

APPLICATION OF JESS OR KIRSCHNER'S WIRES IN CLOSED FRACTURES OF HAND

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Article Received on 22/09/2021

Article Revised on 12/10/2021

Article Accepted on 01/11/2021

ABSTRACT

The human hand is the most vulnerable part of the body prone to a variety of injuries especially in industries, agricultural fields and increased road traffic accidents resulting in high incidence of phalangeal and metacarpal fractures particularly mutilating hand injuries, open fractures, comminuted fractures and intra-articular fractures. Herein we report two case studies where closed fractures of the hand managed with external and internal fixators and purpose of the case report is to evaluate the overall functional outcome of hand treated with Joshi's external stabilization system (JESS) for external fixation and kirschner's wires for internal fixation of closed metacarpal and phalangeal fractures.

KEYWORDS: Joshi's external stabilization system, Kirschner's wire, Metacarpophalangeal joint.**INTRODUCTION**

Human hand has evolved into an organ of exceptional function which is capable of complex movements & manipulation. Variety of functions vary widely from pinch grip, hook function to powerful grip for lifting heavy weights.^[1] The hand consists of a main body known as the palm and five digits - a thumb and four fingers. Each hand is attached to the forearm at the wrist joint. There are twenty-seven bones within the hand, arranged into three distinct groups- carpals, metacarpals and phalanges. Fractures of the metacarpals are the most common of hand fractures accounting for up to 40% and are usually the injury described as a broken hand by the general public.^[2] They are often neglected as minor injuries. Most of the fractures are treated conservatively, but some form of fixation is often indicated in unstable fractures, intra-articular fractures, open fractures and multiple fractures.^[3] Present case study showed that JESS external fixator is a better modality for stabilizing unstable closed fractures with soft tissue injuries.

Case Report 1

A 32 years old male presented to open patient door (OPD) with pain and swelling right hand after physical assault. He had difficulty in lifting weight and was not able to make fist. On examination there was tenderness over fifth metacarpal. Xray of right hand was done in anteroposterior (AP), lateral and oblique view (Figure 1). X ray shows spiral fracture of shaft of fifth metacarpal, right hand with volar angulation >40°, shortening of metacarpal >5mm with rotational deformity. The fracture was not reducible. Patient was counseled for surgical management, after taking anaesthetic clearance and

informed consent, patient was taken for surgery under axillary block. Closed reduction was achieved by traction and manipulation, for maintenance of reduction external fixator was applied by passing two kirschner's wires proximally and one distally. These were connected by using connecting rods and distraction was given (Figure 3,4). The patient was taught active mobilization of unaffected fingers, elbow and shoulder from immediate postoperative period. Pin tract dressings were done regularly and patient was called for follow up 2, 4 and 6 weeks (Figure 5,6). JESS was removed at fourth week with immediate mobilization of immobilized joint to avoid stiffness. Functional outcome was assessed based on active range of movements in degrees according to Duncan et al.⁴ and it was excellent with external fixator.

Case Report 2

A 26 years old male presented to open patient door (OPD) with pain and swelling left hand after fall on outstretched hand. He had difficulty in lifting weight. On examination there was tenderness over ring finger. X ray of left hand was done in anteroposterior (AP), lateral and oblique view (figure 2). X ray shows transverse comminuted fracture of shaft of proximal phalanx of ring finger. After taking anaesthetic clearance and informed consent, patient was taken for surgery under wrist block. Closed reduction was achieved by traction and manipulation, for maintenance of reduction internal fixation was done with two cross kirschner's wires (K-wires) (Figure 7,8). The patient was taught active mobilization of unaffected fingers, elbow and shoulder from immediate postoperative period. Pin tract dressings were done regularly and patient was called for follow up

2, 4 and 6 weeks. Kirschner's wires were removed at fourth week with immediate mobilization of immobilized joint to avoid stiffness. Functional outcome was assessed based on active range of movements in degrees according to Duncan *et al.*^[4] and it was good with internal fixation (Figure 9,10).



Figure 1: Xray showing fracture of fifth metacarpal (Case Report:1).



Figure 2: Xray showing fracture of proximal phalanx ring finger (Case report:2).



Figure 3: Fracture reduction and application of JESS (Anteroposterior view).



Figure 4: Fracture reduction and application of JESS (Oblique view).



Figure 5: Range of movements with JESS fixator.



Figure 6: Range of movements with JESS fixator.



Figure 7: X ray showing lateral view of cross K wire application in fracture proximal phalanx ring finger.



Figure 8: X ray showing anteroposterior view of cross K wire application in fracture proximal phalanx ring finger.



Figure 9: Range of movement after cross K wire application.



Figure 10: Range of movement after cross K wire application.

DISCUSSION

The management of hand injuries has always been the topic of controversy as there are so many different types of treatment with advantages and disadvantages. Most phalangeal and metacarpal fractures are treated conservatively. Patients with unstable fractures require operative reduction and stabilisation to obtain the optimal position for bone healing and to allow early movement.

The main objective of management is early skeletal stabilization and immediate motion of adjacent joints to prevent long term complications like joint stiffness. JESS external fixation is proved to be a suitable technique for stabilizing unstable, open fractures with severe soft tissue injuries. Kirschner's wires alone cannot provide a stable fixation as they need to be further supplemented with external splints to avoid complications like malunion.^[5] In addition, with these internal fixation methods, there may be a secondary displacement at fracture site, stiffness at wrist, metacarpophalangeal and proximal interphalangeal joint⁵ as seen in patients discussed in present case reports where patient managed with internal fixation achieved good functional outcome in comparison of excellent functional outcome achieved by patient treated with JESS fixator. In addition to this external fixator can provide distraction across the joint, which takes load off the articular fragments, thereby allowing them to heal without a deforming force. Second, traction across the joint and soft tissue can reduce fracture fragments through ligamentotaxis. Third, early active and passive range of movements allowed by this fixator prevent contractures or adhesions of the collateral ligaments, volar plate, and tendons. The continuous passive motion itself has been shown to help cartilage healing by supplying nutrition to and removing

waste products from the joints. Literature review suggests that an external fixator is a good option for treatment of these fractures.^[6-8]

CONCLUSION

Though Kirschner's wires are the preferred treatment in closed fractures, the external fixation method by JESS is much more stable with excellent results. Therefore in hand fractures, the use of JESS method would be more useful.

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