Original Article

A comparative study of intramedullary and extramedullary fixation devices in type two unstable trochanteric fractures

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Abstract

Background*:* For many years, the sliding hip screw and plate had been the gold standard in treating pertrochanteric fractures. Nowadays, there is an increasing interest in intramedullary nailing. Intramedullary devices, although technically difficult seems to have a biomechanical advantage over laterally fixed side plates2.Literature is full of articles categorizing DHS in stable Trochanteric fractures, (31-A1.1, A1.2, A1.3 and 31-A2.1) and use of intramedullary devices PFN as implant of choice in unstable trochanteric, sub trochanteric fractures and particularly in reverse oblique (all A 31.3). But there is always a grey zone of decision of implant to be applied in unstable type A2.2 and A2.3 fractures.

This study was designed to compare functional outcome and complications of the PFN device with those of a traditional extramedullary device, the Dynamic hip screw (DHS), inpatients with unstable type 2 trochanteric fracture. (AO/ASIF Classification 31-A2.2 & 31-A2.3)

Method*:* In this Randomised control prospectively, designed study 60 consecutive patients having Fracture according to AO/ASIF classification 31-A2.2 and 31-A2.3 are included and randomized to either PFN or DHS group. The functional outcome and clinical results of the patients was evaluated and graded using HARRIS HIP SCORE system.

Results*:* The average blood loss in PFN was 88.3ml while in DHS it was 318.33ml. Hospital stay after surgery in PFN was average days 4.13 DHS was average days 5.63. Harris hip score in PFN 22 (73.33%) were good, 06 (20%) were fair and 02 (6.66%) while with DHS 12 (40%)were good, 12(40%) were fair and 06 (20%).Average time of union in PFN was 13.4 weeks in DHS was 15.1 weeks.

Conclusion: In Type 2 unstable trochanteric fractures PFN gives advantage of lesser blood loss, shorter operating time, faster union, better functional outcome with low complication rate as compared to DHS.
Keywords: Unstable trochanteric fracture, PFN, DHS

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Introduction

Unstable trochanteric fractures are a growing concern for the orthopaedic surgeons all over the world. Sliding devices like the Dynamic Hip Screw (DHS) and Intramedullary devices like the proximal femoral nail (PFN) have their own advantages & disadvantages and various meta-analysis conducted so far have come out with conflicting results regarding superiority of PFN over DHS [1].

For many years, the sliding hip screw and plate had been the gold standard in treating

pertrochanteric fractures. Nowadays, there is an increasing interest in intramedullary nailing. Intramedullary devices, although technically difficult seems to have a biomechanical advantage over laterally fixed side plates [2]. Literature is full of articles categorizing DHS in stable Trochanteric fractures, (31-A1.1, A1.2, A1.3 and 31-A2.1) and use of intramedullary devices PFN as implant of choice in unstable trochanteric, subtrochanteric fractures and particularly in reverse oblique (all A 31.3) [3]. But there is always a grey zone of decision of implant to be applied in unstable type A2.2 and A2.3 fractures. This study was designed to compare functional outcome and complications of the PFN device with those of a traditional extramedullary device, the Dynamic hip screw (DHS), inpatients with type2 trochanteric fracture. (AO/ASIF Classification 31-A2.2 & 31-A2.3)

Materials and Methods

In this prospective study from September 2014 to august 2016, 60 consecutive patients with trochanteric femoral fractures having an unstable pattern, of either sex were randomized by computer generated tables to undergo fixation with either PFN (PROXIMAL FEMORAL NAIL) or DHS (DYNAMIC HIP SCREW). A detailed history and clinical examination was done in a systemic manner and noted on a specially designed proforma. Plain radiographs were obtained on admission and all fractures categorized according to AO/ASIF classification, patients having Fracture classification 31-A2.2 and 31-A2.3 were included and randomized for the study.

Exclusion criteria -

- AO/ASIF type other than 31-A2.2 and 31-A2.3.
- Pathological /Compound fracture
- Patient with other fracture in the same limb

Patients of respective groups underwent DHS or PFN using standard operating technique.

Patient were followed up fortnightly in the first month, then monthly until 6 months or till clinical and radiological union is achieved. X-ray of the involved hip with femur was done to assess union.

The functional outcome of the patients was evaluated and graded using HARRIS HIP SCORE system [4]

Harris Hip Score	**RESULT**
90 – 100	EXCELLENT
80 – 89	GOOD
70 – 79	FAIR
o <70	POOR

Results

The following observations were made from the data collected duringthis comparative study of proximal femoral nail and dynamic hip screw in treatment of trochanteric fractures of 60 cases. 30 cases were operated for PFN and 30 cases were operated for DHS.

In our study, age of patients ranged from 24 - 90 years with fracture more common in 6^{th} decade of life. 42 (70%) patients were male and 18 (30%) were female. In PFN group 22 (73%) patients were male and 8 (26.6%) female. In DHS group 20(66.6%) patients were male and 10 (33.3%) female.

Out of 60 patients, 37 (61.6%) have AO Type Fracture 31-A2.2 and 23 (38.3%) patients have AO Type Fracture 31-A2.3. $X^2 = 0.2$, OR=0.65 (0.23-1.86)

Table No. 1- AO Type Fracture

Type	PFN	DHS	Total
31.A2.2	17 56.6%)	20 (63.4%)	37 (61.6%)
31.A2.3	13 (43.3%)	10 (33.3%)	23 (38.3%)

The average time for PFN surgery was 44.83 minutes, standard deviation (SD) = ± 4.83 and average time for DHS surgery was 60.16 minutes, standard deviation (SD) = ± 5.16 Student- t Test T=11.88 p value =<0.05 (Highly significant).

The average blood loss in PFN was 88.3ml, standard deviation (SD) = ± 12.88 and average blood loss in DHS was 318.33ml, standard deviation (SD) = ± 24.50, Student-t-Test T=45.22 p value =<0.05 (Highly significant).

Hospital stay after surgery in PFN was average days 4.13 AND in DHS was days 5.63 standard deviation (SD)= +0.49 p value =<0.05 (Highly significant)

Table No. 2 Harris Hip Score

Score of Patients	PFN	DHS
Good(80-89)	22 (73.33%)	12 (40%)
Fair (70-79)	06 (20%)	12(40%)
Poor (<70)	02 (6.66%)	06 (20%)

x^2=6.94 p value = 0.03(<0.05 significant)

Table No. 3 Intra Operative complication PFN

Complication	No.	%
1. Failure to achieve closed reduction	01	3.3%
2. Fracture of Lateral Cortex	03	10%
3. Varus Malrotation	02	6.6%
4. Fracture displacement by Nail insertion	01	3.3%

Table No. 4 Intra Operative complication DHS

Complication	No.	%
1. Improper insertion of compression screw	02	6.6%
2. Medial Displacement of Distal fragment	04	13.3 %

Table No. 5 Infection

No. of Patients	PFN		DHS	
Infection	01	(3.03%)	02	(6.66%)
Normal	29	(96.7%)	28	(93.33%)

x^2=0.87 OR(95%CI)=0.22 (0.02=2.14)

Table No. 6 Implant Failure

Implant	No. Of Patients	Percentage
PFN	0	0
DHS	1	3.3%

Average time to union in PFN was 13.4 weeks standard deviation (SD) ±1.19 ,and average time to union in DHS was 15.1 weeks standard deviation ± 0.93, p value= 0.000001(significant)

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. The aim of management accordingly has drifted to achieving early mobilization, rapid rehabilitation and quick return of individuals to pre-injury state. Operative treatment in the form of internal fixation permits early rehabilitation and offers the best chance of functional recovery, and hence has become the treatment of choice for virtually allfractures in the trochanteric region. Literature so far does not support any treatment DHS or PFN as an exclusive option for unstable type II fracture.

In this study an attempt was made to evaluate our success in the management of such individuals by using Proximal femoral nail (PFN) and Dynamic Hip Screw (DHS) implants and compare the result in these two groups.

Ujjal Bhakat et al in his study on 60 patients, reported average operating time for the patients treated with PFN - 45 min as compared to 70 min in patients treated with DHS [5]. In 2016, Neritan Myderrizi, conducted study on 63 patients, average operating time for the patients treated with PFN was 49.3 min as compared to 72.3 min in patients treated with DHS [6]. Ujjal Bhakat reported average blood loss 100 ml in PFN surgery and 250 ml in DHS surgery. This study shows similar results for duration of surgery and blood loss.

In 2011 Richard Armelin Borger, conducted study on 70 patients of trochantric fracture. 40 patients underwent osteosynthesis by PFN with unstable trochantric fracture. The Harris Hip score one year after the operation in 16% of the patients was excellent, 19% good, 28% reasonable and 38% poor [7]. In 2015, S.K. Venkatesh Gupta, Conducted study on 400 patients in group 1 (240 patients treated with DHS) excellent result was observed in 37.5 %contrast to 66.2% in group 2 (160 patients treated with PFN). In this study functional outcome was better in PFN group (good result in 73.3 % in PFN Vs 40% in DHS group) [8].

Umesh M. Shivanna, conducted study on 30 patients of trochanteric fracture. All the fractured united at a mean of 12 weeks [9]. In 2015, Hemant Sharma reported no significant difference in time to union between the two groups (mean 16.71 vs. 17.27 weeks) $P > 0.05$ [10]. In our study average time to union in PFN group was 13.4 weeks as compared to 15.1 weeks in DHS group, this difference was statistically significant (p value= 0.000001).

Conclusion

In Type 2 unstable trochanteric fractures PFN gives advantage of lesser blood loss, shorter operating time, faster union, better functional outcome with low complication rate as compared to DHS.

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