KW's augmented external fixator.
Case study and unique technique.

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Summary
Fifth metacarpal fracture also known as a Boxer's fracture is following direct trauma and represent 10% of all metacarpal fracture. Treatment of fifth metacarpal fracture varies and is widely arguable between conservative treatment with plaster and different surgical techniques. This is a case representing a 19 years old young male with acute Boxer fracture after a direct hit with his right hand. The patient was treated using two KWs and PMMA. We believe that this technique a simple and cost-effective way improves stability and allows early protected movement to achieve a faster and better final result of treatment.

Introduction

Metacarpal fractures represent 40% of all hand fractures, (1) while fractures of the fifth metacarpal neck are not more than 10% of all hand fractures. (1) The males established five times higher than females. (2) Young males aged 10 to 19 have the highest incidence, followed by males aged 20 to 29(2). They commonly occur in different sports actions. (2)(3) Almost all orthopedic surgeons were involved in the treatment of this condition and usually used different tools to achieve better results.
Historically patients with Boxer's fractures present with dorsal hand pain after direct blow injury, swelling, possible deformity, and inability to active movement on their fifth finger. Appropriate physical exam of a fifth metacarpal fracture should include an examination of the injured hand, and a comparison to the contralateral hand, with special attention to skin, neurovascular exam, angulation, rotation alignment, and malrotation.
Treatment options include immobilization alone, usually, then angulation, not more than 30 degrees, without finger malrotation. Closed reduction and splitting are required with significant angulation of more than 30 degrees. Different analgesia options available include hematoma block and ulnar nerve block. For very young and sensitive patients, sedation is the preferable option. The injury should be immobilized with instric plus position using the ulnar gutter splint for adequate reduction support. (4)
Surgical treatment is considered for open fractures, multi-fragmental fractures associated with neurovascular injuries, and for fractures with any malrotation.

Case presentation

This is a case representing a 19 years old young male with injury to his right hand. In the emergency department, he was diagnosed as he suffered from acute Boxer (figure 1,2) fracture and was primarily treated with splinting. On his first follow-up in hand surgery at the outpatient clinic, the splint have been removed and malrotation was noted.
After the appropriate explanation of treatment options, including conservative and surgical treatment, the second option was decided by the patient.

Figure 1.

Figure 2.

Technique

The surgery is performed after the brachial plexus anesthesia in the supine position using by radiolucent hand table.

In the first step, the reduction has been performed using by “90-90 method”, where MCP, DIP, and PIP joints should all be flexed to 90 degrees. Under direct supervision using by C-arm fluoroscope, the appropriate reduction was achieved.
For obtaining the appropriate support of reduction, two smooth K-wires 1.5 mm were inserted. One proximal and one distal to the fracture line on the fifth metacarpal to the fourth metacarpal bone. The external part of the K-wires was bent and crossing over. Then the PMMA is applied over the crossed KW's. Finally, the external fixator is achieved (Figure 3,4,5) and was draped with a sterile bandage.

Figure 3.

Figure 4.

Figure 5.

The postoperative patient spent a few hours in the recovery room and was discharged with the following recommendations. The patient can apply movement of the wrist and fingers freely, with weight lifting restricted. The usual duration of treatment depends mainly on the presence of fracture union but does not exceed six weeks.

Discussion

The case presented in this study comprehends a young male with a fracture of the fifth metacarpal bone, also described in the literature as Boxer fracture, which is a known condition that is widely presented in the current literature.

Fifth metacarpal injuries are a common injury and most of them have a good outcome with conservative, nonoperative, treatment.

Treatment options are widely described in the literature from closed reduction with percutaneous pinning to open reduction with internal fixation.

Plate fixation considers a good treatment option, stable fixation, and allows the patient early active mobilization. However, plate fixation has many disadvantages including metacarpal head avascular necrosis, nonunion, severe tendon irritation, and a high rate of stiffness due to excessive soft tissue damage. (5)

Compare to the plate, the KW's are cheaper and available in different hospitals around the world. Various options of KW's are described such as antegrade, retrograde, crossed, and transverse. However, this type of treatment is also not without complications such is tendon and nerve injuries. (6)

First cases of rigid fixation of bones of the hand using KW's bonded with acrylic resin date by 1974. (7) Other work described the application of the mini external fixator for hand and fingers fractures with comminution or for open fractures with skin injuries. (8)
Despite previous work, the use of external fixation for the treatment of acute and isolated metacarpal fractures has not been reported. Using the describer technique above, we believe that placement of the KW's in the fourth metacarpal provides better stability to the system as the fracture is held between two rigid and stable structures, the cement, and the fourth metacarpal itself.
This simple external fixator is cheap and provides appropriate mechanical stability, thus allowing the patient to early mobilization after the surgery.
For future studies, this external fixator should be biomechanically investigated and then clinically evaluated to determine the correctness of our assumptions.

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