

# Clinical Outcome of Supracondylar Femoral Fractures Managed Locking Plate Osteosynthesis in a Rural Hospital

Shashank Jain<sup>1</sup>, Sunil Nikose<sup>2</sup>, Sohael Khan<sup>3</sup>, Suvarn Gupta<sup>3</sup>, Ankush Mohabey<sup>4</sup>

<sup>1</sup>Assistant Professor, Department of Orthopaedics, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Wardha, <sup>2</sup>Professor, Department of Orthopaedics, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Wardha, <sup>3</sup>Assistant Professor, Department of Orthopaedics, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Wardha, <sup>4</sup>Assistant Professor, Department of Orthopaedics, Datta Meghe Medical College, Shalinitai Meghe Hospital and Research Centre Nagpur

## Abstract

**Introduction:** Distal femur fractures in the supracondylar region accounts for approximately seven per cent of all femur fractures and are very challenging to manage. These fractures occurs majorly due to severe grade of injury in young age groups and low grade injury in geriatric people with significant soft tissue injury with joint surface involvement and is bimodally distributed.

**Material and Method:** This prospective study consisted of 45 patients of supracondylar femur fracture surgically managed by locking plate osteosynthesis in Department of Orthopaedics at our institute within the study period of 2 years from June 2016 to June 2018. Functional outcome was measured using Neer's scoring. Patient were followed up regular intervals of 12 weeks and last follow up was done at the end of 1 year.

**Results:** 45 patients were studied i.e 36 males and 9 females with a mean age of  $45.46 \pm 17.55$ SD years. Road accident was the most common cause of injury (71.1%), AO classification was used to classify fracture configuration and most common was type "33 C3" (26.67%). 39 patients (86.66%) were treated with distal femur locking plate osteosynthesis and 6 patients (13.33%) with external fixation which was later converted into plate osteosynthesis after infection control. Knee stiffness (17.78%) was a common complication and shortening was seen in 6 patients (13.33%). Neer's scoring was used to calculate outcome of patients in which 31(68.89%) patients had excellent to good outcome, 9 patients had fair and 5 patients had poor outcome.

**Conclusion:** Distal femoral locking plate can be considered as a suitable choice for achieving adequate fixation in distal femoral fractures as there was significant progressive increase in Neer's outcome scores in majority cases

**Keywords:** Distal femur fractures; clinical outcome; Neer's score

## Introduction

Distal femur fractures in the supracondylar region accounts for approximately seven per cent of all femur fractures and are very challenging to manage<sup>1</sup>. These fractures occurs majorly due to severe grade of injury in young age groups and low grade injury in geriatric people with significant soft tissue injury with joint surface involvement and is bimodally distributed. Multiple fracture patterns are observed with this type

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### Corresponding Author:

#### Dr. Suvarn Gupta

Assistant Professor, Department of Orthopaedics,  
Jawaharlal Nehru Medical College, Datta  
Meghe Institute of Medical Sciences, Wardha,  
Maharashtra-442001  
e-mail: suvarn27@gmail.com

of fracture and these are often associated with open wounds, fractures shaft or neck of femur, tibia fractures etc. Thus, it is challenging for a surgeon to treat these kind of fractures.

The major cause of such fractures are vehicular accidents, fall from high altitude, assault, etc. Historically, these fractures were managed conservatively with traction and often resulted in complications but in recent times, surgical management is the treatment of choice. Surgical aim is anatomical restoration of joint surface, restoration of leg length, bone alignment and correction of rotation of fracture fragments.

The study was done to evaluate clinical outcome of distal femur fractures treated with locking plate osteosynthesis and to evaluate complications associated with it.

### Material and Method

The study was aimed to analyse clinical outcome of patients having supracondylar femoral fractures. This prospective study consisted of = 45 patients of supracondylar femur fracture treated by distal femur locking plate osteosynthesis in Department of Orthopaedics, at our institute during the study period of 2 years (June 2016 – June 2018). Inclusion criteria was all patients more than 15 years of age having open or closed supracondylar femur fractures. Exclusion criteria were Patients of age below 15 years, pathological fractures, polytrauma patients, patients with polyneuropathy disorders and patient not willing to consent for study.

In every case a detailed history was taken regarding the mode of injury, duration of injury and nature of injury. A thorough examination of the affected limb with examination of neighbouring joints was done. Special attention was given regarding the neurovascular status of the limb. Detailed general and systemic examination of the patient was done. Immediate posterior splinting of the affected limb was done with plaster of paris (POP) slab or Thomas splint with traction or skeletal traction on Bohler Brown splint was given till surgery.

All the patients were subjected to radiological evaluation to know the type of fracture. Radiological assessment was done using Anteroposterior and X rays of distal thigh with knee joint. Fractures were classified in accordance with AO classification and treatment modality decided accordingly keeping in mind the type of fracture (Open/Closed) and severity of fracture.

Comminuted fractures with gross swelling were given proximal tibial skeletal traction. Haematological, biochemical and other radiological investigations were carried out as per the requirement. Closed supracondylar femur fractures were surgically reduced and fixed with distal femur locking plate osteosynthesis and open supracondylar fractures were primarily stabilized with knee spanning external fixator application till the infection control and wound management. After wound healing and infection control, open reduction and plate osteosynthesis was done. Static quadriceps strengthening exercises started immediately from day 1 and active knee range of motion was started as soon as soft tissue healed. After clinic radiological union of the fracture, weight bearing on the affected limb was initiated.

Neer’s Functional Scoring<sup>2</sup> was used to evaluate surgical outcome for distal femoral fractures. It is combination of two units: Functional (70 units) and Anatomic (30 units).

The results were evaluated by taking into consideration the following factors:

1. Pain – 20 points
2. Function – 20 points
3. Motion – 20 points
4. Work – 10 points
5. Gross Anatomy – 15 points
6. Roentgenograms – 15 points

Functional outcome and radiological assessment evaluated postoperatively, 12 weeks, 6 months and 1 year.

**Table 1: Showing interpretation of outcome using Neer’s score**

Outcome	Score
Excellent	Above 85
Good	70-84
Fair	55-69
Poor	< 55

Post operatively physiotherapy in bed was started on the 2nd post-operative day or according to the tolerance of patient and associated injuries. The physiotherapy of patients were initiated with quadriceps strengthening exercises, knee and ankle active range of motion exercises. Walking with weight bearing on unaffected

limb was initiated depending upon the intra operative stability of fracture.

### Observations and Results

The demographical assessment of the study population was done. The mean age being  $45.46 \pm 17.55$  SD (standard deviation) years. 36 (80%) patients were male and 9 (20%) patient were female. In 21 patients, right side of femur was involved and 24 patients had left side involvement. Vehicular accident (71.11%) was the mode of injury in majority number of cases. Femur fracture were classified in accordance with AO classification of distal femur fracture with maximum being type 33 C3 (26%) followed by 33 A1(22%). 13 (28.8%) patients sustained an compound fracture and 32 (71.1%) cases sustained a simple supracondylar femur fracture.

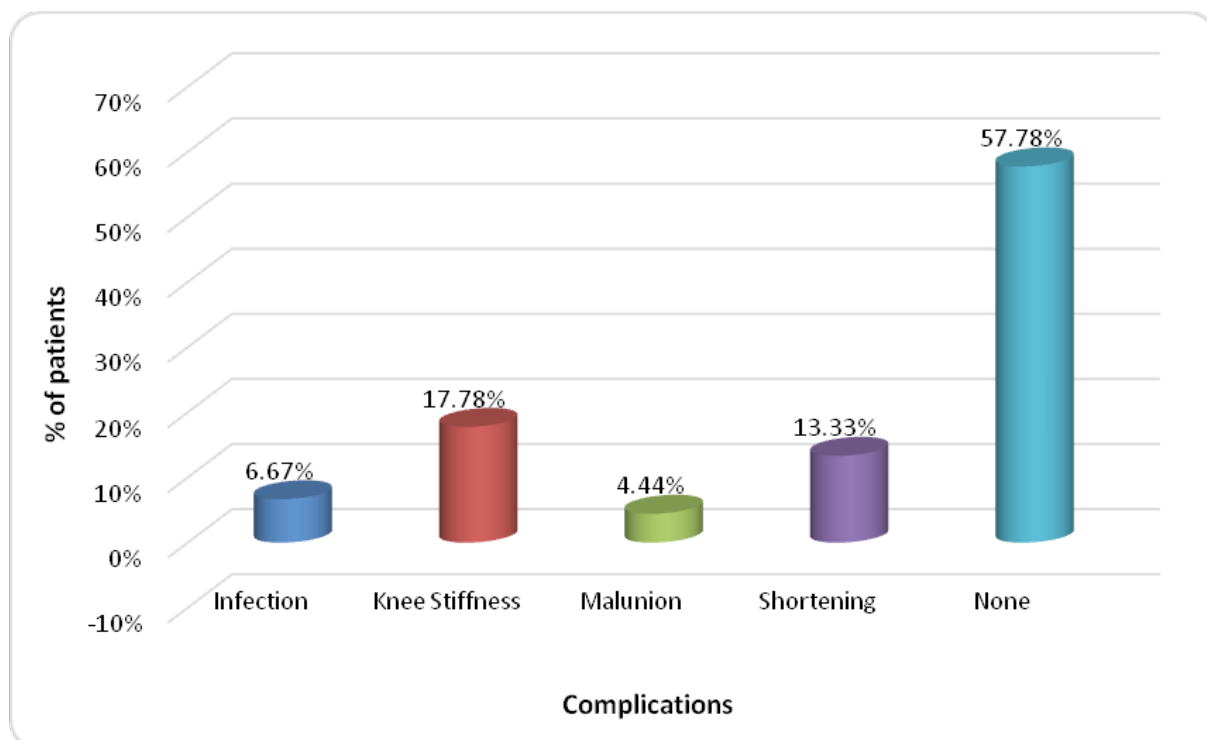
39 (86.66%) patients were managed by surgical reduction and locking plate fixation and 6 (13.33%) patients were managed initially with application of

external fixator, which was later converted to open reduction and plate osteosynthesis after wound management and infection control.

**Table 2: Showing Neer’s functional outcome scoring at follow-up period of 1 year.**

Final Outcome	No. of patients	Percentage (%)
Excellent	7	15.56
Good	24	53.33
Fair	9	20
Poor	5	11.11
Total	45	100

68.89 % patients had excellent and good final outcome score, 20% had fair outcome and poor outcome was seen in 11.11 %. 19 (42.2%) patients had complications with knee stiffness (17.78%) being the most common, followed by limb length shortening (13.33%).



**Graph 1: Showing distribution of complication in the study population.**

Patients with shortening were given shoe raise accordingly. All the fractures were united between 16-24

weeks with a mean duration of union being  $18.93 \pm 2.15$  SD weeks.

**Table 3: Showing Progression in Neer’s score at sequential follow ups.**

Neer’s Score	Mean	N	Std. Deviation	P value
Preoperative score	22.84	45	10.61	-
Postoperative Score	37.55	45	9.64	0.0001
At 6 months	45.24	45	10.58	0.0001
At 1 year	71.13	45	12.95	0.0001

Neer’s score was evaluated at sequential follow ups. with mean score before surgery being 22.84±10.61 SD which increased post-operatively to a score of 37.55 ± 9.64SD, and at 1 year follow up score was 71.13±12.95 SD. Thus, a statistically significant increase in the mean functional score was observed post operatively, at 6 months follow-up and at 1 year follow-up as shown in Table 3.

On comparison of age with outcome scores, it was found that there was no statistical significance between age and outcome scores. Gender and outcome scores were also correlated and it was observed that 88.89% females had good outcome scores and the result was statistically significant.



Closed fracture treated with plate osteosynthesis directly had significantly better outcome scores as compared to open fractures which were treated primarily with external fixator and eventually plate osteosynthesis (P value 0.024) and more number of complication were seen in patients of compound fractures as compared to closed fracture (p value 0.001).

Type of fractures were correlated with time of union and it was observed that (87%) closed fractures were united in 16-20 weeks whereas 61% open fractures united in the same time and results were statistically significant. (P value : 0.03)

**Clinical Photographs and Radiographs:** 46 year old male with closed supracondylar femur fracture managed with surgical reduction and distal femur locking plate osteosynthesis.

Figure 2 showing Pre operative, post operative x rays and final follow up radiographs and clinical photographs showing post operative range of motion.

## Discussion

This prospective study had a study population of 45 patients. We evaluated the clinical outcome of supracondylar fracture of femur surgically managed by open reduction and locking plate osteosynthesis. Supracondylar fractures of the femur are complex fracture that are difficult to treat and causes morbidity for long period of time. Thus, surgical management with open reduction and internal fixation became necessary. Surgical treatment of intraarticular fractures, especially in weight bearing joint, requires anatomic reduction and maintenance of the congruity of joint surfaces.<sup>3</sup>

The locking plate (LCP) system has advantages in fracture fixation as it provides angular stability through the use of locking screws. This angular allows extra periosteal fixation of the plate to bone.<sup>3</sup>

In our study, mean age was 45.46 years. Comparable Mean ages of different studies are shown in Table 4.

**Table 4: Comparable Mean ages of different studies**

Study	Mean age (years)
Our study	45.46
EJ Yeap et al.4	44
Srinath et al.5	47
Wong et al. 6	75
Schütz et al. 7	52

80% study population were males and 20% study population were females. Studies done by Tapi Nalo et al.<sup>8</sup>, Srinath et al.<sup>5</sup> and Wong et al.<sup>6</sup> also showed male preponderance. In 46.67 % right femur of the patient was affected and in 53.33 % patients, left side involvement was observed. Sabarisree M et al.<sup>1</sup> stated that, bilaterally equal involvement was seen in his study and in study done by Srinath et al.<sup>5</sup>, right femur was more commonly involved.

The distal femur fractures were categorised in accordance with AO classification and it was found that type 33 C 3 (26.67%) was most common, followed by 33 A1 (22.22%), 33 A2 (15.56%), 33 C2 (15.56%) 33 C1 (08.89%). Srinath et al.<sup>4</sup> observed 33 C2 (45%) in maximum study population. Sabarisree M et al.<sup>1</sup> also observed 33 C3 (37.3%) to be a major type.. 86.66 % patients in this study were treated with locking plate, 13.33% were initially treated with external fixation which was later converted to plate osteosynthesis after wound management and infection control, whereas in study done by Rijal et al.<sup>9</sup>, 47.8% patient were fixed with distal femur locking plate, 15.2% with closed reduction and CC screw fixation and 2.2% with externa fixation.

In this study, clinical outcome was evaluated using Neer's Scoring. In 68.89 % patients excellent to good outcome was seen, 20% had fair outcome and 11.11% had poor outcome. The findings of other studies were shown in Table 5.

**Table 5: Showing outcome scores of different studies.**

Study	Excellent %	Good %	Fair %	Poor %
Our Study	15.56	53.33	20.00	11.11
Sabarisree M et al. <sup>1</sup>	58.4	20.8	12.5	8.35
Tapi Nalo et al. <sup>12</sup>	83.33	13.33	3.33	-
EJ Yeap et al. <sup>8</sup>	36.36	36.36	18	9
Srinath et al. <sup>9</sup>	65	15	20	-

On correlation of age and outcome, 75% of young age patients had excellent and fair outcome whereas 25% of patients had poor outcome. In middle aged patients (31-50yrs), 85.72 % had excellent and fair outcome and 14.29% resulted in poor outcome. In geriatric age group (>50 yrs), none of the patients had poor outcome scores. The correlation of age and clinical outcome score was statistically insignificant. Sabarisree M et al.<sup>1</sup> studied that 11(91.7%) patients with age smaller than 40 years had excellent and good outcome and only 1(8.3%) patient resulted in poor outcome, similarly in age more than 40 years 8(66.7%) patients showed excellent or good outcome and 4(33.3%) resulted in poor outcome.

Correlation of gender and functional outcome was tabulated. It was seen that 63.88% males had excellent or good outcome and 88.89% females had good outcome and the result was statistically significant as number of fractures in females were less as compared to males. Sabarisree M et al.<sup>1</sup> witnessed, good outcome scores in males as compared to female population.

On correlating fracture type and clinical outcome of the patient, it was evaluated be a statistically significant correlation (p= 0.024) i.e. 30.77% of all open fractures resulted in poor outcome whereas 86.89% of closed fractures showed good outcome. Thus, closed fractures had better outcome scores as compared to open fractures.

On crosstabulation of modality of treatment with outcome, association was significant (p - 0.0001). 76.47 % patients managed fixation with locking plate had excellent and good outcomes, 83.33% patients managed initially with external fixation resulted in poor outcome scores.

Mean time of union of fracture was 18.93 weeks. Average time of union in comparison with other studies is shown in table 6.

**Table 6: Average time of union in comparison with other studies**

Study	Time of Union (weeks)
Our study	18.93
Sabarisree M et al. <sup>1</sup>	13.5
Tapi Nalo et al. <sup>12</sup>	14.47
EJ Yeap et al. <sup>8</sup>	18
Srinath et al. <sup>9</sup>	18
Wong et al. <sup>10</sup>	16.6

**Complications:** Knee stiffness was commonest complication (17.78%) which was followed by Infection (06.67%) and malunion (4.44%). Tapi Nalo et al.<sup>12</sup> observed infection in 2 % cases and Srinath et al.<sup>9</sup> in 10 % patients respectively.

2 (04.44%) patient had malunion and 6 (13.33%) patients had shortening on the affected limb. Shortening was managed with the use shoe raise while walking on the affected limb. Sabarisree M et al.<sup>1</sup> also encountered shortening in 2 patients which was managed with shoe raise.

### Conclusion

Distal femoral locking plate can be considered as a suitable choice for achieving adequate fixation in distal femoral fractures as there was statistically significant progressive increase in Neer’s outcome scores in majority cases.

To conclude, clinical outcome in supracondylar femur fractures was found to be dependent on type and complexity of fractures i.e. closed fractures resulted in excellent and good outcomes and were united in lesser time and with lesser complications as compared to open fractures. AO Type 33 C fractures had maximum poor outcome scores due to comminution of fragments. Complications like Infections, knee joint stiffness and shortening occurred commonly in compound fractures. Although study was not free of complications, but management with distal femur locking plate provides satisfactory functional outcome in supracondylar femur fractures.

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**Conflict of Interest:** Nil.

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