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Study of management of the supracondylar femur fracture by locking compression plate

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Abstract

Introduction of locking compression plate (LCP) has revolutionised the management of supracondylar fracture femur.

Material & Methods: Prospective observational study carried out JMF ACPM Medical College on the patients having fracture distal femur between November 2015 to December 2017. Study done on 36 patients, (NEER'S Classification) age range of 18 to 70 years (irrespective of their sex), were subjected to fixation by locking compression plate after obtaining thorough written informed consent.

Result: Functional evaluation of LCP by Neers criteria was excellent in 61.5% patient's upto 50 years age and in 40% more than 50 years old. There was statistically no significant ($p>0.05$) difference of functional status of patients in between the age group of patients with distal femur fracture, which were stabilized by LCP.

Locking compression plate is safe procedure for supracondylar femur fracture with excellent functional outcome and early clinical and radiological union with minimum complications.

Keywords: supracondylar fracture, Neer's classification, locking compression plate, early healing

Introduction

The objective of compression plating is absolute stability and no inter-fragmentary motion. Compression plating utilizes both Locking compression plate (LCP) and Dynamic compression plate (DCP). Locking compression plate (LCP) is better because it combine conventional compression plating and locked plating techniques.

The incidence of distal femur fractures is approximately 37 per 1, 00, 000 person-years. Distal femur fractures are complex injuries that are difficult to treat^[1]. These fractures are usually caused by high velocity trauma and can also be occur due to trivial trauma in osteoporotic elderly patients. The trend of open reduction and internal fixation has become popular in recent years with good results, due to fixation with the AO blade plate, dynamic condylar screw, intramedullary supracondylar nail & locking compression plates. Elderly patients with severe osteoporosis add further to the difficulties in management of fractures around knee as they require restoration of articular congruency for painless free movements of joint. Loss of stable fixation in osteoporotic bones is of great concern in such elderly patients. Nonetheless, internal fixation of the distal femur is difficult due to thin cortices, a wide medullary canal, relative osteopenia, and fracture comminution.

The purpose of this study is to evaluate locking compression plates in distal femur fractures under headings' technical requirements, clinical results, radiological results, complications and outcomes.

Material and Methods

Prospective observational study carried out JMF ACPM Medical College on the patients having fracture distal femur between November 2015 to December 2017. Study done on 36 patients, age range of 18 to 70 years, (irrespective of their sex) were fixed with compression plate after obtaining thorough written informed consent. And then fractures were classified according to NEER classification.

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Inclusion criteria

1. The patients with diagnosed distal femur fractures.
2. Skeletally mature patients.
3. Patients of either gender.
4. Simple fractures.
5. Type I and Type II compound fractures.

Exclusion criteria

1. Patients suffering distal femur fracture with head and chest injury.
2. Medically unfit patients.
3. Patients with pathological fracture.
4. Type III A, B and C compound fractures
5. Skeletally immature patients.

Exposure

Conventional Lateral Approach [2]

The incision is made directly laterally in the thigh and through the midpoint of the lateral condyle distally while staying anterior to the proximal insertion of the lateral collateral ligament.

Proximally, the incision is extended as necessary for diaphyseal involvement of the supracondylar fracture.

The incision can be extended distally, so that it gently curves from the knee joint axis and anteriorly to the lateral border of the tibial tubercle, when the fracture involves the articular condyles. The fascia lata is then incised in line with the skin incision, and its fibers are split. Distally, it is often necessary to incise the anterior fibers of the iliotibial tract, and the incision is then carried down through the capsule and synovium on the lateral aspect of the lateral femoral condyle.

To expose the distal femoral shaft, the vastuslateralis muscle must be reflected off the lateral intramuscular septum. Care must be taken to identify and ligate the perforating vessels. It is only necessary to expose enough of the lateral cortex to apply the plate.

Reduction achieved and confirmed under C-arm in AP and lateral images then, locking compression plate was fixed with the help of distal locking cancellous screw which was followed by compression screw fixation at proximal site to achieve compression at fracture site, and fixation of locking screw proximally.

Result

Present study was carried out to evaluate surgical management of distal femur fracture in 36 patients. LCP was done in the patients within 1 to 9 days duration from the time of trauma with mean duration of 4 days with 2 days SD

Criteria for evaluation of the results

Table 1: Age group of patients having distal femur fracture

| Age group (years) | Frequency | Percent |
|-------------------|-----------|---------|
| less 30 | 5 | 13.9 |
| 31 to 45 | 10 | 27.8 |
| 46 to 60 | 15 | 41.7 |
| >60 | 6 | 16.7 |
| Total | 36 | 100.0 |

Table 2: Nature of trauma in patients having distal femur fracture

| Nature of trauma | Frequency | Percent |
|------------------|-----------|---------|
| Fall | 10 | 27.8 |
| RTA | 26 | 72.2 |
| Total | 36 | 100.0 |

Nature of trauma causing distal femur fracture in the study was due to RTA in 72.2% which was common cause while in 27.8% it was fall

Table 3: Intra-operative complication in distal femur fracture managed by LCP.

| Intra-operative Complication | | Frequency | Percent |
|------------------------------|-----|-----------|---------|
| Reduction Difficulty | No | 27 | 75.0 |
| | Yes | 9 | 25.0 |
| Excess Bleeding | No | 26 | 72.2 |
| | Yes | 10 | 27.8 |
| Total | | 36 | 100.0 |

During LCP in 25% patients there was difficulty in reduction of fracture while in 27.8% excess bleeding was the intra-operative complication.

Table 4: Post-operative complication of distal femur fracture managed by LCP.

| Complication | | Frequency | Percent |
|--------------------------|----------------|-----------|---------|
| Immediate (Present =8) | Bleeding | 8 | 22.2 |
| | Infection | 2 | 5.6 |
| Late (Present=7) (19.5%) | Knee Stiffness | 4 | 11.1 |
| | Non-union | 1 | 2.8 |

Functional evaluation of LCP by Neers criteria was excellent in 61.5% patients upto 50 years age and in 40% more than 50 years old. In 50 years and less age group patients 30.8% had good while 7.7% had fair function evaluation. While in more than 50 years old patients 20% had Good function, 30% had fair and 10% had poor function according to Neers criteria. There was statistically no significant (p>0.05) difference of functional status of patients in between the age group of patients with distal femur fracture after LCP.

Complication: explain under table no.3 and 4

Table 5: Neer’s scoring system [9]

| Functional (70 points) | | Anatomical (30 points) | |
|--|-----|---|----|
| a) Pain (20 points) | | a) Gross anatomy (15 points) | |
| No pain | 20 | Thickening only | 15 |
| Intermittent | 16 | 5 degree angulation or 0.5 cm shortening | 12 |
| With fatigue | 12 | 10 degree angulation or rotation, 2 cm shortening | 9 |
| Limits function | 8 | 15 degree angulation or rotation, 3 cm shortening | 6 |
| Constant or at exertion | 4-0 | Healed with considerable deformity | 3 |
| | | Non-union or chronic infection | 0 |
| b) Walking capacity (20 points) | | b) Roentgenogram (15 points) | |
| Same as before accident | 20 | Near normal | 15 |
| Mild restriction | 16 | | |

| | | | |
|------------------------------------|-----|--|----|
| Restricted stair side ways | 12 | 5 degree angulation or 0.5 cm displacement | 12 |
| Use crutches or other walking aids | 4-0 | 10 degree angulation or 1 cm displacement | 9 |
| c) Joint movement (20 points) | | 15 degree angulation or 2 cm displacement | 6 |
| Normal or 135 degrees | 20 | Union but with greater deformity, spreading of condyles and osteoarthritis | 3 |
| Up to 100 degrees | 16 | Non-union or chronic infection | 0 |
| Up to 80 degrees | 12 | | |
| up to 60 degrees | 8 | | |
| Up to 40 degrees | 4 | | |
| Up to 20 degrees | 0 | | |
| d) Work capacity (10 points) | | | |
| Same as before accident | 10 | | |
| Regular but with handicap | 8 | | |
| Alter work | 6 | | |
| Light work | 4 | | |
| No work | 2-0 | | |

Excellent More than 85 points

Fair 55 to 69 points

Poor Less than 55 points

Good 70 to 85 points

Discussion

This prospective observational study was conducted on a total 36 cases presenting with distal femur fracture at Department of orthopaedics in ACPM medical college. Overall final outcome was evaluated by NEER’S Score (based on regaining the lost knee function). In this study males out-numbered females with male to female ratio 1.8:1

Distal femoral fracture associated with high energy trauma in youngers and low energy trauma in osteoporotic bones in elderly. To maintain the anatomical reduction of fracture fragments and to minimize the soft tissue trauma, minimally invasive plating techniques have been developed for the fixation of distal femoral fractures.

We have included cases done with LCP in this study because Locking compression plate (LCP) is better because it combine conventional compression plating and locked plating techniques which enhances the plate osteosynthesis [3, 4, 5].

The pull-out strength of locking screws is substantially greater than that of conventional screws, and it is difficult for one screw to pull out or fail unless all adjacent screw do so. This enable better hold in osteoporotic bones. The main goals of the above-mentioned techniques are to maintain the important anatomy and to promote early fracture healing.

In one study, femur fractures treated with less invasive stabilization system using locking compression plate. Study shows high union rates of fractures without autogenous bone grafting [6].

Those patients, who were treated with locking plate fixation with less invasive stabilization system had better functional outcome [7].

The outcome seems to correlate with fracture severity, anatomic reduction, etiology, bone quality, length of time elapsed from injury to surgery, concomitant injuries, and exact positioning and fixation of the implant [8].



Pre op x ray

Post-op x-ray 3 Months follow-up

6 Months follow-up



Full flexion at 6 Months follow-up



Full Extension 6 Months follow-up

Conclusion

The introduction of locking compression plates with Compression screws provides the compression at fracture site, and locked screw provides increased rigidity of fixation in osteoporotic bone.

It's greatest applications is in osteoporotic fractures, to tackle problems like screw cut out, late collapse, and malalignment, since the stability of the construct does not entirely depend on the quality of the bone.

Locking compression plate is a good fixation system for distal end femoral fractures particularly intra-articular type.

Operative time is certainly reduced when working with Locking Compression Plate since surgical dissection is kept to a minimum. There was one case which landed into non-union in our study. Which we believe was due to technical errors in the fixation. This goes further to say that understanding the basic principles of fixation and the appropriate indications for use of LCP in fractures of distal end femur is a must, before its use. Mobilization of the knee can be done even in osteoporotic patients with modern locking compression plate fixation techniques.

Follow up and physiotherapy do have a great role.

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