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Original Research Article

Functional and radiological outcome of surgical fixation of distal femur fractures by distal femoral locking plate in a tertiary care hospital in North India

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ABSTRACT

Background: the aim of the study was to the functional and radiological outcome of fracture of distal femur treated by open reduction and internal fixation with locking compression plate.
Methods: A prospective cohort study was conducted on patients admitted in orthopedic department in government medical college, Jammu with distal femur fracture AO 33A, AO 33B and AO 33C during the period of June 2019 to February 2021 treated with open reduction and internal fixation with distal femur locking compression plate with 4.5 system. All patients were followed up for an average of 6 months. Outcome was assessed by Neer's score.
Results: The 42 patients (18 female and 24 males), mean age was 45 years (18 to 62 years) 26 cases were high energy trauma and out of 26, 8 patients had type I compound wound as per Gustilo Anderson classification and remaining 16 patients had trivial trauma. Out of 42 fractures treated, 38 fractures showed radiological signs of union within 6 months, remaining 3 cases showed delayed union which united completely by end of 10 months. One patient required bone grafting, 3 patients got infected, 2 implant failure, mean range of motion of all patients were 110 degrees.
Conclusions: Open reduction and internal fixation of distal femur fractures with locking compression plate provides the good angular stability, prevents varus collapse and is gratefully helpful in osteoporotic patients.

Keywords: Distal femur, Locking plate, Osteosynthesis, Functional outcome

INTRODUCTION

Distal femoral fractures have a bimodal distribution: in young patients due to road traffic accidents and in elderly due to osteoporotic bone, fracture may occur due to trivial trauma like domestic self-fall, fall from height.[1] In old age these fractures are associated with high morbidity and mortality.[2] Distal femoral fracture contributes to 6% of femoral fracture and 29% of non-proximal femoral fractures.[3,4] Distal femoral fractures is a challenge to orthopedic surgeons.[5,6] Proper anatomical reduction of articular surface and rigid fixation is required, if not done leads to morbidity like knee pain, decreased range of motion and compromised knee function.[7] Variety of implant choices are available for treating distal femoral fracture like dynamic condylar screw (DCS), condyle buttress plate, intramedullary nail, ex-fix, locking condylar plate. Locking plate has become increasingly popular since late 1990s.[8] Locking plate had fixed angle at each screw holes and head is secured to the plate by locking plate mechanism and preserve the periosteal blood supply and are very useful in osteoporotic bone as it resists varus collapse.[9-14] Our purpose in this prospective study was to study functional and radiological outcome of distal femoral fracture treated with distal femoral locking plate (DFLP) by lateral approach. scoring system used was Neer's knee score.

METHODS

Source and method of collection of data

A prospective cohort study was conducted in government medical college Jammu, between June 2018 to February 2021. Clearance was taken from the institutional IEC and informed consent was taken from all the patients who were included in the study. The classification system used was AO classification and statistical analysis was done using SPSS and Epi-info.

Inclusion criteria

Patients with distal femur fractures type 33A, 33B and 33C, age >18 years, closed fracture and Gustilo Anderson type I and II compound, patient willing for treatment and given informed consent were included in study.

Exclusion criteria

patients with type III compound fractures, pathological fractures other than osteoporosis and polytrauma were excluded.

Surgical technique

Operation was performed under spinal anesthesia in supine position. Lateral approach was used in the plane between vastus lateralis and lateral intermuscular septum and to address the intra articular involvement lateral para patellar arthrotomy was done by using the swash-buckler approach. Importance was given to the precise reduction of articular fragments and rigid fixation by using 4.5 system DFLP, proximal fragment with locking and non-locking screws and distal fragment by locking screws. In cases of fractures with severe comminution we used extra partially threaded cancellous screws and for articular fragments we used Herbert screws. Drain was placed *in-situ.* Wound closed in layers, sterile compressive dressing done drain removed after 48 hours.

Post-operative rehabilitation

Standard rehabilitation protocol was followed post-surgery. First dressing was done on 3rd day and knee moments were advised. Patient was mobilized with crutches/walking aids on post-op day 5-6, until 6 weeks. Full weight bearing was allowed after 3-4 months when radiological evidence was seen. Staples were removed on 12th day and patient was discharged and patient was followed up at 3 and 6 months and at the end of 1 year.

RESULTS

Out of 42 cases in our study, lowest age of patient 18 years and highest age of the patient 62 year and mean age was 45.3, out of 42 cases female 18 (42.8%), male 24 cases (57.2%) (Table 1). High velocity trauma like RTA in 26 cases (62 %), trivial trauma in 16 cases (38%) and type one compound in 8 cases. As per AO classification AO33A fractures in 26 cases, AO33B type fracture in 13 cases and AO33C fracture in 3 cases. In type one compound fracture, immediate through wash with normal saline and IV antibiotics started in emergency room only. Out of 42 cases we got ROM>110 degrees in 29 cases, ROM 90-110 degrees in 11 cases and 70-89 degrees in two cases and less than 70 degrees ROM was recorded in none of the patients. Average range of motion was 110 degrees (Table 2). We got good range of motion 33 A fracture than intra articular fracture and no significant deference in ROM between closed and open fracture. Post-operative complications divided into early and late complications. in our study we come across early post op complications like superficial infection of wound in 3 cases associated risk factor DM and type 1 compound, One deep infection in old age female patient with DM, no neurovascular and thromboembolic complications. In deep infection debridement done in operation theatre and secondary suturing done. Late complications like implant failure in two cases due to short plate like less cortical screws in proximal fragment (less than8 cortexes), stiffness in 2 cases (Table 3). Out of 42 cases 16 radiological union got in 15-18 weeks and 21 cases united around 19-22 weeks and remaining five cases got delayed union after 6months, one required bone graft because of bony void. Functional outcome was assessed by clinical based outcome Neer's knee score, it includes 6 subscales like pain (20points), function (20 points), motion (20 points), work (10 points), gross anatomy (15 points), roentgenogram (15 points) and interpretation of outcome like excellent (86-100 points), satisfactory (70-85), unsatisfactory (55-69), failure (<55 points). Excellent score in 30 patients, 10 patients satisfactory and two patients' unsatisfactory results. (Figure 1). In our study we got overall good positive results with distal femoral fracture treating with locking plate by open reduction technique and early knee bending exercises.

Table 1: Demographic representation of gender.

Age distribution (years)	Males	Females
18-30	5	2
30-39	3	4
40-49	11	7
50-62	5	5
Total	24	18

Table 2: Final range of motion at 6 months.

Type of fracture	Range of motion at 6 months			
	>110º	90º-110º	70º-89º	50º-69º
33 A1	11	1		
33 A2	6	2		
33 A3	4	1		
33 B1	2	1	1	
33 B2	3	2		
33 B3	2	2		
33 C1	1	2	1	
Total	29	11	2	

Table 3: Post-operative complications.

Complications	Number of cases
Infections	4
Neurovascular injury	0
Implant failure	2
Malunion	0
Delayed union	5
Stiffness	2

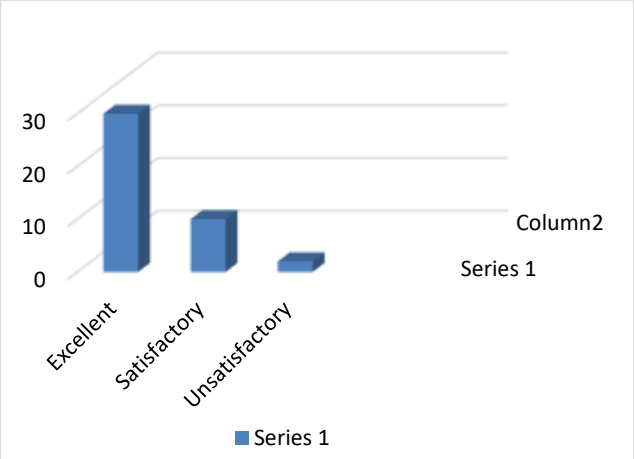

Figure 1: Functional outcome using Neer's score final follow up.

Figure 2 (A and B): Pre-operative and post-operative radiographs.

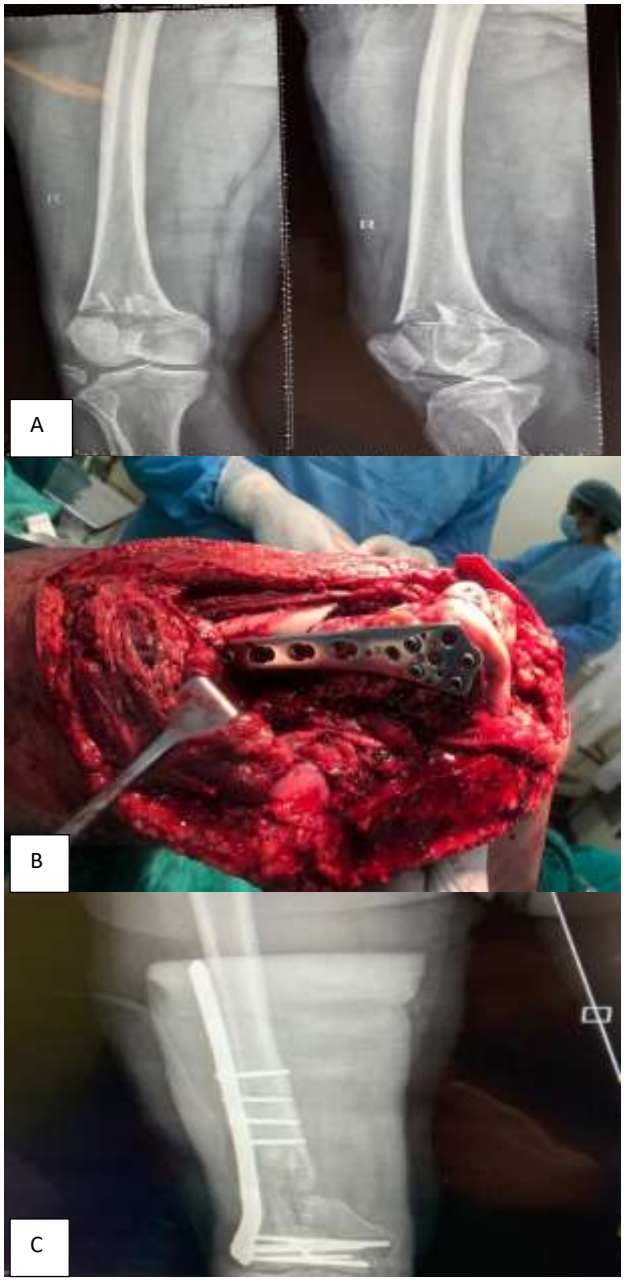

Figure 3 (A-C): Pre-operative radiographs, intra operative exposure and fixation and immediate post-operative radiograph.

DISCUSSION

We achieved union in all distal femoral fracture cases treating with DFLP by open technique and average range of motion at knee joint 110 degrees, similar results were obtained by Rademaker et al in study of 67 patients and one year follow up with mean ROM 111 degrees. Henderson et al reported high rates of non-union (20%) in distal femoral fracture treating with locking plate. advantage of locking plate is by locking mechanism of screw head to plate converts whole implant into single construct.[15] It is especially very useful in osteoporotic and commutated fractures and also useful in peri-prosthetic

fractures like THR and TKR.[16] In our study we used in all cases stainless steel we achieved union finally in all cases and good amount of callus. Henderson et al found less callus in patient treating with stainless steel compare to titanium plate.[17] We used open technique in all cases showing positive results and many studies also shows positive results treating by less invasive stabilization system (LISS) method.[18-21] In our study we had 2 implant failures due to short plate. Ricci et al studying 335 distal femoral fracture treating with DFLP identified that diabetes, smoking, open fractures and short plate were risk factors for failure of locking plate.[22] Hoffman et al suggested that at least three bi-cortical screws at each side of fracture.[23]

Limitations

Sample size taken for study was small and a future study with a larger sample size is desired. Most of the patients in the study were males so groups were not comparable on basis of gender.

CONCLUSION

We can get positive results in distal femoral fractures like extraarticular, partial articular and intra articular treating with DFLP if we follow all basic principle of fracture fixation and good knee joint physiotherapy in post-operative period. DFLP is a very good and sensible option in treatment of distal femur fractures with a good functional and radiological outcome.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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