

Comparative Study of Different Modalities of Management of Hand Fractures

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ABSTRACT

Introduction: Present day modern injury to the hand is more due to modern mechanized system. Injuries are in the form of laceration sharp cut and blunt injuries. There are various modalities for the treatment of Metacarpal and phalangeal fractures. We present a comparative study of different modalities of treatment of MC and phalangeal fracture. Study aimed to study incidence of MC and phalangeal fractures, and to study mechanism of injury and classify various types of fractures and to study various methods of management of MC and phalangeal fractures.

Material and methods: In the study 58 patients with metacarpal and phalangeal fracture were analyzed and there observation was recorded. All traumatic fractures of MC and phalangeal fractures included in study. All fractures treated with different modalities of treatment like splintage, k wire, and plate and screw fixation.

Results: Maximum number of cases was due to road traffic accidents accounting for 52% of injuries Treatment within 6 hours of injury reduces possibility of infection in all modalities of treatment. Transverse fractures were the most common in proximal phalanges and metacarpal shaft. The patients having transverse fracture had excellent or good results in 32 (76%) cases and fair to poor in 10 (24%). With 23 comminuted fractures only 11 (48%) cases had good or excellent result.

Conclusion: Most of phalangeal and metacarpal fracture can be managed conservatively with closed reduction and splintage. Open reduction using plate and screw or only screw fixation has good outcome with early return of function and good range of motion of joints.

Keywords: Hand Fractures, Modern Injury to Hand

INTRODUCTION

Bunnel said in 1994 “The hand is so intimately routed in our lives, thoughts and expression that it has become a part of our language. The hand is amazing gift to humans in that it has extraordinary manipulative abilities.” The MC provides and maintains the width of the hand which is useful for the power grip. The first mc with rest of thumb structure forms a separate functioning unit of hand and thereby enables the hand for pinch, Key pinch, grasp and power grip.^{1,2}

Present day modern injury to the hand is more due to modern mechanized system. Moving machines such as belts, pulleys, gear, power press, revolving shafts and rollers are dangerous. Injuries are in the form of laceration sharp cut and blunt injuries. There are various modalities for the treatment of mc and phalangeal fractures. Regarding hand fractures it is said “If u can move them early then do so, if not fix them and then move them early.”

We present a comparative study of different modalities of treatment of mc and phalangeal fracture.

Study aimed to study incidence of MC and phalangeal fractures, and to study mechanism of injury and classify various types of

fractures and to study various methods of management of MC and phalangeal fractures.

MATERIAL AND METHODS

All patients attending emergency and OPD department with metacarpal and phalangeal fractures were included in study. Patients were examined with reference to age, sex, mode of injury, magnitude of trauma, digits involved and no. of phalanges and metacarpal involved. Clinical and radiological examination was done. Patients are explained about all modalities of treatment in that particular case and well informed consent and ethical clearance was taken before start of study. All traumatic fractures of MC and phalangeal fractures included in study however pathological and stress fractures excluded from study. Also patients with associated carpal bones and patients with that of revascularization and replantation excluded from study. After admission patient was given wound irrigation and dressing. Antibiotic analgesic and tetanus prophylaxis was also given. Limb elevated and splintage was given in functional position.

Management planned as

- Care of soft tissue
- Reduction of fracture
- Holding of position
- Rehabilitation

After classifying fracture it was decided those patients who had closed simple non displaced or minimally displaced fracture treated by

- Distal phalanx-buddy taping with gutter splint
- Middle or proximal phalanx-Pop cast, k-wire or gutter splint. Jahass¹ maneuver was used for fracture reduction of proximal phalanx.
- Metacarpal – k wire and pop cast
- Those patients who had open comminuted fractures treated by
- Distal phalanx-buddy taping with gutter splint
- Proximal and middle phalanx-Gawande splint
- Metacarpal inter osseous wiring
- Those patients who had butterfly fragment treated by
- Screw fixation or k wire fixation for middle, proximal phalanx or metacarpal fracture

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- Intra articular fracture –screw fixation or Gawande splint
- Fractures with soft tissue loss-external fixators
- Immediate post op x-ray was taken and correction if needed was done.

Follow up

All cases were followed up frequently for initial -3 weeks and then as per requirement. Those with external splints or with k-wire, splints removed at 3 weeks and referred to occupational therapist for hand mobilization. Evaluation of range of movement and strengths of the involved hand fingers was done after 3 weeks of removal of splint. Immediate mobilization as soon as patients able to do it, started for the patients treated with ORIF.

STATISTICAL ANALYSIS

Microsoft office 2007 was used for the statistical analysis. Descriptive statistics like mean and percentages were used to interpret data.

RESULTS

In present study 58 patients with metacarpal and phalangeal fracture were analyzed and their observations were recorded. The most common age group was 21-40 years with male preponderance of 88% compared to 12% of female. There was near equal distribution of both hand also and also of dominant and non-dominant hand.

Maximum number of cases was due to road traffic accidents accounting for 52% of injuries. Occupational injury was the second most common factor responsible (28%). This shows clear dominance of vehicular injuries and occupational injuries in our study. Thirty six (62%) patients presented within 6 hours of injury enabling early reduction and stabilization. Treatment within 6 hours of injury reduces possibility of infection in all modalities of treatment. Out of 58 cases 21 had open fracture and 37 patients had closed injury. Open fractures were due to road traffic accidents (10 cases), household (4 cases), occupational injuries (5 cases), 1 case was due to firecracker and 1 case was because of fall from height. There was variable amount of soft tissue injury in the form of skin loss, flexor and extensor tendon injury and intrinsic muscle damage etc. out of 58 patients, 21 patients had elements of soft tissue injury.

Transverse fractures were the most common in proximal phalanges and metacarpal shaft 42 (49%) out of 85. Comminuted fractures were common accounting for 23 (27%). Spiral and oblique accounted for 20%. All fractures of head and base of metacarpal and phalanges were intra articular.

The patients having transverse fracture had excellent or good results in 32 (76%) cases and fair to poor in 10 (24%). With 23 comminuted fractures only 11 (48%) cases had good or excellent result. With spiral and oblique fractures 11 (65%) out of 17 cases had good to excellent. 2 (66%) out of three intra-articular fracture had poor results (table-1).

As we could see the fracture involving base has fair to poor results. Most fracture of the distal phalanx had excellent or good result. And 23 out of 63 (37%) of shaft fracture had fair or poor results. All of neck fractures involving distal phalanx and treated conservatively had good results. Out of 12 tuft fractures only 2 had fair/poor results and rest 10 had excellent or good results. In 6 cases of fracture of head 2 had fair or poor result



Figure-1: Cross k wire



Figure-2: Buddy strapping splintage



Figure-3: Functional position splintage

Results	Excellent	Good	Fair/poor	Total
Head	2	2	2	6
Neck	0	2	0	2
Shaft	10	29	24	63
Base	0	0	2	02
Tuft	4	6	2	12
Total	16	39	30	85

Table-1: Analysis of results according to site of fractures

(33%) while rest 4 had excellent to good results. Out of 43 patients treated conservatively 12 (28%) had excellent result, good in 21 (49%) and 10 (23%) had fair to poor result.

Analysis k wire fixation: Out of 21 fracture stabilizes with k wire 13 (62%) had excellent and 8 (38%) had poor to fair result.

Analysis of plate and screw fixation: In our study only 8 patients with metacarpal and phalangeal transverse shaft fractures treated with plate and screw fixation. The result was excellent or good in 6 out of 8 cases (75%).

Screw fixation: Three cases were treated with screw fixation for proximal middle phalanx and metacarpal fracture. The results were excellent in all cases.

Inter-osseous wiring: The result of inter osseous wiring was poor. One patient required removal

External fixator: Outcome of external fixator was poor in the both cases used for. Assessing the final range of motion at corresponding finger, it was found that the outcome was poor to fair in 17 metacarpal and phalangeal fractures (49%) and was excellent or good in 18 metacarpal and phalangeal fractures (51%). Out of 37 patients without soft tissue injury 26 (52%) were with full range of motion, excellent to good results and 11 (48%) were with fair to poor result.

DISCUSSION

In this study of 58 cases with 85 fractures age of the patient ranged from 14-70 yrs with male dominance of 88% which is comparable to Stern's study of male predominance of 85%. About 43% patient required admission in hospital. Injury was evenly distributed between left and right hand. Out of 15 patients with occupational injury 11 had injury in dominant hand indicating that occupational injuries commonly involve dominant hand. In Reyes's² study hand dominance was evenly distributed.

Maximum number of cases were due to road traffic accident accounting for 52%, with occupational injury second most common. Crush injury due to weight and entrapment was common in Stern's³ study. In Divakar's⁴ study 17% was industrial trauma, 23% were sports, injury 10.5% cases were assaults.

Out of 58 cases 21 had open fracture and 37 had closed injuries. In Dr. B.B. Joshi's⁵ study he also found more of closed injuries than open. The result was good or excellent in 51% of open fracture and 74% of open fracture which is comparable to Pun's⁶ study.

Presence of soft tissue injury directly affects final outcome of final range of movements comparable to Duncan's study of 140 cases. This also corresponds with the Strickland and Kleinman⁷ who described factors influencing digital performance. In Green's^{5th} edition middle finger and thumb phalanges were most common with 5th metacarpal in all metacarpal bones is same as in our study. Barton's⁸ found majority of closed metacarpal and phalangeal fractures can be managed conservatively especially those with un-displaced non comminuted and those with fracture of distal phalanx. K wire fixation as method of fixation has poor to fair result in most of our cases. The screw fixation used in proximal and middle phalanx and in metacarpal fracture. Crawford's⁹ observed that screw fixation is excellent for proximal phalanx but did not offer any advantage over conservative means. This was disputed by Dabazeis and Schutte¹⁰ who advocated screw fixation for spiral fracture.

Only two patients underwent external fixator treatment and the result was poor or fair in both which is because in both cases soft tissue loss was present at the time of injury itself and they require flap coverage, although Freeland¹¹ reported 70% good or excellent results with external fixator.

In 3 cases there were an angulations or rotational deformity after conservative or k wire treatment. This includes one case of fracture base of 5th metacarpal, one case of IF proximal phalanx and one case index finger middle phalanx fracture. This was due to failure to maintain reduction after splinting.

Pin tract infection was the most common complication after k wire fixation. It was seen 4 out of 21 cases of k wire fixation i.e. 19% in Swanson's¹² series of 200 open fractures, 14% was the infection rate. Botte¹³ reported 7% infection rate, 4% rate of loosening of k wire, and loss of reduction rate was 4%. Overall 18% was the complication rate.

Loosening of k wire is also seen in 4 out of 21 k wire. The pins were kept for 3 weeks for stabilization and in both cases infection subsided within 7 days of pin removal.

All patients treated conservatively were started physiotherapy at 21 days. Those patients treated with some form of fixation were started physiotherapy between 7-20 days indicates that with the help of internal fixation, early physiotherapy can be started.

42 of 58 patients had hospital stay of less than 5 days or were treated as outdoor patients. The patients with soft tissue injury had hospital stay average of 14.4 days.

CONCLUSION

The hand fracture is more common in age group of 21-40 with equal distribution between right and left hand. The patients having closed injury has better prognosis as compared to open injuries. Middle finger is most common finger involved with proximal phalanx of middle finger is most common individual bone fracture. Transverse fracture of shaft is commonest pattern of injury. Multiple fracture, soft tissue injury, tendon cut and comminuted fracture associated with poor outcome. Most of phalangeal and metacarpal fracture can be managed conservatively with closed reduction and splintage. Metacarpal fractures in general has got better outcome than phalangeal fractures. Open reduction using plate and screw or only screw fixation has good outcome with early return of function and good range of motion of joints. K-wire fixation associated with complication like pin tract infection and loosening and has poor results compared to mini plate screw and splintage. Stiffness is common complication followed by infection.

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