



## Clinical experience with low cast plastic sheath cover of spinal needle fixator in treating 5th metacarpal fracture

Authors

Mohd Ahsan Wani, Mushtaq Ahmad Ganaie, Muneeb Ul Islam

GMC Srinagar Kashmir, India

### Abstract

**Background:** Fractures of the 5th metacarpal bone is a common hand injury. For restoration of function and cosmesis in certain unstable fracture patterns, displaced and angulated fractures, open injuries, Percutaneous fixation could be applied to 5th metacarpal using K-wires.

**Aim of the study:** To evaluate the results of plastic tubing cover of spinal needle external fixation method in the management of 5<sup>th</sup> metacarpals fractures of the hand.

**Materials and Methods:** A prospective study held from January 2016 to January 2017 in Govt Medical College Srinagar Hospital. Twenty patients having unstable 5<sup>th</sup> metacarpal fractures were included in the study with mechanism of injury were fighting (boxer fracture), road traffic accidents, fall on the ground and industrial crush injuries. Inclusion criteria were irreducible or unstable fracture, rotational deformity, comminuted fractures and open fractures. 12 patients were males, and 8 patients were females with mean age of 32 years. In 12 patients the right hand was affected while in 8 patients fracture affect the left hand. 16 patients have neck fracture, 2 patients have shaft fracture and 2 patients have comminuted fracture.

**Result:** Fracture healed within 6-8 weeks. The mean follow up period was 6 months. At the final follow-up, the mean TAM was 230°. The mean grip strength of injured hand 90% of the non-injured side strength, average Quick Dash score was 6 ( $\pm 3.5$ ). 15 patients were very satisfied (75%) and 5 patients were satisfied (25%). The mean visual analogue score for pain was 1.5. 3 patients presented superficial pin tract infection at the site of K-wire insertion 2 patients united with mild angulation of the 5th metacarpal.

**Conclusion:** Treatment of unstable fracture of the 5th metacarpal bone using plastic tubing cover fixator is a good option with low cost and good functional outcome.

### Introduction

Fractures of the 5th metacarpal bone is a common hand injury. The ulnar four metacarpals represent 88 % of all metacarpal fractures, with the fifth metacarpal most commonly affected.<sup>1</sup>

Most of fractures of the metacarpal have excellent functional results with conservative management<sup>2</sup>. For certain displaced and angulated fractures, fractures with intra-articular extension, unstable fractures, open fractures or combined injuries,

surgical treatment is required for restoration of satisfactory function and good appearance. The causes of the fracture include falls, sporting incidents, road accidents and fighting. Single metacarpal can be fractured and sometimes more than one metacarpal are fractured<sup>3</sup>. The fifth finger ray accounts for 38% of all fracture The neck is the weakest point and most common part fractured which known as boxer's or fighter's fracture<sup>4,5</sup>

Because of subcutaneous access for insertion of K-wires, percutaneous fixation can be easily applied to fractures of the hand with the advantage of minimizing the stiffness and swelling that may occur after using plates or screws. Although percutaneous k-wires fixation is not as rigid as plate and screw fixation, increased rigidity may not be needed when the hand is immobilized for short time<sup>6</sup>

Metacarpal fractures especially when associated with soft tissue and tendon, ligaments or neurovascular injuries can be difficult to manage. External fixation of hand fractures is a good option for patients with these injuries and avoids wide surgical exposures and resultant limitations in postoperative range of motion. The use of external fixator that is low profile with adequate rigidity and is made of items commonly found in an ordinary operating room is advantageous. The simple fixator have a number of advantages when compared with commercially available external fixator in that it is low profile, radiolucent, cost effective and allows for a multitude of different pin placements<sup>7</sup>. The aim of the current study is to evaluate the result of simple plastic tubing cover of soinsl needle used as external fixator cross bar in the management of 5<sup>th</sup> metacarpals fractures.

### Materials and Methods

A prospective study held from January 2016 to January 2017 in orthopaedic department of govt medical college srinagar. Twenty patients having unstable 5<sup>th</sup> metacarpal fractures were included in the study. The mechanism of injury were fighting (boxer fracture), road traffic accidents, fall on the ground and industrial crush injuries. Inclusion criteria were irreducible or unstable fracture, rotational deformity, comminuted fractures and open fractures. Exclusion criteria were associated neurovascular injury, sever osteoporosis, and fractures with massive soft tissue injury or bone loss and flexor tendon injury.

12 patients were males, and 8 patients were females with mean age of 30.3 years. In 12

patients the right hand was affected while in 8 patients fracture affect the left hand.

Preoperative at least 3 views of the hand anteroposterior, oblique and lateral views were obtained. 16 patients had neck fracture, 2 patients had shaft fracture and 2 patients had comminuted fracture. Clinical preoperative assessment of injured hand was done giving special attention to open wounds, hand swelling and vascularity by capillary refill test was done.

**Table 1:** Demographic data of the patients

NO.	AGE in years	SEX	SIDE	MECHANISM OF INJURY
1	30	Male	Left	Fighting
2	46	Male	Right	Fighting
3	33	Female	Left	road traffic
4	22	Male	Left	road traffic
5	41	Male	Right	Simple fall
6	46	Female	R Right	Simple fall
7	50	Male	Igh	road traffic
8	36	Female	Right	crush injury
9	26	Male	Left	crush injury
10	26	Male	Left	crush injury
11	47	Female	Right	Simple injury
12	42	Male	Right	Fighting
13	39	Female	Right	Fighting
14	27	Male	Left	Crush injury
15	20	Male	Right	Road traffic
16	44	Female	Right	Simple fall
17	33	Male	Right	Road traffic
18	29	Female	Right	Crush injury
19	33	Female	Left	Crush injury
20	30	Male	Left	Crush injury

### Procedure

The procedure was done under local anesthesia, generally the fixator construct require a plastic tube and wires proximal and distal to fracture. 1 gram of CEFAZOLIN as Prophylactic antibiotic was given, initial debridement was done for any present wounds. To restore length and correct any rotational deformity manuplation was done under c arm control.

First wire was introduced transversely from medial to lateral in fractured bone proximal to the fracture after passed at first from plastic tubing and then its tip washed by saline to remove the plastic debris and continued through the 5<sup>th</sup> metacarpal bone in bicortical purchase. Second k-wire was introduced in the same way in fractured bone distal to the fracture after passed at first from

plastic tubing, the fracture is checked with the image intensifier then other wires were placed one proximal and one distal. Final fluoroscopic checks for the reduction and fixation and clinical check for good alignment and rotational position of the little finger were carried out then the K-wires were cut and bent over the plastic tubing cover fixator.

### Postoperative care

The patients were encouraged to do active and passive range of motion of all fingers and pin tract care to avoid pin tract infection. The patients were followed every 2 weeks for functionally and radiologically. When radiological union achieved, wires and fixator were removed and patients starts physical therapy. Final assessment was done using Visual analogue pain score (VAS), Quick Dash Score, grip strength and Range of motion using total active motion (TAM equals the sum of active motion of MP, PIP and DIP joint)

### Results

Average follow up was 6 months.. At the final follow-up, the mean TAM was  $210^{\circ}$  ( $200^{\circ}$  -  $230^{\circ}$ ). Functional outcome was satisfactory with mean grip strength of injured hand 80% of the non-injured side strength, average Quick Dash score was  $5 (\pm 3.5)$  ranging from zero to 10.5 points. 15 patients were very satisfied (75%) and 5 patients were satisfied (25%).

The mean visual analogue score for pain was  $1.5 (\pm 0.9)$  ranging from zero to 4. 3 patients presented superficial pin tract infection at the site of K-wire insertion 2 patients united with mild angulation of the 5th metacarpal.

### Discussion

Metacarpal fractures are common hand injury. External fixation is a good choice in these patients. However, the high cost of available external fixators may be an obstacle during decision making in treating some of the patients who cannot afford fixator price. In the current study, we used a simple plastic cover tubing of spinal needles as an external fixator cross bar. This surgical principle was not original, it was

first described in 1974 by Crockett who used methylmethacrylate resin as a bar holder to hold transverse k wires for fixation of metacarpal fractures<sup>8</sup>

In 1999, McCulley and Hasting<sup>9</sup> published their results over another simple external fixator bar for management of metacarpal fractures. They used the plastic sheath of an intravenous cannula as an external fixator to hold K-wires. But the main disadvantage of this method was the short bar which is not applicable for all fracture patterns, slippage of the bar over the k-wires which produce some pressure on the skin, and loss of reduction occurred in some patients. Moreover, the narrow width hard plastic sheath makes the introducing of K-wires in a parallel way difficult. Again in 2004 Rosenburget et al followed the same principle and used joints of LEGO combined with plastic coverings of intravenous cannula to obtain rigid fixation while maintaining adjacent joint movement<sup>10</sup>.

In the current study the plastic sheath of spinal needle fixator is radiolucent making lateral x-ray view which was a disadvantage when traditional radio-opaque fixator used. It has a good and satisfactory length to hold several K-wires and we can use it according to the fracture pattern even if we want to cross a joint. The k-wires can easily perforate the soft plastic sheath tubing of spinal needle body in a parallel way to avoid loss of reduction during insertion of wires. Moreover, it is a lightweight and the construct is stable. Moreover, the fixator can be easily removed in the outpatient clinic.

Capsuloligamentotaxis is the main principle of this fixation method through which the fracture reduction is obtained and maintained using external fixator.<sup>11</sup> This fixation principle should not be used in displaced or impacted intra articular fractures which requires internal fixation or dynamic distraction.<sup>12, 13</sup>

The limitations of this study were the number of cases that was relatively small, and the short period of follow-up and lack of direct comparison with another method of fixation.

**Conclusions**

Treatment of unstable fracture of the 5th metacarpal bone using Pastic sheath covering of spinal needle fixator is a good option with low cost and good functional outcome

**References**

1. Gudmundsen TE, Borgen L. Fractures of the fifth metacarpal. *Acta Radiol.*2009; 50:296–300.
2. Kollitz KM, Hammert WC, Huang JI. Metacarpal fractures: treatment and complications. *American Association for Hand Surgery*, 2014; 9:16–23
3. Orbay J. Intramedullary nailing of metacarpal shaft fractures. *Tech Hand Up ExtremSurg* 2005; 9(2):69–73.
4. Kamath JB, Harshvardhan, Naik DM, Bansal A. Current concepts in managing fractures of metacarpal and phalanges. *Indian J Plast Surg.* 2011; 44:203–11.
5. Henry MH. Fractures of the proximal phalanx and metacarpals in the hand: preferred methods of stabilization. *J Am AcadOrthop Surg.* 2008;16:586–595.
6. Green DP, Anderson JR. Closed reduction and percutaneous pin fixation of fracturedphalanges. *JBone Joint Surg Am* 1973; 55(8):1651–4.
7. Lorgelly PK, Dias JJ, Bradley MJ, Burke FD: Carpal tunnel syndrome, the searchfor acost-effective surgical intervention: arandomised controlled trial. *Ann RColl Surg Eng* 2005; 87(1):36–40.
8. Crockett DJ. Rigid fixation of bones of the hand using K Wires bonded with acrylic resin. *Hand*, 1974 ', 6 : 106~107.
9. Mculley SJ & Hasting. External fixator for the hand: a quick, cheap and effective method. *J.R.CollSurg .Edinb* , 1999,44: 99~10
10. Rosenberg L, Sagi A, Jackson IT, Sharpe D. A dynamic, jointed external fixator for fingers a preliminary report. *European Journal of Plastic Surgery*, 2004', 12(1):972~ 75
11. Vidal J, Buscayret C, Connes H. Treatment of articular fractures by ligamentotaxis with external fixation.In : A. E. Brooker Jr., C. C. Edwards (eds). *External Pixation.The Current State of Art.*Williams and Wilkins, Baltimore, 1979', 7 5~81.
12. Bilos ZJ, Vender MI, Bonavolonta M. fracture subluxation of proximal interphalangeal joint treated by palmar plate advancement. *J Hand Surg*, 1994 ', 19(A): 189~95
13. Schenck RR. The dynamic traction method. Combining movement and traction for intra~articular fractures of the phalanges.*Hand Clinics*, 1994', 10: 187~98.