

# International Journal of Orthopaedics Sciences

ISSN: 2395-1958  
IJOS 2019; 5(2): 911-922  
© 2019 IJOS  
www.orthopaper.com  
Received: 01-02-2019  
Accepted: 05-03-2019

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## A study of the functional outcome of different operative modalities of treatment for distal femur fractures

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DOI: <https://doi.org/10.22271/ortho.2019.v5.i2n.111>

### Abstract

**Background:** Purpose of this study is evaluation and determination of functional outcome of distal end femur fracture treated by different operative modalities of treatment.

**Material and Methods:** This is a prospective study done at orthopaedics department of Krishna institute of medical science and hospital karad (Satara). In our study 30 cases of distal femur fracture studied. Fracture types were classified according to AO classification into AO type A AO type B and AO type C. Patients were treated surgically with intramedullary supracondylar nail, distal femur non locking plate, buttressing plate, cannulated cancellous screws & Herbert screws. Distal femur condylar locking compression plate. Functional outcome was assessed according to Neer's knee score.

**Results:** Functional outcome was analyzed according to the NEERS knee scoring system, average score was 82 with a range of 29-94. In our study of 30 patients, 6(20%) observed excellent result, 9(30%) observed good result, 6(20%) observed fair result and 9(30%) observed poor result.

**Conclusion:** Distal femur fractures are most commonly seen in males & most common cause is road traffic accident. Close fractures unite earlier than open fractures irrespective of type of the fracture. Bone grafting is necessary in case of comminution. Distal femur locking compression plate is an optimal tool for supracondylar fractures of femur especially AO Type A fractures and AO type C fractures. Cannulated cancellous screws is an optimal tool for AO Type B fractures. However careful understanding of basic principles and identification of appropriate fracture pattern for use of particular implants are essential to avoid complications and to produce excellent result.

**Keywords:** Distal femur, condylar locking compression plate, intramedullary supracondylar nail

### Introduction

In the modern world with the increase in speed and number of fast moving vehicles there is great increase in number and severity of fractures. Knee joint is most vulnerable for injuries in accidental injuries fracture, since bumper of most of the car is at the knee height. Vehicular accidents invariably lead to higher incidences of bumper fractures (Fracture around knee) [1]. In elderly patients distal end of femur fractures occur after minor trauma or slip because of osteoporotic bones. These fractures are difficult to treat. Unstable and comminuted type of distal end of femur fractures may occur in high energy trauma and elderly patients. Because of proximity of these fractures to the knee joint, regaining of the full knee motion and function may be difficult [1]. Distal femur fractures occur at approximately one tenth the rate of proximal femur fractures and make up 6% of all femur fractures. There is a bimodal distribution of fractures based on age and gender. Most high-energy distal femur fractures occur in males between 15 and 50 years, while most low-energy fractures occur in osteoporotic women >50 years. The most common high energy mechanism of injury is a traffic accident (53%) and the most common low energy mechanism is a fall at home (33%) [2]. These potentially serious injuries result in various degrees of permanent disability and continue to pose a therapeutic challenge to the modern orthopaedic surgeons even today in achieving successful outcome. Therapeutics challenges posed by distal femoral fractures are due to following peculiarities:-

- Osteoporotic fractures
- Open fractures
- Fractures with short articular segments [3].

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Before the development of techniques and implants to provide stable fixation, most distal femur fractures were treated with skeletal traction <sup>[1]</sup>. Disappointments with closed treatment were in terms of prolonged hospitalization, knee stiffness, deep vein thrombosis, urinary tract & pulmonary tract infection, non-union, malunion, pin tract infection <sup>[3]</sup>. Recent literature thus supports surgical intervention in non ambulatory patients to avoid such complications <sup>[2]</sup>. Many fracture fixation implants are now available each having its own merits and demerits. Anatomic reduction of the articular surface, restoration of limb alignment, and early mobilization has been shown to be effective ways of managing most distal femoral fractures. Despite the advances in techniques and the improvements in surgical implants, treatment of distal femoral fractures remains a challenge in many situations<sup>1</sup>. Hence a study is carried out to evaluate the results of distal femur fractures treated with different modalities so that it helps in careful selection of patients and implants and determine its outcomes.

### Material and Methods

This is prospective study conducted in Department Of Orthopedic Surgery at Krishna Institute of Medical Sciences Deemed to be University, Karad. For this study 30 patients with distal femur fractures were included who presented to KIMS casualty who fulfilled the criteria. Patients were classified into AO classification of distal femur fractures.

### Inclusion criteria

1. All cases of ipsilateral distal femur fractures age > 18 years
2. Both closed and open fractures.
3. Both sexes.
4. Patients who were preoperative mobile.

### Exclusion criteria

1. Children (<18 years), with distal femur fractures – skeletally immature patients.
2. Unwillingness to participate in the study.
3. Patients unfit for surgery.
4. Patients with pathological fractures.
5. Fractures in ipsilateral limb.

### Initial management

As the patient presented to the emergency department, proper assessment of the injuries was done. Initial management involved resuscitation and haemodynamic stabilization of the patient and splinting the limb in thomas splint or plaster slab or skeletal traction given later on. 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. Appropriate antibiotics were started and prophylactic tetanus toxoid was given. Primary closure of the wound was done. The subject was 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. Patients having Open fractures were classified according to Gustilo and Anderson 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. The limb to be operated was shaved and prepared a day before scheduled surgery. One gram of second/ third generation intravenous cephalosporin was injected previous night and early morning on the day of surgery. Test dose of xylocaine was done one day prior to surgery. Informed written consent was obtained from all patients and also consent for bone grafting from either ipsilateral or contralateral iliac crest was obtained. Primary care was given to all these patients and then they were treated with surgical management.

### Postoperative evaluation

All patients were evaluated postoperatively at regular follow up of 6 weeks, 3 months, 4.5 months, 6 months. Serial x-rays and functional assessment were carried out at each visit in outpatient clinic itself using the Neer's Knee Score. All the patients were assessed using a standard Proforma.

Physiotherapy was started from postoperative day 1 as quadriceps and hamstring strengthening exercises. Knee mobilisation was started depending upon the fracture pattern and modality of fixation. Non weight bearing was started and gradually increasing to partial and full weight bearing depending upon the modality of fixation.

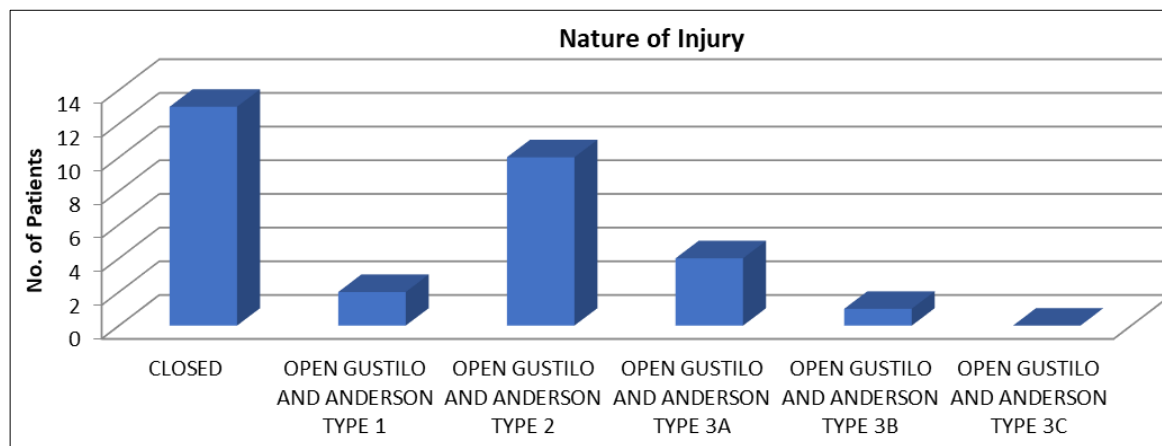
### Method of statistical analysis

The Excel and Graphpad Instat (Graphpad softwares inc, USA) software packages were used for data entry and analysis.

### Observation and result

Age group ranged from 20 years to 70 years. Majority of the patients were from the age group 41-50 years (43.33%) followed by less than 30 years (20%), 31-40 years (16.67%), more than 60 years (13.33 %) and 51-60years (6.67 %). Average age of patients was 44 years with a standard deviation of 13.48 years. Out of total patients majority of the patients were male 24 (80 %), and 6 female (20 %). In our study, out of total 23 patients, 20 patients had right lower limb injury (66.67 %) and 10 patients had left lower limb injury (33.33 %). Right sided dominance was seen. Out of 23 patients in our study, 25 patients (83.33) had road traffic accident, while 5 patients (16.67 %) had fall from height. In our study 17(56.7%) patients are farmers, 4(13.3%) patients are businessman, 3(10%) patients are housewives, 3(10%) patients are labour, 2(6.7%) patients are students and 1(3.3%) patient is driver.

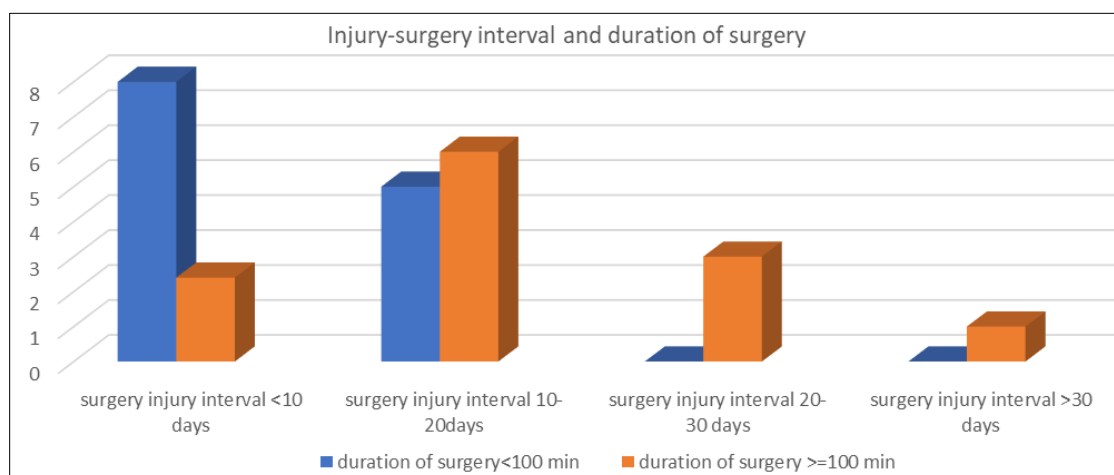
Out of 30 patients, majority femur fracture were closed- 13 cases (43.33 %) followed by open type 2 in 10 cases (33.34 %), open type 3A in 4 cases (13.33 %), open type 1 in 2 cases (6.67 %) and open grade 3B in 1 patient (3.33 %).



**Fig 1:** Nature of injury according to gustilo and Anderson classification

In our study of 30 patients, 23(76.67%) patients had no associated injuries, 2(6.67%) patients had contralateral lower limb injury, 2(6.67%) patients had upper limb injuries, 1(3.33%) patient had chest trauma, 1(3.33%) patient had head injury, and 1(3.33%) patient had facial injury. In our study of 30 cases, 15 cases were operated within less than 10 days, 11 cases operated between 10-20 days, 3cases were operated between 20-30 days and 1 patient was operated after 30 days.

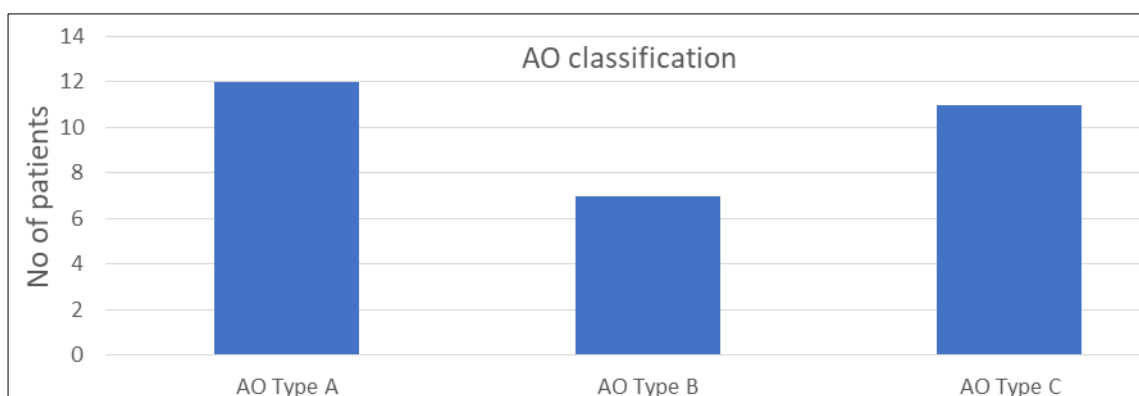
In our study 13 surgeries required less than 100 minutes and 17 surgeries required more than 100 minutes. Mean time for operative procedure in study was 100.33 minutes with standard deviation of 27.60 minutes. In our study of 30 patients, majority of patients were operated within 10 days of injury and most of patients require more than or equal to 100 minutes. We compared surgery injury interval and duration of surgery in all patients.



**Fig 2:** Comparison between Injury-surgery interval and duration of surgery

Distal femur fractures was classified according to AO classification. Out of total 30 patients, 12 cases (40.0%) the

majority were classified into Type A fracture, 7 cases (23.33 %) into Type B and 11 cases (36.66 %) under Type C



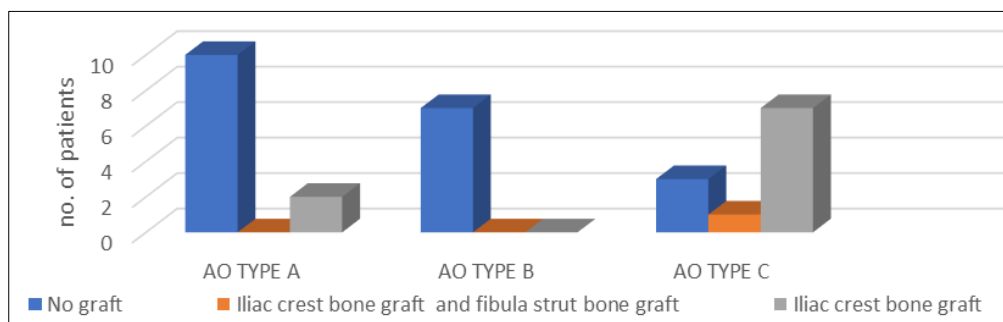
**Fig 3:** Distribution of patient into AO types

In our study of 30 patients, 17 patients were treated with condylar locking compression plate (56.67%), 5 patients with lag screws (16.67%), 5 patients with retrograde nailing

(16.67%), 1 with lag screws and buttress plate (3.33%), 1 with lag screws and headless screws (3.33%), and 1 with condylar buttress plate (3.33%) In our study of 30 patients, In AO type

A fractures 1(3.33%) patient was operated with condylar buttress non-locking plate, 5(16.66%) patients with supracondylar nail, 6(20%) patients with condylar locking compression plate. In AO type B fractures 1(3.33%) patient was operated with 6.5mm CC screw with washer and 3.5mm dynamic non locking compression plate, 1(3.33%) patient with 6.5mm CC screw with washer and headless (Herbert) screw, 5(16.66%) patients with 6.5mm CC screw with

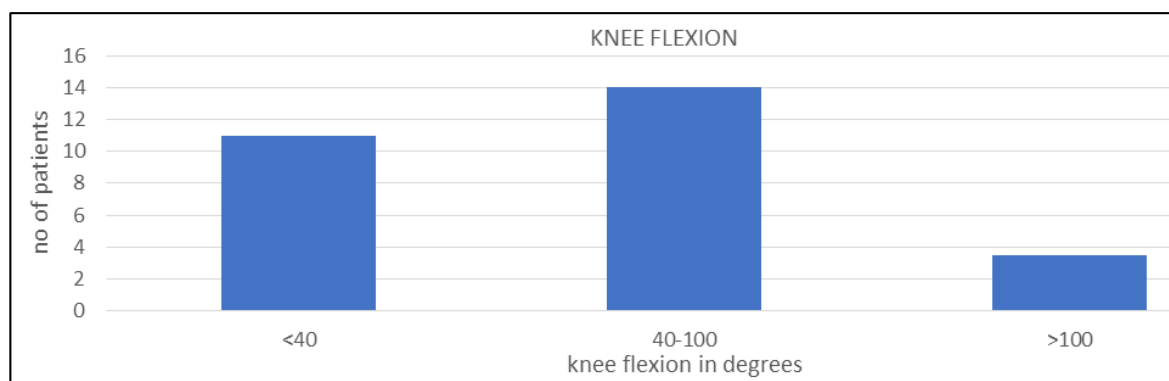
washer. In AO type C fractures all patients 11(36.66%) were operated with condylar locking compression plate. In our study of 30 patients, no bone graft required in 20(66.67%) patients, iliac crest bone graft required in 9(30%) patients and combined iliac crest and fibula strut graft in 1(3.33%) patient. In our study of 30 patients, majority in AO type C fractures required bone graft, no bone graft was required in AO type B fractures.



**Fig 4:** Bone graft in specific AO types

In our study of 30 patients, majority patients were started with knee mobilization within 2 weeks 9(30%) patients, 6(20%) patients in 10-12 weeks, 5(16.66%) patients in 12-14 weeks, 4(13.33%) patients in 8-10 weeks, 4(13.33%) patients in 4-6 weeks, 1(3.33%) patient in 6-8 weeks and 1 (3.33%) patient in

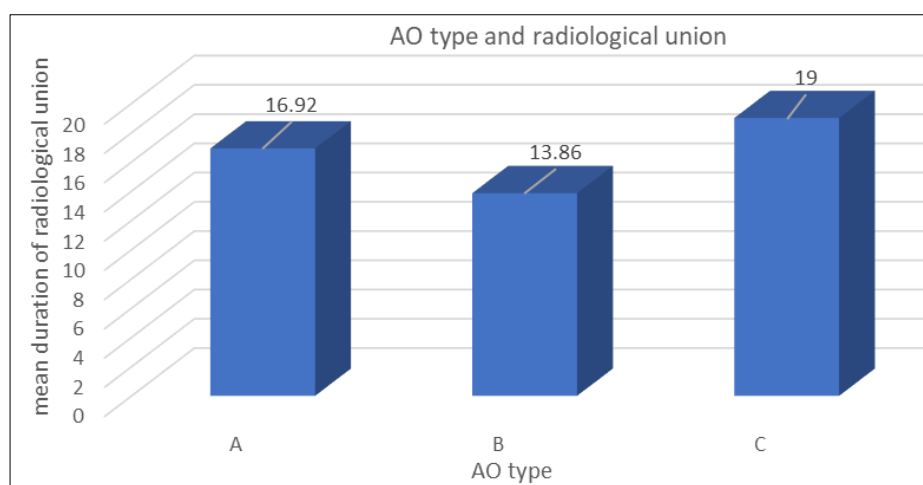
2-4 weeks. Knee flexion was studied in all patients, out of total patients mostly observed knee flexion was 40-100° 14 patients, (46.67%), preceding to that patients had <40° 11 patients, (36.67%) and >100° 5 patients, (13.33%). average knee flexion was 76.66°.



**Fig 5:** Knee flexion after 6 months

Out of total 30 patients 23 (76.67%) patients had 0° extensor lag, preceding to that 6(20%) had 10° extensor lag and only 1(3.33%) patient had 20° extensor lag. Out of total 30 patients, most of the patients 18(60%) had radiological union

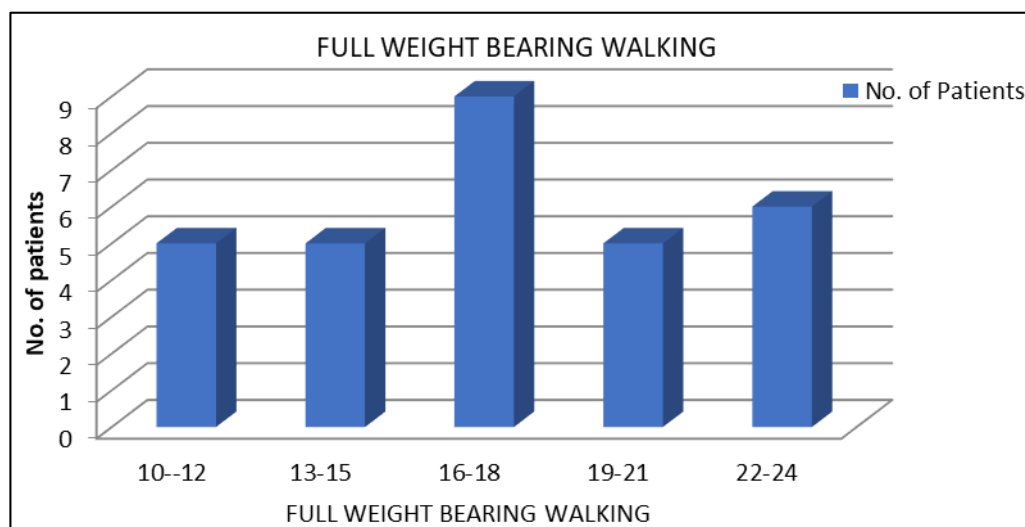
between 15-18, preceding to that 7 (23.33) patients had radiological union between 11-14, 2 (6.67%) patients had radiological union between 19-22 and 3 (10.0%) patients had no signs of radiological union at 24 weeks.



**Fig 6:** Radiological union in specific AO type fractures

Out of total 30 patients, 5 (16.67%) started full weight bearing walking between 10-12 weeks, 5 (16.67%) started full weight bearing walking between 13-15 weeks, 9 (30%) started full weight bearing walking between 16-18 weeks, 5 (16.67%)

started full weight bearing walking between 19-21 weeks and 4(13.34%) started full weight bearing walking between 22-24 weeks. 2(6.67%) patient were non weight bearing walking at 24 weeks.



**Fig 7:** Full weight bearing walking starting period

In our study, out of 30 patients 4(13.34%) patients had varus malalignment and 3 (10%) patients had valgus malalignment. 23 (76.67%) patients had no malalignment. Out of total 30 patients, No limb length discrepancy was seen in 22 (73.33%) patients, equal or less than 2 cm limb length discrepancy was

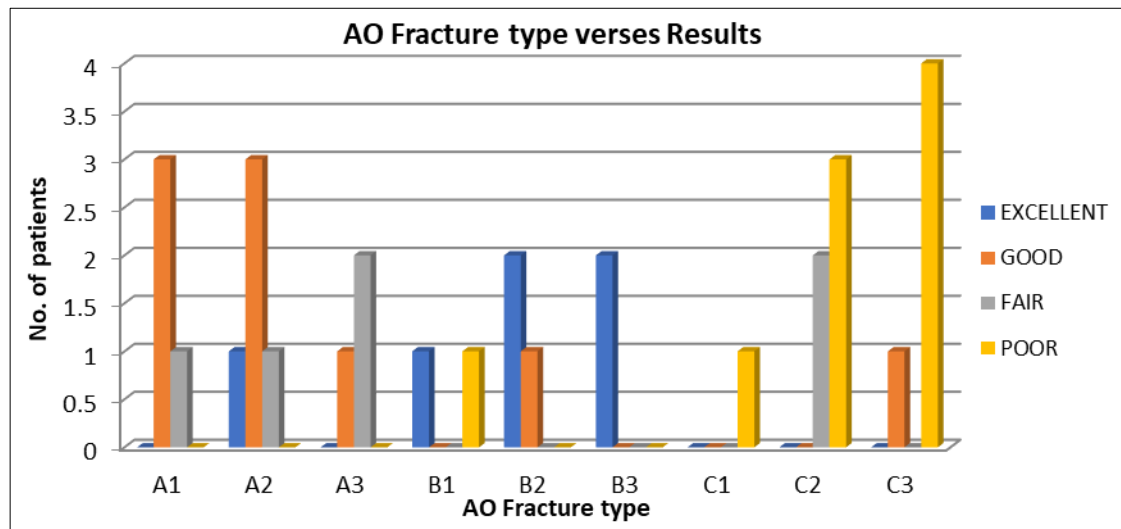
seen in 6 (20%) and 2 (6.67%) patients had more than 2 cm limb length discrepancy. In our study of 30 patients, 6(20%) observed excellent result, 9(30%) observed good result, 6(20%) observed fair result and 9(30%) observed poor result.



**Fig 8:** Functional outcome according to NEER's Score

No any significant association observed between nature of injury and result. Most of the patients (13) had closed nature of injury, out of them 4 patients had excellent result, 5 patients had good result, 3 patients had fair result and one patient had poor result. (10 patients) had open gustilo and anderson type 2, out of that only one patient had excellent result, 3 patients had good result, 3 had fair result and 3 patients had poor result. In our study of 30 patients, we

studied correlation between AO type and results. Significant correlation observed between AO type and results. Table shows that AO type A had good results, AO type B has excellent result and AO type C had poor result. Out of total 30 patients, maximum patients (17) were operated with condylar locking compression plate, most of them 8 patients had poor result, preceding to that 5 patients had fair result and 4 patients had good result.

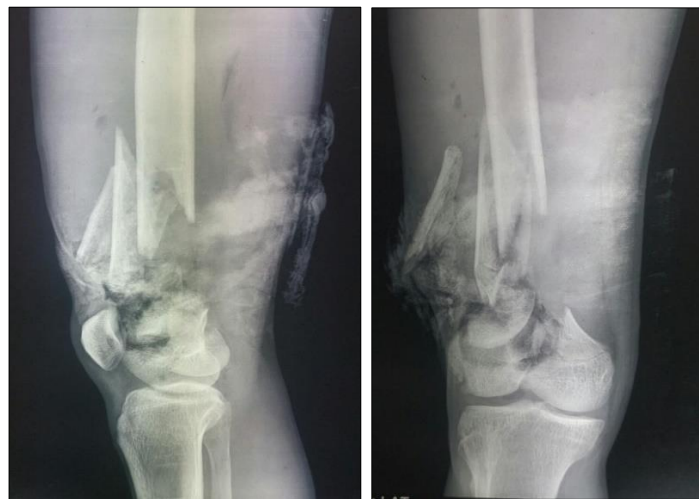


**Fig 9:** AO types and result

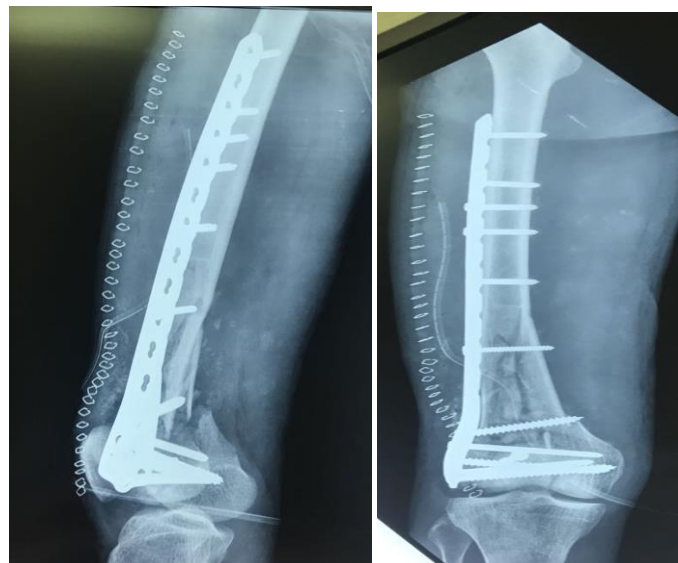
Lag screws and Retrograde nail was used in 5 patients each, out of 5 patients with lag screw 3 patients had excellent result, 1 had good result and 1 had poor result. 5 patients with retrograde nail, 3 patients had good result, 1 patient had fair and 1 patient had excellent result. In our study of 30 patients, most common complication knee stiffness 21(70%), post

traumatic arthritis 18(60%), malunion 7(23.33%), infection 4(13.33%), delayed union 3(10%) and implant failure 2(6.66%).

#### Case 1



**Fig 10:** Pre-operative X-ray



**Fig 11:** Post-operative X-ray



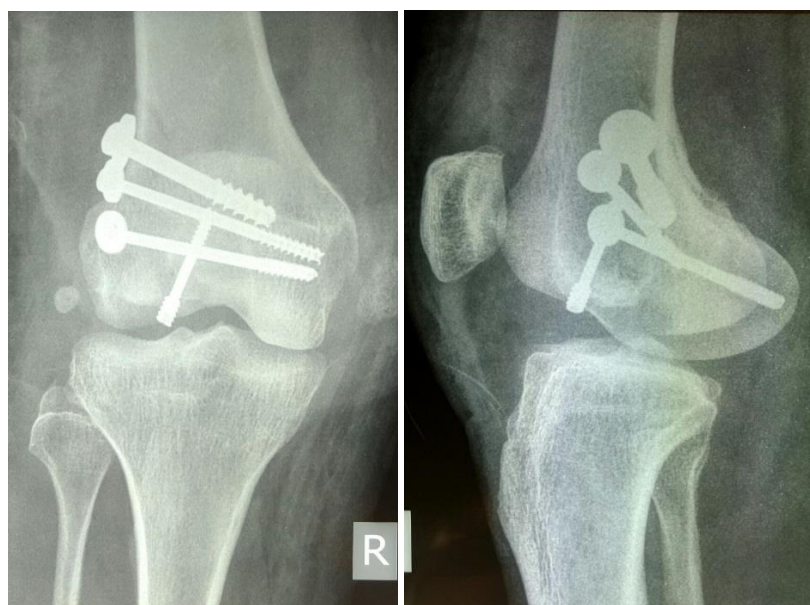


**Fig 12:** Follow up X-ray 6 months

## Case 2



**Fig 13:** Pre-operative X-ray



**Fig 14:** Post-operative X-ray



**Fig 15:** Follow up X-ray 6 months



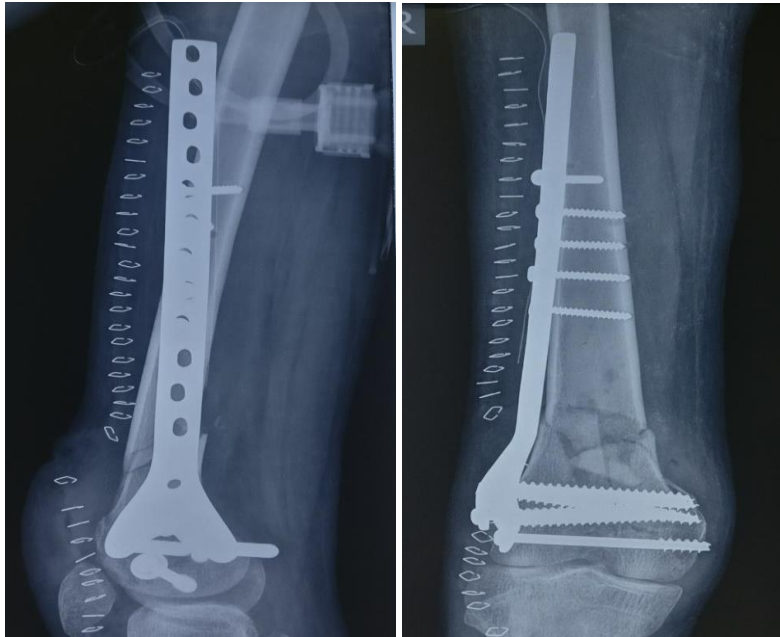
**Fig 16:** Post implant removal

### Case 3

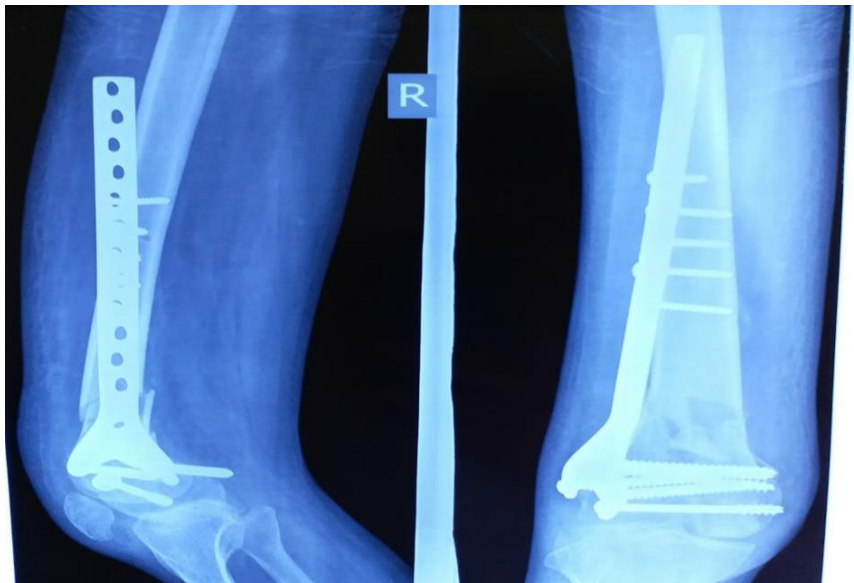


**Fig 17:** Pre-operative X-ray





**Fig 18:** Post-operative X-ray



**Fig 19:** Follow up x-ray 6 months

### Discussion

Distal end of femur is defined as the area between femoral condyles and metaphyseal- diaphyseal junction comprising of distal 15 cm of femur measuring from articular surface.

**Age:** The age distribution was from 18 years to 70 years (Mean 44 years). Majority of the patients were from the age group 41-50 years 13(43.33 %) patients. Skeletally immature paediatric age group was not included in the study. Dr. Ram Avatar Saini *et al.* <sup>[4]</sup> observed age ranged from 18 to 82 years where mean age of patients was 44.94 years. Ramji Lal Sahu <sup>[5]</sup> observed average age of 41.4 years with range from 17-62 years.

**Sex:** In our study of 30 patients, males predominated in our study (80% male, 20% female). Ramji Lal Sahu <sup>[5]</sup> observed 80% (136/170) male and 20% (34/170) female in there study. Vishwanath C *et al.* <sup>[6]</sup> observed 64% male and 36% female in there study.

**Mechanism of Injury:** It occurs usually due to high velocity

trauma. There is an increase in the occurrence of distal femur injuries due to the increase in number of road traffic accidents. These are always associated with high morbidity. In our study the most common mechanism of injury was road traffic accidents 25 (83.33 %). The more number of road traffic accident cases were due to the fact that our hospital is situated on a major highway and that our hospital is a tertiary referral center. Ramu *et al.* <sup>[7]</sup> when the machine in which the subject is travelling stops suddenly, much of the impact is taken first upon the patella, then the condyles of the femur and then the tibia in varying proportions and positions. Kumar SK *et al.* <sup>[8]</sup> described 60% in there study had road traffic accidents. Dr. Ram Avatar Saini *et al.* <sup>[4]</sup> observed 76.5% road traffic accidents cases in there study.

**Side:** In our study, out of total 30 patients, 20 patients had right lower limb injury (66.67 %) and 10 patients had left lower limb injury (33.33 %). Right sided dominance was seen. Vishwanath C *et al.* <sup>[6]</sup> observed right lower limb injury (66 %) and left lower limb injury (34 %) in there study. Right sided dominance was seen. Patil *et al.* <sup>[9]</sup> observed right lower

limb injury (60 %) and left lower limb injury (40 %) in there study. Right sided dominance was seen.

**Nature of injury:** Out of 30 patients, majority femur fracture were closed- 13 cases (43.33 %) followed by open type 2 in 10 cases (33.34 %), open type 3A in 4 cases (13.33 %), open type 1 in 2 cases (6.67 %) and open grade 3B in 1 patient (3.33 %). Vishwanath C *et al.* [6] Observed majority of cases were close 56% fractures and remaining were open 44% fractures.

### Injury-surgery interval

In our study of 30 cases, patients were operated from 4 days to 35 days, 15 cases were operated within less than 10 days after injury, 1 patient was operated after 30 days of injury because of uncontrolled hypertension. Mean injury to surgery duration was 11 days. M. Agunda *et al.* [10] concluded mean duration between injury to surgery was 11 days and range was from 1 day-63 days

### Duration of surgery

In our study patients were operated between 40 min to 160 min with mean time for operative procedure was 100.33 minutes, Rajanish R. Menon, Subramanian V [11] took an average 83 minuits for operative procedure. There was no significant association between injury-surgery interval and duration of surgery in our study.

### AO classification

All 30 patients were classified according to AO classification, 12 cases (40.0%) the majority were classified into Type A fracture, 7 cases (23.33 %) into Type B and 11 cases (36.66 %) under Type C.

**Table 1:** AO classification and other studies

AO Classification			
Study	A	B	C
Ramu <i>et al.</i> [7]	14	4	12
In our study	12	7	11

### Definitive management

In our study of 30 patients, 17 patients were treated with condylar locking compression plate (56.67%), 5 patients with lag screws (16.67%), 5 patients with retrograde nailing (16.67%), 1 with lag screws and buttress plate (3.33%), 1 with lag screws and headless screws (3.33%), and 1 with condylar buttress plate (3.33%).

### Associated other injuries

The associated injuries were found in 7 cases (23.33%).

- Contralateral lower limb injuries were found in 2 cases (6.67%). 1 patient had contralateral shaft fracture tibia, was operated with intramedullary nailing. One patient had 1<sup>st</sup>, 2<sup>nd</sup> metatarsal head fracture treated conservatively with plaster cast.
- Upper limb injuries was found in 2 cases (6.67%). One patient had 4<sup>th</sup>, 5<sup>th</sup> metacarpal fracture treated with plaster cast. One patient had midshaft radius fracture operated with plating and clavicle fracture treated conservatively with clavicle brace.
- No patients had spine injuries in our study.
- Head injury was observed in 1 case (3.33%) but was treated with medical management. Surgical intervention was not required in any case. The fixation of the distal femur fracture had to be delayed till the patient was

stabilized.

- Chest injuries occurred in 1 patients (3.33%) in the form of rib fracture, managed conservatively with chest strapping.
- Facial trauma occurred in 1 patient (3.33%) in form of mandible fracture, managed with open reduction internal fixation with mini fragment plate and screws.

### Primary bone grafting

In our study of 30 patients, primary bone grafting was done in 10 cases (33.34%), iliac crest bone graft required in 9(30%) patients and combined iliac crest and fibula strut graft in 1(3.33%) patient. Association between AO classification and bone graft was calculated and Patients requiring bone graft is significantly higher in type C fractures. No bone graft was required in AO type B fractures Reddy JAV and Chary NB [12] in there study of total 60 cases operated primary bone grafting was performed in 20 cases (33.34%) same as our study and stated "When comminution is present, supracondylar femoral fractures are especially prone to varus collapse that is why we have done primary bone grafting in many cases of our series".

### Knee range of motion

Minimum knee range of motion was 0-10° and maximum was 0-130°. Average knee range of motion was 0-71.66°. In AO Type A fractures average range was 0- 78.34°, AO Type B fractures it was observed to be 0- 97.14°, AO Type C fracture it was observed to be 0-48.18°.

Average range in extra-articular fracture was 0-78.34° and average range in intra-articular fractures was 0-67.22°. The average post operative range of motion reported by Seinsheimer *et al.* [13] was from 100 -125°. The average range of motion as reported by ramu *et al.* [7] was 87°. It was also seen in there study that extra articular fractures had better knee function compared to intra articular fractures. In our study, 10 patients (33.34%), achieved more than 90° flexion. Smit Shah [14]. Majority of distal femur fracture of AO type A and B had more than 80° flexion however majority of patients with AO type C had range of movement less than 80°.

### Extensor lag

In study of Ramu AC *et al.* [7] One patient had extensor lag of 10°.

In our study of total 30 patients 23 (76.67%) patients had 0° extensor lag, preceding to that 6 (20%) had 10° extensor lag and only one (3.33%) patient had 20° extensor lag.

### Radiological union

Out of total 30 patients, 27 (90%) distal femur fractures united within 13 weeks to 20 weeks, most of the patients 18(60%) had radiological union between 15-18. In AO type A fractures average time for union was 16.92 weeks. In AO type B average time was 13.86 weeks and in AO type C average time for union was 19 weeks. 3 (10.0%) patients had no signs of radiological union at 24 weeks. Overall average time period for union was 16.51 weeks.

**Table 2:** Comparison of bone union at final follow up

Study	Average time for union (In weeks)
Ramji Lal Sahu [5]	12.8
Rajanish R Menon and Subramanian V [11]	18
Dr. Prasad Aparajit [15]	13.7
In our study	16.51

### Full weight bearing walking

Full weight bearing was permitted depending on the modality of fixation and bony union seen radiologically. In majority, it was started within 16-21 weeks in 14 cases (46.67 %) followed by 10- 15 weeks in 10 cases (33.33 %). Average time period was 16.78 weeks. 2 patients were advised not to do full weight bearing walking because of poor bone union.

**Table 3:** Comparison of starting time for full weight bearing walking

Study	Statring time for full weight bearing (In weeks)
Rajanish R Menon and Subramanian V <sup>[11]</sup>	17.42
Dr. Prasad Aparajit <sup>[15]</sup>	7.8
In our study	16.78

### Post operative complications and additional procedures required

Infection occurred in total 4 patients (13.33%) out of which 2 patients recovered with regular dressings but 1 patient required wound debridement and vaccum assisted dressing followed by stsg and 2 patients required skin thickness skin grafting. Poor functional outcome was observed in 1 patients amongst these. Ramu AC <sup>[7]</sup> in there study had 2 cases of infection (1 superficial and 1 deep infection), Smit Shah *et al* <sup>[14]</sup> in there study of 39 distal femur fractures had 33 cases of postoperative infection. Delayed union occurred in 3 patients (10%). Malunion was observed in 7(23.33%) patients, 4 (13.34%) patients had varus malalignment and 3 (10%) patients had valgus malalignment. All 7 patients were treated with condylar locking compression plate. 6 patients had AO type C fractures. Ramu AC <sup>7</sup> studied 30 patients, out of which 2 patients had malunion. Shahhoseini *et al.* <sup>[16]</sup> malunion was

31.6%. Moradi *et al.* <sup>[69]</sup> malunion rate was (21.3%). Implant failure occurred in 2(6.66%) patients in form of plate bending and screw backout. Both were AO type 3 fractures, Out of which 1 patient had bone loss and was augmented with primary contralateral fibula strut graft. Ramu AC <sup>7</sup> observed 2(6.66%) cases of implant failure. Patil *et al.* <sup>[9]</sup> Observed 1 case with implant breakage and was removed and reoperated augmenting bone graft. Most common complication in our study was knee stiffness 21(70%) patients. 11(36.66%) patients were AO type C. Ramu AC <sup>7</sup> observed knee stiffness as most common complication in his study. M. Agunda *et al* <sup>10</sup> reported 10(22%) patients with knee stiffness as most common complication in there study. Post traumatic arthritis was observed in 15(50%) patients in our study. 12(40%) patients were having articular fractures and 3(10%) patients were having extra-articular fractures. Implant removal was done in one patient operated with intra-articular headless screw in a AO type B fracture. Out of total 30 patients, 8(26.66%) patients has limb length discrepancy and all were classified under AO type C fracture. Equal or less than 2 cm limb length discrepancy was seen in 6 (20%) no treatment required in such cases, and 2 (6.67%) patients had more than 2 cm limb length discrepancy, they were managed with shoe raise. Ramji Lal Sahu <sup>[5]</sup> 5.83% (7/170) patients had limb length discrepancy of < 2 cm and no treatment were needed. G. Sai Krishna <sup>[17]</sup> reported 3(15%) cases of shortening 1(5%) of them had more than 3cm shortening.

### Functional outcome

Functional outcome was analyzed according to the NEERS knee scoring system in our study of 30 patients, 6(20%) observed excellent result, 9(30%) observed good result, 6(20%) observed fair result and 9(30%) observed poor result.

**Table 4:** Comparison of functional outcome with other studies

Study	Excellent (%)	Good (%)	Fair (%)	Poor (%)
Ramu AC <sup>[7]</sup>	30	46.7	23.3	0
Ramji Lal Sahu <sup>[5]</sup>	66.4	22.30	7.05	5.83
M. Agunda <i>et al.</i> <sup>[10]</sup>	48	41	6.5	4.3
Maedicia buchar <sup>[8]</sup>	70	16.6	8.33	5.55
Supanich V, MD <sup>[18]</sup>	41	31	18	10
In Our Study	20	30	20	30

### Various variables were correlated with each other and the factors which are significant are as follows-

**Nature of injury and functional outcome:** No any significant association observed between nature of injury and result (p=0.112).

**AO classification and functional outcome-** Significant correlation observed between AO type and results (p=0.005).

**Ao classification vs radiological union-**No significant association observed between AO fracture patterns and results. (p=0.154).

**Bone graft vs AO classification:** Significant association observed between AO fracture patterns and primary bone graft requirement (p=0.005).

**AO type and malunion:** Significant association observed between AO fracture patterns and malunion (p=0.003).

**AO classification and definitive management:** AO type fracture pattern and type of implant used was compared and is

found to highly significant  $p < 0.001$

### Definitive management and knee mobilization starting period

Definitive management and knee mobilization starting period was compared and was found to be significant p-0.03

### Conclusion

Distal femoral fractures were common in young males in the age group of 30 – 50 years. It was mainly seen with high velocity high impact injuries like road traffic accidents and fall from height. Closed type fractures were common and unite earlier then open fractures irrespective of type of the fracture. Extra – articular fractures AO Type A fractures had good functional outcome while compared to AO Type C fractures. Early diagnosis of Hoffas fracture and it fixation yields excellent results. Bone grafting is necessary in case of comminution. Regular Follow up and physiotherapy along with early knee mobilisation have a great role in deciding the prognosis of operative management. The prognosis seems to be less depended on the implant than on the type of fracture. No implant is superior to other implant in treating distal femur

fractures. Neuro – vascular compromise is rare. Most common complications in patients treated operatively are knee stiffness, post traumatic arthritis and infection. We have not tried minimally invasive percutaneous osteosynthesis (MIPO). Since biological healing via this technique, may reduce infection and promote healing and need to assessed.

The weakness of this study is obvious. It is a small sample study, with no strict criteria of treatment modality and many surgeon's involvement.

#### Neer's scoring system

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	09
Limits function	8	15 degree angulation or rotation, 3 cm shortening	06
Constant or at exertion	4	Healed with considerable deformity	03
B)Walking capacity (20 points)		Non-union or chronic infection	
Same as before accident	20	B) Roentgenogram (15 points)	
Mild restriction	16	Near normal	15
Restricted stair side ways	12	5 degree angulation or 0.5 cm displacement	12
Use crutches or other walking aids	4	10 degree angulation or 1 cm displacement	09
c)Joint movement (20 points)		15 degree angulation or 2 cm displacement	06
Normal or 135 degrees	20	Union but with greater deformity, spreading of condyles and osteoarthritis	
Up to 100 degrees	16	Non-union or chronic infection	
Up to 80 degrees	12	Excellent :- More than 85 points Good :- 70 to 85 points Fair :- 55 to 69 points Poor :- Less than 55 points Total:-	
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		

#### References

- Colling C, Wiss D. Rockwood and Green's fracture in adults, 7th edition. 2:1719-1751.
- Crist B, Rocca G, Murtha Y. Treatment of acute distal femur fractures. Orthopaedics. 2008; 31:681.
- Hakeem A, Khan N, Khan M, Ullah F. Dynamic Condylar Screw (DCS) fixation in treatment of Supracondylar fracture of distal femur. Rawal Medical Journal. 2010; 35(1):45-47.
- Dr. Ram Avatar Saini, Dr. Nihar Shah, Dr. Divyansh. Sharma International Journal of Orthopaedics Sciences 2018; 4(1):439-444.
- Ramji Lal Sahu Acta Orthopaedic Belg. 2015; 83:215-222.
- Vishwanath C, Harish K, Gunnaiah KG, Chetan Kumar. International Journal of Orthopaedics Sciences. 2016; 2(4):233-239.
- Ramu AC, Roshan SD, Anoop Hegde, Albert Naveen A. National Journal of Clinical Orthopaedics. 2018; 2(1):32-36.
- Kumar SK, Ghosh A, Dasgupta S, Naiya S, Chatterjee D, Sarkar A. Short Term Evaluation of Distal Femoral Fracture Fixation by Locking Plate. Ann. Int. Med. Den. Res. 2017; 3(4):OR15-OR19.
- Patil *et al.* Asian Pacific Journal of Health Sciences. 2016; 3(1):135-139.
- Agunda M *et al.* East African Orthopaedic Journal. 2013; 7:57-63.
- Rajanish Menon R, Subramanian V. Functional outcome of distal femoral fractures treated by minimally invasive surgery using locking condylar plate. Kerala Journal of Orthopaedics, 2014, 22-28.
- Reddy JAV, Chary NB. Functional Outcome of Distal End of Femur with Locking Compression Plate: A Prospective Study. Ann. Int. Med. Den. Res. 2016; 2(1):362-65.
- Seinsheimer F. Fractures of the distal femur. Clin Orthop. 1980; 153:169-179.
- Smit Shah *et al.* Study of distal femoral fractures International Journal of Biomedical and Advance Research (Online).
- Prasad Aparajit/International Journal of Biomedical and Advance Research. 2016; 7(8):402-408.
- Shahosaini GhR, Yegane A, Moghtadie M. Comparison of the surgical results of retrograde intramedullary nail (RIN) and locking condylar plate (LCP) in the treatment of distal femoral fracture. Med J Islam Repub Iran. 2010; 16(62):131-139.
- Sai Krishna G. Minimally invasive plate osteosynthesis of lower end of femur fractures using locking compression plating. Dissertation submitted to Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore.
- Supanich V, Jrcost MD. 2012; 36:1-2.