National Journal of Clinical Orthopaedics

ISSN (P): 2521-3466
ISSN (E): 2521-3474
Impact Factor (RJIF): 5.34

www.orthoresearchjournal.com
2025; 9(2): 41-46
Received: 11-04-2025
Accepted: 16-05-2025

Dr. MD Mumtaz Alam
PG Resident, AIMS Dewas, Madhya Pradesh, India

Dr. Ankit Verma
H.O.D Department of Orthopaedics, AIMS Dewas, Madhya Pradesh, India

Dr. Mohd Sameer Qureshi
Associate Professor, Department of Orthopaedics, AIMS Dewas, Madhya Pradesh, India

Corresponding Author:
Dr. MD Mumtaz Alam
PG Resident, AIMS Dewas, Madhya Pradesh, India

Functional and radiological outcome: Olecranon tension band wiring vs plating

MD Mumtaz Alam, Ankit Verma and Mohd Sameer Qureshi

DOI: https://www.doi.org/10.33545/orthor.2025.v9.i2.A.475

Abstract
Background: Olecranon fractures represent one of the frequently encountered injuries of the upper limb, especially among adults and the elderly population. When these fractures are displaced, surgical intervention becomes the preferred line of treatment, with plate osteosynthesis (PO) as well as tension band wiring (TBW) being the two most widely practiced methods. The present prospective study evaluates and compares clinical, functional, and radiological outcomes, along with the incidence of postoperative complications and the need for revision surgeries, in patients suffering from more complex fractures and Mayo type IIA treated by either TBW or PO.
Methods: 17 individuals suffering from olecranon fractures were treated by PO or TBW at our institution were included in this study. Their demographic details, survey responses, and clinical findings were recorded, analyzed, and reviewed. All patients were admitted through the outpatient department (OPD) or the emergency department of Amaltas Hospital. Functional outcomes were evaluated with help of range of motion (ROM) along with 3 validated scoring systems: "the American Shoulder and Elbow Surgeons Standardized Elbow Assessment score (pASES-e), the Mayo Elbow Performance Score (MEPS), and the Disabilities of the Arm, Shoulder and Hand (DASH) score".
Results: Of the 17 patients, 12 (70.58%) underwent TBW, while 5 (29.41%) were treated with PO. The mean pASES-e, MEPS, and DASH scores were 75.1 ± 19.2, 75.6 ± 15.3, and 21 ± 21.7 respectively, in the PO group and 83.6 ± 12.4, 80.5 ± 14.7, and 14.5 ± 17.2, in TBW group, (p=0.03, p=0.17, and p=0.16). Average surgery duration along with hospital stay were lengthier in PO group (p=0.002, p = 0.37). Conversely, complications, nonunion, along with malunion rates were higher in the TBW group (p=0.24, p=0.15).
Conclusions: As per existing literature, both tension band wiring (TBW) as well as plate fixation (PF) are considered effective surgical choices for management of displaced, isolated, simple olecranon fractures. Our conclusions are consistent with these reports, demonstrating good to excellent outcomes with no statistically substantial variances amid the 2 techniques.

Keywords: Olecranon, range of motion, clinical-functional outcome, plate, tension-band wiring, fracture, complications, reoperation

Introduction

In adults, around 10% of all fractures in upper extremities are olecranon fractures. Because these injuries typically occur inside the joint, the best course of action is typically an ORIF procedure that involves exact anatomical restoration of the joint surface. The following methods of fixation have been detailed: intramedullary screw fixation, figure-of-eight tension band wiring (TBW), plate osteosynthesis (POS), and, in rare instances, fragment excision with triceps advancement.

Traditionally, TBW has been the method of choice for isolated, non-comminuted fractures. However, increasing use of plate fixation is supported by biomechanical evidence demonstrating greater stability. While plate fixation is widely accepted for comminuted fractures, its use has recently expanded to include simple transverse fractures, largely because of higher complication rates reported with TBW.

Current research aims to contrast the complication rates of POS versus TBW in management of intra-articular olecranon fractures. Furthermore, it seeks to examine whether patient- or surgeon-related factors influence differences in complication profiles between these two surgical techniques.

The ultimate goal is to provide evidence that can assist both surgeons and patients when assessing the advantages and disadvantages of each fixation method when determining the most appropriate treatment strategy.

Method and Material

This study was designed as a prospective, evaluating a group of patients who were all part of the same integrated healthcare system, with the green light from the IRB beforehand.

Patient data were prospectively collected. All individuals with a preliminary assessment of a closed olecranon fracture of ulna who subsequently underwent internal fixation (ORIF) besides open reduction of the olecranon process were included in this study.

Inclusion criteria

- Isolated olecranon fracture
- Traumatic etiology: History of acute trauma within 10 days prior to admission
- Adult patients(more than 18 yrs and less than 70 yrs)

Exclusion criteria

- Open fracture
- Olecranon fracture associated with elbow dislocation
- Infection of olecranon
- Paediatric population
- Polytrauma patient

Outcome Measures

A comprehensive review of digital radiographs along with electronic medical records was conducted to evaluate all outcome variables. The recorded dependent variables encompassed loss of fixation that necessitated revision surgery, stiffness that required surgical intervention, infections that demanded surgical treatment, and symptomatic hardware that called for removal. To ascertain the primary outcome concerning the loss of fracture fixation, a thorough examination of operative notes and radiographs was conducted to pinpoint patients necessitating revision surgery. A subsequent investigation was conducted utilizing a blend of diagnostic codes pertaining to surgical site infections and symptomatic hardware, in conjunction with procedural codes for hardware removal and manipulation under anesthesia. Infections were categorized into two distinct types: superficial infections, which necessitated only antibiotic therapy, and deep infections, which required incision and drainage, sometimes accompanied by the removal of hardware. The minimum follow-up period for all individuals was three months from date of the index procedure.

The recorded independent variables encompassed patient demographics, the pattern of fractures, and the classification of fractures as either open or closed. The demographic data of the patients encompassed various factors, including history of diabetes, body mass index (BMI), sex, age, smoking history. The classification of diabetes encompassed individuals with a background of type 1, type 2, or diet-managed diabetes. The smoking history was classified into four distinct categories: “current,” indicating ongoing use; “former,” for those who had ceased smoking; “never,” for individuals who had never smoked; and “unknown,” for cases where the smoking status was not specified, without regard to the duration of smoking in any category. The classification system established by the American Society of Anesthesiologists (ASA) was employed to evaluate the baseline health status, where Class I denotes patients in a state of normal health, while Class II indicates those with mild systemic disease. Class three encompassed individuals afflicted with significant systemic illness. Patients classified as class four or higher exhibit severe systemic diseases that pose a continuous risk to life, or they are individuals whose survival is deemed unlikely without surgical intervention. The data set did not encompass any additional comorbidities.

Scores used

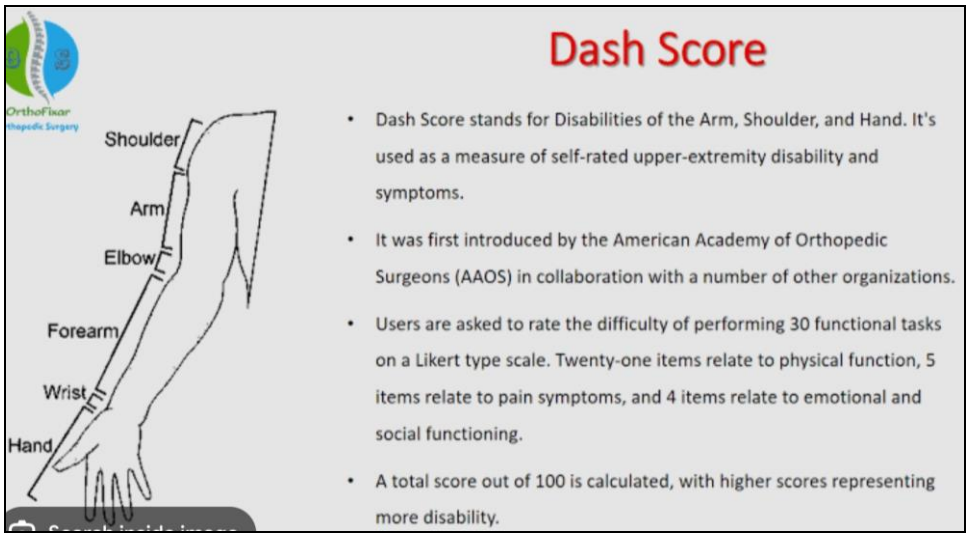
- The Broberg and Murrey elbow score
- Mayo elbow performance index
- Dash scoring system

Mayo performance score

	points *
Pain (45 points)	
None	45
Mild	30
Moderate	15
Severe	0
Range of motion (20 points)	
>100° flexion arc	20
50°-100° flexion arc	15
<50° flexion arc	5
Stability (10 points)	
Stable	10
Mild instability (<10° of varus-valgus laxity)	5
Gross instability (≥10° of varus-valgus laxity)	0
Daily function (25 points)	
Combing hair	5
Feeding oneself	5
Hygiene	5
Putting on shirt	5
Putting on shoes	5
Maximum possible (total)	100

* The outcome is rated as follows: excellent, 90 to 100 points; good,

DASH score



Calculation of DASH score

DISABILITIES OF THE ARM, SHOULDER AND HAND

Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. Open a tight or new jar.	1	2	3	4	5
2. Write.	1	2	3	4	5
3. Turn a key.	1	2	3	4	5
4. Prepare a meal.	1	2	3	4	5
5. Push open a heavy door.	1	2	3	4	5
6. Place an object on a shelf above your head.	1	2	3	4	5
7. Do heavy household chores (e.g., wash walls, wash floors).	1	2	3	4	5
8. Garden or do yard work.	1	2	3	4	5
9. Make a bed.	1	2	3	4	5
10. Carry a shopping bag or briefcase.	1	2	3	4	5
11. Carry a heavy object (over 10 lbs).	1	2	3	4	5
12. Change a lightbulb overhead.	1	2	3	4	5
13. Wash or blow dry your hair.	1	2	3	4	5
14. Wash your back.	1	2	3	4	5
15. Put on a pullover sweater.	1	2	3	4	5
16. Use a knife to cut food.	1	2	3	4	5
17. Recreational activities which require little effort (e.g., cardplaying, knitting, etc.).	1	2	3	4	5
18. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).	1	2	3	4	5
19. Recreational activities in which you move your arm freely (e.g., playing frisbee, badminton, etc.).	1	2	3	4	5
20. Manage transportation needs (getting from one place to another).	1	2	3	4	5
21. Sexual activities.	1	2	3	4	5

The Broberg and Morrey elbow score

Evaluated criteria	Point value
Range of motion (max 64 points)	Multiply range × 0.2
Flexion (max 150°)	
Extension (max 100°)	
Pronation (max 80°)	
Supination (max 80°)	
Grip-strength	(max 12 points)
Normal	12
Slight Impairment	8
Moderate Impairment	4
No useful strength	0
Functional stability	(max 12 points)
Normal	12
Moderate Instability	6
Severe Instability	0
Pain	(max 12 points)
No pain	12
Mild pain	8

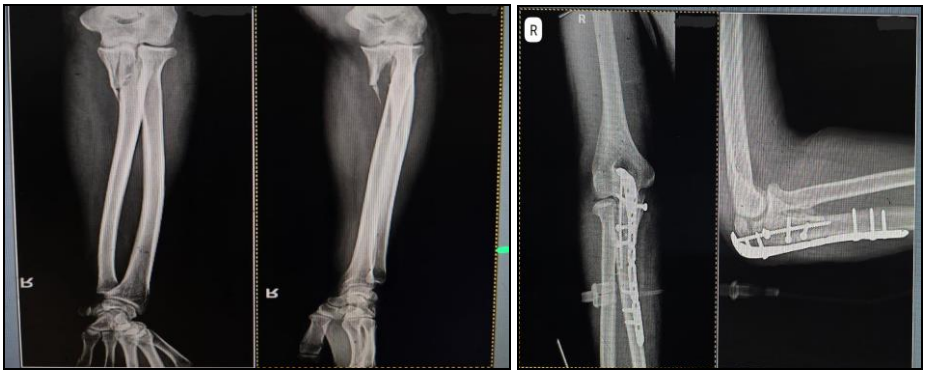
Results

A comprehensive review was conducted on the medical records and digital radiographs of 17 identified patients. The cohort comprised 9 females (57.3%) along with 8 males (42.7%), with a median age of 38 years. Within the cohort, 5 patients received internal fixation along with open reduction utilizing plate osteosynthesis (POS), whereas 12 patients were managed with tension band wiring (TBW). The evaluation was carried out roughly a year following the final case to analyze results and potential complications.

Follow ups

The simple transverse fracture, characterized by a single fracture line, was the injury pattern that occurred most frequently in both groups, occurring in 12 patients in the TBW group and 5 patients in POS group. Plate osteosynthesis (POS) was more frequently employed than TBW for patients presenting with multifragmentary fracture patterns. The type of internal fixation did not significantly affect the primary outcome. For secondary outcomes, there was no substantial variance in infection rates amid the 2groups. However, significantly more individuals in TBW group needed hardware removal (HWR) when contrasted with POS group. Individuals within the POS cohort exhibited a reduction of approximately 60% in the probability of requiring HWR (OR = 0.39, P = 0.001). The integration of primary and secondary outcomes revealed that the POS group demonstrated a noteworthy association with a reduction in overall complications (OR = 0.59, P = 0.04). In a comprehensive multivariable analysis that accounted for factors such as gender, age, ASA class, body mass index (BMI), diabetes status, as well as smoking history, the only association that retained statistical significance was between POS and reduced rates of HWR. Notably, no patients in either group required reoperation for stiffness.

Follow up radiographs



Pre-op Post-op.

A univariate logistic regression analysis was done to evaluate potential independent effects of sex, age, diabetes mellitus, smoking status, BMI, as well as ASA class on complication rates between the two groups. Complications considered included infection, loss of fixation, and requirement of symptomatic hardware removal (HWR). No substantial associations were observed for any variables except BMI. Individuals who faced issues had a slightly but substantially less mean BMI (23.7 kg/m²) than those who did not experience complications (24.6 kg/m²).

Post operative complications

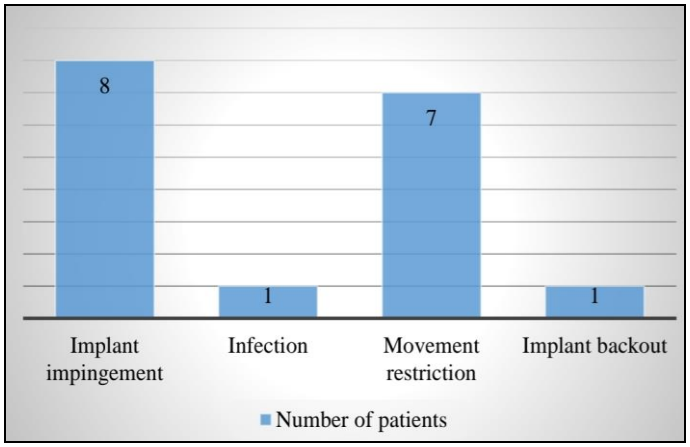


Fig 1: Postopertaive complications in patients

Discussion

Displaced olecranon fractures are generally classified as intra-articular injuries, necessitating meticulous anatomical reconstruction of articular surface. The fundamental objectives of surgical intervention encompass restoration of joint congruity, the preservation of stability within the joint, the facilitation of a pain-free range of motion, the promotion of early rehabilitation, and the reduction of associated morbidity. A range of internal fixation techniques has been articulated, encompassing tension band wiring (TBW) and plate osteosynthesis (POS).

TBW method is based on the idea of transforming compressive stresses acting on joints from posterior tensile forces and is frequently employed for displaced, minimally comminuted fractures. However, TBW has been associated with complications such as olecranon bursitis, soft tissue irritation, fracture displacement, as well as wire migration. Plating may also be hindered by constraints in hardware prominence as well as elbow extension, but generally results in lower rates of symptomatic hardware.

In our study, the incidence of hardware removal (HWR) was substantially lower in POS group than TBW group. Individuals managed with POS had a 58% lower likelihood of needing HWR. Subcutaneous position of K-wires and their potential for migration are likely contributors to local pain and discomfort. Notably, even after HWR following TBW, 66.6% of patients reported persistent mild pain, highlighting the lower rates of reoperation because of symptomatic hardware in POS versus TBW for treating olecranon fractures.

Therapeutic considerations comprising gender, age, smoking status, diabetes mellitus, fracture pattern, along with closed versus open fracture status, were not discovered to significantly influence relationship amid type of fixation and outcomes. These results may provide valuable guidance for patients as well as surgeons in weighing the benefits along with risks of TBW versus POS when selecting the most appropriate treatment approach for olecranon fractures.

Conclusion

In our study, olecranon fractures exhibit a higher prevalence among males, reflected in a male-to-female ratio of 2.5:1, and are observed to occur more often in the older population. Direct trauma to the elbow, often resulting from a fall, represents the most prevalent mechanism of injury. Among the various classifications of fractures, the Mayo type 2 non-comminuted pattern emerges as the most commonly observed.

The optimal treatment modality depends on the fracture type. Comminuted fractures are generally best managed with olecranon plating, whereas non-comminuted fractures are often treated with tension band wiring (TBW) with K-wires. Mayo type 1 non-comminuted fractures may be treated with intramedullary cancellous screw (CCS) fixation, though the risk of implant backout should be considered.

Although TBW with K-wires remains the most commonly used technique for olecranon fracture fixation, it is related with complications such as implant impingement in about one-third of individuals. Olecranon plating may represent a significant alternative, offering lower complication rates while providing comparable functional outcomes at six months postoperatively. TBW with K-wires allows for the earliest postoperative rehabilitation, whereas plating is associated with the lowest rate of complications. Mid-term outcomes regarding union as well as range of motion are similar across all three approaches. Long-term investigations with bigger patient cohorts are needed to further evaluate olecranon plating as a potentially preferred technique for most olecranon fractures.

Conflict of Interest

Not available

Financial Support
Not available

References

1. Ren Y-M, Qiao H-Y, Wei Z-J, Lin W, Fan B-Y, Li Z-J. Efficacy and safety of tension band wiring versus plate fixation in olecranon fractures: a systematic review and meta-analysis. J Orthop Surg Res. 2016;11:137. DOI:10.1186/s13018-016-0476-7.
2. Buijze GA, Doornberg JN, Ham JS, Ring D, Bhandari M, Kloen P. Surgical fixation of olecranon fractures: a systematic review. Strategies Trauma Limb Reconstr. 2010;5(2):97-110. DOI:10.1007/s11751-010-0080-x.
3. Tada C, Singh D, Parikh H, Chavada A, Rathod M. Comparative study of outcome of tension band wiring versus plate fixation in olecranon fractures. Int J Res Orthop. 2020;6(5):1081-1086. DOI:10.18203/issn.2455-4510.IntJResOrthop20204292.
4. Mahajan R, Thakur M, Sharma V. Comparative study of functional outcome of olecranon fractures treated by hook plate versus tension band wiring. Int J Res Orthop. 2023;9(4):774-780. DOI:10.18203/issn.2455-4510.IntJResOrthop20232211.
5. Powell AJ, Farhan-Alanie OM, Bryceland JK, Clement ND, Duckworth AD, McQueen MM, *et al*. Plate versus tension-band wire fixation for olecranon fractures: a retrospective cohort study. Bone Joint J. 2021;103-B(2):276-282. DOI:10.1302/0301-620X.103B2.BJJ-2020-0991.R1.
6. Hume MC, Wiss DA. Olecranon fractures: a clinical and radiographic comparison of tension band wiring and plate fixation. Clin Orthop Relat Res. 1992;(285):229-235.
7. Li Z, Xu J, Ma B, Fan H, Wu S, Wang H, *et al*. Comparison between novel internal fixation and traditional tension band wiring for olecranon fractures: a systematic review and meta-analysis. J Orthop Surg Res. 2025;20:111. DOI:10.1186/s13018-025-06061-y.
8. Campbell's operative Orthopaedics, 13th Edition...
9. Rockwood and Green's fracture in adults, 8th Edition.

How to Cite This Article
MD Alam M, Verma A, Mohd Qureshi S. Functional and radiological outcome: Olecranon tension band wiring vs plating. National Journal of Clinical Orthopaedics. 2025;9(2):41-46.