International Journal of Biomedical Research
ISSN: 0976-9633 (Online); 2455-0566 (Print)
Journal DOI: https://doi.org/10.7439/ijbr
CODEN: IJBRFA

Original Research Article

Surgical Management of Unstable Intertrochanteric Fractures of Femur with Proximal Femoral Nail versus Dynamic Hip Screw Fixation: A Comparative Study

Salim Kamal*

Associate Professor, LNCT University, L.N. Medical College and J.K. Hospital Campus, Bhopal, M. P. India-462042

Abstract

Background: The intertrochanteric fractures are most common injuries in patients over sixty years of age. Also it is occur in people with poor bone quality, about half of the intertrochanteric fractures are comminuted and unstable. The purpose of present study was to evaluate and compare the clinical, radiological and functional outcomes of patients with unstable intertrochanteric fractures of femur treated with proximal femoral nail versus dynamic hip screw.
Method: Total 60 patients were enrolled in the study. 30 patients were treated by proximal femoral nail (PFN) and 30 patients were treated by dynamic hip screw (DHS). Intraoperative details, early and late complications were recorded and the functional outcome of each group was assessed using the Harris Hip Score (HHS) and compared statistically.
Results: Union rate was better in PFN group (96.6%) as compared to DHS group (86.6%), ($p<0.05$). Complication rate and requirement of revision surgery was more in DHS group, ($p>0.05$). Post-operative blood transfusion was significantly more in DHS group i.e. 40% as compared to PFN group 6.6% , ($P <0.05$). The functional outcome was found to be more in PFN group as compared to DHS which was statistically very highly significant.
Conclusion: PFN is better than DHS in terms of higher union rates, low complication rate, less blood transfusion and good functional outcome. Thus, it is better fixation device especially in unstable intertrochanteric fracture.
Keywords: Intertrochanteric fractures, Proximal femoral nail, Dynamic hip screw, Harris Hip Score, Union rate.

***Correspondence Info:**
Dr. Salim Kamal, MS (Orth)
Associate Professor,
LNCT University, L.N. Medical College and J.K. Hospital Campus, Bhopal, M. P. India-462042

***Article History:**
Received: 07/06/2019
Revised: 28/06/2019
Accepted: 29/06/2019
DOI: https://doi.org/10.7439/ijbr.v10i9.5270

QR Code

How to cite: Kamal S. Surgical Management of Unstable Intertrochanteric Fractures of Femur with Proximal Femoral Nail versus Dynamic Hip Screw Fixation: A Comparative Study. *International Journal of Biomedical Research* 2019; 10(09): e5270. DOI: 10.7439/ijbr.v10i9.5270 Available from: https://ssjournals.com/index.php/ijbr/article/view/5270

1. Introduction

Intertrochanteric (IT) fractures are defined as 'fractures involving upper end of femur through and in between both trochanters with or without extension into upper femoral shaft' [1]. The incidence of intertrochanteric fractures has been increasing with advancing age due to higher longetivity and rising incidence of road traffic accidents [2, 3]. These fractures are classified as stable and unstable based on the intactness of posteromedial cortex and amount of comminution. Both these fracture patterns are globally viewed as an injury best treated with surgical repair [4]. The goal of treatment of an intertrochanteric fracture is the restoration of the patient to his or her pre-injury status as early as possible. This led to internal fixation of these fractures to increase patient comfort, facilitate nursing care, decrease hospitalization and reduce complications of prolonged recumbency [5].

Stable proximal femoral fractures can be managed with conventional implant with predictable results whereas unstable fractures are challenging, and prone to complications [6]. Dynamic hip screw (DHS) is commonly used for treating unstable intertrochanteric fractures. Recently its usage has declined due to its complications including shortening, medialisation of the distal fragment; implant cut-outs, uncontrolled lateralisation of the proximal fragment, and varus collapse [7]. To circumvent these issues, the proximal femoral nails were introduced by the AO/ASIF group in 1998, has gained widespread popularity for treatment of trochanteric fractures in recent years. 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 [4,8,9].

Till date most of the studies have evaluated the outcomes of PFN in unstable fractures and comparison with DHS in stable IT fractures but comparison with DHS in unstable IT fractures is less studied. Therefore present study was done to evaluate and compare the clinical, radiological and functional outcomes of patients with unstable intertrochanteric fractures treated by PFN and DHS.

2. Materials and Methods

In this prospective study, total 60 surgically fit post traumatic patients of age >50 years and who diagnosed to have unstable intertrochanteric fractures, undergone proximal femur nail and dynamic hip screw randomly at Tertiary Care Hospital from December 2016 to May 2018 and followed up till November 2018 were enrolled. This study was conducted by collecting data of 60 patients from medical record department. Patients with pathological or compound fractures, bilateral fractures, fractures associated with polytrauma, Pre-existing femoral deformity preventing hip screw osteosynthesis or intramedullary nailing and Sub-trochanteric fractures, fractures extending 5 cm distal to the inferior border of the lesser trochanter, patients who had <6 months of follow-up and admitted for reoperation were excluded from the study.

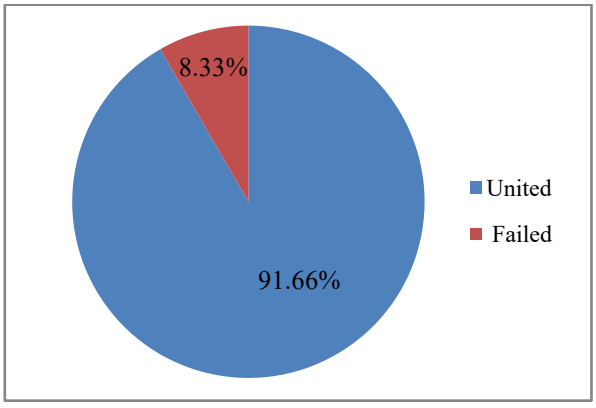
Same post-operative mobility protocol was followed for both groups of patients. The comparison in terms of Union was done. On post-operative follow neck shaft angle was calculated and variations as noted. Any intraoperative or postoperative blood transfusion and any complications arise during follow up were noted. Early-intraoperative blood loss, immediate postoperative blood transfusions, infection as well as late- infection, hip pain, re-admission, screw cut out, varus collapse were also seen. Data was statistically analyzed to reach a conclusion. Analysis is descriptive with limitation. As patients were analyzed till time of discharge, patient was followed up only till next6 months post operatively.

3. Observations and Results

Total 60 patients of unstable intertrochanteric fractures were enrolled in the study, of them 30 were treated by PFN and 30 by DHS. Out of total cases, 28 (46.66%) patients were male and 32 (53.33%) were female. The mean age of patient was 68.75±13 year ranging from 51-83 years. Out of 60 patients, maximum no. of cases (36; 60.0%) had AO 31-A2.3 type of intertrochanteric fracture followed by AO31-A2.2 type (24; 40%). In AO type 31-A2.3 fractures dominated in both the groups.

All the patients were analyzed radiologically for union rates at 6 weeks and 6 months postoperatively. The overall union rate was 91.66% as shown in figure 1.

Figure 1: Overall union



Association of modality of treatment and union is shown in table-1. Union rate was better in PFN group (96.6%) as compared to DHS group (86.6%) and difference was statistically significant.

Table 1: Association of Modality of Treatment and Union

Union	PFN	DHS	Total
United	29 (96.6%)	26 (86.6%)	55 (91.6%)
Failed	01 (3.3%)	4 (13.3%)	5 (8.3%)
Total	30 (100%)	30 (100%)	60 (100%)
Fisher's Exact p= 0.015 (Significant)			

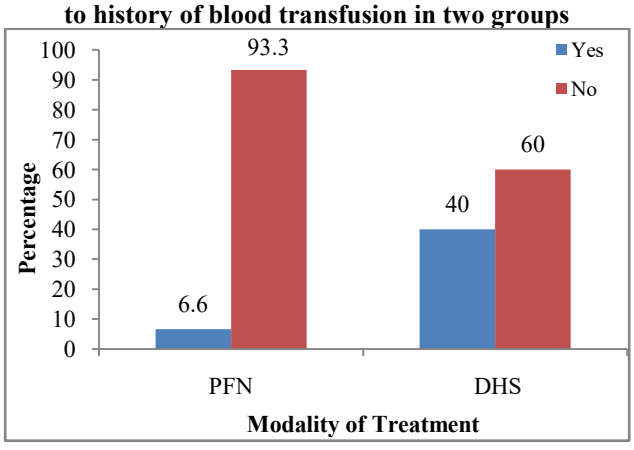
There were no complications observed in majority of the cases (46; 76.66%) while complications observed in 14 (23.33%) cases, (Table 2). Complication rate and requirement of revision surgery was more in DHS group but this was not found to be statistically significant.

Table 2: Distribution of patients according to complication between two groups

Complications	PFN	DHS	Total
Screw Cut Out & Varus Collapse	2 (6.6%)	5 (16.6%)	7 (11.6%)
Z Effect	02 (6.6%)	0 (0.0%)	2 (3.3%)
Infection	01 (3.3%)	4 (13.33%)	5 (8.3%)
No	25 (83.3%)	21 (70%)	46 (76.6%)
Total	30 (100%)	30 (100%)	60 (100%)
Fisher's Exact p= 0.238 (Non-Significant)			

Intra operative blood loss leading to post-operative blood transfusion was significantly more in DHS group i.e. 40% as compared to PFN group 6.6% and the difference between two groups was statistically significant (P <0.05), (Figure 2). The overall history of blood transfusion was 15; 25%.

Figure 2: Percentage distribution of patients according to history of blood transfusion in two groups



At 6 weeks and at 6 months, Harris Hip Score and hence the functional outcome was found to be more in PFN group as compared to DHS and which was statistically very highly significant (Table 3).

Table 3: Association of Modality of Treatment and Haris Hip Score at 6 Weeks and 6 months

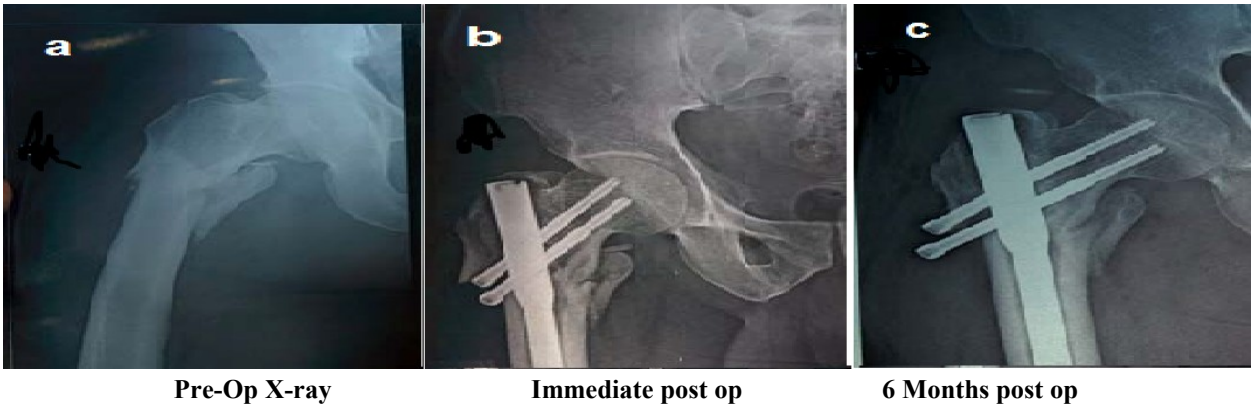
Modality of Treatment	HHS (6 weeks)	HHS (6 months)
PFN	47.5±3.1	91.2±4.5
DHS	40.3±5.4	83.3±6.1
P Value	<0.001	<0.001
	t= 11.214, df=58	t=8.452, df= 58

<0.001= Very Highly Significant

Figure 3: Unstable IT fracture post DHS fixation

Pre-Op X-ray Immediate post op6 Months post op

Figure 4: Unstable IT fracture post PFN fixation



Pre-Op X-ray **Immediate post op** **6 Months post op**

4. Discussion

Fractures of intertrochanteric femur have been recognized as a major challenge by the Orthopaedic community, not solely for achieving fractures union, but for restoration of optimal function in the shortest possible time that to with minimal complications [10]. DHS has been the considered the gold standard of intertrochanteric fracture fixation for a long time, especially for the stable fracture types [11], but many complications reported for unstable intertrochanteric fractures [12]. The PFN was designed to overcome implant-related complications of DHS and facilitate the surgical treatment of unstable intertrochanteric fractures[13]. Various studies showed PFN has several advantages over DHS [14, 15]. The present study has been made to compare the management of unstable intertrochanteric femoral fractures with the use of DHS and PFN.

The mean age for DHS patients was 69.64 years and for PFN group was 71.16 years. The mean age for both the groups combined was 68.75±13 years. These observations are comparable with the earlier studies [1,16,17]. The unstable intertrochanteric fractures were observed in older age group. The reason for this as inadequate protective reflexes, reduced energy below

critical threshold, inadequate local shock absorbers e.g. muscle and fat around hip and inadequate bone strength at the hip on account of osteoporosis or osteomalacia in the older age group [18]. Similar to the study done by Kumar *et al* [1] and Mundla *et al* [17], in this study females patients were more affected than males. The increased incidence in females is attributed to postmenopausal osteoporosis, which is usually associated with unstable fractures. We classified the cases of intertrochanteric femoral fractures by AO Classification. The maximum number of cases (60.0%) had AO 31-A2.3 type of intertrochanteric fracture followed by AO 31-A2.2 type (40%). In AO type 31-A2.3 fractures dominated in both the groups which is similar to the study done by Goel and Taneja [19] as well as Hussain and Kamat [20].

Radiological union was achieved within 16 weeks in approximately 60% cases in both the groups and in between 16-24 weeks in most of the remaining cases. In the study by Shivanna and Rudrappa [21] the fractured united at a mean of 12 weeks. In current study, 4 cases (13.3%) went into non-union in DHS group and 1 (3.3%) in the PFN group, thus failure rate seen more with DHS as compared to PFN requiring revision surgeries. These findings are correlated with the previous studies [19, 22]. Screw cut out and varus collapse of fracture was seen in 5 cases of DHS group while 2 cases of the same went into non-union. Infection was seen in four cases in the DHS group. Z effect complication was seen in two cases of the PFN group due to longer proximal cannulated cancellous screws. Cases of Z effect were managed conservatively with protected weight bearing and fracture united. Complication rate is seen to be higher in DHS than PFN but was not statistically significant.

On comparing the history of blood transfusion post operatively we found higher blood transfusion in DHS group which is statistically significant and comparable with the other studies [1,22,23]. This could be accounted to larger incision and more soft tissue dissection leading to intramuscular bleed and a higher blood loss in cases of DHS group. This difference in lesser blood loss in PFN procedure was due to less tissue damage. Similar observations are also reported by Suranigi *et al* [24] and Faisal *et al* [25].

The patients were followed up and the two groups were compared for the final functional outcome at 6 weeks and 6 months. At 6 weeks, the average Harris Hip Score in PFN was higher 48.2 as compared to 41.6 in the DHS group. Similarly, at 6 months, average score in PFN group was higher 90.7 as compared to DHS group 82.1. Thus, it was observed better functional results in PFN group as compared to DHS group. Also, in study by Gupta *et al* [26] functional outcome was better in PFN group (good result in 73.3 % in PFN Vs 40% in DHS group).

5. Conclusion

From the observation of present study, it can be concluded that PFN is better than DHS in terms of high rate of union, low complication rate, less blood transfusion and good functional outcome. PFN provides good fixation for unstable intertrochanteric fractures and supported the use of PFN for unstable intertrochanteric fracture femur with lesser failure rates, lesser blood loss, less shortening, early union, less revision surgery and better functional outcome. However, during implantation of PFN a more precise technical performance is required for better outcome.

As present study was time bound, the patients were followed up for a minimum of 6 weeks and a maximum of 6 months. Therefore, the long-term effects of this intervention remain unknown. A longer follow up would have made a complete assessment of the surgical intervention.

References

[1]. Kumar R, Singh RN, Singh BN. Comparative prospective study of proximal femoral nail and dynamic hip screw in treatment of intertrochanteric fracture of femur. *J Clin Orthop Trauma* 2012; 3:28–36.

[2]. Leung K. Subtrochanteric fractures. In: Bucholz RW, Heckman JD, Court-Brown C, editors. Rockwood and Green's fractures in adults. 6th ed. Philadelphia, Lippincott: Williams & Wilkins; 2006. p. 1827–44.

[3]. David Lavelle G. Fractures and dislocations of the hip. In: Canale ST, editor. Campbell's operative orthopaedics. Philadelphia: Mosby; 2008:3237–308.3.

[4]. Mohan H, Kumar P. Surgical Treatment of Type 31-A1 Two-part Intertrochanteric Femur Fractures: Is Proximal Femoral Nail Superior to Dynamic Hip Screw Fixation? *Cureus*. 2019; 20; 11(2):e4110.

[5]. Kaufer H, Mathews LS, Sonstegard D. Stable Fixation of Intertrochanteric Fractures. *J Bone Joint Surg.* 1974; 56A:899-907.

[6]. Kumar N, Kataria H, Yadav C, Gadagoli BS, Raj R. Evaluation of proximal femoral locking plate in unstable extracapsular proximal femoral fractures: Surgical technique & mid-term follow up results. *J Clin Orthop Trauma.* 2014; 5(3):137-45.

[7]. Veeragandham P, Sahu RK, Misra S. Comparative study between proximal femoral nailing and dynamic hip screw with proximal femoral locking compression plates in intertrochanteric fracture of femur. *Int J Res Orthop* 2017; 3: 339-49.

[8]. Kish B, Sapir O, Carmel A, Regev A, Masrawa S. Full weight bearing after unstable per and subtrochanteric fracture using proximal femur nail. *J Bone Joint Surg Br*. 2001; 83:289.5.

[9]. Steinberg EL, Blumberg N, Dekel S. The fixion proximal femur nailing system: biomechanical properties of the nail and a cadaveric study. *J Biomech*. 2005; 38(1):63–8.6.

[10]. Dhakad RKS, Jain S, Verma R, Prajapati J. A comparative study of intramedullary and extramedullary fixation devices in type two unstable trochanteric fractures. *Orthop JMPC* 2017; 23(2): 11-15.

[11]. Jensen JS, Sonne-Holm S, Tøndevold E. Unstable trochanteric fractures. A comparative analysis of four methods of internal fixation. *Acta Orthop Scand*. 1980; 51(6):949–62.4.

[12]. Yong C, Tan C, Penafort R, Singh DA, Varaprasad MV. Dynamic hip screw compared to condylar blade plate in the treatment of unstable fragility intertrochanteric fractures. *Malays Orthopedics J* 2009; 3:8–13.

[13]. Kulkarni GS, Limaye R, Kulkarni M, Kulkarni S. Intertrochanteric fractures. *Indian J Orthop*. 2006; 40(1): 16–23.8.

[14]. Jonnes C, Sm S, Najimudeen S. Type II Intertrochanteric Fractures: Proximal Femoral Nailing (PFN) Versus Dynamic Hip Screw (DHS). *Arch Bone Jt Surg.* 2016; 4(1): 23-8.

[15]. Zhang K, Zhang S, Yang J, Dong W, Wang S, Cheng Y, Al-Qwbani M, Wang Q, Yu B. Proximal femoral nail vs. dynamic hip screw in treatment of intertrochanteric fractures: a meta-analysis. *Med Sci Monit*. 2014; 20:1628-33.

[16]. Jose A, D'Almeida V, Acharya R and Rai R. A comparative study of proximal femoral nailing versus dynamic hip screw device in the surgical management of intertrochanteric fractures. *International Journal of Orthopaedics Sciences* 2017; 3(3): 743-745.

[17]. Mundla MKR, Shaik MR, Buchupalli SR, Chandranna B. A prospective comparative study between proximal femoral nail and dynamic hip screw treatment in trochanteric fractures of femur. *Int J Res Orthop* 2018; 4: 58-64.

[18]. Cummings SR, Nevitt MC. Non-skeletal determinants of fractures: the potential importance of the mechanics of falls. Study of Osteoporotic Fractures Research Group. *Osteoporos Int*. 1994; 4 Suppl 1:67-70.

[19]. Goel K, Taneja DK. Proximal femoral nail v/s Dynamic hip screw in treatment of intertrochanteric fracture femur. *Indian J Orthop Surg*. 2018; 4(3): 249-255.

[20]. Hussain N and Kamat SG. A comparative study of proximal femoral nail versus dynamic hip screw fixation for unstable and complex intertrochanteric fractures of the femur. *J Cont Med A Dent* 2017; 5(2):46-50.

[21]. Shivanna UM, Rudrappa GH. A Comparative Study of Functional Outcome between Dynamic Hip Screw and Proximal Femoral Nail in Surgical Management of Per-Trochanteric Fractures. *Journal of Evolution of Medical and Dental Sciences* 2015; 4 (43); 7489-7498.

[22]. Saudan M, Lübbeke A, Sadowski C, Riand N, Stern R, Hoffmeyer P. Pertrochanteric fractures: is there an advantage to an intramedullary nail?: a randomized, prospective study of 206 patients comparing the dynamic hip screw and proximal femoral nail. *J Orthop Trauma*. 2002; 16(6):386-93.

[23]. Pajarinen J, Lindahl J, Michelsson O, Savolainen V, Hirvensalo E. Pertrochanteric femoral fractures treated with a dynamic hip screw or a proximal femoral nail. A randomised study comparing post-operative rehabilitation. *J Bone Joint Surg Br.* 2005; 87(1):76-81.

[24]. Suranigi SM, Shetty N, Shah HM. Study Comparing the Advantages of Proximal Femoral Nail Over Dynamic Hip Screw Among Patients with Subtrochantric Fracture. *J Med Thesis* 2014;2(1):35-8.

[25]. Faisal M, Nistane P. Proximal Femoral Nailing vs. Dynamic Hip Screw in unstable Intertrochanteric Fracture of Femur– A comparative analysis. *Int J Biomed Adv Res.* 2016; 7(10):489-92.

[26]. Gupta SKV, Valisetti VS, Comparative study between dynamic hip screw vs proximal femoral nailing in inter-trochanteric fractures of the femur in adults, *International Journal of Orthopaedics Sciences* 2015; 1(1): 07-11.