Trauma has impact on the socio-economic status (SES) of a patient.[6] Fingertip is the component of finger, distal to insertion of flexor and extensor tendon into the base of the distal phalanx. Tuft of distal phalanx is well-padded by adipose tissues, and the overlying skin is tethered through fibrous septa. Histologically, the nail bed has two parts; sterile and germinal matrices. The germinal matrix has the ability to give rise to cells that become nail plate in 90% cases.[7] The sterile matrix lies underneath the nail plate. The skin fold that attaches the nail plate to the dorsal skin of the nail complex is known as eponychium. Skin distal to the nail bed complex is called hyponychium.[8] Skin fold on each lateral aspect of the nail is referred to as asparonychium.

Fingertip injuries are found in all ages, peak age incidence in 4 to 30 years old patients.[9] Crushed injuries are common variety noted in children, usually by trap doors.[10-12] Tuft fractures are frequently parallel to crush injuries but failed union is rarely found, however till six months there may not be findings of union on radiological films.[13,14] During our routine clinical practice in the plastic surgery department different types of digital injuries presenting with varying degrees of severity involving the nail plate, nail bed and distal phalanx fractures with complete or partial amputation of fingertips were managed. Early and appropriate treatment of these kind of injuries gives rise to adequate healing, speedy recovery and counteract delayed deformities.[15-17]

Typically the nail has to be detached as a standard protocol for primary repair of a nail-bed injury. In case of minute laceration, it is left to heal by secondary intention. However, currently in patients of all ages dermabond is used as a medical adhesive to repair the nail bed.[11] Cyanoacrylate is a sterile solution that has liquid consistency with good adhesive property and is widely used on surgical wounds.[18] Split thickness or full thickness skin graft are used for nail bed defect that cannot be repaired primarily.[19,20]

These types of fingertip injuries can also be managed by properly washing the wound with normal saline, reducing the fractured parts, replacing the nail plate or substitute in nail fold, and fixing it with vertical figure-of-eight suture against the flawless tissue of fingertip, without retrograde k-wire fixation or without repairing bed of the nail. Each technique has its own pros and cons concerning management of such injuries. The current study was planned to determine the efficacy of vertical figure-of-eight suture technique in getting a clinical union of fracture

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of distal phalanx with intact nail bed and clinically a non-deformed and functional finger.

Patients and Methods

The longitudinal study was carried out from May to October 2019 at the emergency department (ED) of the Dow University of Health Science (DUHS), Civil Hospital, Karachi (CHK). After approval from the institutional ethics review board, the sample was raised using non-probability purposive sampling technique from among patients of either gender aged 10-60 years with partial or complete nail avulsion of any digit of hand along with associated fracture of the distal phalanx, either with sharp cut or blunt trauma to nail. Those presenting with finger nail avulsion without distal phalanx fracture and fingertip injury without nail or injury with distal tissue loss were excluded. Severely crushed fingers and patients with co-morbidities were also excluded. After taking consent from the subjects, detailed history was noted and examination of the patients, including an X-ray of the affected hand, was done. All patients were managed surgically. Local anaesthesia was given to the elderly, while general anaesthesia was used for children. Vertical figure-of-eight sutures technique was used in all cases. In partially avulsed nail, the plate was left attached, the nail bed was washed with normal saline meticulously without formal suture repair. Haematoma, if found, was evacuated and the distal phalanx fracture was reduced back to its original position under direct vision. In completely avulsed nail injuries, the nail was re-inserted to the dorsum of finger and secured with vertical figure-of-eight suture against its unharmed soft tissues. Patients who presented with sharp cut injury were managed by putting vertical figure-of-eight suture just to keep the edges aligned.

Prolene 4/0 suture was used, which was anchored proximally by inserting suture transversely via the dorsum of the skin fold and then distally through the pulp by traversing over the replaced nail plate to make the figure of eight. Care was taken while knotting the suture to entail adequate tension that was enough to hold and maintain reduced fracture in its state. Vascularity of the fingertip was also kept in mind at the time. Per-operatively, dressing with a hard splint was given for short term over the injured finger to avoid further injury. Thereafter, the patients were discharged and followed up at 2nd and 7th days post-operatively.

The hard splint was removed on the 7th day post-operatively. Figure-of-eight suture was removed at the end of the 4th week. Post-operative results were evaluated on the basis of clinical union of fracture which usually requires three to four weeks. Evidence-based union of fracture on radiograph is not necessary for figure-of-eight suture removal. The affected finger was mobilised at the 4th week and finger grip and pinch was allowed. All patients were followed up for three months.

Data was collected using a proforma and was analysed using SPSS 21.

Results

Of the 74 patients, 58(78.4%) were males and 16(21.6%) were females. The overall mean age was 28.9±13.23 years. Of the total, 65(88%) were operated under local anaesthesia, while 9(12%) were given general anaesthesia. Distal phalanx tuft fracture was found in 33(44.6%) cases, while base, segmental and comminuted fractures were noted in 30(40.6%), 9(12%) and 2(2.7%) cases respectively. The right hand was dominant in 63(85.1%) cases, while the left hand was dominant in 11(14.9%) (Table 1).

During follow-up71(95.9%) patients gained painless pinch, while 3(4.1%) had mild pain on pinch at the end of the visit. Also, 70(94.6%) patients had painless movement at the distal inter-phalangeal joint, but 4(5.4%) had some difficulty in moving the joint compared to the other hand. All patients had fingertip pain on follow-up at the 7th post-operative day, but the fingertip became painless in three months. Five (6.8%) patients had fingertip infection on the 7th post-operative day, which was managed with local wound care and antibiotics.

Association between fracture union and painless pinch was significant (Table 2).

Table-1: Socio-demographic factors.

Demographic factors	n (%)
Gender	
Male	58 (78.4)
Female	16 (21.6)
Hand dominance	
Right handed	63 (85.1)
Left handed	11 (14.9)
Pain on pinch	
Painless pinch	71 (95.9)
Painful pinch	3 (4.1)
Movement at distal interphalangeal joint	
Painless movement	70 (94.6)
Painful movement	4 (5.4)
Fracture	
Union	71 (95.9)
Non-Union	3 (4.1)

Table-2: Association of fingertip pinch with distal phalanx fracture union.

	Painless pinch	Painful pinch	*p*-value
Fracture union	71	-	<0.001
Fracture non union	-	3	

Figure: A 28-year-old male with dominant right hand had door-trap injury to the left index finger. There was laceration of the nail plate and nail bed along with distal phalanx tuft fracture (A and B). Vertical figure-of-right suture was applied (C). Post-operative results were satisfactory (D and E).

Discussion

Fingertip injuries resulting secondary to crush mechanism are frequently associated with fracture of the distal phalanx. Fracture can happen at the level of base, shaft and tuft along with multiple tissue involvement, like nail bed, nail plate and nail folds.[8,10] Failure of seeking prompt treatment results in unstable finger and prolonged functional deficit.[15,16,21]

It was assumed that middle finger ranked top amongst all fingers in terms of fingertip injuries. The middle finger is the longest of all digits and the thumb is responsible for grip and pinching, making it prone to injury during routine activities.[1,22] However, the index finger was found to be the most injured in the current study, followed by the middle one.

Fingertip injuries were treated by different techniques. These strategies damage the already-damaged tissue because of sectioning of needle through it, prompting further harm. Passing needle suture through nail is troublesome and does not provide sufficient contact between the nail plate and the nail bed, manifesting poor outcome.[8] Schiller had used mattress sutures horizontally via eponychium.[23] However, this technique fixes nail plate from one side so there were chances of nail plate rotation under fold. It is unreliable in case of eponychial fold injury.

Strauss et al. compared the results of use of octyl-2-cynoacrylate verses suture repair for nail bed, and found no major difference between the results of the two patient groups except that faster healing was noticed in patients of the adhesive group.[5,18] Retrograde k-wire for fixation technique was used to address fingertip damage related with fracture of the distal phalanx, and all fingertip injuries with or without associated fracture of distal phalanx were included. The technique was complex, more time-taking and also resulted in deformity in two patients.[24] Transverse figure-of-eight suture used to anchor disrupted nail was also utilised in a study which did not include the distal phalanx fracture.[25]

In the current study, all patients had single digit injury except 3 cases with two fingers injuries. These types of injuries were managed by proper wound washing with normal saline, reducing the fractured parts under direct vision in cases of displaced base or shaft fractures, replacing the nail plate in the nail fold and fixing it with vertical figure-of-eight sutures against the flawless tissue of fingertip, without retrograde k-wire fixation or without repairing bed of the nail. Nail plate acted as a native bandage.[8,25] This native nail plate in conjugation with vertical tension band suture offers support on dorsum and soft tissue on volar aspect reflects double support to distal phalanx fracture till the healing ensues.[12] The current study used another suture if soft tissue necessitated approximation. Figure-of-eight suture was removed by the 4th week on follow-up.

No patient in the current study suffered post-treatment finger deformity and the fractures healed appropriately. No patient had to change occupation

Conclusion

Using vertical figure-of-eight tension sutures was found to be a simple technique which helped in proper healing of distal phalanx fractures and a non-deformed fingertip.

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Conflict of Interest: None.

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