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Original Research Article

Proximal phalanx fracture treated with extension block Splint: An observational study at a tertiary care centre

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ABSTRACT

Background: Proximal phalangeal fractures are common fractures of the hand. The fracture are difficult to treat because of vicinity of 2 important joints and presence of tight osseofascious tunnel. The purpose of this study was to evaluate the efficacy of extension block splint in the management of selective proximal phalangeal fracture of hand.

Materials and Methods: 21 Patients with proximal phalangeal fractures were treated by extension block splint and evaluated prospectively. Patient were followed up after 1 week, 3 weeks, and thereafter on monthly basis. Average follow up period was 9.8 months and outcomes were assessed by Belsky's criteria.

Results: In our study, 76.19% patients had excellent outcomes, 19.04% had good, 4.76% had poor outcomes. 2 patients had extensor lag which subsided at further follow up at 1 year.

Conclusion: The results of this prospective study shows that with careful selection of patients extension block splint is a simple, safe and effective technique for managing proximal phalanx fracture of hand.

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1. Introduction

Fractures of metacarpals and phalanges are the most common fractures of upper extremity and account for 10% of total such cases. The outer rays of hand are most commonly injured.¹ Phalangeal fractures are almost twice as common as metacarpal fractures and mostly occur in proximal phalanx.²⁻⁴ They are often neglected or regarded as trivial injuries.⁵ Proximal phalanx is fractured more frequently than middle or even distal phalanges. Fractures usually present with the apex volar angulation due to the insertion of the interossei muscle onto the base of proximal phalanx, thus flexing the proximal fragment, while distal fragment is hyperextended by the central slip acting on the base of the middle phalanx.⁶

2. Materials and Methods

45 proximal phalanx fractures of 2nd to 5th fingers of hand were treated in a single orthopedic unit at Jawaharlal Nehru Main Hospital & Research Centre, Bhilai, Chhattisgarh from January 2020 to March 2021.

In our prospective study 23 patients were treated with extension block splint, out of which 2 were lost in follow up. So, this study included 21 patients. The mechanism of injury, exact location of fracture were documented. At mean of 9.8 months (range from 5 to 15 months) patients were assessed regarding functional outcomes and complications if any.

Inclusion criteria of our study were extra-articular undisplaced & stable fracture; extra-articular fracture which is displaced but stable after closed reduction.

Exclusion criteria of our study were open Fracture ; paediatric Fracture ; thumb fracture ; multiple fractures ;

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first presentation of fracture after more than 2 weeks from day of injury ; extra-articular fracture which is displaced and unstable after closed reduction ; all intra-articular fractures.

After careful history taking and clinical examination of the injured digit, AP (antero-posterior) and oblique radiographs were taken of the injured hand. Patients were taken to operation theatre and closed reduction was attempted under local anaesthesia and extension block splint was given.

First volar slab is applied till distal palmar crease. Wrist is then positioned in slight extension and dorsal slab applied till PIP (Proximal inter phalangeal) joint (Figure 1 a-f). The splint blocks a specific arc of terminal PIP joint extension while allowing unrestricted flexion. With metacarpophalangeal (MCP) joint flexed at 90 degrees, the proximal phalangeal fractures are usually held in reduction.^{5,7,8} The collateral ligaments of the MCP joint in flexed position are taut with minimal chances of stiffness due to contracture. The extension of proximal interphalangeal (PIP) joints prevents volar plate contracture.⁶ Since this splint provides no lateral stability, it is not recommended for injuries in which damage to the collateral ligaments has rendered the joint unstable.⁹



Fig. 1: a): Technique of reduction; b): Reduction of fracture of proximal phalanx; c): Reduction of fracture held in place; d): Covering of injured hand for padding; e): Making a plaster of Paris (POP) splint; f): Injured hand in POP splint as seen from AP view

After the reduction and splint application check radiographs were taken under C-arm. Fractures which could not be reduced anatomically were taken for operative intervention and excluded from our study. Patients were followed up after 1 week and radiographs were taken. Any unacceptable reduction was counselled for operative intervention. No rotational deformity was accepted; up to 15 degrees of angular deformity in any plane and 3 mm

shortening were accepted. All fractures were found to be acceptable at this point. After 3 weeks, the slab was removed and active range of motion exercises started. Serial follow up was done (Figure 2 a,b) and results were analyzed by Belsky's criteria¹⁰ for assessment of finger injuries and were graded as (1) excellent- pain free union/ no deformity/ total active motion^{11,12} (TAM) > 215 degrees, and PIP motion >100 Degrees ; (2) Good- Pain free union/ minimal deformity/ TAM>180 degrees, PIP motion >80 degrees; (3) Poor- Pain or non- union ? deformity affecting function or cosmesis/ TAM<180 degrees, PIP motion <80 degrees(7).



Fig. 2: a,b): Follow-up

TAM stands for total active motion of MCP, PIP, DIP joint flexion combined together.

3. Results

During our study period 45 patients were diagnosed with proximal phalanx fracture of 2nd to 5th phalanx of hand, out of which 23 were treated with extension block splint and were followed up. 2 patients did not turn up at subsequent follow ups and were excluded from study. The mean age of patients was 43.76 (18-76) (Figure 3). There were 15 males and 6 females (Figure 4). Most common mechanism of injury (Figure 5) was found to be domestic (n=13) followed by Road traffic accident and sports injuries of 3 cases each. 2 cases were due to assault. Little finger was most commonly injured (n=13) followed by ring (n=7) and middle finger (n=1) (Figure 6). No index finger fracture were seen in our study. Most common location (Figure 7) of fracture was shaft (n=11), followed by base (n=7), neck (n=2). Head was least common fracture site in our study (n=1). Almost equal distribution (Figure 8) was noted for dominant and non-dominant hand (10- dominant, 11- non - dominant). Average day of presentation was 4.5 days (range 0-12 days). In our study, excellent outcomes (Figure 9) were seen in 76.19% patients, 19.04% had good outcomes whereas only 4.76% had poor outcomes.

Complications such as extensor lag, shortening, angular deformity, Metacarpophalangeal joint & Proximal interphalangeal joint stiffness, skin related complications

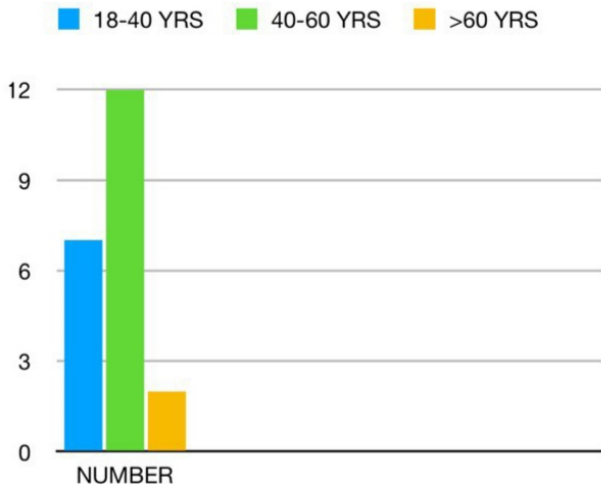


Fig. 3: Age distribution

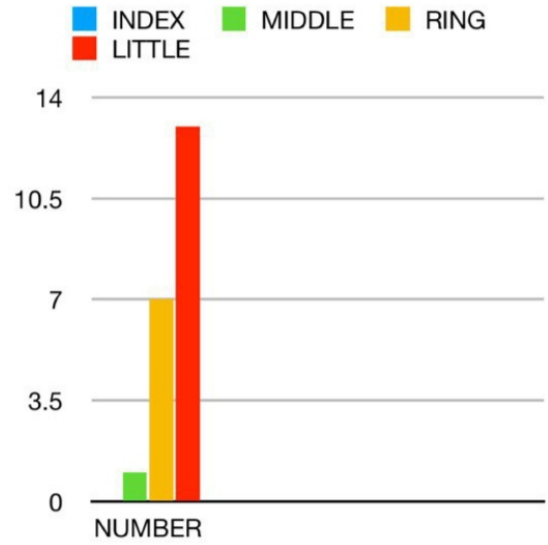


Fig. 6: Digits injured

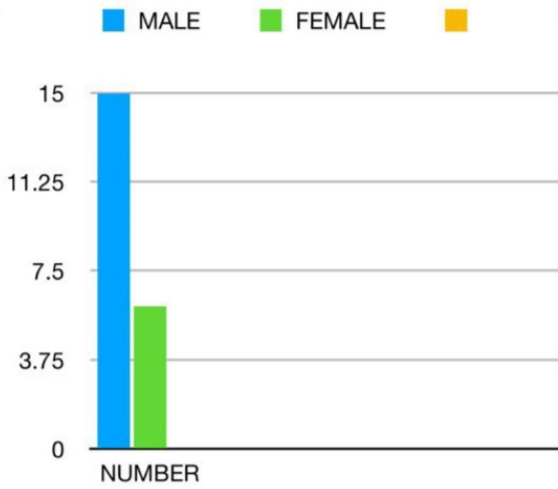


Fig. 4: Sex distribution

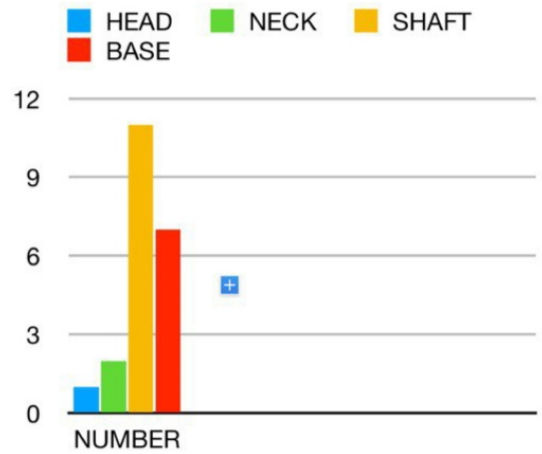


Fig. 7: Location of fracture

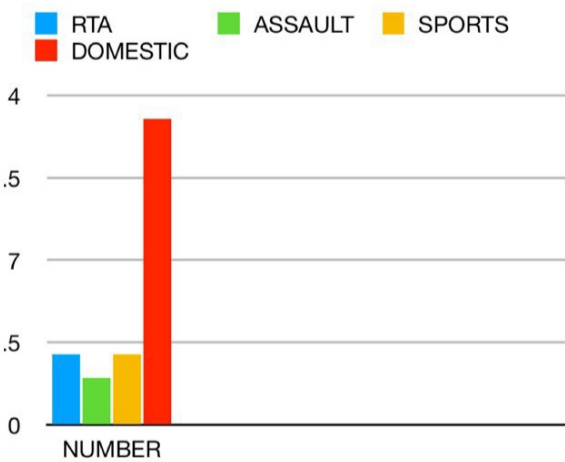


Fig. 5: Cause of injury

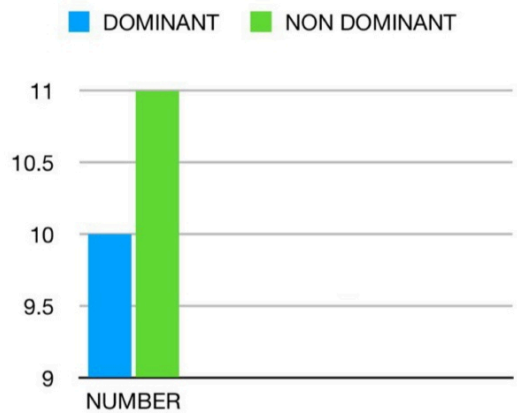


Fig. 8: Dominancy of hand



Fig. 9: Outcome assessment according to Belsky's criteria

were looked for. 2 patients had extensor lag of 15 degrees at 3 months of follow up and were put on supervised physiotherapy. On final follow up of 1 year, there were no extensor lag in both the patients. No other complication were noted in our study.

4. Discussion

Multiple treatment protocols and options ranging from splinting, percutaneous wires, external fixation, interfragmentary screw fixation to mini fragment plates point towards the challenges arising from the management of fractures of proximal phalanx. The key to acceptable functional result is to achieve a stable reduction with correct alignment and to allow early mobilisation of the digit.⁴

The most common complication after these fractures is malunion resulting in proximal interphalangeal joint extension lag which is worsened by extensor tendon zone IV adherence and shortening at the fracture site.^{4,7,13}

Extension block splint helped us to avoid surgery and anaesthesia related complications such as pin-tract infection, osteomyelitis, multiple surgical intervention (fixation and removal). Lesser radiation exposure, decreased hospital stay were among the advantages. This method is also cost-effective, simple and rapid procedure and shows good patient compliance. Similarly, study done by Jaswinder et al¹⁴ showed conservative treatment modalities are sufficient for most stable fractures. Our study also showed similar outcomes as compared with Rajesh et al⁶ who reported excellent outcome in 72% of the patients, good in 22% and poor in 6%.

Limitation of this study is relatively less number of cases and non-comparison of extension block splint with other treatment modalities.

The authors think that in light of this study fracture of proximal phalanx of hand which are extra-articular, undisplaced and stable; displaced and stable after closed reduction can be treated with extension block splint with acceptable results.

Strict adherence to physiotherapy and rehabilitation is mandatory for better outcome.

5. Source of Funding

None.

6. Conflict of Interest

None.

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