

## Original Research Article

# Prospective study of management of unstable intertrochantric femur fractures in elderly: hemiarthroplasty vs. osteosynthesis by proximal femoral nail

Kishor G. Murkute\*, Shivsagar V. Jadhav, Jeevan Tonde, Omprakash Kumar Badgujar

Department of Orthopaedics, PCMC's Postgraduate Institute Yashwantrao Chavan Memorial Hospital, Pimpri, Pune, Maharashtra, India

**Received:** 29 September 2022

**Revised:** 08 November 2022

**Accepted:** 09 November 2022

### \*Correspondence:

Dr. Kishor G. Murkute,

E-mail: [kishormurkute01@gmail.com](mailto:kishormurkute01@gmail.com)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** A prospective study was done to compare the outcomes of management of unstable intertrochantric femur fractures in elderly by hemiarthroplasty and osteosynthesis by proximal femoral nail.

**Methods:** This was an interventional prospective study. The study was carried out over 3 years from 2019 to 2022 at PCMC's PGI YCMH, Pimpri, Pune, Maharashtra, India. The study was carried out over 3 years from 2019 to 2022; 50 Patients were randomly divided into two groups; Group A (unstable intertrochantric femur fracture patients treated by bipolar hemi-arthroplasty) and Group B (unstable intertrochantric femur fracture patients treated by proximal femoral nailing) with 25 patients in each group. Outcomes were evaluated based on functional outcomes, mean surgical time, mean blood loss during surgery, post-operative length of stay, post-operative complications. Harris hip Score was used to assess clinical functional outcomes.

**Results:** The PFN group showed a better Harris Hip score at 1, 3, and 6 months follow ups. Mean surgical time was more in bipolar hemiarthroplasty group. Mean blood loss during surgery was more in bipolar hemiarthroplasty group. Post-operative length of stay was more in bipolar hemiarthroplasty group. Post-operative complications like infections, limb length discrepancies were more in bipolar hemiarthroplasty group, whereas 2 implant failures occurred in PFN group compared to a single one in bipolar hemiarthroplasty group.

**Conclusions:** Both PFN and bipolar-hemiarthroplasty appear to produce satisfactory outcomes in surgically treated unstable IT fractures, bipolar-hemiarthroplasty has the advantages of early mobilization and early weight bearing, no risk of non-union but PFN group is superior when it comes to functional outcomes, mean surgical time, Mean blood loss during surgery, post-operative length of stay, post-operative complications.

**Keywords:** Unstable intertrochantric femur fracture, Bipolar hemi-arthroplasty, Proximal femoral nail, Coxafemoral bypass technique

## INTRODUCTION

Intertrochantric fractures account for roughly 34% of all hip fractures.<sup>1</sup> With the aging population, the incidence rate of osteoporosis is rapidly increasing.<sup>2</sup> These fractures are predicted to reach 2.6 million in 2025 and 4.5 million in 2050 worldwide.<sup>3</sup> The incidence of these fractures,

which frequently occur due to falls, is two-three times higher in females than in males.<sup>4</sup> Intertrochantric fractures, which are unstable, usually can only be treated surgically.<sup>5</sup>

Intertrochantric fracture in the elderly is still a grievous issue with multiple options of managing them with often

suboptimal outcomes especially in unstable osteoporotic and severely comminuted intertrochanteric fractures. There is no consensus for the treatment of unstable intertrochanteric fractures and the most appropriate line of management according to the patient's age, osteoporosis and fracture pattern. It has been concluded that bipolar prosthesis is a viable alternative to internal fixation in the management of unstable trochanteric fractures in the elderly patients.<sup>6</sup>

### Objectives

The present study was undertaken to compare the functional outcome in patients of unstable intertrochanteric femur fractures in elderly treated with hemiarthroplasty against those treated with proximal femoral nail and complications and to determine which implant would be ideal for which fracture type so as to provide the best results with the least complications.

## METHODS

### Study design, duration and location

This was an interventional prospective randomized control trial study. The study was carried out over 3 years from 2019 to 2022. The present study had been carried out in the hospital settings of department of orthopaedics, PCMC's postgraduate institute Yashwantrao Chavan Memorial Hospital, Pimpri, Pune, Maharashtra, India

### Sample size

Total 50 patients were randomly divided into two groups; Group A (unstable intertrochanteric femur fracture patients treated by bipolar hemi-arthroplasty) and Group B (unstable intertrochanteric femur fracture patients treated by proximal femoral nailing) with 25 patients in each group. Outcomes were evaluated on follow ups at 1/3/6 months based on functional outcomes, mean surgical time, mean blood loss during surgery, post-operative length of stay, post-operative complications. Harris hip Score was used to assess clinical functional outcomes. SPSS (Statistical package for social sciences) was used for statistical analysis.

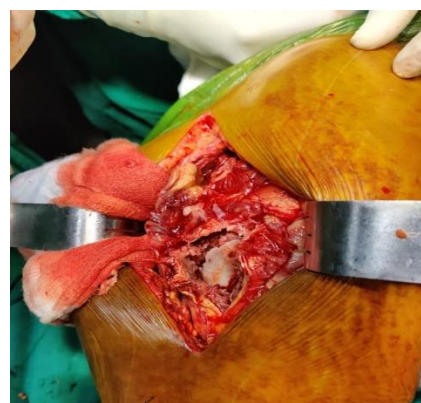
### Inclusion and exclusion criteria

Inclusion criteria in current study were; patient age >60 years, traumatic unstable intertrochanteric fractures of proximal femur and ability to walk before trauma. Exclusion criteria in current study were; patients age <60 years, pathological fracture, compound fractures, concomitant neuromuscular pathologies, unwillingness to participate and pre injury status non-ambulatory.

### Group A-Hemiarthroplasty group

Planning was done on preoperative roentgenograms to find out the horizontal and vertical offset, the size of head

of femur and length of extra-medullary portion of the femoral prosthesis. position: patients were placed in true lateral position, with the affected limb uppermost. Because most patients requiring surgery are elderly and have delicate skin, it is important to protect the bony prominences of the legs and pelvis and so cotton pads were placed under the lateral malleolus and knee of the bottom leg and a pillow between the knees. Prosthesis: the prosthesis used was the standard modular bipolar hip prosthesis. Coxafemoral bypass technique: all patients in coxafemoral bypass group were operated using a standard lateral approach. After assessing fracture anatomy, incision was made over greater trochanter, which extended proximally and distally about 3 inches.<sup>7</sup> Tensor fascia lata incised in the plane of incision and coronal fracture plane was identified. Plane between the fragments was developed by reflecting anterior and posterior fractured trochanteric fragments. Head along with neck was circumferentially dissected from the capsular attachments. After delivering the head out, it was measured. Limb was placed in flexion and internal rotation. Shaft was then reamed with sequential broaching. Trial reduction was done to know the limb length and version stability. Two drill holes were placed in the proximal end of the shaft of femur for passing stainless steel wires. Then bone cement was put into the medullary canal manually. After cementing Modular bipolar prosthesis was placed with proper anteversion. The wound was closed in layers with suction drain, sterile dressing was done.

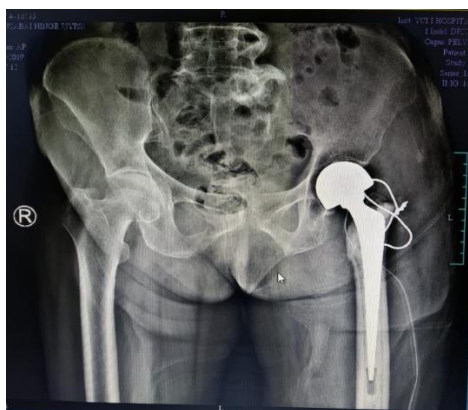


**Figure 1: Surgical exposure: coxafemoral bypass technique, fractured fragments of greater trochanter, through which femoral head is extracted.**

### Group B: Proximal femoral nail (PFN) group

All patients were given supine position following anaesthesia, on a fracture table, closed reduction and manipulation was done after the patients were anaesthetized. 3-5 cm skin incision was made few cm proximal to the tip of greater trochanter. Soft tissue dissected to identify the tip of trochanter and awl entry was made under c-arm guidance. Guide wire was passed maintaining fracture reduction, successive reaming was performed maintaining reduction. Proximal femoral nail

was inserted to the appropriate depth to allow screw placement in femoral head. Two guide pins were passed under c-arm guidance for placement of Femoral neck screw and Derotation screw respectively and were overdrilled with 6.5 mm drill bit for 8.0 mm femoral neck screw and 5.0 mm drill bit for 6.4 mm derotation screw. Appropriately sized femoral neck screw and derotation screws were placed to adequate depth in femoral head for subchondral purchase. Distal locking done with 4.9 mm interlocking bolts of appropriate sizes after drilling with 4.0 mm drill bit.



**Figure 2: Anteroposterior radiograph showing an unstable intertrochanteric fracture of left hip in a 67-year-old female patient who fell at home, radiograph is of 6 months after fixation with a hemiarthroplasty.**

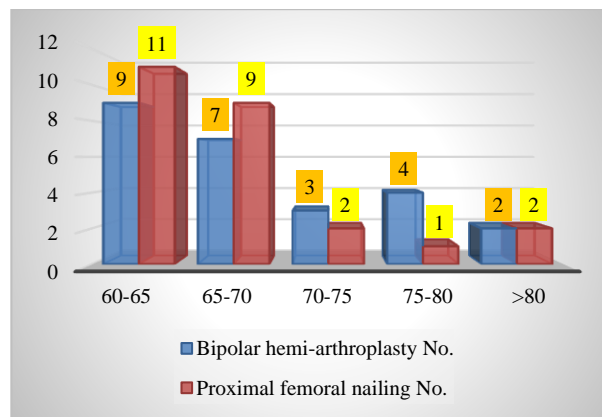
**Post operative protocol**

IV antibiotics given till fifth post-op day. Analgesics 5 days/epidural top up for 2 days on an average, drain removal on second post-op day. Static quadriceps exercises from day 2 were begun. Early hip and knee assisted ROM were started. Suture removal after 14 days. Rehabilitation: partial weight bearing was started around 3-4 days for bipolar hemiarthroplasty group and around 2 weeks post operatively for PFN group patents. Full weight bearing was allowed after radiological and clinical signs of union Subsequently they were followed up in OPD at monthly, 3 monthly and 6 monthly intervals. After 1 month.

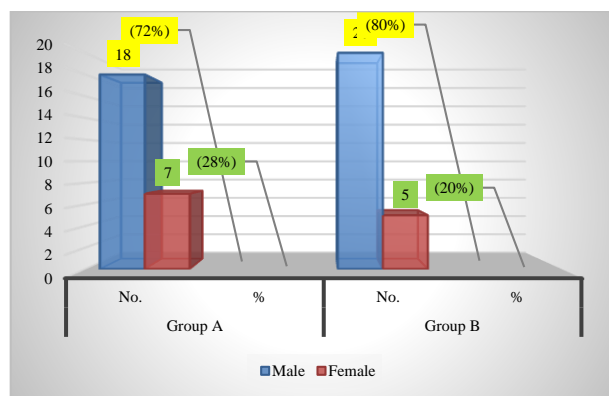
**RESULTS**

**Demographic data**

Most common age group was 60-65 years i.e., 09 (36%) and 11 (44%) in-group A & B followed by 65-70 years group i.e., 07 (28%) and 09 (36%) in-group A & B respectively. Mean age with standard deviation in years for Group A was 67.24±9.47 years, for Group B was 64.71±10.19 years, and after independent t test result was not statistically significant with p value 0.368 respectively. Most number of patients were male i.e., 18 (72%) and 20 (80%) in Group A & B respectively in comparison to females 07 (28%) and 05 (20%).



**Figure 3: Age distribution amongst patients.**



**Figure 4: Gender distribution amongst both groups.**

**Table 1: Functional outcome assessment by Harris hip score at different follow-ups after surgery for Group A.**

Groups	After 1 month	After 3 months	After 6 months
<b>Group A</b>	62.25±08.26	65.82±07.65	73.71±08.21

**Table 2: Functional outcome assessment by Harris hip score at different follow-ups after surgery for Group B.**

Groups	After 1 month	After 3 months	After 6 months
<b>Group B</b>	70.18±09.05	73.82±07.61	79.12±08.06

Based on functional outcome assessment by Harris hip score at different follow-ups after surgery for Group A it was found that HHS was 62.25±08.26, 65.82±07.65 & 73.71±08.21 at 1 month, 3 months and 6 months respectively. Based on functional outcome assessment by Harris Hip Score at different follow-ups after surgery for Group B it was found that HHS was 70.18±09.05, 73.82±07.61 and 79.12±08.06 at 1 month, 3 months and 6 months respectively.

**Table 3: Mean surgical time (minutes) in both groups.**

Variable	Group A	Group B
Mean surgical time (minutes)	124.15±37.92	101.04±42.32

**Table 4: Mean blood loss during surgery (ml) in both groups.**

Variable	Group A	Group B
Mean blood loss during surgery (ml)	500.13±40.23	200.54±12.19

**Table 5: Post-operative length of stay (days) in both groups.**

Variable	Group A	Group B
Mean post-operative length of stay (days)	14.22±03.59	07.21±03.68

**Table 6: Mean time for partial standing in both groups.**

Variable	Group A	Group B
Mean time for partial standing (days) with range	4 (2~4.5)	10 (8~14)

**Table 7: Functional outcome after both surgeries in studied groups.**

Functional outcome	Group A		Group B	
	N	%	N	%
Excellent	09	36	06	24
Good	12	48	18	72
Fair	04	16	01	04
Total	25	100	25	100

**Table 8: Post-operative complications in both groups.**

Post-operative complications	Group A		Group B	
	N	%	N	%
Infection	02	08	01	04
Pressure sores	01	04	00	00
Implant failure	01	04	02	08
Limb lengthening	01	04	00	00
Limb shortening	02	08	02	08
Total	07	28	05	20

Mean surgical time (minutes) were 124.15±37.92 and 101.04±42.32 minutes in Group A & B respectively. Mean blood loss during surgery (ml) were 500.13±40.23 and 200.54±12.19 ml in Group A & B respectively. Mean post-operative length of stay (days) were 14.22±03.59 and 07.21±03.68 days in Group A & B respectively. Mean time for partial standing (days) with range were 4 (2~4.5) and 10 (8~14) days in Group A & B respectively. Based on functional outcome most patients given good outcome i.e., 12 (48%) for Group A and 18 (72%) for

Group B followed by excellent results i.e., 09 (36%) for Group A and 06 (24%) for Group B respectively.

**DISCUSSION**

Most common age group was 60-65 years i.e., 09 (36%) and 11 (44%) in-group A & B followed by 65-70 years group i.e., 07 (28%) and 09 (36%) in-group A & B respectively. Yogi et al study conducted on 30 elderly patients with intertrochanteric fractures. In the PFN group average mean age was 69.6 (range 60-77 years).<sup>8</sup> In the Bipolar prosthesis group of 15 patients 7 were males and 8 were females. The average mean age was 70.6 (range 62-79 years).

**Table 9: Mean surgical time.**

Studies	Mean surgical time (minutes)±SD	
	Bipolar hemiarthroplasty group	PFN group
Present study	124.15±37.92	101.04±42.32
Gormeli et al. <sup>11</sup>	48.70±10.20	32.40±07.10
Sonar et al. <sup>14</sup>	86.33	74.33
Prasad et al. <sup>12</sup>	86.00	49.63
Jin et al. <sup>10</sup>	124.5±37.92	112.5±42.32
Tang et al. <sup>13</sup>	127	79

**Table 10: Mean blood loss during surgery.**

Studies	Mean blood loss during surgery (ml)±SD	
	Bipolar hemiarthroplasty group	PFN group
Present study	500.13±40.23	112.5±42.32
Gormeli et al. <sup>11</sup>	136.50±34.20	30.60±12.50
Sonar et al. <sup>14</sup>	300	132.50
Prasad et al. <sup>12</sup>	309.23	101.85
Ekinci et al. <sup>9</sup>	321.4	78.90
Jin et al. <sup>10</sup>	200	50
Tang et al. <sup>13</sup>	254.7	75.4

Gormeli et al study shown average age in PFN group was 76.20 years and for Bipolar hemiarthroplasty group was 77.40 years respectively.<sup>9-11</sup> Sonar et al study shown average age of patients in PFN group was 75.73±6.57 years and in hemiarthroplasty group was 78.07±6.16 years.<sup>12-14</sup> Prasad et al study also shown average age of patients in PFN group was 57 years and in hemiarthroplasty group was 67 years.<sup>12</sup> Most common mode of injury was trivial fall i.e. 16 (64%) and 17 (68%) in Group A & B respectively. Result was statistically not significant with p value >0.05. Based on laterality of injury most common were right sided i.e., 13 (52%) and 14 (56%) in Group A and B respectively. Prasad et al study shown in Bipolar hemiarthroplasty group right sided injury was 62.96% and for the PFN right sided injury was 51.85% respectively.<sup>12</sup> Sonar et al study

showing in PFN group in seventeen i.e., 56.67% and in hemiarthroplasty group in twelve fractures i.e., 40% involved right side. Rest fractures were left sided.<sup>14</sup> Most common comorbidities were type 2DM and hypertension i.e., 13 (52%) and 14 (56%) and 14 (56%) and 12 (48%) for Group A and B respectively. Mean time from injury to admission (hours) were 17.25±05.54 and 20.14±06.12 hours in Group A and B respectively. Mean surgical time (minutes) were 124.15±37.92 and 101.04±42.32 minutes in Group A & B respectively. Mean blood loss during surgery (ml) was 500.13±40.23 and 200.54±12.19 ml in Group A & B respectively. Mean post-operative length of stay (days) were 14.22±03.59 and 07.21±03.59 days in Group A & B respectively. Based on functional outcome most patients given good outcome i.e., 12 (48%) for Group A and 18 (72%) for Group B followed by excellent results i.e. 09 (36%) for Group A and 06 (24%) for Group B respectively. Based on functional outcome assessment by Harris hip score at different follow-ups after surgery for Group A it was found that HHS was 62.25±08.26, 65.82±07.65 & 73.71±08.21 at 1 month, 3 months and 6 months respectively. Based on functional outcome assessment by Harris Hip Score at different follow-ups after surgery for Group B it was found that HHS was 70.18±09.05, 73.82±07.61 & 79.12±08.06 at 1 month, 3 months and 6 months respectively. In present study in-group A, complications i.e., 07 (28%) and that of group B only 05 (20%) respectively. Most common complication for group A was infection & limb shortening and that for group B was limb shortening & implant failure respectively.

### Limitations

There were few limitations in current study. Firstly, it is not randomized and not double blinded. Secondly, Power of the study is inadequate. Thirdly, Selection bias patients in both groups are not matched. Fourthly, short-term follow-up. Fifth, implants used were the same in all patients.

### CONCLUSION

In conclusion, both PFN and bipolar-hemiarthroplasty appear to produce satisfactory outcomes in surgically treated unstable IT (intertrochanteric) fractures. Both groups are associated with their own complications, but although internal fixation with PFN had higher reoperation rates, it's less surgery related trauma and lower mortality rates are main advantages. Therefore, the surgeon should choose the ideal method for each individual patient, but we think internal fixation may be the effective and appropriate treatment modality for elderly patients with unstable IT (intertrochanteric) fractures.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

### REFERENCES

- Gill JB, Jensen L, Chin PC, Rafiei P, Reddy K, Schutt RC. Intertrochanteric hip fractures treated with the trochanteric fixation nail and sliding hip screw. *J Surg Orthopaed Adv.* 2007;16(2):62-6.
- Tokgöz MA, Atik OŞ, Esendağlı G, Ögüt B, Bozkurt HH. Is it possible that the pathogenesis of osteoarthritis could start with subchondral trabecular bone loss like osteoporosis?. *Joint Dis Related Surg.* 2018;29(3):152-8.
- Emami M, Manafi A, Hashemi B, Nemati A, Safari S. Comparison of intertrochanteric fracture fixation with dynamic hip screw and bipolar hemiarthroplasty techniques. *Arch Bone Joint Surg.* 2013;1(1):14.
- Özkayın N, Okçu G, Aktuğlu K. Intertrochanteric femur fractures in the elderly treated with either proximal femur nailing or hemiarthroplasty: a prospective randomised clinical study. *Injury.* 2015;46:S3-8.
- Paul O, Barker JU, Lane JM, Helfet DL, Lorich DG. Functional and radiographic outcomes of intertrochanteric hip fractures treated with calcar reduction, compression, and trochanteric entry nailing. *J Orthopaed Trauma.* 2012;26(3):148-54.
- Green S, Moore T, Proano F. Bipolar prosthetic replacement for the management of unstable intertrochanteric hip fractures in the elderly. *Clin Orthopaed Res.* 1987;1(224):169-77.
- Patil A, Ansari M, Pathak A, Thakker CJ. Role of cemented bipolar hemiarthroplasty for comminuted inter-trochanteric femur fracture in elderly osteoporotic patients through a modified transtrochanteric approach "SION hospital modification". *IOSR J Dent Med Sci.* 2013;9(4):40-7.
- Yogi LK, Mahi G. A Comparative study of treatment of intertrochanteric fractures with bipolar prosthesis and proximal femoral nail in elderly. *JMSCR.* 2019;7(3):2455-9.
- Ekinci Y, Gürbüz K, Batın S, Kahraman M, Doğar F, Erten ZK. A multicenter intertrochanteric fracture study in the elderly: Hemiarthroplasty versus proximal femoral nailing. *Joint Dis Related Surg.* 2020;31(2):209.
- Jin WJ, Dai LY, Cui YM, Zhou Q, Jiang LS, Lu H. Reliability of classification systems for intertrochanteric fractures of the proximal femur in experienced orthopaedic surgeons. *Injury.* 2005;36(7):858-61.
- Gormeli G, Korkmaz MF, Gormeli CA, Adanas C, Karatas T, Simsek SA. Comparison of femur intertrochanteric fracture fixation with hemiarthroplasty and proximal femoral nail systems. *Turk J Trauma Emerg Surg.* 2015;21(6):503-8.
- Hari Prasad S, Patil SN, Sarath Chandra P, Cecil Fernando A. Functional outcome of unstable intertrochanteric femur fracture in elderly osteoporotic patients treated by primary cemented bipolar hemiarthroplasty versus internal fixation with

- proximal femoral nailing. *Int J Orthopaed Sci.* 2017;3:319-23.
13. Tang P, Hu F, Shen J, Zhang L, Zhang L. Proximal femoral nail antirotation versus hemiarthroplasty: a study for the treatment of intertrochanteric fractures. *Injury.* 2012;43(6):876-81.
  14. Sonar UV, Ingle MV, Koichade MR, Yelne AB, Malu N. Comparative study between trochanteric fixation nailing and cemented bipolar hemiarthroplasty for the treatment of unstable

osteoporotic intertrochanteric neck femur fractures in elderly patients. *IOSR J Dent Med Sci.* 2014;3:31-40.

**Cite this article as:** Murkute KG, Jadhav SV, Tonde J, Badgujar OK Prospective study of management of unstable intertrochantric femur fractures in elderly: hemiarthroplasty vs. osteosynthesis by proximal femoral nail. *Int J Res Orthop* 2023;9:71-6.