



# A Prospective Study on the Functional Outcome in Supracondylar Fracture of Femur Internally Fixed Using Locking Compression Condylar Plates

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(Received: 04 December 2023

Revised: 19 February 2024

Accepted: April 5, 2024)

## Keywords

Myxoid chondrosarcoma, Metacarpal hand, Medial assisted plating, Functional and clinical outcome, Dual plating, Fracture, Distal femur.

## ABSTRACT:

**Introduction:** Distal femur fractures include fractures of the supracondylar and intercondylar region and are relatively common injuries. The goals of treatment follow AO principles of anatomic reduction of the articular surface, restoration of limb alignment, length, and rotation. Despite improvements in implant design, management of distal femur fractures remains a challenge; fractures are often comminuted, intra-articular, and involve osteoporotic bone, making fixation challenging to achieve.

**Purpose:** The aim of the study is to Prospective Analysis of Functional Outcome in Supra Condylar Fractures of Femur Internally Fixed Using Locking Compression Condylar Plates at the department of orthopaedics and traumatology, Vinayaka Missions Kirupananda Variyar Medical College Salem between the years November 2020 to November 2022.

**Materials and Method:** This prospective study is an analysis of functional outcome of 30 cases of displaced distal femoral fractures.

**Results:** In the study, 53.1% had excellent outcome, 40.2% with good outcome and 6.7% with unsatisfactory outcome.

**Conclusion:** A Satisfactory functional outcome can be obtained for a great majority of patients with most of the supracondylar femur fractures treated with locking compression condylar plates.

## Introduction

Distal femur fractures include fractures of the supracondylar and intercondylar region and are relatively common injuries. The goals of treatment follow AO principles of anatomic reduction of the articular surface, restoration of limb alignment, length, and rotation. Despite improvements in implant design, management of distal femur fractures remains a challenge, fractures are often comminuted, intra-articular, and involve osteoporotic bone, making fixation challenging to achieve.

Adult distal femur fractures present in a bimodal distribution. Younger male patients generally present secondary to high-energy mechanisms, such as motor vehicle accidents. Elderly patients present typically after low-energy

mechanisms, such as ground level-falls. Elderly patients often present with significant comorbidities impacting their operability, recovery, and survival. In the pediatric population, the problem can involve the long-term impact of improperly treated intra-articular fractures and early joint damage. As the population ages, the treatment of these complex fractures has correlated with poor outcomes.

Distal femur fractures account for less than 1% of all fractures and about 3 to 6% of all femoral fractures. The incidence of distal femur fractures around a primary total knee arthroplasty has been reported to be from 0.3% to 5.5%, and upwards to 30% after revision knee arthroplasty.

Supracondylar fractures are complex injuries They can produce significant long-term

disability. They account for 7% of all femoral fractures. If hip fractures are excluded 31% of femoral fractures involve distal portion.

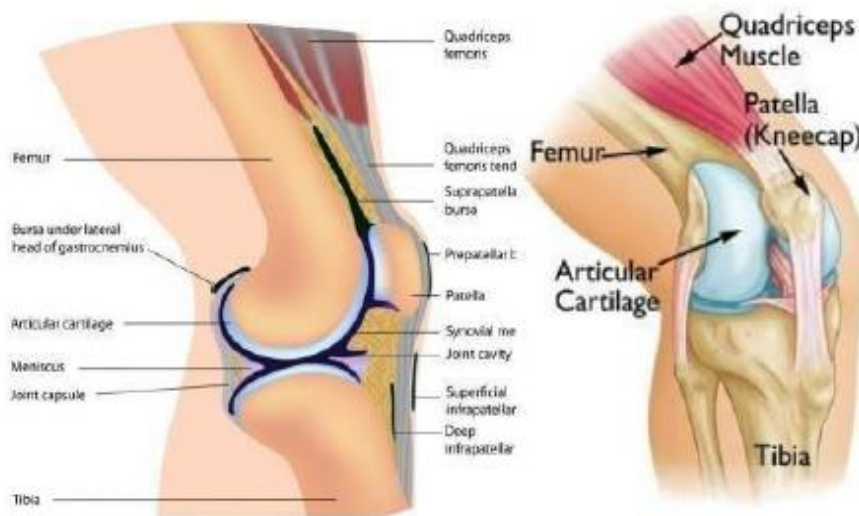
Although open reduction and internal fixation with plates and screws has become a standard method of treatment. For many type of fractures, the management of comminuted, intra articular distal femoral fractures still remains complex and challenging to the orthopaedic surgeon.

Many of these fractures are the result of high energy trauma which generates severe soft tissue damage and articular and metaphyseal communication. The incidence of Malunion, nonunion and infection are relatively high in many reported series. Coronal plane fractures and extensively comminuted fractures preclude the use of commonly used devices like 95-degree side plate, the dynamic condylar screw with 95-degree side plate and supracondylar nails. Lateral buttress or neutralization plate may be used, but when this

device is applied in presence of medial comminution or bone loss, failure of fixation and varus deformity is a complication.

The present study was conducted to study functional outcome in supra condylar fractures of femur internally fixed using locking compression condylar plates at the department of orthopaedics and traumatology, Vinayaka Missions Kirupananda Variyar Medical College Salem.

Distal femur fractures are uncommon, but an important cause of patient morbidity. Surgical management can be technically challenging, with no clear advantage of any one particular surgical implant. Despite increased biomechanical and clinical research alongside the development of modern implants, persistent disability and poor clinical outcome often result. Some of the poorer outcomes may relate to surgical technique, with a lack of understanding of the principles of the management of these fractures.

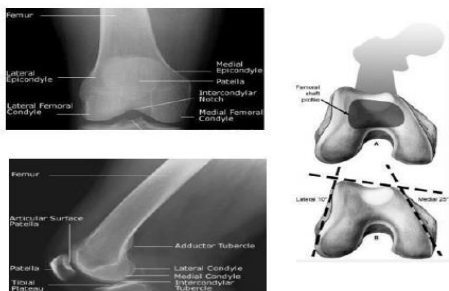


**Figure 1.** Surgical Anatomy

## Epidemiology

Distal femoral fractures account for 4-6% of all femoral fractures and approximately one third of all femoral shaft fractures. They have a bimodal age distribution, tending to occur in young males from high energy trauma, and in elderly osteoporotic females from low energy trauma. 85% of low energy fractures occur in the elderly

population. In low energy trauma, most fractures remain extra-articular, whereas in high energy trauma over half have an intra-articular extension. Extra-articular and intra-articular comminution is frequent. Open fractures occur in 19%-54%, with up to 80% being Gustilo type III. Approximately 1-5% of primary knee arthroplasties are complicated by periprosthetic fracture.



**Figure 2.** Anatomy

## MATERIALS AND METHODS

This prospective study is an analysis of functional outcome of 30 cases of displaced distal femoral fractures, internally fixed using locking compression condylar plates, conducted in the department of Orthopaedic surgery at VMKV Medical College and Hospitals, Salem from November 2020 to November 2022. We have a 24 hours emergency casualty, running all 365 days a year and fully equipped to tackle both medical and surgical emergencies, with an emergency operation theatre Sample size: 30 patients

### Inclusion criteria

- Patient aged > 18 years.
- Patients with osteoporosis.
- Open distal femur fractures GUSTILLO Type and 3a.
- Patients who need to be fixed with mullers type A, type B, type C fractures.

### Exclusion criteria

- Un displaced fractures patterns needing only conservative management.
- Distal femur fractures with neurovascular compromise.
- Gustillo type 3b, 3c.
- Periprosthetic supracondylar femur fractures.

If the patient was brought to casualty patients airway, breathing and circulation were assessed. Then a complete survey was carried out to rule out other injuries. Plain X-ray of wrist both AP and lateral view was taken.

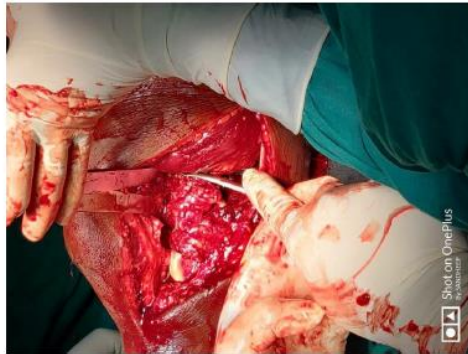
### Methodology

Under spinal/epidural anaesthesia, with patient in supine position, 2 sandbags one below the operating side knee and another below the ipsilateral hip to internally rotate the leg. Incision of around 12cm was made through the direct lateral approach to distal femur.

Skin, subcutaneous tissue were cut, the tensor fascia Lata was incised, followed by which the superior geniculate vessels were isolated and surrounding bleeders were cauterized. Using bone spikes the fracture site was reached and the articular fragments were reduced temporarily with pointed reduction forceps. We secured the condyles with 6.5mm cancellous screws. A Condylar plate guide and plate itself was held laterally on the condyle to select an area where screws will not interfere with plate placement.

Then a K wire was placed across the femoral condyle, at the level of the knee to indicate the joint axis and place a second K wire across the patellofemoral joint on the trochlear surface. With the use of anatomic landmarks and C – arm guidance, we mounted the plate on the intact/reconstructed condyle without attempting to reduce the proximal portion of the fracture.

Finally we checked, whether the guide wire inserted in through the central hole was parallel to both distal femoral joint axis and patella-femoral joint. Screw length determined using depth gauge. screws inserted starting from central hole in the condylar portion and was checked under image control and subsequent screws were inserted. After reduction was found to be satisfactory, the plate shaft was fixed with appropriate cortical screws after confirming final reduction of the fracture.



INTRA OPERATIVE SURGICAL PICTURES



**Statistical analysis**

Data Entry was done using Microsoft excel 2013 and analysis done using SPSS V 16. Qualitative data was expressed in frequencies and percentages and Quantitative data in mean and

standard deviation. Bar diagrams and pie chart were used to represent the data. p value of <0.05 was considered statistically significant.

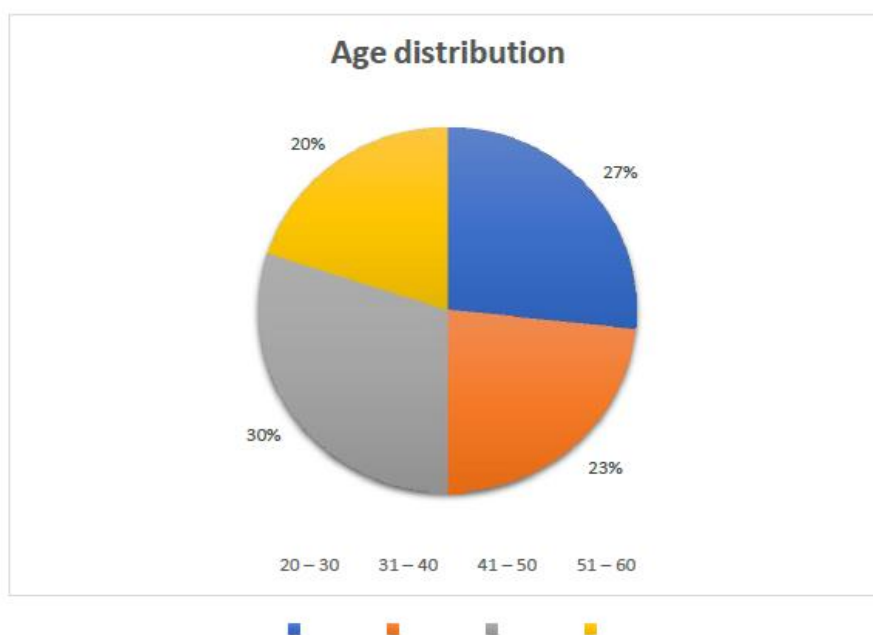
**Table 1: Age distribution**

Age	Frequency	Percentage
20 – 30	8	26.7
31 – 40	7	23.3



41 – 50	9	30
51 – 60	6	20
Total	30	100
Mean ± SD	39.76 ± 10.56	

Table 1, shows distribution based on Age, 26.7% belong to 20-30 years, 23.3% belong to 31-40 years, 30% belong to 41-50 years and 20% belong to 51-60 years. **The mean Age of the study population was 39.76 ± 10.56 years.**

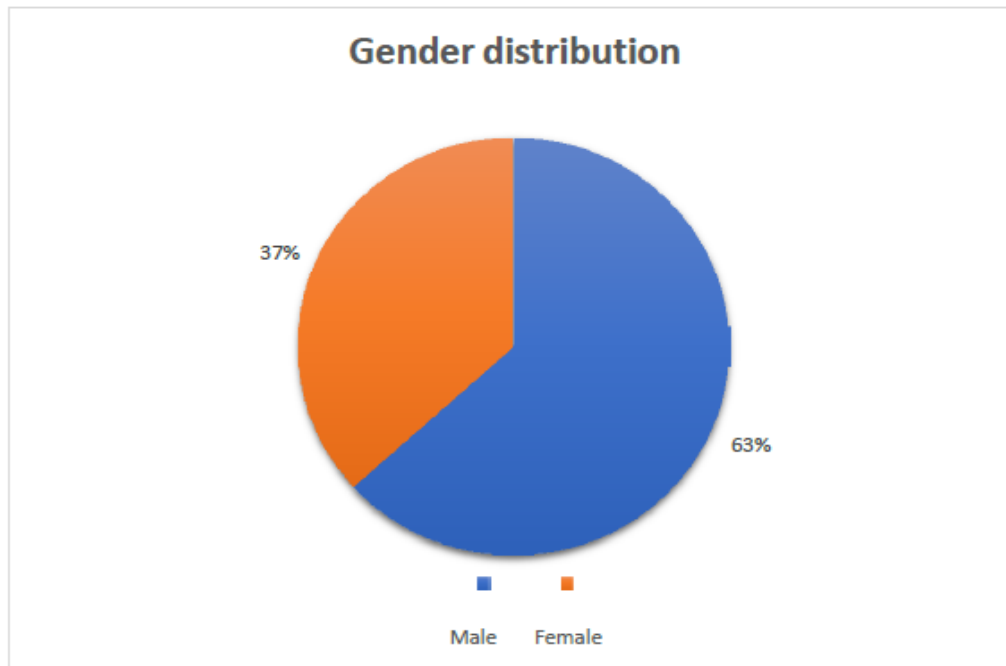


**Graph 1: Age Distribution**

**Table 2: Gender distribution**

Gender	Frequency	Percentage
Male	19	63.3
Female	11	36.7
Total	30	100

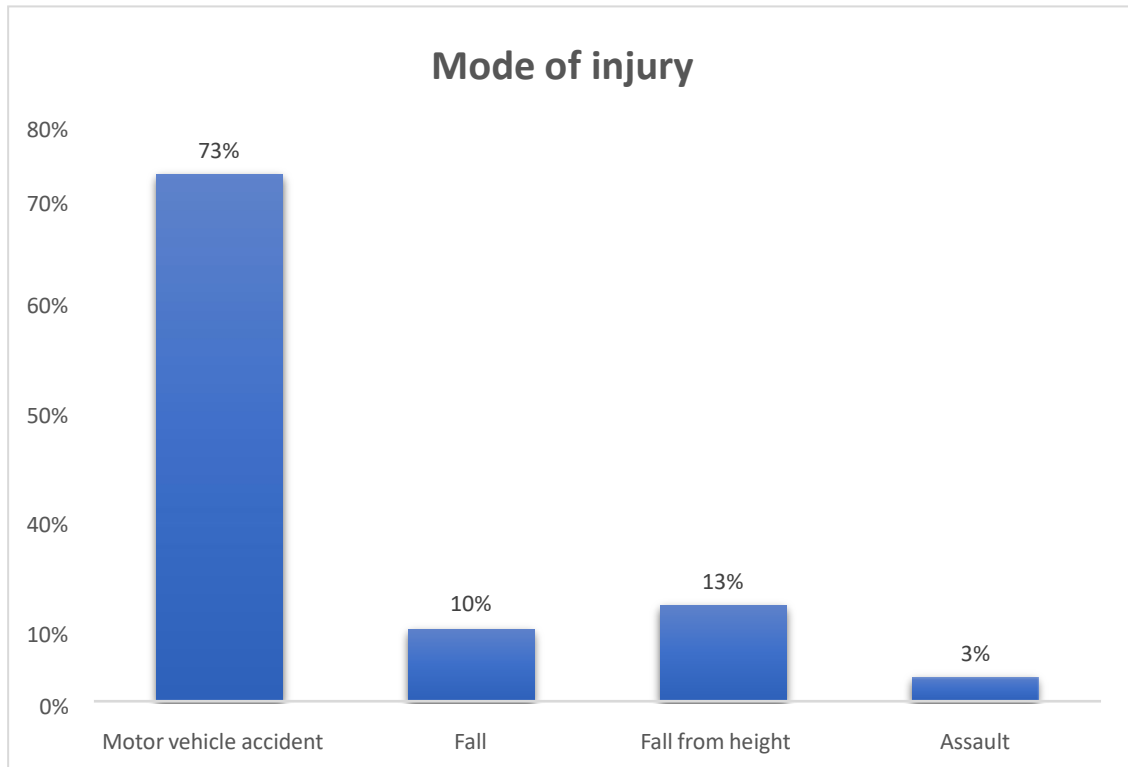
Table 2 shows distribution based on Gender, 63.3% are male and 36.7% are female.



**Graph 2:** Gender Distribution

**Table 3:** Mode of injury

Mode of Injury	Frequency	Percentage
Motor vehicle accident	22	73.3
Fall	3	10
Fall from height	4	13.3
Assault	1	3.3
Total	30	100



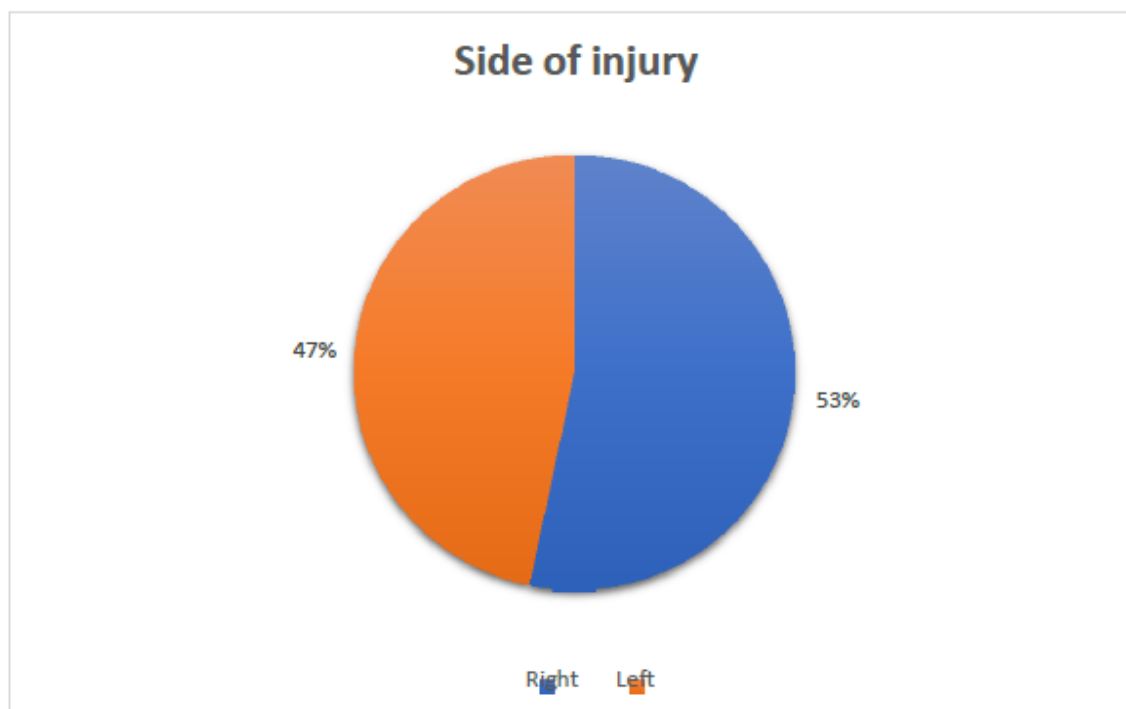
**Graph 3: Mode of injury**

Table 3 shows distribution based on Mode of Injury, 73.3% due to motor vehicle accident, 10% due to fall, 13.3% due to fall from height. 3.3% due to Assault.

**Table 4: Side of injury**

Side	Frequency	Percentage
Right	16	53.3
Left	14	46.7
Total	30	100

Table 4 shows distribution based on Side of Injury, 53.3% had right sided injury and 46.7% had left sided injury.



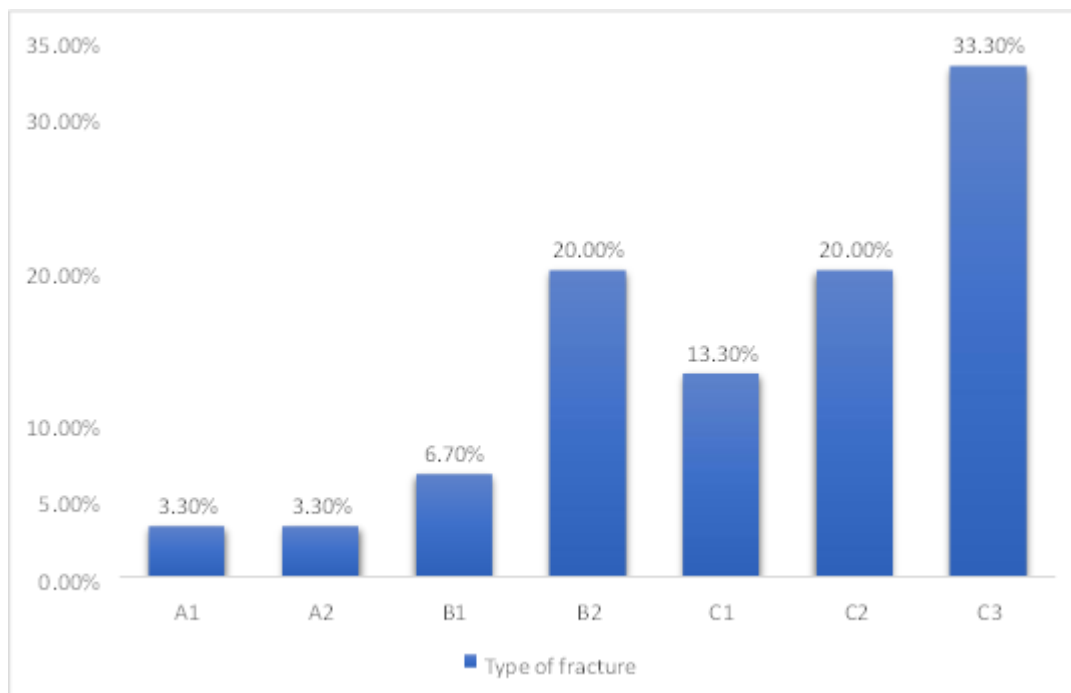
Graph 4: Side of Injury

**Table 5: Type of fracture**

Type	Frequency	Percentage
A1	1	3.3
A2	1	3.3
B1	2	6.7
B2	6	20
C1	4	13.3
C2	6	20
C3	10	33.3
Total	30	100

Table 5 shows distribution based on Type of Fracture, Type A1 In 3.3%, Type A2 in 3.3%, Type B1 in 6.7 % and Type B2 in 20%, Type C1 in 13.3%, Type C2 in 20%, Type C3 in 33.3%.



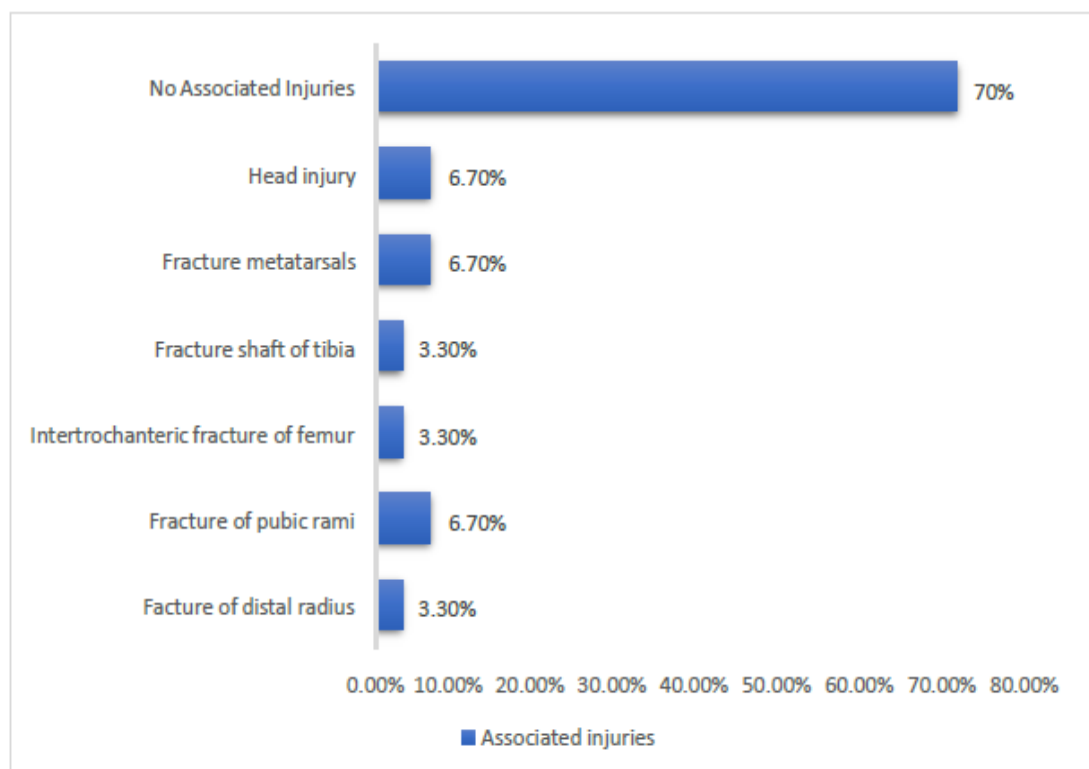


**Graph 5: Type of fracture**

**Table 6: Associated injuries**

Associated Injuries	Frequency	Percentage
Fracture of distal radius	1	3.3
Fracture of pubic rami	2	6.7
Intertrochanteric fracture of femur	1	3.3
Fracture shaft of femur	1	3.3
Fracture metatarsals	2	6.7
Head injury	2	6.7
No Associated Injuries	21	70
Total	30	100

Table 6 shows distribution based on associated injuries, 3.3% had Fracture of distal radius, 6.7% had fracture of pubic rami, 3.3% had Intertrochanteric fracture of femur, 3.3% had Fracture of femur, 6.7% with fracture metatarsals, 6.7% with head injuries.

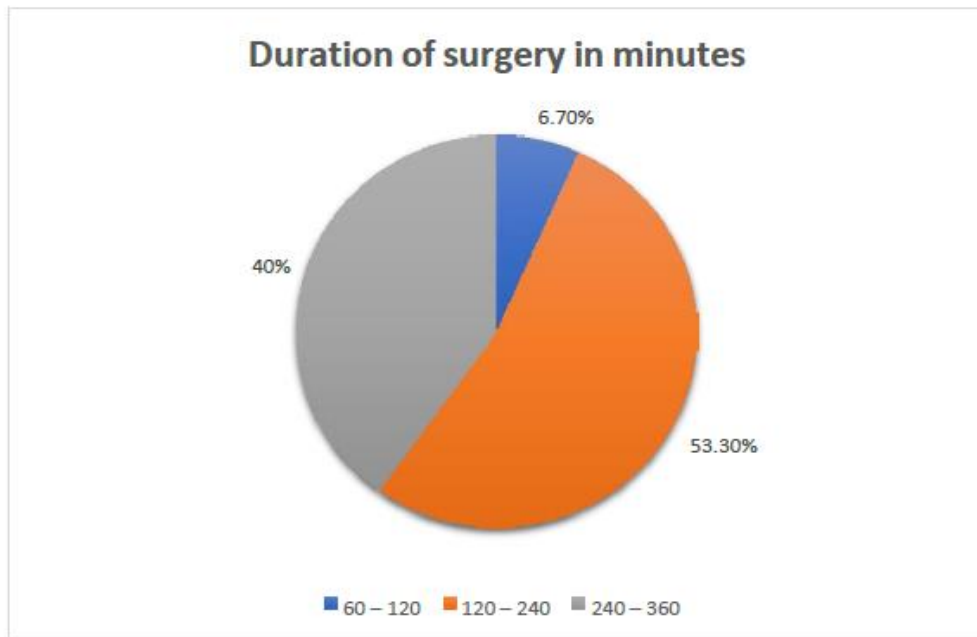


**Graph 6:** Associated Injuries

**Table 7:** Duration of surgery in minutes

Duration	Frequency	Percentage
60 – 120	2	6.7%
120 – 240	16	53.3%
240 – 360	12	40%
Total	30	100%

Table 7 shows distribution based on Duration of surgery in minutes, 6.7% had duration of surgery for 60-120 min, 53.3% with duration of surgery for 120-240 minutes, 40% had duration of surgery for 240-360 min.

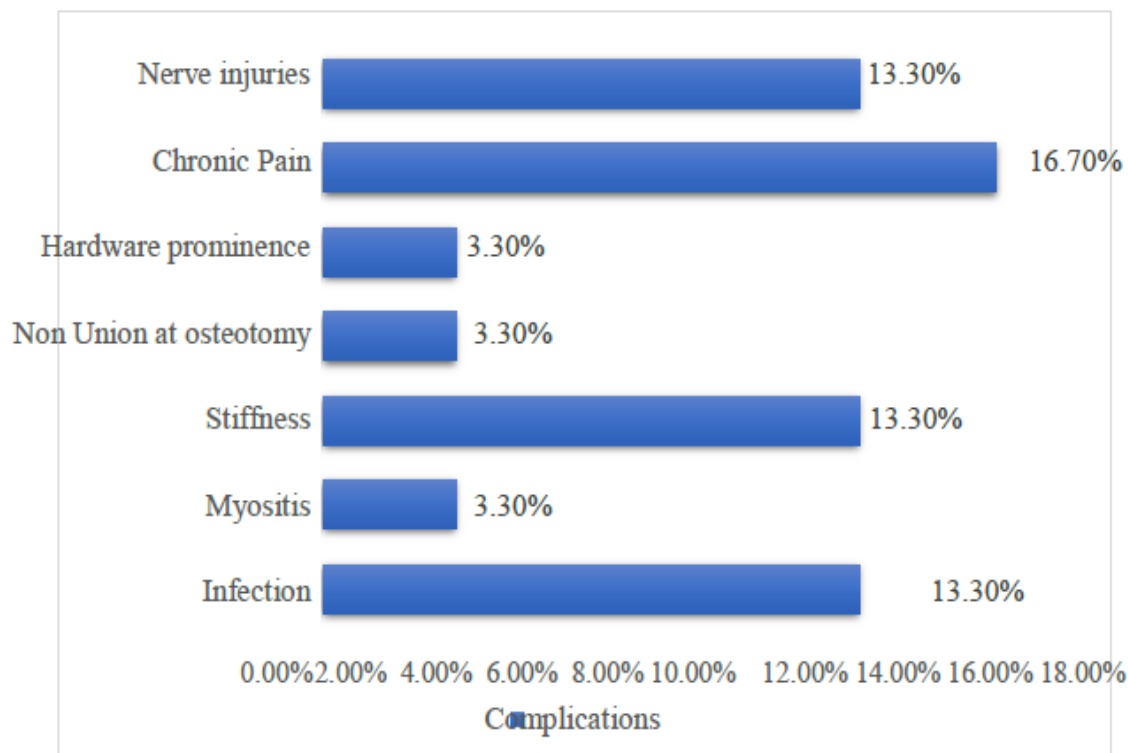


**Graph 7:** Duration of surgery in minutes

**Table 8: Complications**

Complications	Frequency	Percentage
Infection	4	13.3
Myositis	1	3.3
Stiffness	4	13.3
Non Union at osteotomy	1	3.3
Hardware prominence	1	3.3
Chronic Pain	5	16.7
Nerve injuries	4	13.3

Table 8 shows distribution based on Complications, 13.3% had infection, 3.3% had myositis, 13.3% had Stiffness, 3.3% had Non union at osteotomy, 3.3% had hardwareprominence, 16.7% with Pain and 13.3% had Nerve injuries.

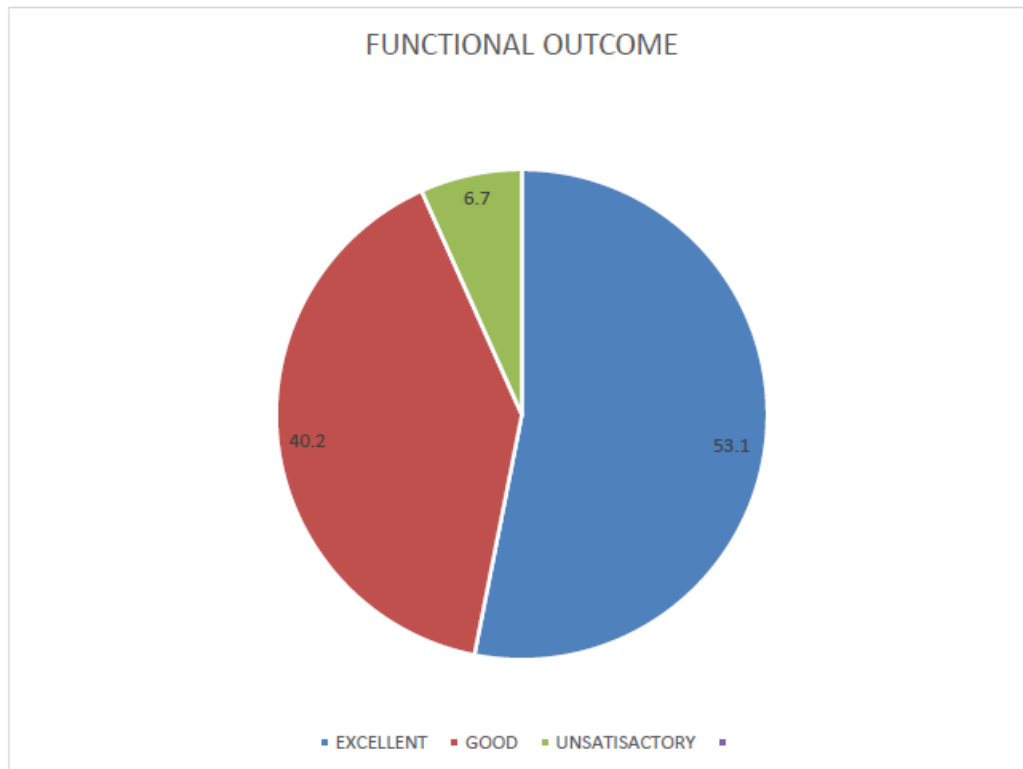


Graph 8: Complications

Table 9: Functional outcome – Knee society knee scoring system

Outcome	Frequency	Percentage
Excellent	16	53.1
Good	12	40.2
Unsatisfactory	2	6.7
Total	30	100

Table 9 shows distribution based on functional outcome, 53.1% had excellent outcome, 40.2% with good outcome and 6.7% with Unsatisfactory outcome.



**Graph 9:** Functional outcome – Knee society knee scoring system

## DISCUSSIONS

### Age distribution

26.7% belong to 20-30 years, 23.3% belong to 31-40 years, 30% belong to 41-50years and 20% belong to 51-60 years.

The mean Age of the study population was  $39.76 \pm 10.56$  years.

Present study	$39.76 \pm 10.56$ years
Bhimani et al <sup>68</sup>	44 years

Bhimani et al in their study included patients' ages ranged from 18 to 74 years with a mean age of 44 years.



### Gender distribution

63.3 % are male and 36.7% are female.

Present study	63.3% are male and 36.7% are female.
Bhimani et al <sup>68</sup>	21 patients were males and 9 patients were females

### Mode of injury

73.3% due to motor vehicle accident, 10% due to fall, 13.3% due to fall from height. 3.3% due to Assault Bhimani et al study, causes of fractures were motor vehicle accident in nineteen patients and a domestic fall in remaining eleven.

### Side of injury

53.3% had right sided injury and 46.7% had left sided injury. Bhimani et al study included Twenty fractures involved the right side, and ten involved the left side

#### Type of fracture

Type A1 In 3.3%, Type A2 in 3.3%, Type B1 in 6.7 % and Type B2 in 20%, Type C1 in 13.3%, Type C2 in 20%, Type C3 in 33.3%.

According to Muller's classification of distal femur five Bhimani et al study included Muller's type A1; nine Muller's type C1; ten Muller's type C2; and six Muller's type C3. Twenty-six of them had closed fracture and four open type fractures.

### Associated injuries

3.3% had Fractur of distal radius, 6.7% had fracture of pubic rami, 3.3% had Intertrochanteric fracture of femur, 3.3% had

Fracture of femur, 6.7% with fracture metatarsals, 6.7% with head injuries.

### Duration of surgery in minutes

% had duration of surgery for 60-120 min, 53.3% with duration of surgery for 120-240 minutes, 40% had duration of surgery for 240-360 min.

### Complications

13.3% had infection, 3.3% had myositis, 13.3% had Stiffness, 3.3% had Non union at osteotomy, 3.3% had hardware prominence, 16.7% with Pain and 13.3% had Nerve injuries.

Due to the high rate of comorbidities in the population that is most likely to sustain this injury (elderly patients), the mortality rate at 30 days, 6 months, and 1 year are thought to be 6%, 17%-18%, and 18%-30%, respectively

The prognosis is better for patients without multiple concurrent traumatic injuries, less fracture displacement, and limited extension into the femoral shaft.

### Complications Early

- Neurovascular injury
- Compartment syndrome
- Infection Late
- Chronic pain
- Nonunion or malunion
- Infection
- Thromboembolic disease

### Associated conditions

All patients with femoral fractures should be closely evaluated for other polytrauma injuries especially of the hip and knee

	Infection	Implant fail/ Hardware prominence	Malalignment
Present study	13.3%	3.3%	3.3%



Schandelmaier et al	7%	6%	1%
Dhanda et al	1.9%	7.4%	13%
Kregor et al	3%	1.5%	5%

### Functional outcome – Knee society knee scoring system

In the study, 53.1% had excellent outcome, 40.2% with good outcome and 6.7% with Unsatisfactory outcome.

Locking plate systems such as the LISS have been extensively used for distal femoral fractures. LISS has a lower risk of early implant loosening than the dynamic condylar screw and promotes early mobilization and rapid healing without bone grafting with low risk of infection and less blood loss. The LCP differs from the LISS in that the LCP has combination holes and does not have a jig. Pain over lateral aspect of the distal femur following fixation with LISS has been attributed to the jig.

Previous studies have demonstrated successful early results and relatively low complication rates using minimally invasive plating techniques for the fractures of distal femur.

Kiran Kumar et al in their case series of 44 patients, there were no cases of infection and varus/valgus alignment of more than 5 degrees. This study noted 2 cases of nonunion, out of which one case required autogenous iliac crest bone grafting and the other case required bone grafting along with refixation using longer plate due to breakage of proximal screws. One case required arthrolysis with implant removal due to severe restriction of ROM and hardware prominence.

As reviewed by Miclau et al bone graft rates of supracondylar femur fractures ranged between 0% and 87%. Relatively low rate of bone grafting in our series is probably due to improved surgical technique with better soft tissue handling.

Early experience with the LISS for distal femoral fractures in multicentric study in Europe demonstrated a 20% incidence of varus/valgus

deformity greater than 5 degrees. Our relatively low incidence of deformity is probably because of improved surgical expertise along with better understanding of fracture anatomy.

In Agarwal et al study the Local complications were present in 13 (21.6%) patients. They included restriction of knee movements (6 patient) with 5-100 terminal extension lag in two patients, chronic swelling of injured lower limb (1 patient), and superficial infection (2 patients), Restriction of movement is common complication of Distal femur fracture.

Ravi prasad et al study reported that Four patients in medial parapatellar group had reoperation for insertion of patella button and one patient underwent manipulation under anaesthesia of knee for stiffness.

In Rajesh Chandra et al study 5 cases (16.66%) developed superficial infection which healed by regular dressing, antibiotics according to culture and sensitivity. The range of motion of the knee at the end of the follow up period was 0- 120 degree in 73.33% of our patients. (n=22 cases).

Similar findings were reported by Jaspal singh et al<sup>90</sup> where Complications were found to be present in 2 patients in Swash Buckler group. Superficial infection and restriction of movement was seen in 1 patient each. The overall incidence of complications was 10 percent

Zlowodzki et al. in a systematic review of different fixation techniques in the operative management of acute non periprosthetic distal femur fractures found that the use of locked plates is associated with a decreased relative risk of nonunions and infections as compared to compression plates.

Yeap E.J. and Deepak A.S conducted a retrospective review on eleven patients who were treated for Type A and C distal femoral fractures (based on AO classification) between January 2004 and December 2004. All fractures were fixed with



titanium distal femoral locking compression plate. Clinical assessment was conducted at least 6 months post-operatively using the Schatzker score system. Results showed that four patients had excellent results, four good, two fair and one failure.

Min BW, et al. demonstrated that the radiological and clinical results of MIPO with locking compression plate were not inferior to ORIF and resulted in fewer intraoperative complications than ORIF.

Similarly, Xing W, et al showed that 90% of

the distal femur fracture fixation had an excellent outcome using a locking compression plate through a posterolateral approach. In our study, we treated 30 cases of distal femur fractures with an average age of 44 years. The average union time was 16 weeks. The time required for surgery ranged from 90 to 240 minutes. This is because few patients had associated injuries like mandible fracture, humerus fracture, patella fracture and radius and ulna fracture



**POST OP PATIENT WITH IMPLANT PROMINENCE.**

## SUMMARY

- The mean Age of the study population was  $39.76 \pm 10.56$  years.

- 63.3% are male and 36.7% are female

- 73.3% due to motor vehicle accident, 10% due to fall, 13.3% due to fall from height. 3.3% due to Assault.

- 53.3% had right sided injury and 46.7% had left sided injury.

- Type A1 In 3.3%, Type A2 in 3.3%, Type B1 in 6.7% and Type B2 in 20%, Type C1 in 13.3%, Type C2 in 20%, Type C3 in 33.3%.

- Unsatisfactory outcome.

- based on associated injuries, 3.3% had Fracture of distal radius, 6.7% had fracture of pubic rami, 3.3% had Intertrochanteric fracture of femur, 3.3% had Fracture of femur, 6.7% with fracture metatarsals, 6.7% with head injuries.

- based on Duration of surgery in minutes, 6.7% had duration of surgery for 60- 120 min, 53.3% with duration of surgery for 120-240 minutes, 40% had duration of surgery for 240-360 min.

- 13.3% had infection, 3.3% had myositis, 13.3% had Stiffness, 3.3% had Non union at osteotomy, 3.3% had hardware prominence, 16.7% with Pain and 13.3% had Nerve injuries.

- 53.1% had excellent outcome, 40.2% with good outcome and 6.7% with



PRE AND POST OPERATIVE FOLLOW UP PICTURES

CASE 1



CASE 2



CASE 3



CASE 4



COMPLICATIONS





## MYOSITIS OSSIFICAN



## NON UNION OF 3 MONTHSOLD FIXATION

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