

A study of the benefits and complications after ORIF (open reduction and internal fixation) with proximal humerus locking plate in fracture proximal humerus

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Abstract

Background: The major goal in the treatment of the proximal humerus fracture is to promote a pain free, mobile, and stable functional shoulder joint. ORIF can offer excellent outcomes when performed in the appropriate patient and utilizing proper techniques. **Aim:** To evaluate the benefits and complications after ORIF with PHLP in fracture proximal humerus. **Material and Methods:** A total of 30 patients with proximal humerus fracture treated with proximal humeral locking plates were studied for benefits and complications. **Results:** Out of 30 patients, 22 patients (73.3%) had excellent, good or satisfactory results, but in 8 (26.6%) the outcome was poor. Eight (26.6%) complications were noted resulting in poor functional outcome. There were 2 (6.66%) cases of subacromial impingement. 3 patients (9%) had stiffness of shoulder joint in which 2 patients had ipsilateral distal end of radius fractures and in third patient there was significant varus malunion. **Conclusion:** The use of locking proximal humeral plate is a good option for displaced proximal humeral fractures with less complications.

Key Words: Proximal humerus fracture, open reduction internal fixation, Locking plate, functional outcome, complications.

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INTRODUCTION

Proximal humerus fractures are one of the most common osteoporotic fractures with an annual incidence of between 63 and 105 per 100000 populations per year.¹ These fractures usually result from low velocity indirect trauma while as in younger age group the mechanism is that of high velocity trauma like road traffic accidents. The major goal in the treatment of the proximal

humerus fracture is to promote a pain free, mobile, and stable functional shoulder joint. The patient's baseline level of function, hand dominance, functional demand, and ability to participate in rehabilitation must be assessed as these factors contribute to clinical management decisions. While the many of these injuries can be managed non-operatively, a certain percentage require operative treatment. Open reduction internal fixation (ORIF) can offer excellent outcomes when performed in the appropriate patient and utilizing proper techniques. However, even with the use of the proximal humerus locking plate (PHLP), many complications still occur after fixation, including avascular necrosis of the humeral articular fragment, malreduction (particularly varus malalignment), and screw penetration.^{2,3} The present study was conducted to assess the benefits and complications after ORIF with PHLP in fracture proximal humerus.

MATERIAL AND METHODS

After obtaining institutional ethical committee clearance, a total of 30 cases of proximal humerus fractures treated with proximal humeral locking plates (PHLP and PHILOS) at our Tertiary Care Centre were included in this study.

Inclusion Criteria

- Patients with Simple closed fractures of proximal humerus - two, three and four parts.
- Fracture with dislocation.
- Medically fit for surgery
- Mono-trauma / poly-trauma patients.
- Adult patients age more than 18 years.

Exclusion Criteria

- Fracture due to malignancy
- Compound injuries
- Medical contraindications to surgery
- Distal neurovascular deficit
- Patients less than 18 years old
- Patients with signs of infection
- Patients not willing for surgery
- Severely osteoporotic patients.

The patients were assessed on the basis of their history of mechanism, the mode of injury, clinical signs and symptoms. All patients were thoroughly examined. The shoulder trauma series radiographs including True antero-posterior view of shoulder joint and / or Axillary view of scapula were taken carefully by positioning of patient. All radiographs were evaluated to assess the fracture configuration and the extent of comminution. After initial work up, patients were posted for surgery after medical fitness till then immobilized in a pouch arm sling. All patients were operated within average period of 5 days (2 days-18 days) of injury depending upon admission to hospital and medical fitness. Twelve patients were operated under general anesthesia and 18 patients were operated under local block anesthesia. All the patients were operated through deltoid splitting approach and the delto-pectoral approach. Postoperative pouch arm sling was given to all patients. All the patients were put on intravenous antibiotics initially and thereafter 5 days of oral antibiotics were given. Shoulder was immobilized in a shoulder immobilizer for 2 days following which passive and pendulum exercises were started. Patients were allowed controlled active mobilization from second post-operative day. Sutures were removed at day 11. Follow up appointments were given at 1 month, 3 months and 6 months postoperatively and yearly thereafter. Radiographs were taken regularly to check the position of the plate and progress of fracture healing. The patients shoulder range of movement was recorded. The patients

were evaluated using the Constant and Murley shoulder scoring system at 1, 3 and 6 months postoperatively.

RESULTS

The present study consists of 30 cases of proximal humerus fractures treated with proximal humeral locking plates (PHLP and PHILOS). The age of patients ranged from 20-80 years with mean age of 44.5 years. The number of patients between 15-30 years constituted maximum (33.4%) in this study. Among the 30 patients included, 20 were male and 10 were female patients. Left side was involved in 56.6% of patients and right in 43.3% of patients. Non dominant side was involved in 56.6% of patients. Eleven (36.7%) patients were injured due to fall on outstretched hand, 16 (53.4%) were injured in road traffic accidents, 1 patient (3.4%) had fall from height and 2 (6.7%) patients were injured during seizures. Out of the 30 patients in our study, 21 (70%) were less than 60 years and 9 (30%) were ≥ 60 years of age. Of the 21 (70%) patients younger than 60 years, 15 (50%) had sustained proximal humerus fractures in road traffic accident. Of the 9 (30%) patients ≥ 60 years, 8 (26.7%) patients had sustained this fracture due to fall on outstretched hand. Of the 30 cases, there were 15 (50%) cases of two part fractures, 9 (30%) with three part and 6 (20%) with four part fractures. The mean duration since injury to surgery was 5.03 days with range from 2-18 days. The mean duration of stay in hospital was 10 days (7-23 days).

Table 1: Type of fracture

Type of fracture	No. of cases	Percentage
Two part	15	50%
Three part	9	30%
Four part	6	20%
Total	30	100%

The mean Constant and Murley score at 1 month was 26.36, at 3 months was 50.50 and at 6 months was 63.76. Out of 21 patients below 60 years of age 3 patients had poor results and 18 patients had satisfactory, good and excellent results. Out of 9 patients ≥ 60 years of age 5 patients had poor results and 4 patients had satisfactory, good and excellent results. This shows better results in younger population with a significant p value of 0.0192. In 21 patients (< 60) years old the mean constant score at 6 months was 65.28 and in 9 patients (≥ 60) years the mean constant score was 53.44. This shows better results in younger patients which may be due to vigorous exercise done by them.

Table 2: Distribution of fracture type and complications

Fracture Parts	Complications		Total
	Present	Absent	
2-parts	1	14	15
3-parts and 4-parts	7	8	15
Total	8	22	30

($\chi^2 = 6.136$, $df = 1$, $p = 0.013$)

Association of Fracture parts with complications. 15 patients with 2 part fractures were treated and only 1 patient had complications till 6 months of follow up. In

total 15 patients with 3 part and four part fractures 7 patients had complications.

Table 3: Complications

Sr. no.	No. of Patients	Age in years	Type of fracture Neers	Complications	Outcome
1.	2	20 30	2 part 3 parts	Sub-acromial impingement. Superior plate placement.	Implant removal is planned Underwent gentle passive manipulation of shoulder under short general anaesthesia at 6 weeks post operation. Patient achieved good range of all movements.
2.	1	65	4 parts	Shoulder stiffness. (Varus malreduction)	Screw removal done under short general anaesthesia
3.	1	70	4 parts	Screw back-out with palpable implant	Deferred further operative procedure
4.	1	48	3 parts	Non-union	Manipulation of shoulder under short general anaesthesia done. All movements were achieved except terminal abduction and flexion of the shoulder joint.
5.	2	65 65	3 parts 4 parts	Stiffness of shoulder joint in associated injury with fracture lower end radius.	Readmission and intravenous antibiotics cover with daily dressing done.
6.	1	75	3 parts	Superficial infection	

DISCUSSION

Complications of proximal humeral fixation remain prevalent despite the increased use of angular stable plates. They can be attributed to fracture reduction, plate position, and preoperative displacement. Rates of postoperative complications range from 9.7% to 39% of patients.^{4,5} In our study there was no case of intraoperative screw penetration of the humeral articular surface. The locking mechanism impairs the surgeon's ability to assess the quality of screw purchase in bone and can often lead to false sense of security regarding the implant purchase in osseous fragment. In series by Konrad G et al, 14% patients had intra-articular penetration of the humeral articular surface.⁶ This complication can be avoided by looking for placement of screws under image intensifier in neutral, internal rotation and external rotation position of the shoulder as well as axillary view after completing fixation of the plate. In our study there was only one (3.3%) case that was fixed in slight varus. Inability to achieve anatomical reduction was due to medial comminution. Agudelo JF et al in his study concluded that there is a significant association between varus reduction and loss of fixation.⁷ Varus malreduction substantially increases the risk of post-operative failures. 14% patients in series by Miyazaki AN, et al. (2012) had inadequate intra-operative fracture reduction.⁸ Aksu N et al had 4.9% patients with fractures fixed in varus which is comparable to our study.⁹ In our study there was no case of nerve injury. Geiger EV et al

had transiently decreased radial nerve sensations for few months in 7.2 % of their patients.¹⁰ Aggarwal S et al had two cases (3.6%) of axillary nerve palsy which improved within one year in their series.¹¹ Vascular injury is an extremely rare entity and may result from screw tips impinging axillary artery leading to pseudoaneurysm formation. In our study there was no case of vascular injury. In our study there were two (6.6%) cases of impingement and it was due to more cranial placement of the plate. To prevent mechanical impingement, the proximal end of the plate should be placed 5 to 8 millimeter distal to tip of greater tubercle. Miyazaki et al⁸ and Schliemann B et al¹² had 12.5% and 18.5% patients respectively in their series having sub-acromial impingement. The incidence of infection is low after ORIF with locking plates. Egol et al¹³ observed only one (1.9%) case of acute infection in their series of 51 patients who mainly had three- or four-part fractures. Gardener et al¹⁴ reported superficial wound dehiscence in one patient, and Moonot et al¹⁵ reported one superficial infection that healed with oral antibiotic treatment. In our study there was one (3.3%) case of superficial infection that also got treated by intravenous antibiotics and daily dressing and did not require implant removal. This lower incidence may be due to appropriate antibiotic prophylaxis as well as to good preservation of the soft tissues during surgery. Implant failure and loss of primary fixation of the implants occur in 2.7% to 13.7% following ORIF with a locking plate in proximal humeral fractures.^{14,15} In our

study there was one (3.3%) case of screw loosening at 6 months follow up. It may be due to improper placement of the screw. The risk of osteonecrosis after open reduction has been reported to be 50%. However, in our study there was no case of avascular necrosis. This lower rate can be attributed to minimal soft tissue dissection, taking care of anterolateral branch of anterior circumflex humeral artery. Also in our study we had only 6 months follow up period. The patients should be monitored further for the risk of avascular necrosis. Surgeon should approach proximal humeral fractures as not only a bony procedure but also a soft tissue procedure. The after care of the patients in our series was quiet aggressive with patients allowed controlled active mobilization within 24 hours. Discharged within a week with active pendular exercises and range of movement exercises and thus aiming of full early mobility. The implant removal should be advocated early and all the locking head screws must be loosened first followed by removal in sequence to avoid jamming of particular screw or loss of hexagonal head serrations. We have planned two patients for implant removal. Proximal humeral locking plate is an excellent method of osteosynthesis for complex proximal humerus fractures allowing early mobilization, good functional outcome and is one of the superior treatment option for displaced proximal humeral fractures. So our study evaluated that the use of this locking proximal humeral plate is a good option for displaced proximal humeral fractures with less complications.

REFERENCES

1. Court-Brown CM, Caesar B. Epidemiology of adult fractures. A review. *Injury* 2006; 37(8):691–697.
2. Haasters F, Siebenburger G, Helfen T, Daferner M, Bocker W, Ockert B. Complications of locked plating for proximal humeral fractures -Are we getting any better? *J Shoulder Elbow Surg.* 2016; 25:e295–e303.
3. Sproul RC, Iyengar JJ, Devcic Z, Feeley BT. A systematic review of locking plate fixation of proximal humerus fractures. *Injury.* 2011; 42:408–413.
4. Faraj D, Kooistra BW, VdStappen WA, Werre AJ. Results of 131 consecutive operated patients with a displaced proximal humerus fracture: an analysis with more than two years follow-up. *Eur J*

- OrthopSurgTraumatolOrthopTraumatol. 2011; 21(1):7–12.
5. Hardeman F, Bollars P, Donnelly M, Bellemans J, Nijs S. Predictive factors for functional outcome and failure in angular stable osteosynthesis of the proximal humerus. *Injury.* 2012; 43(2):153–8.
6. Konrad G, Hirschmüller A, Audige L, Lambert S, Hertel R, Südkamp NP. Comparison of two different locking plates for two-, three- and four-part proximal humeral fractures an international multicentrestudy. *IntOrthop.* 2012; 36(5):1051-8.
7. Agudelo J, Schürmann M, Stahel P, et al. Analysis of efficacy and failure in proximal humerus fractures treated with locking plates. *J Orthop Trauma.* 2007; 21(10):676–681.
8. Miyazaki AN, Fregoneze M, Santos P, da Silva LA, do ValSella G, Results of open reduction and internal fixation of severe fractures of the proximal humerus in elderly patients. *Revista Brasileira de Ortopedia* 2014; 49(1):25-30.
9. Aksu N, Goguss A, Kara AN, Isiklar ZU. Complications encountered in proximal humerus fractures treated with locking plate fixation. *ActaOrthopTraumatolTurc* 2010; 44(2): 89-96.
10. Geiger EV, Maier M, Kelm A, Wutzler S, Seebach C, Marzi I. Functional outcome and complications following PHILOS plate fixation in proximal humeral fractures. *ActaOrthopTraumatolTurc.* 2010; 44(1): 1-6.
11. Aggarwal S, Bali K, Dhillon MS, Kumar V, Mootha AK. Displaced proximal humeral fractures: An Indian experience with locking plates. *J OrthopSurg Res.* 2010; 5:60.
12. Schliemann B, Siemoneit J, Theisen Ch, Kösters C, Weimann A, Raschke MJ. Complex fractures of the proximal humerus in the elderly - outcome and complications after locking plate fixation. *MusculoskeletSurg* 2012; 96: S3-11.
13. Kenmet A, Egol et al. Early Complications in Proximal Humerus Fractures (OTA Types 11) Treated With Locked Plates. *Journal of Orthopaedic Trauma* 2008; 22(3):159-164.
14. Gardner MJ, Weil Y, Barker JU, Kelly BT, Helfet DL, et al. The importance of Medial support in Locked Plating of proximal humerus fractures. *J Orthop Trauma* 2007; 21:185-191.
15. Moonot P, Ashwood N, Hamlet M. Early results for treatment of three and four part fractures of the proximal humerus using the PHILOS plate system. *JBJS [Br]* 2007; 89-B: 1206-9.

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