



## THE FUNCTIONAL OUTCOME OF FRACTURES OF OLECRONONE TREATED WITH ANATOMICAL LOCKING PLATE.

### Orthopaedics

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### ABSTRACT

#### Objective :

- To study the results of operative procedures in olecranon fractures
- To study the improvement in pain, range of motion and activities of daily living following surgery
- To study the advantages and complications of various surgical procedures done for the complex comminuted fractures of olecranon.

**Methods:** A prospective study of 29 patients of complex comminuted fractures of olecranon was done. All patients were operated in Tertiary care Hospital, Surat and complete clinical examination was done with satisfactory follow up. **Results:** Selected patients were evaluated clinically and radiologically, after the relevant lab examinations, they were taken for surgery. Fractures were classified according to various classification system, operated with Open Reduction Internal Fixation using anatomical locking plate. Post operative immobilization was given and active mobilization of elbow given within 1-3 weeks. **Conclusion:** Operative treatment with anatomical internal fixation will be the line of treatment for all types of olecranon fracture, more so in young adults as it gives best chance to achieve good elbow function.

### KEYWORDS

Fracture of Olecranon , Osteo-arthritis, Plate Osteosynthesis, Open reduction internal fixation, Immobilization

#### INTRODUCTION:

Elbow is a complex joint comprising of the ulno-humeral, radio-ulnar and radio-capitellar joint. Over the past several years the understanding of the anatomy and biomechanics of the joint has developed various fundamentals regarding the treatment of the olecranon fractures. The protocols which initially began with the idea of the removal of the olecranon or the conservative management of the olecranon fractures were later on declared obsolete because studies clearly showed that the ulno-humeral joint constraint is directly proportional to the congruity of the same joint.

Improper management of the olecranon fractures have shown leading the patient to elbow arthritis and pain. The principle of anatomic restoration of articular surface, stable fixation and early motion are the optimal treatment goals. Recent treatment supports these goals and early postoperative active mobilization. By adhering to this protocol the literature supports this as the most reliable view for a good result.

The availability of new implants, however, has increased the reliability of operative stabilization, while placing additional demands upon the surgeon's expertise.

#### MATERIALS AND METHODS:

A prospective study of 29 patients of complex comminuted fracture of olecranon was done. All patients were operated in SMIMER Hospital, Surat and complete clinical examination was done with satisfactory follow up.

Patients were operated by plate osteosynthesis , Evaluation of treatment was done by Mayo elbow performance score<sup>1</sup>.

Patients were selected by below mentioned criteria.

#### Inclusion Criteria

- Age between 18-65 years.
- Patients of either sex.
- Patients with closed olecranon fracture without association of radial head or coronoid process fracture.
- Fractures less than 1 week old.
- Patients who comply with regular follow up for a period of at least 6 months.

#### Exclusion Criteria

- Patients with history of previous fracture around elbow joint.
- Multiple Trauma / Neurovascular injuries.
- Pathological Fractures.

#### RESULTS:

In our study, majority of the patients were male (55.17%), predominantly on right side (58.62%). Majority of the patients sustained these injuries following ground level falls (62.07%).

According to Mayo classification system, most common type of fracture was type 2 non-comminuted fracture. Radiological union was seen at 8 weeks in 2 (6.9%) cases, 10 weeks in 2 (6.9%) cases, 12 weeks in 16 (55.17%) cases, 14 weeks in 6 (20.69%) cases and 16 weeks in 3 (10.34%) cases. One case had superficial infection which resolved completely with oral antibiotics and one case had elbow joint stiffness. There were no cases of implant impingement, nonunion or malunion in the present study. No patient had any implant related complication like implant failure, implant breakage or loosening. All 29 patients achieved fracture union in 6 months follow up period. As per Mayo Elbow Performance Score (MEPS), 55.17% cases had excellent results, 31.03% cases had well, 10.35% cases had fair and 3.45% of the cases had poor results respectively.

#### Range Of Motion:

Analysis of range of motion (ROM) comprised flexion and extension of the elbow and pronation and supination of the forearm measured with a goniometer and evaluated with respect to the arc of movement of the uninjured arm.

#### Gender Distribution:

**Table 1: Gender**

| Gender | Frequency | Percent % |
|--------|-----------|-----------|
| Male   | 16        | 55.17     |
| Female | 13        | 44.83     |
| Total  | 29        | 100       |

#### Side Distribution:

There was a predominance of right side in our study, accounting for 58.62% of the patients.

**Table 2: Side**

| Side  | Frequency | Percent % |
|-------|-----------|-----------|
| Right | 17        | 58.62     |
| Left  | 12        | 41.38     |
| Total | 29        | 100       |

#### Mode of Injury:

There was a predominance of Ground level fall as a mode of injury in our study, accounting for 62.07% of the patients.

**Table 3: Mode**

| Mode of injury    | Frequency | Percent % |
|-------------------|-----------|-----------|
| Ground Level Fall | 18        | 62.07     |
| RTA               | 8         | 27.59     |
| Sports Injury     | 3         | 10.34     |
| Total             | 29        | 100       |

**Patient Distribution According to Fracture:**

There was a predominance of Mayo Type 2A fracture in our study, accounting for 58.62% of the patients.

**Table 4: Classification**

| Mayo Classification        | Non Comminuted | Comminuted |
|----------------------------|----------------|------------|
| Type 1 Undisplaced, Stable | 1              | 4          |
| Type 2 Displaced, Stable   | 17             | 5          |
| Type 3 Displaced, Unstable | 2              | 0          |

**Radiological Union in Weeks:**

Radiological union was seen at 8 weeks in 2 (6.9%) cases, 10 weeks in 2 (6.9%) cases, 12 weeks in 16 (55.17%) cases,

14 weeks in 6 (20.69%) cases and 16 weeks in 3 (10.34%) cases.

**Table 5: Union**

| Union In Weeks | Number of Cases | Percentage % |
|----------------|-----------------|--------------|
| 8 Weeks        | 2               | 6.90         |
| 10 Weeks       | 2               | 6.90         |
| 12 Weeks       | 16              | 55.17        |
| 14 Weeks       | 6               | 20.69        |
| 16 Weeks       | 3               | 10.34        |
| Total          | 22              | 100          |

**Complications:**

Out of 22 cases, one (3.45%) cases had superficial infection which resolved completely with oral antibiotics and one (3.45%) case had elbow joint stiffness. There were no cases of implant impingement, nonunion or malunion in the present study. No patient had any implant related complication like implant failure, implant breakage or loosening. (Table 6)

**Table 6: Post Op Complications**

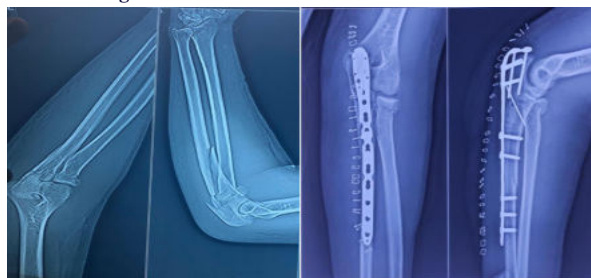
| Post -Op Complications | Number of Cases |
|------------------------|-----------------|
| Superficial Infection  | 1               |
| Deep Infection         | 0               |
| Elbow Joint Stiffness  | 1               |
| Implant Impingement    | 0               |
| Non Union/ Mal union   | 0               |

**Functional Outcome**

As per Mayo Elbow Performance Score (MEPS), 55.17% cases had excellent results, 31.03% cases had good, 10.35% cases had fair and 3.45% of the cases had poor results respectively.

**Surgical Hardware****Table 7: Functional Outcome**

| Functional Outcome | Cases | Percent % |
|--------------------|-------|-----------|
| Excellent          | 16    | 55.17     |
| Good               | 9     | 31.03     |
| Fair               | 3     | 10.35     |
| Poor               | 1     | 3.45      |
| Total              | 22    | 100       |

**Clinical Images:****Pre- OP****Post- OP****Clinical:****DISCUSSION:**

The elbow plays a critical part in the normal arm functioning. Complex fractures of the olecranon process of the ulna threaten the integrity of both the elbow and forearm joints. The treatment goals are to maintain a stable and anatomic reduction, realign the longitudinal axis of the olecranon process, and enable immediate rehabilitation.<sup>1,2,3</sup> these fractures are more commonly associated with ligament injuries like coronoid tip avulsion, annular ligament, radial collateral ligament injuries which play important part in elbow joint stability. Hence reconstructing these ligaments play pivotal role.

Soft-tissue injury is the main factor predicting outcome.<sup>4</sup> swelling of the neighbouring soft tissues may play a role in development of infection. The severity of soft-tissue injury affects the management of closed fractures. Blunt injuries to soft tissues involve microvascular and inflammatory processes that produce localised tissue hypoxia and acidosis. Incisions made through such compromised tissue may lead to wound breakdown and deep infection.<sup>5</sup>

Therefore, recognising the signs of soft-tissue injury is important for successful management of closed fractures. Patient satisfaction is affected by non-union, instability, deep infection, stiffness and loss of joint motion, or hardware complaints.<sup>6,7,8</sup> Open reduction and rigid internal fixation has become the generally accepted method of treatment for displaced fractures of the olecranon in order to allow early mobilisation, and the prevention of contracture of the elbow. The goals of fixation are realignment of the longitudinal axis of the olecranon, the provision of sufficient stability to allow early mobilisation, preservation of the coronoid process, and anatomical restoration of the articular surface of the trochlear notch.<sup>9</sup>

Where there is marked comminution with bone loss, tension-band wiring may lead to collapse of the fragments with shortening of the articular surface of the olecranon, dyscongruity of the joint, impingement, loss of movement and degenerative osteoarthritis.<sup>9</sup> In the presence of comminution, plate fixation has been used with supplementary K wires, screws or bone grafting.<sup>10-15</sup> In some circumstances, the proximal bone fragment may be small and thin, making fixation with a plate difficult.

Severe comminution of the mid-portion of the olecranon may occasionally make satisfactory reconstruction impossible, and excision of the comminuted section with shortening of the olecranon may be the only option.<sup>16</sup> Here I have compared the result of the present series with the results of the study conducted by Ernesto Munoz-Mahamud, Jenaro A Fernandez-Valencia, Josep Riba on the "outcome of comminuted fractures of olecranon." <sup>17</sup> (2010).

**Table 1: Demography**

|                         | Ernesto series | PRESENT SERIES |
|-------------------------|----------------|----------------|
| Sample size             | 10             | 29             |
| Sex distribution        | M:F (60:40)    | M:F (72:28)    |
| Age distribution (mean) | 53 YRS         | 40 YRS         |

**Table 2: Associated Local Injuries (number Of Patients)**

|                   | Ernesto series | Present series |
|-------------------|----------------|----------------|
| Radial head #     | 2              | 10             |
| Coronoid #        | 3              | 5              |
| Elbow dislocation | 1              | 4              |

The present series showed higher incidence of associated injuries. However it had no impact in final outcome when proper reduction technique & physiotherapy had been used.

**Table 3: Complications**

|                  | Ernesto series | Present series |
|------------------|----------------|----------------|
| Infection        | 3 (30%)        | 6(20%)         |
| Non union        | 0              | 2 (6.8%)       |
| Hardware problem | 4 (40%)        | 8 (27.5%)      |

This shows the infection rate & hardware problem was lower in our study. It shows it is a preventable complication with the use of proper aseptic condition. However we had 2 cases of Non-union. This might be associated with higher incidence of patient associated factors like smoking/tobacco chewing.

The most common complication is hardware problem in form of impingement or olecranon bursitis. This is mainly because olecranon is a subcutaneous bone.

**Table 4: Flexion Extension (in Degree)**

|                | >100     | =<100   |
|----------------|----------|---------|
| Ernesto series | 8 (80%)  | 2 (20%) |
| Present series | 21 (72%) | 8 (28%) |

**Table 5: Outcome**

|                           | Ernesto series | Present series |
|---------------------------|----------------|----------------|
| Mayo elbow score(average) | 84             | 85             |
| Excellent                 | 6 (60%)        | 21 (72%)       |
| Good                      | 2 (20%)        | 6 (21%)        |
| Fair                      | 2 (20%)        | 2 (7%)         |

The outcome is based on scale of Mayo elbow score. The average Mayo elbow score were similar in both the studies, because in both the studies emphasis has been put on proper reduction & fixation technique & ultimate restoration of articular margin.

None of any patient in our series had unstable elbow. Final satisfaction of the patient depended on stability rather than range of motion only.

## CONCLUSION:

In this study 29 patients having complex comminuted fracture of olecranon were included. Fractures are common in male patients and most of them are due to road traffic accidents.

Operative treatment with anatomical internal fixation will be the line of treatment for all types of comminuted olecranon fracture, more so in young adults as it gives best chance to achieve good elbow function.

During open reduction internal fixation, anatomic nature of articular surface shall be given prime importance.

The most common complication is hardware problem in form of impingement or olecranon bursitis. This is mainly because olecranon is a subcutaneous bone.

Vigorous, active physiotherapy is a must for good results. Stable fixation allows early, active and aggressive postoperative mobilization.

Optimum internal fixation is best accomplished by low profile anatomical plate with locking screws. Fixation provide optimal biomechanical stability so early mobilization has started and patient have good functional outcome.

In elbow joint there is always fear of loss of range of motion. But restoration of the articular margin and anatomy, post-operative range of motion can be gained within functional range. So that patient's routine activity won't be affected.

Complex fractures of the olecranon require a combination of different techniques whose objective is joint as well as ligament reconstruction

wherever required as close to perfect as possible because this seems to be the best guarantee of a good prognosis.

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