



ISSN Print: 2394-7500  
ISSN Online: 2394-5869  
Impact Factor: 5.2  
IJAR 2020; 6(5): 17-22  
[www.allresearchjournal.com](http://www.allresearchjournal.com)  
Received: 14-03-2020  
Accepted: 16-04-2020

**Dr. MV Sudhakar**  
Assistant Professor, Dept. of  
Orthopedics, Dr SM CSI  
Medical College & Hospital,  
karakonam, Kerala, India

## A clinical study on surgical management of proximal humeral fractures by locking plates

**Dr. MV Sudhakar**

### Abstract

#### Aims and objectives

1. To study the efficacy, functional outcome and time taken for union of the fracture following surgery with locking plates in proximal humeral fractures.
2. To evaluate the incidence of complication that may occur with plating in proximal humeral fractures.

**Background and objective:** Proximal humerus fractures are common and debilitating injuries and incidence of them are increasing especially in elderly. Treatment of unstable, displaced, and comminuted fractures of the proximal humerus remains challenging. Significant controversy continues regarding the best methods of treating displaced proximal humerus fractures. Classification of fracture types has been inconsistent, and thus selection of surgical approaches has been variable. Various operative procedures are carried out, recent trend in internal fixation has moved on to locking plates. The present study is undertaken to evaluate the functional outcome and complication of proximal humerus fractures treated by locking compression plate.

**Methods:** The proposed study is a prospective study centered in CSI Memorial Hospital, karakonam attached to Dr SM CSI Medical College, Karakonam. In the proposed study a minimum of 20 cases presenting with proximal humeral fractures are evaluated clinically and radiologically and treated by ORIF with Locking Compression Plates functional outcome was assessed with the use of Neer's shoulder score at the end of the study.

**Results:** In our series, majority of the patients were males, with RTA being the commonest mode of injury in young population and domestic fall being most common mode of injury in elderly, involving 2 part, 3part and 4part fractures of proximal humerus. The fractures united in all 20 patients. Excellent and satisfactory results were found in 75% of patients with unsatisfactory results in 25% according to Neer's criteria. And there are no failures.

**Interpretation and conclusion:** In conclusion locking Compression plate is an advantageous implant in proximal humeral fractures due to angular stability, particularly in comminuted fractures and in Osteoporotic bones in elderly patients, thus allowing early mobilization.

**Keywords:** Proximal; humerus; fractures; open reduction

### Introduction

Proximal humerus fractures are common and debilitating injuries and incidence of them are increasing especially in elderly. They account for about 5% of all injuries to appendicular skeleton.1 They are the third most common fractures in elderly population after hip and distal radius fractures. Increase in incidence is due to more geriatric population with osteoporosis in aged population and increasing incidence of higher velocity injuries, Increasing incidence of road traffic accidents, natural disasters and industrial accidents, together with assault lead to multiple fractures and higher incidence of morbidity in young patients.

In the past century, most of the proximal humeral fractures have been treated by nonoperative methods.2 About 80-85% of proximal humeral fractures treated nonoperatively, resulting in good functional outcomes. Where as in the 15% to 20% of displaced proximal humerus fractures it is noted that significant displacement, especially in comminuted fractures were associated with poor functional outcome, hence moving to surgical fixation for better results.3 However Significant controversy continues regarding the best methods of treating displaced proximal humerus fractures.4 Over the last 3 decades, various modalities of fixations have evolved for the proximal humerus fractures (trans

**Correspondence Author:**  
**Dr. MV Sudhakar**  
Assistant Professor, Dept. of  
Orthopedics, Dr SM CSI  
Medical College & Hospital,  
karakonam, Kerala, India

osseous suturing, percutaneous pinning, tension band wiring, plating, rush nailing, arthroplasty). Of this proximal humerus locking plate is the implant of choice now for treatment of displaced proximal humerus fractures since they provide rigid anatomical fixation and more angular stability hence it permits early mobilization and good functional limb. With this background, I have chosen "A clinical study on surgical management of proximal humeral fractures by locking plates" as my research interest topic to evaluate the results.

**Materials and methods**

The proposed study is a prospective study centered in Dr SM CSI Medical College & Hospital, Karakonam. In the proposed study a minimum of 20 cases presenting with proximal humeral fractures admitted to the hospital are evaluated clinically and radiologically. The fractures are classified by using Neer's classification.

**Inclusion criteria**

- Age group: >18 years
- Gender: Male and female patients
- Two part, three part and four part fracture of proximal humerus
- Patients who are willing to participate in the study

**Exclusion criteria**

- Children and adolescent patients <18 yrs
- Compound fractures
- Undisplaced fractures
- Fractures associated with neurovascular deficits
- Patients not willing for surgery

Routine investigations will be carried out in order to get fitness for surgery.

Consent of the patient will be taken.

Once the patient is fit for surgery, will under goes open reduction and internal fixation with locking plates under brachial plexus block or general anesthesia Patient will be placed in Beach chair or supine position. All the patients are approached by Deltopectoral approach, cephalic vein is dissected and retracted, intervening plane between deltoid and biceps tendon. Once fracture site is exposed, fracture is reduced provisionally with K wires and checked in fluoroscopy. And final fixation done with locking plate, position is confirmed in fluoroscopy.

Post-operatively limb is immobilized in arm pouch; mobilization was started in the second week with pendulum exercises as per patient's tolerance.

Immediate post-op X-Rays were done routine A-P and scapular view to assess the reduction of fracture and stability of fixation. Most of the suture removal was done on 10th day. Patients were discharged with arm pouch and advised to continue pendulum exercises. Patients were followed from 6 weeks -1 year on OPD basis at intervals of 6 Weeks, 12 Weeks, 6 Months and 1 Year. During this period in each visit clinical evaluation of wound healing, pain, shoulder function and range of movements were assessed and recorded. Anatomy of the fracture was assessed by radiographs. Fractures were assessed for clinical and radiological union. Clinically fracture was considered united when there were no complaints from patients like residual pain, sense of insecurity, no tenderness, at the fracture site or full function of shoulder. Radiologically

fracture was regarded as united when there is no visible fracture line. Results were evaluated by the use of Neer's shoulder score based on pain, function, range of motion and anatomy for each case assessed and recorded.

**Functional assessment evaluation of results by means of Neer's score 8**

The final results were evaluated using Neer score This system based on 100 units. Pain is the most important consideration to the patient and is assigned 35 units. The result in any patient with significant pain is graded as failure.

1. Pain (35 units)		4. Range of motion (25 units)	
		Flexion (sagittal plane)	
a. None/ignores	35	180 <sup>o</sup>	6
b. Slight, occasional, no compromise in Activity	30	170 <sup>o</sup>	5
c. Mid, no effect on ordinary activity	25	130 <sup>o</sup>	4
d. Moderate, tolerable, makes concessions, uses aspirin	15	100 <sup>o</sup>	2
e. Marked, serious limitations	5	80 <sup>o</sup>	1
f. Totally disabled	0	Less	0
2. Function (30 units)		Extension	
a. Strength		45 <sup>o</sup>	3
Normal	10	30 <sup>o</sup>	2
Good	8	15 <sup>o</sup>	1
Fair	6	Less	0
Poor	4	Abduction (coronal plane)	
Trace	2	180 <sup>o</sup>	6
Zero	0	170 <sup>o</sup>	5
b. Reaching		140 <sup>o</sup>	4
Top of head	2	100 <sup>o</sup>	2
Mouth	2	80 <sup>o</sup>	1
Belt buckle	2	Less	0
Opposite axilla	2	External rotation (from	
Brassiere hook	2	Anatomical position with elbow bent	
c. Stability		60 <sup>o</sup>	5
Lifting	2	30 <sup>o</sup>	3
Throwing	2	10 <sup>o</sup>	1
Pounding	2	Less	0
Pushing	2		
Hold overhead	2	Internal rotation (from anatomical position with elbow bent	

3. Anatomy (10 units) rotation, angulation, joint incongruity, retracted tuberosities, failure metal, myositis, non-union, avascular necrosis)	90 (T-6)	5
	70(T-12)	4
	50 (L-5)	3
	30 (gluteal)	2
	Less	0
None	10	
Mild	8	
Moderate	4	
Marked	0-2	

Total points

Excellent Results Above 89 units;

Satisfactory between 80 units to 89 units

Unsatisfactory 70 Units to 79 units

Failure below 70 Units

**ILLUSTRATION NO.1 (Case No.1)**



**CLINICAL PRESENTATION**



**PRE OPERATIVE**



**INTRAOPERATIVE**



**POST OPERATIVE**

**ILLUSTRATION NO.2 (Case No.5)**



**PRE OPERATIVE**



**POST OPERATIVE**



**12 WEEKS POST OP**



**1 YEAR POST OP**

**ILLUSTRATION NO.3 (Case No.9)**



**ABDUCTION**



**FORWARD FLEXION**



**INTERNAL ROTATION**



**EXTERNAL ROTATION**

**ILLUSTRATION NO.4 (Case No.12)**



**ABDUCTION**



**EXTERNAL ROTATION**



INTERNAL ROTATION

FLEXION

**Observations and results**

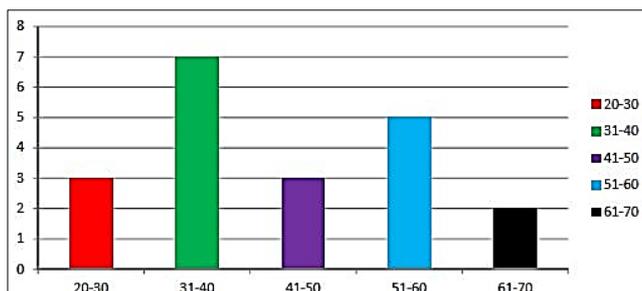
We studied 20 adult patients of proximal humeral fracture of which most of the patients were brought to the causality or admitted through outpatient department basis, clinical history was elicited. Careful clinical examination of skeletal system and soft tissue injuries was recorded. Radiographs were done. Arm was immobilized in a “U” Slab and arm sling. Once patient’s general condition stabilized and planned for operative fixation All cases were approached by deltopectoral approach. Fractures were anatomically reduced and fixed with Locking compression plates. Fixation rigidity was checked on table, post-operative check radiographs taken. Patients were mobilized in the arm pouch; all patients were encouraged pendulum exercises in the second week. Sutures were removed on the 10th post-operative day. All patents followed regularly and the following observations are made.

**1. Age distribution**

In our series of twenty patients 3 are in the age group of 21-30(15%) 7 are in the age group of 31-40(35%), 3 are in the age group of 40-50(15%) 5 are in the age group of 51-60 (25%) and two are in the age group of 61-70(10%). The youngest patient is 25years and oldest is 70 years, the average age is 45 years.

**Table: 1**

AGE	NO OF PATIENTS	PERCENTAGE
20-30	3	15
31-40	7	35
41-50	3	15
51-60	5	25
61-70	2	10
TOTAL	20	100

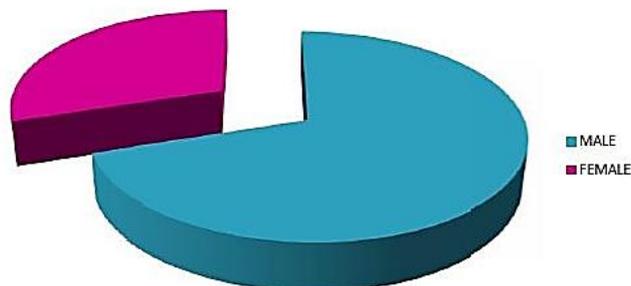


**Graph 1: Age distribution**

**2. Sex distribution**

In our study 14(70%) are male patients and 6(30%) are female patients. The ratio of Male to Female is M: F=2.3:1. The incidence is more in males is due to most cases in our study are young patients sustained fracture due to RTA.

**GRAPH 2:SEX DISTRIBUTION**



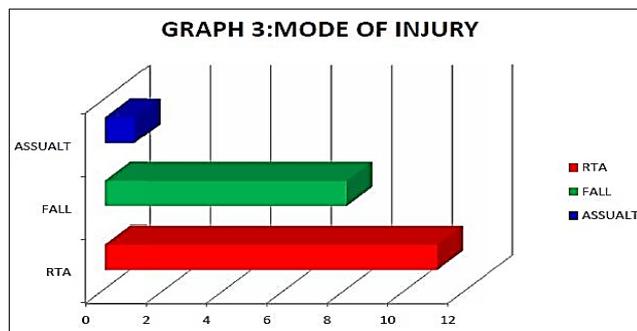
**Graph 2: Sex distribution**

**3. Mode of injury**

The most common mode of injury observed in our series was road traffic accident. It accounted for 11 patients (55%). The next common cause was history of fall accounting for 8 patients (40%) and one patient had a history of assault (5%).

**Table: 2**

RTA	11	55%
FALL	8	40%
ASSUALT	1	5%



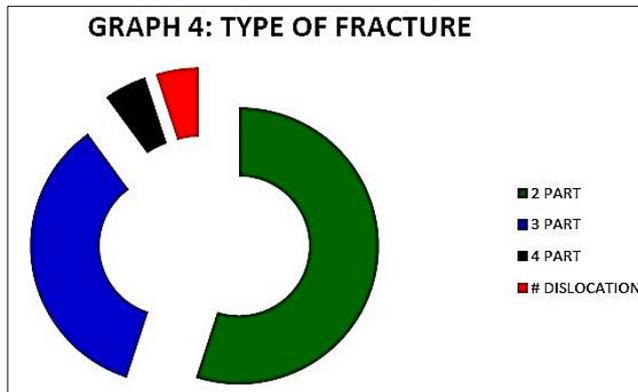
**Graph 3: Mode of injury**

**4. Type of fracture**

In our study series the most common type of fracture observed was 2 part fracture accounting for 11 of 20 patients (55%). The next common being 3 part fracture accounting for 7 of 20 patients (35%). In one patient it is 4 part fracture (5%). The fracture dislocation was observed in one patient (5%).

**Table: 3**

TWO PART	11	55%
THREE PART	7	35%
FOUR PART	1	5%
FRACTURE DISLOCATION	1	5%



Graph 4: Type of fracture

### 5. Side affected

In our present study fracture occurred on right side in 12(60%) patients and on left side in 8(40%) patients.

### 6. Associated injuries

Apart from neurovascular injury (exclusion criteria) the following injuries are associated in our patients

### 7. Time taken for fracture union

In our study, we observed that the average time taken for fracture to unite is 12 weeks. In 8 of 20 patients it is 10weeks, among 6 patients it took 12 weeks, in 4 patients 14 weeks took to unite and in another 2 patients 16 weeks taken.

### 8. Complications

During the follow up period 3 patients had shoulder stiffness (15%), 2 patient had plate impingement (10%). One (5%) patient had varus malunion which was 4 part fracture, one (5%) patient developed superficial wound infection, which is healed uneventfully with Antibiotics. There were no incidences of non-union and osteonecrosis of the proximal humerus in our study.

### 9. Functional Assessment of final results

The final results are evaluated by using NEER'S Score. In our study the minimum score was 70 and maximum of 94. The average score is 82.6. We had excellent results in 5 (25%) of patients, 10(50%) had satisfactory results, 5(25%) patients had unsatisfactory results but none of the case is failure in our study.

### Summary and conclusion

Twenty patients with proximal humerus fractures were treated with open reduction and internal fixation with Locking compression plates to study the surgical management of fractures of proximal humerus and functional outcome of shoulder at Dr. SM CSI Medical College and Hospital, Karakonam.

- In our series bimodal age incidence was seen with peak incidences b/n 30-40years in males due to RTA and another b/n 50 -70 years in females due to domestic fall.
- Two-part fractures and three-part fractures is common in younger age group b/n 20-40 years and 3 part fractures is common in elderly patients.

- In our study Right side fractures are more common than left side.
- The average time taken for union in our study is 12 weeks.
- In our series, 3 patients had post-operative shoulder stiffness, 2 had plate impingement, and one each had varus malunion and post-operative infection.
- In our study of 20 patients 25% got excellent results, 50% got satisfactory results and 25% had unsatisfactory results.

Osteosynthesis with open reduction and internal fixation with Locking Compression plates has given good results.

Operative management yields good functional results in proximal humeral fractures in adult's b/n 20-40years with fewer complications. These patients responded well to the rehabilitation programme than their older counterparts.

### References

1. Court Brown CM, Caesar B. Epidemiology of adult fractures: A review Injury. 2006; 37:691-697.
2. Terry Canale's Campbell's Operative Orthopaedics, Mosby Publishers, USA. 1998; 3(9):2286-2296.
3. Steven H Rose, Joseph Melton, Bernard F Morrey *et al.* Epidemiological features of humeral fractures Clin. Orthop. 1982; 168:24-30.
4. Sahu RL. Philos Locking plates in proximal humerus fractures literature review. The Internet Journal of Health, 2010, 11.
5. Bigliani LU, Flatow EL, Pollock RG. Fractures of the proximal humerus In: Rockwood CA, Green DP, Bucholz RW, Heckman JD, eds. Fractures In adults. Philadelphia, etc. Lippincott-Raven, 1996, 1055-107.
6. Buchanan JJ. IV. Fracture through the anatomical neck of the humerus with dislocation of the head. Ann Surg. 1908; 47:659-71.
7. Lous U. Bigliani Chapter 9 The shoulder, Vol-1 ed. Charles Rockwood, Frederick A. Fractures of proximal humerus. In Rockwood CA, Matsen. Philadelphia: W.B. Saunders, 1990, 278-334.
8. Neer CS. Displaced proximal humeral fracture: Part 1: Classification and evaluation. J Bone Joint Surg (Am), 1970; 52-A:1077-89.
9. Neer CS. Displaced proximal humeral fractures. Part II. Treatment of three part and four-part displacement. J Bone Joint Surg. 1970; 52A:1090-11.
10. Paavolainen P, Bjorkenheim JM, Slati P, Pauku P. Operative treatment of severe proximal humeral fractures. Acta Orthop Scand. 1983; 54:374-379.
11. Siebler G, Kuner EH. Late results following the surgical treatment of proximal humerus fractures in adults. Unfall chiru rgie. 1985; 11(3):119-127.
12. Kristiansen B, Christensen SW. Plate fixation of proximal humeral fractures, Acta Orthop Scand, 1986; 57:320-323.
13. Mourdian WH. Displaced proximal humeral fractures. Seven years experience with a modified zickel supracondylar device. Clin Orthop. 1986; 212:209-218.
14. Moda SK, Chadha NS, Sangwan SS, Khurana DK, Dahiya AS, Siwach RC. Open reduction and fixation of proximal humeral fractures and fracture dislocations. J Bone Joint Surg. 1990; 72-B:1050-1052.

15. Szyszkowitz R, Seggl W, Schleifer P, Cundy PJ. Proximal humeral fractures: management techniques and expected results. *Clin Orthop*. 1993; 293:13-25.
16. Robinson CM, Christie T. Two-part proximal humeral fracture: A review of operative treatment using two techniques. *Injury*. 1993; 24(2):123-125.
17. Zyto K, Wallace WA, Frostick SP, Preston BJ. Outcome after hemiarthroplasty for three- and four-part fracture of the proximal humerus. *J Shoulder Elbow Surg*. 1998; 7:85-9.
18. Koval KJ, Blair B, Takie R, Kummer FT, Zuckerman D. Surgical nerve fractures of proximal humerus; a laboratory evaluation of ten fixation techniques. *J Trauma*. 1996; 40(S):778-783.
19. Hessmann M, Gehling H, Gotzenl. Plate fixation of proximal humerus fracture with indirect reduction; surgical technique and results using the shoulder score. *Injury*. 1999; 30:453-462.
20. Hintermann B, Trouillier HH, Schufer D. Rigid internal fixation of fractures of the proximal humerus in older patients. *J Bone Joint Surg (Br)*. 2000; 82(8):1107-1112.
21. Wijgman AJ, Roolker W, Patt TW *et al.*, open reduction and internal fixation of three and four part fractures of proximal humerus. *Scientific Article*, 2002, 01.
22. Jan-Magnus Björkenheim, Jarkko Pajarinen *et al.*, "Internal fixation of proximal humeral fractures with a locking compression plate *Acta Orthop Scand*. 2004; 75(6):741-745.
23. Gerber C, Worner CM, Vienne P. Internal fixation of complex fractures of the proximal humerus. *J Bone Joint Surg (Br)*. 2004; 86(60):848-855.
24. Charalambous CP, Siddiqe I *et al.* Proximal humerus internal locking for the treatment of proximal humerus fracture *Archives of orthopaedic and trauma surgery*. 2007; 127:205-210.
25. Reto Babst. Flexi Brunner Plating in proximal humeral fractures *European Journal of trauma and emergency surgery*. 2007; 33:345-56.