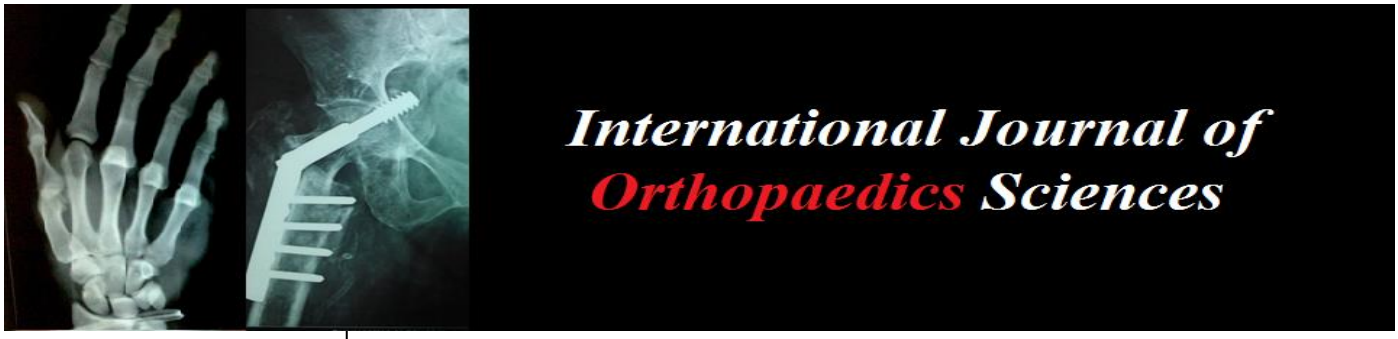

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A study to assess proximal femoral nailing versus dynamic hip screw device in surgical management of intertrochanteric fractures: A comparative study

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Abstract
Background: An inter-trochanteric fracture is a type of hip fracture specifically, which are bony protrusions of femur where the muscles of thigh and hip attach. 50% of all hip fractures caused by falling are inter-trochanteric.
Aim: The present study assessed the functional outcomes with DHS and proximal femoral nail (PFN) in inter-trochanteric management of fractures.
Materials and Methods: This study was a prospective study which was performed for a period of one year. A total of 40 patients were enrolled during the study. DHS and PFN are the two different implants used for management of intertrochanteric fractures.
Results: Functional outcome was better and excellent in PFN (65%) compared to that of DHS (50%). The complications were lesser in Paticipants who were treated by PFN compared to that of participants treated with DHS.
Conclusions: Proximal femoral nailing method is preferable method in inter-trochanteric fractures management as it has better functional outcome and lesser complications compared to DHS method.

Keywords: Dynamic hip screw, proximal femoral nailing, inter-trochanteric, implant

Introduction
A fracture which extends from the extra capsular basilar neck of the femur to the lesser trochanter was called as intertrochanteric fracture. It was observed that there was a high incidence of the intertrochanteric fracture as there was an increase in life span and sedentary life style among the people of the society. There was an increased osteoporosis incidence among elderly, which lead to high intertrochanteric fracture incidence. Women are more prone to fractures compared to men as about 90% of the elderly of more than 50 years of age fall from height. These fractures are more in men due to high speed vehicular accidents and are more common in the younger age i.e. around 40 years [1]. By 2040, it was estimated that there was doubling the incidence of the intertrochanteric fractures [2]. 45% to 50% of the elderly population were affected. Unstable fractures will be observed in nearly 60% of the population. The communication of the posteromedial buttress which exceeds a lesser trochanteric fragment or the sub trochanteric extension is considered to be an unstable intertrochanteric fracture. These unstable fractures are the major cause of morbidity and mortality among the elderly. Depending on the type, cause and severity, the intertrochanteric fracture is presented. As there is a shortening and externally rotated limb leading to inability of the patient to walk, a fracture which is displaced is symptomatic, thus not much pain is observed and mobility is also observed in patients [3]. To restore the mobility of the patients in an efficient way with least complications is very important. This depends on the quality of the bone and the implant used for the treatment. For treating the trochanteric fractures, dynamic hip screw (DHS) or sliding hip screw (SHS) has been the standard. There is a biomedical disadvantage, which is a greater distance between the weight bearing axis and the implants was observed [4, 5]. To face this challenge, it is better to use inter-medullary implants. The proximal femoral nailing is found to be more efficient intramedullary load transfer, less failure of implants, maintenance of controlled impaction, less deformity and shortening of limbs and lesser blood loss was observed in management of inter-trochanteric fractures.

Thus, the present study assessed the functional outcomes with DHS and proximal femoral nail (PFN) in inter-trochanteric management of fractures.

Materials and Methods

This study was a prospective study which was performed in Department of Orthopaedics at Gandhi Medical College, Hyderabad for a period of one year from February 2017 to March 2018. The patients were evaluated as per the history, mode of injury. Necessary radiological investigations and hematology profile was done on admission. Type of surgery and details were noted. The immediate post-operative x-rays were evaluated. All the cases were again evaluated through clinical and radiological methods at 6 weeks, 12 weeks, 6 months and 1 year for any morbidity and mortality.

Descriptive and comparative study of functional outcome following surgical management of intertrochanteric fractures with either proximal femoral nailing or dynamic hip screw fixation.

A sample of size 40 was selected using purposive sampling technique. 20 patients have undergone proximal femoral nailing. 20 patients have undergone dynamic hip screw fixation.

Inclusion criteria: All patients above 18 years of age with fresh intertrochanteric fracture and who were able to walk prior to the fracture.

Exclusion criteria: Patient with pathological fracture, active infection unstable medical illness and non-traumatic disorder.

The mode of injury were classified under 3 different categories taking into consideration whether the injury was due to a road traffic accident, trivial fall or a fall from height. 30 out of 40 cases mode of injury was due to road traffic accident.

The youngest patient in the series was aged 32 years and the oldest was 86 years. 27 of our patient were older than 60 yrs.

The pre-injury walking ability was recorded as per the classification of Sahlstrand74. Anterioposterior and lateral radiographs of the affected hip were taken. The patients were then put on skin traction over a Bohler– Braun frame. All the patients were initially evaluated as to their general condition; hydration and corrective measures were undertaken. The fractures were classified as per Jensen and Michealsen's modification of Evans classification of intertrochanteric fractures. Type I and type II were considered as stable fractures and type III, IV and V were considered as unstable fractures. No open fractures were encountered in this series. Patients were taken up for surgery on next elective OT day. Adequate blood transfusion and other supportive measures were given depending on the preoperative condition of the patient and blood loss during surgery.

The fractures were fixed with either dynamic hip screw fixation or proximal femoral nailing. Allocation of the fractures to each treatment group was done by random selection. Of the 40 patients in the study, 20 were treated with dynamic hip screw fixation and 20 with proximal femoral nailing. The length of the incision, duration of surgery, blood loss and fluoroscopy time was recorded intraoperatively.

After the Institutional ethical committee clearance, a pre-designed, pre-structured questionnaire was prepared. Informed consent was signed from all patients. In causality department, all the participants who had inter-trochanteric fractures were initially treated with emergency. All clinical and radiological investigations were performed. Postoperative care.

There was no defined postoperative patient protocol, but all patients were given peri-operative antibiotics for 24 to 48 hours and deep venous thrombosis prophylaxis. Patients were allowed to sit up in bed on the second post-operative day. Static quadriceps exercises where started on the second and third post-operative day. Sutures were removed after 10 to 14 days. Patients were mobilized non-weight bearing as soon as the pain or general condition permitted. Weight bearing was commenced depending upon the stability of the fracture and adequacy of fixation, delaying it for patients with unstable or inadequate fixation.

All the patients were followed up at 6 weeks 3 months and 6 months intervals for a period of 6 months and check x-rays were taken to assess fracture union and signs of failure of fixation. Walking ability of each patient was recorded and compared with pre-injury walking ability using the Sahlstrand74 grading. Post operative pain was evaluated using the four-point pain score as also used by Saudan40. The fracture union was considered as malunion if Varus angulation was greater than 10 degrees.

Results

Table 1: Distribution of patients according to age and sex**.**

Age Distribution	DHS	PFN
Age (in years)	N (%)	N (%)
20-40	03 (15%)	03 (15%)
41-60	06 (30%)	05 (25%)
>60	11 (55%)	12 (60%)
P-Value	0.935	
Sex Distribution	DHS	PFN
Male	13 (65%)	14 (70%)
Female	7 (35%)	6 (30%)
P-Value	0.865	

Table 1 shows that the age group of more than 60 years showed majority of study participants in patients who were treated with DHS i.e. 55%, while in patients treated with PFN, majority of study participants were observed in age group of more than 60 years i.e. 60%. In DHS group, 30% were in age group 41-60 years, while in PFN group, 25% were in age group 41-60 years. Majority of patients were males in both the groups, in DHS (65%) and PFN (70%) respectively.

Table 2: Distribution of study participants with other characteristics.

Characteristics	DHS	PFN
Site of fracture	**N (%)**	**N (%)**
Right	09 (45%)	12 (60%)
Left	11 (55%)	8 (40%)
Type of trauma	**N (%)**	**N (%)**
Road traffic accident	8 (40%)	7 (35%)
Domestic Fall	10 (50%)	12 (60%)
Others	2 (10%)	1 (5%)

Table 2 shows that right side injury was observed in 45% patients who were treated with DHS, and it was observed in 60% of patients treated with PFN. Left side injury was observed in 55% patients treated with DHS and 40% patients treated with PFN. Among those patients who were treated with DHS, the type of trauma of due to road traffic accident was in 40%, due to domestic fall 50% and due to other reasons 10% while in PFN, inter-trochanteric fractures was seen in 35% due to road traffic accident, 60% due to domestic fall and 5% due to other reasons.

Table 3: Distribution of participants with type of intertrochanteric fractures

Type of Inter-trochanteric fractures	DHS	PFN
Type I	4 (20%)	3 (15%)
Type II	5 (25%)	6 (30%)
Type III	8 (40%)	1 (5%)
Type IV	1 (5%)	7 (35%)
Type V	2 (10%)	3 (15%)

Table 3 shows that among those treated with DHS, 40% of the participants were having type III inter-trochanteric fractures while 35% were having type IV inter-trochanteric fractures who were treated with PFN.

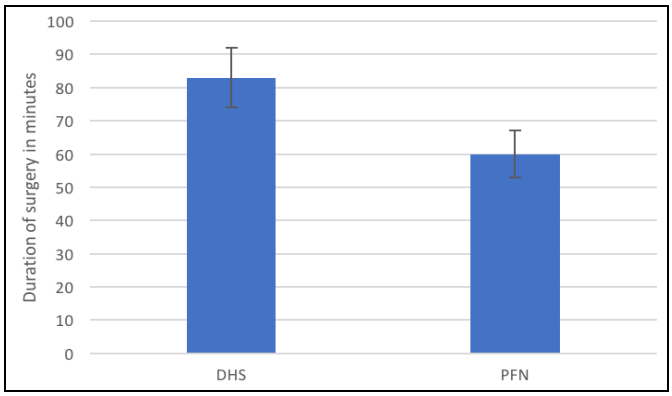

Fig 1: Duration of surgery in study

Table 4: Distribution of participants with complications

Complications	DHS	PFN
Bed sore	2 (10%)	2 (10%)
Non union	2 (10%)	0
Shortening	0	2 (10%)
UTI	3 (15%)	2 (10%)
Thrombophlebitis	1 (5%)	1 (5%)
Superficial infection	1 (5%)	0

Table 4 shows that in both groups, the post-operative complications were minimal. UTI was observed in 15% of the participants who were treated with DHS while it was seen in 10% participants who were treated with PFN. Non-union was seen in 10% of the participants who were treated with DHS. Thrombophlebitis was seen in both the groups in one study participants only.

Table 5: Distribution based on outcome using Harris hip score.

Harris Hip score	DHS	PFN
Excellent	10 (50%)	13(65%)
Good	3 (15%)	6 (30%)
Fair	4(20%)	1(5%)
Poor	3(15%)	0

Table 5 shows that the functional outcome using Harris hip score was excellent in 50% in participants treated with DHS, 65% in participants treated with PFN. Good score was more in participants who were treated with PFN (30%), Fair score was more in participants

Discussion

Our study consists of 40 patient with 40 intertrochanteric fractures out of which 20 was treated with DHS and 20 with PFN.

In present study age group of more than 60 years showed majority of study participants in patients who were treated with DHS i.e. 55%, while in patients treated with PFN, majority of study participants were observed in age group of more than 60 years i.e. 60%. In DHS group, 30% were in age group 41-60 years, while in PFN group, 25% were in age group 41-60 years. Majority of patients were males in both the groups, in DHS (65%) and PFN (70%). In study done by Swamy *et al.* [6], it was observed that majority of study participants were in the age group of 41-60 years such as 56% those who were treated with DHS and 53% those who were treated with PFN which is not similar with the present study. In present study, it was observed that the age group of more than 60 years showed majority of study participants in patients who were treated with DHS i.e. 55%, while in patients treated with PFN, majority of study participants were observed in age group of more than 60 years i.e. 60%. In DHS group, 30% were in age group 41-60 years, while in PFN group, 25% were in age group 41-60 years. In Kumar RM[7] study, participants were in the age group of 50-80years which is similar to present study.56% were males in DHS group and in PFN group, 50% were males in Swamy *et al.* [6] study. In Mansukhani *et al.* [8], study majority of males were present in both the groups whereas in the present study, majority of patients were males in both the groups, in DHS (65%) and PFN (70%) respectively.

In the present study, right side injury was observed in 45% patients who were treated with DHS, and it was observed in 60% of patients treated with PFN, left side injury was observed in 55% patients treated with DHS and 40% patients treated with PFN, whereas in Kumar RM[7] study, right sided injury was observed in 62.5% of the DHS group and left sided injury was observed in 37.5% which was not similar to present study. In PFN group 58.3% were having right side injury and 41.7% were having left side injury which is similar to present study. In DHS group, 70% were having right side injury and in PFN group 35% were having right sided injury in Veergandham *et al.* [9] study. In the present study, among those patients who were treated with DHS, the type of trauma of due to road traffic accident was in 40%, due to domestic fall 50% and due to other reasons 10% while in PFN, inter-trochanteric fractures was seen in 35% due to road traffic accident, 60% due to domestic fall and 5% due to other reasons whereas in Veergandham study [9], domestic accident Played a pivotal etiological factor for inter-trochanteric fractures in both the groups i.e. DHS (65%) and PFN group (45%). 68.8% of the participants had a domestic fall and 31.3% had road accident in Kumar *et al.* [10] study. In the present study, 40% of the participants were having type III inter-trochanteric fractures in DHS group while 35% were having type IV inter-trochanteric fractures who were treated with PFN. Majority of study participants in DHS group were having type-II type of intertrochanteric fracture which was similar with PFN group also which is not similar with present study in a study done by Swamy *et al.* [6] study.

The duration of surgery in the DHS group ranged from 83 minutes to 112 minutes with a mean of 86.5 minutes. The duration of surgery in the PFN group ranged from 60 minutes to 90 minutes with a mean of 70 minutes. The difference in the operative times in both groups was found to be highly significant and we attributed this difference to the smaller incisions in the PFN group. Baumgaertner *et al*. 35 also found that the surgical times were 10 per cent higher in the DHS group in their series. Saudan and colleagues40 found that there was no significant difference between the operative times in the two groups in their series.

In the present study, the post-operative complications were

minimal in both the DHS and PFN group. UTI was observed in 15% of the participants who were treated with DHS while it was seen in 10% participants who were treated with PFN. Non-union was seen in 10% of the participants who were treated with DHS. Thrombophlebitis was seen in both the groups in one study participants only. In Veeragandham study [9], 10% of study participants showed UTI in both the groups which was followed by superficial infection in both the groups. In Mansukhani study [8], superficial infection was seen in 11% of study participants in DHS group. Swamy study [6] showed DHS group superficial infection was seen in 3.3% study participants. Non-union was seen in 3.3% in PFN group while shortening was seen in 6.6% in DHS group in both Kumar RM[7] and Swamy studies [6].

The functional outcome using Harris hip score was excellent in 50% in participants treated with DHS, 65% in participants treated with PFN. Good score was more in participants who were treated with PFN (30%), Fair score was more in participants who were treated with DHS (20%) in the present study whereas In Kumar RM study [7] it was found that 62% were having excellent score with PFN which is consistent with the present study findings. In Swamy *et al*. [6], study excellent core was seen in majority of study participants who were operated using PFN. In Kumar *et al*. [10] and Chaitanya *et al*. [11] studies, similar findings were observed that functional outcome was excellent in majority study participants in PFN group.

Conclusion

In the present study, for management of inter-trochanteric fractures, two different implants were used and lesser complications were observed in participants who were treated with PFN compared to DHS marginally. In PFN group, the functional outcome was better compared to the DHS group. Hence, for inter-trochanteric fracture management, preference is to be given to PFN method.

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