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# A Comparative Study of Proximal Femur Nail (PFN) Versus Dynamic Hip Screw (DHS) In Treatment of Stable Intertrochanteric Femur Fractures.

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**ABSTRACT:**
Objective: To compare the clinical and radiographic outcomes of patients with stable intertrochanteric femur fractures treated with a proximal femoral nail versus a dynamic hip screw.
Methods:Forty-eight patients older than 18 years with stable intertrochanteric fractures were randomly assigned to the proximal femoral nail or dynamic hip screw groups. For the smaller Asian population, a short proximal femoral nail was employed together with a dynamic hip screw with a three-hole side plate and an anti-rotation screw. Intra-operative, early, and late problems were documented, and the Harris Hip Score was used to evaluate the functional result of each group.
Results: In the group treated with dynamic hip screws, the mean Harris Hip Score at one month was marginally lower than in the group treated with proximal femoral nails. At the three- and six-month monthly follow-ups, the dynamic hip screw group had higher mean scores than the proximal femoral nail group; however, at the one-year monthly follow-up, both groups had similar scores.
Conclusion: The proximal femoral nail allows for a significantly shorter operation with a smaller incision, resulting in fewer wound-related problems. However, the frequency of technical mistakes was much greater with the proximal femoral nail than with the dynamic hip screw, as the former is a technically more demanding procedure that results in more implant failures and subsequent re-operations.

## I. INTRODUCTION:

The incidence of Intertrochanteric fractures has increased as a result of longer life expectancy and more road traffic accidents. Inter-trochanteric fractures account for almost fifty percent of hip fractures in the elderly.[1, 2] The objective of treating any Intertrochanteric (IT) fracture is to restore early mobility in order to reduce the risk of medical problems and return the patient to their pre-operative condition. Currently, the dynamic hip screw (DHS) is regarded the standard device for comparing results, particularly for stable intertrochanteric fractures.[3] The proximal femoral nail (PFN), which was established by the AO/ASIF group in 1998 for the treatment of trochanteric fractures, has gained considerable favour in recent years. By decreasing the distance between the hip joint and implant, Proximal Femur Nailing fixation produces a more biomechanically robust design.[4, 5] The majority of trials to date have assessed the efficacy of PFN in unstable IT fractures, while comparisons with DHS in stable IT fractures have received less attention. This study evaluated and compared the clinical and radiological results of individuals with stable Intertrochanteric fractures treated with PFN and DHS.

**Materials and techniques:**

This prospective interventional study was carried out between 2021and 2022.Forty-eight stable intertrochanteric femur fracture patientswho were admitted under the Department ofOrthopaedics in Siddhartha Medical College, Vijayawada, Andhra Pradesh, and who fulfilled theinclusion and exclusion criteria were included inthe study and alternatively treated with PFN and DHS.

Inclusion criteria:
1. Stable Intertrochanteric fractures
2. Age above 18 years of age.

Exclusion criteria:
1. Another implant in situ,

2. Deformed femur/abnormal bowing of femur,
3. Narrow marrow cavity (Osteopetrosis)
4. Pathological fracture or old complicated fracture.

The study was approved by the ethical committee of the hospital, and informed consent was obtained from each patient.Alternate patients who met the inclusion and exclusion criteria were respectively treated with DHS or PFN. There were no patients lost to follow-up. In both groups, all patients were operated on by the same surgeon. After relevant investigations, radiography, anaesthetic evaluation, and physician clearance, patients were rushed into surgery as soon as feasible. The patient was placed on a typical fracture table in a supine posture. Since all fractures were of the stable type, DHS with a side plate having 3 or 4 holes combined with an anti-rotation screw was used in all cases of one group, and in the other group, a short PFN (25 cm in length, 6.4 mm in diameter of the anti-rotation screw, and 8 mm in diameter of the hip screw) was used. In all cases, closed reduction was attempted, and if unsuccessful, indirect reduction utilizing percutaneous or mini-open methods was performed prior to accessing the PFN and DHS. Postoperatively, all patients followed a similar rehabilitation protocol consisting of dynamic quadriceps and ankle pump exercises beginning on the first day, early mobilization with a walker as soon as possible while non-weight bearing, and later partial weight bearing depending on patient compliance. Patients were instructed to return for their initial follow-up appointment four weeks after hospital release, and then every six weeks until 24 weeks postoperatively. In accordance with the fracture site's radiological assessment, the patient's weight-bearing was gradually increased. Six-monthly follow-ups were indicated for one year, and then annually thereafter.

The intraoperative, early (within the first month after hip fracture repair), and late complications (after the first month) were recorded and the clinical outcome for each group was analyzed.Patients were followed at regular intervals of 4 weeks, 8 weeks, 12 weeks, 6 months, and annually thereafter, and Harris Hip Scores were used to evaluate the functional outcome. Using the student's t-test for quantitative data such as time, blood loss, and Harris hip scores, and the Z ratio to determine the significance of the difference between two independent proportions for qualitative demographic data, the collected data were statistically evaluated. Using the null hypothesis as a guide, the observed difference was deemed significant if the p-value was less than 0.05.

## II. RESULTS:

From 2021 to 2022, the present study included 48 cases of stable intertrochanteric femur fracture in both sexes. 24 were treated with a Dynamic hip screw and 24 were treated with a Proximal femoral nail. In our study, the maximum age was 81 and the minimum age was 40. Mean incision length was substantially shorter in the PFN group (p 0.01), while radiation exposurewas significantly higher (p 0.01). Surgical time was shorter in the PFN group, which was statistically significant (p 0.01; Table 1). (Table 1). Significantly more blood was required postoperatively in the DHS group (p 0.01), with two patients requiring transfusions as opposed to none in the PFN group.The DHS group had a slightly longer mean hospital stay, although this was not statistically significant (Table 1). The average implant cost for DHS was around 55% of that for PFN. The mean time of complete weight bearing was somewhat longer in the DHS group, but this difference was not statistically significant. In both groups, early and late problems were recorded and compared. The prevalence of technical mistakes was greater in the PFN group (8.35% vs. 4.14% in the DHS group), while extended drainage and superficial infections were more prevalent in the DHS group (Table 2), although this difference was not statistically significant. There were no cases of iatrogenic fracture, deep vein thrombosis, deep infections, nonunion, or malunion. Mortality rates were comparable in both groups (one death in each group), were unrelated to surgery, and occurred three months following surgery. In the PFN group, the incidence of loss of reduction, implant failure, and subsequent re-operation was greater (Table 2), but not statistically significant. At the last follow-up, the mean shortening was comparable between both groups. At the one-month, three-month, six-month, and yearlong follow-ups, all patients' functional outcomes were evaluated using the Harris hip score. The D.H.S group's one-month mean hip score was marginally lower than that of the P.F.N group, but this difference was not statistically significant ($p > 0.05$). (Table 3). But, during the three- and six-month follow-ups, the DHS group had higher mean scores than the PFN group (p 0.01); however, at the one-year follow-up, both groups had identical scores (p-value> 0.05).

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Table 1: pre and post-operative observations in both groups.

| **Observations** | **DHS (n = 24)** | **PFN (n = 24)** | **p-value** |
|---|---|---|---|
| Mean age (range) | 62.27 yrs (44–81) | 60.67 yrs(40–80) | 0.53 |
| Sex ratio (M:F) | 66.67% | 58.33% | 0.93 |
| Mean age of fracture at surgery(in days) | 4.5 | 4.1 | 0.34 |
| Mean length of incision (in cm) | 7.9 | 4.9 | <0.01 |
| Mean radiation exposures (in no.) | 48.7 | 71 | <0.01 |
| Mean duration of surgery (incision to fixation + fixation to closure) | 69.7 min (39.5 + 30.2) | 56.9 min (37.3 + 19.6) | <0.01 |
| Average blood loss (in mL) | 221 mL | 109 mL | <0.01 |
| Patients requiring blood transfusion | 1 | 0 | 0.29 |
| Failure to achieve closed reduction | 0 | 1 | 0.29 |
| Mean hospital stay (in days) | 10.1 | 9.29 | 0.13 |
| Mean duration of full weight bearing | 7.8 wks | 7.2 wks | 0.412 |

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Fig 1: Pre and immediate post-opx-raysof each case in both groups

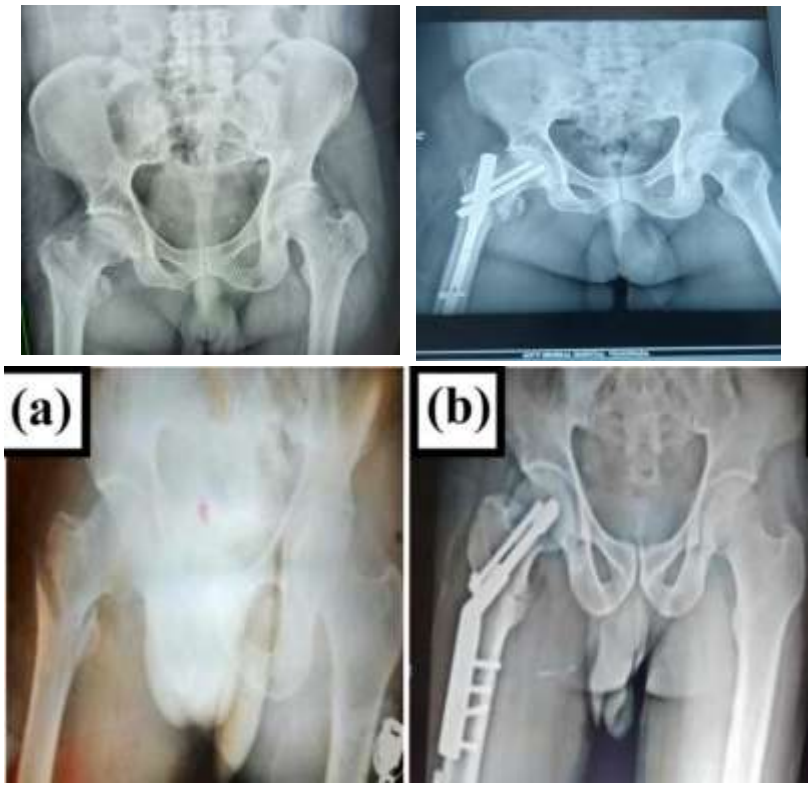


Table 2: Early and late complications in both groups.

| Complications | DHS (n = 24) | PFN (n = 24) | p value |
|---|---|---|---|
| **Early** | | | |
| Iatrogenic fracture | 0 | 0 | |
| Technical errors | 1 (4.17%) | 3 (12.5%) | 0.33 |
| Prolonged drainage | 2 (8.33%) | 0 | 0.13 |
| Superficial infection | 1 (4.17%) | 0 | 0.29 |
| DVT | 0 | 0 | |
| **Late** | | | |
| Loss of reduction | 1 (4.17%) | 2 (8.33%) | 0.59 |
| Implant failure | 1 (4.17%) | 3 (12.5%) | 0.33 |
| Second surgery | 1 (4.17%) | 3 (12.5%) | 0.33 |
| Mean shortening | 5.5 mm | 5.3 mm | 0.60 |
| Non union | 0 | 0 | |
| Mal union | 0 | 0 | |
| Deaths | 1 (4.17%) | 1 (4.17%) | 0.96 |

Table 3: Harris hip scores in both groups.

| Average Harris hip scores at | D.H.S group | P.F.N group | p-value |
|---|---|---|---|
| 1 month | 24.8 | 26.1 | 0.10 |
| 3 months | 53.4 | 47.6 | <0.01 |
| 6 months | 88.7 | 82.2 | <0.01 |
| 2 years | 94.2 | 94.0 | 0.79 |

## III. DISCUSSION:

The treatment of intertrochanteric fractures has improved dramatically during the past few decades. Numerous fixation device techniques have come and gone. The treatment still considers the type of fracture and bone quality. DHS has long

been regarded as the gold standard for intertrochanteric fracture fixing, particularly for stable fracture types.[3] As an intramedullary implant, the PFN imparts a lower bending moment, compensates for the function of the medial column, and acts as a buttress to prevent the medialization of the shaft, thereby overcoming implant-related complications of DHS and facilitating the surgical treatment of unstable intertrochanteric fractures.[7] In stable IT fractures, it remains debatable whether any of these factors contribute to an improved prognosis compared to the DHS.

In the present study, intraoperative observations, complications, and functional result were compared between two groups of patients treated with DHS and PFN, respectively, and matched for demographic and preoperative factors. The average length of incision in the PFN group was 60% shorter than in the DHS group. This was consistent with the results of numerous other research, such as those by Pan et al.[8] and Zhao et al.[9] The duration of surgery was shorter in the PFN group by a mean of 12.8 minutes. While the duration of implant fixation was practically identical in both groups, the time necessary to close the wound was much longer in the DHS group, likely due to a bigger incision and more extensive dissection. Pan et al.,[8]Saudan et al.,[10] Shen et al.,[11] and Zhao et al. reported findings that were similar.[9] The DHS group had a higher average blood volume, but it was not clinically significant enough to necessitate blood transfusion, as only one patient in the DHS group required blood transfusion. In the PFN group, both the average length of hospital stay and time of full weight bearing were marginally shorter. In the DHS group, early problems included superficial infections and protracted wound drainage, which were not observed in the PFN group, which cleared with frequent dressings. These were likely a result of the lengthier incisions and extensive dissections performed in DHS instances, but no cases of profound infection were recorded. The incidence of technical errors was greater in the PFN group (3 cases, or 12.5%) than in the PFN group (1 case, or 4.17%). These included varus angulation at the fracture site (1 in each group), distal translation of the head and neck fragment due to it being pushed distally by the nail at the entry point, opening up of the fracture site in one case after insertion of the nail when the fracture was located at the entry point itself, and protrusion of the nail at the entry point due to a mismatch between the direction of the neck screws and the neck shaft angle. Thus, these inaccuracies were often associated with the nail's entry position and trajectory. Consequently, the PFN group had a greater frequency of reduction loss, implant failure, and re-operation rate. This was consistent with the findings of numerous previous research.[12,13] Implant failure consisted of two instances of superior cut out (one in each group) and two instances of Z-effect failure in the PFN group. In three of these cases of implant failure, reduction loss was manifested as varus collapse (one in DHS group, two in PFN group). In one case (PFN), the laterally impinging screws were extracted under local anaesthesia following fracture consolidation. The ultimate mean shortening was comparable between the two groups. Unlike the majority of prior research, all of the patients in our investigation were of stable type. Intertrochanteric fractures that had been minimised intraoperatively, leaving little room for the sliding mechanism of DHS to generate any shortening. Mean Harris hip scores at one month, three months, six months, and yearlong follow-up were determined and compared between the two groups. Initially, these functional scores were slightly lower for the DHS group; however, at three- and six-month follow-ups, the DHS patients performed marginally better than the PFN group. This was likely the result of abductor lurch when walking and a somewhat reduced range of abduction in the PFN group compared to the DHS group. At annual follow-ups, however, the results in both groups were comparable, likely due to the recovery of abductor strength with gradual physiotherapy. As indicated by Giraud et al.[14], a comparable clinical outcome might be reached with the DHS at a substantially lower cost than with the PFN.

A likely weakness of this study was its limited sample size. Some observations, such as the incidence of technical mistakes, implant failure, and second surgery, which were not statistically significant in our analysis but were recorded in numerous other studies, are likely the result of this study's small sample size.

## IV. CONCLUSION:

Recently, the PFN has gained immense popularity as a therapy for unstable intertrochanteric fractures. For stable fractures, however, it remains debatable whether DHS is superior. Despite the fact that PFN offers the benefits of greater biomechanical strength, a shorter duration of surgery, less extensive surgery, and earlier weight-bearing, numerous recent studies have revealed an increase in the incidence of post-operative implant-related complications and the rate of reoperation. In the present study, we also found that PFN offers a substantially shorter procedure with a smaller incision, resulting in

fewer wound-related problems. However, the incidence of technical errors was somewhat higher with PFN because it is a technically more demanding surgery, which leads to a greater number of implant failures and, consequently, reoperations. As the incidence of superior cut out was comparable between the PFN and DHS, the PFN's double screws do not give any additional hold in the head. The PFN is a substantially more expensive implant than the DHS with nearly identical results. In stable IT fractures, the PFN is not superior to the DHS in terms of shortening at final follow-up. Despite the fact that the end functional outcome is comparable for both implants, early abductor lurch for many months is a substantial disadvantage of PFN.

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