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A comparative study of long versus short proximal femoral nail in peritrochanteric and subtrochanteric fractures in adults

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Abstract

Introduction: Peritrochanteric fractures are devastating injuries that most commonly affect the elderly and also in young, have a tremendous impact on both the health care system and society in general. Peritrochanteric fractures mainly comprise of fractures of trochanter and subtrochanteric region. The goal of treatment of an intertrochanteric fracture is restoration of the patient to his or her pre-injury status at the earliest possible time. Internal fixations of these fractures are recommended to increase patient comfort, facilitate nursing care, decrease hospitalization and reduce complications of prolonged recumbency.

Material and methods: A prospective comparative study was carried out in orthopaedic department at tertiary care centre. Total 60 patients were enrolled in the study which were randomized into 2 groups. Group I (n=30) patients were operated with Long PFN and Group II (n=30) patients were operated with Short PFN. Patient were evaluated using Hip Harris score and p value of < 0.5 was considered significant.

Results: The mean age in Long PFN Group was 49.63±13.82 years and 47.77±14.83 years for short PFN groups. Road Traffic Accident was observed to be the main cause of fracture in both the groups (70% and 66.7% respectively). Mean blood loss 87.17±27.84 ml in Long PFN group and 98.67±47.32 ml in short PFN group. The mean operative time was 75.5±19.62 minutes in long PFN group and 73±19.01 minutes for Short PFN group. The mean time for fracture union was 3.30±1.82 months. There was no significant difference between the groups. There was 1 complication of non-union in Long PFN group. In Short PFN group there were 2 cases of deep infection and 1 case each of non-union, bed sore and shortening. There was comparable improvement in both the groups as per Harris Hip Score but the difference was statistically not significant.

Conclusion: Both the long and short intramedullary nails are the optional internal fixation choices for Peritrochanteric and subtrochanteric Fractures. But the long nail could avoid the refracture of femur and reduced postoperative hip pain.

Keywords: Peritrochanteric hip fractures, short PFN, long PFN

Introduction

Peritrochanteric fractures are devastating injuries that most commonly affect the elderly and also in young, have a tremendous impact on both the health care system and society in general. Peritrochanteric fractures mainly comprise of fractures of trochanter and subtrochanteric region. Despite marked improvements in implant design, surgical technique and patient care, peritrochanteric fractures continues to consume a substantial proportion of our health care resources, remains a challenge to date. Trochanteric fractures are common in the elderly people. The frequency of these fractures has increased primarily due to the increasing life span and more sedentary life style brought on by urbanization. Trochanteric fractures occur in the younger population due to high velocity trauma, whereas in the elderly population it is most often due to trivial trauma. The goal of treatment of an intertrochanteric fracture must be restoration of the patient to his or her pre-injury status at the earliest possible time. This lead to recommendations for internal fixation of these fractures to increase patient comfort, facilitate nursing care, decrease hospitalization and reduce complications of prolonged recumbency^[1].

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Stable fractures can be very well treated with dynamic hip screw alone with good results proven by various studies. It is the unstable fractures which are difficult to manage with dynamic hip screw alone. Rates of complications like screw cut out, shortening of limb, varus deformity of proximal femur and even non-union are higher in unstable fractures as compared with stable fractures [2]. Intramedullary devices like the proximal femoral nail have been reported to have an advantage in such fractures as their placement allowed the implant to lie closer to the mechanical axis of the extremity, thereby decrease the lever arm and bending moment on the implant. They can also be inserted faster, with less operative blood loss and allow early weight bearing with less resultant shortening on long term follow up [3]. Hence the present study at our tertiary care centre to compare Long versus Short Proximal Femoral Nail Fixation in Peritrochanteric and Subtrochanteric Fractures in adults with respect to intraoperative parameters and to compare the functional outcome.

Materials and Method

The present study was carried out in the Department of Orthopaedics at our institute from July 2014 to November 2016. Approval from hospital ethics committee was taken to conduct this study. Patients were enrolled after obtaining written, informed consent from the patients. Total 60 patients were enrolled in the study with peritrochanteric and subtrochanteric femur fractures who were randomized into 2 groups. Group I (n=30) patients were operated with long PFN and Group II (n=30) patients were operated with Short PFN.

Inclusion Criteria:

1. All Adult patients with Peritrochanteric and Subtrochanteric fractures having AO/OTA classification 31-A2I31-A3 and 32A.
2. Patients who are medically fit for surgery.
3. Fractures less than two weeks.

Exclusion Criteria

1. Patients with compound and pathological fractures.
2. Patients with disorders of bone metabolism other than osteoporosis (i.e. Paget's disease, renal osteodystrophy or osteomalacia).
3. <18 years of age.
4. Medically unfit for surgery.
5. Patients with ipsilateral concomitant pelvic, acetabular, joints or bone fractures.
6. Low Subtrochanteric fractures 3cms below lesser trochanter.

Variables associated with recovery were noted like patient's age, strength of affected hip abductor, type of surgical technique, number of days from surgery to discharge, number of visit to physiotherapy. And predictors of functional recovery were also kept in mind like cognition of patient, hygiene, impaired mobility, vision, dizziness, poor health. After basic and other relevant investigations based on the medical history, Particular attention given to restore the circulatory volume and attention to chronic medical conditions. All patients had been provided air/water beds to prevent bed sores and bucks traction applies to reduce pain. Patients were operated as soon as the medical conditions allowed and fit for anesthesia. We used pre-operative (prophylactic) antibiotics in all the cases. In most of the patients, one dose of third generation cephalosporin injection was given one hour before the surgery. Post operatively

patients were maintained pain free by use of analgesics like NSAIDs, Opioid analgesics for initial few days and thereafter as and when required. All the other patients were allowed to sit up on the bed within 24 hours. They were taught quadriceps strengthening exercises and were encouraged to sit on the side of the bed within three days. Patients were made to ambulate as early as possible to prevent DVT and pressure sores. Association among the study groups is assessed with the help of Fisher test, student t'test and Chi-Square test. P value less than 0.05 is taken as significant.

Observations and result

Majority of the patients (30%) in Long PFN Group were from the age group of 51-60 years followed by 26.7% from the age group of 41-50 years, 20% from the age group of > 60 years, 13.3% from the age group of 21-30 years and 10% from the age group of 31-40 years. The mean age in Long PFN Group was 49.63±13.82 years.

Majority of the patients (33.3%) in Short PFN Group were from the age group of 51-60 years followed by 20% from the age group of 21-30 years, 16.7% each from the age groups of 41-50 years and > 60 years and 13.3% from the age group of 31-40 years. The mean age in Short PFN Group was 47.77±14.83years.

As per Student t test, there was no significant difference between the groups.

Table 1: showing distribution of patients according to sex

Sex	Long PFN Group		Short PFN Group		p Value
	N	%	N	%	
Male	18	60%	16	53.3%	<i>p</i> >0.05
Female	12	40%	14	46.7%	
Total	30	100%	30	100%	

Table 2: showing distribution of patients according to laterality of fracture

Sex	Long PFN Group		Short PFN Group		p Value
	N	%	N	%	
Male	18	60%	16	53.3%	<i>p</i> >0.05
Female	12	40%	14	46.7%	
Total	30	100%	30	100%	

Table 3: showing distribution of patients according to mode of injury

Sex	Long PFN Group		Short PFN Group		p Value
	N	%	N	%	
Male	18	60%	16	53.3%	<i>p</i> >0.05
Female	12	40%	14	46.7%	
Total	30	100%	30	100%	

Table 4: showing distribution of patients according to AO classification

Sex	Long PFN Group		Short PFN Group		p Value
	N	%	N	%	
Male	18	60%	16	53.3%	<i>p</i> >0.05
Female	12	40%	14	46.7%	
Total	30	100%	30	100%	

Table 5: shows distribution of patients according to co-morbidities

Sex	Long PFN Group		Short PFN Group		p Value
	N	%	N	%	
Male	18	60%	16	53.3%	<i>p</i> >0.05
Female	12	40%	14	46.7%	
Total	30	100%	30	100%	

In Long PFN group, 19 (63.4%) patients had blood loss of 50-100 ml followed by 10 (33.3%) patients with blood loss of 100-150 ml and 1 (3.3%) patient with blood loss of > 150 ml. The mean blood loss was 87.17±27.84ml. In Short PFN group, 20 (66.7%) patients had blood loss of 50-100 ml followed by 6 (20%) patients with blood loss of 100-150 ml and 4 (13.3%) patient with blood loss of > 150 ml. The mean blood loss was 98.67±47.32ml. As per Student t test, there was no significant difference between the groups. In Long PFN group, 26 (86.7%) patients had operative time of 50-100 minutes while 4 (13.3%) patients had operative time of 100-150 minutes. The mean operative time was 75.5±19.62

minutes. In Short PFN group, 25 (83.3%) patients had operative time of 50-100 minutes while 5 (16.7%) patients had operative time of 100-150 minutes. The mean operative time was 73±19.01 minutes. As per Student t test, there was no significant difference between the groups. The post-operative stay of all patients ranged from 2.46 to 14 days in Long PFN group. The mean post-hospital stay was 6.80±2.46 days. In Short PFN group the hospital stay of patients ranged from 2.99 to 15 days. The mean post-hospital stay was 7.93±2.99 days. There was no significant difference between the groups as per Student t test.

Table 6: showing comparison of results among both groups

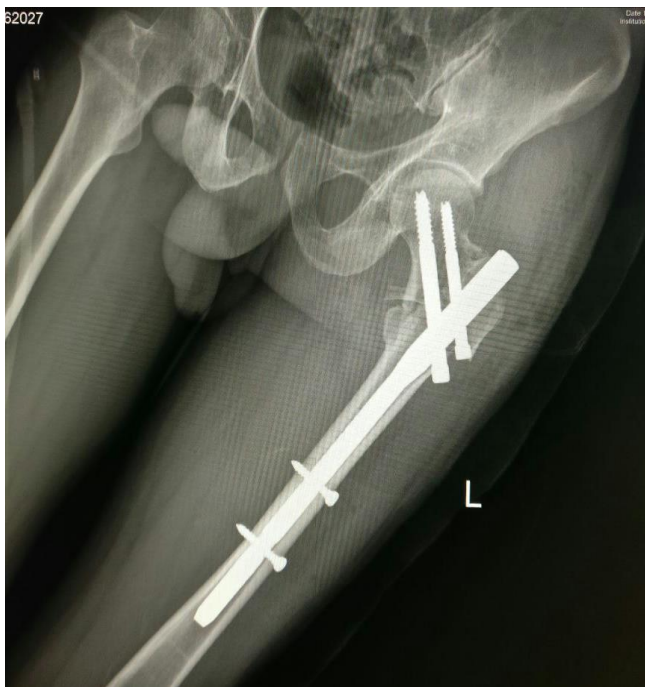
Results	Long PFN Group		Short PFN Group		p Value
	N	%	N	%	
Excellent	10	33.3%	8	26.6%	<i>p</i> >0.05
Good	10	33.3%	14	46.7%	
Fair	9	30%	5	16.7%	
Poor	1	3.3%	3	10%	
Total	30	100%	30	100%	

Table 7: showing comparison of complications among both groups

Complications	Long PFN Group		Short PFN Group		p Value
	N	%	N	%	
Non-Union	1	3.3%	1	3.3%	<i>p</i> >0.05
Deep infection	0	-	2	6.6%	
Bed Sore	0	-	1	3.3%	
Shortening	0	-	1	3.3%	

Table 8: showing comparison of Harris Hip score among both groups

Harris Hip Score	3 months		6 months		9 months		12 months	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Long PFN Group	81.07	8.64	82.87	8.71	84.03	8.44	85.83	8.55
Short PFN Group	80.63	9.38	82.33	9.01	83.43	8.89	85.10	8.99



1a. showing anteroposterior view of PBH and operated left IT fracture with short PFN



1b. showing lateral view of left hip with centre-centre position of proximal screws

Fig 1: 50 year old male with intertrochanteric femur fracture operated with short PFN



2a. Anteroposterior view of PBH showing operated left proximal femur # with long PFN



2b. full length AP view of right femur radiograph



2c. lateral view of right hip with femur

Fig 2: 57 year old male with h/o RTA presented with IT-subtroch fracture

Discussion

Peritrochanteric fractures are devastating injuries that most commonly affect the elderly and also in young, have a tremendous impact on both the health care system and society in general. Koval KJ *et al.* [4] observed that fractures in adults were due to result most often with high energy trauma such as motor vehicular accidents. Horn *et al.* [5] stated that mechanism of injury is not direct but due to failure of stress resisting forces during sudden bending or twisting. Zhi L *et al.* [6] compared failure rates between short and long intramedullary nails used for the treatment of hip fractures in 156 patients. The patients were allocated to two groups: those treated with long nail (n=59) and short nail (n=97). Relevant patient variables and medical comorbidities were collected. Medical comorbidities were evaluated according to the American Society of Anesthesiologists classification and medical records were also reviewed for age, sex, intraoperative blood loss, operative time, length of stay, time to fracture union, hip pain, Harris Hip Score 1 year postoperatively, and failure rates. The failure rate was defined as periprosthetic fracture or reoperation requiring removal or revision of nail. Variables were statistically compared between the two groups, with statistical significance at $P < 0.05$. Patients treated with long nails and short nails were comparable for all assessed clinical variables. There were no statistically significant differences between these groups in intraoperative blood loss and time to fracture union at 1 year postoperatively. The long nail group had significantly less failure rate (0/59) and hip pain rate (3/59) than those with short nail (3/97 and 13/97, respectively), but the operative time was significantly longer in the former (60.60 ± 11.43 minutes) than the latter (53.10 ± 8.51 minutes) group. In the study of B. Mall *et al.* [7] (30 patients) average time of ambulation was 14 days whereas in the study of Kulkarni GS [8] ambulation was usually started after 11-12 days after the stitch removal. The mean time for fracture union in our study was 3.30 ± 1.82 months. There was no significant difference between the groups. The radiological time of union in studies of Harrington KD *et al.* [9], Rao JP *et al.* [10] and B. Mall *et al.* [7] were 16 weeks, 18 weeks and 14 weeks respectively. There was 1 complication of non-union in Long PFN group. In Short PFN group there were 2 cases of deep infection and 1 case each of non-union, bed sore and shortening. There was no significant association between the groups. A Bodoky *et al.* [11] advocated the use of two doses of cephalosporin antibiotics preoperatively in the patients managed with internal fixation of hip fractures. According to their study antibiotics prophylaxis significantly reduced the incidence of wound infection. The mean HHS evaluated over a time interval of 12 months showed good results throughout the entire period. There was comparable improvement in both the groups as per Harris Hip Score but the difference was statistically not significant. Similarly in the study of Zhi L *et al.* [6] there were no statistically significant differences between these groups in Harris Hip Score at 1 year postoperatively.

Conclusion

Both the long and short intramedullary nails are the optional internal fixation choices for Peritrochanteric and subtrochanteric Fractures. But the long nail could avoid the refracture of femur and reduced postoperative hip pain.

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