

Closed Proximal Phalangeal Fracture Management in Hand: An Outcome Analysis

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Abstract

Introduction: The proximal phalanx (PP) of the fingers is fractured more frequently than the middle or even distal phalanges. The problems of malunion, stiffness, and sometimes loss of skin or other soft tissue associated with PP fracture increases the disability.

Aim: The objective of the study was to analyze the treatment outcome in a series of closed proximal phalangeal fractures of the hand.

Materials and Methods: All acute and delayed presentation of closed proximal phalangeal fracture patients was included in the study. The treatment modalities were conservative treatment and surgical treatment.

Results: Most commonly performed procedure was open reduction and internal fixation (ORIF) (58%). Postoperatively, total range of movements achieved up to 270° in 83% of patients treated with ORIF. Grip strength is achieved up to ≥90% of normal strength in 90% of patients treated with ORIF, 83% of patients in patients treated with post-operative pain (POP), 67% of patients treated with an external fixator. Pinch strength achieved up to ≥90% of normal strength in 97% of patients treated with ORIF, 92% of patients treated with POP, and 89% of patients treated with an external fixator.

Conclusion: External fixator for hand injuries is a cheap, technically less demanding and effective procedure. This procedure is mainly used in comminuted and intra-articular fractures.

Key words: Closed reduction, Hand, Open reduction, Proximal phalanx fracture

INTRODUCTION

Fractures of metacarpals and phalanges are the most common fractures of the upper extremity and account for 10% of total such cases. The outer rays of the hand are most commonly injured.^[1] Unfortunately, the metacarpal and phalangeal fractures are often neglected or regarded as trivial injuries.^[2] The proximal phalanx (PP) of the fingers is fractured more frequently than the middle or even distal phalanges. The deformity with considerable displacement is typical when the PP is fractured, fractures commonly

involving the outer rays. The PP of the fingers is fractured more frequently than other phalanges.^[3] The deformity with displacement is typical when the PP is fractured. Majority of the fractures are stable and can be treated with non-operative methods. They are fare well with protective splintage and early mobilization. However, closed treatment has poor outcome due to malunion, stiffness, and associated soft tissue injury.^[4] Proximal phalangeal fractures with angulations >20° in anteroposterior view and >15° in lateral view, <50% bony contact, rotational deformity, collapse, and multiple fractures require operative fixation. Operative fixation must be used judiciously. Selection of the treatment depends on fracture location, fracture geometry, deformity, whether they are open or closed and fracture stability. Final outcome is assessed by pain-free union, deformity, total active motion, grip strength, pinch strength and metacarpophalangeal joints (MCP), proximal interphalangeal, and distal interphalangeal joint motion. In

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case of thumb outcome is assessed by palmar abduction and total flexion.^[5,6]

Aim

The objective of the study was to analyze the treatment outcome in a series of closed proximal phalangeal fractures of the hand.

MATERIALS AND METHODS

This is a non-randomized descriptive prospective study was conducted in Coimbatore Medical College Hospital. Inclusion criteria: All acute and delayed presentation of closed proximal phalangeal fracture patients were included. Exclusion criteria: Patients with open proximal phalangeal fractures and who cannot make assessment of their management outcome were excluded. Patients with a fracture involving multiple fingers are excluded. On first consultation name, age, and sex recorded in the patients with proximal phalangeal fractures. History of mode of injury, duration, pain, and previous treatment received were recorded. To diagnose proximal phalangeal fractures effectively, the mechanism of injury and the force of the trauma should be queried in the initial examination. After careful inspection, identification of the most painful area should be done by palpation. The active and passive ranges of motion of the joints, existence of a possible capsule and ligament instability should be searched. The stability of the joint can be assessed with the stress test, which is performed while the finger is in flexion and extension. In X-ray examination, three views are essential: Anteroposterior, lateral and 45° oblique. Articular fractures are often not seen without the oblique views. Anatomically, proximal phalangeal fractures can be divided into four categories, fracture involving condyle, neck, shaft, and base.

RESULTS

Out of 50 patients studied, males were commonly affected (88%). The most common age group involved in between the age of 26 and 35 years.

Road traffic accidents being the predominant cause. Right hand is more commonly involved (54%). Out of five fingers, F5 is more commonly involved (36%).

Among fracture sites, shaft is more commonly involved (48%). Oblique and spiral type of fractures is commonly encountered (56%) and most of the fractures are unstable (76%) [Figures 1 and 2].

About 86% of patients are presented with joint involvement, and about 78% of patients are intervened within 2nd day of fracture [Figure 3].

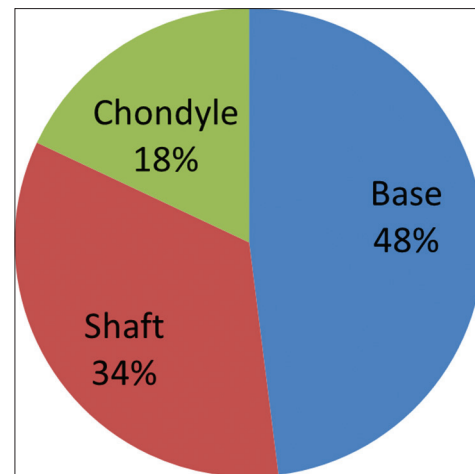


Figure 1: Distribution of fracture site

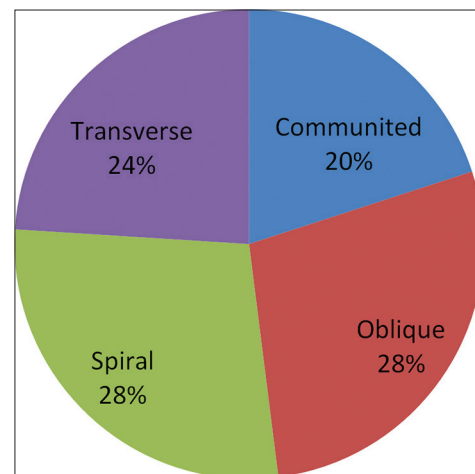


Figure 2: Distribution of type of fracture

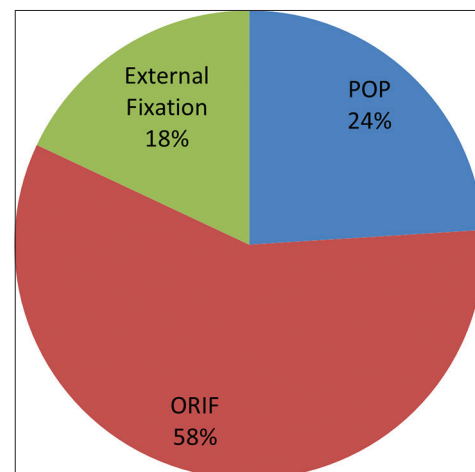


Figure 3: Distribution of type of intervention

Most commonly performed procedure was open reduction and internal fixation (ORIF) (58%). Patients managed with post-operative pain (POP) in 24% of patients and external fixator in 18% of patients [Table 1].



Figure 4: Open reduction and k wire fixation for proximal phalanx fractures

Postoperatively, total range of movements achieved up to 270° in 83% of patients treated with ORIF, 75% of patients treated with POP, and 44% of patients treated with external fixator.

Grip strength is achieved up to $\geq 90\%$ of normal strength in 90% of patients treated with ORIF, 83% of patients in patients treated with POP, and 67% of patients treated with external fixator.

Pinch strength achieved up to $\geq 90\%$ of normal strength in 97% of patients treated with ORIF, 92% of patients treated with POP, and 89% of patients treated with external fixator.

About 94% of patients managed with ORIF, returned to their work within 13 weeks, 89% of patients managed with external fixator returned to their work in 13 weeks, and 75% of patients managed with POP returned to their work in 13 weeks [Figure 6].

Pin tract infection encountered in 4% of patients, pin loosening presented in 6% of patients and malunion in 2% of patients.



Figure 5: External fixator for proximal phalanx fractures

Based on the above results it was concluded that the average outcome was good in ORIF group and moderate in POP group.

The assessment of outcome helps in forming a protocol for the management of proximal phalangeal fractures and pinpoints the deficiencies existing in the management and the need to improve the already evolving management techniques.

Table 1: Distribution of outcome

Procedure	Total cases	TROM	Grip strength	Pinch strength	Return to work in 13 weeks (%)
		≥270° (%)	≥90 (%)	≥90 (%)	
POP	12	9 (75)	10 (83)	11 (92)	75
ORIF	29	24 (83)	26 (90)	28 (97)	94
External fixation	9	4 (44)	6 (67)	8 (89)	89

TROM: Total range of movements, POP: Post-operative pain, ORIF: Open reduction and internal fixation



Figure 6: Conservative management of proximal phalanx fractures

Thus this study shows the importance of analysis of the outcome of proximal phalangeal fracture management thereby critically evaluating and helping us to adopt methods of management of proximal phalangeal fractures which is still evolving to improve and prognosticate our results.

DISCUSSION

Extra-articular fractures of the distal phalanx are common and are associated with significant soft tissue injury. Most distal phalangeal fractures are crush injuries from a perpendicular force. They can be associated with significant debility, usually in the form of soft tissue loss, nail bed injury, or post-traumatic neuromas. Intra-articular fractures of the distal phalanx can result from avulsion of either the extensor tendon, also known as mallet fractures or of the flexor digitorum profundus, also known as jersey fractures.^[7,8] These can be associated with either small dorsal fragments or larger articular fragments with volar subluxation of the volar fragment [Figure 4]. Conservative management is usually the standard of treatment. Fractures of the PP in the hand are difficult to treat due to the presence of an important joint on either end of this bone. Important flexor and extensor tendons cross this bone for distal attachment.^[9,10] The aim of the treating surgeon is not only to achieve timely union with good alignment but also to preserve the gliding mechanisms of these tendons. Usually, in the sagittal plane, the fracture adapts a palmar apical configuration with the proximal fragment in flexion and the distal fragment in extension. This is because the

intrinsic muscles flex the MCP joint; hence, the proximal fragment is in flexion. The distal fragment goes into extension due to the short excursion of the extensor tendon hood and lateral bands. When reduced properly, the fracture can be held using a splint with traction and the stabilizing effect of tense soft tissue. The treatment options include ORIF, external fixators, and conservative modalities [Figure 5]. ORIF can cause further soft tissue damage which can result in impairment of the gliding layers. However, surgical management becomes necessary in unstable, irreducible and open fractures with soft tissue damage.^[11-13]

CONCLUSION

For most stable fractures, conservative treatment modalities are sufficient, but for most unstable fractures, surgical treatment gives the better results. Conservative treatment is a reliable, inexpensive modality, especially in children and in elderly age groups, but is associated with complication of malunion. External fixator for hand injuries is a cheap, technically less demanding and effective procedure. This procedure is mainly used in comminuted and intra-articular fractures. This procedure not only corrects the deformity but also at the same time keeps the joint surface apart, thereby avoiding any crushing force on the bone cartilage. Furthermore, this is being a semi-invasive procedure; it does not require bone and soft tissue resection.

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