

A comparative study between intramedullary and transverse k-wires fixation of neck of fifth metacarpal fracture "boxer's fracture"

Thesis Submitted for Partial Fulfillment
of Master Degree in Orthopedic Surgery

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

**"قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا
عَلَّمْتَنَا إِنَّكَ أَزْكَى الْعَالَمِينَ الْحَكِيمُ"**

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Abstract

Background

There is no robust evidence for the best treatment practice for metacarpal neck fractures. The purpose of this comparative study was to investigate whether the intramedullary k-wires or transverse k-wires allows for good clinical and radiological results for displaced metacarpal neck fractures.

Methods

We prospectively reviewed 40 patients with a displaced metacarpal neck fracture who underwent surgery: 20 with intramedullary k-wires and 20 with transverse k-wires. Radiographic and clinical outcomes of both groups were compared. Objective findings of range of finger motion and grip strength were assessed at 3 and 6 months postoperatively.

Results

All patients achieved union, and postoperative complications included proximal migration of k-wires in one and pin tract infection in another one. Radiological parameters after the fracture healing were comparable between the two groups.

Postoperative range of finger motion was slight better in patients with the intramedullary k-wire, and acquired grip strength in the low-profile plate group was superior to that in the intramedullary nail group.

Conclusions

The current results indicate that both procedures are highly effective in maintaining fracture restorations. Although extra-articular metacarpal fractures are common, there is no consensus on the mode of treatment. Overall, hand function was good, and no difference was detected between the two methods (Quick DASH, grip strength, range of motion, VAS pain and VAS satisfaction).

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Key words:

A comparative study between intramedullary and transverse k-wires fixation of neck of fifth metacarpal fracture "boxer's fracture"

INTRODUCTION

Fractures at the neck of the little finger metacarpal, also known as boxer's fractures, are among the most common injuries to the hand. They comprise 20% of all hand fractures⁽¹⁾, with manual workers forming the largest occupational group⁽²⁾. Boxer's fractures are usually caused when a clenched fist directly strikes a hard object at an angle. The little finger metacarpal is more slender and less well supported than the shafts of the other metacarpals⁽³⁾, predisposing it to injury.

The deformity and instability are due to comminution of volar metacarpal cortex and the deforming action of the interossei which pulls the distal fragment down into a flexed position.

As a result of the force causing the fracture and the natural flexion forces across the metacarpophalangeal (MCP) joint produced by the resting tension of the intrinsic and extrinsic muscles, displacement of the metacarpal head occurs in the volar direction⁽⁴⁾. If the fracture heals in this position, hyperextension at the MCP joint is required for full finger extension.

The MCP hyperextension is accentuated by some shortening of the metacarpal neck due to the angulated fracture. These geometric changes can shorten the resting length of the intrinsic muscles spanning the MCP joint.

Any shortening of these muscles could compromise their potential excursion and hence their ability to initiate MCP joint flexion.

Controversy exists over the degree of acceptable angulation of boxer's fractures. Investigators who recommend treatment do not agree on a threshold fracture angulation requiring reduction; recommendations vary from 20° to 70°^(5, 6).

Such wide variation in treatment recommendations results from the many different methods of measuring angulation, as pointed out by **(Lowdon, 1986)**⁽²⁾.

Furthermore, specific treatment recommendations vary from no treatment^(5, 8), to manipulation⁽⁹⁾, external fixation⁽¹⁰⁾, or internal fixation⁽¹¹⁾.

We concur with **(Konradsen et al.)**⁽¹²⁾ that the literature reveals many differences in opinion which are often unsupported by scientifically controlled evidence. To date, no clinical study has provided a conclusive answer to the question of how much angulation of a boxer's fracture should be acceptable.

Most closed fractures of the neck of the little finger metacarpal can be treated conservatively **(Hansen and Hansen, 1998; Theeuwes et al., 1991)**^(13,14), particularly fractures with a moderate palmar angulation of up to 30°, as they have a good outcome after functional treatment **(Braakman et al., 1998; Kuokkanen et al., 1999; Statius Muller et al., 2003)**^(15,16,58).

The indication for surgery can be a rotational deformity, or a clinically relevant palmar displacement of the little finger metacarpal head. It remains controversial, however, how much palmar displacement can be tolerated, upper limits of 20° to 70° being discussed (**Ford *et al.*, 1989**; **Theeuwes *et al.*, 1991**)^(5,14).

Commonly, the dominant hand is the punching hand and this hand is affected. When palmar angulation exceeds 45° , or when the patient presents a rotational deformity of the little finger in flexion, ***Reduction***, with or without surgical treatment, is mandatory (**Ali *et al.* 1999**)⁽¹⁶⁾.

Various operative procedures have been described, including percutaneous transverse K-wires fixation (**Galanakis *et al.*, 2003**)⁽¹⁷⁾ and intramedullary K-wires (**Foucher, 1995**)⁽¹⁸⁾. Although each method has its own advantages and disadvantages, there is a lack of reports comparing these operative interventions.

(Foucher et al., 1976)⁽¹⁸⁾ Reported fixation of these fractures by the insertion of fine K-wires antegradely to avoid the metacarpal articular surface. Foucher(1995) later reported a series of 66 cases treated in this manner and called this the “*Bouquet*” technique.

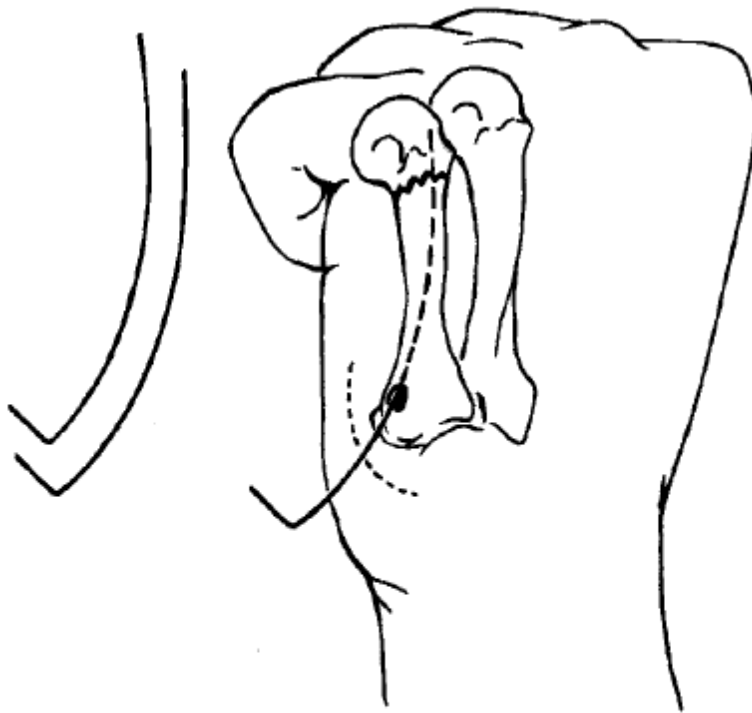


Fig.1:Bouquet osteosynthesis technique: Aciform incision is made proximal to base of the metacarpal. A hole through ulnar cortex at base of metacarpal is created. Three blunt-tip K-wires are bent at their proximal ends to control orientation and curved lengthwise to allow insertion in divergent directions.

(Berkman and Miles, 1943)⁽¹⁹⁾ First described the transverse pinning technique of little finger metacarpal fracture fixation in which several K-wires are passed transversely between the fifth and the fourth metacarpal to stabilize the fracture.

(Galanakis *et al.*, 2003)⁽¹⁷⁾ Reported that treatment of closed metacarpal neck, shaft, and intra-articular fractures of the base of the fifth metacarpal with percutaneous transverse pinning, using two K-wires distally and one proximally, has shown excellent functional and anatomic outcome.

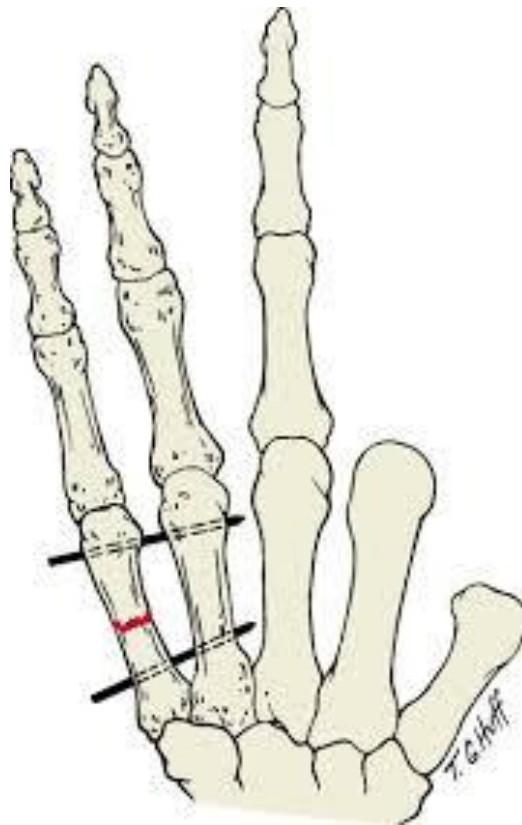


Fig.2: Percutaneous transverse pinning of displaced metacarpal fracture. After closed reduction, significantly angulated metacarpal fracture can be held with two percutaneous pins extending into adjacent intact metacarpal.