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Dr. F Abdul Khader
Professor & HOD, Department
of Orthopaedics, Shri Sathya Sai
Medical College & Research
Institute, Ammapettai,
Chengalpattu District,
Tamil Nadu, India

Dr. Mahendhira Varman
Associate Professor, Department
of Orthopaedics, Shri Sathya Sai
Medical College & Research
Institute, Ammapettai,
Chengalpattu District,
Tamil Nadu, India

Dr. Reddy Jyothi Krishna
Final Year Postgraduate,
Department of Orthopaedics,
Shri Sathya Sai Medical College
& Research Institute,
Ammappettai, Chengalpattu
District, Tamil Nadu, India

Corresponding Author:
Dr. Mahendhira Varman
Associate Professor, Department
of Orthopaedics, Shri Sathya Sai
Medical College & Research
Institute, Ammapettai,
Chengalpattu District,
Tamil Nadu, India

Prospective and comparative study of functional outcome of intertrochanteric fracture of femur treated with dynamic hip screw (VS) proximal femoral nail

**Dr. F Abdul Khader, Dr. Mahendhira Varman and Dr. Reddy Jyothi
Krishna**

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Abstract

Without proper management, it is a sensitive issue to regaining quality of life is difficult for fractures of the lower limb. Re-establishing the pre-operative status & mobility without any medical complications is the main goal of management for any fracture. This study was done as a prospective comparative study among 44 subjects who underwent DHS or PFN for inter-trochanteric fracture in SSSMC&RI, Ammapettai. The groups were compared on basis of blood loss, surgery time, post-operative ambulation, fluoroscopic exposure, % union at 14 weeks and Harris-hip score at 6 months. Most of the subjects in both groups had Boyd/Griffin classification-type 2 injury. In each group, there is the history of Road Traffic Accident (11), slip and fall (9) and heavy object fall (2) leading to fracture. Amid DHS group shortening of limb (2), bed sore (2), delayed union (1), lag Screw pulls out (1) and varus angulation (1) as complications. Amid PFN group malunion (2), delayed union (1), limb shortening (1) and infection (1) as complications. PFN group had lesser reduced blood loss, surgery time, less fluoroscopic exposure, early post-operative ambulation. PFN has a better % union at 14 weeks and Harris-hip score at 6 months. The differences were statistically significant.

Keywords: functional outcome, intertrochanteric fracture, femur treated, dynamic hip screw (VS), proximal femoral nail

Introduction

There is 35% mortality and morbidity in the patients who are effected with Hip fractures. Connected traumas are the most common cause of mortality in hip fractures. Approximately 20% of mortality occurs within 1 month & 25% of mortality within 1 year. For women <35 years and >85 years, the incidence is 2/1 lakh and 3032/1 lakh respectively. For men 4/1 lakh and 190/1 lakh person-years respectively [1-4]. Inter-trochanteric fractures account for 50% population among hip fractures [8]. High energy trauma is the prime factor for inter-trochanteric fracture in youth. Age >60 years, female, osteoporosis, unable to maintain body balance, pre-existing fracture/falls are major risk factors for Inter-trochanteric fracture [10]. Major weight of the body is supported by the femur, so any fracture to it patient becomes un-ambulatory and causes complications leading to mortality if there is no proper management [11]. Inter-trochanteric fractures are managed by 2 ways non-operative & operative.

Non-operative treatment includes prevention of fall, protection of hip, supplementation of vit D, de-rotation boot. But these treatment options will cause various complications (ulcers, UTI, pneumonia, elevated pain, prolonged immobilization) leading to reduced quality of life & mortality in patients [12, 13, 14, 15].

Operative options include a Dynamic hip Screw (DHS) which is used as a benchmark implant from the preceding 20 years. DHS fixation is a open-type procedure that causes damage to periosteum, soft tissue (&) fracture haematoma. Proximal femoral Nail (PFN) has various advantages over DHS (Dynamic hip Screw) like stable biomechanically, the lever arm is short, anti-rotation Screw, bearing of axial load [15-22].

In this study advantages, of radio-logical and functional outcome is assessed between DH (Dynamic Hip) Screw and PF (Proximal Femoral) Nail.

Materials and Methods

The present prospective comparative study was conducted from September 2018 to June 2020 among 44 patients, 22 in each group who underwent Dynamic Hip Screw fixation or Proximal Femoral Nailing for inter-trochanteric fracture after fulfilling inclusion and exclusion criteria in Shri Sathya Sai Medical College and Research Institute, Ammapettai, Chengalpattu District, Tamilnadu. Inclusion Criteria:-Patients between 45 years of age to 75 years, Both genders, Intertrochanteric fracture after native management within 3 weeks, Stable and unstable intertrochanteric fractures, Who were able to walk prior to fracture. Exclusion criteria:-Polytrauma, Bilateral fractures, Patient with active infection, Severe medical co-morbid conditions, Pre-existing femoral deformity preventing hip Screw osteo synthesis or intra medullary Nailing. The collection of data of patients presenting with inter-trochanteric fracture were done as follows. The patients were evaluated as per the history, mode of injury. Necessary radiological investigations and haematology profile was done on admission. Type of surgery and details was noted. The immediate post-operative x-rays was evaluated. All the cases was evaluated through clinical and radiological methods at 6 weeks, 3 months and 6 months. Descriptive and comparative study of functional and radiological outcome following surgical management of inters trochanteric fractures with either Proximal Femoral Nailing or Dynamic Hip Screw fixation was assessed. Numerical variables like age, duration of surgery, amount of blood loss, Fluoroscopic time exposure, early mobilization time and Harris Hip Score are represented in mean, median, mode and standard deviation. Categorical variables like gender and injury related characteristics are represented in frequencies and percentages. Pie-charts and bar diagrams are used as appropriate.

Results

The mean (SD) of age in years among the population was 58.70(6.90) years. The minimum age was 47 years and maximum was 70 years. The mean (SD) of age in years among DHS group was 58.95(6.48) years and that of PFN group was 58.45(7.44) years. The minimum age in both groups was 47 and maximum was 70 years. The gender distribution among population- 18(40.9%) of the subjects were males and 26(59.1%) were females. The DHS group had 10(45.5%) males and 12(54.5%) females. The PFN group had 8(36.4%) males and 14(63.6%) females. The most of the subjects in both DHS and PFN group had type 2 injury [36.4%]. Type 3 injury was 27.3% among DHS and PFN group. Type 1 injury was 27.3% and 22.7% among DHS and PFN group respectively. Type 4 injury was 2(9.1%) and 3(13.6%) among DHS and PFN group respectively. Among the population 11(50%) had a history of Road Traffic Accident, 9(40.9%) had slip and fall and 2(9.1%) had heavy object fall to cause the injury among the DHS and PFN group respectively. Among the population 13(59.1%) among DHS group and 14(63.6%) among PFN group had left side injury. The 17(77.35%) of subjects among DHS group and

15(68.2%) among the PFN group had no associated injuries. The 2(9.1%) subjects had distal radius injury among both the groups. 1(4.5%) of subjects had bimalleolar, metatarsal, metacarpal, proximal humerus, olecranon and rib fractures among the groups respectively. The mean (SD) of distribution of interval between injury and surgery was 2.27(0.70) among DHS group and 2.41(0.85) days among PFN group. The minimum distribution of interval between injury and surgery was 1 day and maximum was 4 days among the population. Most of the subjects in DHS group 10(45.5%) had done the surgery within 2 days, 9(40.9 percent %) did it within 3 days and 3(13.6%) did surgery within 1 day. Among PFN group 9(40.9%), 8(36.4%) and 3(13.6%) did surgery within 1 day. All the fractures were closed fractures. The DHS procedure was done as an open type of procedure and PFN as semi-closed one. The mean (SD) of distribution of surgery time was 130.68(21.39) minutes among DHS group and 104.77(17.96) minutes among PFN group. The minimum distribution of surgery time was 105 minutes among DHS group and 80 minutes among PFN group. The maximum surgery time was 170 among DHS group and 140 minutes among PFN group. The mean (SD) of distribution of blood loss was 219.55(71.35) ml among DHS group and 131.36(34.68) ml among PFN group. The minimum blood loss was 140 ml among DHS group and 80 ml among PFN group. The maximum blood loss was 380 ml among DHS group and 200 ml among PFN group. The above table shows the fluoroscopic exposure among the groups. The mean (SD) of distribution of fluoroscopic exposure was 26.55(6.31) seconds among DHS group and 17.86(5.42) seconds among PFN group. The minimum distribution of fluoroscopic exposure was 18 seconds among DHS group and 10 seconds among PFN group. The maximum fluoroscopic exposure was 42 seconds among DHS group and 30 seconds among PFN group. The mean (SD) of distribution of the post-operative mobilization in days was 7.31(1.04) days among DHS group and 2(0) days among PFN group. The minimum and maximum distribution of the post-operative mobilization in days was 7 and 11 days among DHS group respectively. Among the PFN group all the subjects got mobilized on post-operative day 2. Among the DHS group 2(9.1%) had a complication of bed sore, shortening of limb, 1(4.5%) of subjects had delayed union, leg Screw pull out and varus angulation. Among the PFN group 2(9.1%) had malunion, 1(4.5%) had delayed union, limb shortening and infection. The mean (SD) of distribution of % of union at 14 weeks was 77.18(3.43)% among DHS group and 87.23(4.31)% among PFN group. The minimum distribution of % of union at 14 weeks was 69% among DHS group and 76% among PFN group. The maximum percentage of union at 14 weeks was 82% among DHS group and 94% among PFN group. The mean (SD) of distribution of Harris hip score at 6 months was 69.32(4.98) among DHS group and 87.36(4.90) among PFN group. The minimum distribution of Harris hip score at 6 months was 61 among DHS group and 78 among PFN group. The maximum Harris hip score at 6 months was 78 among DHS group and 94 among PFN group.

Table 1: Association of variables (age, interval between injury time and surgery, gender and Boyd/griffin classification) among the group

Variable	Group	Mean(SD)	Table value	P value	
Age in years	DHS	58.95(6.48)	0.67	0.81a	
	PFN	58.45(7.48)			
Interval between time of injury and surgery	DHS	2.27(0.70)	1.09	0.57a	
	PFN	2.41(0.85)			
Boyd/Griffin classification	DHS	1	6(27.3percent)	0.46	0.96b
		2	8(36.4percent)		
		3	6(27.3percent)		
		4	2(9.1percent)		
	PFN	1	5(22.7percent)		
		2	8(36.4percent)		
		3	6(27.3percent)		
		4	3(13.6percent)		
Gender	DHS	Male	10(45.5percent)	0.54	0.76c
		Female	12(54.5percent)		
	PFN	Male	8(36.4percent)		
		Female	14(63.6percent)		

a- independent t test

b- Fischer’s exact test

c- Chi square test

*-p value<0.05 is significant

Table 2: Association of variables (surgery time, blood loss, fluoroscopic exposure, post-operative mobilization day, percentage union at 14 weeks and Harris hip score at 6 months) among the group

Variable	Group	Mean(SD)	Table value	P value
Surgery time	DHS	130.68(21.39)	1.47	<0.001a*
	PFN	104.77(17.96)		
Blood loss	DHS	219.55(71.35)	18.31	<0.001a*
	PFN	131.36(34.68)		
Fluoroscopic exposure	DHS	26.55(6.30)	0.19	<0.001a*
	PFN	17.86(5.42)		
Post-operative mobilization in days	DHS	7.32(1.04)	10.03	<0.001a*
	PFN	2(0)		
Percentage union at 14 weeks	DHS	77.18(3.43)	0.18	<0.001a*
	PFN	87.23(4.31)		
Harris hip score at 6 months	DHS	69.32(4.98)	0.03	<0.001a*
	PFN	87.36(4.90)		

a- independent t test

*-p value<0.05 is significant

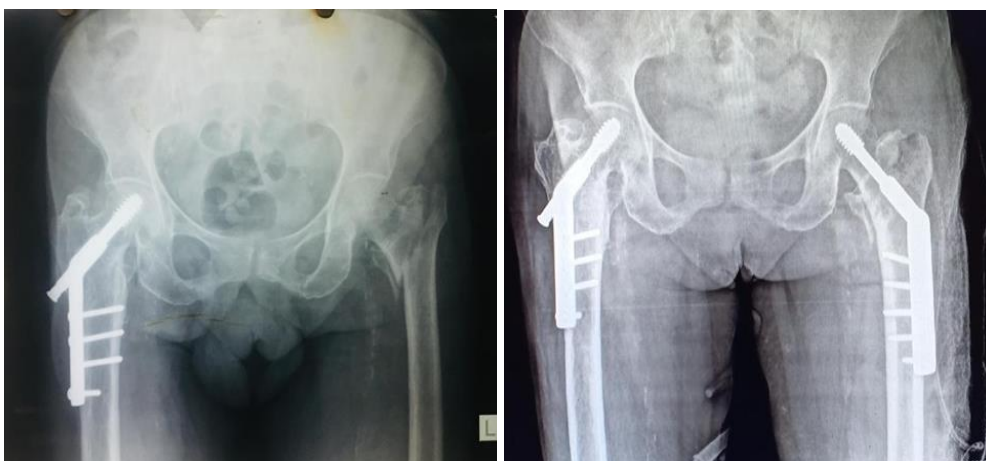


Fig 1: Pre-operative & Post-operative x-ray of DHS

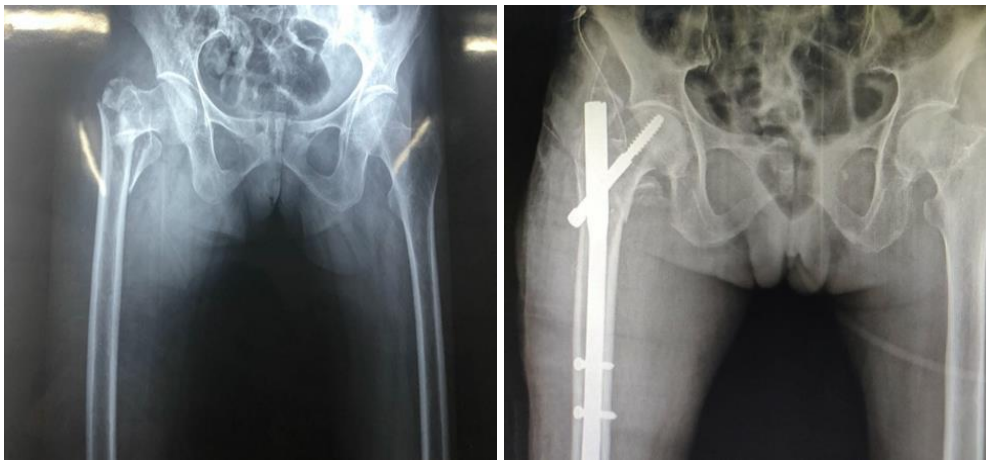


Fig 2: Pre-operative & post-operative x rays of PFN

Discussion

This study was done to observe outcomes between DH (Dynamic hip) Screw and PF (proximal femoral) Nail groups. Various variables have been compared between two groups. 58.70(6.90) years was the mean (SD) age among population. 58.95(6.48) years was the mean (SD) age in DH Screw group & 58.45(7.44) years in PF Nail group. 10(45.5%) males & 12(54.5%) females included in DH Screw group. 8(36.4%) males & 14(63.6%) females included in PF Nail group. 2.27(0.70) days was the mean (SD) of interval between surgery and injury in DH Screw group & 2.41(0.85) days in PF Nail group.

In DH Screw group the mean (SD) of blood loss distribution was 219.55(71.35) ml & 131.36(34.68) ml in PF Nail group. In DH Screw group the mean (SD) of fluoroscopic exposure was 26.55(6.31) seconds & 17.86(5.42) in PF Nail group. In DH Screw group the mean (SD) of mobilization post-operatively was 7.31(1.04) days & 2(0) in PF Nail group. In DH Screw group 2(9.1%) has bed sore, 2(9.1%) has shortening of limb, 1(4.5%) has delayed union, 1(4.5%) has lag screw pull out and 1(4.5%) has varus angulation as a complication. In PF Nail group 2(9.1%) has malunion, 1(4.5%) has delayed union, 1(4.5%) has limb shortening and 1(4.5%) has the infection as complications.

In DH Screw group the mean (SD) of % of union at 14 weeks is 77.18(3.43)% & 87.23(4.31)% in PF Nail group. In DH Screw the mean (SD) of Harris-Hip score at 6 months the distribution was 69.32(4.98) & 87.36(4.90) in PF Nail group. Based on the statistics PFN group had lesser surgery time, reduced blood loss, reduced fluoroscopic exposure, lesser post-operative mobilization day. The % union at 14 week and Harris hip score at 6 months was more among the PFN group.

Conclusion

From our study, in stable inter-trochanteric fractures PFN & DHS have shown similar results. For unstable inter-trochanteric fractures PFN has shown better results than DHS. PF Nail has postoperatively less pain, minimal time for surgery, less bleeding, x-ray exposure, early ambulation. PFN has less iatrogenic tissue damage & reoperation time. Hence from our opinion, PFN may be the better fixation device for treatment of Inter-trochanteric fractures.

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