

FIXATION OF HAND FRACTURES BY MINI-PLATES

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ABSTRACT

Fractures of metacarpals and phalanges are probably the most common fractures in the skeletal system and are often neglected as minor injuries. Most of the fractures are treated conservatively but some form of fixation is often indicated in unstable fractures. A retrospective analysis of 40 cases of such metacarpal and phalangeal fractures treated by mini plates over a period of one year was undertaken. The study showed that right hand was more commonly involved. Most common mechanism of injury was fall and second ray was most commonly involved. The patients were followed up at regular intervals and union was achieved in 98% of fractures. From our study we would emphasize that plating of unstable metacarpal and phalangeal fractures has definitely an advantage over the closed methods of treatment.

Keywords: Unstable fractures, Mini-plates, Range of motion.

INTRODUCTION

Hand injury is extremely common and accounts for about 15% of the attendance at accidents and emergency departments. Fractures of metacarpals and phalanges are probably the most common fractures in the skeletal system. Some of the common causes of hand injuries are crush /compression injuries, blunt trauma, fall, road traffic accidents, machinery injury, sports related activity and explosions / fire arm injuries^{1,2}. The majority of hand fractures are stable. A fracture is considered unstable if it is irreducible, if acceptable reduction cannot be maintained, or if motion at adjoining joints cannot be started without loss of reduction³. Some form of fixation is often indicated in unstable fractures and mini-plating is a good option.

MATERIAL AND METHODS

A retrospective analysis of 40 cases of metacarpal and phalangeal fractures treated by mini-plates over a period of one year was undertaken.

Inclusion criteria

1. Age: Skeletally mature patients.
2. Sex: Both males and females.
3. Duration of injury: Less than 3 days in closed and less than 24 hours in open fractures.
4. Multiple fractures.
5. Open fractures: Swanson's Type-I compound fractures.

Exclusion criteria

1. Skeletally immature.
2. Swanson's Type-II open fractures.
3. Open fractures with associated neurovascular injury.
4. Fingers with amputated digits.
5. Duration: More than 3 days in closed; more than 24 hours in open fractures.
6. Patients with any underlying medical contraindication to surgery.

Based on the above evaluation, the following data was prepared regarding: - Site of fracture

(bones involved), Anatomical location - base, shaft, neck, head, Fracture pattern - transverse, oblique, spiral, avulsion or comminuted, Whether closed or open, Associated soft tissue injury, Deformity - angulation, rotation, shortening, Whether stable or unstable. After carefully studying the fracture details, the nature of operation, incision, approach and fixation was planned.

Phalangeal fractures : Plate fixation of phalangeal fractures was restricted mainly to proximal phalanx [Fig-1]. A 1.5 mm straight mini DCP was used for phalangeal fractures^{4,5}

Metacarpal fractures : A 2.7 mm or 2.0 mm straight mini DCP was used for metacarpal shaft /base fractures[Fig-2]. Generally, 2.7 mm DCP was used for base and 2.0 mm DCP was used for metacarpal shaft fractures^{4,5}.

Post-Operative Management and Follow-Up

The limb was splinted in functional position and kept elevated. Intravenous antibiotic was given for 3 days followed by oral antibiotic for next 5 days. In most of the cases the splint was removed after 48 hours and active range of motion (ROM) exercises started within the limits of pain tolerance. Intermittent ROM exercises out of splint were continued and the patients were discharged on 4th post-operative day with instructions regarding active ROM exercises out of splint. Thereafter these patients were followed-up in OPD^{6,7}. Sutures were removed on 10th postoperative day. In the second week, motion was progressively increased. After 3 weeks increased loading was allowed gradually and patients were encouraged to use the involved hand in light routine day-to-day activities like eating, combing hair, washing face etc. Unrestricted activities were allowed only when the fracture and soft tissues were completely healed and the hand was thoroughly rehabilitated, which usually required 10-12 weeks⁸.

RESULTS

The present study comprised of 50 fractures of metacarpals and phalanges in 40 patients treated by mini-plates. Most of the patients belonged to the age group of 20-30 years (50%). Males dominated the study group (78%). The right hand was more commonly involved (58%). The most common mechanism of injury in our series was fall (28%), followed by blunt trauma and road traffic accident (24% each). 35 out of 40 cases were closed (87.5), whereas 5 were open (12.5). All the open fractures belonged to Swansons Type-1 category. The second ray was most commonly involved in our series (27.39%), whereas the first ray was the least commonly involved (10.95%). Out of total fractures, 40% of the fractures involved the metacarpals (20 fractures), 36% of the fractures involved the proximal phalanx (18 fractures), 10% of the fractures involved the middle phalanx (5 fractures) and 14% of the fractures involved the distal phalanx (7 fractures)[Table-1]. The most common fracture pattern encountered in the study was transverse (46%), followed by oblique (24%), comminuted (14%), spiral and intraarticular (8% each). The patients were followed up at regular intervals and final assessment (clinical and radiological) was done at 6 months. The results were based on a scoring system which took into account three criteria, namely union (5 points), functional result based on total active movement (TAM) (0 -5 points), 16 and complications (negative points). Union was achieved in 98% of the fractures in our series. Functional results based on TAM were excellent in 65%, good in 25%, fair in 5% and poor in 5% of

cases[Table-2]. So functional results were excellent / good in 90% of cases in our study. The average TAM of digits other than thumb was 227.30 whereas for the thumb fractures average flexion range at MCP + IP joints was 126.66%.

The overall results derived by combining above criteria were:

Excellent in 70.45%

Good in 11.36%

Fair in 11.36% & Poor in 6.83%

DISCUSSION

Hand fractures are often neglected as minor injuries and relegated for treatment to the more inexperienced members of the medical team. The results of the treatment of fractures in hand are not universally good and the incidence of stiffness, mal-union and prolonged functional disability and economic loss is striking. Sir Reginald Watson Jones pointed out that an open fracture of a phalanx is no less worthy of the skill of an expert than an open fracture of the femur. This fact was reiterated by Sir John Charnley, who said, "the reputation of a surgeon may stand as much as jeopardy from a fracture of proximal phalanx of finger as from any fracture of femur." In hand, restoration of mobility is of utmost importance. Prolonged immobilization leads to joint stiffness and dystrophy of soft tissues. As per Dr. Alfred Swanson, "hand fractures can be complicated by deformity from no treatment, stiffness from over treatment and both deformity and stiffness from poor treatment." From our study, we would like to emphasize that plating of hand fractures should be undertaken only if a definite indication exists. Indiscriminate use of it should be avoided. Detailed clinical and radiological assessment of the fracture and careful pre-operative planning are a must to select the appropriate approach as well as the implant.^{9,10} Adequate facilities including complete instrumentation as well as wide range of implants should be available. A thorough knowledge of anatomy is important and the surgeon should be well versed with the technique. The dissection should be meticulously performed to avoid soft tissue trauma and excessive periosteal stripping. The technique requires high degree of precision. The procedure can be time consuming and may test the patience and skill of even the most experienced surgeon.^{11,12}

CONCLUSION

The plating of metacarpal and phalangeal fractures has definitely an advantage over the closed methods of treatment especially in displaced, unstable, intra articular and multiple fractures. As already mentioned hand is an important instrument of performance and protection so even a small deformity in the hand can manifest later with severe inability to use the hand and interfere in person's day-to-day activities and loss of livelihood^{13,14}. The plating of metacarpal and phalangeal fractures results in accurate reduction of the fracture without any angulation or rotation, better stability at the fracture site, hastens union of the fracture. The joints should be mobilized early following fixation to prevent stiffness of the fingers and regain the desired ROM at the joint. The postoperative physiotherapy of the hand is must. Complications should be minimized by precision as far as in the selection of case and operative technique. Indiscriminate use of fixation especially in fractures which are stable, undisplaced and which can be managed conservatively should be avoided.

Bone involved

Table 1:

Type of Bone	No. of Fractures	Percentage
Metacarpal	20	40
Proximal Phalanx	18	36
Middle Phalanx	5	10
Distal Phalanx	7	14
Total	50	100

Metacarpal bone was involved in maximum number of cases.

Overall functional results

Table 2:

Functional Result	No. of Cases	Percentage
Excellent (5 points)	26	65
Good (3 points)	10	25
Fair (1 point)	2	5
Poor (0 point)	2	5
Total	40	100

In 90% cases (65% + 25%), TAM was excellent / good



Fig 1: X rays and photographs of hand of proximal phalangeal fracture treated by mini plating

CASE NO-5 MOHD AFZAL**PRE OPERATIVE X-RAY****POST- OPERATIVE X-RAY****X-RAY SHOWING FRACTURE HEALING****Fig. 2: X rays of metacarpal fractures treated by mini plates****REFERENCES**

1. Barton N.J. Fractures of the hand. *Journal of Bone and Joint Surgery* 1984; 66-B: 159-67.
2. Jobe M T. Fractures, dislocations and ligamentous injuries of hand. In : *Campbell's Operative Orthopaedics*, ed. by Canale S.T.Vol. 4. Mosby Year Book Inc. Tenth edition, 2003; pp. 3377-27.
3. Pun W K. A prospective study on 284 digital fractures of the hand. *The Journal of Hand* 1991; 16-A : 113-17.
4. Buchler U. and Fisher T. Use of a minicondylar plate for metacarpal and phalangeal periarticular injuries. *Clinical Orthopaedics and Related Research* 1987; No. 214 : pp. 53-58.
5. Chen S.H. Miniature plates and screws in acute complex hand injury. *Journal of Trauma* 1994; 37 : 237-42.
6. Dabezies EJ, Schutte JP. Fixation of metacarpal and phalangeal fractures with miniature plates and screws. *Journal of Hand Surgery* 1986; IIA : 283-88.
7. Hastings H. Unstable metacarpal and phalangeal fracture. Treatment with screws and plates. *Clinical Orthopaedics* 1987; No. 214: pp. 37-52.
8. Muller ME, Allgower M, Schneider R, Willenegger. *Manual of Internal Fixation Techniques*, recommended by the AO-ASIF group. Third edition. Springer Verlag 1991; pp. 480-84.
9. Melone CP Jr. Rigid fixation of phalangeal and metacarpal fractures. *Orthopaedic Clinics of North America* 1986; 17 : 421-35.
10. Ruedi TP. Stable internal fixation of fractures of hand. *Journal of Trauma* 1971; II : 381-89.
11. Huffaker WH. Factors influencing final range of motion in the fingers after fractures of the hand. *Plastic and Reconstructive Surgery* 1979; 63 : 82-87.
12. James JIP. Fractures of the proximal and middle phalanges of the fingers. *Acta Ortho Scand* 1962; 32 : 410-12.
13. Diwaker HN, Stothard. The role of internal fixation in closed fractures of the proximal phalanges and metacarpals in adults. *Journal of Hand Surgery* 1986; IIB : 103-08.
14. Freeland AE, Geissler WB, Weiss AP. Operative treatment of common displaced and unstable fractures of the hand. *JBJS* 2001; 83-A: 6.