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Original Research Article

# A Comparative Functional Assessment of Proximal Femoral Nailing and Proximal Femoral Locking Plate for Subtrochanteric Fractures of Femur

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**Abstract:**

Subtrochanteric fractures of the femur accounts 7- 44% of all proximal femur fractures. Conservative management in these fractures has no role. Two options exist for unstable fractures, either angular locking plate or a sliding neck screw via a closed technique. Current study compared the functional Outcome of Subtrochanteric fractures those were managed with proximal femoral nail or Proximal Femoral Locking Plate using the modified Harris hip score as an assessment tool at follow-up visits at 6, 12, and 24 wks post-surgery. The mean duration of surgery in proximal femoral nail group was 80 min and in proximal femoral locking plate group was 114 min. Study observed that cases those were operated with proximal femoral nail had shorter operation times, less bleeding, fewer infections, and are more stable than those that were operated with proximal femoral locking plate with significant difference. All patients who were treated by proximal femoral nail were successful, with the exception of two cases that were classified as non-union and one case that was classified as an implant failure. In cases treated by proximal femoral locking plate group, there were two patients that resulted in non-union, four implant failures, and two infections. Early mobilization is possible with proximal femoral nail, in contrast to proximal femoral locking plate, and postoperative stiffness is less likely to occur with proximal femoral nail than with proximal femoral locking plate. Study concluded that proximal femoral nail was a superior implant to proximal femoral locking plate because it promotes fracture union with less disruption of the soft tissues around it, offers more stability, and permits early weight bearing. Compared to proximal femoral locking plate, proximal femoral nail offers better functional and radiological outcomes with shorter operating times, less blood loss, and earlier mobilization. In comparison to proximal femoral locking plate, proximal femoral nail had better union rates and less difficulties.

**Keywords:** Subtrochanteric Fractures, Proximal Femoral Locking Plate, Proximal Femoral Nail.



## Introduction

Fractures of the proximal femur are among the most often encountered by the orthopaedic surgeon. These fractures are associated with substantial morbidity and mortality [1]. Subtrochanteric fractures of the femur account for 7-44% of all proximal femur fractures.

The percentage of peri trochanteric fractures that they account for ranges between 10- 30%. The subtrochanteric region is defined as the region of the femur that lies below the inferior border of the lesser trochanter and extends distally for 5 cm 2 until it meets the intersection of the proximal and middle thirds of the femur. A bimodal distribution may be seen in the two principal populations that are affected by these fractures, which are osteopenic individuals in their later years who sustain low-energy falls and younger patients who sustain high-energy injuries [2].

The majority of patients require early surgical intervention to prevent the serious consequences that might result from prolonged immobility. These consequences include deep vein thrombosis, thrombophlebitis, urinary and lung infections, and ulcers. These complications can be prevented by early surgical intervention. This particular pattern of femoral fracture is associated with a higher incidence of malunion and non-union than any other kind of femoral fracture. This is because of the anatomical idiosyncrasies of this location [3].

The advancement of the technique known as internal fixation has proved helpful in the treatment of trochanteric hip fractures in patients who are older. Failure to achieve early internal fixation does, however, infrequently occur [4]. The initial fracture pattern, poor bone quality, a lack of communication, inadequate fracture fixation, and failure following internal fixation were all to blame for the patient's condition [5].

Current study aimed to compare the functional Outcome of Subtrochanteric Fractures treated with proximal femoral nail and Proximal Femoral Locking Plate.

**Materials and Methods:**

This study compares the surgical results and care of 20 subtrochanteric fracture patients prospectively. Out of the 20 patients, 10 were treated with proximal femur nails and 10 with proximal femur locking compression plates. The prognosis, and complications of each were evaluated by the modified Harris Hip score at follow-up visits at 6, 12, and 24 weeks post-surgery.

**Inclusion criteria:** Cases of subtrochanteric fractures of the femur in the age range between 30 – 70 years. All subtrochanteric fractures classified by Russell-Taylor are enrolled into this study.

**Exclusion Criteria:** Patients with subtrochanteric fractures who are younger than 30 years; Patients who are critically ill or unfit for surgery; A fracture brought on by a tumor or any another pathological condition; and compound fractures were excluded.

Pre-operative work-up of X-ray radiological examination, fracture pattern categorized using the Russell-Taylor system baseline, radiological and clinical diagnosis and all other co-morbid conditions were assessed.

Surgery- proximal femoral nailing (or) Proximal Femoral Locking Plate was operated accordingly.

All Surgeries done under spinal anesthesia. All patients in proximal femoral nailing group were taken on the table in supine position.

Post surgery, weight bearing with toe touches for 6–8 weeks, or up to 12 weeks if comminuted. All patients will get follow-up at 1 mon, 3mon, 6 mon and 1 year after surgery for evaluation of fracture union, range of motion in the hip and knee, and complications, if any. On X-ray, the condition of the implants and any indications of union were also evaluated.

Using statistical analysis, the functional and radiological outcome were evaluated regarding history, clinical examination, radiological evaluation, and functional assessment scores.

**Results:**

**Table 1: Qualitative measures**

| | proximal femoral nail | proximal femoral locking plate | TOTAL |
|---|---|---|---|
| Open | 2(20%) | 10(50%) | 12 |
| Closed | 8(40%) | 0 | 8 |
| **MHH-score** | | | |
| Excellent | 5(50%) | 3(30%) | 8(40%) |
| Good | 3(30%) | 2(20%) | 5(25%) |
| Fair | 2(20%) | 3(30%) | 5(25%) |
| Poor | 0(0%) | 2(20%) | 2(10%) |
| **Complications** | | | |
| Infections | 0(0%) | 1(10%) | 1(5%) |
| Plate Breakage | 0(0%) | 1(10%) | 1(5%) |
| Plate Pullout | 0(0%) | 1(10%) | 1(5%) |
| Screw Breakage | 1(10%) | 0(0%) | 1(5%) |
| Screw Pullout | 0(0%) | 1(10%) | 1(5%) |
| Nil | 9(90%) | 6(60%) | 15(75%) |

**Table 2: Quantitative measures**

| | Group | Mean | Std deviation | Chi-square test | P value |
|---|---|---|---|---|---|
| Age | proximal femoral nail | 45.6 | 9.9 | 18.6 | 0.03 |
| | proximal femoral locking plate | 48.8 | 8.8 | | |
| Union | proximal femoral nail | 3.6 | 0.6 | 1.4 | 0.89 |
| | proximal femoral locking plate | 4.6 | 0.9 | | |
| Operating Time | proximal femoral nail | 81 | 9.7 | 22.5 | 0.007 |
| | proximal femoral locking plate | 115 | 17.5 | | |

## Discussion

Intramedullary fixation provides the following benefits over extramedullary implants since it is more of a biological fixation with less devascularization, less bleeding, and a shorter surgery time. According to several studies intramedullary implants have less issues than extra medullary devices [6,7].

In contrast to their extramedullary counterparts, intramedullary implants are load-sharing devices rather than load-bearing ones, which cause pull-out, implant fracture, varus collapse, and poorer stability. 6 patients in the 10 proximal femoral nail cases were men, and seven patients were women. In the 10 proximal femoral locking plate cases, 7 patients and 3 patients were female. Out of 20 patients, 6 cases had a minor fall, and 14 cases involved RTA.

In our study, the majority of the cases were categorized as Russell and Taylor type -IB by Russell and Taylor. Russel Taylor type-IA was assigned to three cases each, type IIB to three cases, and type 2A to one case.

In our investigation, we observed that 7 out of 20 cases and 13 out of 20 patients, respectively, were right- and left-sided. Out of the 20 cases, 2 were non-union, and of those 2, 2 were proximal femoral locking plate -treated. One of the two patients had revision surgery using proximal femoral nail A1.

The P value on the union rate comparison between the two groups was determined to be 0.997, indicating that there is not a significant statistical difference in the union rates between the two implants.

In our study, out of the 20 cases, 8 cases received closed reduction treatment and 12 cases received open reduction treatment. Among proximal femoral nail cases, 80% of patients had their numbers reduced through closed reduction.

Closed reduction was utilized to reduce cases in 80% of patients in research by Wen Yue Wang et al.[8] In a study by N. Tzachev et al.[9] out of 100 cases, 60 cases were reduced through closed reduction and 40 cases through open reduction. In all cases treated with proximal femoral locking plate, we had to execute an open reduction to achieve good anatomical fracture reduction; however, in 50% of patients handled with proximal femoral nail, we were able to complete the open reduction without disturbing the fracture haematoma.

When the method of reduction in the proximal femoral nail and proximal femoral locking plate groups was examined, we found that 80% of the cases managed by proximal femoral nail could be reduced using the closed technique, which is a substantial difference in the method of reduction when compared to the proximal femoral nail and proximal femoral locking plate group. Patients undergoing proximal femoral nail procedures took an average of 80 minutes, whereas those undergoing proximal femoral locking plate procedures took an average of 114 minutes.

The mean blood loss was determined to be 138 ml in proximal femoral locking plate patients and 65.5 ml in proximal femoral nail patients. Proximal femoral nail groups lost considerably more blood than the proximal femoral locking plate group did, with an average loss of 65.50 ml ($p = 0.00$). Studies conducted by V. Srivastava et al.[10] that compared proximal femoral nail to proximal femoral locking plate also produced a $p < 0.001$.

Out of the 20 cases, 2 had non-union decisions made, and of those 2, one had proximal femoral locking plate treatment. One of the two cases had a revision procedure done using proximal femoral nail. The typical follow-up for patients with proximal femoral nail was 5 months, while for proximal femoral locking plate it was 9.2 months. 8 individuals, or 40% of the 20 patients in our research, had a very high Modified Harris Hip Score. Out of these 8 patients, 5 cases had outstanding Modified Harris hip scores, and 3 cases had great proximal femoral locking plate scores. 10% of cases, or 2 cases, had a bad result, and these 2 cases were handled by proximal femoral locking plate.

Patients were categorized according to their Modified Harris Hip Score as:

Excellent: 90 – 100; Good: 80 – 90; Fair: 70-80; Poor: less than 70.

In our analysis of 20 cases, there were a total of 6 problems, including 1 infection, 1 plate pullout, 1 screw pullout, and 1 plate fracture, all of which are common in proximal femoral locking plate. Derotation screw breakage occurred in just one proximal femoral nail case.

We observed that the reduction method when compared to the proximal femoral nail and PLCP groups is also significant. The differences between the proximal femoral nail and proximal femoral locking plate groups in terms of operating time and blood loss were found to be highly significant. This demonstrates that cases managed by proximal femoral nail have significantly less typical blood loss and shorter operating times than the proximal femoral locking plate group. In patients handled by proximal femoral nail as opposed to proximal femoral locking plate, closed reduction is likewise more frequent.

The average operating time for the proximal femoral nail group was also much less than that of the proximal femoral locking plate group. The bulk of proximal femoral nail occurrences were quickly decreased when compared to the proximal femoral locking plate group. While our study discovered a

mean duration of surgery for proximal femoral nail of 80 minutes, Sadowski et al [11] observed a mean duration of surgery for proximal femoral nail of 82 minutes.

The average duration of proximal femoral locking plate operation in our investigation was 114 minutes. Diarmuid Murphy et al [12] estimated the proximal femoral locking plate operating time to be 163.2 minutes. According to research carried out all throughout the world, surgery times vary substantially. The proficiency and experience of the operating surgeon, as well as the nature of the procedure, largely determine the length of the operation. With 100% unionization in proximal femoral nail cases and no non-union cases, we had a very high unionization rate in our cases. With only two non-union cases, proximal femoral locking plate had an 80% unionization rate.

In our research, we observed that proximal femoral nail union cases had a mean success rate of 3.6. In cases handled by the proximal femoral locking plate, unionization took, on average, 4. 6 months to complete.

Weight bearing was delayed in cases treated with proximal femoral locking plate, and complete weight bearing wasn't permitted to start until all radiological indications of callus development had been confirmed.

In contrast to Yadikar et al [13] study, which indicated that 92% of patients had outcomes that were good to outstanding, our study discovered that 50% of proximal femoral nail cases had good to excellent Harris Hip Scores. In the proximal femoral locking plate group, 30% of cases had Harris Hip Scores that ranged from fair to excellent; in the study by P.K. Chalise [14], 88% of cases had Harris Hip Scores that ranged from good to outstanding; and in the study by Nishanth Kumar et al. 77.5% of patients had Harris Hip Scores that ranged from good to excellent [15].

All patients were united among those treated with proximal femoral nail. The patient reported screw fracture and proximal screw loosening with plate pullout at early weight bearing. Interfragmentary screws might have been utilized on this patient to reduce the fragments, further enhancing stability.

In our investigation of proximal femoral locking plate patients, we discovered that mechanical stress at the plate-screw interface brought on by early weight bearing on the injured limb, before bone healing has fully finished, was the major factor contributing to failure. Key elements in plate fixation include precise surgical technique, solid surgical expertise, protected weight bearing until bone healing is visible, excellent anatomical reduction of the fracture parts, and maintenance of posteromedial continuity.

In our study, we found that when we used interfragmentary screws to perform a good anatomical reduction on a patient, the bone healing and union occurred more quickly than in cases where we had not used these techniques. Additionally, as previously mentioned, this patient had a very good modified HARRIS hip score.

## Conclusion

Compared to proximal femoral locking plate, proximal femoral nail offers better functional and radiological outcomes with shorter operating times, less blood loss, and earlier mobilization. In comparison to proximal femoral locking plate, proximal femoral nail had better union rates and less difficulties. Proximal femoral nail to be a safe, reliable and successful implant for subtrochanteric femoral fractures. Proximal femoral nail combines the intrinsic advantage by taking less operative time, high rate of union, minimal soft tissue damage, less infection rate and early postoperative rehabilitation.

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