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PFN - Future in Intertrochanteric Fracture Treatment

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ABSTRACT

Background: Intertrochanteric femur fracture is one of the major causes of morbidity and mortality in general population. The fracture results from trivial fall in elderly population, high velocity of injuries like motor accidents in younger people. We hypothesize that PFN would be a superior treatment than DHS in treating intertrochanteric fractures by decreasing co-morbid conditions.

Methods & Methodology: A prospective study was conducted in district hospital; Nalgonda over a period of 2 years. Patients aging 32-81 years with stable and unstable proximal femoral fractures treated with DHS and PFN (AO, ASIF) were enrolled in the study. Data was filled in the Excel sheet and categorical variables were tabulated.

Results: Eighty one patients were included in the study. The mean age was 55 years with female predominance (70%), right side involvement (62%) with commonest mode of injury fall (domestic) and high velocity injuries noted in age group below 45 years was noted. In four fifth of the cases the fall occurred at home. The treatment constituted; 1/5th fixed with DHS and 4/5th PFN. The commonest, co-morbid condition was hypertension. Lag screw cut out is commonest with DHS with unstable fractures 15%, limb shortening due to coxa vara results were excellent in 64% good 20% fair 12%, and poor in 6% of cases

Conclusion: Stable and unstable trochanteric with clinical results comparing, PFN would be a superior treatment for intertrochanteric fractures compared with DHS with wild range options with treating trochanteric fractures age, type of fracture and general condition of patient even with co-morbid conditions like HTN and DM.

Keywords: Intertrochanteric fractures, DHS, PFM, early mobilization without pre-operative and post operative complications

MeSH terms: Intertrochanteric fractures, type of implant DHS and PFM

INTRODUCTION

Intertrochanteric fractures constitute 45% of all the hip fractures and are major cause of morbidity and mortality in elderly population. [(1,2)] Hip fractures include mainly trochanteric and femoral neck fractures and the former reported with a mortality ranging from 22 to 30%. Various methods of treatment of ORIF fixations like DHS, PFN, Gama nail, Trochanteric buttress plate, Condylar blade plate, depending up on the type of fracture, (stable and unstable), age and general condition of the patient. Surgical treatment with stable fixation allows early mobilization and reduces complications. There are two main types of fixation for trochanteric fractures which are plate fixation DHS (extra medullary) and intra medullary implant (PFN). DHS or SHS has been the standard implant in treating trochanteric fractures. [(3,4)] However in compliant with PFN it has a bio medical disadvantage because of wilder distances between weights bearing axis and implants. The proximal femoral nail (PFN) introduced by the AO/ASIF group in 1998 has become prevalent in treating trochanteric fractures now a days. Because it was improved by addition of an anti-rotation hip screw proximal to main lags screw however both benefits and technical failures of PFN have been reported. [(5, 7)]

Although the effects of DHS and PFN in treatment of intertrochanteric fractures have been reported, results and conclusion are not consistent. [8–13] Therefore we conducted the study to investigate whether there is significant difference between PFN and DHS fixation in treatment of trochanteric fractures

Our aim was to evaluate clinical results comparing PFN with DHS including operative time, intraoperative blood loss, length of incision, postoperative infection rate, lag screw cut-out rate, and reoperation rate. We hypothesized that PFN would be a superior treatment for intertrochanteric fractures (unstable) compared with DHS.

Aims and Objectives

1. To evaluate the efficacy of DHS and PFN in treating trochanteric fractures in the age group 32 to 81
2. To evaluate the efficacy of PFN and DHS in treating both stable and unstable trochanteric fractures in all age groups, with all co-morbid conditions like HTN and DM and basing on preoperative and postoperative complications

METHODS & METHODOLOGY

It is a non-randomized prospective study conducted on cases with stable and unstable comminuted trochanteric fractures in district hospital; Nalgonda over a period of 2 years.

Inclusion criteria: All the individuals with intertrochanteric fractures stable and unstable fractures in the age group 32 to 81(Evans classification/ AO classifications).

Exclusion criteria:

1. Individuals with sub trochanteric fractures
2. Patients with pathological fractures
3. Patients with trochaneric fractures associated with poly-trauma
4. Patients with previous ipsilateral hip or former surgeries
5. Interochanteric fractures in elderly patients who have other medical problems which make them bedridden and unfit for anesthesia

All the patients were selected from the admission in the department of Orthopaedics who fulfilled the inclusion criteria. The selected patients were then recruited for the study after a written informed consent was taken. They were counseled about all the possible post-operative complications. Post-operatively the patient reviewed by clinical and radiological examination at regular intervals of 2 weeks, 6 weeks, 3 months, 6 months and one year and yearly thereafter.

Once the patient is diagnosed with intertrochanteric fracture, thorough physical examination was done to rule out other injuries. Vital data was recorded and the fracture as temporarily immobilized using a below knee skin traction to which a weight of 2.50 kilos applied. Antero-posterior radiograph of the pelvis with both the hip joints and lateral view on the affected (fractured) side performed.

The type of fractures AO/ASIF classification (stable/unstable) was used. [2] Thickness of cortex of femur, width and shape, medullary canal bone stock, Evans classification system was used for the determination of type of fractures pre anesthetic check up was done prior to surgery in all cases. All the patients were trained to do static quadriceps, ankle pump, and deep breathing exercises pre-operatively so that the same could be carried out post operatively.

All surgeries were performed (Fig 1) in the elective theatre using standard aseptic precautions. Standard lateral approach for fractures treating with DHS and minimal pre-trochanteric incision for PFN was used in DHS, 4 holed barrel with 130-135-140 lag screw various length used in PFN 240 m.m 9,10,11 m.m nail with proximal 2 holes into neck main lags screw and antirational proximal screw 2 holes distally proximal static hole digital dynamic hole. All the patients were mobilized with support in the post-operative period with full weight bearing as permitted by patient. Patients

were followed up and evaluated at regular intervals by clinical and regular examinations.

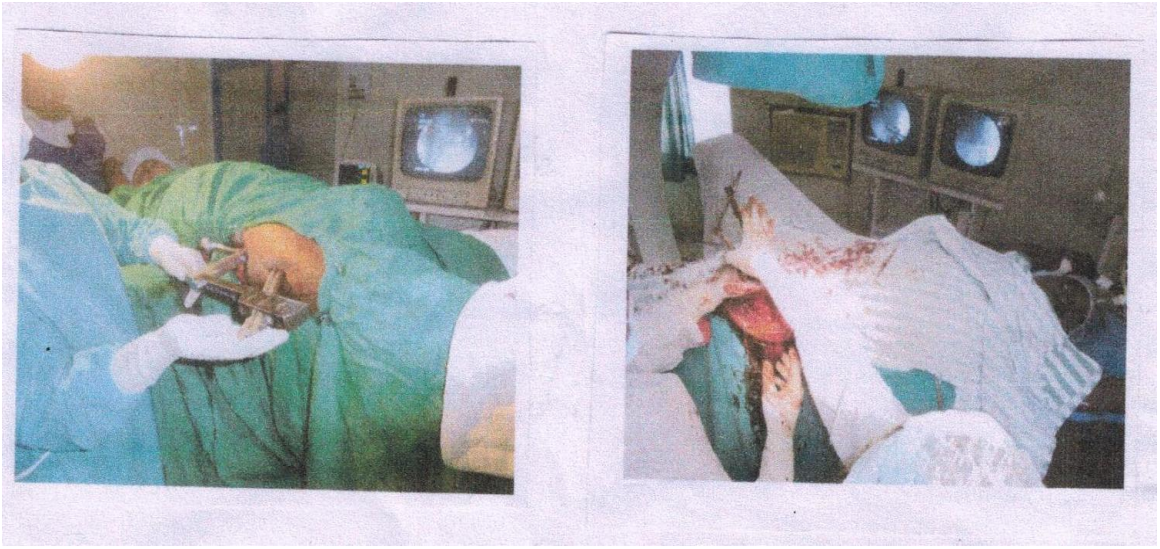

Fig 1: Intraoperative methods: PFN/DHS

RESULTS

The average age of patients in our study was 58 years (32-81years) with female predominance (70%), unstable fractures 62% right side more involved with co-morbid condition 10% and commonest mode of injury due to accidental fall while doing day today activities and 5% due to motor accidents. [(2)] Average interval between injury and admission to hospital was 5 -10 days (mean=7.5 days) and the average duration of hospital stay was 14 days with a range (12-25 days) (Table 1). Implant for DHS 4 holes plat 130-135-140 degrees with hexagonal screws. PFN nail 240 m.m length 9-10-11 with 2 holes proximal and 2 holes distal. The clinical results comparing PFN and DHS including comparison of operative time, intra operative blood loss, length of incision, post- operative rate, lag screw cut out rate and re-operative rate (Table 2). [(8– 13)] Two fifth of fractures were stable and three fifth were unstable. The patients were followed up to one year.

Out of 81 patients, 4 patients died within two weeks after surgery due to unrelated causes. The remaining patients were followed, out of which 48 were women, 27 men.

Table 1: Baseline demographics of the admitted patients

Variable	No of Patients	Percentage
Age Group		
30-40	8	10%
40-50	16	20%
50-60	24	38%
60-70	26	32%
70-80	8	10%
Sex Incidence		
Male	24	30%
Female	58	70%
Side Involved		
Left	34	38%
Right	48	62%
Mechanism Of Injury		
Fall on slippery floor	30	36%
Fall from day to day actives	26	34%
Fall from stairs	14	18%
Fall from cycle	9	8%
RTA	3	4%
Co-Morbid Conditions (10%)		
Hypertension	3	
Diabetes	2	
Anemia	2	
COPD	1	
IHD	1	
Varibles	**No. Of patents**	**Percentage**
INTERVAL BETWEENINJURY AND ADMISSION		
0-3 Days	17	20%
4-7 Days	26	30%
8-10 Days	42	50%
8-10 Days	42	50%
Duration of Hospital stay		
5-10 Days	66	83%
10-15Days	12	16%
>15 Days	3	1%

Table 2: Comparative Study Results

Variable	PFN	DHS
Age Group	30-80 years	< 50
Fracture (evans /AO)	Stable /Unstable (64)	Stable (17)
Comarbid condition	9 cases 10%	2 cases 1%
Type of Operation	Closed Technique	Open Reduction
Operation time	< 1hr	> 1 hr
Intra operative Blood Los	Minimal	Needed 1 or 2 blood transfusion
Length of Inscission	< 5cm	>10 cm
Post Operative Infection	Nil	3 cases
Lag Screw cutout rate	1 case only excuse length	4 case TAD < 25 mm
Re Operation Rate	Nil	2 cases
Hospital stay	< Week	2 to 3 weeks

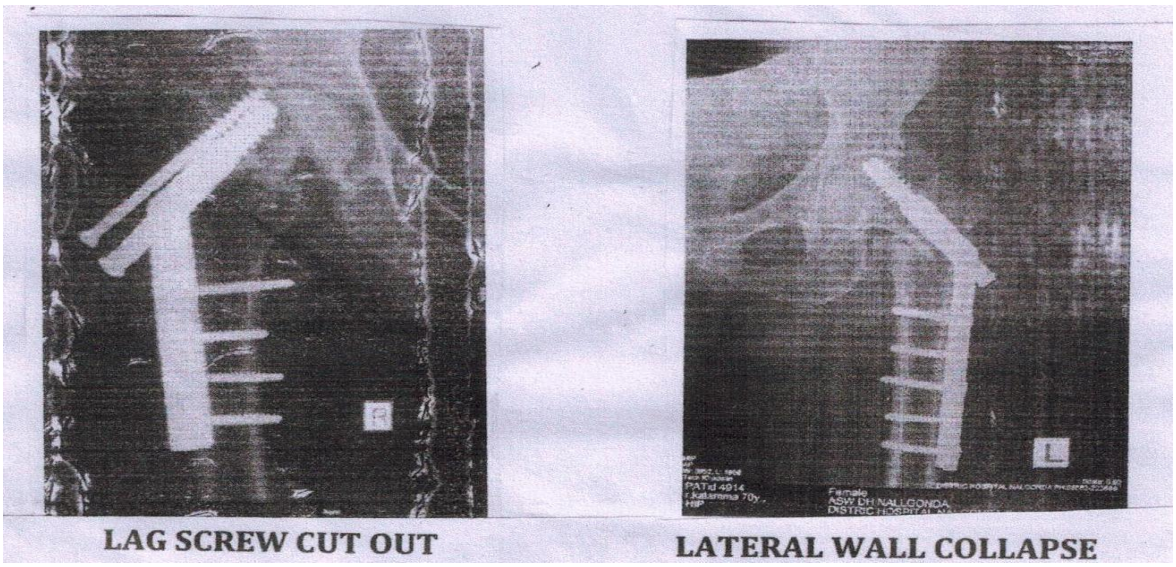

Fig 2: post operative complications with DHS

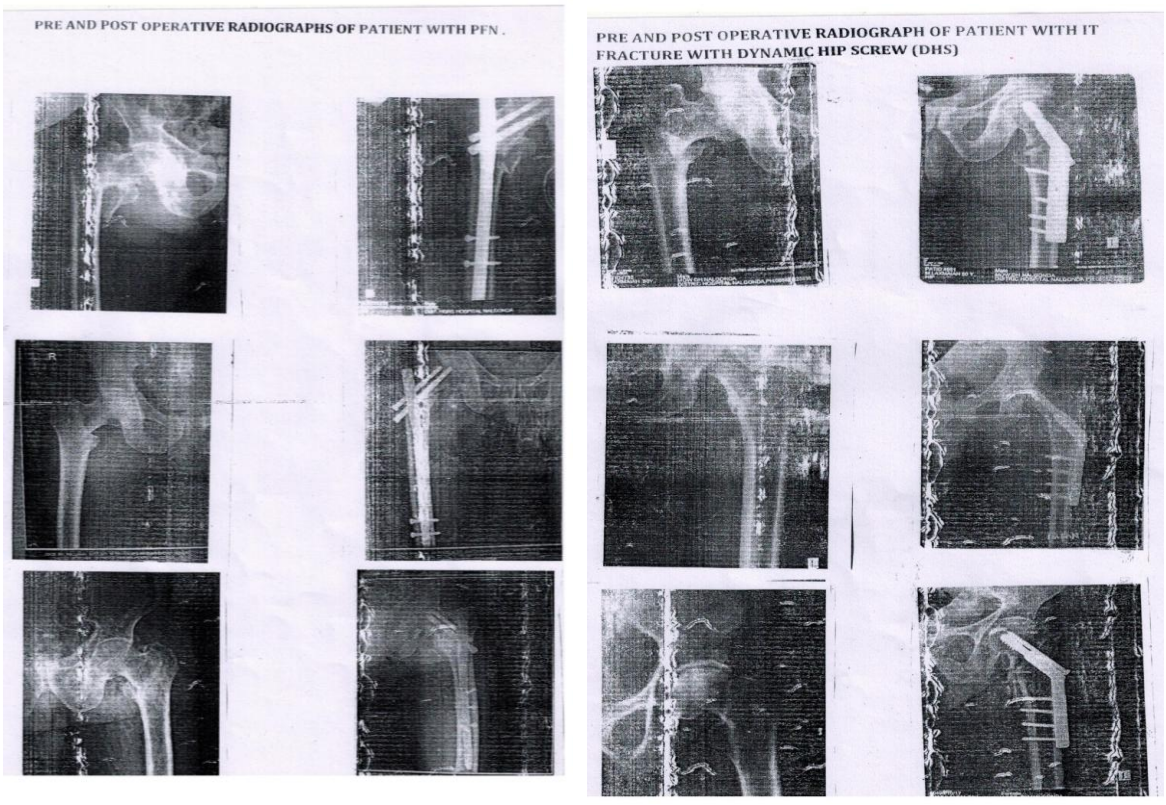

Figure 3: Pre and post operative radiographs comparative between PFN and DHS

Post-operative radiograph (Fig 3) shows near anatomic fracture reduction with both the implants PFN and DHS 74 patients healed the largest consolidation time was 5 months. The patients treated with DHS went into cut through lag screw in 6 cases, in 3 cases the so called "Z effect" was seen it means movement at hip resulted in loosening of screw with destruction of cartilage with entering to join (Fig 2). [(7)]

DISCUSSION

The discussion about the ideal implant for treatment of proximal femoral fractures continues. From the mechanical point of view, a combined intramedullary device inserted by means of a minimally invasive procedure seems to be better in elderly patients (Rosenblume etal.1192, Prinz et al.1996). [(6)] Closed reduction of the fracture preserves the fracture hematoma, an essential element in the consolidation process (McKibbin1978). Intramedullary fixation allows the surgeon to minimize soft tissue dissection thereby reduction surgical trauma, blood loss, infection, and wound complications (Leung et al.1992, Radford et al. 1993). [(6)]

The varus collapse of the head and neck caused by lag screw cut-out or lateral protrusion is one of most common post-operative complications that lead to surgical failure in treatment of intertrochanteric fractures. The cut-out (including "Z" effect) rates were about 1% in PFN and10% in DHS [(14, 15)]

Description of the studies included in the meta- analysis.

Studies	Age (years): PFN / DHS	Men (%)	Target populations	Length of follow-up	Number of fractures		Outcomes*
					PFN	**DHS**	
Our study	32 to 81 (mean=55)	25	Asia	12 months	70	11	4, 5, 6
Saudan at al. [(8)]	83±9.7/83.7±10.1	22.3	Switzerland	12 months	100	100	1, 4, 5, 6
PAN et al [(10)]	70±6.8/69±7.1	73	Aisa	16 months	30	34	1, 2, 3, 4
Papasimos et al. [(11)]	79.4/81.4	38.6	Greece	12 months	40	40	4, 5, 6
Pajarinen et al [(9)]	80±9.1/80.3±10.8	25	Finland	4 months	54	54	2, 4, 5, 6
Shen et al. [(12)]	72.1±6.61/71.2±4.11	40.2	Asia	16 months	51	56	1, 2, 4
ZHAO et al. [(13)]	76(63-87)/74.5 (61-92)	40.4	Asia	19 months	33	71	1, 2, 3, 5

*1 – operative time; 2 – intraoperative blood loss; 3 – length of incision; 4 – postoperative infection rate; 5 – lag screw cut-out rate; 6 – reoperation rate

Most studies reported that lag screw position might be associated with the rate of cut-out in DHS fixation. Cut-out was thought to be caused either by improper lag screw placement in the anterior superior quadrant of the head or by not placing the screw close enough to the subchondral region of the head. [(16)] Baumgaertner et al. showed that a small tip apex distance (TAD)- less that 25 mm was associated with a lower probability for cut-out is that because the screw is rotationally unstable within the bone when a single lag screw is used, flexion- extension of the limb results in loosening of the bone screw interface, leading to the secondary cut-out of the screw. [(14, 16)]

In 1997, PFN was introduced for treatment of intertrochanteric fractures. It was designed to overcome implant-related complications and facilitate the surgical treatment of unstable intetrochanteric fractures. [(17)] PFN uses 2 implant screws for fixation into the femoral head and neck. The larger femoral neck screw is intended to carry most of the load. The smaller hip pin is inserted to provide rotational stability. Biomechanical analysis of PFN showed a significant reduction of distal stress and an increase in overall stability compared with the Gamma nail. [(18)] Despite the mechanical advantages of PFN, lag screw cut-out remains a significant problem, especially in the more unstable fractures. This study also found a higher rate of lag screw cut-out in the DHS group, though it was not statistically significant. This indicates that the anti- rotation screw of the PFN may not be beneficial enough. However, Herman et al. showed that the mechanical failure rate

increased from 4.8% to 34.4% when the centre of the lag screw was not in the second quarter of the head-neck interface line (the so-called "Safe zone") (p=0.001) and that the lag screw insertions lower or high than the head apex line by 11 mm were associated with failure rates of 5.5% and 18.6% respectively (p=0.004). [(19)] They suggested that placing the lag screw within the "safe zone" could significantly reduce the mechanical failure rate when PFN was used to treat intertrochanteric fractures. [(19)]

PFN, inserted by means of a minimally invasive procedure, allows surgeons to minimize soft tissue dissection, thereby reducing surgical trauma and blood loss. The results of this study also demonstrates that operative time, intra-operative blood lose, and length of incision in the PFN group are significantly less than in the DHS group. Therefore, because of its minimal invasiveness, we recommend PFN as a better choice than DHS in the treatment of patients with intertrochanteric fracture.

CONCLUSIONS

In 32-81 years age group with female predominance stable and unstable trochanteric fractures managed with ORIF with extra medullar device DHS and intramedullary device PFN by minimal invasive technique the clinical results comparing PFN with DHS comprising of operative time, intra-operative blood loss, length of incision, post- operative infection rate, lag screw cut-out rate and re-operation rate and came to conclusion that PFN may be a better choice than DHS in the treatment of intertrochanteric fracture.

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