FUNCTIONAL OUTCOME OF PROXIMAL HUMERUS FRACTURES TREATED WITH LOCKING PLATES

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ABSTRACT

INTRODUCTION

For more displaced fractures and osteopenic bone, techniques of internal fixation, which emphasise less disruptive soft tissue dissection, and minimal fixation with wire and non-absorbable sutures have been successful with a low complication rate. Even AO type buttress plates are being used, but they require more soft tissue dissection and may lead to infection. Management of these fractures is associated with some morbidity and undesirable sequelae. They include complications like avascular necrosis, malunion, non-union, infection, neurovascular injury, loss of motion of shoulder from adhesive capsulitis, chronic oedema, elbow stiffness and atrophy of the soft tissues of the immobilised limb causing significant disability during healing and afterwards. The purpose of this study is to evaluate the functional outcome of the surgical management of fresh displaced three- and four-part proximal humerus fractures with locking plate system.

MATERIAL AND METHODS

The present study was carried out from August 2012 to December 2014 at Orthopaedic Department in Bangalore Medical College and Hospital. During this period, 25 patients of proximal humerus fractures were treated with locking plates. All patients were followed up for every 4 weeks. Local examination of the affected shoulder for tenderness, instability, deformity and shoulder movements were assessed. X-rays were taken at each visit to know about progressive fracture union and implant position. Rehabilitation of the affected extremity was done according to the stage of fracture union and time duration from surgery. Patients were followed up till radiological union.

RESULTS

The present study consists of 25 patients of fresh three- and four-part fractures of proximal humerus which were treated surgically with locking plates from August 2012 to December 2014. All the patients were available for follow-up and they were followed every month for first 3 months then once in 3 months. In this study, NEER classification was followed. There were 15(60%) three-part fractures, 9(36%) four-part fractures, and 1(4%) three-part fracture dislocation. A total of 24(96%) fractures united clinically and radiologically at the end of 12 weeks. In 1 patient (4%), delayed union occurred. It was in patient with three-part fracture dislocation. That was united at the end of 20 weeks. The functional outcome is assessed by Constant and Murley score at the end of 20 weeks. Showed excellent results in 8(32%) patients and good in 10(40%) patients. Fair results in 4(16%) patients due to restriction of shoulder movements and poor in 3(12%) due to one or more complications. The mean Constant score in this study was 77.

CONCLUSION

Our result demonstrated that the locking proximal humerus plate provides secure and stable fracture fixation for early mobilisation especially in osteoporotic bone. Early results with locking plate system were promising, the technique is not a panacea and numerous complications also occurred.

KEYWORDS

Proximal Humerus, 3-Part, 4-Part Fracture, Locking Plates.

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INTRODUCTION: Fractures of the proximal humerus are one of the commonest fractures encountered by an Orthopaedician. The incidence of this fracture has significantly increased perhaps due to the increased vehicular traffic and mechanised life. The injury is of great importance when it affects the young and middle age groups of the population. It leads to temporary disability and loss of working hours.

Restoration of the function of the limb is of paramount importance. These fractures usually do not constitute a major therapeutic problem. For most undisplaced and minimally displaced fractures of the proximal humerus, nonsurgical management is preferred because non-union is rare, healing time is short and infection very uncommon. For more displaced fractures and osteopenic bone, techniques of internal fixation, which emphasise less disruptive soft tissue dissection, and minimal fixation with wire and non-absorbable sutures have been successful with a low complication rate. Even AO type buttress plates are being used, but they require more soft tissue dissection and may lead to infection.

Management of these fractures is associated with some morbidity and undesirable sequelae. They include complications like avascular necrosis, malunion, nonunion, infection, neurovascular injury, loss of motion of shoulder from adhesive capsulitis, chronic oedema, elbow stiffness and atrophy of the soft tissues of the immobilised limb causing significant disability during healing and afterwards. The purpose of this study is to evaluate the functional outcome of the surgical management of fresh displaced three-and four-part proximal humerus fractures with locking plate system.

AIMS AND OBJECTIVES:

1. To study the role of open reduction and internal fixation in proximal humerus fractures.
2. To clinically evaluate the results of locking system over proximal humerus fractures.
3. To study merits and demerits of locking system.
4. Finally draw the conclusion of overall study.

MATERIAL AND METHODS: The present study was carried out from August 2012 to December 2014 at Orthopaedic Department in Bangalore Medical College and Hospital. During this period, 25 patients of proximal humerus fractures were treated with locking plates.

Inclusion Criteria: Adult male and female patients above 18 years who have displaced three and four-part proximal humerus fractures were included for this study after taking written consent from them.

Exclusion Criteria: Patients less than 18 years of age. Patients not willing for surgery. Patients medically unfit for surgery. Patients with undisplaced and two-part proximal humerus fracture and pathological fracture. All patients were operated as early as possible once the general condition of the patients were stable and the patients were fit for surgery as assessed by physician. A systemic antibiotic usually third generation cephalosporin intravenously was administrated 30 minutes before surgery to all patients. All patients were operated under general anaesthesia. All the patients positioned beach chair and fracture reached through standard deltopectoral approach. Fracture stabilised with locking plates. Post-operatively, patients were kept nil orally for 6 to 8 hours.

Intravenous fluids were given as needed. Intravenous antibiotics were continued for 2 days. Analgesics and tranquilisers were given according to the needs of the patient. The operated upper limb was immobilised in arm pouch. Check X-rays were taken to study the alignment of fracture fragments. The wound was inspected on 2nd post-operative day. Suture removal was done on 12th postoperative day. Patient was discharged with arm pouch. Rehabilitation of the affected arm was started at the end of 2 weeks. Gentle pendulum exercises and gentle active range of shoulder motion was initiated. Patients are instructed in six exercises they can perform at home independently.

At 6 weeks, independent range of motion exercises with gravity resistance started. All patients were followed up for every 4 weeks. Local examination of the affected shoulder for tenderness, instability, deformity and shoulder movements were assessed. X-rays were taken at each visit to know about progressive fracture union and implant position. Rehabilitation of the affected extremity were done according to the stage of fracture union and time duration from surgery. Patients were followed up till radiological union. The functional outcome was assessed by Constant and Murley score.[1,2]

RESULTS: The present study consists of 25 patients of fresh three- and four-part fracture of proximal humerus which were treated surgically with locking plates from August 2012 to December 2014. All the patients were available for follow-up and they were followed every month for first 3 months then once in 3 months. Results were analysed both clinically and radiologically. Majority of patients came with these fractures because of road traffic accidents, 14 patients (56%) remaining due to fall and some due to seizures 4%. Average age of the patients 48.72 years. Majority 17(68%) were males and 8(32%) were females. In this study, NEER classification was followed. There were 15(60%) three-part fractures, 9(36%) four-part fractures, and 1(4%) three-part fracture dislocation. All the patients were operated as early as possible once the general condition of the patient was stable. All the patients were operated within 7 days. Average time from the day of admission is 3 days. All patients were operated under general anaesthesia.

The fracture was considered to be united when clinically there was no tenderness and full unprotected function of the limb was possible. A total of 24(96%) fractures united clinically and radiologically at the end of 12 weeks. In 1 patient (4%) delayed union occurred. It was in patient with three-part fracture dislocation. That was united at the end of 20 weeks. The most common complication encountered in our study was frozen shoulder which was present in 20% of patients. Malunion occurred in 2(8%), delayed union in 1(4%), avascular necrosis in 1(4%) and impingement in 1 (4%) of patient. The functional outcome is assessed by Constant and Murley score at the end of 20 weeks. Showed excellent results in 8(32%) patients and good in 10(40%) patients. Fair results in 4(16%) patients due to restriction of shoulder movements and poor in 3(12%) due to one or more complications. The mean Constant score in this study was 77.

DISCUSSION: AO T-plates (AO-ASIF, Davos, Switzerland) and the clover-leaf plate give poor results in patients with inadequate bone stock and have a complication rate including screw loosening, subacromial impingement and avascular necrosis of approximately 40%.[3,4] Displaced four-part fractures in the elderly may be treated by hemiarthroplasty. Pain relief is good, but function and range of movement are less predictable.[5,6] Bjorkenheim et al[7] described a study of 72 patients in whom this plate was used: there was a mean Constant score of 72 at follow-up after six months. They particularly recommended use of the plate for the treatment of proximal humeral fractures in patients with poor bone quality. They reported two cases (3%) of non-union, three cases (4%) of avascular necrosis and two implant failures (3%) with loss of fixation.

Koukakis et al[8] published a series of 20 patients with two-, three- and four-part fractures treated with this plate. The mean Constant score was 76 after six months. They described two complications; one elderly patient in whom the plate had separated from the humeral diaphysis and another patient with symptoms from prominent metalwork. There was no difference in functional outcome between the younger (<65 years) and the older (>65 years) patients. The authors stressed the importance of anatomical reduction of the fracture and correct surgical technique. In Moonot et al[9] study also a total of 31(97%) united clinically and radiologically. The mean time to union was 10 weeks (8 to 24). One (3%) non-union occurred in this series. Where as in our study, majority of the proximal humerus fractures, 24(96%) patients, united clinically and radiologically at the end of 12 weeks.

In 1(4%) patient, delayed union occurred that was in the case of three-part fracture dislocation which was united at the end of 20 weeks. There were no non-union. The mean time to union was 11.68 weeks. In Moonot et al[9] study of total 32 patients, 15(47%) patients had excellent results, 12(37%) patients had satisfactory and 5(16%) patients had poor results. The mean Constant score in this study was 66.5. In our study, excellent results in 8(32%) patients and good in 10(40%) patients. Fair results in 4(16%) patients due to restriction of shoulder movements and poor in 3(12%) due to one or more complications. The mean constant score in our study was 77.

CONCLUSION: Proximal humerus fractures are usually treated conservatively, but there are specific indications for which operative treatment is needed like three- and four-part displaced proximal humerus fractures. Among the internal fixation methods, intramedullary fixation do not control rotation so they require longer period of immobilisation till union. In this study, primary open reduction and internal fixation with locking plate system of fresh proximal humerus fractures provides a more rigid fixation and does not require immobilisation for longer periods. The locking plate can be a very rigid construct if locking screws are used both proximally and distally. This can produce a stress concentration at the surgical neck of the humerus.

This can be reduced by using standard screws in the humeral shaft, which reduces the rigidity of the construct. In osteoporotic bone, bicortical self-tapping locking screws should be used so as to increase the working length of the screw and avoid a potential problem at the interface between the screw thread and the bone. Increasing the distance between the plate and the bone can also reduce the stability of the construct.[10,11] Our results demonstrated that the locking proximal humerus plate provides secure and stable fracture fixation for early mobilisation especially in osteoporotic bone. Early results with locking plate system were promising, the technique is not a panacea and numerous complications also occurred.

Some Illustrative Cases:

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