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**Bahubali Aski**

Assistant Professor in Department of Orthopaedics, Srinivas Institute of Medical Sciences and Research Centre, Mukka, Surathkal, Mangalore, India.

**Abhinav Bhatnagar**

Registrar in Department of Orthopaedics, Fortis Hospital, Mulund, Mumbai, India.

**Correspondence:**

**Bahubali Aski**

Assistant Professor in Department of Orthopaedics, Srinivas Institute of Medical Sciences and Research Centre, Mukka, Surathkal, Mangalore, India.

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## Metacarpal fractures treated by percutaneous Kirschner wire

**Bahubali Aski and Abhinav Bhatnagar**

**Abstract**

**Introduction:** Metacarpals and phalanges are injury prone in daily work and life. These constitute 10% of all fractures. Although these fractures are considered minor injuries, such injuries may cause major disabilities if not taken care of. Most hand fractures can be treated by nonoperative methods with good outcome. However unstable fractures need some form of fixation. Aim of our study is to evaluate outcome of K wire fixation for unstable metacarpal shaft fractures.

**Material and methods:** Fourteen cases of unstable metacarpal shaft fractures were treated with closed reduction and percutaneous K wire fixation. Patients age ranged between 18 to 46 years with mean age of 27 years. Nine were male and 5 were female patients. Most cases were treated on day care basis. Indication for surgery was unstable fractures.

**Results:** Callous formation on x ray was visible at 4 weeks in eight patients and all fractures had radiological union by 8 weeks. Pin tract infection observed in 2 patients. All patients had pain free hand movements at final follow up with a full range of movements and good hand grip.

**Conclusion:** K wire fixation gives promising results in unstable metacarpal shaft fractures. It has got advantage of fixing the bone without opening the fracture site which is not possible with mini plate.

**Keywords:** K (Kirschner) Wire, Metacarpal Fracture, Percutaneous pinning, unstable fracture.

### 1. Introduction

Metacarpals and phalanges are injury prone in daily work and life [1]. These fractures constitute 10% of all fractures and are 15-28% of all cases referring to the emergency department [1, 2]. In the hand, fifth metacarpal fractures are the most common, and are reportedly responsible for 16% to 34% of hand fractures [3]. Functional outcome in case of fractures of the small bones of the hand depends upon the injury severity and management [4]. These injuries usually occur in adolescents and active young patients [2]. Extra articular fractures can be treated with closed reduction and cast if they have mild to moderate displacement with good outcome [5]. Although these fractures are considered minor injuries, such injuries may cause major disabilities if not taken care properly [1]. However unstable fractures need some form of fixation. Aim of our study is to evaluate outcome of K wire fixation for metacarpal shaft fractures.

### 2. Material and Methods

Our prospective study includes fourteen cases of metacarpal shaft fractures that were treated with closed reduction and percutaneous K wire fixation. We included metacarpal shaft (closed, type1 and 2 open) fractures and excluded intra articular, highly comminuted and type 3 open fractures. Patient's age ranged between 18 to 46 years with mean age of 27 years. Nine were male and 5 were female patients. Right hand was involved in 11 patients, left hand in 4 patients with dominant hand involvement in 12 patients. All the fractures were closed except in 3 patients (one case of type 2 and 2 cases of type 1 open fracture). Most cases were treated on a day care basis. Indication for surgery was unstable fractures (fig. 1). Image intensifier (fig. 2) was used in all the cases to aid in confirming the reduction and fixation during surgery. K wire passed from head to base following reduction and negotiation through the fracture site. Care was taken not to damage the extensor apparatus or passing of wire through the tendon. Open reduction was not needed in any of our cases. Immobilization with slab was done in 3-4

weeks. After the removal of K wire at 3-4 weeks, physiotherapy started. Postoperatively check X ray done on the day of surgery and pin tract dressing on day two. Patients were

followed up at regular intervals. Follow up check X ray taken after 4, 8 and 24 weeks.

Preoperative radiograph showing displaced 4<sup>th</sup> metacarpal shaft fracture.



### 3. Results

Eight fractures showed callous formation at 4 weeks (fig. 3) and all fractures united by 8 weeks. Pin tract infection observed in 2 patients. Two cases had malalignment of 15<sup>0</sup> at the fracture site during fixation; however, remodeling occurred

by 6 months time (fig. 4). Two cases developed pin tract infection, which subsided with continued antibiotics and dressing. None of the patients had pain at final follow up. All patients had full range of movements (fig. 5) with good hand grip.

Intraoperative image intensifier image showing fracture reduction and negotiation of K wire through fracture site.



One month follow up radiograph showing callous formation.



Six month follow up radiograph showing remodeling with complete consolidation at fracture site



Clinical photographs showing full range of movement at metacarpophalangeal joint and hardly visible scar over the 4<sup>th</sup> knuckle.



#### 4. Discussion

Many treatment methods have been adopted for fracture of metacarpals including conservative by closed reduction, closed reduction and k wire fixation, open reduction and internal fixation with miniplate and external fixture application. Some form of fixation is often indicated for Unstable fractures, Intra-articular displaced fractures, when a fracture is part of a major ligamentous or tendinous avulsion, multiple fractures, Open fractures and implantation of amputated digits [6]. Indication for fixation in our series was unstable fracture (inability to achieve or maintain reduction at fracture site or adjoining joint movement causes loss of reduction).

James [7] reported loss of function in 77% of fingers with unstable phalangeal fractures treated by closed means. But for metacarpal fractures Facca *et al* reported better results in the series stabilized with intramedullary K-wire in comparison to those treated with locking plates. He also reported a deficit, despite the immediate mobilization of the metacarpophalangeal joint due to the adhesences of the extensor in plate group [8]. Faraj suggested that transcutaneous intramedullary wire fixation of oblique extra-articular metacarpal shaft fracture achieves good results and has few complications [9]. In agreement with these statements we got good results with a K wire fixation for metacarpal shaft fractures with 100% union rate. Even for treatment of the boxer fracture, closed reduction and Kirschner wire fixation is widely accepted as adequate treatment [10]. Birndorf states, when the fracture angulation is more than 30 degrees, there will be a significant decrease in mechanical efficiency of flexor system [11]. Two of our cases had fracture angulation of around 15° at the time of fixation; however remodeling occurred by 6 months' time.

While percutaneous fixation using K-wires is a popular choice due to the simplicity of the procedure, the wires can tether to the soft tissues, particularly the sagittal bands of the extensor mechanism [12]. We took precaution to avoid injury to extensor tendons. Since in the K-wire fixation there is no compression of the fracture, it is difficult to control the motions of the fingers [13]. Transverse K-wire fixation for metacarpal fracture stabilization was described for the first time by Berkman and Miles [14]. We don't have experience with this method as we fixed all the cases with intramedullary K wire. The mini plate has got disadvantage of high cost, relatively difficult and invasive procedure which can be overcome by K wire where following reduction, fixation can be done without opening the fracture site. In addition, Xu and Zhang in their meta-analysis say that longer surgery time was taken for patients treated with mini plate fixation than K-wire [15]. Pin tract infection is a possibility with K wire, but will not be a major problem to treat.

#### 5. Conclusion

K wire fixation gives promising results in unstable metacarpal shaft fractures. It has got the advantage of fixing the bone without opening the fracture site which is not possible with mini plate.

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