



ORIGINAL RESEARCH PAPER

Orthopaedics

STUDY OF FUNCTIONAL OUTCOMES AND NEED OF MEDIAL FIXATION OF DISTAL FEMORAL FRACTURES IN SKELETALLY MATURE PATIENTS

KEY WORDS:

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ABSTRACT

Background : Management of distal femur fractures remains challenging in spite of multiple improvements in the design of the implants. It has been found that using a medial plate is necessary to achieve a favourable outcome. It provides rigid fixation in the region of femur, where a wide canal, thin cortices and frequently poor bone stock make fixation difficult and challenging. Recent studies have shown failure rates of 9.3% for lateral compression plates.

Material and Methods : Descriptive Prospective Observational study of Medial fixation of distal femur fractures was conducted at a tertiary care centre over a period of 2 years after IEC approval. Informed consent was obtained from 20 patients, ASA I/II status, scheduled for elective surgery. Functional outcome was assessed by a thorough follow up initially at 6 weeks then at 12 weeks. At each visit degree of extension of the knee joint, SF 36 Score and HSS Score was recorded and analysed at the end of one year and the results were tabulated.

Results and Analysis : The demographic profile showed the typical bimodal nature of the distal femur fractures. 75 % of the patients in the present study had a good SF 36 Score ranging from 81-100 % showing the improved quality of life with physical as well as emotional well being and overall general health. The average time to full weight bearing was 16.1 weeks. There was no plate failure.

Conclusion. Medially based fixation did not lead to marked de-vascularization of the distal femur. It provides a useful biomechanical solution to obtain adequate stability especially in certain selected cases like Medial supracondylar bone loss, medial Hoffa fracture, non-union after failed fixation with AO type C3 fracture lateral plate fixation, and comminuted distal femur fractures.

INTRODUCTION

Fractures of the supracondylar and intercondylar region are common. These fractures are seen in less than 1% of all fractures and account for 3 to 6% of all fractures of the femur [1][4]. 37 per 100000 population is the incidence of distal femur fractures. Distal femur region femur fractures has been reported to have wide medullary canal, thin cortices, compromised bone stalk, and difficult in achieving anatomical alignment, fractures at lower end of femur are difficult to treat [5]. Bimodal distribution is noted in distal femur fractures [6]. Motor vehicular accidents secondary to high-energy mechanisms are usually seen in younger patients. Elderly patients who present with significant comorbidities impacting their operability, recovery, and survival present typically after low-energy mechanisms, such as ground level-falls. In recent years with the advancement of technology and facilities, wide use and trend of open reduction & internal fixation has been evident. Better implants have provided the results which are satisfactorily obtained with the use of intramedullary supracondylar nail, locking dynamic compression plates, buttress plate, cannulated cancellous screws in comparison with condylar Buttress plate and Patients of fractures around knee are difficult to manage as it requires restoration of geometrical relationship of articular surfaces and its rotational axis, for free movement in joint. Medial plate is necessary to achieve better outcome in patients with comminuted fracture as compared to lateral plating. To achieve functional rehabilitation of the limb, surgical treatment should be performed to achieve complete anatomic restoration of the joint surface, adequate anatomical alignment, stable and rigid fixation without external immobilization to allow early mobilization [7,8]. Various types of internal fixation have been developed for this purpose. Dual plating of distal femur fractures offers a reliable stable fixation in cases with medial supracondylar bone loss, comminuted distal femur fractures. Hoffa fracture, non-union after failed fixation with single lateral plate, poor bone quality. Single-incision or dual incision approach may be used. Parallel plate configuration with locked plates provides stable fixation and allows for early rehabilitation. Early mobilization is necessary to prevent joint stiffness [9].

Aims And Objectives:

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- To find out the effectiveness of the Medial fixation plate in

distal femoral fractures

- To review the incidence, diagnosis, treatment, and functional outcome of Fractures of distal Femur
- To decrease the postoperative loss of reduction and malalignment due to their inherent lack of rigidity and in some cases, eventual implant failure

MATERIAL AND METHODS

Descriptive Prospective Observational study performed at a tertiary care centre after IEC approval. Informed consent was obtained from 20 patients, ASA I/II status, scheduled for elective surgery with distal femur fractures who were posted for medial fixation were included in the study. Prior to surgery each patient was examined and a thorough medical history taken. During this period, all patients, diagnosed with distal femoral fracture were screened using inclusion and exclusion criteria. Informed consent was taken from all patients who fit in the inclusion criteria and patients willing to undergo further management.

Eligibility Criteria:

A. Inclusion Criteria: Those patients who are above the age of 20 years and also those patients with osteoporosis managed surgically were included in the study.

Exclusion Criteria

Patients with open distal femoral fractures, Children in whom, growth plate is still open, Distal femoral fractures with neurovascular compromise and poly trauma.

Initial management- As the patient presented to the emergency department, proper assessment of the injuries was done. Management involved resuscitation and hemodynamic stabilization of the patient and splinting the limb in thomas splint or plaster slab or skeletal traction. Radiographs of the affected limb, pelvis and chest were taken and all routine blood investigations were carried out. Open fractures and wounds were documented properly. Cultures were sent. Adequate wound wash and irrigation was done with sterile normal saline.

The subjects were included into the study once a diagnosis of distal femur fracture was made in the Emergency room. Distal femur fractures were classified according to AO Classification. The plan of management for the given patient

was made depending on the nature of fracture, type of fracture and associated soft tissue injuries. CT scan of the affected knee was done in all patients . Patients were classified according to AO classification and all of them were Type 33C3.Implant Used: Medial fixation of the distal femur was done medial distal femoral locking compression plate

Preparation- The supine position with the knee flexed 30° provides good support for the knee and relaxes the tendency of the gastrocnemius muscle to pull the condyles into hyperextension.

Approaches

Lateral/ anterolateral approach to the distal femur

The skin incision is began in the mid-lateral line of the femoral shaft at Gerdy's tubercle and is curved proximally over the lateral femoral condyle. The proximal starting point for the skin incision depends on the most proximal .

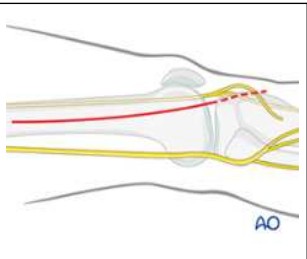


Figure 1:showing lateral incision

A skin incision is made in the line of the tendon of adductor magnus The adductor tubercle is identified, and the line of the adductor tendon is marked proximally. A straight-line incision is made along the posterior border of the adductor magnus tendon. The incision can be extended as far proximally as needed.

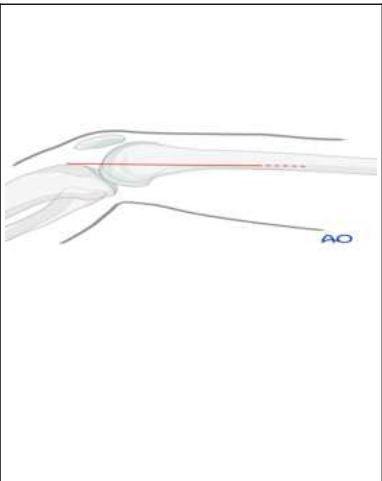



Figure 2 :Showing Medial approach to distal femur



Schematic Representation of the Incisions

A: Classical Swashbuckler incision as described by Starr et al.

B: Modified Swashbuckler incision

C Mini Swashbuckler incision as described by Beltran et al.

Figure 3 Swashbuckler Approach To Distal Femur



Figure 4 : showing Images of pre op and post op x rays .

All the patients were properly counseled and explained regarding the need for surgical procedure Radiograph both AP and Lateral Views Surgical fitness for Anesthesia was taken from the Physician Standard post-operative radiographs needed for all patients are: Knee joint antero-posterior, and lateral view Full length radiograph of Femur of the affected limb- AP and Lateral views Radiological examination was repeated post operatively and at the end of 6 weeks, 12 weeks, 6 months and 12 months intervals. Patient were followed up at 6 weeks, 12 weeks, 6 months and 12 months intervals. Patients were called for follow up after 6 weeks, 12 weeks , 6 months and 1 year to the institute and were evaluated as follows- Physical functioning ,Role limitation due to physical health ,Role limitation due to emotional problems Energy /fatigue ,Emotional well being ,Social functioning Pain ,Geneal health and total SF Score at the end of one year was calculated with a scoring system given to each of the above mentioned criteria Annexure attached.

Hospital for Special Surgery Knee-Rating Scale (HSS) was calculated from the following criteria at the end of one year

Criteria Points	
Pain --30 points	
No pain at any time	30
No pain on walking	15
Mild pain on walking	10
Moderate pain on waling	05
Severe pain on walking	00
No pain at rest	15
Mild pain at rest	10
Moderate pain at rest	05
Severe pain at rest	00
Function --22 points	
Walking and standing unlimited	12
Walking distance of 5-10 blocks and standing ability intermittent >1/2hr	10
Walking 1-5 blocks and standing up < 1/2hr	08
Walking less than 1 block	04
Cannot walk	00
Climbing stairs	05
Climbing stairs with support	02
Transfer activity	05
Transfer activity with support	02
Range of Motion (18 points)	
1 point for each 8 degrees (max 18 points)	18
Muscle Strength	10
Excellent: cannot break quadriceps power	10
Good: can break the quadriceps power	08
Fair: move through the arc of motion	04
Poor: cannot move through arc of motion	00

RESULTS AND ANALYSIS

The demographaic characteristic of these 20 patients was as follows:

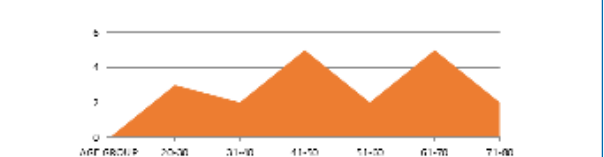


Figure 5: Depicting the bimodal nature of Age group distribution



Figure 6 :Gender Distribution

According to all patients were in the AO 33C3 fracture patterns All fractures were followed-up for one year the first FU at weeks at 6 weeks then 12 weeks ,3 months,6 months and finally at 12 months. Average follow-up was 11 months (range, 10–18 months)

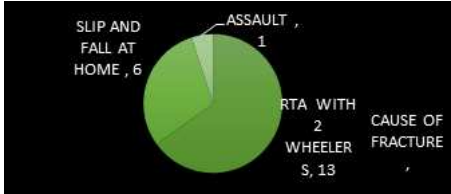


Figure 7 :Showing Causes Of Fractures

There was no varus or valgus malalignment greater than 10 degrees. Post –op period patients were observed in the recovery room for 4 hours and then they were shifted to the wards and monitored for 3-4 days dressing was checked regularly for any discharge and the they were discharged 6 days later Strict Follow up plan was explained to the patients and they were called initially at the end of 3 weeks then 12 weeks and later at the end of 3 months ,6 months and at 12 months There were 7 patients who had complications like infection and 3 of them required VAC dressing 4 patients had stiffness of the knee joint and the remaining patients had no complications as shown in

At each FU visit SF 36 Score and HSS Score was recorded and finally analysed at the end of one year Physical functioning ,Role limitation due to physical health,Role limitation due to emotional problems Energy /fatigue ,Emotional well being ,Social functioning Pain ,General health and total SF 36 Score at the end of one year was calculated with a scoring system given to each of the above mentioned criteria

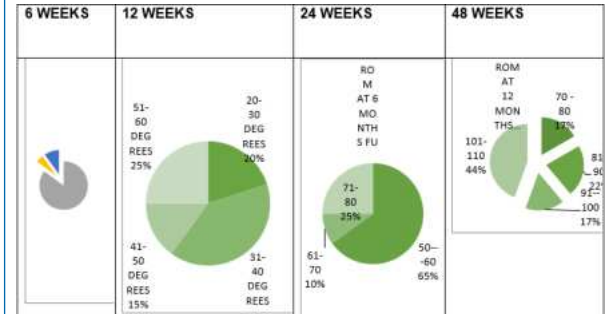
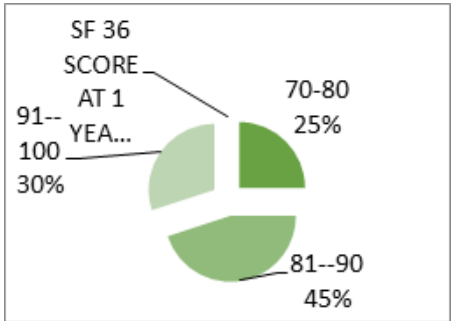


Figure 9 Range of motion was analysed at 6,12,24and 48 weeks post operative period

Good ROM was seen in 61 % of patients ranging from 91-110 % at the end of one year and the remaining 39% had ROM ranging from 70-90 % Finally SF 36 SCORE and HSS Score was calculated at the end of one year as shown in the following figure no 10

Sf36 Score



HSS Score

Column1	Column2	Column3
HSS SCORE AT I YEAR FU		

NO O PATIENTS	NO OF POINTS	GRADE
3	60-70	FAIR
12	71-80	GOOD
5	81-90	EXCELLENT

Figure 10 ::Showing SF Score and HSS Score

75 % of the patients in the present study had a good SF 36 Score ranging from 81-100 % showing the improved quality of life with physical as well as emotional well being and overall general health17 out of 20 patients had good HSS Score ranging between 71-90% 91.8% healed without complication . The average time to full weight bearing was 16.1 weeks (range, 10–32 weeks)There was no plate failure. One case had alignment change with plate bending of ten degrees varus

DISCUSSION

Distal end of femur is defined as the area between femoracondyles and metaphyseal- diaphyseal junction comprising of distal 15 cm of femur measuring from articular surface. The age group of our patients showed a typical bimodal nature of the distal femur fractures which is commonly seen in young patients as well as in geriatric class of patients the two peaks are seen in the age group 41-50 years and the other peak seen in age group of 61-70Ram Avatar Saini et al ¹⁰ and Ramji Lal Sahu ¹¹ observed age ranged from 18 to 82 yearswith mean age of 44.94 years. Male preponderance is seen in most of the studies though post-menopausal osteoporotic women are equally prone to these fractures These injuries occur usually due to high velocity trauma and are associated with high morbidity. In our study the most common mechanism of injury was road traffic accidents 13(65 %), such number of road traffic accident cases were due to the fact that our hospital is a tertiary referral centre Ramu et al ¹² study showed that when the machine in which the subject is travelling stops suddenly, patella bears the major brunt followed by the condyles of the femur and lastly the tibia. Kumar SK et al. ¹³ described 60% in their study had road traffic accidents this finding is again similar to the present study .Dr. Ram Avatar Saini et al¹⁴ observed 76.5% road traffic accidents cases in their study. 50 % of or patients did not have any co morbidities whereas 20 % of or patients had hypertension and 15 % had diabetes and another 15 % had asthma A study by Stephanie Victoria Camargo Leão Edelmut, Gabriella Nisimoto Sorio, Fabio Antonio Anversa Sprovieri, Julio Cesar Gali, and Sonia Ferrari Peron ¹⁵ showed similar comorbidities, In Our study knee mobilisation was started before 4 weeks in 10(40%) patients till 13-16 weeks in 3(12%) patients. Range was 2 weeks to 14 weeks. Average duration was 7.68 weeks. Average duration of knee mobilisation starting period in closed fractures was 5.45 weeks and in compound fractures was 9.42 weeks. Knee flexion atthe end of one year was on an average of was 82.72 degrees in closed fracturesand in compound fractures it was 61.42 weeks.

Radiological Union -In our study,18 (72%)distal femur fractures united within 15 weeks to 18 weeks,5(20%) had radiological union between 11weeks to 14 weeks. In AO type C average time for union was 17.33 weeks.2 (8%) patients had no signs of radiological union at 24 weeks. Average time of union in closed fractures was 15.09 weeks and average union time in open fractures was 17.83 weeks. .Overall average time period for union was 16.43 weeks In studies by Rajesh etall⁸⁶ and Vishwanath C ⁷⁸ the average time period was almost similar to our study Success criteria for this procedure are restoration of an anatomical and thus mechanical axis while preserving the minimally invasive nature of surgery. Evaluation of the quality of reduction.depends on the radiological crieteria both the condyles should overlap perfectly in a high quality fluoroscopic sagittal view image. These criteria are the basis for control of the coronal view which is perpendicular to the sagittal view. Alignment and the correspondence between cortical thicknesses on coronal and sagittal views also help confirm successful correction..

Finally, plate positioning should be optimum to prevent any risk of malunion..

Finally SF 36 SCORE and HSS Score was calculated at the end of one year Thus 75% of our patients had good SF 36 Score of 81-100 points showing the improved quality of life with physical as well as emotional well being and overall general health and only 25 % patients had poor SF 3 Score of 70-80 point The long-term outcome is comparable to early functional gain. Closed fractures have a higher range of motion and a better HSS knee score when compared to open fractures, supporting the fact that soft tissue compromise also affects range of motion and post-op rehabilitation of the limb.

CONCLUSION

Medial plating of distal femoral fractures is an excellent adjuvant to single lateral plating especially in osteoporotic fractures, several comminuted low fractures, periprosthetic fractures. The approach is safe, learning curve is easy, reproducibility is high, early mobilisation of knee joint can be done. The limitations of the study being less sample size, shorter series. More comparative studies between single lateral plate and dual plating of distal femoral fractures need to be carried out

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