

Outcome assessment of Tension band wiring of Mayo type IIA olecranon fractures in tertiary care facility in Bihar, India

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Abstract

Aim: Clinico-radiological and functional outcome of Mayo type IIA olecranon fractures managed with tension band wiring in a tertiary care centre in Bihar, India.

Methods: This observational prospective study conducted in the Department of Orthopaedics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India, for 10 months. 20 Patients were included in the study after proper history, clinical examination, written informed consent for surgery and anaesthesia, and explaining the complications before the surgery. Functional outcome was assessed by Mayo Elbow Performance Score, at 6-month follow-up, consisting of four parameters: pain (maximum score = 45 points), range of motion (maximum score=20 points), stability (maximum score = 10 points), function (5 items, 5 points for each). Isolated olecranon fracture, Mayo type IIA fractures. Age, 18- 70 years. Closed fractures. Duration of trauma less than 2 weeks.

Results: Out of 20 patients, 17 patients had clinical union at 8 weeks and 3 achieved clinical union at 9.5 weeks, with an average healing at 8.8 weeks. In 17 patients, radiological union was achieved at 11.9 weeks and in 3 patients the radiological union was achieved at 13.1 weeks, with an average radiological union at 12.5 weeks. Patients were functionally evaluated on the basis of MEPS at 6 months. The mean flexion was 132.6 degree, mean extension loss was 8.3 degrees, mean arc motion was 124.5 degree. The average MEPS was 91.5. In the present study, at 6 month follow up, 17 patients had no pain, 3 patients had pain at the extremes of motion. Out of 20 patients, (n=16, 80%) had excellent outcome, (n=2, 10%) had good outcome, (n=1, 5%) had fair outcome, (n=1, 5%) had poor outcome. Superficial wound infection was seen in n=1, 5% of patients which was managed by wound wash and antibiotics.

Conclusion: Tension band wiring is an effective method for the treatment of transverse, non-comminuted and unstable fractures of the olecranon which provides stable fixation, early rehabilitation and gives excellent results when done in expert hands.

Keywords: Olecranon, tension band wiring, outcome.

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Introduction

Olecranon fractures are intra-articular fractures accounting for 10% of all upper limb injuries.[1] The primary aim of treatment is to restore function without pain. Tension band wiring (TBW) is the preferred treatment option for most non-comminuted fractures due to ease of technique and good outcomes[1,6] Complications of this technique include median nerve palsy, hardware prominence, hardware back-out, and symptoms from the retained implant[4,7] Alternate methods of fixation have been studied to reduce these complications.[8,11] Very few studies have investigated the use of 4.0-mm screws for fixation with most published research based on a small number of patients, cadaveric studies, or synthetic bone constructs.[4,9] The Mayo classification guides the treatment on the basis of displacement and ulnohumeral joint stability: Type I, non-displaced fractures, treated non-operatively, type II are displaced, stable and require surgical treatment, type III are displaced and unstable, need surgical treatment.[12] Each type has subtypes, A= non comminuted and B= comminuted. The most common complications in the patients after tension band wiring are pain and hardware symptoms due to migration of K-wires.[12,13]

Material and methods

This observational prospective study conducted in the Department of Orthopaedics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India, for 10 months, after taking the approval of the protocol review committee and institutional ethics committee.

Methodology

20 Patients were included in the study after proper history, clinical examination, written informed consent for surgery and anaesthesia, and explaining the complications before the surgery. Functional outcome was assessed by Mayo Elbow Performance Score, at 6 month

follow-up, consisting of four parameters: pain (maximum score = 45 points), range of motion (maximum score=20 points), stability (maximum score = 10 points), function (5 items, 5 points for each).[14] Maximum score can be 100, and the results are graded as excellent if score >90; good if score of 75-89; fair if score of 60-74 and poor for score <60. Pain was evaluated using Visual Analogue Scale[15]

Inclusion criteria

Isolated olecranon fracture
Mayo type IIA fractures
Age 18- 70 years
Closed fractures
Duration of trauma less than 2 weeks

Exclusion criteria

Olecranon fractures with fracture dislocation and terrible triad injuries, compound fractures, fractures presenting after 2 weeks, polytrauma patients.

Investigations

X-rays with anteroposterior and lateral views, CT scan was also done in doubtful and complex fractures. All baseline investigations were done prior to surgery. Informed written consent was taken and antibiotic prophylaxis was given.

Operative technique

The patient was placed in supine position. A posterior midline incision was made, starting over olecranon tip extended proximally and distally. After fracture reduction, two parallel 1.8mm Kirschner wires were placed in the ulna from olecranon tip proximally to distal aspect across the fracture, to engage in the anterior cortex of the proximal shaft of ulna. A transverse tunnel was made with Kirschner wire about 4 cm distal to the fracture site. 18 gauge stainless steel wire was placed in the figure of eight configuration, which was tensioned to reduce, fix and stabilize the fracture fragments. The parallel K-wires achieve the best force transmission across

the fracture[16] Long K-wires may cause vascular and nerve injuries.[17,18] Transcortical K-wires provide higher stability and reduce the risk of wire migration.19 [15]Two wire knots provide greater stability than a single knot[20,21]

Post-operative treatment

The limb was elevated and placed in above elbow slab for 2-3 days. Post-operative intravenous antibiotics and analgesics were given. Immediate postoperatively, check X-rays were done. Early range of motion exercises was started at 3rd post-operative day. Sutures were removed at 14th post operative day. The patients were followed up to 6 months to 1 year, and were assessed clinically and radiologically at 2 weeks, 6 weeks, 3 months, 6 months, 12 months. At 6 months, patients were assessed by MEPS.

As this study was not a comparative study, simple statistical methods of mean and percentage were used.

Results

The total number of patients presented with olecranon fractures was 27, out of which 20

patients (74.07%) had Mayo type IIA fractures, followed by 4 patients (14.81%) which had Mayo type IIB fractures, 2 patients (7.41%) had Type IIIA fractures, and 1 patient (3.70%) had Type IIIB fracture.

Our study was conducted on 20 patients with Mayo type IIA, out of which 14 were males and 6 were females. Most common mode of injury was fall from standing height (80%), followed by road traffic accident (15%) and assault (5%). The age range was between 18 to 70 years, with mean age of 41.5 years. Majority of the patients had trauma on the right side (right side = 15, left side = 5). 14 patients were males, 6 were females. Out of 20 patients, 14 patients reported on the same day, 4 patients reported on third day of injury, 2 patients reported after 1 week of injury.

Out of 20 patients, 17 patients were operated within 1 week of trauma and 3 patients were operated within 10 days of trauma. Mean operating time was 51 minutes (range = 33 to 58 minutes).

Table 1: Gender distribution of patients

Gender	No. of patients	%
Male	14	70
Female	6	30

Clinico-radiological consolidation

Clinical union was achieved when there was no pain and tenderness at the fracture site and there was no abnormal mobility in two planes. Radiological union was achieved when the fracture line was obscured and there was at least three cortex continuity along with bridging bony trabeculae. Out of 20 patients, 17 patients

had clinical union at 8 weeks and 3 achieved clinical union at 9.5 weeks, with an average healing at 8.8 weeks (range, 6 weeks to 11 weeks).

In 17 patients, radiological union was achieved at 11.9 weeks and in 3 patients the radiological union was achieved at 13.1 weeks, with an average radiological union at 12.5 weeks (range, 9 weeks to 14 weeks).

Table 2: Comparison of radiological union.

Study	Average time of union
Hume et al ²⁸	14 weeks
Fan et al ²⁹	14 weeks
Macko et al ¹³	12 weeks
Present study	12.5weeks

Table 3: Comparison of functional outcome.

Study	Results in percentage			
	Excellent	Good	Fair	Poor
Murphy et al ²⁸	60	10	30	-
Yusufbhai et al ²⁷	72	16	12	-
Xieyuan ²⁹	53.33	40	6.66	-
Present study	80	10	5	5

Functional evaluation

Patients were functionally evaluated on the basis of MEPS at 6 months. The mean flexion was 132.6 degree (range = 90 to 140), mean extension loss was 8.3 degrees (range = 5 to 9.6 degrees), mean arc motion was 124.5 degree. The average MEPS was 91.5 (range, 54 to 100). In the present study, at 6 month follow up, 17 patients had no pain, 3 patients had pain at the extremes of motion.

Out of 20 patients, (n=16, 80%) had excellent outcome, (n=2, 10%) had good outcome, (n=1, 5%) had fair outcome, (n=1, 5%) had poor outcome. Superficial wound infection was seen in n=1, 5% of patients which was managed by wound wash and antibiotics.

The main postoperative complaints were the hardware symptoms due to proximal migration of K-wires causing pain reported in 3 (15%) patients

Table 4: Comparison of postoperative complications.

Complication	Ashif et al ³¹	Deepak et al ³⁴	Murphy et al ³²	Present study
	N (%)	N (%)	N (%)	N (%)
Superficial infection	3 (12)	2 (6.66)	-	1 (5)
Hardware symptoms	4 (16)	6 (20)	3 (6.66)	3 (15)

Discussion

Olecranon fractures are caused by direct injury to the posterior part of the elbow joint or due to triceps pull because of fall on partially flexed elbow.[22] In the present study, incidence of fracture was higher in men up to the 4th decade, followed by elderly women above 60 years of age.

In the present study, incidence of olecranon fractures was greater for males upto 4th decade (n=14, 70%) and n=6, 30% were females. Rommens et al, Femke et al and Sullivan et al in their study also reported the higher incidence of olecranon fractures in males in younger males[23,25]

In the present study, presented with olecranon fractures was 27, out of which 20 patients (74.07%) had Mayo type IIA fractures, followed by 4 patients (14.81%) which had Mayo type IIB fractures, 2 patients (7.41%) had Type IIIA fractures, and 1 patient (3.70%) had Type IIIB

fracture. Similar results were reported by Marco et al, Chalidis et al³ and Bruggemann et al[26,27]

The radiological union was achieved at an average time of 12.5 weeks (range, 9 weeks to 13 weeks). Similar results were reported by Hume et al, Fan et al and Macko et al[28,29]

In the present study, the functional assessment was assessed by MEPS. The mean flexion was 132.6 degree (range = 90 to 140), mean extension loss was 8.3 degrees (range = 5 to 9.6 degrees), mean arc motion was 124.5 degree. The average MEPS was 91.5 (range, 54 to 100). In the present study, at 6 month follow up, 17 patients had no pain, 3 patients had pain at the extremes of motion. Similar results were reported by Anani et al[30] The average MEPS was 91.2 (range, 55 to 100). Out of 20 patients, (n=16, 80%) had excellent outcome, (n=2, 10%) had good outcome, (n=1, 5%) had fair outcome, (n=1,

5%) had poor outcome. Similar results were reported by Chalidis et al, Yusuf Bhai et al[31] In the present study, the main postoperative complaints were the hardware symptoms due to proximal migration of K-wires causing pain reported in 3 (15%) patients.

Conclusion

Tension band wiring is an effective method for the treatment of transverse, non comminuted and unstable fractures of the olecranon which provides stable fixation, early rehabilitation and gives excellent results when done in expert hands

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