

Clinical Outcome Assessment of the Management of Distal Femur Fractures Using Locking Compression Plates

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Received: 04-02-2024 / Revised: 16-03-2024 / Accepted: 25-04-2024

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Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to assess the clinical outcome of treatment of distal femur fractures using locking compression plates.

Methods: The present study was done in the Department of Orthopedics, Madhubani Medical College and Hospital, Madhubani, Bihar, India for 10 months. Written consent was obtained from all the participants of the study. A total of n=30 cases were selected for the study based on the inclusion and exclusion criteria.

Results: Majority of the patients belonged to 19-30 years of age followed by 41-50 years. In our study of the 30 patients, 18 (60%) were Males, 12 (40%) were Females. The mode of injury was road traffic accident in 17 patients (56.66%), fall from height/stairs in 13 patients (43.34%). The average range of knee flexion achieved was about 91°. Maximum gain in knee flexion was 110° and minimum gain about 70°. The average knee score of 80 points was rated using the Neer functional score. (Max 100) Neer's scores consist of Functional (70 units) and Anatomic (30 units). The Neer's pain score, functional score, knee flexion score, score of gross anatomy was used to assess the outcome of surgery, for adult distal femoral fractures. Overall results were excellent in 8 patients out of 30 cases and were satisfactory in 21 cases and one had an unsatisfactory result. We observed that all the excellent results were from type A fracture and satisfactory results were seen in type A, B, C. One patient developed superficial wound infection in 1st week and was promptly treated with appropriate antibiotics, wound care and secondary suturing. One diabetic patient had delayed wound healing but was otherwise uneventful. One patient developed a tibial pin tract infection. Late complications included knee stiffness in the n=1 patient, in one of whom it was observed that the patient was not cooperative for physiotherapy and also had a low threshold for pain.

Conclusion: Within the limitations of the present study, we have found higher Neer's scores in this study. The LCP also prevents compression of periosteal vessels. It may not completely solve the age-old problems associated with any fracture like non-union and malunion, but is a valuable technique in the management of these fractures. But however, in type C fractures the outcome is poorer.

Keywords: Locking compression plate, Locked internal fixators, Femoral fractures, Implants

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Introduction

Fractures of distal femur are rare, accounting for less than 0.5% of total fractures and contributing 3-6% of all femoral fractures with a bimodal pattern distribution of with peak in frequencies found in elderly females in their late 70s and young males in their 30s, with males having a history of high-velocity impact trauma and the females having lower energy trauma with osteoporosis. [1,2] Distal femur fractures were traditionally managed utilizing the principle of Watson Jones and John Charnley, which included skeletal traction, closed reduction of the fracture, and casting. [3,4]

Poor outcomes of conservative management led to the need for surgical intervention, which comprised using various modalities of fixation such as condylar

buttress plates, dynamic condylar screw fixation, locking compression plates, fixed angle condylar blade plates, and retrograde interlocking nails.5 The SoFCOT symposium of 1998 reported infection and septic non-union in 13%, aseptic non-union in 14%, residual knee stiffness in 35%, post-traumatic secondary osteoarthritis in 30%, with loss in reduction and chondral damage. [6] Locking plates provided higher levels of stability and resistance to implant failure as compared to retrograde nails. [7] Recent biomechanical studies suggest better implant stability and reliability of distal femur locking compression plate (LCP) compared to retrograde nails. [8]

Currently, minimally invasive plate osteosynthesis (MIPO) and less invasive stabilization system (LISS) procedures have been developed which help in achieving better anatomical fixation while also reducing soft tissue damage during the process of fixation. [5] Adequate rigid fixation of distal femur fractures with minimal soft tissue damage and preservation of blood supply along with appropriate physiotherapy can attain better clinical outcomes and facilitate earlier weight bearing. [9] Complications associated with this fracture fixation with plating include varus collapse, non-union, arthrofibrosis, restriction of knee range of motion, and infection. [10] Single lateral locking plates would fail in distal femur fractures with gross metaphyseal comminution, medial cortical defects, or bone loss, and in osteoporotic fractures. Such fractures require additional medial plating to buttress the medial column. [11]

The aim of the present study was to assess the clinical outcome of treatment of distal femur fractures using locking compression plates.

Materials and Methods

The present study was done in the Department of Orthopedics, Madhubani Medical College and Hospital, Madhubani, Bihar, India for 10 months. Written consent was obtained from all the participants of the study. A total of n=30 cases were selected for the study based on the inclusion and exclusion criteria. The inclusion criteria were Patients admitted to Madhubani Medical College and Hospital, Madhubani, Bihar, India with fracture lower end of femur fixed with LCP, all skeletal mature patients (>18 years), open distal femur fractures up to type I, II and III A, patients willing to participate in the study. Exclusion criteria were patients with open distal femoral fractures type III B

and C, patients with associated tibial plateau fractures, patient with pathological distal femoral other than osteoporosis, distal femoral fractures with neurovascular compromise, patients managed conservatively for other medical reasons. A thorough assessment of the patient to rule out head/chest/abdominal/spinal or pelvic injury was done. Careful assessment of injured limb as regards to neurovascular status. Primary immobilization of the involved limb was done using Thomas splint with a cotton pad below the distal fragment. Radiological assessment: anteroposterior and true lateral views of injured limb including complete knee joint, pelvis and involved femur. Under appropriate anesthesia, we used the standard lateral approach to the distal femur, with the patient in the supine position and a sandbag was kept below the operating knee and one below the ipsilateral hip. Once reduction was satisfactory, the plate may be loaded in tension using articulated tension device. The plate shaft may be fixed with appropriate cortical screws after confirming the final reduction of the fractures. Postoperative rehabilitation was custom made to the patient and the fracture type and is easier, more comfortable and more assured with firm internal fixation. If fracture fixation is stable, then therapy can be started early. The most useful range of motion can be achieved, in the first few weeks of the postoperative period. Most recommend continuous passive motion for 3 hours daily for 2-3 weeks, until the patient achieves more than 100° flexion. Periodic monitoring of knee flexion at end of 1st, 2nd and the 3rd week were done and after completion of therapy, with concomitant isometric quadriceps exercises and knee mobilization exercises.

Results

Table 1: Demographic data

Age group(in years)	No. of patients	Percentage (%)
19-30	11	36.67
31-40	6	20
41-50	8	26.66
51-60	4	13.33
61-70	1	3.33
Gender		
Male	18	60
Female	12	40
Mode of injury		
RTA	17	56.66
Fall	13	43.34

Majority of the patients belonged to 19-30 years of age followed by 41-50 years. In our study of the 30 patients, 18 (60%) were Males, 12 (40%) were Females. The mode of injury was road traffic accident in 17 patients (56.66%), fall from height/stairs in 13 patients (43.34%).

Table 2: Neer’s scores at follow up

Neer’s scores			
Neer’s pain score			
Scores	Pain score 5	Pain score 4	Pain score 3
No. of patients	5	20	5
Neer’s function scores			
Scores	Function score 5	Function score 4	Function score 3
No. of patients	4	18	8
Neer’s knee flexion score			
Scores	Knee flexion score 4	Knee flexion score 3	Knee flexion score 2
No. of patients	15	13	2
Neer’s work score			
Scores	Knee work score 5	Knee work score 4	Knee work score 3
No. of patients	8	19	3
Neer's score of gross anatomy			
Scores	Roentgenogram score 5	Roentgenogram score 4	Roentgenogram score 3
No. of patients	20	8	2

The average range of knee flexion achieved was about 91°. Maximum gain in knee flexion was 110° and minimum gain about 70°. The average knee score of 80 points was rated using the Neer functional score. (Max 100) Neer’s scores consist of

Functional (70 units) and Anatomic (30 units). The Neer’s pain score, functional score, knee flexion score, score of gross anatomy was used to assess the outcome of surgery, for adult distal femoral fractures.

Table 3: Fracture type and outcome

Fracture type	Outcome		
	Excellent	Satisfactory	Unsatisfactory
Fracture type A	8	12	0
Fracture type B	0	2	0
Fracture type C	0	7	1

Overall results were excellent in 8 patients out of 30 cases and were satisfactory in 19 cases and one had an unsatisfactory result. We observed that all the excellent results were from type A fracture and satisfactory results were seen in type A, B, C.

Table 4: Early and late complications in the patients

Complications	No. of patients
Superficial wound infection	1
Delayed wound healing	1
Tibial Pin tract infection	1
Malunion with varus	2
Plate breakage	1
Knee stiffness	1

One patient developed superficial wound infection in 1st week and was promptly treated with appropriate antibiotics, wound care and secondary suturing. One diabetic patient had delayed wound healing but was otherwise uneventful. One patient developed a tibial pin tract infection. Late complications included knee stiffness in the n=1 patient, in one of whom it was observed that the patient was not cooperative for physiotherapy and also had a low threshold for pain.

Discussion

The rapid urban growth, land development, faster transport, etc. has led to a manifold increase in RTA injuries and construction injuries (fall from height) therefore crippling many young lives. Older patients, especially women, sustain fractures due to osteoporosis. Studies have proved that there is usually a bimodal distribution of supracondylar fractures of the femur in these cases. [12] Fractures of distal femur are complex injuries producing long

term disability. [13,14] They account for 6% of all femur fractures and 31% if hip fractures are excluded. Nearly 50% of distal femur intraarticular fractures are open fractures. [12]

Majority of the patients belonged to 19-30 years of age followed by 41-50 years. In our study of the 30 patients, 18 (60%) were Males, 12 (40%) were Females. The mode of injury was road traffic accident in 17 patients (56.66%), fall from height/stairs in 13 patients (43.34%). The average range of knee flexion achieved was about 91°. Maximum gain in knee flexion was 110° and minimum gain about 70°. The average knee score of 80 points was rated using the Neer functional score. (Max 100) Neer's scores consist of Functional (70 units) and Anatomic (30 units). The Neer's pain score, functional score, knee flexion score, score of gross anatomy was used to assess the outcome of surgery, for adult distal femoral fractures. The added advantage of LCP is it also prevents compression of periosteal vessels. It may not completely solve the age old problems associated with any fracture like non-union and mal-union, but is a valuable technique in management of these fractures. However, we found that LCP in type C fractures the outcome was poorer. But still LCP remains the implant of choice since their results are generally superior than the dynamic condylar screws and angle blades for type C fractures also, though there are complications like knee stiffness and extensor lag were encountered in a few cases. [15,16]

With the introduction of plates with option of locked screws, the results are encouraging, as it increases the rigidity of fixation in osteoporotic bone and in presence of periarticular or juxta-articular comminution. [17] The LCP condylar plates provide multiple points of fixed plate to screws contact, generating greater stability and thereby reducing the tendency of varus collapse. [18] LISS plating allows minimally invasive approach by submuscular insertion of plates and thereby preservation of vascularity to the lateral cortex. Overall results were excellent in 8 patients out of 30 cases and were satisfactory in 19 cases and one had an unsatisfactory result. We observed that all the excellent results were from type A fracture and satisfactory results were seen in type A, B, C. One patient developed superficial wound infection in 1st week and was promptly treated with appropriate antibiotics, wound care and secondary suturing. One diabetic patient had delayed wound healing but was otherwise uneventful. One patient developed a tibial pin tract infection. Late complications included knee stiffness in the n=1 patient, in one of whom it was observed that the patient was not cooperative for physiotherapy and also had a low threshold for pain.

The problems in fixing distal femoral fractures with osteoporosis, extensive comminution and revision surgeries following failed implant can be addressed

effectively using locking condylar plate. [19,20] However, the limitations of this new technology and indications for its use have not been completely elucidated and the long-term results are awaited. The locking plates can fail when physiological loads are outside plate-design parameters. [16] The locked screws can disengage from the plate secondary to failure of the screw to seat into the plate properly, as a result of cross threading or when insufficient screw torque is used to engage the screw threads into the plate threads. [21]

Conclusion

Within the limitations of the present study, we have found higher Neer's scores in this study. The LCP also prevents compression of periosteal vessels. It may not completely solve the age-old problems associated with any fracture like non-union and malunion, but is a valuable technique in the management of these fractures. But however, in type C fractures the outcome is poorer.

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