



## ANALYSIS OF USING POSTERIOR APPROACH WITH OLECRANON OSTEOTOMY FOR INTRA ARTICULAR FRACTURES OF DISTAL HUMERUS IN ADULTS.

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**ABSTRACT** **Introduction:** Posterior approach with olecranon osteotomy is a well known approach for operating upon distal humerus fractures. In our study, we studied the clinical outcome of this approach in intra articular fractures of the distal humerus. **Materials and Methods:** We studied 36 adult patients (male: 21, female: 15) having mean age of 45.4 years with closed intra-articular fractures of distal humerus who were surgically managed using posterior approach with olecranon osteotomy and were followed-up for a mean of 18.6 months. Mayo Elbow Performance Score (MEPS) was used to study the outcome and complications were observed. **Results:** All fractures united by the end of three months. Mean elbow flexion achieved was 120°, mean extension lag was 11° and mean active arc of motion was 111°. Mean MEPS was 84 (Excellent: 11, Good: 22, Fair: 2 and Poor: 1). Post-operative transient ulnar nerve palsy was noted in two cases, heterotopic ossification was in one case, infection in two cases, implant prominence in five and elbow stiffness in three cases. **Conclusion:** The olecranon osteotomy approach for distal humerus fractures had good functional outcome with fewer complications. Joint congruity and fixation could easily be assessed intraoperatively.

### KEYWORDS :

#### INTRODUCTION

Distal humerus fractures are less common injuries, but have shown an increasing trend lately.<sup>1</sup> Open reduction and internal fixation (ORIF) of these fractures is well recognised management. It is of paramount importance to reconstruct the anatomy while internally fixing these fractures, for which proper exposure is critical. Various approaches used include the triceps-reflecting anconeus pedicle (TRAP), Bryan and Morrey's triceps reflecting, and Campbell's triceps splitting. These approaches have their pros and cons.<sup>2-6</sup> The posterior approach with olecranon osteotomy provides maximum articular surface visualisation, gives better command on fracture fragments and has minimal consequences on extensor mechanism, is often employed for such fracture.<sup>7</sup> However, the olecranon osteotomy approach has other potential complications such as non-union at the osteotomy site, implant issues and resurgeries.<sup>8</sup> In our study, we evaluated the functional outcome of intra articular distal humeral fracture following the posterior approach with olecranon osteotomy.

#### MATERIALS AND METHODS

We included 36 adults (21 males, 15 females) with intra articular distal humerus fractures in our study, who attended the emergency and the outpatient sections our hospital and were managed with open reduction internal fixation using a posterior approach using olecranon osteotomy. Patients aged > 18 years, both sexes, closed injuries, intra articular fractures, with no associated injuries were included in our study. All the patients which were < 18 years, open injuries, pathological fractures, associated neurovascular injuries were not included in our study. The mean age of the subjects included was 45.4 years. 26 patients (72.22%) had fracture of left side while as 10 patients (27.77%) had fractured the right sided bone. The mechanism of trauma was a road traffic accident among 21 patients (58.33%), fall from height in 7 patients (19.44%) and assault in 8 patients (22.22%). As per AO classification, the fractures were C2 in 20 (55.55%) patients and C3 was in 16 (44.44%) patients, classified according to AO classification. Surgical fixation was done under brachial plexus block or general anaesthesia in lateral decubitus position with arm support with tourniquet in all patients. Prophylactic antibiotic (cefuroxime 1.5gm) was administered in all cases. Signed informed consent was taken from all patients about fracture type, approach used and possible complications. A uniform surgical technique, a midline posterior incision was used, with slight lateral curve on the olecranon tip to avoid weight-bearing zone. Ulnar nerve was identified, followed by release of the ligament of struthers and medial intermuscular septum to transpose the ulnar nerve anteriorly. An interval was created between medial intermuscular septum and triceps, and triceps was lifted from the posterior aspect of humerus to create lateral window. The bare area of ulna was identified, which was roughly 2 cm from the olecranon tip, and chevron-shape osteotomy of ulna was done with apex distally. Fracture fragments were exposed completely, small pieces were fitted with each other and temporarily held with K wires. Herberts screws

were often used whenever necessary. The definitive fixation of articular surface was done using 4.5 mm cannulated screw inserted from lateral to medial direction. Two cannulated screws were preferred to attain rotational stability. This articular fragment was then attached to the condyle and temporarily fixed with K-wires. Fracture sites were stabilised with orthogonal plating: one plate on the medial side and the other on the posterolateral side, roughly perpendicular to each other as per AO principle. First, a plate was applied posterolaterally followed by medial plating, roughly perpendicular to each other as per AO principle. Fracture fragments were fixed with anatomically contoured locking plates. The olecranon osteotomy was fixed with two K wires perforating the anterior cortex distal to the coronoid process and stabilised with stainless steel wire in accordance with tension banding principles. After reduction and fixation, direct visualisation of joint congruity was confirmed, with fluoroscopy to observe joint motion. The wound was closed with suction drain. Post-operatively the elbow was immobilised in a POP back slab in 90 degree flexion for two days. After drain removal at 48 hours, active or assisted range of motion exercises were commenced. Patients were regularly followed-up at six weeks, 12 weeks and thereafter every three months for radiological and functional assessment. Articular step off of more than 2mm or malalignment greater than five degrees in any plane was considered as malunion.

Functional assessment was done using Mayo Elbow Performance Score (MEPS). Wallis test was used to establish relationship between fracture type and motion arc or extension loss.

#### RESULTS

Mean follow-up of patients was 18.6 months. Mean surgical delay was 3.5 days. Fracture and osteotomy site union was radiologically confirmed in all cases. Mean flexion achieved was 120°, extension lag was 11° and active arc of motion was 111°. Mean MEPS achieved was 84 (excellent: 11, good: 22, fair: 2 and poor: 1). Major complication in our series was implant prominence in five patients. Transient ulnar nerve palsy occurred in two cases and recovered spontaneously within three months. Heterotrophic ossifications occurred in one patient. Deep seated infection occurred in two patients which subsided with joint debridement and antibiotics. Elbow stiffness occurred in three patients and arthrolysis was advised but patients declined in spite of limitation in daily activity.

#### DISCUSSION

The optimal surgical approach for distal humerus complex articular fracture is one which provides adequate fracture fragment assessment with minimal tissue disruption. Olecranon osteotomy is conventionally well accepted for distal humeral exposure but has issues related to osteotomy and hardware. In this study, we analysed 36 elbows with intra-articular distal humerus fractures. McKee and Szako retrospectively analysed 11 elbows with type C fracture managed using olecranon osteotomy approach and reported net arc of motion of

102.7°.<sup>8</sup> Also, Ljungquist *et al* in their systematic review detected mean arc of motion after olecranon osteotomy to be 107°.<sup>9</sup> In our series, we were able to achieve 111° of mean active arc of motion which is close to those reported findings. Complications with olecranon osteotomy include implant prominence or failure in 27-80% and non-union in 0-15% cases<sup>12-15</sup>. Non-union of osteotomy site was reported as high as 30% when transverse osteotomy was done.<sup>10</sup> We performed chevron-type osteotomy in all our patients on the basis of its larger contact area and better rotational stability compared to transverse osteotomy.<sup>11</sup> In comparing fixation method for chevron olecranon osteotomy, Wagener *et al* found bicortical purchase was achieved with two K-wires with tension band wiring and with intramedullary cancellous screw with tension band, both providing enough elbow stability for daily use.<sup>11</sup> We utilised two bicortical K-wires and tension band construct to fix our osteotomy site in all cases. We did not experience any non-union issues in our series. Implant prominence was the most common complication in our series. We encountered two patients with transient ulnar nerve injury. The probable cause is traction injury to the nerve during surgery. The incidence of heterotrophic ossification which is a well-established sequelae of elbow trauma, has been reported incidence as high as 89% especially with periarticular elbow fracture with associated traumatic head injury.<sup>12,13</sup> The role of the surgical approach in the development of heterotrophic ossification is still controversial. We observed heterotrophic ossification in one patient in our series.

## CONCLUSION

Posterior approach with olecranon osteotomy for intra-articular fracture of distal humerus has high rate of healing and good functional outcome with fewer complications. Joint congruity can be assuredly restored and fixation can be comfortably assessed intraoperatively.

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