ORIGINAL ARTICLE

A comparison of functional outcome of intercondylar fracture of distal humerus managed by olecranon osteotomy approach versus triceps sparing approach in adults

Muhammad Usman Khalid, Kazi Muhammad Saeed, Muhammad Akhter

Abstract

Objective: To compare the frequency of satisfactory functional outcome of intercondylar fractures of distal humerus managed by the triceps-sparing approach and olecranon osteotomy approach.

Methods: The randomised controlled study was conducted at Mayo Hospital, Lahore, from September 1, 2012 to August31 2014,and comprised patients>14 years of age who were admitted through the Accident and Emergency Department and were prepared for surgery to repair intercondylar fractures of distal humerus. The patients were randomly divided into two equal groups. Implants were arranged preoperatively. Patients in group A were managed by open reduction internal fixationvia olecranon osteotomy approach, and those in group B were managed by open reduction internal fixationvia triceps-sparing approach by the same team of surgeons. Mayo Elbow Performance Score was used to assess the functional outcome. Demographic, preoperative and postoperative clinical information of all patients were entered into a predesigned proforma and variables were evaluated statistically.

Results: The 150 patients in the study were randomly divided into two groups of 75(50%) patients each. The overall mean age was 49.01±14.63 years. Mean age of group A patients was 53.84±11.86 years and that of group B was 44.19±15.59 years. In group A, there were 67(89.3%) patients who had satisfactory functional outcome and 8(10.7%) had unsatisfactory outcome. In groupB,53(70.7%) patients had satisfactory and 22(29.3%) patients had unsatisfactory functional outcome.

Conclusion: Olecranonosteotomy approach was found to be more effective and preferable compared to the triceps-sparing approach.

Keywords: Functional outcome, Olecranon osteotomy approach, Triceps-sparing approach, Intra-articular fracture distal humerus. (JPMA 65: S-119 (Suppl. 3); 2015)

Introduction

The intra-articular fractures of distal end of humerus constitute about 2% of all fractures.[1] Fractures of the distal humerus remain a challenging problem despite advances in techniques and implants. These injuries often involve articular comminution, and many occur in older patients with osteoporotic bone. Joint function often is compromised because of stiffness, pain, and weakness. Rarely is a "normal" elbow the outcome after these fractures, but outcomes have been improved with advances in implant technology, surgical approaches and rehabilitation protocols.[2] 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. When these fractures extend into the elbow joint, there is significant risk of residual pain and functional impairment.[3,4] The recommendations for the treatment range from essentially no treatment to open reduction and extensive internal fixation.[5,6] Conservative treatment of intra-articular fractures of distal humerus usually results in loss of elbow motion and permanent disability.[3,6] With the improvement in surgical skills and implants, the outcome of these fractures continues to improve.[6]

Various operative approaches have been recommended, including triceps splitting, triceps reflecting and olecranon osteotomy approaches.[7,8] Surgical approaches for open reduction and internal fixation (ORIF) of these fractures include those that divide triceps mechanism providing good exposure and those that save triceps mechanism but give limited exposure.[9]

There is no definitive evidence about effectiveness of one approach over the other. A study carried out in Peshawar, Rawalpindi and Karachi from 1999 to 2005 showed that 59.09% had good results and 27.27% had fair results with olecranon osteotomy approach which were comparable to the results of those managed by triceps-sparing

Department of Orthopaedic Surgery, KEMU/Mayo Hospital, Lahore.

Correspondence: Muhammad Usman Khalid. Email: ukkazi179@gmail.com

approach i.e. 57.14% good and 33.33% fair.[10] Another study carried out in Srinagar showed that 87% of patients managed by olecranon osteotomy approach had good to excellent outcome (75 to 100 score).[11] Similarly, in a study conducted in China, showed that the rate of excellent/good Mayo Elbow Performance Score (MEPS) remained above 80% in all age groups of patients treated with ORIF via olecranon osteotomy.[12]

This current study was conducted to determine if there is significant superiority of trans-olecranon osteotomy approach over triceps-sparing approach in respect of functional outcome.

Methodology

The randomised controlled study was conducted at Mayo Hospital, Lahore, from September 1, 2012 to August 31 2014, and comprised patients >14 years of age, diagnosed on plain radiographs, not older than 2 weeks, without any known metabolic bone disease and who were admitted through the Accident and Emergency (A&E) Department and were prepared for surgery to repair intercondylar fracture of distal humerus. The patients were randomly divided into two equal groups after approval was obtained from the Ethical Review Committee of the King Edward Medical University (KEMU), Lahore. Implants were arranged preoperatively. Patients in group A were managed by ORIF via olecranon osteotomy approach and those in group B were managed by ORIF via triceps-sparing approach by the same team of surgeons. There was no difference in surgical procedure except that of approach. MEPS was used to assess the functional outcome of the fractures.[13] Patients with scores of 75 or above were labelled satisfactory, and with less than 75 as unsatisfactory.

Patients were discharged on the 2nd postoperative day and were followed up on 10th postoperative day, 1 month and 3 month postoperatively. All information was recorded on predesigned proforma.

The collected data was analyzed statistically by using SPSS 12. Quantitative variables like age were presented in the form of mean ± standard deviation. Qualitative variables like gender, type of procedure were presented in the form of frequency and percentage. Chi-square test was used to compare surgical approach in both groups. $P \leq 0.05$ was considered significant.

Result

The 150 patients in the study were randomly divided into two groups of 75(50%) patients each. Overall, 87(58%) patients had fracture involving the right humerus and 63(42%) patients had fracture of left humerus. In group A, 47(62.67%) had fracture of right humerus and 28(37.33%) left humerus. In group B, 40(53.33%) patients had fracture of right humerus and 35(46.67%) had left humerus. Mean age of patients was 49.01±14.63 years. Mean age of group A patients was 53.84±11.86 years and in group B it was 44.19±15.59 years (Table-1).

In group A, there were 41(55%) male and 34(45%) female patients, and in group B, 53(70.6%) patients were male

Table-1: Descriptive Statistics.

	Group		Total
	Group A	Group B	
N	75	75	150
Mean	53.84	44.19	49.01
Std. Deviation	11.86	15.59	14.63
Minimum	35	23	23
Maximum	70	67	70

Table-2: Functional activities.

		Group-A	Group-B	Total	p-value
Stability	Stable	75(100%)	33(30.7%)	98(65.3%)	0.000
	Moderately	0(0%)	52(69.3%)	52(34.7%)	
Able to comb hair	Yes	59(78.7%)	60(80%)	119(79.3%)	0.840
	No	16(21.3%)	15(20%)	31(20.7%)	
Able to feed oneself	Yes	75(100%)	75(100%)	150(100%)	-
	No	0(0%)	0(0%)	0(0%)	
Able to perform personal hygiene tasks	Yes	67(89.3%)	67(89.3%)	134(89.3%)	-
	No	8(10.7%)	8(10.7%)	16(10.7%)	
Able to on shirt	Yes	68(90.7%)	46(61.3%)	114(76%)	0.000
	No	7(9.3%)	29(38.7%)	36(24%)	
Able to put shoes	Yes	75(100%)	68(90.7%)	143(95.4%)	0.007
	No	0(0%)	7(9.3%)	7(4.7%)	

Table-3: Functional outcome score.

	Groups		Total
	Group A	Group B	
N	75	75	150
Mean	88.20	84.33	86.26
Std. Deviation	11.49	13.46	12.62
Minimum	60	65	60
Maximum	100	100	100

Table-4: Satisfactory Functional Outcome.

		Groups		Total
		Group A	Group B	
Satisfaction	Satisfactory (>75)	67(89.3%)	53(70.7%)	120(80%)
	Unsatisfactory (<75)	8(10.7%)	22(29.3%)	30(20.0%)
Total		75	75	150

P value= 0.004 (Significant-value<0.05).

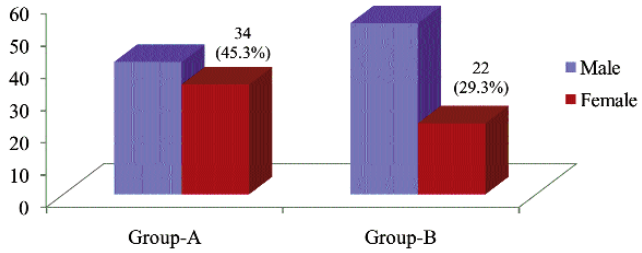

Figure-1: Gender distribution.

and 22(29.3%) females (Figure-1).

In group A, 52(69.3%) patients had no pain, 15(20%) had mild and 8(10.7%) had moderate pain, while in group B, 46(61.3%) patients had no pain, 29(38.7%) had mild and none of the patients had moderate pain (Figure-2).

In group A, patient's range of motion (ROM) was Arc >100 degrees among 22(29.3%) patients and 53(70.7%) patients had Arc 50-100 degrees. In group B, Arc>100 was in 31(41.3%) patients and 44(58.7%) patients had Arc 50-100 degrees (Figure-3).

All patients in group A (100%) had stability, while in group B, stability was reported by only 33(30.7%) patients. In group A, 59(78.7%) patients could easily comb their hair, while in group B the same could be done by 60(80.5%). All patients in both groups were able to feed themselves as well as 67(89.3%) patients in both groups were fully able to perform personal hygiene tasks well. In group A, 68(90.7%) and in group B 46(61.3%) patients were able to put on a shirt. There were 75(100%) patients in group A

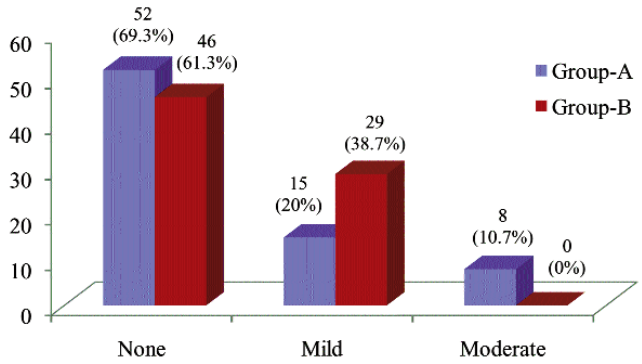

Figure-2: Pain status.

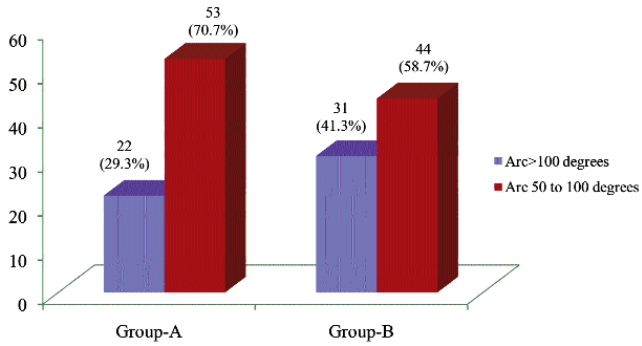

Figure-3: Range of motion.

and 68(90.7%) in group B who were able to put on shoes easily (Table-2).

Overall mean score for functional outcome was 86.26±12.62. Mean score in group A was 88.20±11.49 and in group B it was84.33±13.46 (Table-3).

In group A, 67(89.3%) patients had satisfactory functional outcome and only 8(10.7%) had unsatisfactory, while in group B, 53(70.7%) had satisfactory and 22(29.3%) had unsatisfactory outcome (Table-4).

Discussion

Triceps-sparing approach and olecranon osteotomy are the basic surgical approaches for ORIF of intercondylar fracture of distal humerus, providing good exposure by dividing triceps mechanism. Triceps-sparing approach provides more proximal exposure with resultant triceps weakness and fibrosis. Although olecranon osteotomy approach provides excellent exposure of the distal humerus, but enthusiasm for this approach has been limited by reports suggesting numerous complications.[14] This approach affords more exposure distally, but has a disadvantage of another fracture being created that may result in technical complications. Metallic wires for

fixation of olecranon osteotomy have to be removed after union to avoid irritation of the skin.

Various other authors reported almost comparable results of using operative management. Talha et al. reported 85% good and very good results.[14] Noack et al, and Gupta in their studies reported 75% excellent and good results in patients treated with olecranon osteotomy approach.[15,16] Local studies show no significant difference in functional outcome regarding both these approaches whereas international studies show superiority of olecranon osteotomy approach over triceps sparing approach.

In our study, pvalue provided evidence of significant association between type of treatment and satisfactory functional outcome. It can be said on the basis of satisfactory functional outcome, that olecranon osteotomy treatment was more effective or preferable compared to triceps-sparing approach.

Olecranon osteotomy approach gives better exposure for more accurate anatomical reduction of the intra-articular fracture that results in better functional outcome. Triceps-sparing approach requires splitting or reflecting the triceps which leads to fibrosis and limitation of range of movement of the elbow joint, resulting in less satisfactory functional outcome. The other factor resulting in poorer outcome is the lack of proper exposure for the anatomical reduction of this type of intra-articular fractures.

Conclusion

On the basis of higher frequency of satisfactory functional outcome in group A patients compared to group B patients, osteotomy olecranon approach was more effective or preferable compared to triceps-sparing approach.

References

1. Tak SR, Dar GN, Halwai MA, Kangoo KA, Mir BA. Outcome of olecranon osteotomy in the trans-olecranon approach of intra-articular fractures of the distal humerus. Ulus Travma AcilCerrahi Derg 2009; 15: 565-570.
2. Crenshaw Jr.AH, PerezEA.Campbell's Operative Orthopaedics. 11th ed. Philadelphia, PA: Mosby; 2007. Chapter 54, Fractures of the Shoulder, Arm and Forearm; p.3371-3462.
3. Bickel WE, Perry RE. Comminuted fractures of distal humerus. JAMA1963; 184: 553-7.
4. Helfet DL. Bicondylar intraarticular fractures of distal humerus in adults: their assessment, classification and operative management. Adv Orthop Surg 1985; 8: 223-235.
5. Holdsworth BJ, Mossad MM. Fractures of adult distal humerus. Elbow function after internal fixation. J Bone Joint Surg Br 1990; 72: 362-365.
6. Dowden JW. The principles of early active movement as applied to the treatment of fractures of the upper extremity. Proc R Soc Med 1924; 17: 29-34.
7. Bryan RS, Morrey BF. Extensive posterior exposure of the elbow. A triceps-sparing approach. Clin Orthop Relat Res 1982; 166: 188-92.
8. Coles CP, Barei DP, Nork SE, Taitsman LA, Hanel DP, Bradford Henley M. The olecranon osteotomy: a six-year experience in the treatment of intraarticular fractures of the distal humerus. J Orthop Trauma 2006; 20: 164-71.
9. Jamali AR, Mehboob G, Ahmed S. Extensor mechanism sparing approach to the elbow for reduction and internal fixation of intercondylar fracture of the humerus. J Pak Med Assoc 1999; 49: 164-7.
10. 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.
11. Tak SR, Dar GN, Halwai MA, Kangoo KA, Mir BA. Outcome of intra articular fractures of distal humerus: Does olecranon osteotomy affect the outcome. J Orthopaedics [internet]. 2008 [cited 2014 June 22]; 5(4):e9. Available from: http://www.jortho.org/2008/5/4/e9.
12. Chen G, Liao Q, Luo W, Li K, Zhao Y, Zhong D. Triceps-sparing versus olecranon osteotomy for ORIF: analysis of 67 cases of intercondylar fractures of the distal humerus. Injury 2011; 42: 366-70.
13. Morrey BF, An KN, Chao EYS. Functional evaluation of the elbow. In: Morrey BF, ed. The Elbow and its Disorders.2nd ed. Philadelphia, WB Saunders; 1993. pp. 86-89.
14. Talha A, Toulemonde JL, Cronier P, Lorimier G, Ghestem P, Guntz M. [Supra- and intercondylar fractures of the distal humerus in adults. Apropos of 28 osteosynthesis].J Chir(Paris) 1989; 126: 217-24.
15. Noack W, Kreusch-Brinker R, Trepte CT. [Indication and results of the surgical treatment of distal intra-articular fractures of the humerus in elderly.]Z OrthoplhreGrenzgeb1987; 125: 233-4.
16. Gupta R. Intercondylar fractures of distal humerus in adults. Injury 1996; 27: 569-72.