International Journal of Research in Orthopaedics
Ramachandren NS et al. Int J Res Orthop. 2020 Mar;6(2):252-255
http://www.ijoro.org

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20200530

Locking compression plating for osteoporotic and peri-articular fractures: a short term outcome analysis

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Received: 14 January 2020
Revised: 29 January 2020
Accepted: 30 January 2020

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ABSTRACT

Background: Peri-articular and osteoporotic fractures of long bones are becoming more common and are very challenging injuries to treat even for a veteran orthopaedician. In young patients, peri-articular fractures occur due to high-velocity injuries such as road traffic accidents, firearm injuries, and sports injuries while in elderly patients with osteoporosis it occurs usually due to low-velocity injury like fall during walking. The aim of the study is to analyze the short term results in terms of union and functional outcome for osteoporotic and periarticular fractures treated with locking compression plating.
Methods: This is a study conducted in the Department of Orthopaedics, Government Tiruvarur medical college. Tiruvarur. This study is a prospective study conducted in the Department of Orthopaedics from June 2017 to May 2018 with a sample size of 21 cases. The fracture is classified using the various classification systems earlier described.
Results: Solid union was observed in 18 out of the 21 cases (86%) which are similar to other studies. The range of movements attained at an average follow-up of 15.5 months was 87% of which 17 had excellent results, 2 had a good outcome, 1 had the fair outcome and 1 case had poor functional results.
Conclusions: The results of our study have confirmed earlier reports that locking compression plates provide better fixation in osteoporotic fractures. The chances of implant failure are less as the screws are firmly positioned inside the bone.

Keywords: Locking compression plating, Osteoporotic, Peri-articular fractures, Short term outcome analysis

INTRODUCTION

Peri-articular and osteoporotic fractures of long bones are becoming more common and are very challenging injuries to treat even for a veteran orthopaedician. Peri-articular fractures occur in two different age groups due to different types of injuries.[1] In young patients, peri-articular fractures occur due to high-velocity injuries such as road traffic accidents, firearm injuries and sport's injuries while in elderly patients with osteoporosis it occurs usually due to low-velocity injury like falls during walking. Also, these conditions do result from fractures in the young treated by conservative methods and which in the long term end up in non-unions and furthermore, these conditions are compounded by disuse osteoporosis.[2] Because of the proximity of peri-articular fractures to the corresponding joints, regaining full motion and function may be difficult. Also achieving full union rates are increasingly difficult because of the lack of availability of good bone stock which is very common in periarticular fractures because of the cancellous nature of the metaphyseal fragment.[3] The incidences of malunion,

nonunion, and infection are relatively high in many reported series. In older patients, treatment may be complicated by coexisting osteoporosis. There are multiple options for the treatment of these fractures with their associated merits and demerits.[4] Anatomical restoration of the articular surface in cases of peri-articular fractures and good fracture alignment and adequate compression in osteoporotic fractures along with secure fixation of both proximal and distal fragments are the key to achieve the good functional outcome in these fractures to prevent early secondary osteoarthritis. Treatment of these fractures has been a controversial subject over the past two decades.[5] There has been a changing philosophy towards the surgical treatment of these complicated fractures. Close management of these fractures was the treatment of choice until 1970. This was due to the non-availability of appropriate implants and the lack of proper techniques. Apart from the usual problems of confining the elderly patient to bed, conservative methods at any age may be complicated by joint stiffness, malunion and nonunion.[6] Early surgical stabilization can facilitate the care of the soft tissue, permit early mobility and reduces the complexity of nursing care. Open reduction and internal fixation have been advocated, using implants, including the conventional dynamic compression plates, angle blade plate, fickle devices, Rush roads, Ender nails, dynamic condylar screw, condylar buttress plate, and interlocking nails.[7]

The aim of the study is to analyze the short term results in terms of union and functional outcome for osteoporotic and periarticular fractures treated with locking compression plating

METHODS

This is a study conducted in the Department of Orthopaedics, Government Tiruvarur Medical College. Tiruvarur. This study is a prospective study conducted in the Department of Orthopaedics from June 2017 to May 2018 with a sample size of 21 cases. The fracture is classified using the various classification systems earlier described. Patients were randomly selected from among the admissions to the Orthopaedic ward.

Inclusion criteria

Age more than 16 years, osteoporotic bones either disuse or pathological bones, fractures occurring at or near joints namely distal femur, proximal humerus, distal radius, distal tibia, proximal tibia, osteoporotic non-unions, and patients who consent to be included in the study.

Exclusion criteria

Exclusion criteria were skeletal immaturity, patients with tumourous conditions, severe articular comminution not possible to be reconstructed with internal fixation, undisplaced fracture patterns needing only conservative management and patients are not willing for internal fixation.

Study protocol

A total of 21 patients with osteoporotic and periarticular fractures were included in the study as per the criteria outlined previously. On admission, a detailed examination of the patients was carried out after hemodynamic stabilization. Patients were then immobilized on a plaster of Paris. Then standard antero – posterior and lateral view X-rays are taken and the fracture configuration noted. Computerized tomography is also taken when needed to assess the exact alignment of the fragments. The fracture is classified using the various classification systems earlier described. Then after the assessment for anesthetic fitness open reduction and internal fixation of the fracture are done using a locking compression plate.

Statistical software

The statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver. 2.11.1 were used for the analysis of the data and Microsoft Word and Excel have been used to generate graphs, tables, etc.

RESULTS

Table 1 shows 3 cases were between 17 to 20 years, 6 cases were between 21 to 30 years, in 31 to 40 years 6 cases, 4 were between 41 to 50 years, 2 was in elder age between 51 to 60 years. among 21 cases 17 were male and 4 were females.

Table 1: Age distribution.

Age (in years)	No of patients	Percentage (%)
17-20	3	14.2
21-30	6	28.5
31-40	6	28.5
41-50	4	19.0
51-60	2	9.5

Table 2: Site involvement.

	Distal Femur	Proximal Humerus	Distal Radius	Distal Tibia	Diaphyseal Osteoporotic
No. of patients	2	6	4	1	8

Table 2 shows no evidence of early secondary osteoarthrosis in none of the 14 cases of juxta-articular fractures treated with locking compression plates. 21 patients were satisfied with the functional outcome following plating with locking compression plates. There were 10 patients who had either revision plating or primary plating done for osteoporotic fractures. Nine out of the 10 fractures united without any need for further surgeries. One patient had the infection and this attributed to the poor skin condition and soft tissue condition due to multiple failed procedures in him.

Table 4 shows the range of movements attained at an average follow-up of 15.5 months was 87% of which 17 had excellent results, 2 had good outcome, 1 had fair outcome and 1 case had poor functional results according to the respective scoring systems like DASH, Harris hip score and hospital severity score knee score. There was a total of 3 complications in two patients, two were infections (one case of superficial and one case of deep infection) the infection rate which was 0.01% and is similar to other reported They were treated with thorough wound debridement and I.V. antibiotics for six weeks which soon resolved.

Table 3: Surgery outcome.

Outcome	No of cases	Percentage (%)
Union	19	90.47
Non-union	2	9.5

Table 4: Range of movement attained.

Outcome	No of cases	Percentage (%)
Excellent outcome	17	80.95
Good outcome	2	9.5
Fair outcome	1	4.76
Poor outcome	1	4.76

DISCUSSION

The recent evolution in reduction and internal fixation of fractures is based on an improved understanding of the biology of bone, of the biomechanics of fracture fixation and fracture healing and on the analysis of previous failures. [8] Improvements in implant designs play an important role in avoiding possible complications and in achieving the primary goals of operative fracture treatment. The evolution of locking compression plates in the fixation of specific fracture characteristics has revolutionized the treatment of complicated and failed previous internal fixation procedures.[9] Our study was done to analyze the usefulness of such locking plates in osteoporotic and periarticular fractures and results were computed and compared with similar studies done by other surgeons. Gautier et al reported his series of 36 cases of proximal humeral fractures treated with proximal humeral LCP and reported two cases of humeral necrosis which was not seen in our study.[10] Breakage of the implant was seen in one patient which was also not encountered in our study. The DASH score reported was 18.0 which was similar to the DASH score of 19.0 in our study. Sommer et al reported a series of 72 patients with proximal humeral fractures treated with PHILOS plate and reported a union rate of 94%. There were three cases of non-union (0.04%). Our series also had similar results.[11] Korner et al reported four cases of implant failure with locking plates and attributed this to poor technical application and also a poor choice of the appropriate implant rather than to the features of the locking plate itself. His experience highlights the importance of a detailed understanding of the biomechanical principles of plate fixation as well as meticulous pre-operative planning.[12] Cole et al reported his series of 24 cases of osteoporotic non-unions of diaphyseal fractures treated with locking compression plates and reported a union rate of 97% with two cases requiring additional bone grafting to achieve union.[13] Kassab et al in his series of 44 patients with diaphyseal osteoporotic non-unions and achieved solid union in 40 cases (90%). In our series, it was 86% which was comparable. There were two cases of persistent non-unions that required secondary bone grafting and revision of internal fixation.[14]

CONCLUSION

The correct application of locking compression plates requires a long learning curve and spurious use will negate the advantages of the locking plates. The results of our study have confirmed earlier reports that locking compression plates provide better fixation in osteoporotic fractures. The chances of implant failure are less as the screws are firmly positioned inside the bone. Also since these plates are limited contact plates there is less contact between the plate and the bone and hence there is minimal disruption of sub-periosteal blood supply to the fracture ends and this aids in fracture union. The locking nuts prevent further tightening of the screws and hence reduction is maintained and secondary angular deformities are prevented. We have used locking compression plates in both osteoporotic and juxta-articular fractures and have found to be implant of choice in these fractures. The union rates achieved by us are 86% which is comparable to other studies. Also, the low infection in our study and the non-union rate are also comparable to similar studies done by other groups. Hence locking compression plates are special implants that have been specifically designed for clinical application in osteoporotic and juxta-articular fractures.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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Cite this article as: Ramachandren NS, Anand MR. Locking compression plating for osteoporotic and peri-articular fractures: a short term outcome analysis. Int J Res Orthop 2020;6:252-5.