IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 01 Ver. XI January. (2018), PP 18-23
www.iosrjournals.org

"Management of Distal Humerus Fractures By Bicolumnar Plating"A

*[1]Dr. A. Srinivasa Rao, [2]Dr. C. Shyam kumar M.S,
[3]Dr. D. Venkateswara Rao M.S,[4] Dr.ch. Rajesh M.B.B.
[1] M.S, M.Ch (Ortho), Associate Professor of Orthopedics, Siddhartha Medical College/Government General Hospital, Vijayawada.
[2](Ortho), Associate Professor of Orthopedics , Siddhartha Medical College/Government General Hospital, Vijayawada(Corresponding Author).
[3]M.Ch (Ortho), Professor &H.O.D of Orthopedics, Siddhartha Medical College/Government General Hospital, Vijayawada.
[4]S, Post graduate in Department of Orthopedics, Siddhartha Medical College/Government General Hospital, Vijayawada.
Corresponding Author:Dr. C. Shyam Kumar

Abstract
Back ground: *The management of distal humerus fractures has been improved over the last few years due to more common use of advanced imaging modalities such as computed tomography (CT), understanding the benefits of parallel-plating techniques, the recognition of the more complex*
patterns of shear fractures of the articular surface of the distal humerus, the widespread use of precontoured periarticular plates, and the selective use of elbow arthroplasty.
Methodology: *this study was done in Government General HospitalSiddhartha Medical College Vijayawada. It is a prospective study.done from December 2015 to June 2017,in 20 members of patients. All surgeries were performed by single orthopaedic surgeon at Government General Hospital / Siddhartha Medical college. The type of fracture, time delay for surgery, surgical approach, complications and outcome were recorded. based on inclusion and exclusion criteria.*
Results: *In the present study of 20 cases the average age was 35 years. The youngest age was 21 years and oldest age was 55 years. The Male/ Female ratio was 1.85:1. In present study 12 cases sustained dominant hand injuries. Fractures sustained in a road traffic accident(most common) were more comminuted. Shin SJ et al[1] compared clinical outcomes in patients with intraarticular distal humerus fractures using 2 different double plating methods. 17 patients were treated by orthogonal plating and 18 patients were treated by parallel plating. Arc of flexion, bone union was better in parallel plating compared to orthogonal plating.[2] Patients were follow-up for an average of 8months (range 3 months to 15 months). Excellent results were found in 8cases (40%); Good results in 7 cases (35%), sum of excellent to good results of 15 cases (75%) and fair results were obtained in 5(25%) cases. In present study the functional Flexion - Extension arc gained was at an average of 100[0.] No post operative permanent nerve palsies were found except transient ulnar nerve palsy in one case, which was managed conservatively which recovered completely.In this study hardware pain was noticed in 2 patients. In them proud k-wires were removed after union.*
We had one case of deep Infection for which we did a thorough lavage and treated the patient with high end antibiotics. The patient recovered the fracture united but the patient had elbow stiffness with functional range of motion.
Conclusion:*1 In the surgical management of fractures of the distal humerus anatomical reduction of the articular surface, rigid and stable internal fixation of the distal humerus medial and lateral pillars and accurate reconstruction of the trochlea and capitellum are of prime importance in achieving an excellent functional outcome.2.For open reduction and internal fixation of fractures of the distal humerus, we got similar results with Triceps Reflecting Anconeus Pedicle, Triceps-splitting and Olecranon Osteotomy approach*
Parallel plating of medial and lateral pillars is the preferred technique by us to have a stable and rigid anatomical construct allowing early mobilization.
Keywords: *Mayo Elbow Performance Index (MEPI),medial column,lateral column,trochlea,capitellum.*

Date of Submission: 12-01-2018 Date of acceptance: 25-01-2018

I. Introduction

Fractures of the distal humerus remain one of the most difficult of all fractures to manage since the original description by Desault in 1811.[3] Medial and lateral condyles are usually separate fragments displaced in a T or Y configuration and both unconnected from the humeral shaft and rotated in the axial plane. The goal of treatment is to re-establish the articular congruity and alignment and begin active motion as soon as possible. In most cases open reduction with rigid internal fixation is preferred.In some of these fractures particularly those with intra-articular comminution anatomical restoration of the articular surface cannot be adequately achieved or maintained through manipulative reduction alone.[4] The recent advances in surgical techniques and equipment that made rigid osteosynthesis of smaller intra – articular fractures possible now permit early post operative rehabilitation. Improved and more predictable results can now be achieved with the operative treatment of even the comminuted intercondylar fracture.[5,6]The recent trend has been immediate open reduction and stable internal fixation, and early post operative active range of motion.[7,8] The anatomic complexity of the distal humerus makes surgical reconstruction difficult.[9] The Fabrication of new implants however, has increased the reliability of operative stabilization while placing additional demands upon the surgeons expertise. Injuries of the elbow joint leads to chronic pain and permanent restriction of motion limiting use of the hand in most activities.[10] Positioning of hand for grip and prehension is dominated by freedom of motion at the elbow.Shaft of humerus almost a cylindrical, flattens at the lower shaft and above condyles – a weak area.[11]Intercondylar area of humerus is thin – prone for splitting forces resulting in separation.Wedge shape of trochlear notch of olecranon on forcing in to notch of trochlea, has splitting effect. The articular segment functions architecturally as a tie arch.In the FLEXION type injury Palmer[12] has speculated that the blow against the posterior aspect of elbow (olecranon), coupled with contraction of the forearm muscles produces the fracture with less force than expected. In many instances however, the forces applied to the posterior flexed elbow are violent as in motor vehicle injuries. In the flexion type fracture the condyles are usually found anterior to the humeral shaft. In the EXTENSION type injury the ulna is directed anteriorly against the posterior aspect of the trochlea separating the condyles at the same time as the supracondylar portion is fractured.Another mechanism is proposed by Wilson and Chochrane, who suggested that the separation of the condyles in this type of fractures may be created by the splitting effect of the humeral shaft as it is forced distally. In the extension type injury the condyles are usually found to be behind the humeral shaft.

II. Methodology

1. place of study : government general hospital / siddhartha medical college vijayawada.
2. type of study : it is a prospective study
3. duration of study: december 2015 to june 2017
4. sample size : 20

Inclusion Criteria

closed distal humerus fractures are included in the study.
patients in the age group of 20-70 yrs are included in the study.

Exclusion Criteria :

All Compound fractures are excluded from the study.Age of patients below 20 yrs and above 70 yrs are excluded frm the study.Patients with other gross co-morbidities deferring surgery are excludd from the study (medical contraindications for surgery).Local soft-tissue problems such as infection, wounds, and soft-tissue lesions from blunt trauma.Elderly patients with severe osteoporosis.Associated forearm fractures of ipsilateral limb.All surgeries were performed by single orthopaedic surgeon at Government General Hospital / Siddhartha Medical college. The type of fracture, time delay for surgery, surgical approach, complications and outcome were recorded.

III. Results

In the past one and half years 20 cases of fractures of distal humerus were treated in the orthopaedic department of Government General Hospital / Siddhartha Medical College, Vijayawada. They were managed as follows. All the cases were treated by open reduction and internal fixation with olecranon osteotomy, Triceps-splitting and Triceps Reflecting Anconeus Pedicle approach. These 20 cases were taken up for study. Therefore it is apparent that 14(70%) cases are due to high velocity injuries and 6 (30%) cases moderate to low velocity injuries.One reduction and Internal fixation was done for fractures of the distal humerus between 21 years (youngest) and 55 years (oldest) in this series.13 males 7 female patients were treated.dominant side involved in 12 cases,non dominant side involved in 8 cases.one patient had infection,2 patients had hardwear pain,one patient had transient ulnar nerve palsy as complications in the study.

IV. Discussion

In the present study of 20 cases the average age was 35 years. The youngest age was 21 years and oldest age was 55 years. The Male/ Female ratio was 1.85:1. In present study 12 cases sustained dominant hand injuries. Fractures sustained in a road traffic accident(most common) were more comminuted . Concern has been expressed that the extensive dissection and surgical trauma of the exposure required to achieve rigid internal fixation will lead to soft tissue fibrosis and limitation of motion. The transolecranon approach with the patient in lateral position offers excellent exposure of the articular surface and distal end of the humerus without the soft tissue trauma associated with the triceps splitting or tongue of triceps approach. While the transolecranon approach requires the creation of an additional intra-articular fracture this approach also facilitates identification of and protection of the ulnar nerve. Anterior transposition is indicated when the nerve is contused from the original trauma or intra operative retraction or when the metal implants will cause a mechanical irritation.No other approach known to expose the elbow joint allows so great a freedom of the selection of fixation materials, does so little harm to important anatomical structures or offers such an excellent view of the articulating surfaces. In the hands of a competent surgeon Triceps Reflecting Anconeus Pedicle (TRAP) approach also gives better results. But it has a lot of soft tissue trauma associated with it. We are unclear as to the degree of flexion required to completely expose the olecranon fossa and for reconstruction of distal humeral articular surface. We advocate the principle of parallel plating of the medial and lateral pillars of the distal humerus over orthogonal plating[13] for it allows us to restore the anatomical configuration of the distal humerus permits us to use longer screws that hold each plate to the opposite pillar there by increasing the rigidity of the construct making it stable. The tie arch of the articular surface is restored with stabilization of the medial and lateral pillars with parallel plating. Though it is technically difficult in the hands of experienced surgeon it allows accurate anatomical restoration and a very stable fixation with less wound healing problems as there is no plate on the posterior aspect. Schemitsch et al [14] found that parallel plating with medial recon plate and a lateral J plate had the greatest construct rigidity compared to orthogonal plating.Self et al [15] found that parallel plating trended towards having greater rigidity and load to failure than orthogonal plating.Arnander et al [16] found that two 3.5 mm recon plates applied parallelly have increased stiffness and strength compared to orthogonal plating. Sanchez-Sotelo[17] reported that parallel plating had increased structural stability compared to orthogonal plating.Shin SJ et alcompared clinical outcomes in patients with intraarticular distal humerus fractures using 2 different double plating methods. 17 patients were treated by orthogonal plating and 18 patients were treated by parallel plating. Arc of flexion, bone union was better in parallel plating compared to orthogonal plating.Our results show no instability, increased elbow range and early mobilization which are in par with the series mentioned.

Post operative period was uneventful in all patients. Early mobilization was started in many cases except for osteoporosis in two cases. After 3 weeks these patients were advised vigorous physiotherapy. Patients were discharged with advice of active, assisted active range of motion exercises. The above elbow posterior slab was continued for 3 weeks for it allows good wound healing without any soft tissue contractures.At follow-up, patients were assessed clinically and radiologically. Most patients regained excellent to good range of motion within 3 months (range 6 weeks – 16 weeks), fracture was united in an average of 8.5 weeks (range 8 weeks – 10 weeks) and olecranon osteotomy in an average of 6.2 weeks(range 6 weeks – 8 weeks).Patients were follow-up for an average of 8months (range 3 months to 15 months). Excellent results were found in 8cases (40%); Good results in 7 cases (35%), sum of excellent to good results of 15 cases (75%) and fair results were obtained in 5(25%) cases (Table 3). Results achieved in present study were superior than G. K. Aitken and Rora Beck [18], Joseph B. Zagorski and John J Jennings[19] series and slightly inferior than Jupiter and Peter Holzackseries. G. K. Aitken and Rora Beck treated 29 adult patients of which 17 cases were treated by open reduction and internal fixation. Excellent to good results were obtained in 10 cases (58.84%) as per Mayo Elbow performance Index (Table 3). Jupiter and Peter Holzack34 cases of fracture of distal humerus that were treated by open reduction over a 10year period with a mean followup of 5.8years. 13 cases were rated as excellent and 14 cases as good with sum of excellent to good results of 27 cases (79.40%) as per Mayo Elbow Performance Index(Table1). Joseph B. Zagorski and John J Jennings were treated 42 comminuted intraarticular fractures of humeral condyles were analyzed to compare the results of operative versus nonoperative management. 29 patients were treated by open reduction and internal fixation, of these 19 cases(65.5%) obtained excellent to good results (Table 1).

Table 1- Comparison of Results with Other Series

	SERIES	CASES	EXCELLENT TO GOOD RESULTS
1.	G.K. Aitken and Rora Beck (1985)[10]	17	10 (58.84%)
2.	Jupiter and Peter Holzack (1985)[61]	34	27 (79.4%)
3.	Joseph B. Zagorski and John J Jennigns (1986)[99]	29	19 (65.5%)
4.	Present study	20	15 (75.0%)

It is noteworthy that the clinical evaluation did not always correlate with the follow-up radiograph. Patient with an excellent overall rating may have radiographic evidence of joint space narrowing or marginal spur formation.

In present study the functional Flexion - Extension arc gained was at an average of 100^0 and the complications in this study were varied and the most part, minor with a rate of 10% (Table 2). The functional arc of motion achieved in this study is inferior than Huang et al , Doomberg et al [20] and Shin SJ et al [65] series but equivalent to the Sanchez- Sotelo et al[64] series. Huang et altreated 19 consecutive displaced comminuted articular fractures of the distal humerus with open reduction and internal fixation. In final followup, the average active flexion was 128.4^0 with a range of $115\text{-}140^0$ with 2 early postoperative complications including one superficial infection and one iatrogenic ulnar nerve injury (10.6 %) (Table 2). Doomberg et al evaluated 30 patients at an average of nineteen years after open reduction and internal fixation of distal humerus to assess the range of elbow motion and the functional outcome. The average final flexion arc was 106^0 with a complication rate of 14% (Table 2). Sanchez- Sotelo et al treated 34 complex distal humeral fractures with a mean followup of 2 years. The mean Flexion- Extension arc was 99^0 with the complication rate of 24% (Table 2). Shin SJ et al compared clinical outcome in patients with intraarticular distal humeral fractures treated using 2 different double plate methods. The arc of flexion averaged in patients treated with parallel plating was 110^0 with complication rate of 40%

(Table 2). **Table 2**Comparison of Flexion -Extension RESULTS WITH OTHER SERIES

Study	Outcome Score	Flexion-Extension Arc(degrees)	Complication Rate
Huang et al [2](2005)	MEPI 100 %	128.4	10.6%
Doomberg et al[20] (2007)	MEPI 91 %	106	14%
Sanchez-Sotelo[17] et al (2007)	MEPI 85 %	99	24%
Shin SJ, Sohn HS, Do NH[1], (2010)	MEPI 82%	110	40%
Present study	MEPI 87 %	100	20%

No post operative permanent nerve palsies were found except transient ulnar nerve palsy in one case, which was managed conservatively which recovered completely.

Post op x ray

3weeks post operative extension.

12 weeks post operative extension clinical photos.

In this study hardware pain was noticed in 2 patients. In them proud k-wires were removed after union. We had one case of deep Infection for which we did a thorough lavage and treated the patient with high end antibiotics. The patient recovered the fracture united but the patient had elbow stiffness with functional range of motion.

V. Conclusion

In the surgical management of fractures of the distal humerus anatomical reduction of the articular surface, rigid and stable internal fixation of the distal humerus medial and lateral pillars and accurate reconstruction of the trochlea and capitellum are of prime importance in achieving an excellent functional outcome.Operative treatment of these fractures is a major procedure and preliminary planning is essential for success.For open reduction and internal fixation of fractures of the distal humerus, we got similar results with Triceps Reflecting Anconeus Pedicle, Triceps-splitting and Olecranon Osteotomy approach Parallel plating of medial and lateral pillars is the preferred technique by us to have a stable and rigid anatomical construct allowing early mobilization.Physiotherapy has a great role in the outcome of functional result.Since our sample size is small, our results have to be confirmed with large clinical trials.

In our Institute 20 cases were operated as discussed. The results evaluated as per Mayo Elbow Performance Index (MEPI)[21,22]are as follows

Table 2 : MEPI [21,22]

Grade	No of Cases	%
Excellent	8	40%
Good	7	35%
Fair	5	25%
Poor	-	-

Bibliography

[1]. Shin SJ, Sohn HS ,Do NH : A clinical comparison of two different double plating methods for intra articular distal humerus fractures, J Shoulder Elbow Surg 2010;19(1):2-9.
[2]. Huang TL, Chiu FY, Chuang TY, Chen TH: The results of open reduction and internal fixation in elderly patients with severe fractures of the distal humerus: A critical analysis of the results. J Trauma2005;58:62-69.
[3]. Watson – Jones R: Fractures and joint injuries Vol.2 6th ed. : Churchill Livingstone, New Delhi, 1993.
[4]. Brown RF, Morgar Rg: Intercondylar T shaped fractures of the humerus. Results in ten cases treated by early mobilization. JBJS 53-B; 425.
[5]. Bryan RS: Fractures about the elbow in adults, AAOS, Instructional course lectures 30:200, 1981.
[6]. Bryan RS and Bickel WH: T condylar fractures of the distal humerus, J. Trauma. 111:830, 1971.
[7]. Helfelt DL and Hotchkiss RN: Internal fixation of the Humerus. A Biomechanical comparision Of methods. J.Ortho. Trauma. 4: 260-264, 1990.
[8]. Letsch R, Schmit, Newerberg KP, Sturmer KM, and Walz M; Intra articular fractures of the distal humerus: surgical treatment and results, CORR 241: 238, 1989.
[9]. Helfet DL : Biocondylar Intra – articular fractures of the distal humerus in adults: their assessment, classification and operative management. Adv.Orthop. Surg. 8: 233, 1985.
[10]. Aitken G.K. and C.H. Rora Beck : Distal humeral fractures in the adult. 207: 191-197, 1986.
[11]. Rockwood and Green's : Fractures in adults : 7th Edition, 2010
[12]. Palmer I : Open treatment of transcondylar T fractures of the humerus. Acta. Chir. Scand., 121: 486-490, 1961.
[13]. Jupiter JB: Neff U, Holzach P and Allgower M: Intercondylar fractures of the Humerus JBJS 67A : 226-239, 1985.
[14]. Schemitsch EH, Tencer AF, Henley MB. Bio mechanical evaluation of methods of internal fixation of distal humerus. Orthopaedics 1992; 15(2): 159-163.
[15]. Self J, Viegas SF, Buford WL Jr, et al. A comparison of double-plate fixation methids for complex distal Humeral fractures. J Shoulder Elbow Surg 1995;4(1 pt 1):10-16.
[16]. Arnander MW, Reeves A MacLeod IA et al. A biomechanical comparison of plate configuration in distal humerus fractures. J Orthop Trauma 2008;22(5):332-336.
[17]. Sanchez-Sotelo J, Torchia ME, O' Driscoll SW : Complex distal Humeral Fractures: Internal fixation with a principle-based parallel plate technique. J Bone Joint Surgery Am 2007;89(5);961-969.
[18]. Aitken G.K. and C.H. Rora Beck : Distal humeral fractures in the adult. 207: 191-197, 1986.
[19]. Zagorski JB, Jennings JJ, Burkhalter WE and Uribe JW: Comminuted intra articular fractures of the distal humeral condyles surgical vs Non surgical treatment. CORR; 202: 197-204, 1986.
[20]. Doornberg JN, van Duijn PJ, Linzel D, et al: Surgical treatment of intra-articular fractures of the distal part of the humerus: Functional outcome after twelve to thirty years. J Bone Joint Surg Am2007;89:1524-1532.
[21]. Morrey BF, An KN, Chao EYS (1993) Functional evaluation of the elbow. In Morrey BF(ed.) The Elbow and Its Disorders, 2nd ed. Philadelphia: WB Saunders, 86–89.
[22]. Broberg MA, Morrey BF (1987) Results of treatment of fracture-dislocations of the elbow. Clin Orthop, 216, 109–119.

Dr. A. Srinivasa Rao."Management Of Distal Humerus Fractures By Bicolumnar Plating"A."IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 1, 2018, pp. 18-23