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Original article

Study of assessment of outcome by using Rasmussen's functional knee score in distal femur fractures fixation by locking compression plate

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ABSTRACT

Background: This study was performed to evaluate the results of distal femur locking plate in distal femur fractures by using Rasmussen's functional knee score.

Material and Methods: Study was conducted on 30 patients with distal femur fracture and followed up from 6 months to 18 months.

Results: The mean age was 45.96 years. 22 (73.33%) were men and 8 (26.66%) were women. Road traffic accident was the most common mechanism of injury with 23(76.66%) patients and trivial trauma was found in 7 (23.33%) patients. There were 14 (46.66%) type A and 16 (53.33%) type C fractures. The sub division showed A2-7, A3-7, C2-12 and C3-4 fractures. Of the 30 patients, 22 (73.33%) were closed and 8 (26.66%) were open. Of the 30, 9 (30%) patients had associated bony injuries. The duration between day of injury and day of fixation in open fractures ranged from within 3 days, 3 -7 days. 21 patients (70%) were operated within 3 days and rest 9 patients (30%) were operated within 7 days. The average time for union was 16.13 weeks. No non-union was seen. Clinical and functional outcomes were assessed using Rasmussen's functional knee score. Complications of fractures and operative treatment were assessed. The results of entire study group showed 18 excellent, 10 good, 1 fair and 1 poor.

Conclusion: Study concluded that the distal femur LCP is an optimal tool of good fixation for fractures of distal femur.

INTRODUCTION

The distal end of femur traditionally encompasses the lower third of bone (varying from distal 7.6 cm to distal 15 cm of the femur).[1] A fracture of the distal femur is a grave injury that for years represented an unsolved problem and was considered to result almost always in varying degrees of permanent disabilities. Incident is bimodal with 1 peak in young age 18-30 years age group (high energy trauma) with second peak in elderly women >60 years of age (low energy trauma). Distal femur fractures have been reported to account for between 4%-7% of all femoral fractures.[2] Fractures in supracondylar area characteristically deform with femoral shortening, posterior angulation and displacement of distal fragment. In the past closed procedures consisting principally of traction and splinting were almost always used. Significant drawbacks like malunion, knee stiffness, prolonged immobilization and hospitalization leads to development of operative fixation like blade plate, dynamic condylar screw (DCS) and retrograde intramedullary nailing. Recent advances lead to development of the locking compression plate, a single beam construct. Further when applied via minimal invasive technique it lowers rate of infection and favours biological fixation.

Therefore, the present study was conducted to assess the effectiveness of locking compression plating in patients having distal femur fractures with an aim to evaluate the results of distal femur locking compression plate and complications related to distal

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femur locking compression plate.

MATERIAL AND METHODS

A prospective randomized study of 30 patients with fractures of distal femur (distal 15 cm of femur including supra and inter condylar) were studied. All the cases treated at Department of Orthopaedics, Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana (Ambala), Haryana between January 2020 to July 2021 and followed for a minimum of 6 months. The duration of follow up range from 6 months to 18 months. All the fractures in this series were post traumatic. No pathological fractures was included in this study.

Patients having distal femur fractures, 16 or more years of age irrespective of gender and duration of injury <7 days were included in the study.

Patients having pathological fractures. Open fractures (Gustilo- Anderson type 3B, 3C). Inability or refusal of giving consent and with co-morbid illness were excluded.

The distal femur LCP based on the locking compression plating system was used.

Surgical Technique

Patient was given pre-operative antibiotics. All patients were given proper (spinal / epidural) anaesthesia and before proceeding adequate anaesthesia of the limb was assured. Patient was laid supine on OT table, a tourniquet was applied to the fractured limb, sterile draping was done.

Approach

The condyles were temporarily held reduced and fixed with K wires in severely displaced inter condylar fractures. All wounds with type 2 (Gustilo-Anderson) fractures were closed either primarily or secondarily over a drain. The standard lateral para-patellar approach was used.

ASSESSMENT OF COMPLICATIONS

Flexion deformity, Active ROM less than 90 degree, Non union, Mal union and Deep infections

Minor complications

Delayed union and Superficial infection

Follow up

The follow up of minimum 6 months was done. The duration of follow up ranged from 6 months to 18 months. Follow up X-rays were taken to assess any failure of reduction, failure of fixation and fracture union. Patients were examined for complications. Clinical and functional outcome of all patients were analyzed by Rasmussen's functional knee score on the basis of subjective complaints and clinical signs.

RESULTS

Overall 30 patients were included in study population. The age ranged from 18 to 79 years. The mean age was 45.96 years. The maximum incidence was in 2 peaks one 18-30 years and other at >60 years. Out of 30 patients, 22 (73.33%) were men and 8 (26.66%) were women. Road traffic accident was the most common mechanism of injury with 23(76.66%) patients and trivial trauma was found in 7 (23.33%) patients. There were 14 (46.66%) type A and 16 (53.33%) type C fractures. The sub division showed A2-7, A3-7, C2-12 and C3-4 fractures.

Of the 30 patients, 22 (73.33%) were closed and 8 (26.66%) were open. Of the 30, 9 (30%) patients had associated bony injuries. The duration between day of injury and day of fixation in open fractures ranged from within 3 days, 3 - 7 days. 21 patients (70%) were operated within 3 days and rest 9 patients (30%) were operated within7 days.The average time for union was 16.13 weeks. Radiological union in <16 weeks was seen in 10 (33.33%) patients, in 16-18 weeks in 17(56.66%) patients, 19-20 weeks in 2 (6.67%) patients and delayed union in 1 (3.33%) patient. No non-union was seen. The results of entire study group showed 18 excellent, 10 good, 1 fair and 1 poor.

The results AO type A fractures had 10 excellent and 4 good. The results of AO type C fractures had 8 excellent, 6 good, 1 fair and 1 poor results. Results of open fractures showed 3 excellent, 3 good, 1 fair and 1 poor. Results of closed fractures showed 15 excellent and 7 good. We saw that 3 of 8 (37.50%) open fractures had excellent results whereas 15 out of 22

Condylar reconstruction and temporary holding with K wires

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(68.18%) closed fractures had excellent results. The 14 of 14 type A fractures had excellent or good results whereas 14of 16 (40%) type C fractures had excellent or good results.

The closed fractures united early as compared to open fractures. Of 30 patients that were included in the study 18(60%) had range of motion greater than 120 degrees. The type A fractures had a better range of movement as compared to type C fractures.

DISCUSSION

Fractures of distal femur are serious injuries that have been difficult to treat and frequently results in varying degrees of permanent disability. The literature review shows various different implants and techniques in the management of these fractures. The use of these devices requires a certain amount of bone stock present, which limits their use in some fracture types.

The LCP is a single beam (fixed angle) construct where strength of its fixation is equal to the sum of all screw-bone interfaces rather than a single screw's axial stiffness and pull-out resistance as in unlocked plates. It acts as an internal fixator and functions by splinting the fracture rather than compression and hence allows a flexible stabilization, avoidance of stress shielding and induction of callus formation.

In this study outcome of distal femur fractures which were fixed using distal femoral LCP has been assessed. The present study of 30 cases indicates age group 18-79 years with mean age of 45.96 years. Most patients were in age group 21-45 years indicating this is a fracture of young people who are involved in more activities. This was the most common age group in similar studies Yeap and Deepak[3] (Mean age 44 years, range 15-85), Kregor et al[4] (mean age 49 years, range 18-85), Nayak M and Koichade[5] MR (mean age 42 years, range 21-65).The present study of 30 cases indicates RTA as predominant cause of (23.33%). Other studies also documented most common mode of injury in distal femur fractures are high energy RTA and falls. [Epidemiology of distal femur fractures - reported 64% cases due to road traffic accident and 36% due to fall].[6]Majority of the patients were male (73%) in active age who are more exposed to risks such as vehicular accidents because they are more involved in outdoor activities. Others authors have also noted similar trends [Nayak RM and Koichade[5] MR (male 70%), Yeap & Deepak (male 67%)].[3]

Muller's comprehensive classification system was used to classify fractures. The most common fractures in our study was C2 (12) followed by A2 (7), A3 (7) and C3 (4) respectively.The study by Weight M and Collinge C in a level II trauma centre also had a similar pattern. They had 12 C2, 4 A2, 3 A3 and 3 C3 fractures.[7]The mean time to radiological union in our study was 16.13 weeks compared with other studies mean time to union was 15 weeks (Nayak et al[3], 13 weeks (Weight M et al[7]) and 14 weeks (Schandelmaier et al[8]).The ROM of the affected knee was calculated at the end of the follow up period. The average ROM of the affectedknee was >1200 in 60% of our cases.

The mean ROM in our study was 115.63. The ROM in our study is comparable to studies by other authors 0-1040 (Schandelmaier et al[8]), 0-1250 (Nayak et al[3]) and 5-1140 (Weight M et al[7]).The Rasmussen's functional knee score calculated at the end of follow up period were excellent in 60% of our cases and good in 33.33% in our cases. There were 18 excellent, 10 good, 1 fair and 1 poor result.Comparison of present study with the study by Yeap et al[3] showed total 11 patients with 4 excellent, 4 good, 2 fair and 1 failure. The mean Rasmussen's functional knee score in our study was 25.13.The pain score was assessed during the evaluation of Rasmussen's functional knee score. It showed that 76% of the patients had mild or no pain at all or occasional ache and bad weather pain. The above parameters indicate that our study had a fairly good outcome.

The findings in our study have been briefly summarized as follows:

PARAMETERS	RESULTS
Time for union	16.13 Weeks
ROM of affected knee	>120 degree in 60.00%
Rasmussen functional Knee Score	25.13 (Mean)
Pain	Mild or none in 76%
Malunion	None
Delayed union	One (3.33%)
Superficial Infection	Three (10%)

One of the most common complication of distal femoral fracture is knee stiffness. 1 case has delayed union, another complication was superficial infection.There were 3 cases (10%) which had superficial infection. Other studies also document similar findings. Schandelmaier et al[8] had 1.9% of their patients with infection following internal fixation.

Clinical Pictures

Figures showing AP & Lateral views of fracture fixation with time duration and range of movement after union**.**

Immediate post-operative 2 months post-operative

3 months post-operative Final Union.

Full flexion

Full extension

Full range of motion

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CONCLUSION

Thus, LCP is an optimal tool of good fixation system for fractures of distal femur. It provides rigid fixation in the region of distal femur, where a widening canal, thin cortices and frequently poor bone stock make fixation difficult. Surgical exposure for plate placement requires significantly less periosteal stripping and soft tissue exposure than that of normal plates. Therefore the distal femoral LCP provides a stable fixation in distal femur fractures. In conclusion, the LCP represents an evolutionary approach to the surgical management of distal femur fracture. LCP is an important armamentarium in treatment of fracture of distal end femur, especially when fracture is severely comminuted and in situations of osteoporosis.

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