Original Article Journal of Clinical Orthopaedics 2021 Jan-Jun 2021;6(1):19-23

# Treatment of unstable intertrochanteric femoral fractures in elderly population – A retrospective comparison between those treated by PFNA versus Primary Hemiarthroplasty of the hip.

Ranade Uday Arun[1], Anne Sai Laxman[1]

## Abstract

Unstable intertrochanteric femur fractures (IFF) have traditionally been reduced and internally fixed with either a hip screw and a side plate or more recently with the proximal femur nails. To counteract the complications of prolonged recumbency, some surgeons advocated using a primary hemiarthroplasty of the hip to treat such patients.

**Aim:** Present study is being done to present the data at our institute in order to further our understanding of treatment of unstable IFFs in the elderly.

**Methods and Material:** A retrospective comparison study where data of 32 patients with unstable IFF (AO type 31 A2 and A3), who satisfied the inclusion and exclusion criteria and who underwent either a PFNA fixation or a primary hemiarthroplasty of the hip from the period of June 2018 to Jan 2019 was collected. Follow up was for a minimum of 12 months. Baseline data, perioperative data and post-operative data was collected. Statistical analysis was done by a statistician using SPSS software Ver 21.0.

**Results:** PFNA group showed significantly better Harris hip scores at the end of 12 months than the PHH group. Even the surgical time, intra-operative bleeding, amount of blood transfusions and length of stay was significantly less in PFNA group than PHH group.

**Conclusions:** Proximal femur fixation with PFNA device with its smaller incision, lower blood loss, faster operating time and shorter hospital stay has definitive advantages over a primary hemiarthroplasty hip.

**Keywords:** Unstable Intertrochanteric Femur Fractures, PFNA, Primary hemiarthroplasty Hip, Bipolar modular prosthesis, Proximal femur fixation

## Introduction

Intertrochanteric femoral fractures are commonly seen in elderly population, being one of the most common fractures seen in the emergency ward. Coventionally, intertrochanteric femoral fractures (IFF) have been treated with a dynamic hip screw and side plate assembly [1]. Recently, this has been surpassed by the use of proximal femoral nail antirotation (PFNA) devices. Stable fixation with immediate post-operative mobilization of elderly patients is generally recommended to avoid complications of immobilization. While the intramedullary fixation is the treatment of choice in stable IFF, the unstable IFF (e.g., the AO type 2 and type 3) presents a significant challenge to early weight bearing mobilization [2]. Some surgeons prefer to offer such patients a primary hemi-arthroplasty of the hip either with a cemented bipolar prosthesis or an Austin Moore prosthesis [3]. Several studies have documented that the cemented bipolar hemiarthroplasty of the hip showed better results than those treated with a hip screw and plate device, name the DHS assembly [4, 5]. However, comparison studies between those unstable IFFs treated with an intramedullary device and those treated with primary hemiarthroplasty are few and as such definitive recommendations are lacking. Present study is being done to present the data at our institute to further our understanding of treatment of unstable intertrochanteric femoral fractures.

[1]Department of Orthopaedics, KIMS Hospitals, Kondapur, Hyderabad, Telangana. 500084

**Address of Correspondence**
Dr. Ranade Uday Arun,
Department of Orthopaedics, KIMS Hospitals, # 1-112/86, Survey No 55/ EE, Kondapur Village, Serilingampally Mandal, Hyderabad – 500084
**E-mail:** dr.udayranade@gmail.com

## Materials and Methods

The retrospective study was conducted in a tertiary institute by accumulating the

**Figure 1:** Immediate post-operative radiographs in AP and lateral views followed by 6 months post-operative AP and lateral views.

**Figure 2:** Pre-operative, Immediate post-operative, and 6 months post-operative radiograph in AP view.

data of 39 patients, who suffered an unstable IFF (AO type 31 A2 and AO type 31 A3) and were treated either with a PFNA device (n = 21) or a cemented hemiarthroplasty (n = 18) during the time period of Jun 2018 to Jan 2019. Inclusion criteria were surgically fit patients with ASA Grades II and III, age more than 65 years with a history of fall from standing height and diagnosed with unstable intertrochanteric femoral fractures (AO type 31 A2 and A3). Unstable patterns included comminuted fractures, fractures with lateral wall comminution, split greater trochanters, single or multiple posteromedial fragments, basicervical patterns, and fracture patterns of reverse obliquity. Patients with older or concomitant contralateral fractures, fractures associated with polytrauma and pathological fractures, as also surgically unfit patients were excluded from the study. Patients who were lost to follow-up and those who had nonunion in the PFNA group for whatever reason were excluded from the study. All patients were followed for a minimum period of 12 months. The patients' baseline data, perioperative data, and post-operative complications were obtained and rehabilitation protocol was followed as per type of treatment given. All patients were counseled about the procedure they were advised and consent was taken. AO classification was used for diagnosis. A total of 32 patients (PFNA = 17 and Hemiarthroplasty = 15) were found eligible and were analyzed for the study.

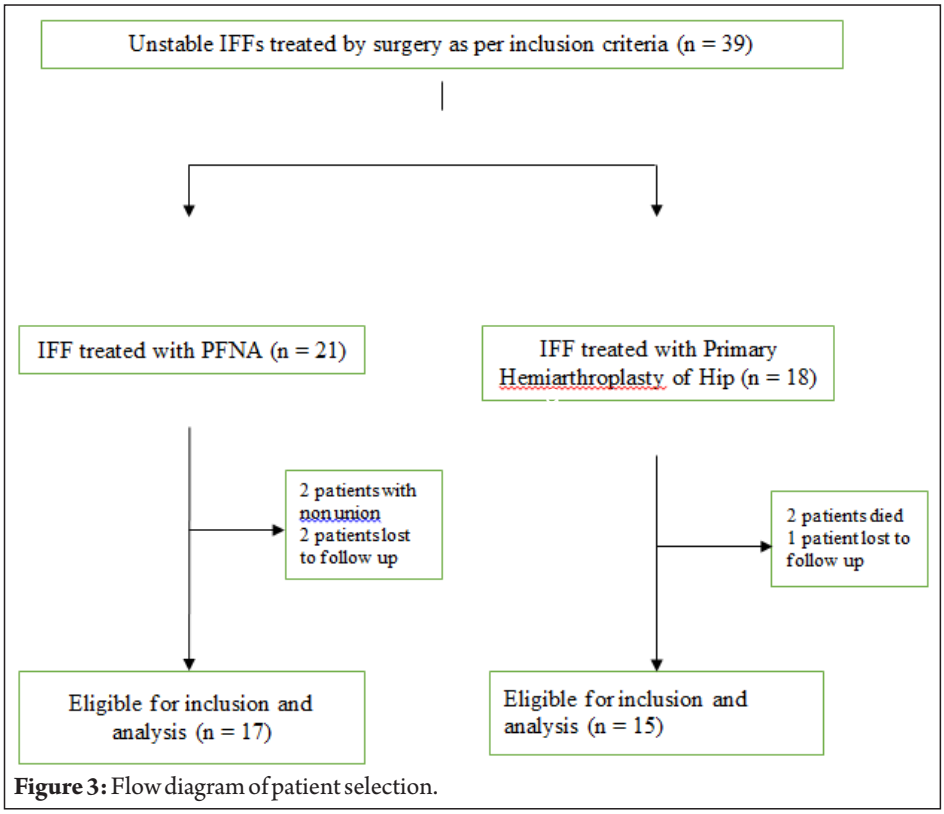


**Figure 3:** Flow diagram of patient selection.

## Surgical method

Patients were operated by one of the three experienced surgeons in our institute. Patients were given either general anesthesia or spinal anesthesia. All patients were given intravenous antibiotic Cefuroxime 1.5 g half an hour before surgery. Patients treated with PFNA were placed on a fracture table. Traction was given and closed reduction was done under fluoroscopy control. The limb was then adducted to about 10 degrees and kept in neutral rotation. A proximal incision was made just proximal to the greater trochanter in line with the longitudinal axis of the femur. A guide wire was inserted and the proximal femur was reamed. An appropriate sized PFNA was then passed intramedullary and the fracture was fixed with a helical blade, reaching about 5–10 mm from the subchondral bone. This blade was usually located in the lower half of the femoral neck in the AP view while it was central or slightly posterior in the lateral view. The PFNA as distally locked with static and dynamic locking bolts. The size used was in accordance with the preoperative templating in most instances.

**Table 1:** Comparison of baseline characteristics

| Characteristics | PFNA group ($n$ = 17) | PHH group ($n$=15) | $P$-value |
|---|---|---|---|
| Gender: Male/Female | 9-Aug | 8-Jul | 0.98 |
| Age (years) | 69.5 | 74 | 0.04 |
| Side: Right/Left | 8-Sep | 8-Jul | 0.7 |
| AO type | | | 0.39 |
| AO type A2 | 12 | 9 | |
| AO type A3 | 5 | 6 | |
| ASA Grade | | | 0.537 |
| ASA Grade 2 | 14 | 11 | |
| ASA Grade 3 | 3 | 4 | |
| Associated Comorbidities | | | |
| Hypertension | 14 | 10 | 0.36 |
| Diabetes | 8 | 10 | 0.264 |
| COPD | 3 | 1 | 0.47 |
| Coronary Artery Disease | 1 | 6 | 0.19 |
| Chronic Kidney Disease | 2 | 4 | 0.28 |
| Time from Injury to Surgery | 2.05 | 4.26 | 0.002 |
| Anesthesia: General/Spinal | 14-Mar | 11-Apr | 0.53 |
| Pre-operative Hemoglobin | 11.22 | 11.05 | 0.17 |

Patients who underwent primary hemiarthroplasty were placed in the lateral decubitus position. Exposure was done using the anterolateral approach to the hip. The head and neck fragments were excised. The greater and lesser trochanter fragments along with their attachments were preserved. The femur was prepared with broaches. An appropriate size femoral stem, in accordance to the preoperative templating over the contralateral normal hip, was implanted and cemented using gentamycin cement. All patients included in the study had a cemented modular bipolar prosthesis implanted. Anteversion of the stem was between 10 and 15$^0$ and was ascertained using the lesser trochanter position or in cases of comminution of lesser trochanter, it was based on pre-operative templating and intra-operative trials with different offsets. The greater trochanter fragment was reduced over the proximal part of the femur stem and sutured with the proximal bone using Ethibond™ sutures. The wound was closed in a routine manner over a drain.

**Table 2: Comparison of outcomes between the two groups**

| Variable | PFNA ($n$=17) | PHH ($n$=15) | $P$-value |
|---|---|---|---|
| Harris Hip score at 12 months | 91.52 | 83.3 | 0.017 |
| Excellent | 13 | 6 | |
| Good | 3 | 4 | |
| Medium | 1 | 3 | |
| Poor | 0 | 2 | |
| **Secondary outcomes** | | | |
| Surgical time (minutes) | 72.52 | 121.73 | <0.00001 |
| Intra-operative blood loss (ml) | 115.88 | 292.33 | <0.00001 |
| Perioperative blood transfused (ml) | 20.58 | 256.66 | 0.00536 |
| Post-operative Hemoglobin | 10.67 | 9.72 | 0.00018 |
| Duration of Hospital stay (days) | 3 | 4.8 | <0.00001 |

## Post-operative and rehabilitation protocol

All patients were given three doses of intravenous antibiotics postoperatively. Low molecular weight Heparin, Dalteparin, was given subcutaneously to all patients for thromboprophylaxis. All patients were started on incentive spirometry and ankle pump exercises from the day of surgery. PFNA patients were mobilized non-weight bearing with a walker on the 1st post-operative day and subsequently to toe touch weight bearing from post-operative day 15. Full weight bearing for PFNA patients, was usually started only after affirmative signs of healing were seen on radiographs. Hemiarthroplasty patients were mobilized full weight bearing from 1st post-operative day with the help of walker. Sitting and supine knee and hip range of movement exercises were started from post-operative day 1 for all patients. Drains were removed after 48 h and dressing was changed. Sutures were removed on post-operative day 15.

## Follow-up and outcome measures

Patients were followed up at 3 months, 6 months, and 12 months interval for clinical and radiological evaluation. The primary outcome measure was the Harris

Hip score which evaluates the functional outcome at the end of a minimum of 12 months follow-up. The HHS was considered excellent when it was 90–100, good for 80–89, medium for a score 70–79, and scores ≤69 were considered poor. The secondary outcome measures were operating time, intra-operative blood loss, perioperative blood transfusions, pre- and post-operative hemoglobin, and duration of hospital stay.

### Statistical analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software (Ver. 21.0).

## Results

Seventeen patients in the PFNA group and 15 patients in the Primary Hemiarthroplasty of the Hip (PHH) group were analyzed in the study. Two patients in the PFNA group showed nonunion and two patients were lost to follow-up, while the PHH group had two patients who died during the course of the study and one patient was lost to follow-up.

A comparison of baseline characteristics is given in Table 1. There was no significant difference in the two groups in most of the baseline characteristics. However, a significant difference was noted in the time from injury to surgery which was 2.05 days for the PFNA group and 4.26 for PHH group. It was unclear to us why this difference was significant but one hypothesis is that the inclusion of seven patients in the PHH group, who were on double antiplatelets which required to wait a minimum of 5 days before operating might have caused the difference in time from injury to surgery.

Comparison of outcomes between the two groups in tabulated in Table 2. The PFNA group was found to have significantly lesser operating time ($P < 0.00001$), intra-operative blood loss ($P < 0.00001$), and perioperative blood transfusions ($P = 0.00536$) as compared to the PHH group. Our study found that the patients in the hemiarthroplasty group had significantly higher duration of hospital stay ($P < 0.00001$) and a lower post-operative hemoglobin value ($P = 0.00018$). Harris hip scores at the end of a minimum of 1 year follow-up also showed significantly better results with a PFNA fixation than that following a primary hemiarthroplasty ($P = 0.017$). Even the subgrouping showed more excellent scores in the PFNA group as compared to the PHH group. 13 out of 17 patients from the PFNA group (76.4%) showed excellent results, while six out of 15 patients from the PHH group (40%) showed excellent results at the end of 1 year.

The included patients showed the following complications – two patients in the PHH group showed dressing soakage with some serous discharge and had delayed suture removal at 21 days. Two patients in the PHH had superficial infection which was treated with debridement and antibiotics. Three patients in the PFNA group showed varus collapse of the head with malunion and limp. One patient of the PFNA group showed mild superior migration of the hip screw but did not perforate the head.

## Discussion

Unstable intertrochanteric fractures in the elderly present a therapeutic dilemma in view of the complications associated with them. Sexson et al. showed that unstable intertrochanteric femoral fractures are associated with significantly high rate of mortality [6]. Several studies reported and recommended better results with such patients being offered a primary hemiarthroplasty of the hip joint [7, 8]. The basis of such a recommendation was the fact the internal fixation of the unstable IFFs was very often associated with complications due to bone quality, implant failure, implant cut out, nonunion and malunion, and femur head perforation [9]. In addition, a primary hemiarthroplasty of the hip allowed the patient to mobilize faster with the prevention of the complications of recumbency. With the evolution of implants used for fixation, several studies came out comparing fixation with hemiarthroplasty following unstable IFFs. Our study results do not support the primary role of a primary hemiarthroplasty in cases of unstable IFFs.

Quicker mobilization is considered as the primary reason to opt for a primary hemiarthroplasty. However, it is possible that morbidity associated with the surgery in combination with the lower post-operative hemoglobin indicating larger blood loss might be one of the reasons why patients in our study in the PFNA group tended to ambulate non-weight bearing or partial weight bearing as quickly as those in the PHH group. In our study, there were more patients with excellent scores in the PFNA group (13 out of 17) as compared to the PHH group (six out of 15). This was comparable to a study by Tang et al. [10], who reported no significant difference between the two groups overall but found a significant difference in the rate of excellent to fine functional results (PFNA 90.2% and Hemiarthroplasty 79.6%). Kumar et al. [11] carried out a meta-analysis and systematic review to determine the superiority of PFN over hemiarthroplasty of seven published studies, of which four were retrospective and three were prospective randomized controlled studies. They concluded that proximal femoral nails are superior to bipolar hemiarthroplasties for unstable intertrochanteric femoral fractures and that the PFN imparts better functional outcomes and have lower rates of overall mortality. Our study also has findings in accordance to the above conclusions.

Limitations of the study include the low number of subjects included in the groups and the fact that it is a retrospective study with inherent selection bias. Loss of follow-up and improper documentation were one of the many

reasons for that. Second, some patients whose 1 year follow-up were due in the early part of 2020 was affected due to the COVID-19 pandemic situation and consequent lock down. There were seven such patients (five of the PFNA group and two of the PHH group), who had a follow-up of more than 20 months which might have had some effect on the eventual Harris hip scores.

## Conclusion

Unstable intertrochanteric femoral fractures are better treated by internal fixation using the PFNA. Primary role of hemiarthroplasty in such patients still needs further study as they are associated with higher rates of morbidity and mortality. PFNA, with its smaller incision requirements, lower blood loss, faster operating time, and shorter duration of stay has definitive advantages over a primary hemiarthroplasty hip.

## References


1. Zhou S, Liu J, Zhen P, Shen W, Chang Y, Zhang H, et al. Proximal femoral nail anti-rotation versus cementless bipolar hemiarthroplasty for unstable femoral intertrochanteric fracture in the elderly: A retrospective study. BMC Musculoskelet Disord 2019;20:500.
2. Koval KJ. Intramedullary nailing of proximal femur fractures. Am J Orthop (Belle Mead NJ) 2007;36 Suppl 4:4-7.
3. Park MS, Cho HM, Kim JH, Shin WJ. Cementless bipolar hemiarthroplasty using a rectangular cross-section stem for unstable intertrochanteric fractures. Hip Int 2013;23:316-22.
4. Luo X, He S, Zeng D, Lin L, Li Q. Proximal femoral nail antirotation versus hemiarthroplasty in the treatment of senile intertrochanteric fractures: Case report. Int J Surg Case Rep 2017;38:37-42.
5. Bansal K, Dahuja A, Kaur R, Singh J, Shyam R. Proximal femur nail vs cemented bipolar prosthesis in unstable intertrochanteric femur fractures in elderly: A prospective study. Int J Orthop Sci 2019;5:642-5.
6. Sexson SB, Lehner JT. Factors affecting hip fracture mortality. J Orthop Trauma 1987;1:298-305.
7. Kumar GN, Meena S, Kumar NV, Manjunath S, Raj MK. Bipolar hemiarthroplasty in unstable intertrochanteric fractures in elderly: A prospective study. J Clin Diagn Res 2013;7:1669-71.
8. Lee YK, Ha YC, Chang BK, Kim KC, Kim TY, Koo KH. Cementless bipolar hemiarthroplasty using a hydroxyapatite-coated long stem for osteoporotic unstable intertrochanteric fractures. J Arthroplasty 2011;26:626-32.
9. Enocson A, Mattisson L, Ottosson C, Lapidus LJ. Hip arthroplasty after failed fixation of trochanteric and subtrochanteric fractures. Acta Orthop 2012;83:493-8.
10. 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;43:876-81.
11. Kumar P, Rajnish RK, Sharma S, Dhillon MS. Proximal femoral nailing is superior to hemiarthroplasty in AO/OTA A2 and A3 intertrochanteric femur fractures in the elderly: A systematic literature review and meta-analysis. Int Orthop 2020;44:623-33.


Conflict of Interest: NIL
Source of Support: NIL

How to Cite this Article

Arun RU, Laxman AS. Treatment of unstable intertrochanteric femoral fractures in elderly population – A retrospective comparison between those treated by PFNA versus Primary Hemiarthroplasty of the hip.. Journal of Clinical Orthopaedics Jan-Jun 2021;6(1):19-23.