Original Research Article

A study to compare the early outcomes and complications in patients of intertrochanteric femur fractures who underwent proximal femoral nailing (PFN) and bipolar hemiarthroplasty (BPH) at a tertiary hospital

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Abstract

Background: Intertrochanteric fractures of the femur are one of the most common fractures. Due to the increasing longevity of mankind, the incidence of these fractures is also on the rise. Newer modality of fixation of these fractures is by the 4th generation of intramedullary nails like the gamma nails or the proximal femoral nails. In present study we compared early outcomes and complications in patients of intertrochanteric femur fractures who underwent proximal femoral nailing (PFN) and bipolar hemiarthroplasty (BPH) at a tertiary hospital. **Material and Methods:** Present prospective study was conducted in patients more than 60 years age, recent traumatic history, displaced, unstable intertrochanteric femur fracture. 50 cases were equally divided into two groups by systematic random sampling: one operated with proximal femoral nail (PFN) and one with bipolar hemiarthroplasty (BPH). **Results:** All the patients were elderly. The most common age group was 71-75 years (34%), average age for arthroplasty was 74.2 years and PFN was 76.12 years. Females were predominantly affected in both cases (70%). Right side was involved in Hemiarthroplasty in 9 (36%) patients and left side in 16 (64%) patients and in PFN right side was 10(40%) and left side was 15(60%). Domestic fall (slip and fall at home) accounted for the most common mode of injury in both hemiarthroplasty (88%) and in PFN (84%) groups. **Conclusion:** Cemented bipolar hemiarthroplasty should be considered as one of the best modalities for the primary treatment of comminuted unstable intertrochanteric fractures of femur in elderly as compared to PFN

Keywords: Intertrochanteric fractures, Cemented bipolar hemiarthroplasty, comminuted unstable fractures, proximal femoral nail.

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Received Date: 20/03/2021 Revised Date: 12/04/2021 Accepted Date: 25/05/2021
DOI: https://doi.org/10.26611/1031913

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 07 July 2021

INTRODUCTION

Intertrochanteric fractures of the femur are one of the most common fractures. Due to the increasing longevity of mankind, the incidence of these fractures is also on the rise. This is directly linked to osteoporosis which is increasingly common with increasing age.[1] Unstable intertrochanteric fractures in the elderly are associated with high rates of morbidity and mortality due to the need of prolonged immobilization, although the results have improved with the use of internal fixation. Because of prolonged

How to site this article: Rachit Vipul Shah, Anil Mohan, Shrinivas S Shintre. A study to compare the early outcomes and complications in patients of intertrochanteric femur fractures who underwent proximal femoral nailing (PFN) and bipolar hemiarthroplasty (BPH) at a tertiary hospital. *MedPulse International Journal of Orthopedics.* July 2021; 19(1): 09-13. https://www.medpulse.in/Orthopedies/

immobilization, complications like deep vein thrombosis, hypostatic pneumonia, pressure sores, dehydration, atelectasis, metabolic complications, etc have also contributed to the increasing mortality.[2] Newer modality of fixation of these fractures is by the 4th generation of intramedullary nails like the gamma nails or the proximal femoral nails.[3] But these are found to be not very suitable in Indian population with osteoporotic bones and narrow neck of femur bone. Even with these implants immobilization is often needed. Management of such cases with a primary hemiarthroplasty is believed to permit early mobilization, thus avoiding most of these complications.[4] The patient may be mobilized early giving good rehabilitation and better options for independent living. In present study we compared early outcomes and complications in patients of intertrochanteric femur fractures who underwent proximal femoral nailing (PFN) and bipolar hemiarthroplasty (BPH) at a tertiary hospital.

MATERIAL AND METHODS

Present prospective study was conducted in Department of Orthopaedics, Government Medical College Miraj. The study was conducted over a period from October 2017 to October 2019. Study was approved by institutional ethical committee.

Inclusion criteria

Patients more than 60 years age, recent traumatic history, displaced, unstable intertrochanteric femur fracture, patients willing to consent for participating in the study

Exclusion criteria :

- Age less than 60 years
- Patients with pathologic fractures.
- Patients with multiple fractures.
- Patients with old neglected fractures.
- Patients with osteoarthritis of the hip joints.
- Patients not willing to participate

The patients confirming into criteria were included in present study. Clinical diagnosis of intertrochanteric fracture was done with external rotation, shortening and history of trauma. Classification of the fracture was done using the Tronzo's classification and types 3, 4 and 5 of the Tronzo Classification being unstable types were included in the study. Emergency treatment in the form of analgesics is given. Anteroposterior X-ray of pelvis with both hips in 15 degree internal rotation and lateral view of the injured joint were taken. The preoperative neck-shaft angle and the medullary canal diameter was calculated with the help of the radiographs of the normal opposite hip. Injured limb was kept in a Thomas' splint with skin traction with adequate splintage to correct flexion deformity if any and to prevent overriding whenever present. Preoperative routine blood and urine investigations were done. Informed consent was obtained by patient for both the surgical procedure and participation in the study. 50 cases were equally divided into two groups by systematic random sampling: one operated with proximal femoral nail (PFN) and the other with bipolar hemiarthroplasty (BPH). Under regional anesthesia (spinal + epidural), with position Supine on fracture table for PFN and lateral for hemiarthroplasty, patients were operated. Preparation was done with betadine scrub, saline, betadine solution, spirit and sterilium, later draped using stockinet and sterile drapes to minimize contamination from surrounding skin. Surgical approach was lateral for PFN and Anterolateral or Watson-Jones approach for hemiarthroplasty, operated as per standard operative protocols of department. Standard post-operative care was provided. Limb elevation was given. Foot end elevation was given for one day, DVT prophylaxis was given with low dose aspirin. Static exercise in bed for glutei, hamstrings, quadriceps and breathing exercises were started next day of surgery. Sitting was allowed on next day of surgery with passive exercises in bed. Drain if inserted was removed after 48 hours. ROM exercises were started actively. Partial weight bearing after 6 weeks and full weight bearing was started after 3 months approximately. Follow up was done post operatively at 1 months, 3 months, 6 months. At each follow up visit patients were evaluated radiologically and clinically. Functional outcome was evaluated by Harris hip score. Radiographs were taken at each follow up to analyze any evidence of dislocation or prosthesis loosening. Rehabilitation was continued up to 1 year in the form of lifestyle modification like avoiding squatting, sitting cross legged or climbing high steps and gait training. Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Non-parametric Chi-square and t test was used for comparative analysis of results between different groups and to find significance (p) value. Continuous data was represented as mean and standard deviation. P value of <0.05 was considered as statistically significant.

RESULTS

The present study was done in 25 cases of unstable intertrochanteric fracture which were treated by cemented bipolar hemiarthroplasty and 25 cases were treated by PFN. All the patients were elderly, most common age group was 71-75 years (34%), average age for arthroplasty was 74.2 years and PFN was 76.12 years. Females were predominantly affected in both cases (70%). Right side was involved in Hemiarthroplasty 9 (36%) patients and left side in 16 (64%) patients and in PFN right side was 10(40%) and left side was 15(60%). Thus affection of left side was marginally more in both group compared to that

on the right. Difference between both groups for mean age, gender and side was comparable and was not significant statistically. Domestic fall (slip and fall at home) accounted for the most common mode of injury in both hemiarthroplasty (88%) and in PFN (84%) groups. Many patients were having some medical co- morbidities like diabetes mellitus, hypertension or cataract. Hypertension and diabetes being the most common among them.

Table 1: General characteristic

Characteristics	BPH group	PFN group	p value
AGE IN YEARS			
65-70	8 (32%)	5 (20%)	
71-75	9 (36%)	8 (32%)	
76-80	5 (20%)	8 (32%)	
81-85	2 (8%)	2 (8%)	
>85	1 (4%)	2 (8%)	
MEAN ± SD	74.2 ± 5.78	76.12 ± 6.02	0.25
SEX			0.35
MALE	6 (24%)	9 (36%)	
FEMALE	19 (76%)	16 (64%)	
SIDE			0.77
RIGHT	9 (36%)	10 (40%)	
LEFT	16 (64%)	15 (60%)	
MODE OF INJURY			
DOMESTIC FALL	22 (88%)	21 (84%)	
RTA	3 (12%)	4 (16%)	
MEDICAL CONDITION			
Diabetes	4 (16%)	3 (12%)	
Hypertension	3 (12%)	4 (16%)	
Diabetes with hypertension	1 (4%)	2 (8%)	
Cataract	1 (4%)	0	
No medical ailment	16 (64%)	16 (64%)	

Most of the patients were operated within 6 days following admission after getting medical fitness for anaesthesia. All 25 cases of hemiarthroplasty were operated using Antero lateral approach by in order to prevent damage to posterior capsule and short external rotators. In all cases cementing was done using slow setting SIMPLEX P cement (40 grams). All 25 PFN cases were operated using lateral approach was taken from the tip of greater trochanter extending proximally for 3-8 cm depending upon the fracture and the patient. Average surgery duration for hemiarthroplasty was 82 min and for PFN was 78 min. Average blood loss for hemiarthroplasty was 356 ml and for PFN was 116 ml. Time for full weight bearing for hemiarthroplasty was 4.84 ± 2.32 days and for PFN was 96.6 ± 18.29 days, difference was statistically significant.

Table 2: Operative characteristic

Operative characteristics	BPH group	PFN group	p value
Trauma to surgery Interval (days)			
1-6	16 (64%)	20 (80%)	
> 6	9 (36%)	5 (20%)	
MEAN ± SD	4.24 ± 2.93	4.44 ± 2.38	0.79
Time taken for surgery (minutes)	82.2 ± 10.71	78.68 ± 15.81	0.36
Time for full weight bearing (days)	4.84 ± 2.32	96.6 ± 18.29	0.0001

In hemiarthroplasty limb shortening was seen in 1 case having 1 cm shortening which was managed by simple shoe raise. But in PFN limb shortening was seen in 6 cases. Out of six, shortening in 2 cases was due to implant breakage and screw cut out which needed re-operation and in the remaining 4 cases, shortening was due to varus Malunion. There were 6 cases of pressure sore in PFN group as compared to 1 case of pressure sore in hemiarthroplasty group. No case of pulmonary embolism occurred in the hemiarthroplasty group but one case of pulmonary embolism was seen in the PFN group. Four case of PFN and one case of hemiarthroplasty had DVT which was managed by close monitoring and conservative management in ICU setup. Two cases of hemiarthroplasty and one case of PFN had superficial infection which was managed by targeted antibiotic therapy after culture and sensitivity testing. In PFN group complications like pressure sore (due to prolonged immobilization) and limb shortening were more than BPH group and difference was significant.

Table 3: Complications:

COMPLICATION	BPH group	PFN group	p value	INFERENCE
Pressure sore	01 (4%)	06 (24%)	0.04	SIGNIFICANT
Limb shortening	01 (4%)	06 (24%)	0.04	SIGNIFICANT
Deep vein thrombosis	01 (4%)	04 (16%)	0.51	NOT SIGNIFICANT
Pulmonary Embolism	00	01 (4%)	0.31	NOT SIGNIFICANT
Superficial infection	02 (8%)	01 (4%)	0.54	NOT SIGNIFICANT
Dislocation	01 (4%)	00	0.31	NOT SIGNIFICANT
Chest infection	00	01 (4%)	0.31	NOT SIGNIFICANT
Implant breakage	00	01 (4%)	0.31	NOT SIGNIFICANT
Screw cut out	00	01 (4%)	0.31	NOT SIGNIFICANT

All patients were followed up to a period of 1, 3 and 6 months. After 6 months of follow up, according to harris hip score, fair to excellent result were seen in 96% of the cases of hemiarthroplasty group but in case of PFN there were only 76%. Results were better in BPH group as compared to PFN group and difference was statistically significant at 1 month, 3 months and 6 months.

Table 4: Harris hip score

Harris hip score	BPH group	PFN group	p value
After 1 month			
90-100 (excellent)	1 (4%)	0	
80-89 (good)	12 (48%)	0	
70-79 (fair)	11 (44%)	6 (24%)	
<70 (poor)	1 (4%)	19 (76%)	
Mean ± SD	79.92 ± 6.23	66.96 ± 5.29	<0.0001
After 3 month			
90-100 (excellent)	1 (4%)	0	
80-89 (good)	14 (56%)	8 (32%)	
70-79 (fair)	9 (36%)	9 (36%)	
<70 (poor)	1 (4%)	8 (32%)	
Mean ± SD	81.68 ± 5.8	76.36 ± 7.76	0.008
After 6 months			
90-100 (excellent)	3 (12%)	1 (4%)	
80-89 (good)	12 (48%)	8 (32%)	
70-79 (fair)	9 (36%)	10 (40%)	
<70 (poor)	1 (4%)	6 (24%)	
Mean ± SD	81.72 ± 6.74	73.2 ± 8.19	0.0002

DISCUSSION

Hip fractures are associated with notable morbidity and mortality in elderly patients. Complexity of unstable intertrochanteric fractures in elderly patients poses challenging problems, with an added risk of increased morbidity and mortality. Early ambulation following surgeries is important for preventing complications that can be caused by long term bed rest in elderly patients with poor general conditions. The reported complication rate for treating unstable intertrochanteric fracture range from 18-50%.[4] Internal fixation has drastically reduced the mortality associated with intertrochanteric fractures. Traditionally intertrochanteric fractures have been treated with internal fixation using dynamic hip screw (DHS) or cephalo-medullary nailing devices. PFN acts as a buttress to prevent medialisation of the shaft and provides more efficient load transfer. It is designed to provide linear intraoperative compression of head neck segment to shaft along with rotational stability which minimizes neck malunions resulting in negligible complication rate. It also reduces stress concentration at the tip and the smaller distal diameter may prevent femoral shaft fractures. Union rates of close to 100% have been achieved in stable, well-fixed fractures in patients with good quality of bone. However, problems arise in unstable osteoporotic fractures, where a high incidence of complications has been observed.[3] Studies with Proximal femoral nail (PFN) in unstable inter-trochanteric fractures have shown a high incidence of complications. According to a study by Tyllianakis *et al.*,[5] technical and mechanical complications were noted in 41.3% during operation and 30.4% during followup. Overall re-operation rate was 28.8%. Only 30% of the patients recovered to the previous level of functional scores. After analysing the cases of lateral and intra articular protrusion of screws, they suggested a possible explanation that screws were jammed or their sliding through PFN did not proportionately follow the fracture subsidence or impaction and PFN implant acted as a fixed

device. Studies of internal fixation of comminuted intertrochanteric hip fractures reported failure rates of as high as 56% owing to comminution, suboptimal fracture fixations and poor bone qualities in elderly patients.[4] Davis TR *et al.*[6] recommended central positioning of the screw in the femoral neck. which yields cut- out rate of about 13%. Gundle R *et al.*[7] noted that the strength of fixation depends on screw positioning and bone quality. The cut-out rate in the present study was 16% and the respective patients underwent revision surgery (arthroplasty or implant removal). Studies of the recent trochanteric femoral nail also show a high rate of complications and require a precise surgical technique. The study by Crawford *et al.*[8] reported 11% re-operation rate because of screw cut-out or fracture at the distal tip of the nail, in our study there was 8% reoperation rate due to one case of implant breakage and one case of screw cut out. Largest series available in literature comparing both methods is study done by Peifu Tang *et al.*[9] with 303 cases, they reported complications which include infection, non union, screw breakage, dislocations and screw cut outs. Other studies include studies done by Jun Shen *et al.*[10] and Kim *et al.*[11] with 124 and 58 patients respectively. So for internal fixation early mobilization is still avoided in cases with comminution, osteoporosis, or poor screw fixation. So in PFN there were significant complication like pressure sore, DVT and Chest infection as compared to hemiarthroplasty due to prolonged immobilization. Liang *et al.*[12] in their study of comminuted intertrochanteric fractures concluded hemiarthroplasty is an effective method to treat the comminuted intertrochanteric fractures in elderly. It can decrease the complications, reduce the mortality, and improve the patient's living quality. Surgeon is often confronted with a challenge and dilemma between achieving bony union in a weakened bone stock, against need for early mobilization. All these problems are addressed by hemiarthroplasty. Primary hemiarthroplasty offers a modality of treatment that provides adequate fixation and early mobilization in these patients thus preventing postoperative complications such as pressure sores, pneumonia, atelectasis, and pseudo arthrosis. A larger prospective randomized study which compares the use of intramedullary devices against primary hemiarthroplasty for unstable intertrochaneric fractures is needed to study these concerns.

CONCLUSION

Intertrochanteric fractures of femur are very common among old age patients, females being more commonly affected. PFN in the treatment of unstable intertrochanteric femur fracture have early post-operative rehabilitation of the patients, better functional outcome and lesser complication. Cemented bipolar hemiarthroplasty should be considered as one of the best modalities for the primary treatment of comminuted unstable intertrochanteric fractures of femur in elderly as compared to PFN

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Source of Support: None Declared
Conflict of Interest: None Declared