ORIGINAL RESEARCH

Assessment of management of distal humeral shaft fractures with locking compression plate

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ABSTRACT

Background: Fractures of the proximal humerus represent approximately 4% of all fractures and 26% of humerus fractures. For a successful functional outcome and early rehabilitation, alignment restoration and secure fixation are essential. **Aims and objectives:** The present study assessed the management of distal humeral shaft fractures with a locking compression plate (LCP). **Materials and Methods:** This prospective cohort study was conducted on 84 distal humeral shaft fractures of both genders, and parameters such as kind of fracture, weeks needed for union, Mayo Elbow Performance Score (MEPS), UCLA, related injuries, and consequences were recorded. **Results:**Out of 84 patients, males were 52 and females were 32. Fracture type was 12-A3 in 8, 12-B1 in 12, 12-B2 in 28, 12-B3 in 20, 12-C2 in 12, and 12-C3 in 6. Associated injuries were open fracture tibia in 3, abdominal trauma in 1, and ipsilateral DRUJ injury in 2 cases. The complications found were PIN injury in 2 cases, radial nerve palsy in 1 case, and wound infection in 3 cases. The difference was not significant ($P > 0.05$). The time to union was 23.7 weeks, the UCLA score was 36, and the Mayo Elbow Performance Score (MEPS) was 95.3. The difference was significant ($P < 0.05$). **Conclusion**: A useful technique for treating extraarticular distal humeral fractures is the locking compression plate.

Keywords: humerus fractures, locking compression plate, Mayo Elbow Performance Score (MEPS), University of California Los Angeles (UCLA), Malunion.

INTRODUCTION

Fractures of the proximal humerus represent approximately 4% of all fractures and 26% of humerus fractures.[1]Only a minor percentage of fractures of the upper extremities are distal humerus fractures. They have been challenging to control up until now. Worse, the issue is often worse in older patients who have low tolerance to joint immobilisation, metaphysealcomminution, and osteoporotic bone abnormalities.[2]For adults, internal fixation and open reduction have become the go-to treatments throughout the past few decades. Many authors support the operational stabilisation of these fractures because it makes sense.[3]For a successful functional outcome and early rehabilitation, alignment restoration and secure fixation are essential. Treatment for both humeral shaft and intercondylar fractures serves as a model for managing both injuries. These complicated fractures are specifically addressed by the extraarticular distal humerus plate.[4] Humeral shaft fractures can be described by location (proximal, middle, or distal), fracture pattern (transverse, oblique, spiral, or comminuted), and whether the fracture is open or closed. The AO humeral shaft fracture classification system is widely used in clinical practice, where humeral shaft fractures (attributed number 12 within the classification) are categorised by fracture pattern (uppercase A (simple), B (wedge), or C (complex/multifragmented).[5]

It is anatomically precontoured to be positioned on the lateral supracondylar ridge distally and along the central humeral diaphysis proximally.[6]The distal piece is strongly fixed thanks to the lateral column's higher density of locking screws. The drawback of intramedullary nailing and plating with 4.5-mm compression or locking procedures is insufficient fixation. Research indicates that in cases of distal humeral diaphyseal osteotomies, the posterolateral plate performs better biomechanically than the 3.5-

mm locking compression plate (LCP).[7,8] The present study assessed the management of distal humeral shaft fractures with a locking compression plate (LCP).

AIMS AND OBJECTIVES

The present study assessed the management of distal humeral shaft fractures with a locking compression plate (LCP).

MATERIALS AND METHODS

The present prospective cohort study comprised 84 distal humeral shaft fractures of both genders. This study was conducted with those who met the specified criteria for inclusion and exclusion at the Department of Orthopaedics, Major S.D. Singh Medical College & Hospital, Farrukhabad, Uttar Pradesh, India, for a period of one year (January 2013–December 2013). All were informed regarding the study, and their written consent was obtained. The Institutional Ethics Committee gave the study its approval. Data such as name, age, gender, etc. was recorded. Every patient had radiographic testing, including lateral views, PA views, and humeral bone CT scans. Everyone was controlled by a locking plate. Recorded were parameters including the kind of fracture, weeks needed for union, Mayo Elbow Performance Score (MEPS), University of California Los Angeles (UCLA), and related injuries and consequences.

INCLUSION CRITERIA

- Patients are to give written informed consent.
- Patient's age between 18 and 60 years
- All adult patients were admitted with proximal humerus fractures.
- Available for follow-up.

EXCLUSION CRITERIA

- Patients who do not give written informed consent,
- Pathological fractures, patients with distal neurovascular deficit, fractures more than 3 months old.
- Patients with immunocompromised status and patients on chemotherapy or steroid treatment.
- Those unable to attend follow-up.

STATISTICAL ANALYSIS

The data obtained was subjected to statistical analysis using a Microsoft Excel spread sheet and analysed using SPSS. Chi-squared and Student's t-test were used as the tests of significance to assess the statistical significance. A p-value less than 0.05 was deemed significant.

RESULTS

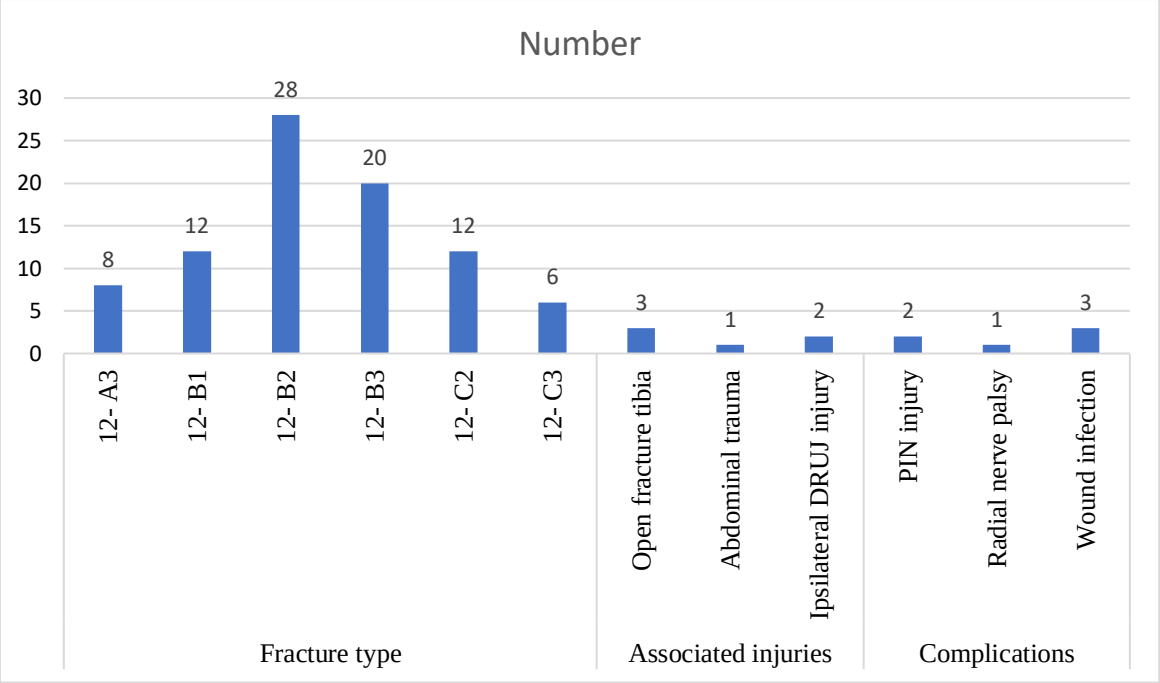
Table I: Distribution of patients

Total- 84		
Gender	**Male**	**Female**
Number	52	32

Table I shows that out of 84 patients, males were 52 and females were 32.

Table II: Assessment of parameters

Parameters	Variables	Number	P value
Fracture type	12- A3	8	0.05
	12- B1	12	
	12- B2	28	
	12- B3	20	
	12- C2	12	
	12- C3	6	
Associated injuries	Open fracture tibia	3	0.16
	Abdominal trauma	1	
	Ipsilateral DRUJ injury	2	
Complications	PIN injury	2	1
	Radial nerve palsy	1	
	Wound infection	3	



Graph I: Assessment of parameters

Table II, graph I, shows that the fracture type was 12-A3 in 8, 12-B1 in 12, 12-B2 in 28, 12-B3 in 20, 12-C2 in 12, and 12-C3 in 6. Associated injuries were open fracture tibia in 3, abdominal trauma in 1, and ipsilateral DRUJ injury in 2 cases. The complications found were PIN injury in 2 cases, radial nerve palsy in 1 case, and wound infection in 3 cases. The difference was not significant (P > 0.05).

Table III: Assessment of time to union, UCLA score and MEPS

Parameters	Mean	SD	P value
time to union (weeks)	24.2	5.2	0.16
UCLA score	36	4.1	<0.0001
MEPS	95.3	8.4	<0.0001

Table III shows that the time to union was 24.2±5.2 weeks, the UCLA score was 36±4.1, and the Mayo Elbow Performance Score (MEPS) was 95.3±8.4. The difference was statistically significant (P < 0.05).

DISCUSSION

Approximately 4 to 5% of all fractures are proximal humeral fractures. These fractures occur in two age groups: younger individuals who have experienced high energy trauma or elderly individuals who have sustained low velocity injuries, such as a simple fall.[9] Slings, slabs, and plaster cast techniques were used to treat these fractures in the past when they were thought to be uncomplicated. For orthopaedic surgeons, managing proximal humerus fractures continues to be a challenging issue.[10] There is disagreement over the optimal course of care for displaced fractures; some research support replacing the prosthesis.[11,12]

The present study assessed the management of distal humeral shaft fractures with a locking compression plate (LCP).

We found that out of 84 patients, males were 52 and females were 32. Rouleau DM et al.[13], thirty-four patients were included in this study with a 1-year minimal postoperative follow-up. Twenty-two patients presented with a two-part surgical neck fracture according to the Neer classification, and 12 patients had a three-part valgus-impacted fracture. DASH (Disabilities of the Arm, Shoulder, and Hand) and constant scoring systems were used for functional evaluation. Specifically, no axillary nerve injury and no loss of reduction were observed. The median constant score and the mean DASH score were 82 and 26, respectively, at 1-year follow-up. The age-adjusted functional score values were satisfactory. Two of the patients (6%) required surgical revision for intra-articular screw penetration.

We observed that the fracture type was 12-A3 in 8, 12-B1 in 12, 12-B2 in 28, 12-B3 in 20, 12-C2 in 12, and 12-C3 in 6. Associated injuries were open fracture tibia in 3, abdominal trauma in 1, and ipsilateral DRUJ injury in 2 cases. The complications found were PIN injury in 2 cases, radial nerve palsy in 1 case, and wound infection in 3 cases. We found that the time to union was 23.7 weeks, the UCLA score was 36, and the Mayo Elbow Performance Score (MEPS) was 95.3. Agudelo J et al.[14] studied 153 patients (111 female, 42 male) 18 years of age or older with a displaced fracture or fracture-dislocation of the proximal humerus treated with a PHLP. The

mean age was 62.3 +/- 15.4 years (22–92), and the mean injury severity score (ISS) was 9.5 +/- 10.16 (4–57; n = 73). The surgical approach was delto-pectoral (90.2%) or transdeltoid (9.8%). No intraoperative complications were reported. The mean postoperative head-shaft angle was 130 degrees (95 degrees to 160 degrees; SD = 13). The overall incidence of loss of fixation was 13.7%. There was a statistically significant association between varus reduction (<120 degrees) and loss of fixation (30.4% when the head-shaft angle was <120 degrees versus 11% when the head-shaft angle was > or = 120 degrees; P = 0.02).

LIMITATION OF THE STUDY

The shortcoming of the study is the small sample size and the short duration of the study.

CONCLUSION

The authors found that a useful technique for treating extraarticular distal humeral fractures is the locking compression plate.

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