Functional and radiological outcome of surgical fixation of distal femur fractures by DFLCP: A prospective study

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Abstract

Objective: To study the functional and radiological outcome of fracture of distal femur treated by open reduction and internal fixation with locking compression plate.

Design: Prospective study

Methods: data collected for the study is from the patients admitted in orthopedic department in K R hospital, Mysore with distal femur fracture AO 33A, AO 33B and AO33C during the period of August 2016 to September 2018 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 12 months. Outcome was assessed by neer’s score.

Results: of 36 patients (14 female & 22 males), mean age was 43 years (18 to 62 years) 24 cases were high energy trauma and out of 24, 6 patients had type I compound wound as per gustillo Anderson classification and remaining 12 patients had trivial trauma.

Out of 36 fractures treated, 33 fractures showed radiological signs of union within 6 months, remaining 3 cases showed delayed union which united completely by the end of 12 months.1 patient required bone grafting, 3 patients got infected, 2 implant failure. Mean range of motion of all patients were 110 degree.

Conclusion: 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. Best results are optioned when standard protocol of locking plate fixation is followed with good soft tissue care, early knee bending exercises and physiotherapy.

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. In old age these fractures are associated with high morbidity and mortality. Distal femoral fracture contributes to 6% of femoral fracture and 29% of non-proximal femoral fractures. Distal femoral fractures are a challenge to orthopedic surgeons. 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, 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. 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. Our purpose in this prospective study was to study functional and radiological outcome of distal femoral fracture treated with distal femoral locking plate by lateral approach. Scoring system used was Neer’s Knee Score.

Materials and methods

This prospective study was conducted in K R Hospital Mysore, MMC & RI between August 2016 to September 2018.
Ethical committee clearance was taken from our institution and informed consent was taken from all the patients who were included in the study. The classification system used was AO classification which was earlier called as muller’s classification.

**Inclusion criteria**
1. Distal femur fractures type 33A, 33B and 33C
2. Age more than 18 years
3. Admitted in KR hosp with distal femoral fracture
4. Closed fracture and guestilo Anderson type I & type II compound
5. Patient willing for treatment and given informed consent

**Exclusion criteria**
1. Age less than 18 years
2. Non willing patients
3. Type III compound fractures
4. Pathological fractures other than osteoporosis
5. Poly trauma patients

In emergency room initial treatment for distal femur fractures was done by splinting the limb with Thomas splint after resuscitating the patient thermodynamically. For type I and type II compound fractures intravenous antibiotics like 3rd generation cephalosporin’s and amikacin was given. Routine pre operative investigations was done and anesthesia clearance was taken.

In operating room under spinal anesthesia in supine position, limb was prepared and scrubbed, painted and draped. Lateral approach was used in the plane between vastus lateralis and lateral intermuscular septum and to address the intra articular involvement lateral para patellar arthroscopy 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 distal femoral locking plate, 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. Wound closed in layers, sterile compressive dressing done drain removed after 48 hrs, first dressing was done on 3rd day and knee moments were advised. IV antibiotics was given for 5 to 7 days, patient was mobilized with crutches or walking aids on post op day 5-6, until 6 weeks. Full weight bearing was allowed after 3 to 4 months when radiological evidence was seen. Staples was removed on 12th day and patient was discharged and patient was followed up at 3 months, 6 months and at the end of 1 year.

| Table 1: Age and sex distribution of cases. |
| Age distribution | Number of cases male | Number of cases female |
|--------------------|----------------------|-----------------------|
| 18-22              | 0                    | 1                     |
| 22-27              | 1                    | 1                     |
| 28-32              | 2                    | 2                     |
| 33-37              | 5                    | 3                     |
| 38-42              | 3                    | 0                     |
| 43-47              | 3                    | 1                     |
| 48-52              | 2                    | 1                     |
| 53-57              | 2                    | 2                     |
| 58-62              | 4                    | 3                     |
| Total              | 22                   | 14                    |

| Table 2: Final range of motion at end of follow up |
| Type of fracture | Range of motion and number of cases | Total |
|------------------|------------------------------------|-------|
|                  | >110° | 90-110° | 70-89° | 50-69° |      |
| 33A1             | 8     | 1       |        |        | 9     |
| 33A2             | 4     | 1       |        |        | 5     |
| 33A3             | 6     | 1       |        |        | 7     |
| 3B1              | 3     | 1       |        |        | 4     |
| 3B2              | 2     | 3       |        |        | 5     |
| 3B3              | 2     | 1       | 1      |        | 4     |
| 3C1              | 1     | 1       |        | 1      | 2     |
| Total            | 25    | 9       | 2      |        | 36    |

**Post-operative complications**

**Early**

| Complications     | Number of Cases | %    |
|-------------------|-----------------|------|
| Thromboembolic Events | 2              | 2%   |
| Superficial Infection | 2              | 2%   |
| Deep Infection     | 1              | 1%   |
| Neurovascular Injury | 1              | 1%   |
Late complications

| Complications    | Number of Cases | %     |
|------------------|-----------------|-------|
| Late Infection   |                 |       |
| Implant Failure  | 2               |       |
| Malunion         |                 |       |
| Stiffness        | 3               |       |
| Delayed Union    | 3               |       |

Radiological Union: 15-18week, 19-22 Weeks, After 6months

| Number of Cases | 11 | 22 | 3 |
|-----------------|----|----|---|

Functional outcome

Excellent=26, Satisfactory=8, Unsatisfactory=2

Discussion

We achieved union in all distal femoral fracture cases treating with distal femoral locking plate by open technique and average range of motion at knee joint 110°, similar results were obtained by rademaker et al., in study of 67 patients and one year follow up with mean ROM 111°. henderson et al. [15] reported high rate 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. it’s especially very useful in osteoporotic and commutated fractures and also useful in peri-prosthetic fractures like THR [16] and TKR. 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 distal femoral locking plate 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].

Conclusion

We can get positive results in distal femoral fractures like extraarticular, partial articular and intra articular treating with distal femoral locking plate if we follow all basic principle of fracture fixation and good knee joint physiotherapy in post operative period.
Clinical and radiological pictures

Fig 1: Pre and post op x-rays

Fig 2: Pre and post op x-rays

Fig 3: Pre and post op x-rays

Fig 4: Pre op and post op x-rays

Clinical follow up

Flexion and extension at knee joint

Three months and one year end follow up x-rays

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