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### Comparison of the functional and radiological outcomes of unstable intertrochanteric fractures treated with dynamic hip screw and proximal femoral nail- A prospective randomized controlled study

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#### Abstract

The intertrochanteric fractures constitute 34% of all hip fractures<sup>1</sup>. 50% are unstable patterns. DHS and PFN are the two main options for treatment. A prospective randomized control study including 40 patients was carried out. The average blood loss, operating time and complications were significantly higher in the DHS group. PFN provides better fixation for unstable intertrochanteric fractures, if proper preoperative planning, good reduction and surgical technique are followed.

**Keywords:** Intertrochanteric fractures (I/T), Proximal femoral nail (PFN), Dynamic Hip screw (DHS)

#### Introduction

The intertrochanteric fractures include fractures from extra capsular part of neck to the lesser trochanter. They constitute 34% of all hip fractures<sup>[1]</sup>. The incidence is on the rise mainly due to increased life expectancy. The main modality of treatment of intertrochanteric fractures is operative treatment<sup>[2]</sup> with both intramedullary fixation and extra medullary fixation as the two primary options. The dynamic hip screw (DHS), commonly used in extra medullary fixation, has become a standard implant in treatment of these fractures<sup>[3]</sup> while Proximal femoral nail (PFN) is commonly used device in the intramedullary fixation. More than 50% of intertrochanteric fractures are unstable<sup>[4]</sup>. The DHS has shown 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 in unstable patterns<sup>[5]</sup>. The aim and objective of this study is to analyze and compare the results of Dynamic Hip Screw (DHS) and Proximal Femoral Nail (PFN) in unstable intertrochanteric fractures in terms of time for union, procedural differences, functional outcomes and complication rates.

#### Materials and Method

A prospective randomized control study was carried out in the Orthopedics department, GMCH from 01/10/2015- 01/08/2016. 40 patients of unstable intertrochanteric fracture (AO type 31A.2; 31A.3) in the age group of 18-70 were included in the study after their informed consent. The patients were randomized according to a computer generate plan and were operated with either DHS or PFN under image intensifier using standard textbook procedures. Rehabilitation started on the 2<sup>nd</sup> post op day in the form of quadriceps and knee bending exercises. Patients were allowed partial weight bearing with walker/ crutches according to pain tolerability. Only in patients with very unstable pattern or poor post op reduction (Fogagnolo criteria)<sup>[6]</sup> weight bearing was delayed. The patients were discharged after 2-3 days on oral antibiotics. Follow-up was done at 2 weeks, 6 weeks, 3 months, 6 months and at 1 year. Clinical assessment in the form of level of pain, hip motion, deformity and other complications; radiological assessment for union or implant failure and functional Assessment using HARRIS HIP SCORE<sup>[7]</sup> was done at each visit. Two tailed p-values were calculated for each group and comparison was done using appropriate statistical analysis.

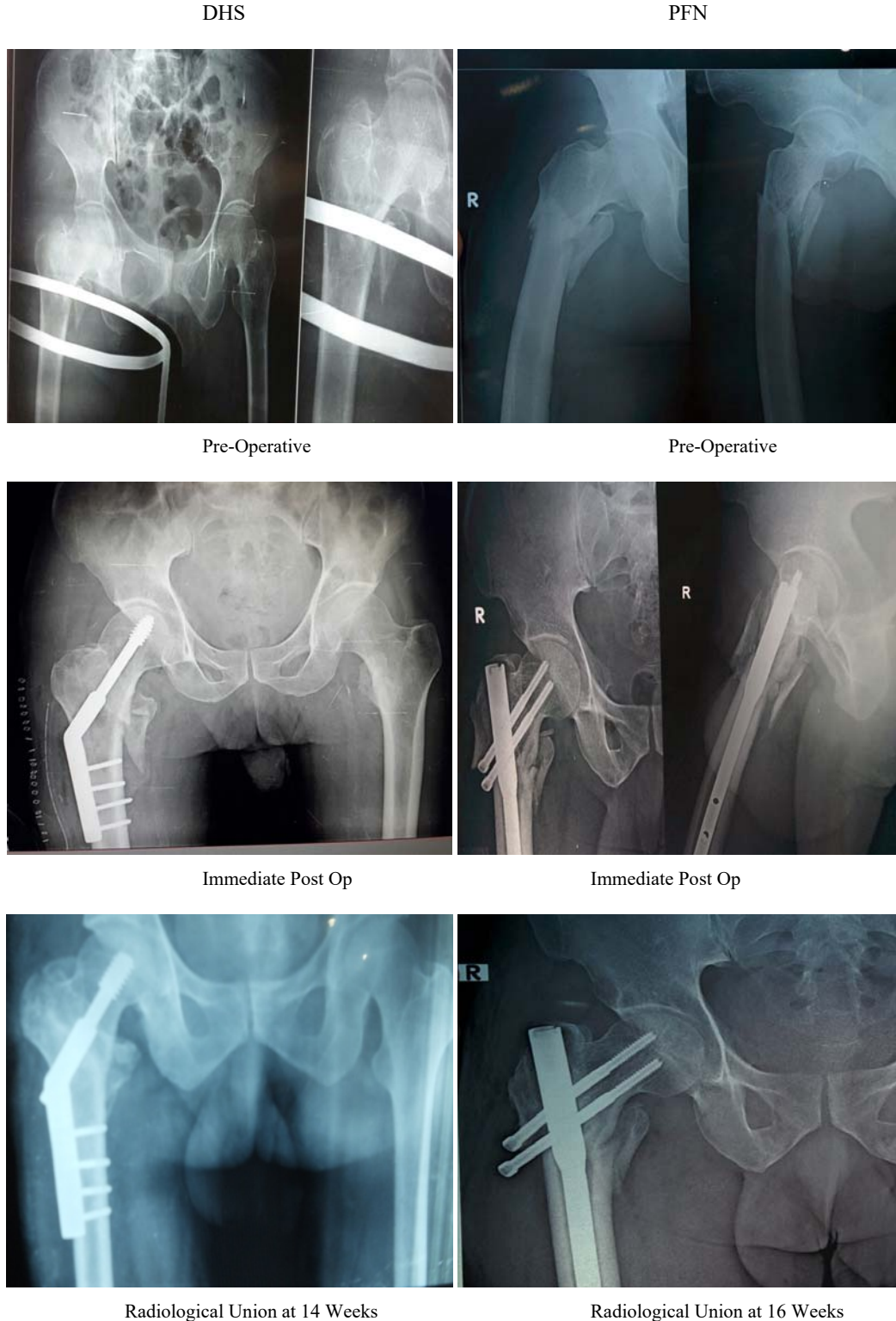
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**Result**

The average age of our patients is 61 years. The average blood loss in DHS group was 233ml and in PFN group was 99ml (p value <0.001), which was found to be statistically significant. The average operating time was 53.25 minutes for PFN and was 72.25 minutes for DHS (p value <0.001), which showed statistically significant difference. Long-term functional outcome was comparable for both the groups with total of 28 patients falling in excellent and good range. The

average time of radiological union in DHS group was 18.35 weeks in comparison to PFN where it was 17.5 weeks (p value= 0.3628) that showed no significant difference. There was one case of superficial infection, 6 cases of varus deformity and 8 cases with shortening (>2.5cm) seen in DHS group. 1 case showing Z effect, 1 case of varus deformity, 1 case with iatrogenic shaft femur fracture and 2 cases with shortening (>2.5cm) were seen in PFN group.



**Fig 1:** Operated Cases

DHS

PFN



Fig 2: Complications

**Discussion**

The ever-increasing incidence of intertrochanteric fractures and being the most commonly operated fracture, there has been a constant interest in developing new techniques and improving the existing ones. The unstable variety is difficult to be stabilized and associated with complications with the traditional DHS implant which has led the surgeons to try for the new modalities of intramedullary fixation devices.

The concept of lateral wall stabilization is a new and well-accepted principle in unstable I/T fractures, which can't be achieved with DHS alone. The various proposed methods of

fixation for lateral column stabilization are: -

1. DHS with Trochanteric Stabilization Plate.
2. PFN
3. PFLCP (Proximal Femoral Locking Compression Plate)

PFN offers the advantage of bypassing the lateral wall and also decreases the lever arm (Fig. 3) by decreasing the distance between the implant and the hip joint. Another advantage of PFN is being a load sharing device and thus having an advantage in osteoporotic fractures.

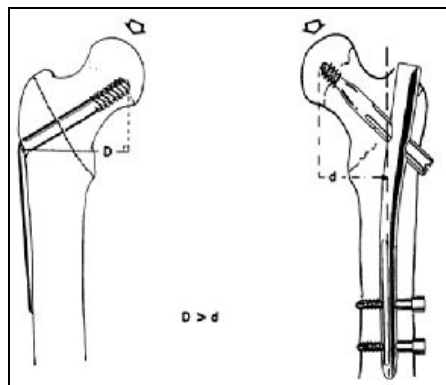


Fig 1

Many studies have been done to compare DHS & PFN but still the use of PFN as the definitive treatment has not been established.

In terms of operating time our study showed comparable results with other studies.

**Table 1:** Comparison of average operative time

Authors	Year	Operation	Mean Time (Min.)
Bridle <i>et al.</i> [8]	1991	DHS	42.5
Goldhagen <i>et al.</i> [9]	1994	DHS	47
Little <i>et al.</i> [10]	2008	DHS	40.4
Simmermacher [11]	1999	PFN	76.7
Domingo <i>et al.</i> [12]	2001	PFN	44
Schipper <i>et al.</i> [13]	2004	PFN	60
Our Study	2016	PFN	53.25
		DHS	72.25

In terms of intra operative blood loss we find comparable results in both the PFN and the DHS group. The higher blood

loss can be explained in DHS group by the fact that it requires larger incision and more soft tissue dissection.

Authors		Intra Operative Blood Loss
Little <i>et al.</i> (2008) [10]	DHS	160 ml
Guo Chun Zhaet <i>al.</i> (2011) [14]	DHS	150 ml
Ishrat A. Khan <i>et al.</i> (2004) [15]	PFN	200ml
Subhadip <i>et al.</i> (2015) [16]	DHS	240ml
	PFN	124 ml
Present study	PFN	98.75 ml
	DHS	223.5 ml

Our study shows the complication rate of infection (5%) similar to other studies viz. Larsson *et al.* [17] (1990), Bannister *et al.* (1990) and Butt [18] *et al.* (1995) showing infection in 1.8 to 5 %. However the incidence of varus deformity (30%) in our study is significantly higher in our study in comparison to the other studies- Sinha *et al.* [19] - 5%, Kamboj *et al.* - 9.34% and Boldin – 8.29%.

Varus malunion occurred in 5% of cases in our study in PFN group which is comparable to the study of Gadegone *et al.* [17] (6%) and Tyllianakis *et al.* (5.2%). We found fracture shaft of femur in 1 case (5%) which is comparable to the study of Al – yassari *et al.* (5.3%). The fracture occurred in our case during reaming through a larger than required reamer size. But the complication was managed and a good reduction was achieved. Overall average shortening in the DHS group was more than the PFN group.

**Conclusion**

In Unstable Trochanteric fracture of femur, the two groups of implant, PFN and DHS provide excellent results in terms of fracture union. Poor functional outcome and the complication rates have been seen more in cases of DHS treated patients. Statistically significant differences between the two groups were found in relation to operative time and intra operative blood loss. PFN provides good fixation for unstable intertrochanteric fractures, if proper preoperative planning, good reduction and surgical technique are followed. As our study was time bound, the patients were followed up for a minimum of 6 months and a maximum of 1 year. Therefore, the long-term effects of this intervention remain unknown in our study. A longer follow up would have made a complete assessment of the surgical intervention.

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