

A Comparative Study of Dynamic Hip Screw versus Intramedullary Nail Fixation of Intertrochanteric Femur Fractures

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ABSTRACT

Background: The Intertrochanteric femur fractures are one of the commonest fractures in elderly population. surgical management has kept changing and evolved with development of newer concepts and implants. Dynamic Hip Screw (DHS) most commonly used implant is still considered the gold standard for treating intertrochanteric fractures. The load sharing devices (PFN) have better biomechanical strength and offer advantages like small incision, shorter operative time, early weight bearing and better results in intertrochanteric fractures. **Methods:** The goal of this study is to compare the functional results (harris hip score) and radiological results of the DHS and PFN for the treatment of Intertrochanteric femur fractures. In our study we have included 50 inter-trochanteric fractures, out of which 25 were treated with DHS fixation and 25 treated with PFN **Results:** patients were followed up at least for a period of 6 months and were assessed for radiological and functional outcome. **Conclusion:** In our assessment PFN may be the better fixation device for most inter-trochanteric ifractures.

Keywords: Inter-trochanteric femur fractures, Load bearing vs Load shearing, implants DHS/PFN, Internal fixation, closed reduction, radiological and functional outcome.

INTRODUCTION

The Intertrochanteric femur fractures are one of the commonest fractures in elderly population. Incidence of these fractures is increasing due to better life expectancy, growing number of population, industrialization and the road traffic accidents. In younger patients these fractures usually result from high energy trauma like road traffic accident, fall from height and accounts for only ten percent of total fractures whereas geriatric patients suffering from a trivial fall can sustain fracture in this area because of weakened bone due to osteoporosis and these accounts for ninety percent.^[1]

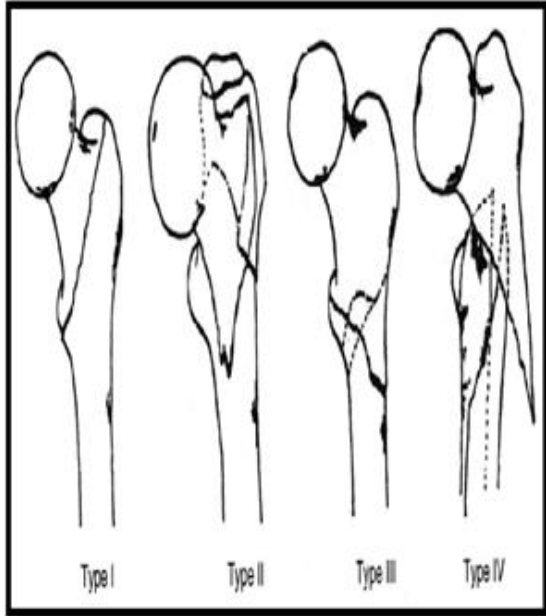
The geriatric age group, fractures are further associated with co-morbid conditions like diabetes mellitus, hypertension, coronary artery disease, chronic renal failure, thyroid disorders & other major chronic ailments which pose a high risk of life for anaesthesia and fracture complications. This imposes a significant challenge to orthopaedic surgeon for its efficient management by early

mobilization whether in elderly to reduce morbidity and mortality or in young to bring pain free productive life. All the circumstances mentioned above require using an urgent surgical solution for early rehabilitation and mobilization of the patient. Even surgical management has kept changing and evolved with development of newer concepts and implants. The load bearing Dynamic Hip Screw (DHS) most commonly used implant is still considered the gold standard for treating intertrochanteric fractures. The advantages and disadvantages of the DHS have been well established in several studies done in the past. The load sharing devices (PFN) having shorter lever arm with better biomechanical strength and offering other advantages like shorter operative time, less blood loss, less soft tissue damage, smaller incision & less wound related complications, perseveration of fracture biology, better rotational stability, early weight bearing and better results in intertrochanteric fractures, but it has its own short comings and disadvantages of higher cost, difficult technique, errors related to entry point, nail trajectory, screw migration and over exposure to radiation. The goal of this study is to compare the functional and radiological results of the DHS and PFN for the treatment of Inter-trochanteric femur fractures (Load bearing vs Load shearing).

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Boyd and Griffin's classification:



- Type 1:** Undisplaced, stable (two part).
- Type 2:** Unstable with posteromedial comminution.
- Type 3:** Subtrochanteric extension into lateral shaft, extension of the fracture distally at or just below the lesser trochanter.
- Type 4:** Subtrochanteric with intertrochanteric extension with fracture lying in at least two planes.

Aim and objective

Aim to compare the results of dynamic hip screw versus proximal femoral nail fixation of intertrochanteric femur fractures.
Objective Functional and radiological outcomes during 6 months of followup.

MATERIALS AND METHODS

Study center:

Department of Orthopaedics, muzaffarnagar medical college and hospital.

Period of study:

Eighteen months

Study design:

Prospective Randomized Control Trial.

Patient were randomized according to AO type of fracture pattern There were 2 units assigned for treatment and allocation was done such that one unit performed only DHS and another unit performed only PFN and patient operated according to the OT day of respective units as patient presented in the hospital. A total of 50 patients with Intertrochanteric fracture femur were managed with DHS and intramedullary nailing, 25 patients taken in each group. The patients were followed up for average 24 weeks.

Table 1: Study Groups

SL. NO	Age group(in years)	No.of patients	
		DHS	PFN
1	20 - 40	2	4
2	40 - 60	8	8
3	61 - 70	7	6
4	71 - 80	8	7
Sl. No	Type of fracture	Number of patients	
		DHS	PFN
1	31A2.1	5	4
2	31A2.2	13	12
3	31A2.3	7	9

According to AO/OTA classification.

A1 fractures are simple, two-part fractures,
A2 fractures have multiple fragments
A3 fractures includes reverse oblique and transverse fracture patterns

Inclusion Criteria:

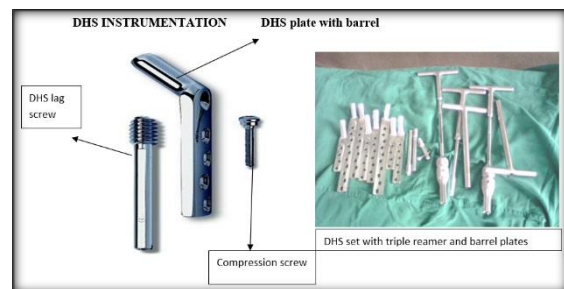
1. Clinicoradiological diagnosis of intertrochanteric femur fracture. (AO Type 31A2.1 to 31A2.3)
2. Age >20 years and <80years.
3. Both genders.

Exclusion criteria:

1. Compound fractures.
2. Pathological fractures.
3. Polytrauma patients.
4. Patients non ambulant before the fracture.
5. Previous surgery done on proximal femur.
6. Below 20 years of age.
7. Reverse oblique fractures and fractures with subtrochanteric extension.
8. Patients with cognitive disorders, on steroids or immunosuppressants.

Instrument specification-

These specific instruments are easily available and are cost effective.

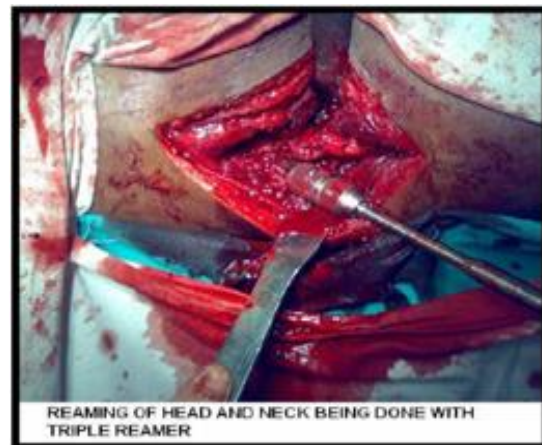
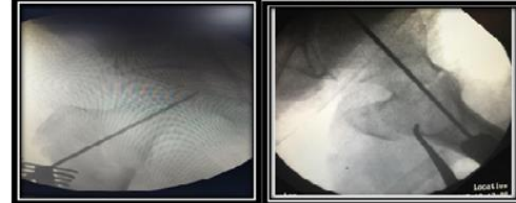
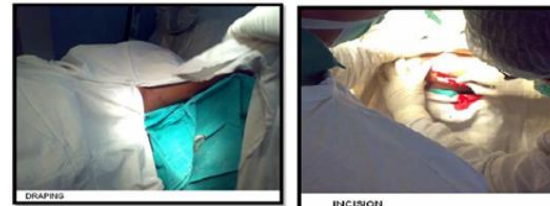
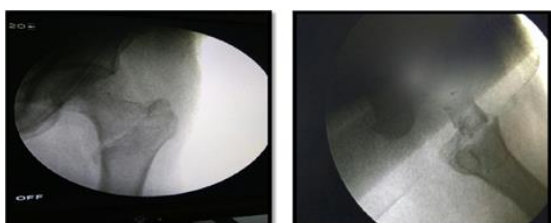
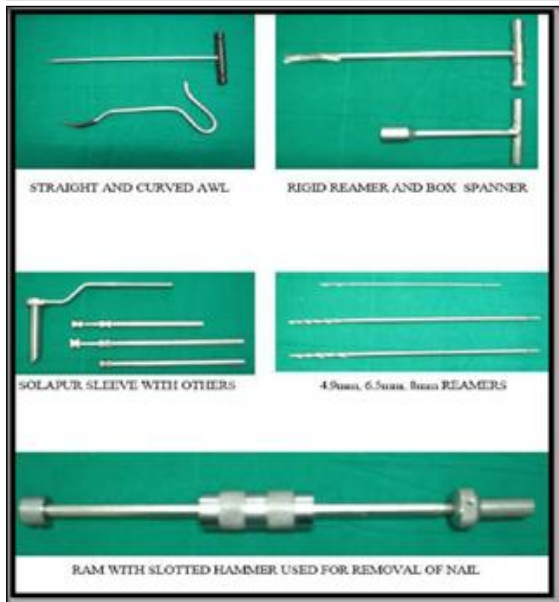
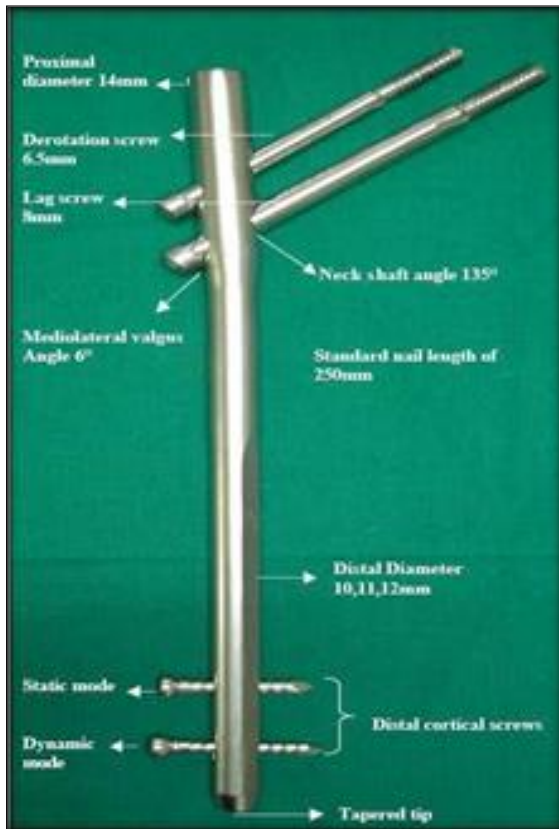


Specifications: Proximal Femoral Nail

Operative Procedure

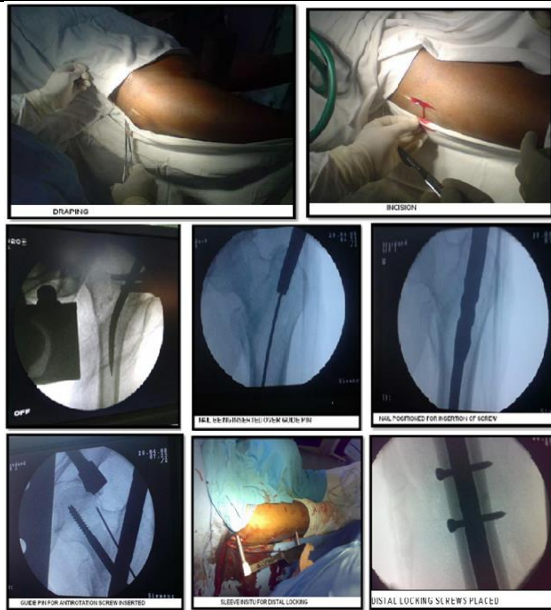
Patient prepared on the morning of day of surgery. Single dose preoperative antibiotic given after test dose. Under spinal anaesthesia patient was placed on fracture table with unaffected leg in flexion and abduction attitude by using lithotomy position. Affected leg placed in traction boot and fracture reduced by traction & internal rotation/external rotation along with adduction or abduction attitude.

C arm checked and placed in optimal position relative to patient's position to ensure better visualization of fracture reduction in both Anteroposterior and lateral projections.





Intraop images of PFN.



The clinical outcome for each group was analyzed, and intraoperative, early (within first month after hip fracture repair), and late complications (after first month) 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 Scores.

Table 2: Harris Hip Scores

Parameters	Grading
Pain	
Limp	Excellent 90-100
Distance Walked	
Support	Good 80- 89
Sitting	
Enter Public transportation	Fair 70-79
Stairs	
Put on shoes and socks	Poor <70
Absence of deformity	
Range of motion	

RESULTS

The results were analyzed and observations of our study were as follows;

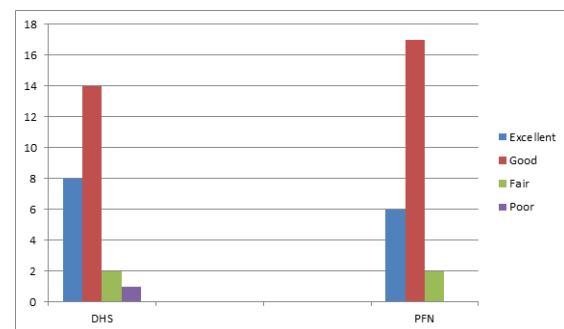
Most of patients in our study were in the age of >50 years of age. Fall due to slipping (trivial fall) was most common mode of injury. All patients had good mobility prior to injury and were ambulating independently unassisted. Patients were operated within 7.6 days in DHS group and 7.2 days in PFN group on an average. Mean operating time in DHS was 85 minutes and in PFN was 61.5 minutes. Mean blood loss in DHS 172.6ml and in PFN was 58.26 ml [Table 3].

Table 3:

Ranks				
	Group	N	MeanRank	P-value
B/L ML	DHS	23	35.00	.000
	PFN	23	12.00	
	Total	46		
Duration surgery minutes	DHS	23	35.00	.000
	PFN	23	12.00	
	Total	46		
Full weight bearing initiated (weeks)	DHS	23	33.63	.000
	PFN	23	13.37	
	Total	46		

In our study 8 patients in DHS and 6 patients in PFN with excellent results, 14 patients in DHS and 17 patients in PFN with good results, 2 patient in DHS and 2 patient in PFN with fair results, 1 patient in DHS poor results [Figure 1]. Post-operative complication was superficial wound infection in 3 patients these patients were diabetic and in 4 patients fever noted on 4th postoperative day. These patients were having urinary tract infection. [Table 4].

Functional outcome by Harris hip score



Complications

Infections

2 patients in DHS and 1 patient in PFN had superficial wound infection. These patients were diabetic. The infection controlled with continuation of intravenous antibiotics and regular wound dressings. Wound healed without creating any complication.

4 patients (2 in each group) had fever on 4th postoperative day. These patients were diagnosed to have urinary tract infection which subsided with course of antibiotics.

Table 4: post-operative Complications

SL.No	Complication	DHS	PFN
1	Superficial wound infection	2	1
2	Urinary tract infection	2	2
3	Varus collapse with shortening of >1cm	2	0
4	Persistent thigh pain	1	0
5	Persistent hip pain	1	2
6	Non union	0	0
7	Peri –implant fracture	0	0

DISCUSSION

Intertrochanteric femoral fractures contribute to more than half of total hip fractures in elderly osteoporotic patients ageing over 60 years. With increasing life expectancy due to advancements in medical care, the incidence of intertrochanteric fractures are also increasing.

Fall due to slipping is the most common mode of injury in these patients. Diminished vision, reduced reflexes, poor muscle tone and balance also contribute to the increased incidence in elderly.

The ultimate goal of the treatment being early mobilization of the patients preventing the complications of fracture disease.

Sliding hip screw is still most widely used implant for these cases. The decision to use a compression hip screw or an intramedullary nail is multifactorial and is based on patient demand, fracture characteristics, surgeon training and preference. Proponents of intramedullary nail fixation argue that less shortening occurs with an intramedullary nail than with a compression hip screw.

In a more recent study, minimal shortening (mean 5.9 mm) was found at union in a series of intertrochanteric femoral fractures considered “stable” and treated with a compression hip screw; similar shortening (5.3 mm) was found in “unstable” fractures treated with intramedullary nailing. The purpose of the study was not to compare shortening in stable and unstable fractures treated with different devices but to show that experienced surgeons can identify stable intertrochanteric femoral fractures and that these stable intertrochanteric femoral fractures can be treated with a compression hip screw with minimal shortening.

Although more shortening does occur with the use of compression hip screws, the amount of shortening that is functionally relevant has not been well defined. there was no overall difference in functional outcomes in patients 65 years of age or older with an intertrochanteric femoral fracture treated with either a intramedullary nail or a compression hip screw; however, when patients with unstable fracture patterns were analyzed, those with an intramedullary nail had better walking ability at 6 months than those treated with a compression hip screw. Pajarinen et al. compared

outcomes of proximal femoral nailing with compression hip screw fixation in the treatment of AO/OTA 31A fractures. At 4 months after surgery a much larger percentage of patients (76%) treated with intramedullary nail fixation had returned to their pre injury walking ability than patients treated with compression hip screws (54%). the mean shortening of the femoral neck also was much less in patients treated with intramedullary nail fixation (1.3 mm) than in those with compression hip screws (6.1 mm)

Advantages of dynamic hip screw and proximal femoral nailing in intertrochanteric fractures are as follows.

Table 5: Advantages of DHS and PFN

Sl.No	DHS	PFN
1	Larger incision so fracture can be accessed.	Less operating time and minimal blood loss.
2	Load bearing device	Load sharing device.
3	Controlled impaction in Intertrochanteric fractures.	Shortened lever arm there by less deforming forces at the fracture site.
4	Prevents collapse and shortening.	Prevents excessive varus collapse and neck shortening.
5	Single point fixation,less rotation stability.increased chances of screw cut out in unstable fracture	Increased rotation stability and less chances of screw cut out in osteoporotic head.
6	Chnces of varus malpositioning in unstable fracture	Prevents varus malpositioning.



A. Preoperative view

Our study was conducted in Muzaffarnagar Medical College & Hospital, Muzaffarnagar. 50 consecutive patients of intertrochanteric fractures were treated with DHS and PFN in equal numbers by random sampling the fractures were classified according to AO/OTA classification and fractures of AO type 31A2.1 to 31A2.3 were included in our

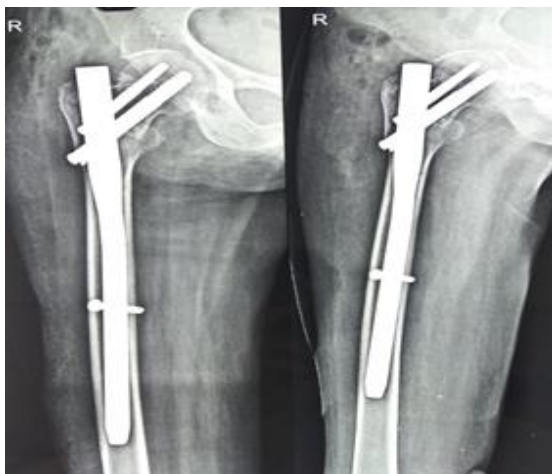
study. All patients were followed up at least for a period of 6 months and were assessed for radiological and functional outcome. The overall response rate was 88.46%.



B. postoperative view DHS



A. Preoperative view



B. postoperative view PFN

CONCLUSION

We conclude that there is no statistically significant difference in terms of radiological union, varus collapse and functional outcome at six months follow up between patients operated with Dynamic Hip Screw and Proximal Femoral Nail, which is consistent with Zhang K, S, et al study & Faisal M et al study.^[13,15]

PFN had better functional outcome in our series of intertrochanteric fractures in terms of duration of surgery, blood loss during surgery and time taken to full weight bearing, requires shorter operating time and smaller incision, So from our study PFN may be better implants for fixation of most intertrochanteric femur fractures.

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