

# Functional and Radiological Outcome of Supracondylar Femoral Fractures

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## ABSTRACT

**Background:** Young adults involved in high-velocity traffic accidents and older patients with osteoporotic bone and many comorbidities are at risk for supracondylar femur fractures. About 4-6% of and less than 1% of all femoral fractures are said to be caused by supracondylar femur fractures. Despite the advancement of treatment modalities and operating techniques along with surgical implants, the fracture of the supracondylar femur is highly debatable regarding the choice of implants. The present study assessed radiological and functional outcomes of supracondylar femur fractures treated with different modalities and evaluated the clinical outcomes and associated complications of supracondylar femur types of fractures.

**Methods:** This randomized prospective cohort study was conducted on 45 patients with supracondylar femur fractures in the Department of Orthopaedics, Traumatology, and Rehabilitation Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India, from December 2019 to September 2021. Clinical and radiological parameters were studied, and a functional evaluation was performed at 12 months.

**Results:** A distal femur locking plate is a good and stable fixation system for supracondylar femur fractures. It provides considerable stability and helps mobilise patients even with comminuted supracondylar femur fractures.

**Conclusion:** The study revealed that managing patients with supracondylar femur fracture, with plating can result in better radiological and functional outcomes with fewer complications. To achieve satisfactory results, precise positioning and fixation are necessary.

**Key-words:** Clinical parameter, Femur fracture, Radiological outcomes, Radiological parameters, Supracondylar femur

## INTRODUCTION

Approximately 7% of all femoral fractures are identified as supracondylar femur fractures. These fractures are caused by motor vehicle accidents that induce low-velocity trauma in older people with extensive soft tissue injury involving the articular and metaphyseal regions and high-velocity trauma in young adults.

Due to the difficulty of repairing these fractures, surgery is frequently recommended for a satisfactory result<sup>[1-3]</sup>.

A wide range of fracture patterns can be seen in supracondylar femur fractures, which are linked to tibia fractures, acetabulum fractures, open wounds, complex injuries, and femoral shaft and neck fractures<sup>[4]</sup>.

Management of supracondylar femur fractures becomes challenging and demanding due to these associated injuries. Road traffic accidents falls from height, assault by heavy objects, and firearm injuries are the common causes of such fractures.

Two different modes of injury and different populations are involved in supracondylar femur fractures. It is typically observed in young adults following high-velocity

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trauma such as road traffic accidents and sports activity with injuries sustained (60% of the cases are generally males less than 40 years of age). It is experienced by the elderly following low-velocity trauma (60% of them are females older than 60 years of age with a history of falls on the ground) [5-7].

The paradigm for treating supracondylar femoral fractures has changed from non-operative treatments in 1960 to biological fixation and the development of contemporary implants and specialized techniques today [8].

Historically, supracondylar femur fractures were treated conservatively along with skeletal traction, which resulted in complications like angular deformity, joint incongruity, delayed patient mobilization and knee stiffness in the 1960s but with the evolution of modern implants and surgical techniques, open reduction internal fixation became the choice of management. [8]

Several treatment methods are available nowadays depending upon the type of fractures, degree of comminution, bone grafting for extensive bone loss, patient's age, fracture location, availability of implants and instruments and surgeons' expertise. By surgery, we aim to reduce the fracture anatomically and restore the length, alignment and rotation of limbs. Locking compression plates are among the most effective surgical procedures for improving clinical outcomes, particularly in comminuted and osteoporotic fractures for which intramedullary fixation is impossible because of the tiny distal fragment [9-11].

The present work aims to evaluate the functional and radiological results of supracondylar femur fractures treated with different modalities and the clinical outcome and comorbidities associated with these fracture types.

## MATERIALS AND METHODS

**Place of the Study-** A randomized prospective cohort study was conducted in a tertiary care hospital, Department of Orthopaedics, Traumatology and Rehabilitation, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India from December 2019 to September 2021.

**Methodology-** The sample size of the present study was 45. Clinically and radiologically proven supracondylar femur fracture cases following inclusion and exclusion

criteria were included in the study. AO classification system was employed to classify fractures. A radiographic evaluation was performed on each patient to determine the fracture type. Lateral and anteroposterior views of the femur with hip and knee joints were done after obtaining IEC and informed and written consent from the patient's attendants. A thorough examination of the afflicted limb and its neighboring joints was conducted.

Functional assessment was made using Neer knee scoring. Clinical healing was marked by a lack of tenderness and pain at the fracture site. Follow-up was done at predefined time frames of the immediate postoperative period at the end of 1, 3, 6 and 12 months through clinical and radiological analysis.

Pre anaesthetic checkup of all patients was done and taken for surgery only after the final fitness by the anaesthetist. Cardio-respiratory evaluation was done for all the patients who were planned for surgical management. Patients were optimized for other comorbid conditions such as diabetes mellitus, hypertension and renal disease etc. These were noted and treated accordingly.

K wires were used to decrease fractured pieces in their anatomical positions temporarily. After selecting the right-sized plate, it was positioned and secured using k wires or reduction bone clamps. Stable fixation was achieved by the insertion of various cortical screws, locking cortical screws and locking cancellous screws. Postoperative follow-up of the patients was done at 1, 3, 6, and 12 months with radiographs of the full-length femur and neer scoring. A record of the patient's history, treatment, and results obtained for each patient was maintained.

### Inclusion criteria

- Adult patients with distal femur fractures.
- All skeletal mature patients (> 18 years).
- Grade I & II open fractures of distal and supracondylar femur fractures (up to 15 cm from the joint line).

### Exclusion criteria

- Pathological fractures & patients aged below 18 yrs.
- Grade III open fractures.
- Patella Baja.
- Patients not willing to give consent.

**Ethical Analysis-** The authors declared no potential conflicts of interest to this article's research, authorship, and/or publication.

**RESULTS**

In our study, we seek to evaluate the functional outcome of supracondylar fracture of the femur treated with internal fixation using plate/screws. Treatment for femur supracondylar fractures with comminution has always

been challenging. Numerous complications such as varus collapse, limb length discrepancy, non-union, malunion, infection, and knee joint stiffness frequently occurred before indirect reduction techniques and fixed angle plates were popularized. The pre-operative and postoperative X-ray images of four studied cases are represented in Fig. 1-4.



Pre-operative X-ray

Postoperative X-ray

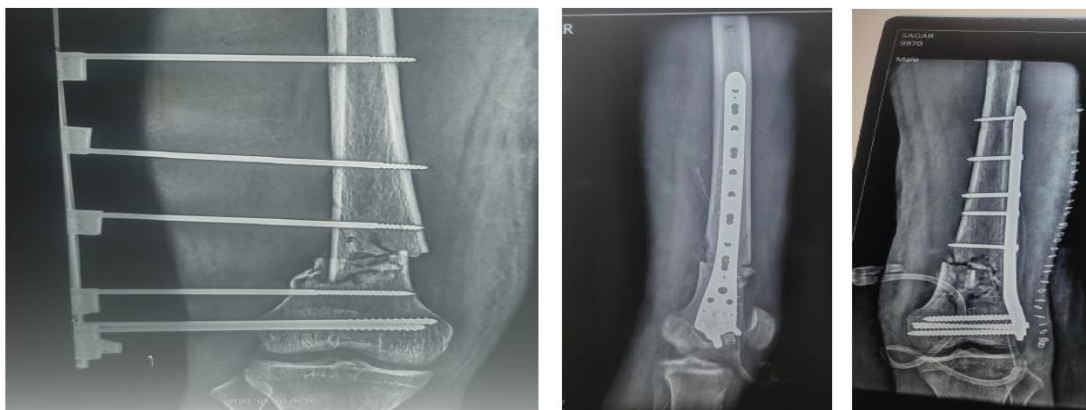
**Fig. 1:** Pre-operative and postoperative X-ray images of case 1.



Pre-operative X-ray

Postoperative X-ray

**Fig. 2:** Pre-operative and postoperative X-ray images of case 2.



Pre-operative X-ray

Postoperative X-ray

**Fig. 3:** Pre-operative and postoperative X-ray images of case 3.



Pre-operative X-ray

Postoperative X-ray

**Fig. 4:** Pre-operative and postoperative X-ray images of case 4.

When age and functional outcome were compared, patients in the age group under 30 years had good to fair outcomes in 75% of cases, whereas poor outcomes were seen in 25% cases. About 85.71% had excellent to fair outcomes in 30-50 years age group and 14.29% had poor outcomes. All patients over 50 years of age showed excellent to fair outcomes. The comparison of gender distribution and functional outcome in the present study showed that 63.88% of males had excellent and good outcomes and 88.89% of females had good outcomes. The comparative study of functional outcome and type of fracture in the patient enrolled for the current study showed poor outcomes for 30.77% of all open fractures, whereas excellent or good outcomes for 75.01% of closed fractures.

The relationship between functional outcome and mode of treatment in the present study showed excellent and good outcomes in 76.47% of patients managed with distal femur locking plate osteosynthesis. On the other hand, poor outcomes were reported for 83.33% of patients who were managed with external fixator applications. In our analysis, knee stiffness was the most common complication (17.78%), followed by infection (6.67%), and malunion (4.44%). In this study, six patients (13.33%) had 1 cm shortening and 2 (4.44%) patients had 2 cm shortening.

## DISCUSSION

The study sample's mean age was 45.64 years, compared to the present study. Various studies reported different mean age of studied subjects ranging from 27.50 years to 75 years [12-16]. About 80% of the patients in our study were males and 20% of patients were females. Similar gender distribution was reported by some studies [15,16],

however, most subjects were female in a study by Wong *et al.* [13].

About 53.33% of fractures in this study occurred on the left side and 46.67% on the patient's right side. Sabarisree *et al.* [17] reported equal side distribution, whereas Srinath *et al.* [15] demonstrated 60% of patients with fractures on the right side and 40% on the left side. The mechanism of injury in the majority (71.11%) of patients was road traffic accident (RTA). Similar findings were reported by some studies [14,15,17] where most cases were due to RTA.

AO classification was employed to classify supracondylar fractures in the present study. Maximum fractures were classified as 33C3 (26.67%), followed by 33A1 (22.22%), 33A2 (15.56%), and 33C1 (08.89%). Srinath *et al.* [15] observed 33C2(45%) in the majority of patients followed by 33C3 (20%), 33A1(10%), and 33 A2(10%). Similarly, 33C3 (37.3%) was observed as the most common fracture in a study by Sabarisree *et al.* [17].

Most (75.56%) of the patients in this study were managed with plate osteosynthesis. The mode of treatment for 13.33% of patients was external fixator application. Approximately 04.44% underwent supracondylar nailing, and 06.67% underwent CC screw fixation. A study by Rijal *et al.* [18] reported that 47.8% of patients managed with distal femur locking plate, followed by 15.2% with CC screw fixation and 2.2% with external fixator application. The mean union time in our study was 18.93 weeks. However, this union time ranged from 13.5 weeks to 18 weeks for other studies [13-17].

The functional outcome of the present study was good in the majority (53.33%) of patients, followed by excellent in 15.56% of patients, fair in 20% of patients, and poor in

11.11% of patients. Most previous studies reported excellent functional outcomes<sup>[14-17]</sup>. Sabarisree *et al.*<sup>[17]</sup> conducted a study involving 12 patients under 40 years old and observed excellent to good functional outcomes in 11(91.7%) patients; only one (8.3%) patient had unsatisfactory to poor outcomes. Sabarisree *et al.*<sup>[17]</sup> observed that among 16 male patients treated in the study, only 2(12.5%) patients had unsatisfactory to poor outcomes, while 14(87.5%) patients had excellent to good outcomes. Out of 8 females who underwent surgery, 5(62.5%) females had excellent to good outcomes and 3(37.5%) had unsatisfactory to poor outcomes.

Knee stiffness was the most common complication in our study (17.78%). Other studies reported infection as the most common complication after operative procedures<sup>[15,16]</sup>. In a study by Garg *et al.*<sup>[19]</sup>, 10% of subjects each suffered non-union, knee stiffness, and superficial infections. Sabarisree *et al.*<sup>[17]</sup> reported shortening in two patients, one with 1 cm shortening and the other with 2 cm shortening. Similarly, a shortening of greater than 1.5 cm was observed in 10% of patients in a study by Rekha *et al.*<sup>[20]</sup>

## CONCLUSIONS

Radiological and functional outcome in supracondylar fractures of femur depends upon the modality of treatment and type of fracture. In uncomplicated and closed fracture cases, distal femoral locking plate osteosynthesis produced excellent and good radiological and functional outcomes compared to alternative techniques. Most patients with closed fractures had minimal complications, showed excellent to good outcomes, and bones were united in less time than open fractures. Complications such as knee stiffness, infection, and shortening were reported in open fractures.

The distal femur locking plate offers strong stability and facilitates early mobilization, especially in cases with comminuted fractures, making it a useful fixing method for supracondylar fractures of the femur. However, to have good outcomes, precise placement and fixation are needed.

## CONTRIBUTION OF AUTHORS

**Research Concept-** Sparsh Naik, SMG Raza, L.S Maravi

**Research design-** Md Salman Khan, Sparsh Naik, SMG Raza

**Supervision-** L.S Maravi

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**Final Approval-** L.S Maravi

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