



## FUNCTIONAL OUTCOME OF OLECRANON FRACTURES TREATED WITH TENSION BAND WIRING.

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### KEYWORDS :

#### INTRODUCTION

Olecranon fractures are one of the most commonly seen orthopaedic injuries in the emergency room. Fractures of the olecranon process of the ulna typically occur as a result of a motor-vehicle or motorcycle accident, fall, or assault

Nondisplaced 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.

In the past, closed reduction and plaster cast application were treatment for fracture of olecranon. But, prolonged immobilization with its own complications increased the morbidity and mortality of patient.

So keeping this in consideration, it has become important to intervene surgically. Thus active mobilization after surgery will return the patient to normal function as early as possible. The early and active movements not only prevent the tissue from fracture disease but greatly influence the quality and rapidity of fracture union.

Stable internal fixation with figure-of-eight tension-band wire fixation for simple transverse fractures allows early motion to minimize stiffness. The K-wire used in AO tension – band technique resist shearing force better than the figure of eight wire alone. So this gives a good result.

The advent of modern reconstructive techniques has produced a sea-change in the prognosis. In all but the most devastating injuries, patients can now expect a well-healed, functional elbow at the conclusion of treatment, and most will return to their original employment.

Many of the problems of treatment are not yet fully resolved and new challenges are emerging: the proportion of elderly patients who sustain these injuries is ever-increasing, and this trend will continue. With this change in population come fresh challenges for reconstruction, including poor bone quality, fracture comminution, and reduced capacity for rehabilitation.

In our study we assess the functional outcome both subjectively and objectively by limb specific questionnaires and measurements using the Mayo Elbow Performance Score.

**Principle of tension band technique:** Open reduction and fixation with figure-of-eight wire loop is applicable to fractures of the olecranon that are not comminuted and that are well proximal to the coronoid process. This fixation is used most commonly for avulsion and transverse fractures, but may be combined with intramedullary fixation in comminuted fractures and fracture-dislocations. A simple loop is not as satisfactory as a figure-of-eight loop. The tension surface of the bone is the superficial surface, and a figure-of-eight wire placed on this surface produces compression along the olecranon fracture line, with the trochlea functioning as a fulcrum. If a simple wire loop is used, particularly if it is anterior to the axis of the olecranon, the pull of the

triceps tends to separate the fragments posteriorly, and tilting of the proximal fragment results in limited extension. Use of the tension band principle requires early active motion of the elbow so that compression across the fracture line can occur. We usually use this tension band, figure-of-eight wire principle in conjunction with some form of intramedullary fixation, either Kirschner wires, as advocated by the AO group, or, more frequently, an intramedullary pin or 6.5-mm AO cancellous screw

#### METHODOLOGY

The following data are obtained for all study patients as per the Proforma attached below: Age, Sex, Occupation, Socioeconomic Status, Nature of Trauma, Side of fracture, Bone(s) Fractured, AO Classification of Type of Fracture, Compounding of Fractures, Any Associated Injuries and/or Co Morbidities.

After proper history taking, clinical examination, radiological work up, pre operative work up and informed written consent, patients will be taken up for surgery. Surgery will be done by the guide with the assistance of the principal investigator. Patients will be taken up for surgery as early as possible after general blood and radiological work up.

Operation details are recorded and Post operative rehabilitation done and recorded. Patient is discharged from hospital with appropriate advice regarding immobilisation, ROM exercises and as necessary.

Post Operative Protocol will typically include Early Mobilisation on Day 3 and serial follow up Xrays every 3 Weeks uptill 3 months and two monthly Xrays thereafter till the 6<sup>th</sup> month. Functional outcome will be assessed by Elbow scoring systems and Range of motion testing at the end of 6 months.

On each review, patient is assessed both clinically and radiologically and signs of union are assessed. Clinical Union is said to be achieved when the fracture site is painless and non tender and shows absence of abnormal mobility in two planes. Transmitted mobility should also be present across the involved bone. Radiological union is said to be achieved in plain x rays showing two views when fracture line has been obscured and there is atleast three cortex continuity along with bridging bony trabeculae. Other complications are also looked for and treated appropriately

#### OBSERVATIONS

##### Functional outcome based on MAYO score

Table 8.

##### Functional outcome based on MAYO score

Score	No of patients	Percentage
Excellent, >90	5	16.7
Good, 75-89	13	43.3
Fair, 60-74	9	30.0
Poor, <60	3	10.0
Total	30	100

#### Discussion

Olecranon fractures may be caused by direct injury to the posterior part of the elbow joint or indirectly by forces generated within the triceps

muscle during a fall on a partially flexed elbow [20]. The clinical picture is obvious and conventional radiographs are usually sufficient to depict the lesion and the potential associated injuries [15].

The findings, the end results and various other data have been analysed and compared in the following discussion.

### Closed/Open fractures

In our study there was only 3 open fractures (10%) and rest 27 cases were closed fractures(90%). Our study are comparable with Rommens PM, Kuchle R, Schneider RU, Reuter M, which says more than 97 % are closed fractures.

### Complications

Complications observed in our study included shoulder stiffness in 2(6.7%) patients, which later improved with physiotherapy. 3(10%) patients had deep seated infection of which two were controlled by intravenous antibiotics. The other patient went into an infected non union, which made implant removal mandatory.

Delayed union was observed in 1(3.3%) patient. Bone grafting was not needed for union as the fracture healed with continued plaster immobilization

Hard ware prominence was noticed by 1(3.3%) patient. But patient had no pain or functional impairment apart from the poor cosmetic appearance

Our overall complication rate was 30%

In spite of the efficacy of TBW fixation even in cases with severe fracture displacement and comminution, many patients express pain or discomfort due to subcutaneous position of the K-wires and the relevant incidence of metalware removal may be raised to 87% [16,17,18]. Rommens et al stated that suboptimal pins placement (K-wires which are not inserted parallel or they do not transverse the opposite cortex of the proximal ulna) was not correlated with increased rate of implant loosening or secondary procedures [17]. As the above finding was also evident in our study, we advocate that insertion of K-wires into the anterior ulnar cortex may increase TBW construct stability and stiffness but it couldn't prevent posterior pin migration when active motion of the elbow joint has been commenced. Furthermore, hardware removal seems not always to be a panacea for symptoms resolution as 66.6% of TBW removals were still complaining for mild pain or discomfort. Romero et al [19] noted that backing-out of K-wires and metalwork prominence could not justify alone the need for TBW removal and they should not be considered entirely responsible for patients' subjective complaints.

### Arc of motion attained

In our study, the mean flexion-extension arc of motion of elbow was 81.5 degree (range 30-125). Various degrees of postoperative elbow stiffness and deficit of range of motion have been reported in literature after surgical treatment of olecranon fractures [14, 22, 23]. Ring et al [24] and Teasdall et al [25] reported that patient compliance, fracture comminution and extension into the ulnar diaphysis or coronoid process, concomitant radial head fracture and elbow instability may lead to inferior results. On the other hand, Villanueva et al [18] noted that fracture comminution does not necessary have a harmful effect on both clinical and radiological outcome

The results of mean flexion – extension arc at elbow in our study are comparable

### Pronation-supination

In our study we got near full pronation and supination of forearm after internal fixation.

Gartsman GM, Sculco TP, Otis JC also mentioned in their study that they got full rotation of forearm.

### Mayo score

The mean Mayo elbow performance score in our study was 75.5(range 30 to 100).

5 patients (16.7%) had excellent functional outcome, 13 patients (43.3%) had good outcome, 9(30%) had fair outcome and 3(10%) patient had poor functional outcome

### Summary and conclusion

Even though the study was conducted with limited number of patients ,and the follow up time was short, we may arrive at certain conclusions after the study that are supported by literature. They include-

- Most of the patients are in the productive age group(20-50years)
- Right side is more frequently involved than left.
- Males are more commonly affected than females.
- In young adults, the fracture usually results from high velocity trauma.
- The overall functional outcome of olecranon fractures treated with tension band wiring is good.
- Early active mobilization after surgery is necessary for good functional outcome.
- Achieving good functional outcome in elderly patients is challenging due to factors like lack of absolute stability, poor compliance to early mobilization, co morbidities etc.

To summarize, rigid internal fixation and early active mobilization is the key to achieve a good functional outcome. Tension band wiring fixation for isolated olecranon fractures leads to good elbow function and minimal loss of physical capacity. The technique remains the "gold standard" for the treatment of displaced and minimally comminuted olecranon fractures despite the introduction of new implants designed specifically to address the problems of wound irritation and metalware removal.

### References

1. David Ring " Elbow fractures and dislocations in 'Rockwood and Green Fractures in Adults' Chapter 32 Vol 1 7thEdn 2010, BucholzRW, Heckman JD., Lippincott Williams & Wilkins. 936-942.
2. Crenshaw, Andrew. H "Fractures of Shoulder, arm and forearm" Chapter 54, 'Campbell's Operative Orthopaedics', Vol 3, 11thEdn, Canale S Terry, James H. Beaty. 2008 3411-3417pp.
3. John R Willams 'Coronoid, Radial head, Olecranon fractures and Elbow Dislocations' Chapter 3-35 Vol -3 in Oxford Text book of Orthopaedics and Trauma. 2002 1969-1972pp.
4. Cooper, Jerald L. and D'Amrosia Robert D., "Fracture and Fracture Dislocation about the Elbow" Chapter 33 Operative Orthopaedics, Vol. I 2ndEdn. Chapman Michael W., J.B. Lippincott Company, Philadelphia 1993 :479-482pp.
5. Morrey B.F. "Fractures and Dislocation of the Elbow" Chapter -14 in Fracture and Dislocations. Vol .1 ,Gustile, Ramon B, Kyle Richard F, Templeman David, St Louis, Mosby 1993 ;471-484 pp.
6. Byron E Chaldis , Nick C Sachinis, Efthimios P Samoladas 2008 'Is tension band wiring technique the "gold standard" for the treatment of olecranon fractures. Journal of orthopaedic surgery and research.
7. Wolf gang, G et al 1987. "Surgical treatment of displaced olecranon fractures by tension band technique". Clinorthop 224: 192-204.
8. B.F. Morrey . 1995 "Current concepts in the treatment of fractures of the olecranon" J Bone and Joint Surg, Am 77:316-327.
9. Macko, Donald and Szabo, Robert M, 1985; "Complications of tension band wiring of olecranon fractures". J Bone and Joint Surg 67-Am 1396-1401