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Original Research Article

Comparative Evaluation of Hip and Femur Fractures by DHS versus PFN Treatment

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Abstract

Aim: To assess and contrast the radiological and clinical results of patients with stable intertrochanteric fractures treated with proximal femoral nail (PFN) versus dynamic hip screw (DHS)

Method: The PFN and DHS groups each contained 50 patients with stable intertrochanteric fractures who were older than 19 years. An adapted ultra-short PFN and DHS with a three-hole side-plate and an anti-rotation screw were implemented for the lower population. The intraoperative, early, and late problems were noted, and the Harris Hip Score was used to evaluate each group's functional result.

Results: The Harris Hip Score was marginally lower in the DHS group over the course of 15 days than it was in the PFN group. However, the DHS group displayed higher mean scores than the PFN group at the 2- and 5-month monthly follow-ups; at the 6-month follow-up, both groups obtained comparable scores.

Conclusion: PFN offers a substantially quicker procedure with a smaller incision that causes fewer issues from the wound. However, because PFN is a technically more difficult procedure that results in more complications associated and the subsequent re-operations, the occurrence of technical mistakes was much greater in PFN when compared to DHS.

Keywords: proximal femoral nail, dynamic hip screw, Harris Hip Score

Introduction

Since higher long-term viability and an increase in traffic accidents, intertrochanteric fractures have become more common. About 50% of hip fractures in the elderly are inter-trochanteric fractures [1, 2]. Any Intertrochanteric (IT) fracture should be treated with an early motion restoration strategy to reduce the risk of medical problems and return the patient to their pre-operative condition. The dynamic hip screw (DHS), particularly for stable intertrochanteric fractures, is currently regarded as the gold standard for comparing outcomes. 3 Since its introduction by the AO/ASIF group in 1998, the proximal femoral nail (PFN) has grown significantly in acceptance as a therapy for trochanteric fractures. The benefit of proximal femoral nailing fixation is that it shortens the distance between the hip joint and the implant, resulting in a design that is more biomechanically stable [4,5]. Most research conducted to date have assessed PFN's performance in unstable fractures, but the effectiveness of DHS in stable IT fractures has received less

attention. The objective of the current study was to assess and contrast the clinical and radiological results of patients with stable intertrochanteric fractures who received PFN and DHS treatment. The study's main finding was that stable IT fractures treated with PFN and DHS result in equal functional outcomes.

Method:

50 cases of stable intertrochanteric fractures in patients older than 19 years old were included in this prospective interventional study between 2020 and 2021 at Care Hospital, Hyderabad. Any case where the marrow cavity was closed by a malformed femur or aberrant femoral bending, another implant, osteopetrosis, a pathological fracture, or an old severe fracture fell under the exclusion criteria. The hospital ethics committee gave the study their blessing, and each patient gave their informed consent. Alternative patients who met the inclusion and exclusion requirements received DHS or PFN treatment, accordingly. In both groups, the same surgeon operated on every patient. As soon as feasible following pertinent examinations, radiographs, anaesthesia evaluations, and doctor approval, patients were carried up for surgery. When the patient was supine, a typical fracture table was employed. All fractures were stable, therefore DHS with a side plate that had three holes and an antirotation screw was used in every case.

In the other group, a modified ultra-short PFN that was appropriate for the smaller population was utilised. Before making entry for the PFN and DHS, closed reduction was tried in every patient. If closed reduction could not be achieved, indirect reduction utilising percutaneous or mini-open methods was performed. After surgery, all patients who had undergone a similar rehabilitation regimen, beginning with dynamic quadriceps and ankle pump exercises on the first day. Early mobilisation with a walker was encouraged with no weight bearing at first, followed by partial weight bearing depending on the patient's compliance. First follow-up appointments were recommended for patients two weeks following hospital release, followed by appointments every four weeks until 20 weeks had passed since surgery.

The clinical result for each group was examined, along with the intraoperative, early (within the first month following hip fracture surgery), and late problems (beyond the first month). Harris Hip Scores were used to evaluate the patient functional outcomes following regular follow-up visits [6]. The collected data was then statistically evaluated using the student's t-test for quantitative data like duration, blood loss, and Harris hip scores and the Z ratio for significance of the difference between two independent proportions for qualitative demographic data. If the p-value was less than 0.04 when the null hypothesis was applied, the observed difference was considered relevant.

Results:

In the current investigation, 60 stable intertrochanteric femur fracture cases of either sex were included. Twenty of these patients were treated with a dynamic hip screw, and thirty with a proximal femoral nail. In our research, the oldest participant was 80 years old, and the youngest was 45. Although the PFN group's mean incision length was smaller ($p < 0.02$), their radiation doses were significantly higher ($p < 0.02$). Surgery in the PFN group took less time overall, which was statistically significant ($p < 0.02$) **(Table 1**).

Table 1: Demonstrating pre-treatment and early assessments.

Observation	DHS (n=20)	PFN (n=30)	P-value
Gender ratio (M/F)	65.50%	60.66%	0.92
Mean Age (range)	62.26 yr (45-50)	60.6 (45-80)	0.52
Mean hospital stay	10.0	9.28	0.12
Duration of surgery	39.4±30.1	37.3 ± 19.5	<0.02
Radiation exposure	48.6	70	<0.02
Length of incision	7.8	4.8	<0.02
Average age of fracture in days	4.4	4.0	0.33
Average blood loss (ml)	220 ml	108 ml	<0.02
Individuals who necessitate blood transfusions	2	1	0.28
Duration of weight bearing	7.7 weeks	7.1 weeks	0.411

In the DHS group, average blood was considerably higher (p > 0.02), and three patients needed blood transfusions after surgery as opposed to 1 in the PFN group. Out of the 50 pateints where the decrease was achieved using indirect reduction approaches, closed reduction was attempted and successful in all but 2 case. The DHS group had a slightly longer average hospital stay, however this was not shown to be statistically significant.

For DHS, the average implant cost was roughly 54% of what it was for PFN. The DHS group had a slightly longer mean time before enabling full weight bearing, but this difference was not statistically significant. Both groups' early and late complications were recorded and contrasted. Technical errors were more frequent in the PFN group (9.66% versus 3.47%), whereas extended drainage and superficial infections were more frequent in the DHS group, even if the difference in these complications' occurrence was not statistically significant. Iatrogenic fractures, DVT, deep infections, nonunions, or malunions were not reported in this study. The rate of mortality was the same in all groups (2 death in each group), it didn't have anything to do with the surgery, and it happened 2 months after the operation.

The PFN group had a higher incidence of loss of reduction, implant failure, and subsequent re-operation, but this was not statistically significant. At the final follow-up, mean shortening was comparable between the two groups. At the scheduled interval follow-ups, the Harris hip score was used to evaluate functional outcomes in all patients.

The 2-month mean hip score in the D.H.S group was somewhat lower than in the P.F.N group, albeit this difference was not statistically significant (p value > 0.04) (**Table 2)**.

Table 2: Mean Harris hip score

Mean Harris hip score	D.H.S Group	P.F.N Group	P- value
15 days	24.7	26.0	0.11
2 months	53.3	47.5	<0.02
5 months	88.5	82.1	<0.02
6 months	94.3	94.1	0.78

However, the DHS group had higher mean scores than the PFN group at the two month and five-month follow-ups (p 0.02), but at the 6-month mark, both groups had reached similar levels (p-value > 0.04).

Discussion:

Intertrochanteric fracture therapy has advanced dramatically during the past few decades. Different fixing techniques have changed over time. The kind of fracture and

bone quality still require the appropriate therapy. DHS has long been regarded as the gold standard for fixing intertrochanteric fractures, particularly for stable fracture types [3]. Since it is an intramedullary implant, the PFN imparts a lower bending moment, substitutes for the role of the medial column, and serves as a buttress to prevent medialization of the shaft, which can lead to implant-related comorbidities of DHS and make surgical treatment of unstable intertrochanteric fractures easier [7]. However, it is still debatable if all these traits help in enhancing the result compared to the DHS in stable IT fractures. In the current study, we evaluated postoperative observations, comorbidities, and outcome measures between two groups of patients who were treated with DHS and PFN, respectively, and who were matched for demographic and preoperative factors. Compared to the DHS group, the mean incision length in the PFN group was 61% shorter. Comparable results were found in other research, including those conducted by Pan et al. [8] and Zhao et al. [9]. Although implant fixation took about the same amount of time in both groups as PFN, DHS required much more time to close the wound. This was likely because DHS required a bigger incision and more extensive dissection than the percutaneous method used in PFN. Pan et al., [8] Saudan et al., [10] Shen et al. [11], and Zhao et al. [9] made similar observations. Although the average blood in the DHS group was higher, only 3 of the patients in this group needed blood transfusions, so this difference was not clinically significant. The PFN group experienced shorter median hospital stays and full weight-bearing periods. Early problems in the DHS group included superficial infections and extended wound drainage, which were not detected in the PFN group and were treated with routine dressings. Although there were no occurrences of deep infection, these were probably caused by the longer incision and extensive dissection in DHS cases. In these implant failure cases, loss of reduction was evident as varus collapse. Varus collapse was one symptom of loss of decrease in implant failure situations. In both groups, the mean shortening at the final follow-up was comparable. This stood out from the majority of prior studies likely because all of the cases in our analysis were stable type intertrochanteric fractures that were reduced intraoperatively, leaving little room for the sliding mechanism of DHS to operate and result in any shortening. At 15 days, 2 months, 5 months, and 6 months of follow-up, mean Harris hip scores were calculated and compared in both groups. Initially, the DHS group's functional ratings were marginally lower than those of the PFN group, but at the 2 and 5-month follow-ups, it was discovered that the DHS patients had fared marginally better. This was most likely brought on by the abductor lurch that occurs while walking and the significantly smaller range of abduction in the PFN group when compared to DHS patients. However, at yearly check-ups, the results in both groups were comparable, perhaps as a result of restoring abductor strength with ongoing physical therapy. Thus, as indicated by Giraud et al [12], a comparable end clinical outcome might be obtained by the DHS at a considerably more reasonable cost as compared to the PFN. This study's likely drawback was its smaller sample size. The reduced sample size of this study may have contributed to some observations, such as the frequency of technical errors, implant failure, second surgery, etc., that were documented in many previous studies but were not statistically meaningful in our research. [13]

Conclusion:

Recently, the PFN has become incredibly popular for treating unstable intertrochanteric fractures. But whether it is superior to DHS for stable fractures is still up for debate. Many recent studies have demonstrated that there is a higher prevalence of postoperative implant comorbidities and reoperation rate, despite

PFN proponents' claims that it offers the benefits of better biomechanical strength, shorter operating times, less extensive surgeries, and earlier weight bearing. Similar outcomes were found in the current investigation, showing that PFN offers much quicker surgical times with smaller incisions and fewer wound-related problems. However, because PFN is a technically more difficult procedure, the rate of technical errors was slightly higher. This further results in more implant failures and subsequent re-operations. As the incidence of superior cut out was identical in both, the dual screws of the PFN do not offer any additional hold in the head compared to the DHS. The PFN has a nearly identical final result but is a substantially more expensive implant than the DHS. The PFN also does not perform any differently than the DHS in terms of reduction at final follow up in stable IT fractures. The initial abductor lurch lasting many months is a substantial disadvantage with PFN, despite the fact that the end functional outcome is similar with both implants.

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