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Comparative Analysis Between Dynamic Hip Screw and Proximal Femoral Nail in Management of Peritrochanteric Femoral Fractures

Dr. Ajay Sheoran	(Orthopaedic Resident), Department Of Orthopaedics, RNTM-C,Udaipur.
Dr. Anamendra Sharma	Professor, Dept. of Orthopedics, R.N.T. Medical College, Udaipur
Dr. Dinesh Kumar Meena	(orthopaedic Resident), Department Of Orthopaedics, RNTMC, Udaipur
Dr. Vishnu Sharma	(orthopaedic Resident), Department Of Orthopaedics , RNTMC,Udaipur

ABSTRACT

Purpose: The present investigation is a comparative analysis of Dynamic Hip Screw (DHS) and Proximal Femoral Nail (PFN) to attain correct anatomical and stable reduction, rigid fixation and early mobilization of patient.

Objectives: The objectives of the investigation are to evaluate the effectiveness and strength of DHS and PFN in management of Peritrochanteric fractures and to comparatively analyze the two internal fixations being used to treat similar kind of fracture.

Method: A comparative study of six months duration was conducted on forty patients (all above eighteen years of age) admitted in RNT Medical College, Udaipur. Twenty out of them were treated with DHS and twenty with PFN. The parameters studied were radiological union, operating time, blood loss hip deformity, shortening, range of hip and knee movements, ability to squat and sit cross legged, walking ability.

Result: The mean age of our sample is 60.8 years. The average operating time of PFN is 64.5 minutes as compared to DHS that is 61 minutes. The average blood loss was 166ml & 265 ml in PFN & DHS respectively. There was better Harris Hip Score of patients treated with PFN.

Conclusion: PFN treatment has a better outcome in treatment of Peritrochanteric fractures. PFN group has less blood loss, equal operating time and better Harris Hip score as compared to DHS

KEYWORDS Dynamic Hip Screw (DHS), Proximal Femoral Nail (PFN), Peritrochanteric fracture

INTRODUCTION:

Peritrochanteric fractures comprise of fractures of Trochanter and Subtrochanteric region. Fractures are devastating injuries that consume a considerable proportion of our health care resources. Gulberg *et al*. (1990), [1] has predicted that the total number of hip fractures will reach 2.6 million by 2025 and 4.5 million by 2050. Melton *et al.* (2009) [2] also predicted this figure could rise to 37% in 2025 and 45% in 2050 in Asia. The Trochanteric fractures can be managed by conservative ways and probabilities of nonunion are very few. However they often undergo malunion, resulting in varus and external rotation deformity at the fracture site and shortening and limitation of hip movements. These conjointly are related to complications like bedsores, deep vein thrombosis and chest infections because of prolonged immobilization. There are numerous types of internal fixation devices used for Trochanteric Fractures. The foremost ordinarily used device is Dynamic Hip Screw with side Plate assemblies. This is a collapsible fixation device, which allows the proximal fragment to collapse or settle on the fixation device, seeking its own position of stability. The latest implant for management of Trochanteric fractures is Proximal Femoral Nail that is additionally a collapsible device with added rotational stability. This implant is a centromedullary device and biomechanically much sound. Additionally it has different benefits like small incision and decreased blood loss. In 2001 a study by Kim WY [3] concluded that PFN is a wonderful implant for treatment of unstable fractures of proximal leg bone. The terms of roaring outcome embrace an honest understanding of fracture biomechanics, correct indication and precisely performed osteosynthesis. In 2002 a study by Sadowski CAL [4] to evaluate the PFN for the treatment of seventy six unstable Trochanteric fractures concluded PFN is a helpful device for the treatment of the unstable Trochanteric I fracture. It's a comparatively straightforward procedure and a biomechanically stable construct permitting early weight bearing. In a prospective randomized controlled trial of Subtrochanteric fractures treated with a PFN compared to a ninety five degree Blade plate and concluded that internal fixation of Subtrochanteric fractures with a ninety five degree angular blade plate is related to more implant failure and revision compared to closed Intramedullary nailing employing a PFN. In 2007, a prospective study on one hundred consecutive patients concluded Osteosynthesis with the PFN offers the benefits of high rotational stability of the head-neck fragment, an unreamed implantation technique and also option of static or dynamic distal locking and PFN is beneficial for treating stable and unstable Trochanteric fractures. In 2011,[5] a study concluded that complications of Short PFN like thigh pain and femoral shaft fracture distal to the nail tips are principally prevented by the utilization of Long PFN. In 2013, a study highlight the importance of being aware to the complication of anterior cortical impingement and perforation with full length CMN insertion due to a mismatch of the anatomic femoral bow with presently available Cephalomedullary Nails (CMNs). In 2014 [6], a retrospective study of 256 cases concluded there was an increased risk of secondary femur fracture with short Cephalomedullary Nails when compared to long nails that approached statistical significance.

OBJECTIVES:

- Evaluation of effectiveness and strength of Long PFN and

DHS in the management of Peritrochanteric fracture
- The advantages & disadvantages of the two internal fixations being used to treat similar kinds of fractures.

METHOD:
A comparative study of six months duration was conducted on forty patients (all above eighteen years of age) admitted in RNT Medical College, Udaipur. Twenty out of them were treated with DHS and twenty with PFN. The patients with fresh Peritrochanteric fractures and who were able to walk prior to the fracture were included in the study. The exclusion criteria included Open fracture, Pathological fracture, Active infection & Patients who are medically unfit for surgery. The parameters studied were hip deformity, shortening, range of hip and knee movements, ability to squat and sit cross legged, walking ability and pre-injury occupation. X-Ray pelvis with both hip AP-view and lateral view of operated hip were looked for the Signs of union, Neck - shaft angle, Failure of fixation, Failure of implant & Reaction to metal. Implant either DHS or PFN was randomly selected by operating surgeon. All the cases included in our study were operated as soon as possible. The average delay of surgery in our study was 7 days.

OBSERVATIONS
In this study we compared results of management of Peritochanteric fracture using Proximal femoral nail (PFN) and Dynamic Hip Screw (DHS) implants

1. Age distribution:
Most of patients in present study were from age group of 5th to 7th decade of life. Mean age in years both groups combined =60.4.

2. Sex distribution:
There was slight male preponderance in our patient. The percentage of males was 57.5% and female 42.5% for both the groups.

3. Mode of Injury
Domestic falls (fall at home) and trivial trauma was main reason behind fracture in old patients while in road traffic accident (RTA) young patients were affected in the present study. In the DHS group, in 15 cases(75%) mode of injury was due to domestic fall, while 4 cases (20%) was due to Road traffic accident (RTA)and 1 (5%) was assault case. In the PFN group, 13 cases (65%) were due to domestic fall while there were 6 cases (30%) due to Road traffic accident (RTA) and 1 case(5%) was due to assault.

4. Type of fractures
In present study, out of 20 patients treated by DHS, 16 (80%) were intertrochanteric fractures and 4 (20%) were subtrochanteric fractures and out of 16 intertrochanteric fractures 10 were stable and 6 unstable. Whereas out of 20 patients treated by PFN , 14 (70%) were intertrochanteric fractures and 6(30%) were subtrochanteric fractures and out of 14 intertrochanteric fractures 6 were stable and 8 unstable.

5. Time duration between hospital admission and surgery
Majority of patients in present study series were operated within 10 days following admission in hospital (32/40). But in some patients (8/40) operative procedure was delayed due to medical problems (Hypertension, COPD and Diabetes). Average time lapse for surgery: 7.4 days.

6. Associated Injures
In present study series two patients (in each group DHS & PFN) had distal radius fracture .All were treated conservatively with closed reduction and below elbow cast application. One patient had clavicle fracture (in DHS group) which was managed conservatively. One patient (in each group DHS & PFN) had distal pubic rami fracture. Both were treated conservatively. One patient had ulna fracture (in PFN group) managed with ORIF with SDCP.

7. Complications

Systemic complications:
In patients treated with PFN as well as DHS, one patient in each group was found to have chest infection while in other patient we found complication of urinary tract infection (UTI). This complication was noticed in preoperative phase and appropriate treatment was given. Appropriate treatment in the form of antibiotics was given to the patients who had urinary traction infection which was due to prolonged catheterization.

Wound Complications
Superficial would infection was seen in 3 cases in total. In patient operated by PFN one superficial infection was noted while two cases were seen in those operated by DHS. The patient who was operated by PFN had infection in entry site. While the two cases operated by DHS had superficial wound infection at the suture site. This may be attributed to low immunity status of patient as the patient was of asthenic built and belonging to low socioeconomic status & more soft tissue exposure, which is more in cases operated by DHS.

Intra operative complications
In the cases operated by Dynamic Hip Screw (DHS) we encountered 1 case (5%) having difficulty in reduction. This was due to delay in surgery as the patient presented late. There was one case (5%) of complication in which there was shattering of the lateral cortex while proximal reaming (triple reamer). Thus a long DHS plate had to be used which could counteract the difficulty faced. While in 2 cases (10%) in operated cases by Proximal Femoral Nailing (PFN), there was ill fitting of jig and in 2 cases (10%) difficulty in anti-rotation screw insertion. Due to the corresponding holes of jig and nail was not matching at times the position of the proximal screws was a problem.

Mal-alignment and Shortening
Post operatively the angle was measured and compared to the normal side to assess the correction achieved. Again the neck shaft angle was determined at follow up to assess any variation from immediate postoperative. Varus deformity was noted in two cases (10%) of PFN group and In 3 cases (15%) of DHS group. Due to the pull of the muscle the distal shaft fragment has the tendency to migrate upwards thus resulting in varus deformity. It might be seen due to early backing out of screws. Amongst the DHS group, in 16 cases (80%) we noted shortening at the follow up of 6 months. The average shortening was 1.2 cm while in PFN group shortening was noted in 13 cases (65%) with average shortening is 0.71centimeter. the difference in shortening in two groups was significant with p value less than 0.05. so PFN is better than DHS to prevent the shortening in peritrochenteric fracture. Shortening might have resulted due to comminution of variable degree at fracture site & concentric collapse at fracture site.

Radiological complications
In present study, the cases that we operated by Proximal Femoral Nail (PFN) we have encountered 'Z' effect in one case (5%) while in one cases (5%) we have found reverse 'Z' effect. No case of implant breakage was reported.

8. Fracture Union
Average time of union in all our 40 patients was about 16 weeks (Range from 12 to 22 weeks). In this study fracture has united in all cases within 6 month follow up. There was no significant difference in average time of fracture union in both groups. The criteria used for union was presence of bridging callus at fracture site. Most of the callus with density similar to adjacent cortical bone. Clinically, absence of pain at fracture site.

9. Mean blood loss and mean operative time
Mean operative time was 61 minutes in DHS group and 64.5 minutes in PFN group. Difference was not significant between both groups. Duration of surgery was more for the initially operated cases. More in fractures where we had to do open reduction. Mean blood loss in DHS group was 265 ml while in PFN group it was 166 ml. the difference is significant and in

accord to literature. Blood loss-measured by mop count (each fully soaked mop containing 50ml blood) more blood loss was seen in patients who require open reduction. As the incisions taken in fractures treated by Proximal femoral nailing (PFN) are small, the mean blood loss was relatively lesser as compared to those treated by Dynamic Hip Screw (DHS).

10. Functionl Outcome (As per Harris Hip scoring system)
Harris hip score was calculated for both the groups and was almost same for both group with average of 80.25 for DHS group and 81.1 for PFN group. There were two cases of poor results in each group. Poor results were attributed to complications like screw cut out, z effect or reverse z effect. Functional outcome has also correlation with fracture pattern which is shown by chi square test. Stable intertrochantric fractures mainly showed excellent or good results while unstable intertrochantric fracture showed good and fair results in both groups. Poor result was seen in unstable intertrochantric fracture and subtrochanteric fracture in each group.

TABLLE 1 : Comparison between DHS and PFN

	Implant	N	Mean	SD	Difference	SEd	t	df	P
Duration	DHS	20	61.00	8.974	-3.500	3.193	-1.096	38	.280
	PFN	20	64.50	11.110					
Blood loss	DHS	20	265.00	23.056	99.000	7.877	12.568	38	.000
	PFN	20	166.00	26.636					
Time of union	DHS	20	16.20	2.419	.100	.731	.137	38	.892
	PFN	20	16.10	2.198					
Shortening	DHS	20	1.2000	.85039	.49000	.23995	2.042	38	.048
	PFN	20	.7100	.65446					
Harris Hip Score	DHS	20	80.25	13.174	-.850	3.913	-.217	38	.829
	PFN	20	81.10	11.516					

Result and conclusion

The study of comparison of dynamic hip screw and proximal femoral nail in the management of peritrochanteric femoral fractures has come to following conclusion. Peritrochenteric fracture is more common in elder population 6th to 8th decade of life although previous studies showed a female preponderance but there is no significant difference in male to female ratio in our study.Majority of the mode of injury is fall at home followed by RTA. Almost all patient of old age suffered fracture due to trivial fall while in young patient cause was RTA.In the present study, 16(80%) of intertrochanteric fractures and 4(20%) of subtrochanteric fractures were treated by DHS. While we have 14(70%) intertrochanteric fractures with variable degree of comminution, 6(30%) cases were of subtrochanteric fractures which were treated by PFN.
Out of 40 patient, 21 (52.5%) had injury on left side while 19 (47.5%) had injury on right side. Majority of patients were operated within 10 days of hospital admission. Average time delay in surgery was 7.4 days. In associated injury most common is fracture distal end radius due to fall. Systemic complication like chest infection, UTI are same in both groups while local complication like superficial wound infection is more in DHS group 2 (10%) cases as compared to PFN group 1 (5%) case.No deep infection was encountered in our study.In operative procedure, in DHS group shattering of lateral cortex was noted in 1(5%) case and difficulty in reduction noted in 1(5%) case . PFN is more technically demanding procedure and difficulties like ill fitting of jig and difficulty in putting proximal screws were faced during procedure. Varus and shortening was more in DHS group. Varus was reported in 3 (15%) cases of DHS and in 2(10%) cases of PFN. Shortening at 6 months reported in 16 cases of DHS with average shortening of 1.2 cm while in PFN group shortening was in 13 cases and average was 0.71 cm. this difference is statistically significant. No case of implant breakage was reported in both groups. Although complication of screw cut out in 1 (5%) case, and excessive screw back out in 1 (5%) case was noted in DHS group. In PFN group complication of Z effect and reverse Z effect was reported in 1(5%) case each. Fracture union was present in all cases with average fracture healing time 16.1 week. There was no significant difference in average fracture healing time on basis of implant used.Mean operative time was 61 minute for DHS group and 64.5 minute for PFN group. This difference is not significant. Mean blood loss for DHS was 265 ml while for PFN group was 166 ml. this difference is statistically significant with p valve < 0.05 . Functional outcome is measured by harris hip score. Average harris hip score for DHS group was 80.25 with excellent result in 5(25%) cases, good in 6 (30%) cases, fair in 7 (35%) cases and poor in 2 (10%) cases.While in PFN group harris hip score was 81.1 with excellent result in 4(20%) cases, good in 8 (40%) cases, fair in 6 (30%) cases and poor in 2 (10%) cases. So from our comparative study we concluded bout the implants were good for peritrochenteric fractures , each one having its own merit and demerits.

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