

Original research article

Efficacy and Functional Outcome of Locking Compression Plate in Proximal Humerus Fractures an Observational Study

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Abstract

Proximal humerus fractures are one of the commonest fractures occurring in the skeleton. They account for approximately 4 – 5% of all fracture. Incidence of fracture is more common in elderly because of decreased bone density. But it can occur in younger age group following high velocity trauma. Three- & four-part fractures represent 13 to 16 % of proximal humeral fractures. Treatment options for these displaced fractures include open reduction and fixation. Neer recommended open reduction and internal fixation for displaced two and three parts fractures. Most of the poor results following open reduction and internal fixation of three-part fracture are due to imperfect technique. **Objective:** To evaluate the incidence of complication that occurs with locking compression plate in proximal humerus fractures. **Methodology:** Total 40 prospective samples included in this observational study. Patients undergone Open reduction internal fixation with locking Compression plate for the sustained fracture under general anesthesia, with inclusion criteria of Two-part, three-part, four-part proximal humeral fractures, Acute fracture, Age above 21 and Patient fit for surgery selected admitted in Mahatma Gandhi Memorial Hospital attached to Kakatiya Medical College, Warangal. **Results:** The Neer's scoring system of the severity of Pain, Function, Range of Movement, Anatomy, was done to determine the end results. The end results of 40 patients of proximal humerus fractures which were surgically treated with locking compression plate. In our case study 20% case had excellent results and 60% had satisfactory result 20% had unsatisfactory results and there was no case of failure. **Conclusion:** In conclusion locking compression plate is mechanically and biologically an advantageous implant in proximal humeral fractures particularly in comminuted fractures and in osteoporotic bones in elderly patients, thus allowing early mobilization.

Key words: Proximal humerus fractures, Locking compression plate, Neer's Criteria

Introduction

Proximal humerus fractures are one of the commonest fractures occurring in the skeleton. They account for approximately 4 – 5% of all fracture.¹ Incidence of fracture is more common in elderly because of decreased bone density. But it can occur in younger age group following high velocity trauma.²

Because of increasing incidence of high velocity trauma, the fracture pattern in proximal humerus fractures are becoming complicated. It has been always an enigma of management because of numerous muscles attachment and paucity of space for fixing implant in fracture

of proximal humerus. The treatment is more controversial for articular fractures which carry a high risk of the humeral head necrosis. In Neer's classification, these are two-part anatomical neck, three-part and four-part fracture and those with dislocation of head of humerus. A review of published result suggests that there is no universally accepted form of treatment. Conservative management may be associated with nonunion, malunion, and avascular necrosis resulting in painful dysfunction.^{3,4}

The surgery should be carried out as soon as the patients general condition permit. A delay of several days makes reduction more difficult and a significant delay result in absorption of bone, making secure internal fixation impossible.

⁵The object of the osteo synthesis is to reduce the displacement (usually rotation) of each fragment and hold it in place with an implant. Thus, the greater tuberosity fragment which has usually been displaced proximally and rotated upward by rotator cuff muscles inserted into it, fixed to the major humeral head fragment, lesser tuberosity fragment similarly displaced by subscapularis fixed.³

Three- & four-part fractures represent 13 to 16 % of proximal humeral fractures. Treatment options for these displaced fractures include open reduction and fixation. Neer recommended open reduction and internal fixation for displaced two and three parts fractures.² Most of the poor results following open reduction and internal fixation of three-part fracture are due to imperfect technique. In a three- or four-part fracture dislocation when the head of the humerus is entirely devoid of any blood supply it can be replaced by a humeral prosthesis. However, the goal of Proximal humerus fracture fixation should be stable reduction allowing early mobilization.

This study conducted to analyze fractures of the proximal humerus that were treated with the locking compression plate and document their clinical and functional outcome.

OBJECTIVE

To evaluate the incidence of complication that occur with locking compression plate in proximal humerus fractures

METHODOLOGY

Patients undergone Open reduction internal fixation with locking Compression plate for the sustained fracture under general anaesthesia, with inclusion criteria of Two-part, three-part, four-part proximal humeral fractures, Acute fracture, Age above 21 and Patient fit for surgery selected admitted in Mahatma Gandhi Memorial Hospital attached to Kakatiya Medical College, Warangal. Associated humerus shaft fracture associated neuro vascular injury, Acute infection, Pathological fractures, old fractures, and Compound fracture cases were excluded from study. Post-operative physiotherapy followed according to protocol, to evaluate the functional outcome. Total 40 prospective samples included in this observational study.

Pre-Operative Assessment done by careful history was elicited from the patients and/or attendants of injury and the severity of trauma. The patients were then assessed clinically to evaluate their general condition and the local injury.

Methodical examination was done to rule out fractures at other sides and local examination injured shoulder was done for swelling, deformity loss of function and altered attitude. Radiograph of proximal humerus were taken and fractures were classified according to

Neer's classification. Next the limb was immobilized in U-slab and arm-pouch. The patient was taken for surgery after routine investigation and after obtaining physician fitness towards surgery. Routine pre-operative investigation assessment done. Surgical approaches were used is Deltopectoral approach.

Patients were examined clinically and radiologically, assessed for range of motion and bony union and complication. Further follow ups were done at 6 weeks and 12 weeks and 24 weeks. The patient with shoulder stiffness given physiotherapy for 1 week to 15 days on out patient basis.

The result was evaluated using Neer's Criteria (reference from-journal of orthopedic trauma) Criteria for evaluation of results Excellent Results: Above 89 units; Satisfactory: between 80 to 89 units; Unsatisfactory: 70 s to 79units; and Failure: Below 70 Units.

RESULTS

Age variation in the present study was from 20 to 70 years. Proximal humerus fractures were found to have high incidence in the 31 to 50 age group i.e, 75%. 21-30 years had 15% and above 50 years had 10% of the incidence. Majority of the patients were males i.e.,70% and 30% were females. Male: Female sex ratio is 2.33:1. In majority(70%) cases the mode of injury from RTA (70% of cases) was high energy trauma directly or indirectly to shoulder. Another cause was fall (30%) from fall from height or slip inhouse. Right sided was involved in 65% of the patients. None had both the sides involved. Two-part fractures constituted the most common type i.e., 50%. Three-part fractures were 35%-, and four-part fractures were 15%. Contralateral Distal end of radius (colle's fracture) in one case 5%, for which close reduction and below elbow cast was applied. One more (5%) case presented with closed fracture tibia for which Intra medullary interlocking nail was done. The average interval between fracture and surgery was 3.2 days. The average hospital stay in our study was 10.1 days. Out of 40 patients, 15% had plate impingement, 10% had varus malunion and 5% had stiffness. The Neer's scoring system of the severity of Pain, Function, Range of Movement, Anatomy, was done to determine the end results. The end results of 40 patients of proximal humerus fractures which were surgically treated with locking compression plate. In our case study 20% case had excellent results and 60% had satisfactory result 20% had unsatisfactory results and there was no case of failure.

DISCUSSION

The incidence of proximal humerus fractures has increased in last few years due to changes in lifestyle and increase in road traffic accidents. The best management in these injuries is still uncertain. Most of the proximal humerus fracture which are un-displaced can be treated conservatively. Even if the injury is thoroughly analyzed and the literature is understood, treatment of displaced fracture or fracture dislocation is difficult. Many studies have shown that the displaced fracture of the proximal humerus have a poor functional prognosis when left untreated because of severe displacement of fragments.¹⁻⁴ However, with the aim of getting anatomically accurate reductions, rapid healing, and early restoration of function, which is a demand of today's life, open reduction, and internal fixation, is the preferred modality of treatment. Overall, open reduction and internal fixation, although not in all Institution, have yielded satisfactory results. The best results are obtained if the fracture is well reduced and planned rehabilitation program followed. It must be the goal to select fractures for open reduction and internal fixation which can be anatomically reduced. The present study was conducted to assess the results of two-part, three part and four-part proximal humeral fracture treated by open reduction internal fixation by locking compression plate.

Proximal humerus fractures occur more commonly in elderly age group. Numerous age-related studies point towards this, and our study is consistent with those findings. C. Gerber et al⁶ found mean age 44.9, MA Fazal et al⁷ found 56 as mean age, Sameer Aggarwal et al⁸ found 58.1 mean age and Ramchander siwach⁹ found 62 as mean age of presentation. In our study we found 44 years as mean age.

Further as with other studies, our study showed a higher incidence of fractures in men than in women. The gender ratio was 2.33 : 1. This higher ratio can be explained by a higher involvement of male in day to day activities in compare to female. C. Gerber et al,⁶ found 1.35: 1, Sameer Aggarwal et al⁸ found 1.7:1, Ramchander Siwach al⁹ found 1:1.2. In contrast MA Fazal et al⁷ found sex ratio as 1: 3.5.

Major cause of fracture in our study was RTA in 70% cases, and in 30% the mode of injury was fall. This was similar with Herbert Resch et al¹⁰ study, 80% of cases mode of injury was RTA, in 20% cases mode of injury was fall. In contrast MA Fazal et al⁷ found 20 % injury was from RTA in 80% cases mode of injury was fall.

In our present study fracture occurred on right side in 65% patients and on left side in 35% patients. C. Gerber et al⁶ reported, in their series of 34 fractures 47.05% were on left side and 52.94% were on right side.

The average interval between fracture and surgery was 3.2 days in our study. Average interval between fracture and surgery was 3.2 days in C. Gerber et al study.⁶ In Herbert Resch et al¹⁰ study the operation was done within first 4 days.

The incidence of avascular necrosis ranges from 8% to 35% in different studies. We had no case of avascular necrosis. Comparatively we also had less chance of stiffness because of extensive and planned physiotherapy with stable fixation but four cases went on to have limitation of range of shoulder movements with mild to moderate pain. Ramchander Siwach et al⁹ found 8% malunion, 8% impingement and 4% implant loosening. Felix Brunner et al¹¹ found 1.26% Infection, 2.53% malunion, 8.22% avascular necrosis, 2.53% impingement, 2.53% stiffness, 13.9% screw penetration and 3.16 % implant loosening.

All fracture united by 3 months on an average of 10 weeks (8 to 12 weeks). There were no case of failure in our study. In comparison to other study on surgical management of proximal humerus we had similar results.

The results were graded according to Neer's scoring criteria. We had good to excellent results in 80% of patients treated in our institution. All patients with excellent results and satisfactory results had normal muscle function and functional range of motion according to Neer's Criteria.

Our study compared with studies conducted by Hong-fei Shi et al¹² and Ramchander Siwach et al⁷ which are similar to our study group. All three-study group came up with similar results Although avascular necrosis, screw penetration and loosening of implant were not seen in our group.

Moda SK et al¹³ found 84% of excellent results. Jaberg et al¹⁴ found 62% satisfactory results, 27% unsatisfactory results and 1% poor results. Esser RD et al¹⁵ found 74% excellent results and 19% unsatisfactory results. Hong-fei Shi et al¹² 20% excellent results and 75%

satisfactory results. Ramchander Siwach et al ⁷found 28% excellent results and 64 % satisfactory results.

CONCLUSION

In conclusion locking compression plate is mechanically and biologically an advantageous implant in proximal humeral fractures particularly in comminuted fractures and in osteoporotic bones in elderly patients, thus allowing early mobilization.

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