Original Article

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A comparative study of fixation of Unstable intertrochanteric Fractures of femur in elderly with dynamic hip screw and proximal femoral nail

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Abstract

Introduction: Intertrochanteric femur fractures are a common entity in the elderly population and most of them occur following trivial trauma. The incidence of these fractures worldwide is on the rise owing to the increased life expectancy and osteoporosis. The optimal treatment of unstable fractures especially in severely osteoporotic patients remains controversial. Poor bone quality, excessive collapse, metal failure, loss of fixation, and cut-out of the lag screw are the common problems encountered during the attempts to fix these fractures. However, the advantage of Proximal Femur Nailing fixation is that it provides a more biomechanically stable construct by reducing the distance between hip joint and implant

Objective: The purpose of our study was to compare the results of Proximal femur nail [PFN] and dynamic hip screw [DHS] for unstable intertrochanteric fractures of elderly in terms of functional outcome and complications.

Methods: From 2017-2019, 100 patients were enrolled in the study as per the inclusion criteria and results were analysed prospectively. According to AO Classification, type 3A2.2 and 3A2.3 and above were included. 60 were operated with Short PFN and 40 with Dynamic hip screw. Patients were followed up at regular intervals of 4 weeks, 8 weeks, 12 weeks, 6 months and annually thereafter. The functional results were assessed with Harris Hip Score. Results: 37.5% excellent results in DHS group and 66.2% excellent results in PFN group were obtained. We observed statistically significant difference between two groups in view of functional outcomes, complications and time to union. Total duration of surgery was significantly lower in PFN group

Conclusion: For severe osteoporotic elderly with unstable fractures, Short PFN is an effective surgical method compared to DHS to reduce the complications and improve the functional outcome. The procedure offers the best chance to the patient for faster mobilization, improves the quality of life and gives a long-term solution.

Keywords: Intertrochanteric fractures, femur, dynamic, proximal femoral.

Introduction

Intertrochanteric femur fractures are a common entity in the elderly population and most of them occur following trivial trauma. The incidence of these fractures worldwide is on the rise owing to the increased life expectancy and osteoporosis [1-3]. Intertrochanteric fractures account for 50% of hip fractures and the mortality rate at the end of 1 year following fracture is as high as 15-20% [4]. The goal of treatment of any intertrochanteric fracture is to restore mobility safely and efficiently while minimizing the risk of medical complications and restore the patient to pre-operative status. The DHS has been shown to produce good results but complications are frequent, particularly in unstable inter-trochanteric fracture. The advantage of Proximal Femur Nailing fixation is that it provides a more biomechanically stable construct by reducing the distance between hip joint and implant [5-6]. The goal of this study is to compare the clinical and radiographical results of the DHS and PFN for the treatment of Inter-trochanteric hip fractures (Load bearing vs Load shearing).

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Material and Methods

100 patients aged above 60 years with unstable inter-trochanteric fractures were included in the study. All these patients who underwent treatment at a tertiary care centre between Jan 2017 to Jan 2019 had undergone radiographs and pre-operative screening. Only patients with AO type 3A2.2 and 3A2.3 and above were included in the study. 60 were operated with Short PFN and 40 with Dynamic hip screw. Patients were followed up at regular intervals of 4 weeks, 8 weeks, 12 weeks, 6 months and annually thereafter. Age, gender, type of fracture according to AO classification, modality of the treatment received, associated comorbid conditions, ambulatory status, post-treatment complications were recorded.

Exclusion criteria were age below 60 years, patients with less than 2 years of follow-up bilateral fractures (spontaneous), Pathological fractures, fractures associated with polytrauma, pre-existing femoral deformity [7] preventing hip screw osteosynthesis or intra-medullary nailing, sub-trochanteric

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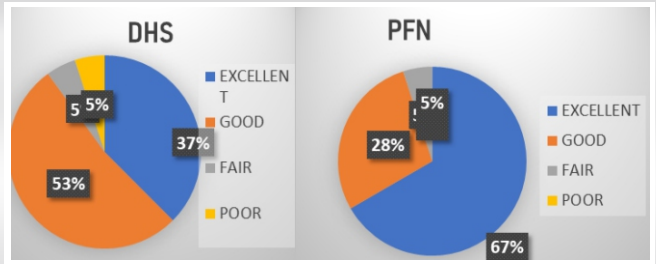

Figure 1: Result according to Harris hip score. Figure 1a shows the result distribution in DHS who's mean score is 79. Figure 1b shows the result distribution in PFN group who's mean score is 91.

fractures [8-9] or fractures extending 5 cm distal to the inferior border of the lesser trochanter, severe cardiovascular disease, patients considered as high risk for surgery.

The decision for the choice of the implant was based on surgeon's preference. Prior to hip surgery, each patient was evaluated by the same trauma team. The overall time from injury to surgery averaged 5.2 days (range: 1–11 days). Patients were optimised prior to surgery. All surgeries were performed on the traction table following closed reduction confirmed with fluoroscopy on two different planes. The functional outcome for each group was evaluated and complications were recorded. Patients followed up at regular intervals of 4 weeks, 8 week, 12 weeks, 6 months and annually thereafter. Their functional outcome assessed with Harris Hip score [10]

Results

In our study, the mean age of the patients was 74 (60-85) years in the group which was treated with PFN and 72 (61-81) in the group which was treated with DHS. The detailed information regarding the age, sex distribution, and fracture classification of the patients have been summarized in TABLE 1. Fracture classification was done by a single person with the help of radiographs. The result was declared excellent (with scores of 90-100), good (80-89), fair (70-79), and fair (scores less than 70). The results of our study according to HARRIS HIP SCORE have been summarised in FIGURE 1. The mean of Harris hip score in the group treated with PFN was 91. Whereas, the group treated with DHS was 79. Statistically significant difference was found between the two groups with a p-value being <0.05.

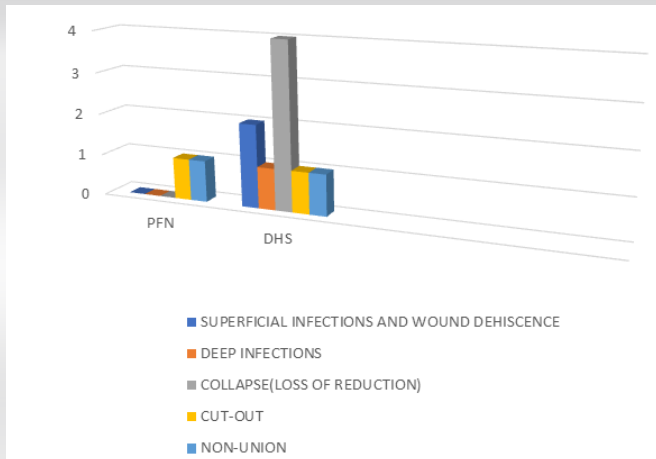

Figure 3: Graphical representation of complications in both the treatment groups.

Figure 2: Pre-operative and 1 year post-operative x-rays of a patient operated with PFN showing radiological union with no complications.

A case illustration showing excellent functional outcome following PFN has been shown in FIGURE 2.

The complications encountered in both the treatment groups as shown in FIGURE 3 were superficial infections, implant cutout, collapse of the reduction leading to medialisation of the shaft as illustrated in FIGURE 4, nonunion and deep infection. The complication rate in the group operated by PFN was 3.33% and DHS was 22.5% which was statistically significant with a p-value of <0.05. The group which was operated with PFN did not develop superficial or deep infection and collapse of the fracture. None of the groups developed the Z effect or implant breakage.

Discussion

Intertrochanteric fractures that occur in elderly individuals are often severely comminuted and displaced. These patients, owing to severe osteoporosis are often associated with complications such as non-union, metal failure, and femoral

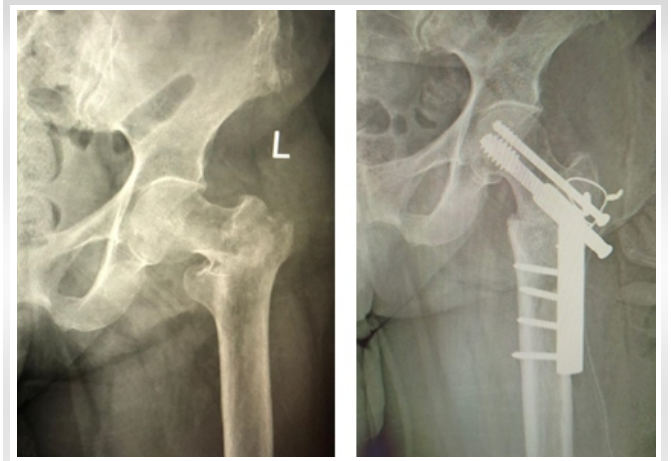

Figure 4: Pre-operative x-ray and 3 month post-operative x-ray of a patient operated with DHS plating showing loss of reduction with medialization of the shaft.

Table 1: Clinical characteristics of two clinical groups.

n	PFN (60)	DHS (40)
Age distribution	60-85yrs	61-81yrs
Sex		
Male	23	15
Female	37	25
Classification		
AO 3A2.2	32	24
AO 3A2.3	28	16

Table 2: Comparison of various intra-operative and post-operative entities of both the group

	PFN (60)	DHS (40)	Test of significance p-value
Mean operative time (in minutes)	88	115	0
Mean blood loss (in ml)	134	227	0
Duration of hospital stay (in days)	5	11	0
Time taken to weight bear (in days)	14	43	0

head perforation with internal fixation. [11-12]. Although union rates as high as 100% have been reported in association with well-reduced, stable fractures that were treated with ideal implant placements, failure rates of as high as 56% have been noted in association with unstable fractures, comminutions, or poor bone qualities in elderly patients. The failure after internal fixation has been attributed to initial fracture pattern, comminution, sub- optimal fracture fixation, and poor bone quality [13-14]. The dynamic hip screw has been the standard implant of choice for stable fractures. However, intramedullary device which provided better biomechanical stability for fixation. However, early weight-bearing following internal fixation with DHS of such comminuted unstable fractures by any means in an elderly osteoporotic individual leads to failure of fixation and poor results necessitating an extended period of nil weight-bearing for these patients [15]. Hence, this period of restricted mobilization leads to various complications such as atelectasis, bedsores, pneumonia, deep vein thrombosis in a subset of patients with various other co-morbidities [16-17]. Hence, early ambulation remains one of the top priorities in deciding the treatment for unstable intertrochanteric fractures in the elderly with severe osteoporosis. Considering the fact that additional surgical exposure is required for the DHS fixation, it can theoretically prolong the operative time and thus the blood loss in DHS than PFN. It can easily be noted that the blood loss and operative time was more in DHS group and it was statistically significant as indicated by the p value. Even, regarding the hospital stay the PFN group had a significantly lower days to spend in the hospital, as they were out of bed early, as the intra-medullary load-bearing device allowed for early mobilisation. The time to weight bear had the striking difference between the two groups. PFN group were able to weight bear at 14 days, whereas the DHS group at 43 days. (TABLE 2). This, prevents various complications associated with prolonged weight bearing. With respect to the above parameters, PFN group fared better than the DHS group. All the above parameters need to be taken into account, while offering a surgical solution to the patient.

Functional outcomes were significantly higher with the PFN group. Patients with excellent results are 40(67%) in PFN and 15(37%) in DHS, patients with good results are 17(28%) in PFN and 21(53%) in DHS, patients with fair results are 3(5%) in PFN and 2(5%) in DHS and patients with poor results are 2(5%) in DHS and no patient with poor results in PFN group.

A comparison of complication rates revealed statistically significant differences between study groups (P = 0.324). The outcome of stable fractures treated with either DHS or PFN are similar, however, unstable inter-trochanteric fractures treated with PFN has significantly better outcomes compared to DHS group. None of the patients operated with PFN developed the dreaded complication of loss of reduction leading to medialisation of the shaft. The intra-medullary device reduced the lever arm distance between the center of hip and the implant. Out of 40 fractures in DHS group, 4 developed loss of reduction. Whereas, none of the PFN group developed this complication. In unstable fractures reduction loss is significantly lower in PFN than in DHS ($p<0.005$). As the PFN requires the smaller incisions with reduced operating time, none of the patients in this group developed any sort of infections.

We recognize some of the limitations in our study. One of them being the small sample size. We have not taken into consideration the fracture obliquity in the outcome. The exact amount of weight transferred onto the weight-bearing limb is not quantified and the osteoporosis is not taken into account.

Conclusion

Our conclusion from this study supported the use of PFN for unstable intertrochanteric fractures in the elderly due to its statistically significant better functional outcomes, early weight bearing, earlier return to pre-injury level of work, lesser operative time, lesser blood loss, limited surgical exposure and low complication rates. The only disadvantage of PFN being that it has a greater learning curve and comes out well only with experienced hands. In current scenario DHS should be limited to stable intertrochanteric fractures with an intact lateral wall.

Declaration of patient consent : The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest : Nil **Source of support :** None

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