

Assessing and comparing Functional outcome in Olecranon fracture managed by tensionband wiring and transcortical screw fixation

Shankar S¹, Abdul Rasheem PT^{2*}, Saj Sreejesh³

¹Assistant Professor, Department of Orthopaedics, PK DAS Institute of Medical Sciences, Ottapalam, Kerala, India

²Assistant Professor, Department of Orthopaedics, PK DAS Hospital, Ottapalam, India

³Assistant Professor, Department of Orthopaedics, Al Azhar Medical College and Super Speciality Hospital, Thodupuzha, Kerala, India

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Abstract

Background: Olecranon fractures typically involve the articular surface of the elbow. Plate and screw fixation is recommended for unstable fracture patterns with significant comminution or a fracture line exiting distal to the semilunar notch (Mayo Type 2B) and fracture-dislocations (Mayo Type 3). Intramedullary nails are now available and may be suitable for some fracture types. Intramedullary devices may avoid the wound complications related to the superficial location of traditional hardware used to treat olecranon fractures. The present study was undertaken for assessing and comparing Functional outcome in Olecranon fracture managed by tension band wiring and transcortical screw fixation. **Materials & methods:** This prospective randomized study was conducted on 30 patients with olecranon fractures. All the patients were broadly divided into two study groups: Group 1 and Group 2. Group 1 patients were managed by Tension band wiring and Group 2 patients were managed by Transcortical screw fixation. Initial follow up was done at 1, 4 and 6 weeks after discharge and all patients were followed up for 6 months. Radiological, clinical and functional assessment was done using Mayo Elbow Performance Score. **Results:** Mean duration of surgery among the patients of the tension band wiring group and transcortical screw fixation group was 38.4 minutes and 48.1 minutes respectively. Mean range of motion on follow-up among the patients of the tension band wiring group and transcortical screw fixation group was 103.1° and 102.1° respectively. Mean time for complete union among the patients of the tension band wiring group and Transcortical Screw Fixation group was 11.58 weeks and 11.47 weeks respectively. Non-significant results were obtained while comparing the outcome among the patients of both the study groups. **Conclusion:** Tension band wiring is better than transcortical screw fixation in terms of duration of surgery. At the same time, tension band wiring has higher chances of development of superficial infection in comparison to transcortical screw fixation.

Key words: Olecranon Fracture, Tension Band, Transcortical.

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Introduction

Fractures around the elbow represent approximately 5.5% of fractures of the entire skeleton of which radial head fractures are seen most frequently (2.8%), followed by fractures of the olecranon and radial neck (1% each), the distal humerus (0.5%), and extra-articular fractures of the proximal radius and ulna (0.2%). [1, 2]

Olecranon fractures typically involve the articular surface of the elbow. Posttraumatic arthritis occurs in approximately 20% of cases and persistent malreduction >2mm is associated with this outcome. In fractures with significant comminution, inadvertent malreduction by narrowing the greater sigmoid notch may further predispose the patient to arthritis [3]. The goals of treating olecranon fractures are anatomic restoration of the articular surface, repair of the elbow extensor mechanism, restoration of joint stability and motion, and prevention of stiffness and other complications. Treatment options include immobilization, surgical reduction and fixation with tension-band wiring or plate osteosynthesis, and excision of the proximal fragment with triceps advancement [4].

Treatment involves immobilization of the elbow in a posterior splint, orthosis, or long-arm cast in approximately 90° flexion for approximately 3 weeks, followed by progressive active elbow ROM and strengthening. Operative fixation should be performed when there is articular incongruity or disruption of the extensor mechanism [5]. Tension-band wiring usually provides stable fixation with a high union rate for simple noncomminuted transverse olecranon fractures. A tension-band construct converts the tensile distraction force of the triceps into a compressive force at the articular surface [6].

Plate and screw fixation is recommended for unstable fracture patterns with significant comminution or a fracture line exiting distal to the semilunar notch (Mayo Type 2B) and fracture-dislocations (Mayo Type 3). An oblique fracture line may be amenable to a lag screw alongside the plate. Intramedullary nails are now available and may be suitable for some fracture types. Intramedullary devices may avoid the wound complications related to the superficial location of traditional hardware used to treat olecranon fractures [7,8]. Hence; under the light of above mentioned data, the present study was undertaken for assessing and comparing Functional outcome in Olecranon fracture managed by tension band wiring and transcortical screw fixation.

Materials & methods

This prospective randomized study was conducted on 30 patients with olecranon fractures. Detailed history, general physical examination,

*Correspondence

Dr Abdul Rasheem PT

Assistant Professor,

Department of Orthopaedics, PK Das Hospital, Ottapalam, Kerala, India.

E-Mail: rasheem36@gmail.com

systemic and local examination and tests were recorded as per the proforma. Lateral, anteroposterior graphic views of the elbow was taken. All the patients were broadly divided into two study groups: Group 1 and Group 2. Group 1 patients were managed by Tension band wiring and Group 2 patients were managed by Transcortical screw fixation. Initial follow up was done at 1, 4 and 6 weeks after discharge and all patients were followed up for 6 months. Radiological, clinical and functional assessment was done using Mayo Elbow Performance Score. All the results were analysed by SPSS software. Chi-square test, Mann-Whitney U test and student t test were used for assessment of level of significance. P-value of less than 0.05 was taken as significant.

Results

Mean age of the patients of the tension band wiring group and transcortical screw fixation group was 42.3 years and 44.48 years respectively. 66.67 percent of the patients of the Tension band wiring group and 73.33 percent of the patients of the transcortical screw

fixation group were males while the remaining were females. Mean duration of surgery among the patients of the tension band wiring group and transcortical screw fixation group was 38.4 minutes and 48.1 minutes respectively. Mean range of motion on follow-up among the patients of the tension band wiring group and transcortical screw fixation group was 103.1° and 102.1° respectively. While comparing the mean range of motion among the patients of both the study groups, non-significant results were obtained. Mean time for complete union among the patients of the tension band wiring group and Transcortical Screw Fixation group was 11.58 weeks and 11.47 weeks respectively. In the patients of the tension band wiring group, excellent results were seen in 80 percent of the patients while good results were seen in 13.33 percent of the patients. Among the patients of the transcortical screw fixation group, excellent results were seen in 66.67 percent of the patients while good results were seen in 20 percent of the patients. Non-significant results were obtained while comparing the outcome among the patients of both the study groups.

Table 1: Duration of surgery

Duration of surgery (Minutes)	Tension Band Wiring	Transcortical Screw Fixation	p- value
Mean	38.4	48.1	0.01 (Significant)
SD	2.69	5.7	

Table 2: Range of motion on follow-up

Range of motion on follow-up	Tension Band Wiring	Transcortical Screw Fixation	p- value
Mean	103.1°	102.1°	0.11
SD	5.86°	5.25°	

Table 3: Time for complete union

Time for complete union	Tension Band Wiring	Transcortical Screw Fixation	p- value
Mean	11.58	11.47	0.15
SD	3.16	3.58	

Table 4: Mayo elbow performance score grading

Mayo elbow performance score grading	Tension Band Wiring		Transcortical Screw Fixation	
	Number of patients	Percentage	Number of patients	Percentage
Excellent	12	80	10	66.67
Good	2	13.33	3	20
Fair	1	6.67	1	6.67
Poor	0	0	1	6.67
Total	15	100	15	100

Discussion

Olecranon fractures are frequently encountered in the practice of orthopedic surgery with a prevalence of 60% among patients with a fracture of the proximal ulna. Generally, the treatment of choice for displaced olecranon fractures is open reduction and internal fixation. The AO tension band technique provides sufficiently strong fracture fixation to result in a low non-union rate but has other common complications[9- 12]. Hence; under the light of above mentioned data, the present study was undertaken for assessing and comparing Functional outcome in Olecranon fracture managed by tension band wiring and transcortical screw fixation.

In the present study, mean age of the patients of the tension band wiring group and transcortical screw fixation group was 42.3 years and 44.48 years respectively. 66.67 percent of the patients of the Tension band wiring group and 73.33 percent of the patients of the transcortical screw fixation group were males while the remaining were females. Mean duration of surgery among the patients of the tension band wiring group and transcortical screw fixation group was 38.4 minutes and 48.1 minutes respectively. Mean range of motion on follow-up among the patients of the tension band wiring group and transcortical screw fixation group was 103.1° and 102.1° respectively. While comparing the mean range of motion among the patients of both the study groups, non-significant results were obtained. In a previous study conducted by Duckworth AD et al, authors compared the outcomes of tension-band wire (TBW) and plate fixation for simple isolated, displaced fractures of the olecranon. They performed a prospective randomized trial involving 67 patients who were ≥16 to <75 years of age and had an acute isolated, displaced fracture of the olecranon. Patients were randomized to either TBW (n = 34) or plate fixation (n = 33) and were evaluated at 6 weeks, 3 months, 6 months,

and 1 year following surgery. The primary outcome measure was the Disabilities of the Arm, Shoulder and Hand (DASH) score at 1 year. The groups also did not differ significantly in terms of range of motion, the Broberg and Morrey score, the Mayo Elbow Score, or the DASH at all assessment points over the 1 year. The complication rate was higher following TBW fixation and was due to a higher rate of implant removal in symptomatic patients. However, the more serious complications of infection and the need for revision surgery occurred exclusively following plate fixation in this trial[13].

In the present study, mean time for complete union among the patients of the tension band wiring group and Transcortical Screw Fixation group was 11.58 weeks and 11.47 weeks respectively. In the patients of the tension band wiring group, excellent results were seen in 80 percent of the patients while good results were seen in 13.33 percent of the patients. Among the patients of the transcortical screw fixation group, excellent results were seen in 66.67 percent of the patients while good results were seen in 20 percent of the patients.

Non-significant results were obtained while comparing the outcome among the patients of both the study groups. Hsu KL et al, in another study, conducted retrospective cohort study recruited consecutive patients underwent surgical fixation for patellar fractures using modified tension band technique. The rates of loss of reduction and implant breakage were significantly higher in the distantly placed tension bands. Regarding depth, 37 patellar fractures were fixed with the Kirschner wires at the superficial one third of the patellae while the K-wires at the middle layer of patella were used in the remaining 133 patellar fractures. The location of the tension band with respect to the superior and inferior border of the patella plays an important role in clinical outcomes. Placing the wire close to the patella may prevent major loss of reduction and implant breakage. Superficially placed

Kirschner wires also affect clinical outcomes by increasing the rate of minor loss of reduction[14]. In a previous study conducted by Powell AJ et al, authors compared clinical outcomes, morbidity and the cost of treatment of TBW versus pre-counter low-profile locking plates for the treatment of Mayo 2A fractures. Patient outcomes were recorded using the QuickDASH (Disabilities of Arm, Shoulder and Hand) score. Eighty-nine patients had Mayo 2A fractures (69%). Sixty-four underwent TBW (n = 48) or locking plate fixation (n = 16). There were no complications and no reoperations in the 16 patients who received locking plate fixation. Both complication and reoperation rates were statistically significantly different. Despite being initially more expensive, when the cost of reoperation for TBW group was included, locking plates were found to be on average £236.33 less per patient than for TBW. They concluded that locking plates are superior to TBW concerning post-operative morbidity, reoperation rate and cost for Mayo 2A fractures[15].

Conclusion

Tension band wiring is better than transcortical screw fixation in terms of duration of surgery. At the same time, tension band wiring has higher chances of development of superficial infection in comparison to transcortical screw fixation.

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