

An Assessment of 3.5mm Reconstruction Plate Fixation in Olecranon Fractures

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Abstract

Background: Olecranon process is a large, curved eminence comprising of the proximal and posterior part of the ulna. It lies subcutaneously which makes it more vulnerable to injury. Due to intra-articular extension of fractures, anatomical reduction and early mobilization should be achieved in every case and usually managed surgically. **Aims and Objectives:** To access the results of reconstruction plate in fracture olecranon. **Materials & Methods:** This was a prospective study consisted of 25 cases of olecranon fractures which were managed by open reduction and internal fixation using 3.5mm reconstruction plate. Patients were followed up every month till 6 months. At each follow up visit clinical and radiological parameters were assessed: Final assessment was done at 6 months using the Mayo Elbow Performance Score. **Result:** According to the AO classification, Type A-1 – 7 cases, A-3 – 1 case, B-1 – 13 cases, B-3 – 1 case, C-1 – 1 case, C-2 – 1 case, C-3 – 1 case. An adequate reduction was maintained in all fractured olecranon until union. Average radiological union time was 12 weeks in 72% cases, 15 weeks in 16% cases, 18 weeks in 8% cases and > 18 weeks in 4% cases. The results were graded as per the criteria laid by Rogers et al as excellent in 84% cases, good in 12% and unsatisfactory in 4% cases. 2 cases developed superficial infection and 1 deep infection and 1 delayed union. **Conclusion:** Open reduction and internal fixation of fracture of olecranon with 3.5mm reconstruction plate is based on sound biomechanical principle with a good functional outcome and a low incidence of complications.

Keywords:- Olecranon Fracture, Fracture Configuration Contouring, 3.5mm Reconstruction Plate, Internal Fixation, Functional Outcome.

INTRODUCTION

Anatomically the olecranon process is a large, curved eminence comprising of the proximal and posterior part of the ulna. It lies subcutaneously which makes it more vulnerable to injury. Together with coronoid process it forms greater sigmoid notch which articulates with trochlea. This provides motion only in the sagittal plane along with stability to the elbow joint. Triceps tendon is inserted into olecranon after covering the capsule of elbow joint. So in displaced or non-united fracture of olecranon, decrease in

length of triceps results in decrease in power of triceps. Approximately 10% of fractures of the adult elbow consist of fractures of the olecranon process of the ulna and range from simple non-displaced fractures to complex fracture-dislocations of the elbow. Most of the olecranon fractures are intra-articular and isolated.^[1,2]

Most common mechanism of injury is direct trauma as falling on the back of the elbow or direct impact at the posterior surface of the elbow or upper part of forearm causing comminution of the olecranon. Degree of

comminution depends on severity of trauma. Another mechanism is high energy trauma in which additional injury to the elbow joint is often present with increased surgical

complexity and carry a higher complication rate and poorer prognosis and occasionally by hyperextension injuries.^[1,2]

Table 1: Age wise distribution of cases

Age Group in Years	No. of Cases	% Age
21-30	3	12
31-40	8	32
41-50	6	24
51-60	5	20
60 and above	3	12
Total	25	100

Table 2: Showing Period of Radiological Union

Time in Weeks	No. of Cases	% Age
6	-	-
9	-	-
12	18	72
15	4	16
18	2	8
>18	1	4
Total	25	100

Patient are classified on the basis of AO classification, Type A-1 - 7 cases, A-3 - 1case, B-1 - 13 cases, B-3 - 1 case, C-1 - 1 case, C-2 - 1 case, C-3 - 1 case. Due to intra-articular extension of fractures, anatomical reduction and early mobilization should be achieved in every case. Fracture fail to heal because of improper immobilization, complete devascularisation of the segment of fracture bone, persistent infection and interposition of soft tissue between the fracture end of bone etc. All cases were managed surgically with open reduction and internal fixation with reconstruction plating. Problems associated with wire protrusion and pain after TBW have been reported without even proximal migration of the pins.^[3] In comminuted or oblique/longitudinal fractures tension band wiring results in shortening of the olecranon which effects the articulation with loss of

motion or impingement.^[3,4,5,6] The AO-ASIF foundation recommends a careful reconstruction of the articular surface and biomechanical testing found that they provide significantly greater compression than tension bands in the treatment of transverse olecranon fracture.^[7,8,9] Fixation by a plate, in combination with bone grafting, is an alternative method used to maintain reduction of comminuted fractures after reconstruction of the joint surface.^[10]

MATERIAL AND METHODS

This was a hospital based prospective study conducted on patients admitted in Orthopaedics Department of Government Medical College Amritsar. Criteria for selection of patients.

Inclusion Criteria

1. Age (above 18 years)
2. Either sex

Exclusion Criteria

1. Open fractures, other than type I.
2. Pathological fractures
3. Poor soft tissue condition.

Immediately on arrival of the patient, all patients managed as per Advanced Trauma Life-support (ATLS) protocols. Elbow immobilized in an above elbow crammer wire. A detailed history taken from the pt. about the duration and mechanism of injury. Detailed clinical examination both local and systemic was done and findings were recorded preoperatively. Standard X-ray in anteroposterior and lateral views were taken for the confirmation of diagnosis and also to know segment of fracture bone, persistent infection and the type of fracture as per the AO classification of olecranon fractures.

All cases are done under sterile condition and fix with reconstruction plate. Range of motion exercises were started on the next post-operative day, within the limits of pain tolerance. Patients were followed every month till 6 months.

At each follow up visit, clinical parameters (pain, surgical wound, swelling, range of movements, any complication) and radiological parameter (Maintenance of reduction, union) were assessed. The patients in our study ranged in age from 21-65 years.

In present study there were 20 (80%) males and 5 (20%) females. Left side was involved in 10 (40%) of cases whereas right side was involved in 15 (60%) of cases. In present study fall from standing height was most common cause of injury comprising of 10 (40%) of all cases and road traffic accident in 1 (4%) case, direct blow 13 (52%) and industrial accident 1 (4%).

Table 3: Rozers et al criteria for evaluation of results

Grade	Loss of Degree of Movement Atelbow (Flexion and Extension)	Union
Excellent	<10	United
Good	<20	United
Unsatisfactory	>20	United
Failure	Unsolved osteomyelitis	Non-union

Table 4: Results as per Roser et al criteria

Results	No. of Cases	%Age
Excellent	21	84
Good	3	12
Unsatisfactory	1	4
Failure	-	-
Total	25	100



Figure 1: Preoperative and postoperative X-Ray of the elbow showing fracture of olecranon and reconstruction plating of the olecranon with union.



Figure 2: Clinical Photographs showing full extension (a) and Full Flexion (b) of the post operated elbow joint.

15 cases (60%) reported within 2 days of injury, 4 (16%) cases within 1 week, 4 (16%) within 2 weeks, 2 (8%) after 2 weeks. 1 (4%) patient had fracture lower end humerus with fracture radius, 4 (16%) with fracture radius and no associated fracture in 20 (80%) cases.

RESULTS

In the present study, results of 3.5mm reconstruction plate in fractures of olecranon

were evaluated according to the criteria laid by ROZERS et al 1984.[\[1\]](#)

In the series normal movements of the upper extremity were taken as:

- Elbow
- Flexion 145 degrees
- Extension 180 degree

The main complication was symptomatic metal prominence which required removal of

the implant in 4 (16%) patients, 2 (8%) patients developed superficial wound infection which was treated by appropriate antibiotics and dressings and 1 (4%) deep infection.

DISCUSSION

Reconstruction plate is a versatile implant which can be contoured easily as per bone anatomy and fracture configuration. It retains the bone length and the articular surfaces thus leading to decrease in late osteoarthritis of the joint.

The main aim of the treatment of fracture is not only achieving union but to preserve the optimum function of the adjacent soft tissues and joints. In the management of intra articular fractures like fractures of the olecranon, a perfect anatomical reduction of the fragments to obtain articular congruity and rigid fixation of the fragments is of utmost importance, if early movements are to be instituted to prevent complications like traumatic arthritis and joint stiffness.

The challenge for these fractures, however, is that because of the subcutaneous nature of the proximal ulna, hardware prominence is common. Hardware prominence often causes discomfort to the patient and is a reason to necessitate its removal. up to 20% of plates have required removal to manage patient reported symptoms of discomfort.

In our study 25 cases of fractures of the olecranon were treated with reconstruction plate. Our experience with this method of fixation has given favourable results. The findings, the end results and various other data are analysed and compared in the following discussion.

Age of patients in the present study ranged from 20 to 65 years with a mean age of 36.8

years. Which is consistent to studies done Gagan K et al & Ramazan Erden et al.^[12] In the present study the most susceptible sex was males, which is comparable to the studies done by Ramazan Erden et al & Ernest Munoz et al.

In the present study the trauma was fall from standing height 10 (40%) which is comparable to the studies done by Benedict Scheiman et al, Greet Buijze et al.^[13,14] Mean union time in our series was 13.8wk which is comparable to the study by Greet Buijze et al & Cervera-Irimia J et al.

The results obtained in our series were excellent in 21 (84%) patients, good in 3 (12%) patients, unsatisfactory in 1 (4%) patients and no poor results. The results in our series are almost in accordance with the studies of Greet Buijze et al.^[13]

In the present study superficial and deep infection was seen in 3 (12%) which is consistent with Greet Buijze et al and Benedict Schiemann et al,^[13] superficial infection was seen in 2 (8%) patients, which was treated with broad spectrum antibiotic and wound dressings consistent with Bailey CS et al.^[15]

CONCLUSION

25 cases of fractures of olecranon treated by reconstruction plate at the Post-Graduate Department of Orthopaedics, Government Medical College, Amritsar has been presented. Special attention was paid for early mobilization of the affected elbow. Patients were diagnosed as having olecranon fractures on the basis of detailed history and thorough examination. Specific investigations like x-ray, (antero-posterior and lateral view) of elbow was done in all 25 cases, which helped to confirm the diagnosis. Routine investigations were carried out.

All patients underwent surgery, various parameters e.g. age, sex, side of involvement, mechanism of injury, type of fracture were analysed.

Surgical procedure (ORIF with reconstruction plate) was carried out in all 25 patients.

In the present study maximum number of patients was found to be in the age group between 31-40 years.

Males formed 80% of the patients while 20% were females.

Males sustained their fracture at a significantly younger age than females.

Right sided 15 (60%) olecranon fracture was more common than Left side 10 (40%) in the present study.

In the present study fall from height 10(40%), direct blow 13 (52%), road traffic accident 1 (4%) and industrial accidents 1 (4%).

All fractures were closed.

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