International Journal of Medical and Health Research
www.medicalsciencejournal.com
ISSN: 2454-9142
Received: 03-03-2021, Accepted: 05-04-2021, Published: 11-05-2021
Volume 7, Issue 5, 2021, Page No. 09-12

A prospective study of different modalities of management of hand fractures at tertiary care Hospital

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Abstract
Background: This Prospective study was undertaken to evaluate different modalities of management of metacarpal and phalangeal fractures.
Material and Methods: In this study 60 patients were included and divided according to the three modality of treatment. Of the total 70 fractures, 30 were metacarpal and 40 were phalangeal fractures. Out of these 41 were managed by Conservative, 17 were managed by the K-wire & 2 were managed by External fixation.
Results: In this study mean age was 38.3 (11.6) of the study subject. Also the male female ratio was 3:1. Out of the total 60 patients excellent result was seen in 11(18.3%) patients, good in 46(76.7%) patients, satisfactory in 1(1.7%) and poor in 2(3.3%) patients. Mayo Wrist score showed statistically significant difference between three modalities.
Conclusion: So we conclude that hand fractures should be treated with proper guidelines and protocols to get good results.

Keywords: conservative, k-wire fixation, external fixation, functional outcome

Introduction

Fractures of the metacarpal and phalanges are common and constitute 10% of all fractures [1]. Nowhere in the body, is the form and function so closely related to each other than in hand. So any skeletal injury in the hand is likely to alter the function. Too often these fractures are treated as minor injuries resulting in major disabilities.

Bunnel said in 1994 “The hand is so intimately routed in our lives, thoughts and expression that it has become a part of our language. The hand is amazing gift to humans in that it has extraordinary manipulative abilities.” metacarpal provides and maintains the width of the hand which is useful for the power grip. The first metacarpal with rest of thumb structure forms a separate functioning unit of hand and thereby enables the hand for pinch, Key pinch, grasp and power grip [2, 3].

Generally these fractures commonly present in three patterns- closed undisplaced, closed displaced and open fractures. After proper clinical and radiological assessment we decided about modality of treatment. We used three modalities- 1) conservative- traction and splintage 2) `k`-wire fixation 3) external fixation.

After fracture stabilisation we followed all the patients at 4, 6, 12 and 24 weeks. At the time of each visit patients were assessed with respect to pain, range of motion using Mayo Wrist Score.

Objective

This Study aim was to know the mechanism of injury, classify various types of fractures and to study various methods of management of metacarpal and phalangeal fractures.

Materials and Methods

In this prospective study all the 60 patients were 18 years and above who attended emergency and outpatient department with metacarpal and phalangeal fractures. All patients were examined with reference to age, sex, mode of injury, return to activity, complications & type of fractures involved. Patients were explained about three modalities of treatment for metacarpal & phalangeal fractures & most of these fractures were treated in emergencies where treatment modality was a) closed stable fractures treated conservatively by strapping or ligamentotaxis (41 patients), b) unstable and intra-articular by open reduction and internal fixation with k-wires (17 patients) and c) compound fractures by external fixators (2 patients). Evaluated these fractures at 4 weeks, 6 weeks and 12 weeks and 24 weeks. Patients informed consent and ethical clearance was taken before start of study.

Statistical Analysis

Descriptive analysis was carried out by mean (s.d) for quantitative variables, frequency (proportion) for categorical variables. Data was also represented using appropriate diagrams. One way Anova test was applied for comparison between groups and p value less than 0.05 was considered as a significant. All analysis was carried out using SPSS 22.0 version & Microsoft Excel 10.0.

Results

In this prospective cohort study, total 60 patients were recruited as per inclusion and exclusion criteria. The mean age of the patients was 38.3 + 11.6 Years. Out of total patients, Majority 75.0% of the patients were male, 60.0% were age between less than 40 years, 58.3% were Worker, 58.3% were Right hand involve, 43.3% of the patients were

injured from fall of heavy weight & 95.0% of the patients returned to activity within 24 weeks. 28.3% of the patients had various complication. (Table no. 1)

Table 1: Socio demographic profile in the study subjects.

Socio Demographic variables		Frequency	Percentage
Gender	Female	15	25.0%
	Male	45	75.0%
Age Group	Less than 30 Years	18	30.0%
	31 to 40 Years	18	30.0%
	41 to 50 Years	12	20.0%
	More than 50 Years	12	20.0%
Occupation	Clerk	11	18.3%
	Doctor	1	1.7%
	House Wife	9	15.0%
	Student	1	1.7%
	Worker	35	58.3%
	Retired	3	5.0%
Hand Invovlement	Right	35	58.3%
	Left	25	41.7%
Mode of Injury	Direct Trauma	11	18.3%
	Crush Injury	3	5.0%
	Fall	20	33.3%
	Fall of Heavy Weight	26	43.3%
Return of Activity	Return	57	95.0%
	Not Return	3	5.0%
Complication	Yes	17	28.3%
	No	43	71.7%

In the below figure no. 1 shows that the majority of the patients were treated by Ligamentotaxis done by dynamic traction and splintage modalities in phalangeal type of fractures. Also half of the patients were treated by Ligamentotaxis done by dynamic traction and splintage in Metacarpal type of fractures.

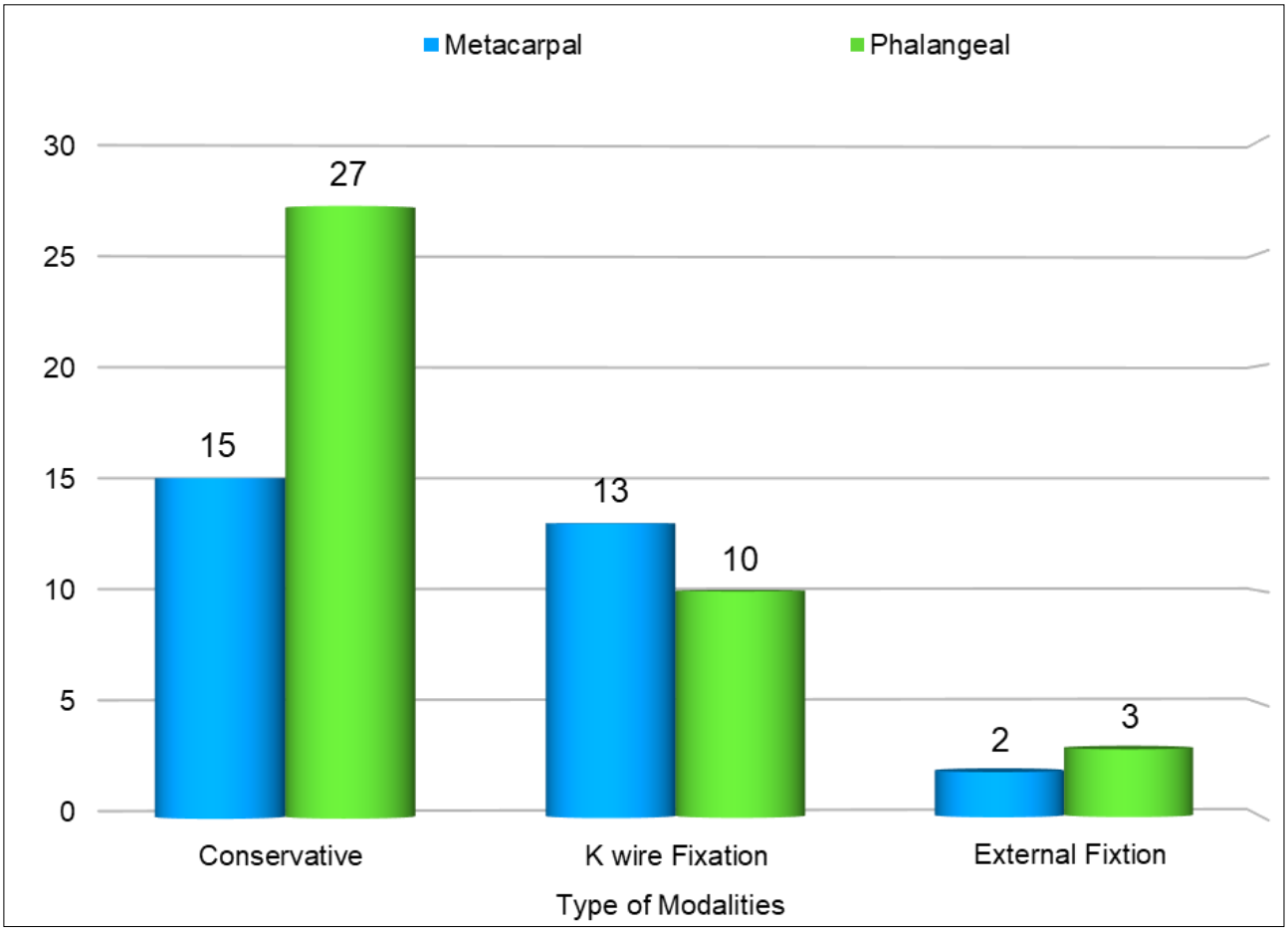

Fig 1: Type of fracture in the subject.

Table 2: Showing the comparison between groups of Mayo wrist score.

Treatment Group	Mayo Wrist Score				
	1st	2nd	3rd	4th	5th
Conservative	14.39 ± 3.39	44.88 ± 7.29	62.20 ± 7.25	79.27 ± 7.03	91.22 ± 5.89
K wire Fixation	10.88 ± 3.64	34.71 ± 9.76	54.71 ± 8.38	73.53 ± 10.12	85.59 ± 9.50
External Fixation	0.00 ± 0.00	17.50 ± 3.54	25.00 ± 0.00	35.00 ± 0.00	60.00 ± 7.07
Total	8.42 ± 0.87	32.36 ± 2.04	47.30 ± 1.92	62.60 ± 2.03	78.94 ± 1.81
P value	0.001 (S)	0.001 (S)	0.001 (S)	0.001 (S)	0.001 (S)

In the above table no. 2 shows that the average mean (s.d) score of first visit was 8.42 (0.87), in the second visits score was 32.36 (2.04), in third visits score was 47.30 (1.92), in fourth visits score was 62.60 (2.03) & fifth visit score was 78.94 (1.81).

Also showing the mean difference of Mayo Wrist score was statistically significant between all three treatment modalities.

Table 3: Functional Outcome of Metacarpal & Phalangeal fractures in three modalities.

Treatment Group	Functional Outcome			
	Excellent	Good	Satisfactory	Poor
Conservative	10 (90.9%)	31 (67.4%)	0 (0.0%)	0 (0.0%)
K wire Fixation	1 (9.1%)	15 (32.6%)	0 (0.0%)	1 (50.0%)
External Fixation	0 (0.0%)	0 (0.0%)	1 (100.0%)	1 (50.0%)
Total	11 (100.0%)	46 (100.0%)	1 (100.0%)	2 (100.0%)

Out of the total 60 patients excellent result was seen in 11(18.3%) patients, good in 46(76.7%) patients, satisfactory in 1(1.7%) and poor in 2(3.3%) patients.

Discussion

In this prospective cohort study, during the study period a total 70 fractures were treated in these 60 patients according to the three modalities of treated. Out of these 70 fractures 30 were metacarpal and 40 were phalangeal.

In this study we observed that male female ratio was 3:1. In our study mean (s.d) age of the patient was 38.3 (11.6). Majority 35 (58.3%) of the patients were Workers followed by 11 (18.3%) were Clerk & so on. In this study observed that maximum patients were injured by the fall of heavy weight (26), followed by the 20 (33.3%) of the patients were direct fall on hand caused and so on. Out of the 60 patients, 35 (58.3%) had right hand fractures & 25 (41.7%) had left hand fractures. In this study divided the 60 patients into three groups according to the type of fractures, reduction technique, stability and soft tissue injury. In Conservative group had 41 (68.3%) patients followed by K wire fixation group having 17 (28.3%) & only 2 (3.3%) of the patients were in External fixation group.

In the study done by Bora & Didizan [4] divided the patients in the following two groups: 1st group they treated intra-articular fractures with no or minimal displacement within a forearm-based wrist immobilisation splint or POP. In 2nd group they included patients with disruption of the joint surface that were reduced and K-wired with wrist immobilisation in a POP for 4–6 weeks. Similarly Zyluk & Budzynski [5] divided the patients in two groups. 1st group is Conservative & 2nd group is Operative group using K-wire fixation.

In a study done by Ali H *et al* [6] shows that male female ratio was 5:1. Also found that the 38.9% fractures were metacarpal & 61.1% fractures were phalangeal. They treated 78.3% patients surgically while 21.7% were managed conservatively.

Similarly study done by Ahmed M *et al* [7] shows that male female ratio was 5:1. The mean age was 32.6 years. They had 64% left side fractures and 36% right side fractures. Also divided the patients into two groups, 15 fractures were treated by conservatively & 44 fractures were treated operative modality.

Also the study done by Yan YM [8] shows the Ratio was 3:2 which was lower compare to ours. Mean age of the patients was 30.4 years with the minimum age was 18 years and maximum age was 56 which was similar to our study. Also found 63.4% fractures on right side & 36.6% fractures on left hand side. Similarly 60.1% were metacarpal & 39.9% were phalangeal fractures.

In a study by Robyn Midgley and Angela Toemen [9] they evaluated 36 patients of hand fractures and found that out of this 36 patients 25 were employed and 11 unemployed. Out of the 25 employed patients 20 had sedentary job and 5 were manual workers. Out of the 11 unemployed 2 were non-employed, 7 were students and 2 were retired.

In a study by Michael N. Nakashian [10], they found that the most common mechanisms of injury were contact with a wall or door, and falls. The most common setting was in the home, followed by recreational locations.

Conclusion

Hand trauma is very common and associated loss of function can impact almost all activities. As per the protocol we have treated 60 patients of metacarpal and phalangeal fractures of hand with different methods of treatment and we conclude that Fractures on right side were more common than left side & Excellent to good results were seen in conservative group followed by k-wire fixation group.

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