

TREATMENT OF PHALANGEAL AND METACARPAL FRACTURES WITH K-WIRE

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ABSTRACT

Background: Phalangeal and metacarpal fractures are the most common skeletal injuries. Most of these fractures which are reducible and stable can be treated by non-operative methods like casts, splints or braces. However some fractures which are irreducible and unstable require open or closed reduction and fixation. The aim of this study was to evaluate the effectiveness of k-wire fixation in phalangeal and metacarpal fractures with minimal dorsal incision.

Material & Methods: This descriptive study was conducted in Orthopedic Unit, DHQ Teaching Hospital D.I.Khan, Pakistan on 54 patients treated with k-wires through a minimal dorsal incision. First follow-up was done after second week, at this time stitches were removed and slab was discontinued. Follow-up was done monthly for 3 months and then every 3 months for one year.

Results: Among 54 patients 41 (76%) were males and 13 (14%) were females, with male to female ratio of 3:1. Among these 37 (68%) were above forty years and 17 (32%) below forty years age. Regarding the types of fractures 37 (68.5%) were transverse, 12 (22.2%) oblique and 5 (9.3%) fractures were comminuted. The modal healing time was 6-8 weeks. Regarding the range of movements after the procedure; 100% of normal ROM was attained in 27, >90% of normal in 20, 75-90% of normal in 4, 50-75% of normal in 2 and <50% of normal in one case. In respect to complications there was only one case of infection and one case of non-union.

Conclusion: If properly selected and timely managed excellent results can be achieved in phalangeal and metacarpal fractures with the simple procedure of k-wire fixation with a minimal dorsal incision.

KEY WORDS: Phalangeal fractures, Metacarpal fractures, k-wire fixation.

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INTRODUCTION

The hand is composed of 27 bones (14 phalanges, 5 metacarpals and 8 carpal bones).¹ Second and third metacarpals are rigid and central pillars while fourth and fifth metacarpals are mobile borders.² Phalangeal and metacarpal fractures are the most common skeletal injuries and account for about 10% of all fractures and about 40% of all hand injuries.³⁻⁶ These fractures can result from a twisting injury, a fall, a crush injury or direct contact in sports. Road-side accidents and machine injuries are the two major causes of hand fractures.⁷ The fracture pattern and soft tissue injury varies with the mechanism of trauma. The imbalance of flexor and extensor forces created by the displaced fractures often produce secondary angulatory deformity.

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Management of these fractures varies widely in different regions of the world. This variability is due to many reasons including availability of resources, social factors and geographic constraints. Most of these fractures which are reducible and stable can be treated by non-operative methods like casts, splints or braces for 3-6 weeks.⁸⁻¹⁰ Anyhow some fractures which are irreducible and unstable require open or closed reduction and fixation.¹¹⁻¹⁶ The implants available are k-wires, plates and screws and external fixators and 90-90 wiring. Now-a-days percutaneous pinning under image intensifier is gaining popularity.¹⁷⁻²² Reduction must be assessed both in flexion and extension to ensure correct rotatory alignment.

The treatment goals should be 1) restoration of articular congruity, 2) reduction of malrotation, 3) maintenance of reduction with minimal surgical intervention, 4) surgical acceptable wounds and scars and 5) assessment of soft tissue injuries. The outcome of treatment is greatly influenced by the condition of surrounding soft tissues. Therefore open fractures should be carefully treated and surgical

trauma be minimized to optimize the results. The aim of this study was to evaluate the effectiveness of k-wire fixation in Phalangeal and metacarpal fractures with a minimal dorsal incision.

MATERIAL AND METHODS

This cross-sectional study was conducted in Department of Orthopedics, DHQ Teaching Hospital, D.I.Khan, Pakistan from January 2014 to December 2015. A sample size of 54 was selected through convenient sampling technique. Patients of all ages and both genders with displaced phalangeal and metacarpal fractures were included in the study. Those with open fractures, intra articular fractures, fracture with tendon and neurovascular injuries, multiple injuries, and patients with more than one month old fractures were excluded.

All the patients were admitted either directly from casualty or via OPD. The patients were registered and history was taken by the doctor on duty. Clinical examination was performed by consultant and necessary investigations were advised.

Surgery was done under general anesthesia and with upper arm tourniquet control. Fractures were openly reduced through minimum dorsal incision and fixed with k-wires. Short arm slab was applied. Patients were discharged on first post-operative day. X-ray was performed on first post-operative day and at each follow-up visit. First follow-up was done after second week, at this time stitches were removed, slab was discontinued, and physical therapy was started. Next follow-ups were advised monthly for 3 months and then after every 3 months for one year.

RESULTS

Among 54 patients 41 (76%) were males and 13 (14%) were females, with male to female ratio of 3:1. The mean of patients was . Among these 37 (68%) were above forty years and 17 (32%) below forty years age. The side affected was right in 27 (50%), left in 17 (31%) and both in 10 (19%) patients. Regarding the types of fractures 37 (68.5%) were transverse, 12 (22.2%) oblique and 5 (9.3%) fractures were comminuted. Mechanism of injury in these cases is given in Fig. 1.

The modal healing time was 6-8 weeks while only one patient had a prolonged healing time of more than a year. (Table 2) Regarding the range of movements (Normal 2700) after the procedure; 100% of normal ROM was attained in 27, >90% of normal in 20, 75-90% of normal in 4, 50-75% of normal in 2 and <50% of normal in one case. In respect to complications there was only one case of infection and one case of non-union.

DISCUSSION

Phalangeal and metacarpal fractures are common hand injuries, mostly need non operative

Table 2: Healing time in patients with phalangeal and metacarpal fractures.

Time (weeks)	Number of patients	Percentage
<6	2	3.70%
6-8	37	68.50%
8-10	10	18.50%
10-12	4	7.40%
>12	1	1.85%

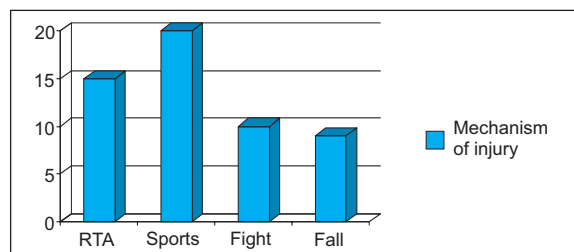


Figure 1: Mechanism of injury in patients with phalangeal and metacarpal fractures.

treatment. Anyhow these injuries gain little attention and mostly treated by juniors in the wards, which lead to stiffness and deformity. Hand is a third eye in a human body, that's why team approach should be used in hand injuries management in order to avoid complications. Various surgical options are available with variable results in literature. Phalangeal and metacarpal fractures can be anatomically fixed with plates and screws but after union the hardware removal needs another surgery. Similarly external fixators disturb the extensor tendons gliding function. K-wire fixation is an easy procedure, can be performed easily and can be removed in an outdoor. Also there is no significant difference in outcome of these different procedures.²³ In hand fractures results are related to functional status, not to the anatomical reduction of fractures. Nonunion is very rare, but malunion is common in hand injuries with good hand working conditions.²⁴ Anyhow if poorly treated deformity and stiffness may occur.²⁵ Regardless of all treatment options rehabilitation and proper physical therapy is most important step for good results.²⁶

We conducted the study on 54 patients, and obtained results comparable to national and international studies. Male and female ratio, age incidence, mechanism of injury and time of union all are almost similar to other studies.^{7,16,27}

Infection occurred in our study only in one patient, this was actually a 55 years old diabetic lady and her blood sugar level was difficult to control due to poor patient compliance. The infection was deep, patient readmitted for one week; debridement was done and on next list wound loosely approximated. Injectable cefaperazone and salbactam combination

were given for one week and then oral Linzolid for two weeks. Fracture union occurred in 11 weeks and 60% of total ROM obtained with steady physical therapy.

Non-union also occurred in only one patient of 72 years old with comminuted fracture of right 1st metacarpal in road side accident. Bone grafting was done at 12th week, union achieved in next four week, but ROM was poor about 40% of normal.

In our study transverse fractures were more common than oblique fractures, this in contrast to another national study conducted by Rafique et al.²⁷ But the mode of treatment we used was similar to them. The range of movements we achieved was comparable to that of plate and screw fixation by Ozer et al.²³

CONCLUSION

If properly selected and timely managed excellent results can be achieved in phalangeal and metacarpal fractures with the simple procedure of k-wire fixation with a minimal dorsal incision.

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CONFLICT OF INTEREST

Authors declare no conflict of interest.
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None declared.