

Evaluation of functional outcome in metacarpal and phalangeal fractures treated by K-wiring versus Mini-plating

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Abstract

Objective: To compare the mean range of motion after internal fixation of metacarpal and phalangeal fractures with k-wire fixation versus mini-plating.

Study design: A Retrospective Study.

Methodology: 40 patients were included in the study. All Patients with metacarpal and phalangeal fractures were divided into two groups; A (mini-plating) and B (k-wiring). Patients were assessed by range of motion using Goniometer at follow-up visits; initially at 2 weeks and then at 4 weeks until the final evaluation at 02 months.

Results: In our study, range of motion was excellent in 60 % cases, good in 30 % cases, fair in 5 % cases and poor in 5 % cases in group A (Mini-plating), and was excellent in 55 % cases, good in 35 % cases, fair in 5 % and poor in 5 % cases in group B (K-wiring).

Conclusion: K-wire fixation and plating are equally effective in the management of metacarpal and phalangeal fractures.

Introduction

Phalangeal and Metacarpal fractures account for 23% and 18% respectively and are the second and third most common fractures below the elbow¹. These are often regarded as trivial injuries and are neglected². Roadside traffic accidents and machine injuries are the two most common causes³. Presentation is either as

open or closed fractures along with injuries to soft tissues or dislocation of the adjacent joints.

These are a cause of significant disability due to loss of sensations, strength and flexibility. Swanson stated "hand fracture can be complicated by deformity from no treatment, stiffness from over treatment and both deformity and stiffness from poor treatment"⁴.

The fundamental rationale for treatment in fractures and dislocations of hand is to achieve sufficient stability so as to permit early range of motion and avoiding malunion, stiffness and residual instability. Essentially 5 major treatment alternatives: immediate motion, temporary splinting, CRIF, ORIF and immediate reconstruction⁵, of these the least invasive technique which can accomplish the above mentioned goals is the preferred treatment option.

K-wiring and mini plate fixation are the modalities of treatment which predominate⁶. Transverse and short oblique fractures are amenable for K-wiring while mini plating being preferred for comminuted, unstable and irreducible metacarpal and phalangeal fractures.¹ The objective of study was comparing the mean range of motion after fixation of phalangeal and metacarpal fractures with mini-plating versus k-wiring.

Material & Method

This functional outcome study was done in the department of orthopaedics, MGM hospital Kamothe from January 2019 to July 2019. During this period a total of 40 patients were included in the study and were grouped into two groups, A (Mini-plating) and B (K-wiring). Every patient presenting either to the emergency department or in Outpatient department with injury to hand were evaluated by history, examination and X-rays. Inclusion criteria were all patients aged between 15-45, unstable and displaced metacarpal and phalangeal fractures. Exclusion criteria being patients with massive soft tissue injury, those having co-morbid conditions such as diabetes mellitus, metabolic diseases, connective tissue disorders and age either less than 15 or more than 45 years.

Group A patients underwent fixation by Mini-plate while group B patients underwent fixation by 1-1.5 mm non threaded k-wires. There were 15 males and 5 females in group A and 17 males and 3 females in group B respectively.

Patients were given a single dosage of third generation cephalosporin pre-operatively and 2 days post-operatively. The procedures were done under local anaesthesia and under tourniquet. Patients were given limb elevation by pillow pouch elevation in the immediate post-operative period. After fracture fixation range of motion exercises were started after 2 days. Patients were followed at 2 weeks, 4 weeks and at 2 months time. K-wire removal was done at 4 weeks.

The outcome was assessed at 2 months. Range of motion was measured with help of Goniometer. Total active range of motion (TAROM) was used for assessment of functional outcome of the two modalities of treatment. Range of motion was graded as excellent, good, fair and poor if it was 85-100%, 70-84%, 50-69% and 0-49% of normal respectively.

Data Analysis:

All the data was analyzed on SPSS version 22. Percentages and frequencies were calculated for qualitative data (gender, fracture site). Mean and standard deviation were calculated for

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Table 1: Frequency of site of fractures.

Site of Fracture	Frequency, n (%)
Metacarpal	22(55%)
Proximal Phalanx	8(20%)
Middle Phalanx	5(12.5%)
Distal Phalanx	5(12.5%)
Total	40(100%)

quantitative data (age, ROM). Comparison of Range of motion in both groups was analyzed by an independent T-test. A p-value < 0.05 considered to be significant statistically.

Results

Forty patients comprised the study group. There were 15 males and 5 females in group A and 17 males and 3 females in group B respectively. Mean age for these patients was 26 ± 8 years. Most of these hand injuries took place in young active individuals between the ages of 15-30 accounting for 78.50% of cases.

Males had more incidence of both phalangeal and metacarpal fractures with 80% being males and 20% being females. 55% fractures were of metacarpal, 20% were of proximal phalanx and 12.5% of middle and distal phalanx respectively.

The different type of fractures seen in this study were, transverse fracture 62.5

%(n=25), oblique fractures 20%(n=8) and intra-articular 17.5%(n=7). 35% of fractures were open fractures with associated soft tissue injuries. Fixation done both with K-wires or mini-plate was done and assessed in terms of range of motion at 2 months.

Comparing the two groups, range of motion was excellent in 60% cases, good in 30% cases, fair in 5% cases and poor in 5% cases in group A, and was excellent in 55% cases, good in 35% cases, fair in 5% and poor in 5% cases in group B (Table 3).

Discussion

The frequency of fractures of hand is between 12.3% to 30

Table 3: ??

Range Of Motion	Group A (Mini Plating) No. Of Patients, n (%)	Group B (K-wiring) No. Of Patients, n (%)
Excellent	12 (60%)	11 (55%)
Good	6 (30%)	7 (35%)
Fair	1 (5%)	1 (5%)

Table 2: Frequency of type of fractures.

Type of Fracture	Frequency, n (%)
Transverse fracture	62.5 %(n=25)
Oblique fractures	20 %(n=8)
Intra-articular	17.5 %(n=7).
Total	40(100%)

%7. Mostly these injuries take place in young active individuals and are one of the commonest injuries affecting upper extremity. In our study 78.50% of cases took place between the ages of 15-30.

Non operative management of these injuries is done for fractures of metacarpal and phalanges which are isolated or undisplaced. 1. Communitied, displaced, unstable and irreducible metacarpal and phalangeal fractures are usually treated by operative management. 1. Early stable fixation and physiotherapy help in achieving an optimal functional outcome. Bone grafting is to be considered in communitied fractures. Since phalangeal fractures are believed to be unstable they are more frequently treated by operative intervention. 8. A good outcome can be expected in metacarpal injuries when an appropriate treatment option is chosen. In our study 40 patients with unstable and displaced and communitied phalangeal and metacarpal fractures were included and treated either by mini-plating or K-wiring a standard mode of treatment as described by Lundin et al. 9. Intramedullary nailing of the long bones of hand has the advantages of being safe, simple, spares joint and avoidance of periosteal stripping has been introduced recently.

Total active range of motion obtained because of treatment and the rehabilitation is accepted as crucial indicator of functional improvement. In comparison to distal and middle phalangeal fractures proximal phalanx fracture had a less favourable outcome. Similarly fractures including the distal interphalangeal and metacarpophalangeal joint have more better outcomes in comparison to proximal interphalangeal joint. 7. Simple stable metacarpal fractures started with early range of motion and strengthening exercises lead to early return to work.

In our study, range of motion was excellent in 60% cases, good in 30% cases, fair in 5% cases and poor in 5% cases in group A (Mini-plating), and was

excellent in 55% cases, good in 35% cases, fair in 5% and poor in 5% cases in group B (K-wiring).

Conclusions

K-wire fixation and plating are equally effective in the management of metacarpal and phalangeal fractures.

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