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# A study to evaluate the functional outcome of supracondylar intercondylar fracture femur fixed by open reduction internal fixation using distal femoral locking plates in a tertiary care centre

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## ABSTRACT

**Background:** Supracondylar Intercondylar fractures frequently exhibit greater complexity than supracondylar fractures and may result in considerable complications if not appropriately managed. The present study assessed the benefit of open reduction internal fixation (ORIF) of supracondylar-inter-condylar fracture femur using distal femoral locking plates in terms of functional outcome of the patient.
**Methods:** The present descriptive study conducted in a tertiary healthcare centre located in Kollam, Kerala. The study included patients suffering from supracondylar intercondylar fracture femur fixed by ORIF using distal femoral locking plates. The patients were treated and assessed using range of motion, Knee society score and time taken for weight bearing. These findings were then compared for association with demographic and clinical variables. The data was analysed using chi-square test and $p<0.05$ was considered as statistically significant.
**Results:** The study involved a total of 63 patients with supra-condylar intercondylar femur fractures, with most being females over 70 years old. Postoperatively, most patients showed a range of motion of 91-120 degrees, and the time for radiological union was less than 6 months. The mean KSS score improved significantly at 12 months, with the majority having excellent scores. The study also found significant differences in mean range of motion based on age, type of fracture, and open/closed fractures. The time taken for full weight bearing was also associated with the type of AO fractures.
**Conclusions:** The study reveals significant differences in weight-bearing outcomes after ORIF of supracondylar intercondylar femur fractures. $C_1$ fractures showed positive recovery, while $C_2$ and $C_3$ required extended rehabilitation. The study emphasizes fracture classification and personalized treatment for improved patient outcomes.

**Keywords:** Distal femur, Fracture, Open reduction, Functional, Outcome

## INTRODUCTION

Distal femur fractures occur in the lower segment of the femur adjacent to the knee joint, involving a fracture in the bone's distal region, which includes the metaphysis and epiphysis. Fractures can be categorized as either simple or complex intra-articular fractures.[1] Distal femur fractures are intricate injuries characterized by multiple fragments, which create significant challenges for fixation.[2] Supracondylar intercondylar distal femur fractures represent significant injuries often associated with concurrent coronal plane fractures, necessitating specialized operative fixation.[3]

Supracondylar fractures occur in the femoral region immediately superior to the condyles, which are the rounded extremities of the femur that engage with the tibia at the knee joint. These fractures are categorized as extra-articular, indicating that they do not penetrate the knee joint. These injuries are relatively rare and generally arise from high-energy trauma, including falls or motor vehicle accidents. However, they may also occur in elderly

individuals following low-energy falls, especially in those with compromised bone density due to osteoporosis.

Intercondylar fractures are located between the femoral condyles and are classified as intra-articular, indicating their involvement with the knee joint. These fractures frequently exhibit greater complexity than supracondylar fractures and may result in considerable complications if not appropriately managed. High-energy impacts typically lead to these injuries, which may be linked to ligamentous damage in the knee region.[4]

Recent studies show 8.7 distal femur fractures per 100,000 per year. Increased high-energy motor vehicle collisions and osteoporotic fractures in native and prosthetic knees are expected. Fractures are more common in younger men and osteoporotic fractures in older women. Surgery is recommended for these fractures to preserve articular congruity, enable early joint motion, and support ambulation. Over past 2 decades, less invasive and quadriceps-sparing surgery and angle-stable implants have helped patients heal faster and return to function.[5] Early surgical therapy for distal femur fractures focused on total fracture stabilization and ignored biological environment. Methods have evolved to limit soft tissue disruption, facilitate implant insertion at fracture site, and address patient's systemic health while assuring fracture fixation. This dynamic process healed fractures completely and improved function.[6] High-energy distal femur fractures require precise joint reduction, fixation, and mechanical axis, length, and rotation restoration. Before locking plates and minimally invasive procedures, these surgeries required large open exposures and soft tissue stripping. Early minimally invasive, physiologically compatible surgery without locking plates sometimes caused varus malunion and considerable callus formation.[7-9]

The primary objectives of surgical intervention for these fractures are anatomical reduction and stable fixation, which aim to restore joint function and facilitate early rehabilitation. ORIF utilizing distal femoral locking plates is preferred for its stability and facilitation of early mobilization. The complex architecture of the distal femur elevates the risk of nonunion, malunion, and complications during hardware installation.[8,9] This study evaluates the functional outcomes of supracondylar intercondylar femur fractures treated with open reduction and internal fixation using distal femoral locking plates. Through the analysis of postoperative recovery metrics and complications, this study aims to provide insights that may enhance treatment protocols for complex injuries. The efficacy of this surgical approach will enhance clinical practices and improve patient care outcomes in orthopaedic trauma settings.

## METHODS

The present study was a descriptive study which included patients who suffered from supra-condylar intercondylar fracture and were treated at Azeezia medical college hospital, Kollam. The study was conducted for a period of twelve months from November 2023 to October 2024. The study was conducted after obtaining informed consent from all study participants along with ethical clearance from institutional ethics committee (30/IEC/19/AIMS/-24).

The present study was conducted among patients aged above 13 years suffering from supra-condylar intercondylar fracture and presented to the hospital casualty or orthopaedics outpatient department. The study included patients with closed or open fractures upto IIIA, type C fractures and patients with more than one years' worth of follow up data. Patients with fractures which occurred in the distal end femur with epiphyseal plate open, pathological fractures and patients which had vascular injury and underwent above knee amputation were excluded from the present study.

### *Sample size estimation*

A previously conducted study from MGM medical college, Navi Mumbai, India showed excellent results of ORIF following supracondylar fracture femur in 71.9% patients (p). The sample size was calculated using the formula: $N=Z(1-a)2pq/d^2$ where N=sample size, p=71.9%, q=100-p= 28.1% and d=Relative precision taken as 20%of the prevalence: d=14.5% which gave a final sample size of 38 patients.

### *Procedure*

Patients were admitted to orthopaedics after stabilization, fracture reduction, and long leg cast immobilization. Patients over 50 and those with medical co-morbidities had routine anaesthesia blood workup and cardiology consultation. Patients were taken for surgery after being deemed fit and the implant choice was stainless steel or titanium distal femoral locking plates.

Surgical method depended on fracture pattern, articular surface access for reduction, and implant position based on preoperative design. Minimally invasive submuscular or formal open plating or retrograde nailing was advised for extra-articular fractures. Importantly, both strategies reduce indirectly. The lateral incision was widened for reduction and plating if minimally invasive plating was difficult. Most methods were: (1) Lateral method-open and less invasive, (2) medial approach. Standard open lateral was utilized in all circumstances. Most distal femur open reduction and plating procedures involved a direct lateral approach. Treatment for type C injuries involved careful anatomic reduction, fixation, and stabilization of the articular surface and metadiaphyseal component. The first stage was articular surface anatomic reduction and stability. OTA type $C_1$ injuries with nondisplaced or minimally displaced simple articular splits were anatomically held or reduced with a large clamp and stabilized openly or minimally invasively with long 3.5-, 4.5-, or 6.5-mm lag screws applied outside the plate

footprint on the lateral femoral condyle or nail path and lag screws were placed from the medial side. The study advocated for open reduction and internal fixation with an anterolateral open arthrotomy for type $C_2$ and $C_3$ injuries to provide good exposure for articular reduction, fixation, and ultimate implant placement.

After installing the locking plate, 1.5 mm K wires were used to stabilize the intercondylar fragments. Standard cortical screws were combined to attach the bone to the plate and locking screws to stabilize the structure. If a fracture fragment used a combination of nonlocking and locking screws, the nonlocked cortical screws was inserted first (lag before locking) or the fixation of the nonlocked screws would be compromised.

***Skin closure***

Once the plate was fixed and confirmed by luoroscopy, the cut iliotibial band was sutured using interrupted absorbable sutures. The subcutaneous tissue was closed using interrupted absorbable sutures and the skin was closed using staplers. Sterile dressings were given.

***Post operative care***

Patients were admitted to ICU for 24 hours under analgesic and antibacterial treatment after surgery. If not contraindicated, started unfractionated heparin for DVT prevention. Cephalosporin IV for 5 days was given for open reduction and internal fixation of closed supracondylar femoral fracture. Cephalosporin+ aminoglycoside + metrogyl for 48 hours and iv cephalosporin for 3 days were given for open fractures. If solid internal fixation was achieved, a CPM machine was used. Reduced quadriceps adhesions, increased knee motion, and limb edema were reasons for CPM. If CPM was unavailable, the knee was splinted at 90° flexion or a Bohler-Braun frame was used for 3-5 days. Isometric muscle strengthening was encouraged and limited activity aided knee mobility. Table internal fixation allowed 10-15% weight bearing. If X-rays revealed significant fracture consolidation at 6 weeks, weight bearing with assistance was increased by 10-15 lbs per week (Wiss, 1996). Most patients tolerated heavy weight at 12 weeks. For those with less stable fixation, a fracture brace was used.

***Implant removal and refracture after implant removal***

Most older patients, anesthesia and operation risk outweigh the benefits of routine hardware removal. Physiologically young patients with no implant-related problems should not have metal removed. The implant should be removed if stress protection and bone resorption beneath the plate progress.

Crutches were used for 4-6 weeks after implant removal to prevent complete weight bearing. Physical examination and knee society score were calculated at 1, 6, and 12 months postoperatively.

***Statistical analysis***

Data collected at the end of the study was analysed using the Chi square test. The chi-square test was used to analyse the difference between the proportions. The results were analysed in 95 % confidence interval and a $p<0.05$ was defined as significant in all tests.

## RESULTS

The demographic and clinical findings from Table 1 showed that most of the participants belonged to the age group between >70 years (26.3%) and were females (60.5%). There was an equal distribution of laterality of supra-condylar intercondylar femur fracture (50% on each side) with falls (55.3%) being the most common mode of injury followed by RTA (44.7%) and most fractures classified as conjoined shaft and supracondylar (65.8%) along with internal derangement of knee being the most common associated injury (36.8%). Most of the fractures were non comminuted (55.3%) and were of closed nature (84.2%) with the fractures were classified as $C_1$ based on the Müller AO classification system (55.3%). The most common implants used were stainless steel (71.1%) and most fractures presented with no complications (94.8%).

The postoperative factors were depicted in Table 2 and the results showed that most patients showed a range of motion of 91-120 degrees (60.5%) and time for radiological union was <6 months (73.7%). Most patients showed an absence of varus malalignment (97.4%) and 92.1% patients had their implants removed. There was no limb length discrepancy seen in most patients (78.9%) and majority patients were able to bear full weight after 3 months of the surgery (68.4%).

KSS was assessed at postoperatively at 1, 6 and 12 months. Table 3 showed frequency distribution of KSS in 3 follow-up visits of our patients. KSS score showed improvement in every follow-up and majority had excellent KSS score at 12 months follow-up (71.1%) and none had poor scores. From Table 4, it can be seen that mean KSS score at 1 month was 65.87 and at 6 months was 78 and this difference is statistically significant when paired t test was applied. There was statistically significant improvement in mean KSS scores after every follow-up ($p<0.001$).

Table 5 depicted the association of KSS with different demographic and clinical variables and the results showed that age ($p<0.001$), type of fracture ($p=0.041$), type of OA fracture ($p<0.001$), limb length discrepancy ($p<0.001$) and presence of comminuted fractures ($p<0.001$) showed a statistically significant difference in their distribution. Table 6 shows the mean range of motion for different variables. There was a statistically significant difference in mean range of motion with regard to age ($p=0.034$), type of fracture based on AO classification ($p<0.001$) and open/closed fractures ($p=0.002$). Mean range of motion at knee was higher in young patients those aged <50 years, C1 and C2 type of fracture and closed fractures ($p<0.05$).

**Table 1: Demographic and clinical findings of the study participants.**

| Variables | Categories | N | Percentage (%) |
|---|---|---|---|
| **Age group (in years)** | 18 to 29 | 7 | 18.4 |
| | 30 to 39 | 3 | 7.9 |
| | 40 to 49 | 6 | 15.8 |
| | 50 to 59 | 4 | 10.5 |
| | 60 to 69 | 8 | 21.1 |
| | >70 | 10 | 26.3 |
| **Gender** | Males | 15 | 39.5 |
| | Females | 23 | 60.5 |
| **Laterality of supra-condylar intercondylar femur fracture** | Left | 19 | 50 |
| | Right | 19 | 50 |
| **Mode of injury** | RTA | 17 | 44.7 |
| | Fall | 21 | 55.3 |
| **Neer's classification of supra-condylar intercondylar fracture** | Group I: minimum displacement | 0 | 0 |
| | Group II: Condyles displaced laterally | 2 | 5.3 |
| | Group IIA: Condyles displaced medially | 9 | 23.7 |
| | Group III: Conjoined shaft and supracondylar | 25 | 65.8 |
| | NA | 2 | 5.3 |
| **Associated injury** | Fracture neck of fibula | 1 | 2.6 |
| | Internal derangement of knee | 13 | 36.8 |
| | Fracture spine | 1 | 2.6 |
| | Ipsilateral fracture radius | 2 | 5.3 |
| | None | 20 | 52.6 |
| **Comminuted fractures** | Comminuted fracture | 17 | 44.7 |
| | Non-comminuted fracture | 21 | 55.3 |
| **Open and closed type of fractures** | Closed fracture | 32 | 84.2 |
| | Open fracture | 6 | 15.8 |
| **Muller AO type of fracture** | $C_1$ | 21 | 55.3 |
| | $C_2$ | 5 | 13.2 |
| | $C_3$ | 12 | 31.6 |
| **Type of implant used** | Stainless steel | 27 | 71.1 |
| | Titanium | 11 | 28.9 |
| **Complications of fractures** | Stiffness | 1 | 2.6 |
| | Delayed union | 1 | 2.6 |
| | None | 36 | 94.8 |

**Table 2: Post-operative range of motion at knee in our study.**

| Variables | Categories | N | Percentage (%) |
|---|---|---|---|
| **Range of motion** | 0-30 | 0 | 0 |
| | 31-60 | 8 | 21.1 |
| | 61-90 | 7 | 18.4 |
| | 91-120 | 23 | 60.5 |
| **Time of radiological union** | <6 months | 28 | 73.7 |
| | 6 months to 1 year | 10 | 26.3 |
| **Varus malalignment** | Present | 1 | 2.6 |
| | Absent | 37 | 97.4 |
| **Implant removal** | Done | 3 | 7.9 |
| | Not done | 35 | 92.1 |
| **Limb length discrepancy** | Nil | 30 | 78.9 |
| | <2 cm | 6 | 15.8 |
| | >2 cm | 2 | 5.3 |
| **Time taken to bear full weight** | After 3 months | 26 | 68.4 |
| | After 4 months | 3 | 7.9 |
| | After 5 months | 7 | 18.4 |
| | After 6 months | 2 | 5.3 |

**Table 3: Frequency distribution of knee society score at follow-ups.**

| Knee society score | 1 month, N (%) | 6 months, N (%) | 12 months, N (%) |
|---|---|---|---|
| **Excellent** | 0 | 20 (52.6) | 27 (71.1) |
| **Good** | 13 (34.2) | 7 (18.4) | 9 (23.7) |
| **Fair** | 16 (42.1) | 10 (26.3) | 2 (5.3) |
| **Poor** | 9 (23.7) | 1 (2.6) | 0 (0) |

**Table 4: Mean knee society score at follow-ups.**

| Follow up | Mean | SD | P value |
|---|---|---|---|
| **1 month** | 65.87 | 7.09 | <0.001* |
| **6 months** | 78 | 10.81 | |
| **12 months** | 87.4 | 10.68 | |

*Statistically significant difference

**Table 5: Association of KSS with different variables at final follow up.**

| Variables | Subcategory | KSS score at 12 months, N (%) | | | P value |
|---|---|---|---|---|---|
| | | Excellent | Good | Fair | |
| **Age (in years)** | 18 to 29 | 5 (18.5) | 1 (11.1) | 1 (11.1) | <0.001* |
| | 30 to 39 | 3 (11.1) | 0 | 0 | |
| | 40 to 49 | 6 (22.2) | 0 | 0 | |
| | 50 to 59 | 4 (14.8) | 0 | 0 | |
| | 60 to 69 | 7 (25.9) | 0 | 1 (11.1) | |
| | >70 | 2 (7.4) | 8 (88.9) | 0 | |
| **Gender** | Males | 10 (66.7) | 4 (26.7) | 1 (6.7) | 0.858 |
| | Females | 17 (73.9) | 5 (21.7) | 1 (4.3) | |
| **Type of fracture** | Open fracture | 2 (33.3) | 4 (66.7) | 0 | 0.041* |
| | Closed fracture | 25 (78.1) | 5 (15.6) | 2 (6.2) | |
| **Type of AO fracture** | $C_1$ | 21 (100) | 0 | 0 | <0.001* |
| | $C_2$ | 5 (100) | 0 | 0 | |
| | $C_3$ | 1 (8.3) | 9 (75) | 2 (16.7) | |
| **Type of implant** | Stainless steel | 19 (70.4) | 7 (25.9) | 1 (3.7) | 0.705 |
| | Titanium | 8 (72.7) | 2 (18.2) | 1 (9.1) | |
| **Varus malalignment** | Present | 0 | 1 (100) | 0 | 0.289 |
| | Absent | 27 (73) | 8 (21.6) | 2 (5.4) | |
| **Limb length discrepancy** | 0 | 27 (90) | 2 (6.7) | 1 (3.3) | <0.001* |
| | <2 cm | 0 | 5 (83.3) | 1 (16.7) | |
| | >2 cm | 0 | 2 (100) | 0 | |
| **Presence of comminuted fracture** | Yes | 6 (35.3) | 9 (52.9) | 2 (11.8) | <0.001* |
| | No | 21 (100) | 0 | 0 | |

*Statistically significant difference

**Table 6: Association of mean range of motion at knee and various variables.**

| Variables | Sub categories | Range of motion | P value |
|---|---|---|---|
| **Age (in years)** | <50 | 95.45° | 0.034* |
| | >50 | 80.89 | |
| **Classification of fracture** | $C_1$ | 97.67 | <0.001* |
| | $C_2$ | 90.96 | |
| | $C_3$ | 75.56 | |
| **Type of fracture** | Closed fractures | 81.48 | 0.002* |
| | Open fractures | 70.13 | |

*Statistically significant difference

**Table 7: Association of time taken for full weight bearing and the type of fracture.**

| AO type | Time of full weight bearing, N (%) | | | | P value |
|---|---|---|---|---|---|
| **$C_1$** | 21 (80.8) | 0 | 0 | 0 | <0.001* |
| **$C_2$** | 4 (15.4) | 0 | 1 (14.3) | 0 | |
| **$C_3$** | 1 (3.8) | 3 (100) | 6 (85.7) | 2 (100) | |
| **Total** | 26 (100) | 3 (100) | 7 (100) | 2 (100) | |

*Statistically significant difference

Table 7 shows the association between time taken for full weight bearing and type of AO fractures, 21 $C_1$ fractures attained full weight bearing after 3 months post op. Four of the $C_2$ fractures attained full weight bearing after 3 months and 1 $C_3$ fracture patient attained it after 3 months. Among the $C_3$ patients, 3 attained full weight bearing after 4 months, 7 attained after 5 months and 2 attained after 6 months post op with this difference being statistically significant ($p<0.001$).

## DISCUSSION

Fractures of the femur represent about 3-6% of all musculoskeletal injuries, with the distal femur being involved in about 1% of all cases.[11] Supracondylar and intercondylar fractures of the femur provide a considerable clinical challenge owing to their intricacy and the risk of serious consequences. These fractures are frequently linked to high-energy trauma in younger individuals, such as motor vehicle collisions, whereas in older adults, they typically arise from low-energy falls, especially in those with osteoporotic bone. The nature of these injuries requires immediate and efficient care to reduce morbidity and enhance functional recovery.[6,8]

From the results obtained, the demographic and clinical findings showed that 26.3% of participants were over 70 and 60.5% were female. Falling (55.3%) was the most common mode of injury, followed by RTA (44.7%) and conjoined shaft and supracondylar fractures (65.8%), with internal knee derangement (36.8%) being the most common associated injury. Most fractures were non-comminuted (55.3%), closed (84.2%), and Müller AO C1 (55.3%). Most implants were stainless steel (71.1%) and most fractures were complication-free (94.8%). These results are supplemented by a previously conducted study which showed that the mean age of patients with distal femur fracture was 81.1 years, another study reported that 11% of women with distal femur fracture reported to have osteoporosis, 21% of patients had diabetes and more than 32% had a cardiovascular disease.[12,13] Mortality rates in the elderly with distal femur fractures have been reported to be around 18% at six months and 18-30% at one year.[14-16] RTAs were found to be the most common aetiology for supracondylar and intercondylar fractures in a previously conducted study which contrasts the results obtained in the present study but a majority of the participants required stainless steel implants which was resonated with the results obtained in the present study.[17,18] The difference can be explained by the difference in populations included in the present study. A higher percentage of complications (8%) were reported in another previously conducted study in the form of superficial infections.[18]

Postoperatively, most patients had a range of motion of 91-120 degrees (60.5%) and a radiological union time of <6 months (73.7%). Most patients (97.4%) had no varus malalignment, and 92.1% had implants removed. About 78.9% of patients had no limb length disparity, and 68.4% could bear full weight three months following surgery. These results are similar to that obtained by a study conducted by Virk et al wherein the mean ROM was 109 degrees.[18] Another study conducted by Madhusudhana A et al assessed the outcome of supracondylar fractures managed by open reduction using locking compression plate and the results showed that the mean ROM was 110 degrees or more among 62% of the study participants which is in accordance with the results of the present study and the same study also reported no limb length discrepancy in 86% of the cases.[19] In a study assessing the outcomes of dual plating for distal femur fractures, 84% of patients achieved normal walking ability by the 12$^{th}$ week postoperatively. This suggests that while the weight-bearing capability in the current study (68.4%) is promising, dual plating may facilitate even earlier functional recovery compared to locking plate fixation alone, highlighting the potential benefits of using dual plating in specific fracture types or patient demographics.[20] Achieving optimal ROM, preventing varus malalignment, avoiding limb length discrepancies, and enabling early weight-bearing are essential components in the management of distal femur fractures. These factors significantly influence functional outcomes, patient satisfaction, and long-term joint health.

KSS measured 1 month, 6 months, and 12 months postoperatively showed that the scores improved with each follow-up, and at 12 months, 71.1% had good scores and none had poor scores. The mean KSS score at 1 month was 65.87 and at 6 months was 78, with the difference between the two findings being statistically significant. Significant improvement in mean KSS scores was observed after each follow-up ($p<0.001$). Previous evidence reported that 53.1% patients showed excellent outcomes.[21] This study corroborates the findings of Ajiboye et al which indicated substantial enhancements in KSS within the initial six months following surgery, emphasizing the importance of early postoperative periods for recovery. Their findings indicated substantial elevations in KSS scores for up to six months, after which enhancements stabilized ($p>0.05$).[22] Another study reported that functional outcome at the end of one year was assed using Neer's scoring system were excellent in 57% patients, good in 19%, fair in 14% and

poor in 10% which was in accordance with the result of the present study.[19]

KSS association with demographic and clinical variables revealed a significant difference in distribution based on age ($p<0.001$), fracture type ($p=0.041$), OA fracture type ($p<0.001$), limb length discrepancy ($p<0.001$), and comminuted fractures ($p<0.001$). Significant differences in mean range of motion were found depending on age ($p=0.034$), fracture type (AO classification, $p<0.001$), and open/closed fractures ($p=0.002$). Knee range of motion was higher in young patients aged <50, $C_1$ and $C_2$ fractures, and closed fractures ($p<0.05$). Previously conducted research indicates that younger age correlates with higher odds of achieving beneficial functional outcomes post-surgery, as older age groups frequently report lower KSS scores due to complications or slower recovery rates. Research indicates that particular fracture classifications markedly influence postoperative KSS scores, with certain types linked to elevated complication rates that may impede functional recovery.[23] Research indicates that patients with post-surgical limb length disparities frequently report diminished KSS scores owing to the biomechanical difficulties encountered during rehabilitation.[24] Research also demonstrates that patients with comminuted fractures often encounter problems including non-union or malunion, which negatively impact their KSS scores over time.[24] These results helps infer that limb length discrepancies and presence of comminuted fractures are associated with KSS scores which can help in assessing outcomes among fracture patients after surgery.

The findings indicated that 21 OTA $C_1$ fractures attained full weight bearing after 3 months, whereas 4 OTA $C_2$ fractures and 1 OTA $C_3$ fracture did so, with specific timings for the $C_3$ fractures achieving weight bearing (3 at 4 months, 7 at 5 months, and 2 at 6 months), and this discrepancy was statistically significant ($p<0.001$). This signifies a distinct variation in recovery durations according to fracture classification. Prior research indicates that patients with stable fracture patterns have superior functional scores and reduced complication rates relative to those with more intricate injuries.[25]

Previously conducted studies reported that 5% of all distal femur fractures fail to heal properly, regardless of whether they are treated with a plate or an intramedullary nail, another previously conducted study showed that 7% patients suffered from non-union at follow up following plate osteosynthesis.[26,27,11] A study conducted by Nuemann-Langen et al studied the outcomes of screw fixation, plating systems and intramedullary nailing systems among distal femur fracture patients and the results showed that clinical outcomes were significantly superior among the screw fixation group ($p=0.009$). However, the study also reported that plating systems were still the preferred method to repair distal femur fractures.[11] The dual plating of distal femur fractures has garnered more focus for its efficacy in avoiding varus collapse and implant failure in comminuted metaphyseal and articular fractures. A systematic review revealed favorable outcomes for comminuted metaphyseal and articular fractures treated with dual plating; however, no significant differences were observed between single lateral plating and dual plating concerning non-union rates, blood loss, functional outcomes, and complications, despite dual plating facilitating expedited fracture healing.[28]

The limitations of the present study include the single centred nature of the conducted study which can affect the generalizability of the results obtained. The study also did not compare the fractures fixed by open reduction internal fixation using distal femoral locking plates to other methods which could help in establishing superiority over those practices. The limited sample size could also affect the generalizability of the present study prompting further research with a larger multicentred study comparing the advent of locking plates in fixing distal femur fractures to other methods. The advantages of the present study include the comprehensive nature of the variables considered that can affect outcome as well as the follow up to ensure recovery of the patients involved which can help in adding to available evidence on the effectiveness of locking plates use among these patients. This study on supracondylar and intercondylar femur fractures treated with distal femoral locking plates emphasizes significant therapeutic implications: elevated union rates and positive functional outcomes endorse this surgical approach. The heightened risk of varus deformity in supra-intercondylar fractures underscores the necessity for precise surgical alignment. Early weight-bearing methods can improve recovery, while findings inform customized rehabilitation strategies and highlight the necessity of continued study to increase patient outcomes.

## CONCLUSION

The present study underscores notable disparities in weight-bearing results after open reduction internal fixation of supracondylar intercondylar femur fractures with distal femoral locking plates. $C_1$ fractures had a positive recovery, with 21 patients attaining full weight bearing after 3 months, but $C_2$ and $C_3$ fractures necessitated extended rehabilitation durations. The results highlight the significance of fracture classification in forecasting functional outcomes and stress the necessity for customized rehabilitation strategies. This study enhances the comprehension of healing trajectories in femoral fractures, emphasizing the significance of surgical technique and personalized treatment in improving patient outcomes.

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