

Comparison of tension band wiring and precontoured locking compression plate fixation in mayo type IIA olecranon fractures

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Abstract

Background: Fractures of the elbow account for up to 7% of all fractures in adults, with approximately 37% affecting only the olecranon. Olecranon fractures are one of the commonly seen orthopaedic injuries in the emergency room. Fractures of the Olecranon process of the Ulna typically occurs as a result of motor-vehicle or motorcycle accident, a fall or assault

Methods: This was a hospital based prospective randomised comparative study .Patients Attending Department of orthopaedics as OPD/IPD patients’ basis included in study group after taking informed written consent.

Results: 80% patients of plating group and 66.7% patients of TBW group shown excellent results at 6

months MEP Score. One patient of plating shown poor score. No patient of TBW group shown poor result.

Conclusion: In conclusion, the findings of this trial demonstrate no clear patient or surgeon-reported benefit of plate fixation over the current gold standard of TBW in active patients with a simple isolated, displaced fracture (MAYO type 2A) of the olecranon. Hardware related complication is more in TBW group. But it is lesser cost, simpler and less duration surgery. However, we believe that patients should be counseled regarding the high rate of metalwork removal in symptomatic patients following the TBW technique.

Keywords: TBW, MEP, Olecranon.

Introduction

Fractures of the elbow account for up to 7% of all fractures in adults, with approximately 37% affecting

only the olecranon. Olecranon fractures are one of the commonly seen orthopaedic injuries in the emergency room. Fractures of the Olecranon process of the Ulna typically occurs as a result of motor-vehicle or motorcycle accident, a fall or assault¹. Anatomically the olecranon process is large curved eminence comprising of proximal and posterior part of ulna. It lies subcutaneously which make it vulnerable for injury. Simple displaced transverse fracture accounts for 85% of all olecranon fractures. Degree of comminution depends on severity of trauma. A classification in the clinical practice is the Mayo classification, which takes the degree of displacement, stability and comminution into account. Mayo type I fractures are non-displaced and stable, type II fractures are stable and displaced but with intact collateral ligaments preventing dislocation of the elbow joint. Type II is divided in type IIa without comminution and type IIb with comminution fracture included. Type III fractures the elbow joint is unstable. The fracture further subdivided into A (no comminution) and B (comminuted fractures). Type III fractures are associated with poorer results due to the instability of the elbow joint². Non displaced olecranon fractures can be treated with a short period of immobilization followed by gradually increasing range of motion. When displaced, open reduction and internal fixation are usually required to obtain anatomical realignment of the articular surface and restore normal elbow function. The fixation should be stable, allow active elbow flexion and extension and promote union of the fracture.³ Fractures are intraarticular fractures so uneven articular surface can cause limited activity, delayed recovery, traumatic arthritis and other complications so accurate reduction and rigid fixation and early mobilization are effective measure to prevent joint instability and occurrence of osteoarthritis.

Therefore treated operatively in order to restore congruency regain absolute stability.

Material and Methods

This was a hospital based prospective randomised comparative study. Patients Attending Department of orthopaedics as OPD/IPD patients' basis included in study group after taking informed written consent.

Randomization

After providing informed consent, patients were randomized to undergo either TBW or plate fixation. This was performed by block randomization (n = 4) using sequential closed opaque envelopes, which were prepared by our statistician and contained a card detailing to which of the 2 groups (TBW or plate) the patient had been randomized. Randomization was on a 1:1 basis. The present study consists of 60 cases of fracture olecranon Mayo type 2A treated by Tension band wiring with Kirshner wire and Precontoured LCP 30 cases each group at Department of orthopaedics, SMS Medical College, Jaipur, Rajasthan between AUG.2018 to completion of sample size. Study was conducted with due emphasis for clinical observation and analysis of results after surgical management of fractures of olecranon by Krishner wires with Tension band wiring and Precontoured LCP.

Statistical Analysis

1. The collected data was revised, coded, tabulated and introduced to a PC as master sheet.
2. The data was compiled using MS-Excel 2007 worksheet and analysed using primer and SPSS software(trial version).
3. Quantitative variables expressed as expressed as mean and SD.
4. Qualitative variables expressed as frequencies and percent.

5. Appropriate statistical tests applied to obtain results.
6. A significance level of $P < 0.05$ will be used in all tests.

Observations

Mean age is 40.28 yr in our study. No significant difference between age groups between both study groups. Mean duration of surgery in plate group was 119.67 minutes and TBW group was 66.67 minutes.

Male (78.3%) dominated the incidence in comparison to female in this study owing to their more outdoor activity. 73.3% cases in plate group and 83.3% cases in TBW group were male. R.T.A. was most common mode of injury (61.7% cases) in our study. R.T.A. was most common mode of injury between both groups. No significant difference between mode of injury between both study groups. Incidence was more on right side (56.7%)

Table 1: Movement at Elbow Joint-on Follow Up Follow up

Follow-up	ROM	LCP		TBM		p-value
		Mean	SD	Mean	SD	
9 Weeks	Flexion Arc	81.50	19.26	66.50	19.34	0.004
	Pronation	67.33	9.80	65.17	7.82	0.348
	Supination	66.50	8.11	65.17	9.51	0.531
3 Months	Flexion Arc	99.83	21.99	90.17	25.61	0.122
	Pronation	74.00	11.01	73.13	10.98	0.761
	Supination	73.33	12.61	73.00	10.30	0.961
6 months	Flexion Arc	121.33	27.66	112.33	28.70	0.221
	Pronation	79.33	10.14	79.17	10.26	0.950
	Supination	80.43	10.55	79.33	11.57	0.702

No significant difference between both study groups for forearm flexion arc and pronation and supination at 3 and 6 months.

Table 2: Radiological Union

Time Union (weeks)						
Group	N	Mean	SD	Median	Maximum	p-value
LCP	30	12.53	2.515	10	18	0.744
TBW	30	12.73	2.196	10	18	
Total	60	12.63	2.343	12	18	

Mean union time was 12.63 weeks in this study overall.

Table No. 3. Complication rate in different treatment group

Complication	LCP		TBW		Total	
	No	%	No	%	No	%
Infection	1	3.33	1	3.33	2	3.33
Neuropraxia	1	3.33	1	3.33	2	3.33
K Wire pulled out	0	0.00	1	3.33	1	1.67
Later on plate exposed	1	3.33	0	0.00	1	1.67
Metal plate prominence pain on tapping	9	30.00	0	0.00	9	15.00
Metal wire irritation	0	0.00	16	53.00	16	26.00

One TBW case got superficial infection. Which was treated by alternate day dressing and oral antibiotic. One plating case got infection, dressing done and oral antibiotics started. Later on plate got expose. Plate removal done after fracture union. One case of both group got ulnar nerve neuropraxia. Which recovered it self within two months. Pulling out of k wire occurred in one case of TBW, on mobilisation exercises, implant removal done after fracture union. 53% cases of TBW group complaint of metal wire irritation and 30% cases of plating complaint about metal plate prominence and

pain on tapping. Follow up in this study was of 6 months.

In the past, closed reduction and plaster cast application was the treatment for fracture of olecranon. But prolonged immobilization with its own complications increased the morbidity and mortality of patients.³ So keeping this in consideration, it has become important to intervene surgically. The active mobilisation after surgery will restore the patient to normal function as early as possible. The early and active movement not only prevents the tissue from fracture disease but greatly influences the quality and rapidity of fracture.

Table 4: Outcome according to MEPS

Outcome according to MEPS	LCP		TBW		Total	
	No	%	No	%	No	%
Excellent	24	80.00	20	66.67	44	73.3
Good	2	6.67	5	16.7	7	11.7
Fair	3	10	5	16.7	8	13.3
Poor	1	3.33	0	0.00	1	1.7
Total	30	100.00	30	100.00	60	100.00

Chi-square = 3.149 with 3 degrees of freedom; P = 0.500
80% patients of plating group and 66.7% patients of TBW group shown excellent results at 6 months MEP Score. One patient of plating showed poor score. No patient of TBW group shown poor result.

Discussion

The main aim of the treatment of olecranon fracture is not only achieving union but to preserve the optimum function of the adjacent soft tissues and joints. In the management of intra articular fractures like fractures of the olecranon, a perfect anatomical reduction of the

fragments to obtain articular congruity and rigid fixation of the fragments is of utmost importance, if early movements are to be instituted to prevent complications like traumatic arthritis and joint stiffness. In our study 60 cases of fractures of the olecranon were treated with Tension band wiring (30 cases) and Kirschner wires, Precontoured LCP (30 cases). The findings, the end results and various other data analysed and compared in the following discussion.

There was greater flexion arc and forearm rotation arc in plating group at 9 week follow up but at 3 month and 6 month follow up no significant difference was found. Duckworth et al⁴ also didn't find significant difference between outcome at 1 yr between TBW and PLATE group.

Hume and Wiss⁵ found overall superior outcome in plate fixation group (86% good) compared with 47% in TBW group.

Complications Mostly hardware related complications were reported in both group. It was more in TBW group (56%) then in LCP group (30%).Hume and Wiss compared TBW and one third tubular plate in their series of TBW (n=19) or plate fixation (n=22).they too found higher complications rate for TBW group. Villanueva⁶ also reported series of 37 patients treated with TBW for olecranon fracture. Hardware removal was necessary in 46% patients. Benedikt et al⁷ (2014) also found that implant related irritation requiring hardware removal was more in TBW group. Implant removal needed due to irritation was 12 out of 13 in TBW and 7 out of 13 in PLATE group.

Duckworth et al⁴ (2017) also found significantly higher complications in TBW group (63% compared with 38%. p=0.042) predominantly because of significantly higher rate of removal of metal work. K wire migration found in Benedikt et al⁷ (2014) also found equal

infection rate between both study groups. Duckworth et al⁴ (2017) did study to compare TBW and LCP .In that study infection occurred only in plate group (13%). 8) Outcome according to MEPSThere is no significant difference in functional outcome as assessed by MAYO elbow performance score at 3 months and 6 months between both study groups. Villanueva³⁸ found superior result in plating group.

Benedikt et al⁷ (2014) found MEPS good to excellent in 92% cases of LCP and 77% cases of TBW IN 43 months follow up. Duckworth et al⁴⁶ (2017) didn't find any significant difference in MEPS at 6 months and 1 yr in TBW and plating group. Taking clinical and radiographic outcome as well as complications and procedure related costs into account, only disadvantage of TBW is high implant related complication. A primary limitation of the study was the lack of blinding of both the surgeon and the patient to the allocated treatment arm. It is argued that this is pragmatic in that, in routine clinical practice, patients would always be aware of their proposed treatment.

The study was also limited by the fact that multiple surgeons were involved over the study period, although again, this is pragmatic and reflective of day- to-day clinical practice. We acknowledge the subjective nature of the decision to remove an implant, and it could be argued that these findings, including in relation to cost, are most applicable to our center. However, it is not routine in our unit to remove implants following Discussion 79 olecranon fracture fixation unless the patient is symptomatic, and and before 6 months. A further limitation to acknowledge is the short duration (6 months) of study. In this short duration we couldn't compare rate of removal of implant & posttraumatic arthritis in both group

Conclusion

In conclusion, the findings of this trial demonstrate no clear patient or surgeon-reported benefit of plate fixation over the current gold standard of TBW in active patients with a simple isolated, displaced fracture (MAYO type 2A) of the olecranon. Hardware related complication are more in TBW group. But it is lesser cost, simpler and less duration surgery. However, we believe that patients should be counseled regarding the high rate of metalwork removal in symptomatic patients following the TBW technique.

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