International Journal of Research in Orthopaedics
Ranjan R et al. Int J Res Orthop. 2017 Sep;3(5):1062-1065
http://www.ijoro.org

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20173942

Role of distal femoral locking plate in management of distal femoral fracture: a prospective study

Rajni Ranjan*, Rakesh Kumar, Ajeet Singh

Department of Orthopaedics, School of Medical Sciences and Research and Associated Sharda Hospital, Greater Noida, Uttar Pradesh, India

Received: 01 July 2017
Accepted: 29 July 2017

***Correspondence:**
Dr. Rajni Ranjan,
E-mail: ranjan974@yahoo.com

ABSTRACT

Background: Distal femoral fracture one of common surgical challenges for an orthopaedic surgeon. Distal femoral locking plate is a good implant to be used in this anatomical location. Aim of our study was to review functional outcome, union time and complications in distal femoral fracture treated with distal femoral locking plate.
Methods: A prospective study was done during June 2012 to July 2016. Patients were included on the basis of inclusion and exclusion criteria. These patients were managed with distal femoral locking plate by close or open method. Pritchett rating system was used to assess functional outcome of patient.
Results: Total 28 patient were enrolled in our study. There were 21 male and 7 female. The age range was from 21 to 68 years. Functional outcome was excellent in 14 patient, good in 7 Patient fair in 3 and poor 4.
Conclusions: Distal femoral locking plate is a reliable implant for treatment of distal femoral fracture including osteoporotic fractures. Proper surgical technique is key to good result.

Keywords: Distal femoral fracture, Distal femoral locking plate, Pritchett rating system, Bone grafting

INTRODUCTION

Fractures of distal femur include 4-6% of all femoral fractures.[1-3] A classic bimodal distribution exist with one peak in incidence in young men (15-30 years) and elderly women (>70 years).[4,5] Young patients are affected by high velocity trauma(including motor vehicle accident, motorcycle or sports injury) and elderly are predisposed to low energy fracture due to osteoporosis.[3,6] Although not as common as femoral shaft or hip fractures, fractures of the distal femur are complex injuries and difficult to manage. It presents considerable challenges in management. The treatment of distal femoral fracture in past 30 years has evolved from conservative to operative.[7] Except on extreme circumstances, operative treatment of distal femur fracture is the standard while non-surgical treatment has fallen out of favour as the result further advances in the technique and implant.[2] Introduction of locking plate with fixed angle screw has improved the fixation strength of plate construct.[8] These plate also enable biological fixation technique that emphasis on preservation of blood supply and functional reduction rather than anatomical reduction.[8] Aim of our study was to review functional outcome, union time and complications in distal femoral fracture treated with distal femoral locking plate.

METHODS

This study was a prospective study. We reviewed 28 case of distal femoral fracture treated with distal femoral locking plate between June 2012 to July 2016 at School of Medical Sciences and Research and associated Sharda

Hospital, Greater Noida. Patients were included in the Study on the Basis of inclusion and exclusion criteria.

Inclusion criteria

Inclusion criteria were >18 year; extra articular and intra articular fracture; closed fracture.

Exclusion criteria

Exclusion criteria were <18 year of age; pathological fracture; periprosthetic fracture; unfit for surgery; non-compliant patient.

Open or closed reduction and internal fixation of supracondylar femoral fracture was performed with the patient in the supine position on a radiolucent table with fluoroscopic assistance. Internal fixation of the metaphyseal part of the fracture was either performed open or sub-muscular. Procedure was augmented with bone grafting where gap created at fracture site after reduction of fracture. Postoperatively, patients had antibiotics. Patients were mobilized based upon the constellation of injuries and femur fracture pattern. In general, weight bearing in distal femoral fracture was delayed until there are signs of healing with callus formation or resolution of fracture lines Formal physical therapy was instituted working on core strengthening, dynamic lumbar stabilization, range of motion and strengthening,. Pritchett rating system was used to asses functional outcome of patient.[9]

RESULTS

In our study 28 patients were included. All cases were fresh, ranging from few hours to 7 days. There were 21 male and 7 female. The age range was from 21 to 68 years. Major cause of injury was road traffic accident (78.6%) followed by fall from height (14.3%). Maximum number of patient (67.9%) was from age 20-40 years. Seven patient (25%) required primary bone grafting due to increase gap at fracture site after reduction of fracture. All fracture with primary bone grafting united well. Mean union time in our study was 22.8 week. One patient developed infection and subsequently plate was removed and fracture united in 34 weeks with discharging sinus and knee become stiff. There were no intraoperative complications. There were 2 nonunion out of which one presented with implant failure and plate was broken, which required revision surgery with iliac crest bone grafting. Other nonunion was managed by bone grafting alone. Both cases united well after secondary procedure. One patient had limb length discrepancy because of severe comminutions at fracture site. Three patient developed varus collapse at fracture site, but range of movement was normal and none developed any other complications related to malunion in one year follow up. Active range of motion >90 degree in 21 (75%) patient and poor range of motion (<75 degree) in 4 patient (14.3%). Functional outcome was excellent in 14 patient (50%), good in 7 patient (25%) fair in 3 (10.7%) and poor 4 (14.3%).

Table 1: The Pritchett rating system for distal femoral fracture.

Result	Criteria
Excellent	Full extension; flexion >110°; no deformity or joint incongruity
Good	Full extension; flexion >90°; <5° of varus or valgus; loss of length <1.5 cm, minimal pain
Fair	Flexion of 75°–90°; varus, valgus, or angular deformity of 5°–10°; mild or moderate pain
Poor	Flexion <75°; valgus, varus, or angular deformity >10°; articulate incongruity; frequent pain requiring analgesics

Table 2: Mode of injury.

Mode of injury	Number	Percentage (%)
Road traffic accident	22	78.6
Fall from height	4	14.3
Sports injury	2	7.1

Table 3: Age distribution.

Age distribution	Numbers	Percentage (%)
10-20	0	0
21-30	12	42.9
31-40	7	25
41-50	3	10.7
51-60	2	7.1
61-70	4	14.3

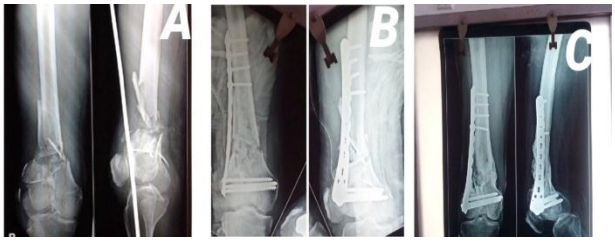

Figure 1: Case 1 (A) preoperative, (B) immediate post-operative and (C) final follow up x-ray.

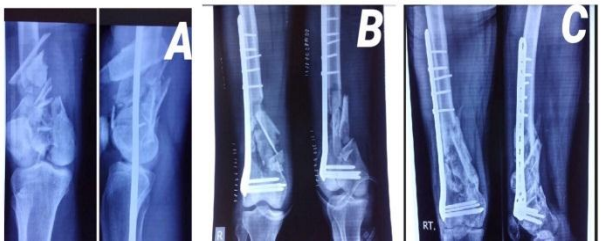

Figure 2: Case 2 (A) preoperative, (B) immediate post-operative and (C) final follow up x-ray.

Table 4: Functinal outcome.

Result	Number	Percentage (%)
Excellent	14	50
Good	7	25
Fair	3	10.7
Poor	4	14.3

Table 5: Complications.

Complications	Number
Infection	1
Severe restriction of movement	4
Shortening	1
Malunion (varus collapse)	2
Implant failure (screw plate breakage)	1
Non union	2

DISCUSSION

Complex fractures of distal femur are frequent and challenging injury encounter by the orthopedic surgeon.[10] Due to increase prevalence of high energy trauma, the current fracture trend is towards complex comminuted fracture especially in young individuals. Improved health care results in longer life span and subsequent present with more osteoporotic fractures in elderly.[5,11]

Conservative treatment is always associated with poor outcome. Insertion of blade plate is technically demanding and dynamic condylar screw requires removal of excess bone for screw insertion. Condylar buttress plate lack the stability of fixed angle devices and are prone to varus collapse. Retrograde nails are not suitable for comminuted intra articular fracture.[12,13]

The locking plate provide better stability in fragile bone, primary stability of plate is independent of friction effect, as screw presses plate, and is obtained by locking the screw into the plate. Anatomical design of plate allow it to use as reduction mould, molding bone to the plate.[4] Definitive treatment of distal femur fracture require maintaining or restoring distal femoral alignment to preserve functions of extremity. Early knee motion is required in achieving good range of movement.

Gap at fracture site decreases callus formation. Primary bone grafting can abolish these gaps and promote bone healing depending on biological properties of bone graft (Osteoinduction, Osteoconduction and Osteogenesis). These can mechanically protect the construct with decrease incidence of implant failure.[14]

Application of distal femoral locking plate is still a challenging technique with majority of failure being with surgical technique rather than the fault of implant itself.[13] Various reason for failure are inadequate plate length, insufficient fracture bridging and inadequate number of locking screw used for fracture fixation.[13,15]

CONCLUSION

The distal femur locking plate is reliable implant to be used in treatment of fracture of distal femur especially when fracture is severely comminuted and in situations of osteoporosis. Mobilization of knee can be done even in osteoporotic bone with this implant. Primary bone grafting always gives better result in severe comminutions of fracture. Surgical technique in application of implant is important factor deciding the outcome and complications. Proper surgical technique is key to good result.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Crist BD, Della Rocca GJ, Murtha YM Treatment of acute distal femur fractures. Orthopedics. 2008;31(7):681-90.
2. Hoffmann MF, Jones CB, Sietsema DL, Tornetta P 3, Koenig SJ. Clinical outcomes of locked plating of distal femoral fractures in a retrospective cohort Orthop Surg Res. 2013;27(8):43
3. Doshi H, Wenxian P. Clinical outcomes of distal femoral fractures in the geriatric population using locking plates with a minimally invasive approach. Geriatr Orthop Surg Rehabil. 2013;4:16–20.
4. Ehlinger M, Ducrot G, Adam P, Bonnomet F. Distal femur fractures. Surgical techniques and a review of the literature (2013) Orthopaedics and Traumatology: Surgery and Research. 2013;99(3):353-60.
5. Rodriguez EK, Boulton C, Weaver MJ, Herder LM, Morgan JH, Chacko AT, et al. Predictive factors of distal femoral fracture nonunion after lateral locked plating: a retrospective multicenter case-control study of 283 fracture. Injury. 2014;45(3):554-9.
6. Nayak RM, Koichade MR, Umre AN, Ingle MV. Minimally invasive plate osteosynthesis using a locking compression plate for distal femoral fractures. J Orthop Surg. 2011;19(2):185-90.
7. Kregor PJ, Stannard J, Zlowodzki M, Cole PA, Alonso J. Distal femoral fracture fixation utilizing the Less Invasive Stabilization System (L.I.S.S.): the technique and early results. Injury. 2001;32 (Suppl 3):SC32-47.
8. Lujan TJ, Henderson CE, Madey SM, Fitzpatrick DC, Marsh JL, Bottlang M. Locked plating of distal femur fractures leads to inconsistent and asymmetric callus formation. J Orthop Trauma. 2010;24:156-62.
9. Pritchett JW. Supracondylar Fractures of the Femur. Clin Orthop Related Res. 1984;184:173-7.
10. Kenneth J, Wilkens, Shane C, Mark AL. Polyaxial Locking Plate Fixation in Distal Femur Fractures: A Biomechanical Comparison. J Orthop Trauma. 2008;22:624–8.

11. Malik I, Khan R, khurana R, Sharma S. Comparative study of management of distal femoral fractures managed by dynamic condylar screw and distal femoral locking compression plate. Webmed Central Orthop. 2015;6(9):WMC004976.
12. Kanabar P, Kumar V, Owen PJ, Rushton N. Less invasive stabilisation system plating for distal femoral fractures. J Orthop Surg. 2007;15(3):299-302.
13. Virk JS, Garg SK, Gupta P, Jangira V, Singh J, Rana S. Distal Femur Locking Plate: The Answer to All Distal Femoral Fracture. J Clin Diagnos Res. 2016,10(10):RC01-5.
14. Rizk AS, Al-Ashhab ME. Primary bone grafting with locked plating for comminuted distal femoral fractures: can it improve the results? Egypt Orthop J. 2015;50:77-83.
15. Toro G, Calabrò G, Toro A, de Sire A, Lolascon G. Locking plate fixation of distal femoral fractures is a challenging technique: A retrospective review. Clin Cases Miner Bone Metab. 2015;12(Suppl 1):55-8.

Cite this article as: Ranjan R, Kumar R, Singh A. Role of distal femoral locking plate in management of distal femoral fracture: a prospective study. Int J Res Orthop 2017;3:1062-5.