

## Functional outcome following olecranon osteotomy approach for fixation of T/Y fractures of distal humerus

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### Abstract

**Objectives:** To evaluate the functional outcome of fixation of T/Y fracture distal humerus through olecranon osteotomy

**Study Design:** Quasi experimental study.

**Place and duration of study:** Department of Orthopedics, Jinnah Postgraduate Medical Centre, Karachi from June 2011 to December 2011.

**Methodology:** Patients of either sex presenting with T/Y(configuration) fracture Humerus of Risenborough-Radin type II-IV and less than three weeks duration were included. Diagnosis was made by X-rays and underwent fixation by posterior approach through olecranon osteotomy. Functional outcome was measured by using Risenborough-Radin criteria of range of motion as good, fair and poor. The data was analyzed using SPSS version 13.

**Results:** 71 patients aged between 20-50 years were enrolled. Mean duration of trauma was  $12.2 \pm 4.4$  days. Majority 55 (77.5%) had type III fracture. Patients less than 40 years had good outcome in 52.8% cases and fair outcome in 41.7% cases better than patients more than 40 years age. In females, outcome was 68.8% which was better than males. Trauma of less than 12 days of duration had good outcome in 60.5% of cases. Type II fracture had better outcome than other types. Overall, 39 patients (54.9%) had good outcome, fair outcome in (33.80%) 24 patients and poor outcome in (11.27%) 8 patients.

**Conclusion:** Posterior approach using Transolecranon osteotomy is a satisfactory procedure for fixation of T/Y fracture of distal humerus, because it achieves good functional outcome post operatively in terms of range of motion of elbow compared to other procedures.

**Keywords:** T/Y fracture, humerus, olecranon osteotomy, range of motion. (JPMA 65: S-25 (Suppl. 3); 2015)

### Introduction

Distal humerus fractures are difficult to manage successfully because of the focal anatomic constraints, the frequent presence of comminution, displacement and osteopenia in old age people.<sup>1</sup>

Standard treatment and protocols for these fractures have not been well developed to achieve maximum acceptable results.<sup>2</sup> The recent trend for displaced, intra-articular fractures of distal humerus is open anatomical reduction and absolute stable osteosynthesis with early rehabilitation.<sup>3</sup>

The surgical approaches for open reduction and internal fixation (ORIF) of these fractures are posterior approach using Campbell's triceps V/Y approach, triceps sparing and olecranon osteotomy approach with their own limitation of exposure of articular surfaces and osteosynthesis respectively.<sup>4</sup>

Purpose of this study is to evaluate the functional

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outcome of fixation of T/Y fractures of distal humerus through olecranon osteotomy and compare the results with other local and foreign studies.

### Methodology

The study was conducted in Department of Orthopedics, Jinnah Postgraduate Medical Centre, Karachi from June 2011 to December 2011. Patients with T/Y fracture of distal Humerus, Risen-Borough and Radin<sup>5</sup> type-II IV of less than three weeks duration, with no previous non operative or operative treatment by medical practitioners or bone setters were selected. Patients with co-morbid, previous fracture at same site, simple, open and pathological fractures, infection, previous deformities at elbow were excluded. T/Y is the configuration or pattern of fracture. Patients were selected and admitted from Accident and Emergency department who reported with fractures. Patients were counseled for the procedure, its risks and benefits. Details and findings were recorded pre operatively on predesigned proforma. Informed consent was taken. Patients were put of first available elective operative list. Surgical procedure was performed and followed up by principal researcher with the help of other investigators. All patients received preoperative antibiotic prophylaxis, one

hour before surgery. Patients were operated under general anesthesia in lateral position, with standard protocol described in Campbell text book of Orthopedics for T/Y fracture of distal humerus.<sup>6</sup> Posterior Campbell approach was used and Chevron olecranon osteotomy was done 2.5 cm distal to tip of olecranon, and reflected with triceps muscle from distal humerus posteriorly to gain complete access to fracture. 4 mm intercondylar cancellous screws, K-wire, 3.5mm reconstruction plates were used at 90 degrees angle to each other and 3.5 mm cortical screws on either pillar to fix intercondylar fractures and reconstruct both condylar pillars. Olecranon osteotomy was reconstructed with tension band wire technique using intramedullary 6.5 mm cancellous screw and cerclage wire. Wound was closed over suction drain. Patient's arm was put in sling for comfort. Post operative antibiotics were given for 7 days.

Static and range of motion exercises were carried out with the help of trained physiotherapist, starting from second postoperative day. Patient was discharged on 4th post operative day with advice of light work with operated limb. Stitches were removed on 14th post operative day. Work load was progressively increased on operated limb with signs of callous formation. Patients were followed at monthly intervals up to six months. At each follow-up clinical and radiological evaluation was performed and recorded in proforma. Radiologically focus was on fracture union as it directly affects outcome in terms of joint mobility and hence range of motion.

The postoperative functional outcome was measured based upon criteria of Risen-Borough and Radin<sup>5</sup> which considers criteria of range of motion in flexion as follows: Good: Range of elbow flexion from 30° or less to 115° or more. Fair: Range of elbow flexion from 30°-60° to 115° or more. Poor: Range of elbow flexion from 60° or more to less than 115°. Range of motion was measured using Goniometer.

Data was analyzed through SPSS version 13. Mean  $\pm$  standard deviation (SD) was calculated for age and duration of trauma. Frequency and percentage was calculated for gender, type of fracture and functional outcome i.e. good, fair or poor. Stratification was done with regards to age, gender, type of fracture and duration of trauma to see the effect of these on functional outcome.

## Results

71 patients aged between 20 to 50 years of either sex with T/Y fracture of distal humerus were enrolled. The mean age of enrolled participants was 39.2 $\pm$ 8 years. Of 71 patients, 39 (54.9%) were male and 32 (45.1%) were female with male to female ratio of 1.2:1. Mean duration of trauma was 12.2 $\pm$ 4.4 days. 55 (77.5%) had type III fracture. Of 71 patients 39 (54.9%) had good, 24(33.8%)

**Table:** Overall outcome with range of motion and number of patients.

Outcome	Good	Fair	Poor
Percentage and Number of Patients	54.93%, 39 patients	33.80%, 24 patients	11.27%, 8 patients

and 8(11.27%) had poor outcome (Table).

Patients who were <40 years of age had good outcome in 37(52.8%) cases, fair outcome in 30(41.7%) and poor in 4(5.6%) cases. In patients >40 years of age, good outcome was in 41(57.1%), fair outcome in 18(25.7%) and poor in 12(17.1%) cases. In females good outcome was present in 49(68.8%) cases, fair in 13(18.8%) and poor in 9(12.5%). In males good outcome was present in 31(43.6%), fair in 33(46.2%) and poor in 7(10.3%). Trauma of less than 12 days duration had good outcome in 43(60.5%), fair in 22(31.6%) and poor in 5(7.9%) cases. In trauma of more than 12 days duration good outcome was in 34(48.5%), fair in 26(36.4%) and poor in 11(15.2%) cases. Good outcome was 46(64.3%), fair 20(28.6%) and poor 5(7.1%) in type II fractures. In Type III fracture good outcome was in 39(54.5%) cases, fair in 24(34.5%) and poor in 8(10.9%). Type IV fractures didn't show good outcome, fair was 36(50.7%) and poor 35(49.2%).

## Discussion

Complex intraarticular distal humerus fractures are considerable challenge even to the most experienced surgeon. Previous treatment methods of closed reduction with immobilization, traction and limited internal fixation have led to significant functional impairment with loss of range of movement.<sup>7-9</sup> The functional outcome of distal humerus fractures is related to the ability to restore the normal anatomy and to allow early movement. Various methods of limited internal fixation have been described using Kirchner wires, screw fixation and single plates.<sup>10,11</sup> These methods do not allow enough stability for early movement and have unpredictable results. The improved techniques for fixation recommended by the AO/ASIF have led to early mobilization with predictable results. The plating of two columns with plates preferably at 90° to one another has become the standard to compare other treatments.<sup>12</sup> Different plates can be used like reconstruction plates, 3.5mm DCP and 1/3 tubular plate. Fixation also depends on degree of exposure of distal humerus. Complete exposure of distal humerus is achieved by posterior Campbell approach using olecranon osteotomy. Goal is to anatomically reduce the fracture, maintain articular congruity and stable fixation. We used 3.5mm reconstruction plates for fracture fixation, because it gives better reconstruction of multi fragmented fracture. Other plates give good results also. Fractures of the distal humerus are relatively rare and large case series are rarely reported. Comparison between the various studies is

difficult owing to the variation in fracture classification, operative techniques and outcome measures used. Comparison was made between our study and other studies using olecranon osteotomy regarding functional outcome.

In our study, functional outcome on the basis of range of motion of elbow, 88.73% patients had satisfactory results. Young and female patients had a better outcome. Low grade and early operated fractures had satisfactory outcome compared to complex and late operated fractures. Other studies have shown satisfactory outcome also.

Similar to our study Majeed and colleagues<sup>13</sup> reported good functional results in 13 (59.09%) patients, whereas fair results in 6 (27.27%), poor results were found in 3 (13.64%) patients.<sup>8</sup>

Drefuss D et al<sup>14</sup> reported good to excellent results in complex intercondylar fractures of distal humerus operated by transolecranon approach, similar to our study. Mardanpour K et al<sup>15</sup> showed excellent, very good and good results in his study. Elmadag M and colleagues<sup>16</sup> showed better results in olecranon osteotomy approach than other approaches, results similar to ours. Cannada L and colleagues<sup>17</sup> showed that sixty-five percent of the patients achieved excellent or good results, 28% fair, and 7% poor. Babhulkar S et al<sup>18</sup> showed range of motion in flexion and extension to be excellent to good in 72% cases (n=67), fair in 19% (n=18), and poor in 9% patients (n=9). Yang Y and colleagues<sup>19</sup> showed excellent elbow function in 16 cases, good in 10, fair in 2 and poor in 2 similar to our results. Tyllianakis M et al<sup>20</sup> showed excellent results in 6 patients (23.1%), very good in 15 (57.6%) and fair in 5 (19.3%). Our results are comparable with other series in the literature although there is considerable variation depending on the outcome scoring system used. But generally the outcome was almost same in these studies. So comparing our study with others mentioned above, we and all the investigators are of the agreement that fixation of T/Y fracture humerus with transolecranon osteotomy approach gives satisfactory results and outcome.

## Conclusion

This study proved that functional results of olecranon osteotomy for internal fixation of type 2 and 3 intercondylar fractures of humerus, where minimum or no intra-articular comminution is present are satisfactory. It is a good procedure for distal humerus T/Y fracture management but it is a complex surgery and needs expertise. So, better results can be achieved if performed by an experienced surgeon.

## References

1. Ziran BH, Smith WR, Balk ML, Manning CM, Agudelo JF. A true triceps-splitting approach for treatment of distal humerus fractures: a preliminary report. *J Trauma* 2005; 58: 70-5.
2. Ilyas M, Bhutta IA, Naeem M. Comparison of different surgical approaches for internal fixation of distal humerus fractures. *J Surg* 2001; 21-22:19-21.
3. McKee MD, Wilson TL, Winston L, Schemitsch EH, Richards RR. Functional outcome following surgical treatment of intra-articular distal humeral fractures through a posterior approach. *J Bone Joint Surg Am* 2000; 82: 1701-7.
4. Wilkinson JM, Stanley D. Posterior surgical approaches to the elbow: a comparative anatomic study. *J Shoulder Elbow Surg* 2001; 10: 380-2.
5. Riseborough EJ, Radin EL. Intercondylar T fractures of the humerus in the adult. A comparison of operative and non-operative treatment in twenty-nine cases. *J Bone Joint Surg Am* 1969; 51: 130-41.
6. Crenshaw Jr AH, Perez EA. Fractures of shoulder, arm and forearm In: Campbell WC, Canale ST, Beaty JH, eds. *Campbell's Operative Orthopaedics*. 11th ed. Philadelphia, PA: Mosby; 2007. pp. 3371-3462.
7. Charnley J. *The Closed Treatment of Common Fractures*. 3rd ed. Baltimore, MD: Williams & Wilkins; 1961. pp 70-71.
8. Keon-Cohen BT. Fractures at the elbow. *J Bone Joint Surg Am* 1966; 48: 1623-39.
9. Letsch R, Schmit-Neuerburg KP, Stürmer KM, Walz M. Intraarticular fractures of the distal humerus. Surgical treatment and results. *Clin Orthop Relat Res* 1989; 241: 238-244.
10. Cassebaum WH. Open reduction of T- and Y-fractures of the lower end of the humerus. *J Trauma* 1969; 9: 915-925.
11. Johansson H, Olerud S. Operative treatment of intercondylar fractures of the humerus. *J Trauma* 1971; 10: 836-843
12. Henley MB. Intra-articular distal humeral fractures in adults. *Orthop Clin North Am* 1987; 18: 11-23.
13. Majeed N, Salim M, Islam Q. Comparison of Campbell's and olecranon osteotomy approaches for treatment of inter-condylar fracture of humerus. *PAFMJ* 2007; 57: 75-84.
14. Dreyfuss D, Eidelman M. Treatment of complex intercondylar humeral fractures in adolescents by open reduction and internal fixation through the transolecranon approach. *J Pediatr Orthop B* 2014; 23: 364-8.
15. Mardanpour K, Rahbar M. Open reduction and internal fixation of intraarticular fractures of the humerus: evaluation of 33 cases. *Trauma Mon* 2013; 17: 396-400.
16. Elmadag M, Erdil M, Bilsel K, Acar MA, Tuncer N, Tuncay I. The olecranon osteotomy provides better outcome than the triceps-lifting approach for the treatment of distal humerus fractures. *Eur J Orthop Surg Traumatol* 2014; 24: 43-50.
17. Cannada L, Loeffler B, Zadnik MB, Eglseder AW. Treatment of high-energy supracondylar/intercondylar fractures of the distal humerus. *J Surg Orthop Adv* 2011; 20: 230-5.
18. Babhulkar S, Babhulkar S. Controversies in the management of intra-articular fractures of distal humerus in adults. *Indian J Orthop* 2011; 45: 216-25.
19. Yang Y, Huang PQ, Fang JW. [Treatment of severely comminuted fractures of humeral intercondylar through approach of osteotomy olecranon with double-plate internal fixation.] *Zhongguo Gu Shang* 2009; 22: 335-6.
20. Tyllianakis M, Panagopoulos A, Papadopoulos AX, Kaisidis A, Zouboulis P. Functional evaluation of comminuted intra-articular fractures of the distal humerus (AO type C). Long term results in twenty-six patients. *Acta Orthop Belg* 2004; 70: 123-130.