

## COMPARASION OF CAMPBELL'S AND OLECRANON OSTEOTOMY APPROACHES FOR TREATMENT OF INTER-CONDYLAR FRACTURE OF HUMERUS

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### ABSTRACT

**Background:** Surgical management of inter-condylar fractures of humerus includes various approaches of open reduction and internal fixation (ORIF), with each having its merits and demerits. In this study we analyzed Campbell's and trans-olecranon osteotomy approaches for ORIF of inter-condylar fracture of humerus in terms of adequacy of exposure and functional rehabilitation.

**Place and Duration of Study:** The study was conducted at Combined Military Hospital Peshawar, CMH Rawalpindi and PNS Shifa, Karachi from 1999 to 2005.

**Patients and Methods:** A total of 43 patients with T/Y fracture of distal humerus were divided into two groups (Gp). Gp A comprising of 22 patients were operated by Campbell's approach while Gp B having 21 patients were operated by trans-olecranon osteotomy approach. The mean age of Gp A and B were  $36.95 \pm 4.21$  (range: 27-49 yrs) and  $35.71 \pm 5.17$  (range: 21-45 yrs) respectively. Follow up of patients varied from 3 to 9 months and they were evaluated for functional results.

**Results:** Mean operating time was significantly longer in Gp B (mean  $124.28 \pm 31.32$  min) as compared to Gp A (mean  $100.40 \pm 25.78$  min) (P-value 0.022). Functional results were evaluated based upon the criteria of Risen-borough and Radin. Gp A shows 59.09% good results and 27.27% fair results which were comparable to the results of Gp B i.e 57.14% good and 33.33% fair.

**Conclusion:** This study proved that both the approaches for internal fixation of type 2 and 3 inter-condylar fractures of humerus with minimum or no intra-articular comminution are comparable in terms of functional results.

**Keywords:** Inter-condylar fractures of the humerus, campbell's V-Y tricepsplasty, olecranon osteotomy

### INTRODUCTION

Management of Inter-condylar fracture of humerus is a challenging task for Orthopaedic surgeon because of its configuration and anatomical peculiarities around elbow joint. The main cause of fracture is direct trauma to elbow which causes impact of ulna in the trochlear groove forcing the condyles of distal humerus apart [1]. The fracture is either 'T' or 'Y' shaped with or without comminution. Clinically, the arm appears shortened due to

proximal displacement of ulna and crepitus can be felt on compressing the condyles together. Depending on the displacement and rotation of fragments various classifications are used to describe these fractures. Based on the Risen-borough & Radin classification fracture can be divided into four types.

The main aim of surgical treatment is to re-establish articular congruity, optimal alignment and secure rigid fixation in order to allow early mobilization. Surgical approaches for open reduction and internal fixation (ORIF) of these fractures include those that divide triceps mechanism providing good

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exposure and those that save triceps mechanism but give limited exposure [2]. Approaches that give good exposure are Campbell's V/Y tricepsplasty and trans-olecranon osteotomy.

This study compares Campbell's approach with trans-olecranon osteotomy approach in respect of adequacy of exposure and early mobilization and functional rehabilitation.

**PATIENTS AND METHODS**

A quasi-experimental study was conducted at Combined Military Hospital Peshawar, CMH Rawalpindi and PNS Shifa, Karachi from 1999 to 2005. A total of 49 patients with T/Y fracture of distal humerus were operated by two surgeons. Based on the type of surgical exposures, patients were divided into two different groups. Group A comprises of 26 patients who were operated by Campbell's approach (fig. 1), while Group B of 23 patients were operated by Olecranon osteotomy (fig. 2). All the patients had either type 2 or 3 fractures based on Risen-borough and Radin classification (table-1).

All the patients were operated in general anaesthesia, in lateral position. A mid line posterior skin incision was made avoiding tip of elbow. In group A, a tongue of triceps tendon was reflected down for exposure of bone, and in group B, olecranon osteotomy was done and triceps tendon reflected upwards.

In both groups internal fixation was done using 4mm partially threaded cancellous screws for restoring joint line. Two 04 mm partially threaded screws or one screw with one K.wire used for internal fixation of articular fragments together. DCP (Dynamic Compression Plate) small, Reconstruction Plate or 1/3rd Tubular plate used for fixation of rest of the humerus with articular portion in different combinations. Olecranon osteotomy was fixed by 6.5 mm partially threaded cancellous screws by tension band construction or K-wires and stainless steel wire (fig. 3,4). After thorough irrigation with

**Table-1: Type of fractures (based on Risen-Borough and radin classification).**

Fracture Type	Gp A (n=22)	Gp B (n=21)	Total (n=43)
Type 2	06 (27.27%)	04 (19.05%)	10
Type 3	16 (72.73%)	17 (80.95%)	33
Type 4	--	--	--

**Table-2: Patient's data.**

	Gp A (Campbell's) (n=22)	Gp B (Olecranon Osteotomy) (n=21)	p-value
Age (Yrs) (mean ± S.D)	36.95 ± 4.21	35.71 ± 5.17	0.135
Gender (Male/Female)	20/2	19/2	0.999
Operation time (min) (mean ± S.D)	100.40± 25.78	124.28 ± 31.23	0.022

Data are mean ± standard deviation

**Table-3: Postoperative functional results.**

Functional result	GroupA (n=22)	GroupB (n=21)
Good	13 (59.09%)	12 (57.14%)
Fair	6 (27.27%)	7 (33.33%)
Poor	3 (13.64%)	2 (9.52%)

P > 0.05



**Fig. 1: Pre operative radiograph (group A).**

saline, suction drain was passed and wound closed in layers. Stitches removed after two weeks. All the patients were encouraged early active range of motion exercises of the injured elbow in both the groups.

Follow up of the patients varied between three to nine months. The results were evaluated based upon the criteria of Risborough and Radin which is as follows:-

- Good: Range of elbow flexion from 30° or less to 115° or more. None or minimal symptoms.
- Fair: Range of elbow flexion from 30° - 60° to 115° or more. None or minimal symptoms.
- Poor: Range of elbow flexion from 60° or more to less than 115° with or without major symptoms.

Statistical analysis was done by using student t-test and a p-value < 0.05 was used as significance cut off point.

## STATISTICAL ANALYSIS

Data was entered and analyzed using SPSS version 10.0. Student t-test was used to compare numerical variables where as chi-square test was used to compare categorical variables. .

## RESULTS

Out of 49 patients initially included in our study, 43 were evaluated (22 of group A and 21 of group B). Four patients having associated fractures were excluded from group A. Similarly two patients from group B were excluded as they had extensive comminution, which required bone grafting in supra condylar non articular area. The two groups were comparable with respect to age and sex (table-2). Most of the patients in both groups were young males in the 4th decade of their life (fig. 5). Adequate exposure and reduction of fracture was achieved in all the patients. Mean operation time for group A was  $100.40 \pm 25.78$  min (range: 65 to 185 min), whereas, it was  $124.28 \pm 31.23$  min (range: 90 to 210 min) for group B which was significantly longer (table-2). One patient in group A developed superficial infection in early post-operative period which was treated by aggressive wound toilet satisfactorily, whereas one patient from group B developed



Fig. 2: Pre operative radiograph (group B).



Fig. 3: Post operative radiograph (group A).



Fig. 4: Post operative radiograph (group).

radial nerve irritation following surgery by tip of the K-wire. He was recovered after removing lateral pin. Twenty five patients had good functional results with 13 (59.09%) from group A and 12 (57.14%) from group B (fig. 6,7), whereas thirteen patients had fair results with 6 (27.27%) belonging to group A and 7 (33.33%) from group B. Poor results

were found in 3 (13.64%) patients of group A and 2 (9.52%) patients of group B (p-value >0.05) (table-3). In one case olecranon osteotomy line remained visible two years post operatively without any functional ill effect even after removal of metal wire.

### DISCUSSION

Campbell's V-Y tricepsplasty and trans-olecranon osteotomy are the basic surgical approaches for ORIF of inter-condylar fracture of distal humerus providing good exposure by dividing triceps mechanism. Campbell's approach provides more proximal exposure with resultant triceps weakness and fibrosis. Although, trans-olecranon osteotomy approach provides excellent exposure of the distal humerus, enthusiasm for this approach has been limited by reports suggesting numerous complications [3]. This approach affords more exposure distally but has a disadvantage of another fracture being created that result in technical complications. Metallic wires for fixation of olecranon osteotomy have to be removed after union to avoid irritation of the skin.

Since inter-condylar fractures of humerus are not common, most studies have limited number of cases and different authors have used different classifications and criteria for evaluation, rendering it difficult to compare functional results.

There is no study available that has compared the results of these two different surgical approaches in terms of operation time and functional results.

Letsch et al, in their study reported 81% good and very good results reflecting the value of operative treatment by using appropriate surgical technique with optimal anatomical surgical reconstruction and post operative care [4].

Various other authors reported almost comparable results of using operative management. Talha et al reported 85% good and very good results [5]. Noack et al, and Gupta in their studies reported 75% excellent and good results [6,7].

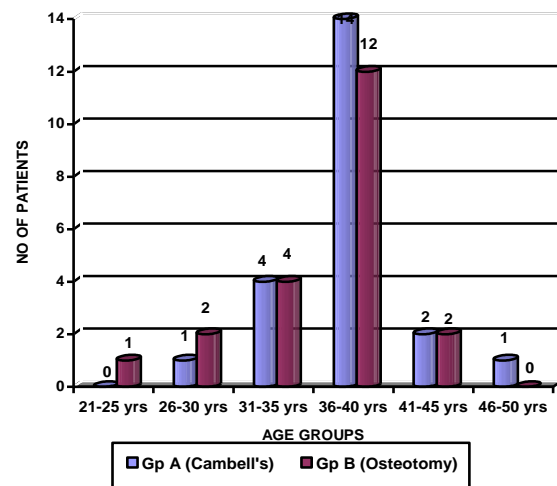


Fig. 5: Age spectrum.



Fig. 6: Range of motion (flexion).



Fig. 7: Range of motion (Extension). (Scar of previous surgery present on medial aspect of elbow).

Functional results of both the surgical technique used in this study are comparable with each other and are slightly better as compared to other relevant studies. The probable cause of better functional results in this series is the exclusion of type 4 fractures.

The basic factors contributing to poor functional results are related to the severity of initial injury, operative trauma, configuration of fracture and poor fixation.

## CONCLUSION

This study proved that Campbell's approach is comparable in terms of functional results to the olecranon osteotomy for internal fixation of type 2 and 3 inter-condylar fractures of humerus, where minimum or no intra-articular comminution is present.

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