

Surgical and Functional Outcome of Metacarpal fracture

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Abstract: Background: Fractures of the metacarpal and phalanges are common and constitute 10% of all fractures. “Too often these fractures are treated as minor injuries and major disabilities occur” underlying the wrong practice of considering these fractures as trivial and worthy of being treated by the junior most resident.

Methods: 50 patients of metacarpal fracture (43males and 7 females),all were treated using k wires ,ao screws and plates and evaluated with DASH ,VAS AND ROM at 3 months ,6 months and 1 year .

Results: All patients at end of 1 year showed improvement in functional score irerespective of implant used .

Conclusion: All patients treated surgically of metacarpal fracture showed good functional outcome at the end of 1 year .

Key Words: Metacarpal fracture,k wire, ao screws .

THESIS SUMMARY

Introduction

Fractures of the metacarpal and phalanges are common and constitute 10% of all fractures. “Too often these fractures are treated as minor injuries and major disabilities occur” underlying the wrong practice of considering these fractures as trivial and worthy of being treated by the junior most resident^{1,2,3}.

Epidemiology

Thirty to forty percentages of all fractures in the hand occur in the metacarpal. Border metacarpals (1st and 5th) are more commonly involved, the base being more commonly involved in the former and neck in the latter. Diaphyseal fractures are common in non border metacarpals. Life time incidence of metacarpal fractures is 2.5%. No where in the body, the form and function are so closely related to each other than in hand. So any skeletal injury in the hand is likely to alter the function^{4,5}.

Surgical anatomy

Metacarpal bones are concave, short tubular bones with in built longitudinal arch and a

collective transverse arch. The metacarpal bases form the CMC joints with the carpal bones, the first being the most mobile, the 2nd and 3rd being most rigid and the 4th and 5th being relatively mobile. The saw tooth articular arrangement of the 2nd and 3rd CMC joints along with reinforcement of the capsule by FCR anteriorly and ECRL, ECRB posteriorly make the joints extremely rigid and immobile and any disruption of these joints indicate a high energy injury. The attachment of APL and ECU on the base of the 1st and 5th makes these joints more prone for unstable fracture dislocations. The cam-shaped head of the metacarpal bones makes the collateral ligaments relaxed in extension and stretched in flexion making it safer to immobilise the MP joints in Flexion (ideally 70-90°) than in extension. This flexed position of the MP joint is also the most stable position of the MP joint in power pinch and grip..The volar plate of the MP joints is a cartilaginous structure which is thicker at the phalangeal attachment and thinner at the metacarpal attachment. The lateral extension of the volar

plate constitutes the deep transverse metacarpal ligament which provides the additional volar stability of the MP joint.6. Metacarpal bones are subcutaneous bones dorsally with a gentle volar concavity. Fracture of the shaft or the neck of the metacarpal caused either due to direct or axial loading injury will mostly result in dorsal apex angulation due to the deforming forces of interossei and other volarly placed muscles. For this reason when these fractures are treated conservatively, the MP joint needs to be immobilised in flexion to relax the lumbricals and the interossei.

General considerations

“Hand fractures can be complicated by deformity from no treatment, stiffness from overtreatment, and both deformity and stiffness from poor treatment”- A fracture is considered functionally stable when during clinical examination it is possible to actively move the fractured digit by 50% of range of motion painlessly. The fracture is considered radiologically stable when the radiographs of the fractured fragment in two planes show

minimum angulation and displacement. A fracture is considered unstable if it can not be reduced or maintained in an anatomic or near anatomic position without implant fixation when the hand is placed in the safe or functional position. The four factors that determine stability are 1) external force, 2) muscle imbalance 3) fracture configuration or personality 4) integrity of soft tissue including periosteal sleeve.

Aims and Objectives

1 To study the various mechanism and pattern of metacarpal fractures and their surgical management

2 To study the functional outcome of metacarpal fractures treated surgically.

Methods

This was a prospective and retrospective study of the patients admitted and treated in our hospital during the period between Jan 2012 to December 2013. In this study we studied patients with metacarpal fractures treated surgically. All patients with metacarpal fractures were screened using inclusion and exclusion criteria and those willing to participate in the study were included. This protocol was approved by Institutional review board.

INCLUSION CRITERIA

1. All patients with metacarpal fractures

EXCLUSION CRITERIA

1. Pathological fracture
2. Crush injury to hand

METHODOLOGY

All patients with metacarpal fractures were screened using inclusion and exclusion criteria and those willing to participate in the study were included. Those who meet up with the criteria were studied them during the peri-operative & post operative period. Post operative follow up to assess union radiologically will be done at 6 weeks, 3 months, 6 months, 1 year. During each follow up repeat X-rays and assessment of complications if any was documented. Improvement in range of motion at metacarpophalangeal joint was evaluated at each follow up visits. During their each visit, we measure the following parameters-

1. Hand Xrays
2. DASH Score.
3. Range of Motion
4. VAS (Visual Analog Score) for pain.

Results

50 patients were treated using different implants such as k wires and screws and plated and followed at end of 1 year there was significant improvement in functional outcome at end of 1 year irrespective of implant used.

Conclusion

Most metacarpal fractures can be treated conservatively. Patient with multiple fractures, open fractures, intra-articular require operative reduction and stabilization to obtain the optimal position for bone healing and to allow early movement.

Clinical Message

Operative intervention is treatment of choice for early recovery and mobilization of metacarpal fracture.

Bibliography

1. Kozin Sh, thodar JJ Lieberman G operative treatment of metacarpal and phalangeal shaft fractures. *J Am orthop surg* 2000 Apr 8(2):111-21
2. Meals RA Meuli HC Carpenter's nails, phonograph needles, pianowires and safety pins; the history of operative fixation of metacarpal and phalangeal fractures. *J Hand Surg [Am]* 1985 Jan 10(1):144-50
3. Dumont C Funchs MBurchhardt H applet D Bohr S Sturmer KM Clinical results of absorbable plates for displaced metacarpal fractures. *J hand Surg [Am]* 2007 Apr 32(4):491-6
4. Edmunds JO traumatic dislocations and instability of the trapeziometacarpal joint of the thumb *Hand Clin* 2006 Aug 22(3):365-92
5. Kawamura K, chung KC, fixations choices for closed simple unstable oblique phalangeal and metacarpal fractures *Hand clin* 2006 Aug 22
6. Roth JJ Aurbech DM Fixation of hand fractures with bicortical screws *J Hand Surg [AM]* 2005 Jan 30
7. Fusetti C Meyer H Borisch N, Stem R Santa DD Papaloizos M Complications of plate fixations in metacarpal fractures *J trauma* 2002
8. Penning D Gausephol T, Mader K Wuleck A the use of minimally invasive fixation in fractures of the hand the minifixator concept *injury* 2000
9. Capo JT Hastings H 2nd Metacarpal and phalangeal fractures in athletes *Clin sport med* 1998
10. Watanabe K Nishikimj J Muro T Irreducible fracture of neck of 5th metacarpal *J Hand Surg* 1996 Aug 21
11. Foster RJ Stabilization of ulnar carpometacarpal dislocation or fracture dislocations. *Clin Orthop Relat Res.* 1996 Jun
12. Schuind F Donkerwolcks M, Burny F External minifixation for treatment of closed fractures of metacarpal bones. *J Orthop Trauma* 1991
13. Howard FM Fractures of the basal joint of thumb. *CLIN Orthop Relat Res.* 1987 Jul
14. Light TR Bender MS Management of intra-articular fractures of the metacarpophalangeal joint *Hand Clin* 1992. Lane CS. Detecting occult fractures of the metacarpal head: The Brewerton view. *J Hand Surg.* 1977;2:131-3.
15. Eyres KS, Allen TR. Skyline view of the metacarpal head in the assessment of human fight-bite injuries. *J Hand Surg Br.* 1993;18:43-44. Lane CS, Kennedy JF, Kushner SH. The reverse

- oblique x-ray film: Metacarpal fractures revealed. *J Hand Surg Am.* 1992;17:504–6.
16. Kozin Sh, thodar JJ Lieberman G operative treatment of metacarpal and phalangeal shaft fractures. *J Am orthop surg* 2000 Apr8(2)111–21.
 17. Meals RA Meuli HC Carpenter's nails, phonograph needles, pianowires and safety pins; the history of operative fixation of metacarpal and phalangeal fractures. *J Hand Surg [Am]* 1985 Jan 10(1)144–50.
 18. Dumont C Funchs MBurchhardt H applet D Bohr S Sturmer KM Clinical results of absorbable plates for displaced metacarpal fractures. *J hand Surg [Am]* 2007 Apr 32(4)491–6.
 19. Edmunds JO traumatic dislocations and instability of the trapeziometacarpal joint of the thumb *Hand Clin* 2006 Aug 22(3)365–92.
 20. Kawamura K, chung KC ,fixations choices for closed simple unstable oblique phalangeal and metacarpal fractures *Hand clin* 2006 Aug 22.
 21. Roth JJ Aurbech DM Fixation of hand fractures with bicortical screws *J Hand Surg [AM]* 2005 Jan 30.
 22. Fusetti C Meyer H Borisch N ,Stem R Santa DD Papaloizos M Complications of plate fixations in metacarpal fractures *J trauma* 2002.
 23. Penning D Gausephol T ,Mader K Wuleck A the use of minimally invasive fixation in fractures of the hand the minifixator concept *injury* 2000.
 24. Capo JT Hastings H 2nd Metacarpal and phalangeal fractures in athletes *Clin sport med* 1998.
 25. Watanabe K Nishikimij Muro T Irreducible fracture of neck of 5th metacarpal *J Hand Surg* 1996 Aug 21.
 26. Foster RJ Stabilization of ulnar carpometacarpal dislocation or fracture dislocatios. *Clin Orthop Relat Res.* 1996 Jun.
 27. Schuind F Donkerwolcks M, Burny F External minifixation for treatment of closed fractures of metacarpal bones. *J Orthop Trauma* 1991.
 28. Howard FM Fractures of the basal joint of thumb. *CLIN Orthop Relat Res.* 1987 Jul.
 29. Light TR Bender MS Management of intra-articular fractures of the metacarpophalangeal joint *Hand Clin* 1992. Lane CS. Detecting occult fractures of the metacarpal head: The Brewerton view. *J Hand Surg.* 1977;2:131–3.
 30. Eyres KS, Allen TR. Skyline view of the metacarpal head in the assessment of human fight-bite injuries. *J Hand Surg Br.* 1993;18:43–44. Lane CS, Kennedy JF, Kuschner SH. The reverse oblique x-ray film: Metacarpal fractures revealed. *J Hand Surg Am.* 1992;17:504–6.
 31. Freeland AE. Philadelphia: Churchill Livingstone; 2000. *Hand Fractures Repair, reconstruction and rehabilitation*; pp. 7–8.
 32. Berkman EF, Miles GH. Internal fixation of metacarpal fractures exclusive of the thumb. *J Bone Joint Surg.* 1943;25:816–21.
 33. Waugh RL, Ferrazzano GP. Fractures of the metacarpals exclusive of the thumb: A new method of treatment. *Am J Surg.* 1943;59:18 15. Gropper PT, Bowen V. Cerclage wiring of metacarpal fractures. *Clin Orthop.* 1984;188:203–7. 16. Gingrass RP, Fehring B, Matloub H. Intraosseous wiring of complex hand fractures. *Plast Reconstr Surg.* 1980;66:383–91.
 34. Kamath BJ, Bhardwaj P, Harshvardhan, Binoy PS, Agarwal T. In 2010 IFSSH - Hand Surgery. In: Chung MS, Baek GH, Gong HS, editors. First edition. Korea: Koon Ja Publishing Inc; 2010. pp. 372–3. a. Lee SG, Jupiter JB. Phalangeal and metacarpal fractures of the hand.
 35. Thurston AJ. Pivot osteotomy for the correction of malunion of metacarpal neck fractures. *J Hand Surg Br.* 1992;17:580–2. 25. Jahss SA. Fractures of the metacarpals: A new method of reduction and immobilization. *J Bone Joint Surg.* 1938;20:178–86.
 36. Foucher G. “Bouquet” osteosynthesis in metacarpal neck fractures: A series of 66 patients. *J Hand Surg Am.* 1995;20:S86–90. 27. Waugh RL, Ferrazzano GP. Fractures of the metacarpals exclusive of the thumb: A new method of treatment. *Am J Surg.* 1943;59:186–94.
 37. Buchler U, Fischer T. Use of a minicondylar plate for metacarpal and phalangeal periarticular injuries. *Clin Orthop.* 1987;214:53–88. 29. Wilson RL, Carter MS. Management of hand fractures. In: Hunter JM, Schneider LH, Mackin EJ, Callahan AD, editors. *Rehabilitation of the Hand.* CV Mosby: St. Louis; 1978. pp. 180–94.
 38. Flatt AE. 3rd ed. St. Louis: CV Mosby; 1972. *Fractures: The Care of Minor Hand Injuries.*
 39. Kumar VP, Satku K. Surgical management of osteochondral fractures of the phalanges and metacarpals: A surgical technique. *J Hand Surg Am.* 1995;20:1028–31.
 40. Billing L, Gedda KO. Roentgen examination of Bennett's fracture. *Acta Radiol.* 1952;38:471–6.
 41. Salgeback S, Eiken O, Carsam N, Ohlsson N. A study of Bennett's fracture. *Scand J Plast Reconstr Surg.* 1971;5:142–8.
 42. van Niekerk JL, Ouwens R. Fractures of the base of the first metacarpal bone: Results of surgical treatment. *Injury.* 1989;20:359–]
 43. Chabon SJ, Siegel DB. Use of the Herbert bone screw compression jig to reduce and stabilize a Bennett fracture.

- Orthop Rev.* 1993;22:97–9.
44. Moberg E. The use of traction treatment for fractures of phalanges and metacarpals. *Acta Chir Scand.* 1949;99:341–52.
45. Kilbourne BC, Paul EG. The use of small bone screws in the treatment of metacarpal, metatarsal, and phalangeal fracture. *J Bone Joint Surg Am.* 1958;40:375–83.
46. Freeland AE. Philadelphia: Churchill Livingstone; 2000. *Hand Fractures Repair, reconstruction and rehabilitation*; p. 106.

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