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Case Report
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5th Metacarpal Neck Fracture of Dominant Hand (BOXER'S Fracture) Due to Axial Impact on Clenched Fist, Managed with 2 Percutaneous Pinning Using Bouquet Technique With 90-90 Method: a Case Series

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ABSTRACT

Introduction: this case series reports the results in 4 patients affected by closed fractures of the neck of the fifth metacarpal bone (boxer's fracture), treated with percutaneous elastic intramedullary nailing using two wires, to verify the effectiveness of this surgical treatment. We reviewed the results of 4 patients treated with 2 Kirschner wire (K-wires) pre-bent in a lazy-S fashion with a mild bend at approximately 5 millimeters, The K-wires is inserted blunt end first in an antegrade manner and the fracture reduced as the wire is passed across the fracture site. The MCP,DIP and PIP should all be flexed to 90 degree (90-90 method). The wire is usually removed with pliers post-operatively at four weeks in the OPD. The follow-up period averaged of 6 months. The parameters evaluated included angulation, rotational alignment, postoperative metacarpophalangeal (MCP) range of motion, and time to union. All the patients were reviewed clinically and radiologically at an average of 1st week, 2nd week, 4th week (for removal) 2,6 months after surgery. At the final follow-up, no patient reported residual pain and all fractures proceeded to bony union but we have one fracture which had superficial wound infections needed antibiotic treatment. We recommend that this minimally invasive: percutaneous intramedullary nailing using 2 k-wires in all metacarpal neck fracture(boxers' fractures), especially when severe swelling of the hand is present, with good functional results and low morbidity.

Keywords: Boxers fracture; 5th metacarpal bone fracture; Bouquet technique.

Introduction

Fractures of the metacarpal bones are very common injuries of the skeletal system and, in approximately 50% of the cases, involve the neck of the fifth metacarpal bone. The Metacarpal neck fractures are among the most common of hand fractures with those involving the fifth metacarpal (boxer's fractures) being the most common. These fractures result from a longitudinal compression force acting on a flexed metacarpophalangeal joint (MCP) — usually when a clenched fist strikes a solid object, The resultant fracture is usually unstable with volar angulation due to comminution of the volar cortex and the deforming action of the interossei These fractures are frequently observed in active young men, occur in the dominant hand and are typical injuries of aggression (boxer's fractures). Their treatment can be problematic, many treatments are numerous: functional treatment by a simple syndactylisation with risk of secondary displacement ;the Conservative treatment consists of a cast immobilization, but sometimes source of skin complications and there are various fixation techniques in use are: a direct osteosynthesis percutaneous pinning; plating and percutaneous transverse pinning.

The purpose of this study was to report the medium-term results in 4 patients affected by closed fractures of the neck of the fifth metacarpal bone (boxer's fracture), treated with percutaneous elastic intramedullary nailing using a single wire, to verify the effectiveness of this surgical treatment.

Case Series

Case-1: A 19 year old man presented to our Emergency department. Patient hit his clenched wrist to a wall due to frustration involving his exams.

He complained of pain, swelling along the ulnar aspect of the right hand. Physical examination showed swelling, discoloration, and limited range of motion in the little finger. Appropriate analgesia was given and the patient was sent with an arm sling to the X-ray department.

Patient was admitted and planned for surgical intervention. Under wrist block, volar Brunner incision was marked and the skin was incised. Reduction attempted and maintained in place with two percutaneous crossing K wires. Volar splint was applied.

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Case-2: A 31 year old man presented to Emergency department with trauma to his right hand. He complained of pain, swelling along the ulnar aspect of the right hand. Physical examination showed swelling, discoloration, normal neurovascular exam, and limited range of motion in the little finger. Appropriate analgesia was given and the patient was sent with an arm sling to the X-ray department.

Patient was admitted and planned for surgical intervention. Under wrist block, volar Brunner incision was marked and the skin was incised. Reduction attempted and maintained in place with two percutaneous crossing K wires. Volar splint was applied.

Case-3: A 31 year old man presented to Emergency department with work place injury to his right hand 2 weeks back.

He complained of pain, swelling along the ulnar aspect of the right hand. Physical examination showed swelling, normal neurovascular exam, and limited range of motion in the little finger.

Under wrist block, volar Brunner incision was marked and the skin was incised. Reduction attempted and maintained in place with two percutaneous crossing K wires . Volar splint was applied.

Case - 4: A 52 year old man presented to Emergency department with history of RTA .He complained of pain, swelling along the ulnar aspect of the right hand. Physical examination showed swelling, and limited range of motion in the little finger.

Patient was admitted and planned for surgical intervention. Volar Brunner incision was marked and the skin was incised. Reduction attempted and maintained in place with two percutaneous crossing K wires . Volar splint was applied. Post operatively, the entry point was infected and appropriate antibiotics were started. During last follow up patient was doing fine. Normal values for wrist ROM are 73 degrees of flexion, 71 degrees of extension, 19 degrees of radial deviation, 33 degrees of ulnar deviation, 140 degrees of supination, and 60 degrees of pronation.

Surgical technique:

After thorough clinical history and physical examination, standard radiographs are performed in the anterioposterior (AP); latero- oblique X-rays. Fracture angulation (whatever angulation) and /or any rotational deformity were the indications for surgical intervention. Reduction of displaced metacarpal neck fractures is best accomplished by using a technique developed by Jhass. The affected finger MCP joint and the proximal interphalangeal (PIP) joints are flexed to 90°, and the fracture is reduced by applying upward pressure on the middle phalanx and downward pressure over the dorsal apex of the fracture. Flexing of the MCP joint tightens the collateral ligaments and provides a rigid lever for reduction. The finger then can be used to control or correct the rotation. After reduction, the fracture is held via pinned to maintain reduction.

Two Kirschner wire (K-wires) is pre-bent in a lazy-S fashion with a mild bend at approximately 5 millimeters and a longer smooth curve bent in the opposite direction. Depending on the metacarpal dimensions, either a 1.6 or a 2.0 millimeter (mm) K-wire is used Under image intensifier .an initial entry point is made at the base of the involved metacarpal using a 2.5 mm drill wire by hand. A T piece mounted K-wire is then inserted blunt end first in an ante grade manner into the medullary canal after fracture reduction.

Final position of the reduction is checked on the fluoroscopy and the wire is cut and a light dressing is applied and the patient is given advice about pin site care. After we realizing syndactylisation with the 4th finger.

Anatomical results:

All fractures proceeded to radiological bony union without rotational or severe angulation deformities . The wire was extracted in all patients at a mean period of 4 weeks (range four to six weeks). All fractures were consolidated to 30 days evolution.

Functional results:

At final follow-up, the mean total passive motion was 285° (range 200°-325°) and the mean total active motion (TAM) was 270° (range 190°-310°). All of the patients achieved full extension of the little finger.

Discussion

Fifth metacarpal fractures are very common and easy to diagnose. While there is a universal agreement on the conservative management of displaced fractures, there are varied opinions regarding the acceptability of the degree of displacement and angulation of the distal fragment for conservative management. The acceptable volar angulation of metacarpal head in literature ranges from anywhere between 20 degrees to 70 degrees[1,2,3,4,5]. However some authors do not consider even 15 degrees of angulation acceptable.

The residual volar flexion deformity of the metacarpal neck may cause discomfort, pain in gripping, cramping, weakness, loss of endurance and even pseudo clawing[2,6,7].

Various experimental and biomechanical studies have confirmed the deleterious influences of residual angulation and metacarpal shortening on hand function[8,9].

A closed reduction of displaced metacarpal neck fracture is reported to be difficult to achieve and impossible to retain in reduced position by non-operative methods. By closed means using plaster splints, three point fixation cannot be achieved[10,11].

Green and Rowland mentioned that all the fractures of metacarpal neck are inherently unstable due to deforming muscle forces and volar comminution at the fracture site[12,13].

Therefore all the displaced metacarpal neck fractures qualify to be called as unstable as defined by Dabezies and Schutte, and would justify internal stabilization[14]. Ashkenaze and Ruby have called for reduction and stabilization of irreducible, rotated and unstable fractures of metacarpal neck[15].

This technique of bouquet osteosynthesis is simple, safe, minimally invasive, and maintains the reduction thus providing reliable fracture stability. It also preserves both carpo-metacarpal and metacarpo-phalangeal joints and spares the extensor hood and the tendon. It allows early mobilization and thus reduces the time off the work. This method compares favorably with the functional non-operative treatment with the main advantage being the restoration of metacarpal anatomy with its functional and cosmetic implications which is impossible to achieve with non-operative methods.

Conclusion

Antegrade k-wires, bouquet technique showed good functional and radiological results with fewer complications. We recommend that this minimally invasive: percutaneous intramedullary nailing using 2 k-wires in all metacarpal neck fracture (boxers' fractures), especially when severe swelling of the hand is present, with good functional results and low morbidity

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