

## Prospective Analysis of Retrograde Supracondylar Nailing in the Treatment of Supracondylar and Distal Femoral Fractures

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### Abstract:

**Background:** Distal femur fractures are complicated wounds that present a challenge to the orthopedic surgeon. About 6% of all femoral fractures are caused by it. Younger people typically experience it during high-energy trauma, and concurrent injuries are frequently linked to it. In contrast, mild trauma like a simple fall could result in a single distal femoral fracture in older patients with significant osteopenia. The study's objective is to analyze prospectively how well Retrograde Supracondylar Intramedullary Nails treat Supracondylar and Distal Femoral Fractures.

**Methods:** This is a prospective study of 20 patients who underwent retrograde supracondylar nail treatment at Patna Medical College and Hospital. Patna, Bihar, from July 2019 to June 2020 for supracondylar and distal femoral fractures. Nine of the 20 patients had distal femoral fractures, while 11 of the patients had supracondylar fractures.

**Results:** Twenty cases were treated with retrograde intramedullary supracondylar nails in our investigation. Following that, patients were checked in on every three weeks for 3 months, 5 months, and 1 year. The Hospital for Special Surgery's Knee Rating System was used to examine the functional results. 38 of the forty cases were available for further investigation. In 12 patients (63%) the functional outcome was good to outstanding, fair in 4 patients (21.0%), and bad in 3 individuals (17.6%).

**Conclusion:** Our study leads us to the conclusion that patient mobilization and early surgical intervention will produce better outcomes. The retrograde intramedullary locked nail offers patients with polytrauma, oating knee injuries, and older patients a practical advantage of a simple and effective treatment.

**Keywords:** Supracondylar Nailing, intramedullary locked nail, polytrauma, floating knee injuries.

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### Introduction

Distal femur fractures are complicated wounds that present a challenge to the orthopedic surgeon. About 6% of all femoral fractures are caused by it. Younger people typically experience it during high-energy trauma, and concurrent injuries are frequently linked to it. In contrast, mild trauma like a simple fall could result in a single distal femoral fracture in older patients with significant osteopenia. Over the past thirty years, significant progress has been made in the management of these fractures. In 1967, Neer came to the conclusion that these fractures were ineligible for internal fixation and recommended traction and cast bracing as a treatment.

Operative fixation has evident advantages over closed forms of treatment because it can preserve anatomical reduction of the joint surface while restoring axial alignment and early range of motion.

The treatment of these fractures has been suggested for a wide range of devices. Regardless of the fixation chosen, the internal fixation principles must be followed. These include early active mobilization, stable internal fixation, minimal soft tissue stripping, and anatomical reduction of the distal femoral articular surface. But with plate devices, there was a chance of infection and a lengthy surgical exposure required. Because it permitted early mobilization and the fixation of intraarticular fractures, fixation with a lateral blade plate or its variants gained popularity.

Their use necessitates extensive soft tissue removal, which could interfere with osseous healing and increase the risk of infection. Because of their potential for load sharing, their intramedullary position, which results in less stress on the implant, and the fact that they may be introduced with less soft

tissue stripping, intramedullary implants have potential biomechanical advantages over plates and screws. However, due to the antegrade nail's incapacity to control the small distal fracture fragment, the use of antegrade intramedullary nail in the treatment of supracondylar femoral fractures has been linked to angular abnormalities. Green, Seligson, and Henry created the supracondylar nail in 1988 to increase the theoretical and practical benefits of intramedullary nailing in distal femoral fractures. Recent studies evaluating the function and effectiveness of supracondylar nailing have produced a mixed bag of findings. This study examined the results of retrograde supracondylar nails used to treat fractures of the distal femur and supracondylar region.

### Materials and Methods

This is a prospective study of 20 patients who underwent retrograde supracondylar nail treatment for distal femoral fractures and supracondylar fractures at Patna Medical College and Hospital, Patna, Bihar, from July 2019 to June 2020. Patients who had closed and grade I or grade II open fractures of the supracondylar and distal femur that extended up to 15 cm from the distal articular surface, closed distal femoral fractures and nonunion, AO type A1 A2 & A3 fractures, and AO type C1 C2 fractures were also included. Open fractures of Grade III and AO types B1, B2, and B3 as well as C3 were disregarded. With a mean age of 37.5 years, the patients' ages ranged from 19 to 65.

The ratio of men to women was 5.4:1. In 15 patients (75%) the mode of injury was RTA, one patient (5%) was hurt by a wall collapse, and four additional patients (20%) had a history of falling from a height. Nine of the 20 patients had distal femoral fractures, while 11 of the patients had supracondylar fractures. In the 18 patients who un-

derwent plate osteosynthesis treatment for a distal femur fracture, two experienced nonunion. After that, the plates were taken off and the supracondylar nails were inserted. Before being taken in for surgery, all of the patients were preoperatively handled with pin traction. For preoperative evaluation, standard anteroposterior and lateral radiographs of the knee and lower femur were acquired. Where appropriate, a CT scan of the distal femur was performed to determine the degree of intra-articular communication of these fractures.

### Results

Twenty cases were treated with retrograde intramedullary supracondylar nails in our investigation. Following fracture unification, patients were checked on every three weeks, then every three months, five months, and a year later. In our study, the minimum follow-up duration was four months, and the highest follow-up term was fourteen months. One month after surgery, two of them had passed away from septicemia brought on by pressure sores and not the surgery itself. At each follow-up, clinical parameters including fracture site discomfort, knee pain, limb length discrepancy, range of motion, and any varus or valgus deformity were evaluated. The results were examined using common lateral and anteroposterior radiographs. At each follow-up, clinical and radiological evidence of union were analyzed. If a callus was visible in at least three cortices in the anteroposterior and lateral views, the fracture was considered to be radiologically united. The Hospital for Special Surgery's Knee Rating System was used to analyze the functional results.

19 of the 20 cases were available for further investigation. In 12 patients (63%) the functional outcome was good to outstanding, fair in 4 patients (21.0%), and bad in 3 individuals (17.6%).

Table 1:

Results	No. of patients	Percentage
Excellent	7	36.8%
Good	5	26.3%
Fair	4	21.0%
Poor	3	15.7%

Table 2: Complications

Complication	No. of patients
Delayed union	6
Knee Joint Stiffness < 90	16
Knee Pain	8
Infection	2
Nail Impingement	2
Leg length discrepancy	2

## Discussion

Distal femur fractures are complicated wounds that can be challenging to treat and have the potential to cause severe long-term morbidity. Nowadays, surgical therapy is the preferred course of action for these injuries, leading to anatomic reduction, early mobilization, and early weight bearing. Previously, a condylar screw and plate were typically used to stabilize.

To solve some of the earlier issues with distal femur fractures, retrograde intramedullary nailing has been created. Many writers have explored the biomechanical aspects of retrograde supracondylar nailing.[1,2,3,4,5] The intramedullary site of the GSH nail has a bio mechanical advantage over laterally positioned conventional devices, according to Henry et al [6] in 1991. The intramedullary position reduces valgus or varus angulations by shortening the lever arm.

Mechanical testing of the retrograde intramedullary nail, 95 screw, and side plate was done in 1995 by Firoobakhsh et al. He discovered that plates and screws were stiffer in tension and lateral bending than a supracondylar nail. He had come to the conclusion that, under varus pressure, supracondylar nails and condylar screws and plates exhibited similar biomechanical rigidities. Supracondylar nailing has advantages such as reduced exposure, no periosteal stripping, less blood loss, shorter operating times, and shorter hospital stays.[1,2,3,4].

40 patients in our study who had distal femoral fractures and supracondylar fractures underwent retrograde supracondylar nailing. In our study, the mean age at which a fracture occurred ranged from 19 to 65 years, whereas Ostrum et al.[7] reported a fracture age of 29.4 years, Gellman et al.[8] reported a fracture age of 50 years, and Herscovici and Whiteman [9] reported a fracture age of 32.4 years. According to our study, the age range between 21 and 35 years had a significant prevalence of fractures. Similar to other studies [10,11,8], road traffic accidents were the most common cause of injury in our study.

In our analysis, there was a clear male preponderance (85%). In his study, Ostrum [12] reported 75%, whereas Seifert et al. [10] reported 60%. In our study, the mean age for men was determined to be 39, while it was 45 for women.

The average time between injury and surgery in our study was longer (4 weeks), which can be attributed to the length of time it takes for the wound to heal in compound injuries, the patient's delayed admission to the hospital after receiving home care, the lack of theater time, and the management of associated injuries. Due to the delay, it was difficult to reduce the fracture during surgery using closed techniques. As a result, the fracture site was opened

in 90% of our instances, and open reduction was accomplished. In fractures with gross comminution and fractures with gross osteoporosis, primary bone grafting was performed. With radiographic and clinical signs of union by 12 to 14 weeks, callus formation was quick in 26 of the 34 patients evaluated at 6 to 8 weeks, similar to prior studies [8,12,11].

In our study, 2 cases (5.2%) of infected non-union and 6 cases (15.1%) of delayed union occurred. Four of the six delayed union cases required bone grafting, and two patients were recommended to fully bear weight while wearing a tube cast. When the research was over, the fracture still hadn't healed entirely. The non-union patient underwent implant removal and underwent Ilizarov fixation. Our findings were comparable to research done in 1994 by Iannacone et al [3]. He had documented the treatment of 41 complicated distal femoral fractures with GSH nails, which had led to four nonunions and a few delayed unions. He attributed this to his study use of the open technique.

Percutaneous supracondylar nailing was compared to open reduction and fixation utilizing a GSH supracondylar nail in Henry et al. [6] evaluation of 120 supracondylar fractures in 2000. Out of 80 patients who underwent an open arthrotomy and an open reduction of the fracture, 29 required bone grafting as an extra surgery. In this category, non-union and delayed union incidents were more common.

In his opinion, percutaneous treatment of supracondylar fractures has the advantages of shorter operating times, less blood loss, and avoiding significant surgical dissection. In their study comparing antegrade versus retrograde nail insertion, Ostrum et al.[7] came to the conclusion that the retrograde group's time to union was somewhat longer and that more extra procedures were required to achieve union. We ascribe the open approach of reduction (which was used in 90% of our cases), the delay in fixation, and the general stability of fixation to our rates of delayed union. In contrast to Gellman et al.[1] study, which revealed a higher percentage (80%) of excellent results, our study series of 40 patients showed 63% good to excellent results and 15.1% unsatisfactory results. In our study, patients who underwent early surgery and those who had closed, non-articular fractures experienced great outcomes. We blame our poor results on the emergence of nonunion and delayed union in some patients, as well as the presence of concomitant injuries that could reduce the patients' functional outcomes. In our investigation, supracondylar nailing using an open approach was linked to subpar functional results.

According to our study, the average knee range of motion was 70 degrees. In 2004, studies by Papa

dokostasis et al [14] and Henry et al [6] revealed that the mean range of motion was  $104 \pm 17.2$  degrees and 93 degrees, respectively. Concerns have been raised about the use of intraarticular entry and the potential for arthrofibrosis and knee stiffness. Similar to other studies [10,15], younger individuals in our study regained a greater range of motion than the elderly. The delay in scheduling patients for surgery, the lack of patient compliance about knee mobilization, the existence of related injuries, lengthy immobilization following surgery with a knee brace made based on fracture patterns stability, and the etiology of knee stiffness could all be contributing factors.

Patients who had stable fixation in our study were deployed on the first or second postoperative day. Exercises for the knee mobilization and static quadriceps were taught. Some patients with less stable fixation required 3 weeks of knee immobilization in a knee brace. In our patients, no continuous passive motion was attempted. The biggest issue was patients' lack of compliance with home physiotherapy exercises, which may have been related to fear or a lack of knowledge about their importance.

Thirty percent of our patients report having a significant problem with knee discomfort. In the Lauri Handolin et al [11] in 2004, anterior knee pain was reported by patients in roughly 20–30% of cases. The iliotibial band impingement, subsequent nail protrusion, distal screw prominence, or prior osteoarthritis are all potential causes of the knee pain.

#### Conclusion

Distal femoral fracture is a difficult problem for orthopedic surgeons because it can happen to young people in high-velocity trauma and to older people in low-velocity trauma. To address some of the issues with fixation of these fractures, the retrograde supracondylar nail been developed. Less periosteal stripping, less blood loss, a shorter hospital stay, and shorter operating times are all benefits. Our investigation leads us to the conclusion that patient mobilization and early surgical intervention will produce better outcomes.

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