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

By

Shady Mohamed Abdel-Salam Habib

M.B.B.ch

Supervisors

Prof. Dr. Ahmed Amin Galal

Prof. of Orthopedic Surgery

Faculty of Medicine

Cairo University

Dr. Mostafa Mahmoud

Assistant Professor ofOrthopedic Surgery

Faculty of Medicine

Cairo University

Faculty of Medicine
Cairo University,
2016

بسم الله الرحمن الرحيم

"قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم "

صدق الله العظيم (البقرة -32)

Acknowledgement

"First, and foremost, thanks to **ALLAH***for whom I always pray to give me the ability to do my work faithfully.*

I wish to extend my sincere thanks to **Prof. Dr. Ahmed Amin Galal,***Prof. of Orthopedic Surgery, Faculty of Medicine, Cairo University, for his encouraging, help and support.*

Profound gratitude to **Dr. Mostafa Mahmoud,***Assistant Professor of Orthopedic Surgery, Faculty of Medicine, Cairo University, for his kind supervision, skillful scientific guidance, marvelous effort and great support to complete this work.*

Great thanks are offered to all my family especially my lovely wife for their support and encouragement and kind help in my present and coming work.

Contents

List of figures

List of figures

List of tables

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 and20 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).

There is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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 thenatural flexion forces across the metacarpophalangeal(MCP) joint produced by the resting tension ofthe intrinsic and extrinsic muscles, displacement ofthe metacarpal head occurs in the volar direction[(4)]. Ifthe fracture heals in this position, hyperextension atthe MCP joint is required for full finger extension.

The MCP hyperextension is accentuated by someshortening of the metacarpal neck due to the angulatedfracture. These geometric changes can shortenthe resting length of the intrinsic muscles spanningthe MCP joint.

Any shortening of these musclescould compromise their potential excursion andhence their ability to initiate MCP joint flexion.

Controversy exists over the degree of acceptableangulation of boxer's fractures. Investigators whorecommend treatment do not agree on a thresholdfracture angulation requiring reduction; recommendationsvary from 20° to 70°[5, 6].

Such wide variationin treatment recommendations results from the manydifferent methods of measuring angulation, aspointed out by **(Lowdon, 1986)**[2].

Furthermore, specific treatmentrecommendations vary from no treatment[5, 8], tomanipulation[9], external fixation[10], or internal fixation[11].

We concur with **(Konradsen *et al,*)**[12] that theliterature reveals many differences in opinion whichare often unsupported by scientifically controlledevidence. To date, no clinical study has provided aconclusive answer to the question of how muchangulation of a boxer's fracture should be acceptable.

Most closed fractures of the neck of the little fingermetacarpal can be treated conservatively **(Hansen and Hansen, 1998; Theeuwen *et al.*, 1991)**[13,14], particularlyfractures with a moderate palmar angulation of up to30°, as they have a good outcome after functionaltreatment **(Braakman*et al.*, 1998; Kuokkanen *et al.*, 1999; Statius Muller *et al.*, 2003)**[15,16 ,58].

The indication forsurgery can be a rotational deformity, or a clinicallyrelevant palmar displacement of the little finger metacarpalhead. It remains controversial, however, howmuch palmar displacement can be tolerated, upper limitsof 20° to 70°being discussed **(Ford *et al.*, 1989; Theeuwen *et al.*, 1991)**[5.14].

Commonly, the dominant hand is the punching hand and this hand is affected. When palmar angulationexceeds 45°, or when the patient presents a rotationaldeformity of the little finger in flexion, ***Reduction,*** with orwithout 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 ownadvantages and disadvantages, there is a lack of reportscomparing 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***.

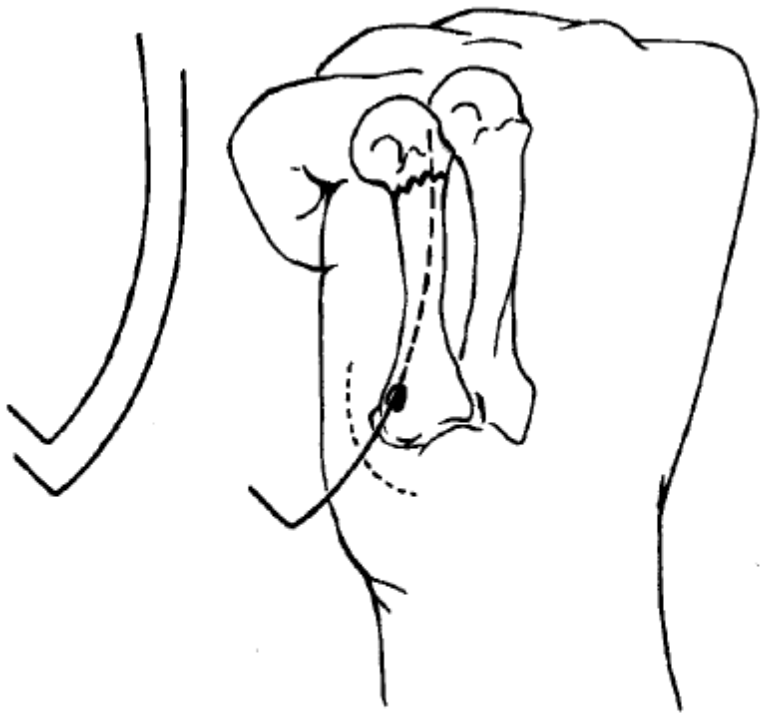

Fig.1: Bouquet osteosynthesis technique: Aciform incision is made proximal to base of the metacarpal. A hole through ulnar cortex at base of metacarpal is created. Three blunt-tip K-wires are bent at their proximal ends to control orientation and curved lengthwise to allow insertion in divergent directions.

(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.

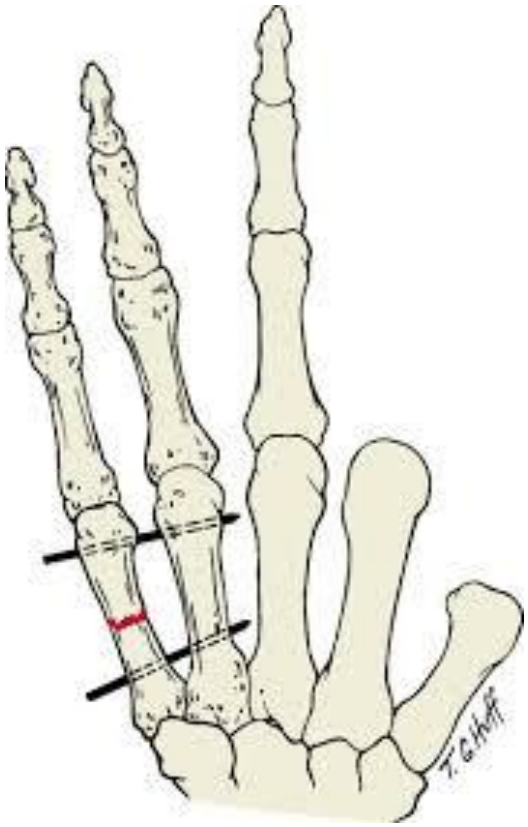

Fig.2: Percutaneous transverse pinning of displaced metacarpal fracture. After closed reduction, significantly angulated metacarpal fracture can be held with two percutaneous pins extending into adjacent intact metacarpal.