

Olecranon Fracture Treated with Locking Plate for Functional Evaluation: A Prospective Study

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Conflict of interest: Nil

Abstract

Aim: To evaluate the functional outcome assessment of olecranon fracture treated with locking compression plate. **Methods:** The prospective clinical study was conducted in the Department of Orthopaedics, All India Institute of Medical Science, Patna, Bihar, India for 18 months. 50 patients operated at a tertiary care centre for olecranon fracture. The mean age was 31.5 years and minimum follow up was 1 year. Patients with isolated olecranon fracture, age >18 years and trauma < 10 days of admission were included in this study. Polytrauma Patients excluded from this study. The Mayo Elbow Performance Index (MEPI) consists of four domains: pain (one item, maximum score 45 points), range of motion (20 points), stability (one item, 10 points), and function (5 items, 5 points each). Each domain is transformed into a 100-point scale with higher score representing better outcome. Maximum possible score can be 100, and the results are graded as excellent for scores >90; good for scores 75-89; fair for 60-74 and poor for scores less than 60. **Results:** In our study of 50 patients, 42 were males and 8 were females. Mean Age of the patient was 31.5 years (range 18 years to 50 years). There were 42 right sided fracture (84%). There were no bilateral cases. 39 patients (78%) had transverse fractures and 11 (22%) had oblique fractures. Comminuted fractures were seen in 7 patients. Most common mode of injury was fall on ground (92%), other being assault (8%). All the cases were operated in 1-7 days following injury. Mean operative time of tension band wiring was 47 minutes (range 28 minutes to 64 minute). The mean range of motion after 1 year was 108 degrees (range 79- 139 degrees). Average radiological union was seen at 8 weeks (range 5 weeks to 14 weeks). Hardware impingement was seen in 9 cases at 1 year follow up, infection was seen in 4 patients. Out of the 27 excellent outcomes, 15 Good, 4 fair and 4 show poor results. 39 had transverse fractures and 11 oblique fractures. The entire 4 poor outcome had comminuted fractures and large proximal fragment of olecranon. **Conclusion:** Tension band wiring is an effective method for treatment of transverse olecranon fractures and yields excellent to good functional outcomes in good percentage. Radiological union too is achieved in satisfactory duration.

Keywords: Olecranon Fractures, Outcome, Locking plate.

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Introduction

Olecranon fractures are one of the most commonly seen orthopaedic injuries in the

emergency room comprising approximately 10-20% of all upper

extremity fractures with an incidence of 11.5 per 100000 population per year[1-5]. Fractures of the olecranon show bimodal age distribution with younger individuals sustaining a fracture due to high energy trauma and older individual as a result of a simple fall due to osteoporosis[1,6,7]. Fractures of the olecranon process of the ulna typically occur as a result of direct trauma such as falling on the tip of the elbow or by indirect trauma such as falling on a partially flexed elbow with indirect forces generated by a strong sudden eccentric contraction of the triceps avulsing the olecranon[8,9]. A variable consensus exists on the optimal management strategies for these patients, with surgeon experience dictating the choice of management in some cases. Undisplaced fractures can be treated with a short period of immobilization followed by gradual mobilization. When displaced, open reduction and internal fixation are usually required to obtain anatomical realignment of the articular surface and restore normal elbow function. Goals of surgical fixation include restoring both the articular surface and the extensor mechanism of the elbow with sufficient stability to allow early range of motion[4,10]. There exists a variety of surgical techniques of which some are indicated for specific types of fractures including K-wire fixation with tension band wiring, and plating. The fixation should be stable to allow active elbow flexion and extension and promote union of the fracture. The active early mobilisation after surgery restores the patient to normal function as early as possible. The early and active movement not only prevents the tissue from disuse atrophy post fracture but greatly influences the quality and rapidity of fracture union. Displaced fractures that are comminuted show evidence of ulno-humeral incongruence. Comminuted fractures, fractures involving the coronoid process, oblique fractures that extends distal to the midpoint of the sigmoid notch are regarded as unstable and unsuitable for tension band wire fixation[11]. Fixation

using plating is considered the most appropriate mode of treatment for such fractures[12-15]. Comminuted olecranon fractures are fixed using plating because subchondral bony comminution opposite the tension band will cause failure in compression. The mechanical properties of the conventional plates and the locking plates show no significant difference[16]. Despite the above and the increasing cost, pre-contoured fixed angle locking plates provide a significant advantage over non-locking plates in unstable fractures. The use of a non locking plate in the fixation of the comminuted olecranon fractures may tend to decrease the radius of the greater sigmoid notch as a consequence of over reduction leading to malunion and joint incongruity. This is avoided by using a rigid fixed angle construct, as the pre-contoured nature of the implant aids in optimal placement[8,17].

Material and methods

The prospective clinical study was conducted in the Department of Orthopaedics, All India Institute of Medical Science, Patna, Bihar, India for 18 months. 50 patients operated at a tertiary care centre for olecranon fracture. The mean age was 31.5 years and minimum follow up was 1 year. Patients with isolated olecranon fracture, age >18 years and trauma < 10 days of admission were included in this study. Polytrauma patients were excluded from this study.

When patient was admitted, informed consent taken for operation and tension band wiring done in all with 2 K wires. The limb elevation in posterior slab for the first two days was done. Arm pouch applied after subsidence of swelling with this, gradual flexion extension. Exercises were started as tolerated by the patient. Follow up was at done at 4weeks, 8 weeks 6 months and 1 year. Radiological assessment was done with X-rays and functional assessment was done using Mayo elbow performance score (MEPS). The Mayo Elbow Performance Index (MEPI) consists of four domains: pain (one item, maximum score

45 points), range of motion (20 points), stability (one item, 10 points), and function (5 items, 5 points each). Each domain is transformed into a 100-point scale with higher score representing better outcome.¹⁸ maximum possible score can be 100, and the results are graded as excellent for scores >90; good for scores 75-89; fair for 60-74 and poor for scores less than 60.

Results

In our study of 50 patients, 42 were males and 8 were females. Mean Age of the patient was 31.5 years (range 18 years to 50 years). Table 1.

There were 42 right sided fractures (84%). There were no bilateral cases. 39 patients

(78%) had transverse fractures and 11 (22%) had oblique fractures. table 2

Comminuted fractures were seen in 7 patients. Most common mode of injury was fall on ground (92%), other being assault (8%). All the cases were operated in 1-7 days following injury. Mean operative time of tension band wiring was 47 minutes (range 28 minutes to 64 minute). The mean range of motion after 1 year was 108 degrees (range 79- 139 degrees). Average radiological union was seen at 8 weeks (range 5 weeks to 14 weeks). Hardware impingement was seen in 9 cases at 1 year follow up, infection was seen in 4 patients. The overall average MEPS was 90 (range 80-99). Functional outcome was as depicted in table 1

Table 1: Gender and age distribution

Gender	Number of patients	%
Male	42	84
Female	8	16
Mean Age in years	31.5	

Table 2. Side and types of fractures

Side	Number =50	%
Right	42	84
Left	8	16
Types of fractures		
transverse fractures	39	78
oblique fractures	11	22

Table 3: functional outcome

Functional outcome	No of patients	%
Excellent	27	54
Good	15	30
Fair	4	8
Poor	4	8

Out of the 27 excellent outcomes, 15 Good, 4 fair and 4 show poor results. 39 had transverse fractures and 11 oblique fractures. All the 4 poor outcomes had comminuted fractures and large proximal fragment of olecranon.

Discussion

To achieve early movements and to prevent complications like traumatic arthritis and joint stiffness we need a perfect anatomical reduction in intraarticular fractures like fractures of the olecranon. Tension band wiring converts tensile forces to compressive forces at the fracture site and thus provides strength of fixation.

In our study, olecranon fractures showed a higher prevalence among men i.e., 42(84%) and female patients being 8(16%). Rommens et al.[19] in his study also reported increased prevalence in male. In 1992, Hume and Wiss and in 1993 fan et al. Reported that union was achieved in about 14 weeks[20,21]. In 1987 Wolfgang g et al. Postulated that a stable fixation with a high union rate is usually provided by tension-band wiring for simple non-comminuted transverse olecranon fractures[22]. In our study hardware impingement was seen in 9 patients (18%) and infection in 4 (8%). Macko et al., Yi Ming Ren et al., Matar he et al. reported similar complications as reported in our study[23-25]. An incidence of non-union of about 1% was reported by Papagelopoulos and Morrey in 1994[26]. Evaluation of functional outcome was done according to Mayo Elbow Performance Scoring System (MEPS). Maximum score is 100 and functional outcome is graded as excellent for scores >90; good for scores 75-89; fair for 60-74 and poor for scores less than 60. In our study we had excellent results in 27 patients (54%) better than that of Ahmed et al. (40%) however good results were obtained in 30% of cases in our study which is less than that obtained by Ahmed et al.[27] Mean range of motion in our study was comparable to other studies like that by Chalidis et al. and Lindenhovius et al. And somewhat superior to that of Van Der Linden et al. In terms of range of motion[28-30]. In his study of 52 patients, Rettig et al. reported ulnar nerve palsy in only 1 that too resolved spontaneously[31]. In our study, we had no patient with ulnar nerve palsy.

Conclusion

Tension band wiring is an effective method for treatment of transverse olecranon fractures and yields excellent to good functional outcomes in good percentage. Radiological union too is achieved in satisfactory duration. Young males, transverse fractures, smaller proximal fragment of olecranon and those compliant

to early physiotherapy show good functional outcomes.

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