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RESEARCH ARTICLE
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A CLINICAL STUDY OF SURGICAL MANAGEMENT OF OLECRANON FRACTURES

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ABSTRACT

Background and Objective: Olecranon fractures are one of the most commonly seen orthopaedic injuries in emergency room. Fractures of the Olecranon typically occurs as a result of RTA, a fall or assault. The accepted management for Olecranon fractures is for non displaced fractures short immobilization followed by gradually increasing range of motion. When displaced, open reduction and internal fixation with k-wire and figure of eight tension band wiring for simple transverse fractures and Olecranon plate for comminuted fractures. The present study is undertaken to evaluate the result of surgical management, the merit and demerits and to asses elbow joint motion and stability after the procedure.

Material and Methods: It is a prospective study which was carried out from August 2019 to November 2020 in Maharana Bhupal General Hospital attached to RNT Medical College, Udaipur. In this study period 25 case of fracture Olecranon treated by Tension band wiring with K-wire for simple transverse fracture and Olecranon plate for communited fractures.

Results: In our series, majority of patients were males, middle age with RTA being the commonest mode of injury. Most of the cases were Type || B fractures I.e., oblique and transverse fractures according to Colton‟s classification. Surgery was performed with in 4.76 average days. Union was noted clinically, radiologically and functional evaluation was done by Mayo elbow performance score. Excellent results was present in 19(76%) patients, 4(16%) good and 2(8%) fair with no poor result.

Conclusion: From the present study it is concluded that the technique of open reduction and internal fixation with K-wire and tension band wiring for simple transverse and oblique fractures and Olecranon plate for comminuted fractures are effective means and gold standard technique of treating fracture of Olecranon and is based on sound biomechnical principal.

Key Words: Olecranon fractures, Tension band wiring, Olecranon plate.

Introduction

Olecranon fractures are one of the most commonly seen orthopaedic injuries in the emergency

room. Non displaced 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[1]. Stable internal fixation with tension-band wire fixation for simple transverse fractures allows early motion to minimize stiffness. For comminuted fractures, distal fractures involving coronoid process, oblique fractures, Plate fixation is most appropriate mode of treatment.

Applied Anatomy[2]

The elbow joint is a hinge variety of synovial joint. The humero-ulnar and humero- radial articulations form a largely uniaxial joint. The ligaments include capsular and the collaterals namely, ulnar and radial collateral. The collateral ligaments supplement the natural stability (valgus and varus stress) of the elbow joint. The olecranon prevents anterior translation of the ulna with respect to the distal humerus. The anterior surface of the olecranon is covered with articular cartilage. Therefore, all fractures (except the rare tip fractures) are intra-articular fractures. The carrying angle may be determined by noting the angle of intersection between a line connecting midpoints in the distal humerus and a line connecting midpoints in the proximal ulna. Studies report a valgus angle ranging from 11° to 14° in men and from 13° to 16° in women[3]. The olecranon articulates with the trochlea of the humerus. The triceps inserts into the posterior third of the olecranon and proximal ulna. The periosteum of the olecranon blends with the triceps.

The ulnar nerve lies on the posterior aspect of the elbow, posterior to the medial collateral ligament. The ulnar nerve sweeps anteriorly to join the ulnar artery.

Fracture displacement is largely due to the pull of the triceps, which tends to pull a separated fragment upward but is resisted by the strong fibrous covering on the olecranon. This fibrous covering is formed by the blending of fibers in the lateral ligaments, the elbow capsule, and triceps fibers that blend with the periosteum. Usually, wide separation of fragments indicates an extensive tearing of the fibrous sheath in which the unopposed triceps is contracted, drawing the separated fragment upward. The lateral ulnar collateral ligament inserts onto the tubercle of the supinator crest, from which the supinator muscle also gains origin. The medial aspect of the coronoid process, the sublime tubercle, serves as an insertion site for the medial ulnar collateral ligament. The posterior capsule inserts proximally above the olecranon fossa, and distally at the annular ligament and the tip ofthe olecranon. Most of the olecranon is therefore an extra capsular structure. (Fig 1)

Muscles acting during Elbow and Forearm ROM[3] Flexion (140°- 150°): Coracabrachialis, Biceps, Brachialis, Brachioradialis Extension (0° in males and upto 5° in females): Triceps, Anconius Pronation (0° to 85°): Pronator Teres, Pronator Quadratus, Flexor carpi radialis Supination (0° to 80°): Supinator, Biceps, Brachioradialis.

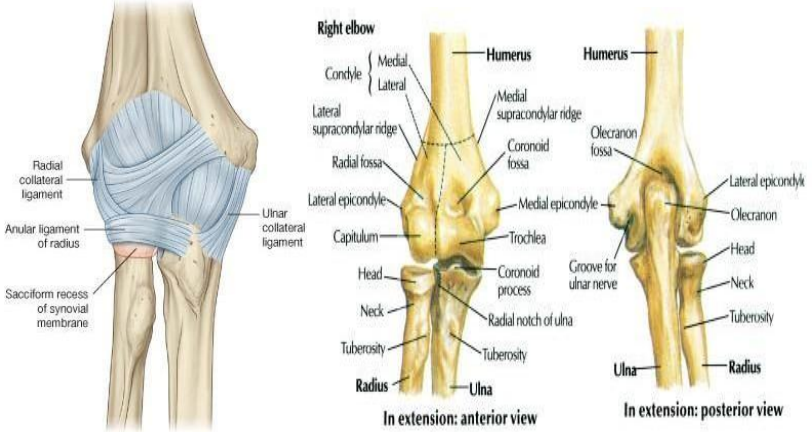


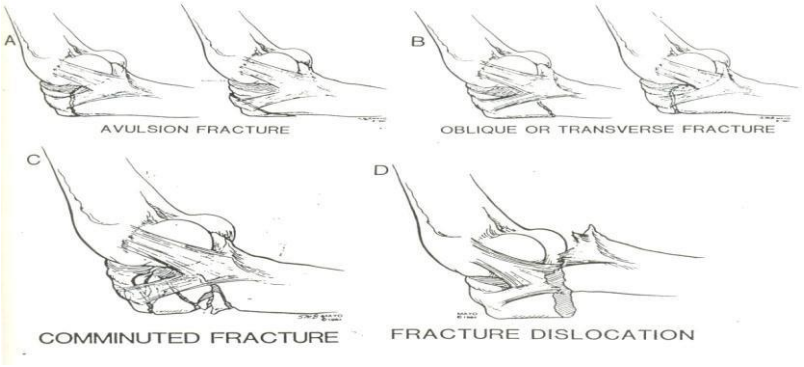
Fig 1 : Applied anatomy

A simple classification of fractures of adult olecranon is proposedby **C.L. Colton** and used as a basis for making recommendations about 4 treatment

1. Non displaced or displacement less than 2mm.2.Displaced fractures

a. Avulsion Fractures. b. Oblique Fractures.

c. Comminuted Fractures d.Fracture–Dislocations.



Material and Methods:

The retrospective study consists of 25 cases of fracture olecranon treated by *Tension band wiring with Kirshner wire for Simple transverse fractures and Olecranon plate for Communited fractures* at the R.N.T. Medical College and Attached Hospitals, Udaipur between August 2019 to November 2020. Study was conducted with due emphasis for clinical observation and analysis of results after surgical management of fractures of olecranon by K-wires with Tension band wiring and Olecranon plate. These patients were followed for 12 months (minimum for 6 months) and evaluated based on union rate through xray radiograph, any complications (infections, mal/nonunion, implant impingement, elbow stiffness) and functionally by Mayo Elbow Performance Score (MEPS)[5].

INCLUSION CRITERIA:

1) Age of patients
2) Extent of damage to articular surface
3) Degree of comminution

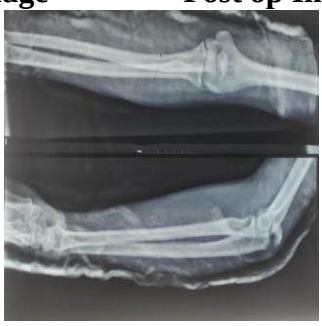
EXCLUSION CRITERIA:

1) Patients of extremes of age
2) Patients in whom operative risk was higher (MEDICAL COMORBIDITY).

Pre-operative protocol: Before the surgical intervention, all the patients were temporarily immobilized with above elbow posterior slab, underwent routine investigations, obtained anesthetic and medical clearance, analgesics and antibiotics.

Post-operative protocol: IV antibiotics for 3-4 days. Sterile dressing was done on second post op day. Suture removal was done after 13-15 days depending upon healing. The AE slab continued till 2 weeks following which the patients were advised elbow Rom exercises. Elbow loading was prevented for 6-8 weeks. Patients were permitted to return to normal daily activities, as tolerated, at 3 months. All the patients were assessed serially for 12 months (minimum period of six months) radiologically with xray of the elbow joint in true anteroposterior and true lateral views and functionally with Mayo Elbow Performance Score(MEPS)[5].


Pre op Image **Post op Image** **Intra op Image**




Pre op Image **Post op Image**

Understanding the Mayo Elbow Performance Score for Functional Assessment

Explanation of Mayo Elbow Performance Score

Function	Definition	Points	Score classification
Pain	None	45	Excellent > 90
	Mild	30	
	Moderate	15	
	Severe	0	
Motion	Arc > 100	20	Good, 75–89
	Arc 50–100	15	
	Arc < 50	5	
Stability	Stable	10	Fair, 60–74
	Moderate instability	5	
	Gross instability	0	
Function	Comb hair	5	Poor < 60
	Feed	5	
	Hygiene	5	
	Shirt	5	
	Shoe	5	
Total		100	

OBSERVATIONS & RESULTS

In our study, majority of the patients were male (76%), most of the patients were in the age group of 21-60 years with mean age of 40.36 years. Majority of the patients sustained these injuries following road traffic accident (60%). According to **C.L. Colton** classification[4] system, most common type of fracture was type 2B Oblique and transverse fracture.

Radiological union was seen at 8 weeks in 3 (12%) cases, 10 weeks in 8 (32%) cases, 12 weeks in 6 (24%) cases, 14 weeks in 1 (4%) case, 16 weeks in 6 (24%) cases and 18 weeks in 1 (4%) case . One case had superficial infection which resolved completely with oral antibiotics and 3 cases had Symptomatic metal prominence. 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 orloosening. All 25 patients achieved fracture union in 6 months follow up period. As per Mayo Elbow Performance Score (MEPS)[5], 76% % cases had excellent results, 16% cases had good, 8% cases had fair and no cases had poor results respectively.

SEX INCIDENCE:

TABLE – I SEX INCIDENCE

Sex	No. of Cases	Percentage
Male	19	76%
Female	6	24%

SIDE DISTRIBUTION :

There was a predominance of right side in our study, accounting for 60% of the patients.(Table 2).

TABLE –2 SIDE OF INVOLVEMENT

Side involved	No. of Cases	Percentage
Right	15	60%
Left	10	40%

MODE OF INJURY:

There was a predominance of road traffic accident as a mode of injury in our study, accounting for 60% of the patients. (Table 3)

TABLE –3 MODE OF INJURY

Mechanism of Injury	No. of Cases	Percentage
Road traffic accidents	15	60%
Fall from height	8	32%
Assault	2	8%

PATIENT DISTRIBUTION ACCORDING TO FRACTURE:

There was a predominance of **Colton's Classification** Type 2B fracture in our study, accounting for 76% of the patients. (Table 4)

TABLE – 4 : TYPE OF FRACTURES

Type of Fractures	No. of Cases	Percentage
I) Un-displaced and stable fractures	-	-
II) Displaced fractures		
A) Avulsion fractures	2	8%
B) Oblique and transverse fractures	19	76%
C) Comminuted fractures	4	16%
D) Fracture – dislocation	-	-

RADIOLOGICAL UNION :

Radiological union was seen at 8 weeks in 3 (12%) cases, 10 weeks in 8 **(**32%) cases, 12 weeks in 6 (24%) cases, 14 weeks in 1 (4%) case, 16 weeks in 6 (24%) cases and 18 weeks in 1 (4%) case.(Table 5.)

TABLE-5 : TIME OF UNION

Time of union	No. of cases	Percentage
< 4 months	18	72%
4-6 months	7	28%
6months- 1year	-	-
Non union	-	-
Total	25	100%

COMPLICATIONS:

Out of 25 cases, one (4%) cases had superficial infection which resolved completely with oral antibiotics and 3 (12%) case had Symptomatic metal prominence . 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 orloosening.(Table 6)

TABLE – 6 COMPLICATIONS

Complications	No.of Cases	Percentage
Superficial infection	1	4%
Symptomatic metal prominence	3	12%

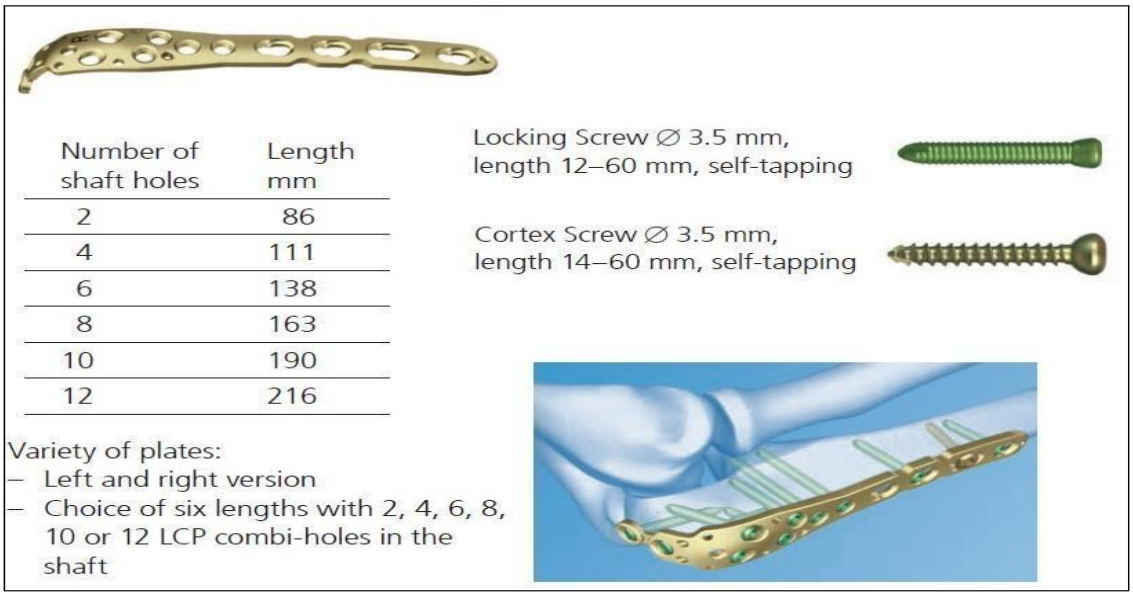
FUNCTIONAL OUTCOME:

As per Mayo Elbow Performance Score (MEPS), 76% % cases had excellent results, 16%cases had good, 8% cases had fair and no cases had poor results respectively. (Table 7).

TABLE- 7 : OUTCOME

Grading	No. of Cases	Percentage
Excellent (Score greater than 90)	19	76%
Good (Score 75-89)	4	16%
Fair (Score 60-74)	2	8%
Poor (Score below 60)	-	-

Surgical Hardware:



DISCUSSION:

LCP Olecranon plate 3.5

Twenty five cases of fractures of the olecranon treated by Kirschner wire with tension band wiring technique for Transverse and Oblique fractures and Olecranon plate for Comminuted fractures. In the present study maximum number of patients were found to be in the age group between 21 to 30 years. (8 patients i.e. 32%), a significant male predominance (19 patients 76%), Right side 15(60%) olecranon fracture were more common and road traffic accident 15(60%) was most comman mode of injury. Results were analysed according to Mayo elbow performance score. Excellent results were achieved in 76%, good results in 16% and fair results in 8%. There were no poor results. The complications like superficial infection and symptomatic metal prominence were noticed in 1 and 3 cases respectively, which were treated accordingly. These results are comparable to studies done by Jiang Xieyuan[6], Wolfgang G.[7], et al , Murphy et al.[8,9], and Hume and Wiss[10]. Maximum ROM of approximately 125° was achieved at 6 months of follow-up. Long term studies with larger database are required to further analyse.

CONCLUSION:

From the our study it is concluded that the technique of open reduction and internal fixation with Kirschner wires and tension band wiring for simple transverse and oblique fractures and olecranon plate fixation for comminuted fractures are effective means and gold standard technique of treating fractures of olecranon and is based on sound biomechanical principle.

By this method post-operative immobilization in POP is greatly minimized. Thereby avoiding fracture disease. Because of rigid fixation between the fracture fragments, early active and functional movements can be achieved at the involved joints during the phase of fracture healing. This reduces the chances of joint stiffness. Early active movement at the involved joint induces compression between the fragments. This compression hastens fracture healing. Because of early union of fracture, patient is back to work earlier. This aspect is very important both from the psychological and economical point of view.

Considering all the distinct advantages Kirschner wires with tension band wiring for transverse and oblique fractures and Olecranon plate for comminuted fractures is the choice of treatment for fractures of the olecranon.

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