

How Early Can We Mobilise 4th And 5th Metacarpal Shaft Fractures? A Retrospective Study

Mohammed KM Ali¹, Abid Hussain¹, CA Mbah¹, Alaa Mustafa¹, Ahmed Mohammed² and John Harrison³

¹Department of Trauma and Orthopaedics, Royal Derby Hospital, United Kingdom

²Department of Radiology, Gateshead NHS foundation Trust, United Kingdom

³Department of Orthopaedics, Gateshead NHS foundation Trust, United Kingdom

***Corresponding Author:** Mohammed KM Ali, Registrar, Department of Trauma and Orthopaedics, Royal Derby Hospital, United Kingdom.

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Abstract

Purpose: Fractures of the shaft of the little and ring finger metacarpals are relatively common injuries and mainly occur in younger males following significant trauma to the hand. An anatomical reduction is unnecessary as an excellent functional result can be achieved without surgery. We have conducted this study in order to compare two of the conservative management modalities; ulnar gutter splint (group one) and Futuro splint (group two). Ultimately considering the healing outcome, stiffness and cost effectiveness of the two procedures.

Methods: We retrospectively reviewed the x-rays, clinical and physiotherapy letters of (60) patients (30) patients from each group), who had presented to orthopaedic department between Jan 2013 and June 2014 with an isolated, closed shaft fracture of either the little or ring finger metacarpal, excluding those who had unacceptable angulation and shortening.

Results: all fractures healed in an acceptable position, no mal-union requiring further treatment was seen in either group. Both methods appeared to adequately maintain the fracture reduction when comparing the initial radiographs with the final radiographs of the healed fracture. Radiological review showed no difference, in terms of shortening or angulation between the 2 treatment methods.

Conclusions: Patients treated in a Futuro splint had a lower incidence of stiffness at a clinical review after 5 weeks post injury. Furthermore, a Futuro splint is convenient for patients and medical staff as when needed it can be removed in order to apply ice to the hand to reduce swelling, it is also cost effective.

Keywords: Metacarpal Shaft; metacarpal fractures; Futuro splint

Introduction

Fractures of the shaft of the little and ring finger metacarpals are relatively common injuries and mainly occur in younger males following significant trauma to the hand. The injury often occurs through aggression by punching a hard object [1].

Generally, significant displacement of a metacarpal shaft fracture is prevented by inter metacarpal ligaments and intrinsic muscles. However, the index and little finger metacarpals are not well supported as compared to the ring and long metacarpals, and are therefore more likely to displace. The displacement usually occurs in a palmar direction due to the axial force causing the fracture and crushing of the palmar cortex [2]. The more proximal the fracture, generally the greater the angulation, and the more noticeable any hand deformity becomes such as clawing [3]. Spiral and oblique metacarpal shaft fractures frequently develop shortening through the fracture site, and it is suggested that for every 2 mm of metacarpal shortening there is a corresponding 7 degree extensor lag at the MCP joint [2].

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The goal of treatment of extra-articular metacarpal fractures is rapid restoration of function with maintenance of acceptable alignment and angulation (Table1).

	Acceptable Shaft Angulation (degrees)	Acceptable Shaft Shortening (mm)
Little Finger	30	2-5
Ring Finger	40	2-5

Table1: Acceptable alignment and angulation.

An anatomical reduction is unnecessary in order to achieve an excellent functional result. Traditionally extra-articular metacarpal fractures are treated non-operatively with closed reduction with a moulded cast. The intrinsic-plus or “Edinburgh” position of the hand is advised to neutralize potentially deforming forces of the intrinsic muscles on the reduced fracture and to prevent loss of proximal interphalangeal joint movement due to contracture of the collateral ligaments. Excellent clinical results have been reported. However, a period of immobilisation of 4-5 weeks is advised.

Potential complications from this treatment include hand stiffness due to prolonged immobilisation and difficulties in applying a moulded cast to a swollen hand due to the risk of pressure damage to skin on the dorsum of the hand [4].



Figure 1: shows Ulnar Gutter splint.

The purpose of this study was to evaluate these two methods of closed treatment. We specifically investigated as to whether permitting full interphalangeal joint motion without restricting the metacarpophalangeal joint extension would affect the short- term functional outcome or final fracture alignment.



Figure 2: shows Futuro splint.

Materials and Methods

We retrospectively reviewed the clinical history and physiotherapy notes of all patients who had presented to our orthopaedic department between Jan 2013 and June 2014 with an isolated, closed shaft fracture of either their little or ring finger metacarpal. These patients were either treated with a Futuro splint or ulnar gutter splint (based on the consultant’s preference) [5]. We identified 30 patients who had been treated with a futuro splint. However, the majority were treated with an ulnar gutter splint. 30 consecutive cases were selected to make an equal comparison between the two groups. Patients were excluded if their fractures demonstrated a significant rotational or angular deformity, or shortening that could not be reduced and maintained within the guidelines presented in Table 1.

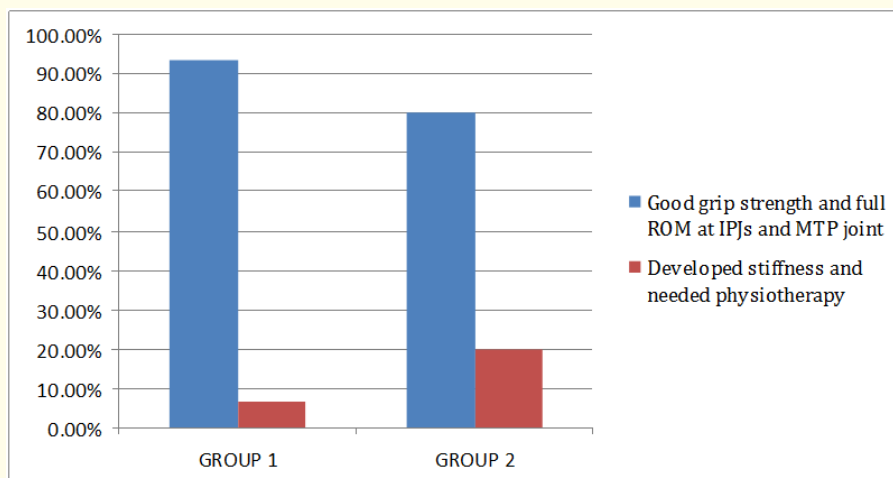


Figure 3: shows stiffness percentages.

The first method, the Futuro splint and finger buddy strapping permit full metacarpophalangeal and interphalangeal joint motion. With the second method (Group 2), a moulded plaster of Paris ulnar gutter splint crosses the wrist and immobilises the metacarpophalangeal joints in flexion and the interphalangeal joints in extension [6-9].

Clinic records and radiographs were reviewed to identify the metacarpal that was involved (4th or 5th), the location and type of the fracture, the alignment, angulation and shortening as seen on antero posterior, lateral and oblique radiographs before and after the immobilisation. The patients were reviewed again after the cast or the splint was removed, the range of motion was immediately assessed after the cast removal and a decision was made as to whether the patient needed urgent physiotherapy for stiffness [10-13].

Results

The initial chart review identified 112 patients, 30 of whom were treated with FS (group 1) and 30 cases from group-2 were selected randomly. The average age was 28.4 years (range 16 to 60 years). Females represent 21% and Males 79%.

All injuries were isolated and closed, 43% were of the ring finger, and 57% were little finger metacarpal fractures. 54.1 % were transverse fractures while 45.9% were oblique.

Both Group1 and Group 2 represent 50% of the sample each. All fractures had an acceptable length and angulation according to table1.

Group 1

Ring finger fractures represented 43%, with an average angulation of 27.5 degrees and shortening of 2.5mm. Little finger fractures represented 57% with an average angulation of 27 degrees and shortening of 2 mm. The transverse pattern formed 70% and the oblique 30%. Five weeks immobilisation was the average time. We found that (93.3%) had good grip strength and a full range of movement at

interphalangeal and metacarpophalangeal joints. From group 1 there was only (6.7%) who had subsequently developed stiffness and thus required physiotherapy.

A final check x-ray confirmed evidence of healing with acceptable length and angulation.

Group 2:

Ring finger fractures represented 26%, with an average angulation of 26 degrees and shortening of 2.5 mm. Little finger fractures represented 74% with an average angulation of 27 degrees and shortening of 2.5 mm.

	Little Finger	Ring Finger	Little Finger Angulation and Shortening	Ring Finger Angulation and Shortening
Group 1	57%	43%	27 degrees 2 mm	27.5 degrees 2.5 mm
Group 2	74%	26%	27 degrees 2.5 mm	26 degrees 2.5 mm

Table 2: The transverse pattern formed 60% and the oblique 40%.

The transverse pattern formed 60% and the oblique 40%.

Five weeks immobilisation was the average time. We found that 80% had good grip strength and a full range of movement at interphalangeal and metacarpophalangeal joints immediately after removal of the plaster. 20% subsequently developed stiffness and required physiotherapy.

A final check x-ray confirmed evidence of healing with acceptable length and angulation.

	Transverse Fractures	Oblique Fractures	Good Grip	Stiffness
Group 1	70%	30%	93.3%	6.7%
Group 2	60%	40%	80%	20%

Table 3: A final check x-ray confirmed evidence of healing with acceptable length and angulation.

Discussion

Metacarpal fractures represent 10% of all fractures, and there is a lifetime incidence rate of 2.5%. The fifth metacarpal is fractured most frequently and accounts for one-fourth of all metacarpal fractures. Males aged 10-29 have the highest incidence of metacarpal injuries. The majority of metacarpal fractures are closed injuries amenable to conservative treatment with external immobilization and subsequent rehabilitation [5]. In this study, we included those with acceptable angulations and shortening, who did not need manipulation or surgical input, all were treated conservatively either in Futuro or Ulnar Gutter Splint. Eventually all fractures healed in an acceptable position with no significant mal-union requiring further treatment seen in either group. Both treatment methods appeared to adequately maintain the fracture reduction when comparing the initial radiographs with the final radiographs of the healed fractures. Radiological review of the healed fractures showed no difference, in terms of shortening or angulation. We found that the plain radiographs were sufficient to evaluate healing of the fractures with no need for further imaging. In addition, patients treated in a Futuro splint had a lower incidence of stiffness at clinic review 5 weeks post injury.

Furthermore, a Futuro splint costs between 3 to 4 pounds whilst a ulnar gutter splints costs 6 to 7 pounds, bearing in mind that the latter cast needs to be changed if it becomes wet, loose or uncomfortable. The Futuro splint is a very convenient treatment modality for patients and medical staff as it can be removed to apply ice to the hand to reduce any swelling and there is no risk of pressure damage to skin [14] or thermal burns associated with plasters.

Conclusion

Based on our study we conclude that all ring and little finger fractures presenting with an acceptable angulation and shortening can be treated with a Futuro splint, This method gives good support and stability to the fracture, in addition it is very convenient for patients and medical staff as it can be removed to apply ice to the hand to reduce any swelling, it is also cost effective. The Futuro splint avoids discomfort for the patient and avoids any risk of pressure sores to the hand.

Level of Evidence

Level three

Conflict of Interest

There is no competing interest regarding to this article.

Authors Contribution

Mr. Mohammed KM Ali has contributed to study concept, design data collection and writing of the paper, analyzed the data and prepared the graphs and tables. Dr. Abid Hussain contributed to data analysis and writing of the paper. Mr. John Harrison contributed towards the management; follow up of the patient and writing of the paper.

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