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# Percutaneous K Wire Fixation of Fifth Metacarpal Neck Fracture - New and Simple Technique

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## ABSTRACT

**Background:** Isolated fractures of metacarpals and phalanges are the commonest injuries affected upper extremity, which constitute about 10% of skeletal fractures in general. Fifth metacarpal(boxer's fractures) being the most common. The objective of this study was to investigate the outcome of treatment of the displaced neck and sub-capital fractures of the fifth metacarpal by percutaneous K wire fixation.

**Methods:** An observational study was conducted in the department of orthopedics Patan hospital as an outpatient procedure from January 2010 to January 2012. All adult patients with unilateral fracture of neck of fifth metacarpal bone were included. Whose physis was open, having previous hand injury or diseases causing deformity or impaired hand function and when fracture was more than 7 days old, were excluded from the study.

**Results:** Twenty eight of 35 patients obtained anatomic reduction, and 7 patients had 2/3 apposition of bone end and no rotational deformity. Follow-up was available for only 30 patients. The follow-up time was up to 12 weeks. The head/shaft angle of the fifth metacarpal was 60.60 degrees ±9.39 degrees preoperatively, and 14.20 degrees ±7.32 degrees postoperatively, and 15.60 degrees ±6.95 degrees in 12 weeks postoperatively. The difference between preoperative and postoperative angles was highly significant. The range of motion of the metacarpal joint was 86.73 degrees ±6.13 degrees postoperatively, which was not significantly different compared with that of uninjured side which was 90.93 degrees ±3.18. The difference between preoperative and postoperative angles was highly significant. The range of motion of the metacarpal joint was not significantly different compared with that of uninjured side. The average union time was 5.46 weeks ±1.22.

**Conclusions:** This method under consideration does not disturb the fracture site itself, the Kirschner wire being introduced in retrograde fashion makes it easier to correctly place the wire, which gives reasonably stable fixation, gives excellent results in a high proportion of selected cases. Local anesthesia is an added advantage.

**Keywords:** fixation, metacarpal neck fracture, percutaneous, wire

## INTRODUCTION

Isolated fractures of metacarpals and phalanges are the commonest injuries affected upper extremity, which constitute about 10% of skeletal fractures in general. Fifth metacarpal(boxer's fractures) being the most common.[1] These fractures result from a longitudinal compression force acting on a flexed metacarpo-phalangeal joint (MCP)—usually when a clenched fist strikes a solid object. The resultant fracture is usually unstable with volar angulation due to comminution of the volar cortex and the deforming action of the interossei. Many methods of immobilization have been described to maintain reduction of metacarpal neck fractures. Early methods included immobilization over a roller bandage and banjo splinting.[2,3] In the 1920s and 1930s, several authors espoused management with straight dorsal splinting, immobilizing the MCP joints in extension.[2,4] Contemporary treatment usually relies upon reduction

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by the Jahss maneuver followed by cast or splint immobilization. Recent methods of immobilization have included anterior splinting, anterior-posterior splinting, ulnar splinting, fracture braces, and immobilization with adhesive tape.[5-10] All typically immobilize the reduced fracture with the MCP joints in flexion. Although reduction of these fractures is usually successful using the Jahss technique, successful maintenance of the reduction has remained a vexing problem. We have developed and employed a different technique for immobilization of fifth metacarpal neck fractures which we have found to be highly successful. The technique is based upon reduction by longitudinal traction and Jahss Maneuver and subsequent immobilization by intramedullary k-wire. Advantages of this treatment method include its efficacy, ease of procedure, freedom of interphalyngeal and metacarpophalyngeal joint motion, and improved patient tolerance. This surgery can be performed under ulnar nerve block.

## METHODS

An observational study was conducted in the department of orthopedics Patan hospital as an outpatient procedure from January 2010 to January 2012 after getting approval from ethical committee.

All adult patients with unilateral fracture of neck of fifth metacarpal bone were included. Whose physis was open, having previous hand injury or diseases causing deformity or impaired hand function and when fracture was more than 7 days old, were excluded from the study.

Patients' demographic parameters such as age, sex, hand domination and mechanism of injury were noted. Preoperative radiological evaluation was done where neck shaft angle in standard oblique view was measured.

Ulnar nerve block at the ulnar groove at the elbow was given using 5 ml of 2% plain lignocaine. Further local infiltration of the same solution was done in the painful site usually at the wrist if patient complained of pain. Tourniquets were not used. Operating time was recorded from the painting and draping to beginning of application of slab. Patients were put in supine position on a radiolucent operation table. Fracture site was felt and identified under image intensifier. A 2mm K-wire was inserted through fracture site in the medullary cavity of the proximal fragment in retrograde fashion (Figure 1).

When resistance was felt then wrist was flexed to maximum and K-wire was brought out of skin through dorsal aspect of wrist skin. Sometimes patient felt pain while k-wire was coming out through skin then local infiltration of anesthetic solution was done. K wire was cut at the fracture site and pulled in about 1 cm proximal to fracture (Figure 2, 3).

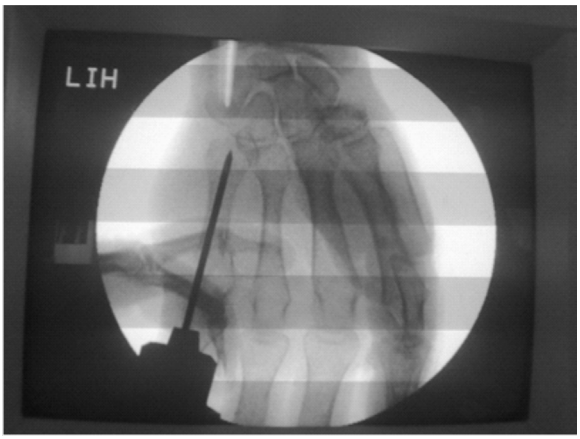


Figure 1. K wire insertion through fracture site under image control.

Figure 2. K- wire was cut and pulled through proximal end.

Figure 3. Reduction by Jahss Maneuver and advancement of k wire upto subchondral bone.

Reduction of fracture was done by longitudinal traction and Jahss maneuver (Figure 3, 4). Reduction was

confirmed under image and k wire was advanced distally to impact at the subchondral bone of the metacarpal head (Figure 5).

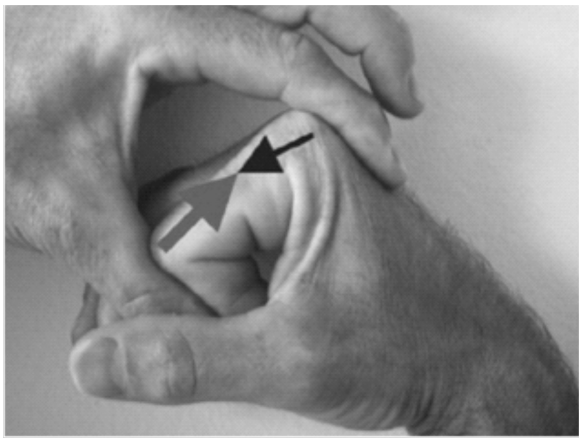

Figure 4. Jahss Maneuver.

Figure 5A. Image view of Figure 3.

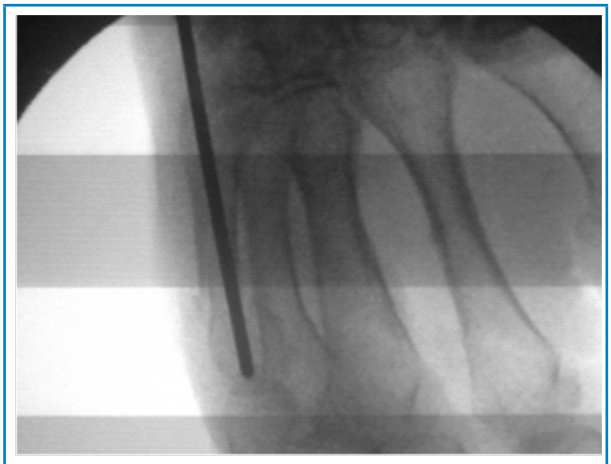

Figure 5B. Oblique view image.

K wire was bent and cut. Post operatively little finger buddy strapping was done with ring finger to control rotation. Ulnar gutter splint was applied with wrist in 30 degree extension and metacarpophalyngeal joint was free. Patients were discharged on the same day with a arm pouch sling. Cap Cloxacilline 500 mg 4 times daily for five days and Ibuprofen 400 mg three times for three days was prescribed. Next day patient were followed up in the OPD and the post operative check xrays were done and radiological measurements noted. Patients were again followed up at 3 weeks post operatively and slab and buddy strapping were removed. They were allowed to move fingers and hand keeping K wire in situ. At six weeks k wire removed and radiological and range of motion was evaluated. At 12 weeks post operatively patients were called for final follow up when again radiological and range of motion evaluation done.

All data were processed in SPSS 16 for windows. Age, Sex, Hand dominance was recorded. Head shaft angle was measured in the initial, post reduction and final follow-up at 12 weeks x rays. Statistical differences between initial and post surgery angle was analyzed using students t test, this showed the effectiveness of the reduction. Again angle is compared between post reduction and final follow up, which demonstrated the effectiveness of the fixation. We also determined the average time of radiological fracture union. Range of motion was measured in degrees and was compared with the normal hand.

## RESULTS

Average age was 23.2 years 87% were male, 83.3% occurred in dominated hand. More than 80% of fracture occurred because of closed fist hitting the hard object like wall or other persons face and 20% of fracture happened because of bicycle or motorbike accident.

Operative time was 24 min averagely (range12 to 36 min). Twenty eight of 35 patients obtained anatomic reduction, and 7 patients had 2/3 apposition of bone end and no rotational deformity. Follow-up was available for only 30 patients. The follow-up time was up to 12 weeks. The head/shaft angle of the fifth metacarpal was 60.60 degrees ±9.39 degrees preoperatively, and 14.20 degrees ±7.32 degrees postoperatively, and 15.60 degrees ±6.95 degrees in 12 weeks postoperatively. The difference between preoperative and postoperative angles was highly significant. The range of motion of the metacarpal joint was 86.73 degrees ±6.13 degrees postoperatively, which was not significantly different compared with that of uninjured side which was 90.93 degrees ±3.18. The difference between preoperative and postoperative angles was highly significant. The range of motion of the metacarpal joint was not significantly

different compared with that of uninjured side. The average union time was 5.46 weeks ±1.22.

## DISCUSSION

Boxers fracture though common but regarded as of little importance, can result in crippling deformities with considerable permanent disability.[11] The disability can occur because of inadequate reduction and inability to maintain reduction. This does not only lead to malunion but also develops contractures at the distal joints such as extension at the metacarpo-phalangeal joint and flexion of the proximal inter-phalangeal joint. From taking into account the functional anatomy of the hand it appears that inadequate control of the ray (digit plus metacarpal) permits the muscle-tendon systems of the hand to distort the fracture fragments. Characteristic deformity causes the metacarpal shaft to bow dorsally, the metacarpal head dropping into the palm. The collateral ligaments, which are short in extension and tend to tighten up the metacarpophalangeal joint during immobilization, tend to limit flexion later. Hence it is important to reduce the fracture and maintain the collateral ligaments and intrinsic muscles in a relaxed state to prevent traction that would displace the fragments during healing. Long duration of over tight dressings and prolonged immobilization must be avoided lest edema, swelling and fibrosis complicate healing. Some of the methods of immobilization may aggravate or prolong stiffness. For undisplaced fracture, splinting of the hand and parts of the digit is the method of choice. Historically, early methods of treatment included simple bandaging over roller bandage, with or without reduction, and immobilization in extension with use of straight dorsal splints or banjo splints. These older methods are no longer used by orthopedic or hand surgeons.

Later, Watson-Jones advocated flexion of the metacarpal joint to 90°, using the base of the proximal phalanx as a lever to reduce the fracture and then keeping this joint at right angles- to maintain the reduction. Immobilization in this manner may result in contractures which require prolonged and intensive physiotherapy to overcome. Still later, many observers advocated open reduction and intramedullary fixation, using wires, screws, plates or intramedullary devices.[12]

To evaluate various methods of treatment in a critical manner, certain criteria must be stablished for reduction and immobilization to provide maximum eventual success. Burnhams criteria seem admirably inclusive even today which states that " The method must provide complete control of the fractured bone during reduction and healing. The hand must be placed so that the muscle tendon systems are at minimal tension. Immobilization must be adequate to prevent distraction by the muscle-tendon systems. There must be post-reduction compression to avoid edema. If possible, the method should be closed rather than open.[13]

In selected cases, however, especially where the patient's livelihood depends on precision use of the hands, percutaneous kirschner wire internal fixation has been found to obviate many complications and their attendant problems. It should be used primarily where standard closed reduction methods or minimal splinting would not be adequate or satisfactory. The advantages are early correction of the deformity of the fracture and rigid internal fixation of the fragments. It is a most effective way of preserving function as during the healing period the patient is able to move fingers.[11] Anatomic reduction is not difficult for one experienced in the technique, but maintaining reduction occasionally presents problems. Reduction of fractures of fifth metacarpal neck and maintaining this reduction by either skeletal traction or casting require extremely close supervision and the results are uncertain. Breakdown of the skin due to pressure palmar ward on the metacarpal head and dorsal ward on the base of the middle phalanx often prevents the patient's working for a considerable time postoperatively. Open reduction entails additional trauma to the fracture site, the hematoma, the adjacent soft tissues and often includes enough periosteal stripping to delay bony union. Open reduction is best reserved for the rare case of compound fracture or of soft tissue interposition.[12] The advantages of this method is that it utilizes many features of both closed and open reduction. There is no extraneous damage at the fracture site, avoids the injury of the extensor hood mechanism and fixation is adequately rigid, which encourages early mobilization of the fingers. Optimum stability of the fracture promotes soft tissue healing. Most important, the postoperative care of the hand is minimized for both the surgeon and the patient, permitting earlier return to full use of the fingers without loss of the desired end result. This procedure is best done as day care surgery where patient does not need admission. Thus, the patient has minimum economic loss and maximum functional recovery. It should be stressed, however, that since the insertion of Kirschner wire makes the fracture a compound one, which might increase the possibility of infection.

## CONCLUSIONS

Anatomically, metacarpal fractures, when reduced, are not spontaneously stable. They require maintenance of this reduction because of the forces acting on the fragments. Closed methods of maintaining this reduction are ideal, but in selected cases, intramedullary fixation of the fracture, using the Kirschner wire, gives excellent results. The method under consideration does not

disturb the fracture site itself, the Kirschner wire being introduced in retrograde fashion makes it easier to correctly place the wire, which gives reasonably stable fixation, gives excellent results in a high proportion of selected cases. Local anesthesia is an added advantage.

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