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## Original Article

## Calcar Replacement Hemiarthroplasty versus Proximal Femoral Nail for Treatment of Unstable Intertrochanteric Fractures in Elderly

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## Abstract

## Article information

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**Background:** Intertrochanteric fractures occur with low-energy trauma because of decreased bone quality and deterioration of histological structure based on osteoporosis. The aim of this work was to compare proximal femoral nail and calcar-replacement hemiarthroplasty in treatment of unstable intertrochanteric fractures of elderly regarding the surgical techniques, clinical and radiological outcomes, complications [intra- and post-operative], functional hip outcome and patient satisfaction.

**Patients and Methods:** This Prospective Randomized Study was conducted on Thirty patients with unstable intertrochanteric hip fracture. Patients were divided into two equal groups: Group I was treated with bipolar calcar hemiarthroplasty, and Group II were treated with a proximal femoral nail.

**Results:** At 3 months, Harris' hip score was significantly higher in hemiarthroplasty group [ $p < 0.001^*$ ]. However, at 6 months and 12 months, the differences in scores were not statistically significant [ $p > 0.05$ ]. At 24-month Harris hip score was significantly higher in PFN group then hemiarthroplasty group [ $p=0.04$ ]. The mean duration of surgery was significantly shorter in the PFN group compared to the Hemiarthroplasty group [ $p = 0.041$ ]. The mean blood loss during surgery was significantly lower in the PFN group compared to the Hemiarthroplasty group [ $p<0.001$ ].

**Conclusion:** PFN and calcar-replacement hemiarthroplasty are two safe and effective fixation methods for treating the elderly with intertrochanteric fractures. Both PFN and calcar-replacement hemiarthroplasty achieve stable fracture fixation, reduce pain, less post-operative complications and restore function of the hip joint.

**Keywords:** Calcar Replacement; Elderly; Hemiarthroplasty; Intertrochanteric Fractures.



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## INTRODUCTION

Hip fractures comprise two main types of fractures, intracapsular and extracapsular [intertrochanteric and subtrochanteric] fractures. Intertrochanteric fractures accounted for 42% of all hip fractures [1].

Intertrochanteric fractures occur with low-energy trauma because of decreased bone quality and deterioration of histological structure on the basis of osteoporosis. Factors such as the presence of systemic diseases in advanced ages, decreased protective reflexes and muscle strength during falls are effective in the formation of fractures [2]. Intertrochanteric fractures are still a big challenge for orthopaedic surgeons due to the multitude of co-morbidities and high 1-year mortality rate associated with them. In order to reduce disability and mortality rate, early surgical procedure, which allows early mobilization, restores the function of the limb, has become the general consensus for the intertrochanteric fractures treatment [3].

Intertrochanteric fractures can be divided into stable and unstable fractures based on AO/OTA or Evans–Jensen classification. A2, A3, or Evans–Jensen III, IV, and V are considered unstable intertrochanteric fractures [4]. Management of unstable intertrochanteric fractures remains challenging, particularly regarding the improvement of mobility and functional outcomes. Modern treatment options for unstable intertrochanteric fractures include intramedullary [e.g., proximal femoral nail anti-rotation [PFNA], Dynamic hip screw or Compression hip screw] fixation or arthroplasty [5]. PFNA is a minimally invasive surgery used in the treatment of intertrochanteric fractures. It allows early mobilization and weight bearing. Biomechanical tests have shown that PFNA has a better effect on anti-rotation and anti-inversion than traditional internal fixation [6].

Despite its minimally invasive nature, it includes risks that can be deemed unfavourable for geriatric patients, such as being performed with the open technique from the proximal femur, raemerization of the medulla, the need for frequent blood transfusion and relatively longer operation times. The distal-locking screw of PFNA can cause pain, femoral cortical erosion, or fracture around the screw [7].

Bipolar hemiarthroplasty has been advocated as an alternative to osteosynthesis for intertrochanteric fractures in the elderly, as it provides the advantages of permitting early full-weight bearing, avoiding the failures of osteosynthesis and good functional outcomes. However, subsidence and failure rates are significant [8].

The aim of this work was to compare proximal femoral nail and calcar-replacement hemiarthroplasty in treatment of unstable intertrochanteric fractures of elderly regarding the surgical techniques, clinical and radiological outcomes, complications [intra- and post-operative], functional hip outcome and patient satisfaction.

## PATIENTS AND METHODS

This Prospective Randomized Study was conducted on Thirty patients with unstable intertrochanteric hip fracture.

**Study period:** Till completion of the study with regular follow-up at 1, 3, 6, 12, and 24 months post-operatively.

**Inclusion criteria** were AO classification where types A2 and A3, older than 60 years old and both males and females.

**Exclusion criteria** were patients with a history of osteoarthritis in the hip joint, pathological fractures, bilateral fractures, ipsilateral additional fractures, rheumatic disease, wheelchair-bound or permanently bedridden before the fracture and who have comorbid psychological or psychiatric conditions that might potentially influence the subjective evaluation of the outcome or compliance with gait analysis.

Patients were divided into two equal groups: The fifteen patients in Group I were treated with bipolar calcar hemiarthroplasty, and the fifteen patients in Group II were treated with a proximal femoral nail.

**Randomization:** Patients with unstable intertrochanteric hip fracture were randomized into two treatment groups. The fifteen patients in Group I were treated with bipolar calcar hemiarthroplasty, and the fifteen patients in Group II were treated with a proximal femoral nail. Randomization was carried out based on sealed envelopes, and a total of 30 envelopes were generated. An envelope was then selected so that appropriate operative planning could be performed.

### Methods:

All patients were subjected to the following: History taking [age, gender, and detailed history]. The diagnosis was confirmed using AP and lateral views radiographs of bilateral hip, anterior posterior hip radiographs in traction was taken to assess the fractures of greater and lesser trochanter. Each patient was graded according to Singh's index for osteoporosis and was scored for mobility prior to injury based on the mobility score of Parker and Palmer. Also, the ASA physical status score and the average duration between occurrence of fracture and day of surgery were noted.

**Pre-operatively:** All patients who underwent operation administered low molecular weight heparin [according to their weight] for deep venous thrombosis prophylaxis that started 12 hours prior to the operation and continued for 35 days postoperatively. All patients administered prophylactic second-generation cephalosporin [according to their weight] 30 minutes preoperatively and continued for 3 doses postoperatively.

### Surgical Setup:

1] Proximal femoral nail group: Operations were performed in supine position on traction tables or laterally without traction under spinal anaesthesia. PFN was performed under C-arm fluoroscopy in a supine position by a standard program. After closed reduction, the nail was inserted from the lateral aspect of the greater trochanter, and then the column screw was inserted until its tip as close as 5 mm to the subchondral bone. Finally, the locking bolt and the end cap was fixed.

2] Hemiarthroplasty group: Hemiarthroplasty was performed through a harding lateral approach with the patient in a lateral position and the affected hip was uppermost. This approach is sufficient to remove the femoral head and insert the prosthesis. After reduction, the greater trochanter was fixed by wire like an '8' shape and the lesser trochanter was round attached to the femur by a wire introducer. Cement would be used to remould the calcar femorale if

it is incomplete by the fracture. Meanwhile, the correct length of the femoral neck would be recuperated after that.

**Postoperative care and follow up:** Patients were discharged when their condition is stable. Patients were trained to activity with walker support and exercised in full weight under care when union was confirmed radiologically. Postoperatively, antiembolic treatment with enoxaparin sodium that was started 12 hours prior to the operation and was continued for 35 days postoperatively and analgesics when needed was prescribed. Postoperative follow-up visits, which included a detailed physical examination and radiographic evaluation, were conducted at 1 month, 3 months, 6 months, one year and 2 years postoperatively. Bony union was determined by clinical and radiological examinations at about 3 months. Implant removal is not necessary unless clinically indicated.

**Statistical analysis:** The collected data was analyzed using the Statistical package for Social Science [IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.]. Mean, Standard deviation [ $\pm$  SD] for numerical data. Frequency and percentage of non-numerical data. Student T Test was used to assess the statistical significance of the difference between two study group means. Mann Whitney Test [U test] was used to assess the statistical significance of the difference of a non-parametric variable between two study groups. Chi-Square test was used to examine the relationship between two qualitative variables. A p value is considered significant if  $<0.05$

## RESULTS

There was no statistically significant difference between study and control group regarding Demographic data, comorbidities and hip fracture data [Table 1].

Preoperative Singh's index, CIRS score and ASA score grading showed no significant difference between the studied groups [Table 2]. The mean duration of surgery was significantly shorter in the PFN group [57.33 $\pm$ 4.95 minutes] compared to the Hemiarthroplasty group [62.33 $\pm$ 5.94 minutes] [ $p = 0.041$ ]. The mean blood loss during surgery was significantly lower in the PFN group [88.67 $\pm$ 24.46 ml] compared to the Hemiarthroplasty group [354.67 $\pm$ 136.74 ml] [ $p < 0.001$ ] [Table 3].

According to Harris hip score, at 3 months, Harris hip score was significantly higher in hemiarthroplasty group [ $p < 0.001^*$ ]. However, at 6 months and 12 months, the differences in score were not statistically significant [ $p > 0.05$ ]. At 24-month Harris hip score was significantly higher in PFN group then hemiarthroplasty group [ $p = 0.04$ ]. Prior to the operation, there were no statistically significant differences in mobility scores between the PFN and Hemiarthroplasty groups [ $p = 0.71$ ]. However, at 3 months, the mobility score was significantly higher in the Hemiarthroplasty group compared to the PFN group [ $p = 0.035$ ]. Similarly, at 6 months and 12 months, the mobility scores were significantly higher in the Hemiarthroplasty group [ $p = 0.04$  for both time points]. In contrast, at 24 months, the PFN group exhibited significantly higher mobility scores than the Hemiarthroplasty group [ $p < 0.001$ ] [Table 4].

According to pain assessment among studied groups, the distribution of pain grades was not significantly different between the studied groups in different follow up periods. According to post operative complications among studied groups, the distribution of complications was not significantly different between the studied groups [Table 5].

**Case 1:** Female patient 75 yrs old, she had intertrochanteric fracture type A3.3 of her left femur. She was admitted to benha teaching hospital on the 1st day of the trauma. She had no chronic illness. He has normal activity before trauma. Clinical examination was done, plain x ray and ct scan were done to identify the fracture type and any extensions to articular surface. The patient was admitted and clinical labs were done for preparing to surgery which was done 3 days after admission. Figure 1

**Case 2:** Female patient 89 yrs old, she had intertrochanteric fracture type A3.3 of her right femur. She was admitted to benha teaching hospital on the 1st day of the trauma. She had no chronic illness. She has normal activity before trauma. clinical examination was done, plain x ray and CT scan were done to identify the fracture type and any extension s to articular surface. the patient was admitted, and clinical labs were done for preparing to surgery which was done 2 days after admission. Figures 2,3,4,5,6,7

**Table [1]: Demographic data, comorbidities and hip fracture data in the studied groups**

|                          |                           | PFN [n=15]       | Hemiarthroplasty [n=15] | Test     | p     |
|--------------------------|---------------------------|------------------|-------------------------|----------|-------|
| <b>Age</b>               |                           | 65.07 $\pm$ 3.41 | 66.53 $\pm$ 2.75        | X2=0.136 | 0.713 |
| <b>Gender</b>            | Female                    | 9[60%]           | 8[53.3%]                | t=1.297  | 0.206 |
|                          | Male                      | 6[40%]           | 7[46.7%]                |          |       |
| <b>Comorbidities</b>     | Cardiovascular            | 4[26.7%]         | 4[26.7%]                | 0.188    | 0.910 |
|                          | Diabetes                  | 4[26.7%]         | 5[33.3%]                |          |       |
|                          | Hypertension              | 7[46.7%]         | 6[40%]                  |          |       |
| <b>Hip fracture data</b> |                           |                  |                         |          |       |
| <b>Side of fracture</b>  | Left                      | 8[53.3%]         | 7[46.7%]                | 0.133    | 0.715 |
|                          | Right                     | 7[46.7%]         | 8[53.3%]                |          |       |
| <b>Mode of trauma</b>    | Direct                    | 3[20%]           | 2[13.3%]                | 0.240    | 0.624 |
|                          | Fall from standing height | 12[80%]          | 13[86.7%]               |          |       |

**Table [2]:** Preoperative Singh's index, CIRS score and ASA score grading among studied groups

|               |   | PFN [n=15] | Hemiarthroplasty [n=15] | Test  | p     |
|---------------|---|------------|-------------------------|-------|-------|
| Singh's index | 1 | 6[40%]     | 7[46.7%]                | 4.095 | 0.393 |
|               | 2 | 3[20%]     | 4[26.7%]                |       |       |
|               | 3 | 1[6.7%]    | 2[13.3%]                |       |       |
|               | 4 | 2[13.3%]   | 1[6.7%]                 |       |       |
|               | 5 | 3[20%]     | 1[6.7%]                 |       |       |
| CIRS          |   | 4.73±2.46  | 6.53±4.78               | 1.192 | 0.233 |
| ASA grading   | 1 | 1[6.7%]    | 2[13.3%]                | 0.676 | 0.713 |
|               | 2 | 11[73.3%]  | 9[60%]                  |       |       |
|               | 3 | 3[20%]     | 4[26.7%]                |       |       |

**Table [3]:** Duration of surgery, Intraoperative blood loss among studied groups

|                               |                      | PFN [n=15]  | Hemiarthroplasty [n=15] | Test     | p       |
|-------------------------------|----------------------|-------------|-------------------------|----------|---------|
| Duration of surgery [minutes] |                      | 57.33±4.95  | 62.33±5.94              | 2.212    | 0.041*  |
| Blood loss [ml]               |                      | 88.67±24.46 | 354.67±136.74           | Z=4.675  | <0.001* |
| Blood transfusion units       | No transfusion       | 15[100%]    | 12[80%]                 | X2=4.493 | 0.048 * |
|                               | One unit transfusion | 0[0%]       | 3[20%]                  |          |         |

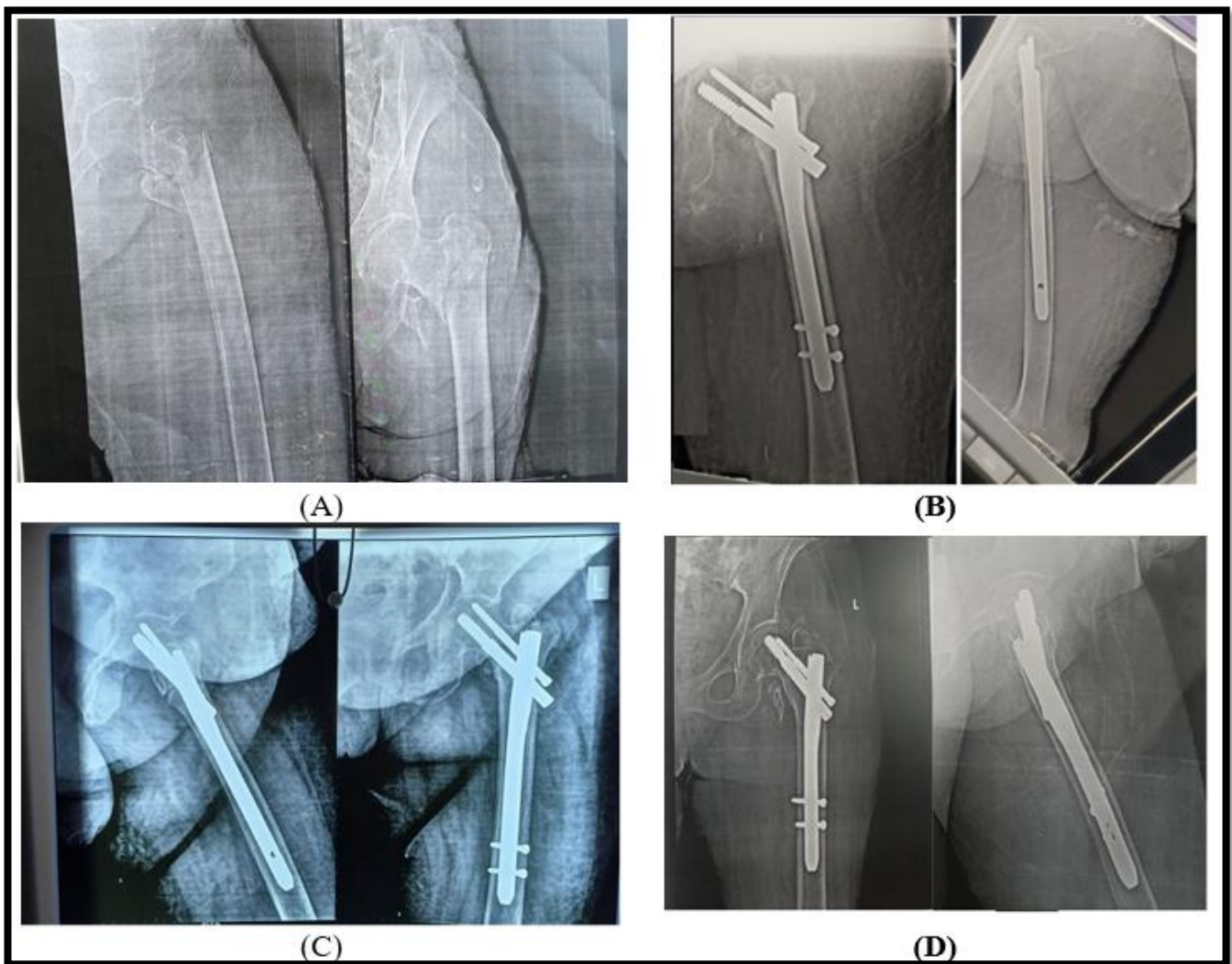
**Table [4]:** Harris hip score and Mobility score [Palmer/Parker] among studied groups during follow-up period

|                  |               | PFN [n=15]  | Hemiarthroplasty [n=15] | Test  | p       |
|------------------|---------------|-------------|-------------------------|-------|---------|
| Harris hip score | 3 months      | 41.8±8.8    | 65.47±8.22              | 4.406 | <0.001* |
|                  | 6 months      | 57.73±14.52 | 69.33±12.05             | 0.685 | 0.635   |
|                  | 12 months     | 68.93±15.37 | 72.87±13.02             | 0.747 | 0.455   |
|                  | 24 months     | 82.6±9.13   | 79.33±10.53             | 2.784 | 0.04*   |
| Mobility score   | Pre operation | 6.33±0.49   | 6.4±0.51                | 0.372 | 0.71    |
|                  | 3 months      | 3.71±0.46   | 4.4±0                   | 2.112 | 0.035*  |
|                  | 6 months      | 4.8±0.41    | 4.6±0                   | 2.595 | 0.04*   |
|                  | 12 months     | 5.0±0       | 4.89±0.26               | 2.635 | 0.04*   |
|                  | 24 months     | 5.31±0.35   | 5.07±0.26               | 4.215 | <0.001* |

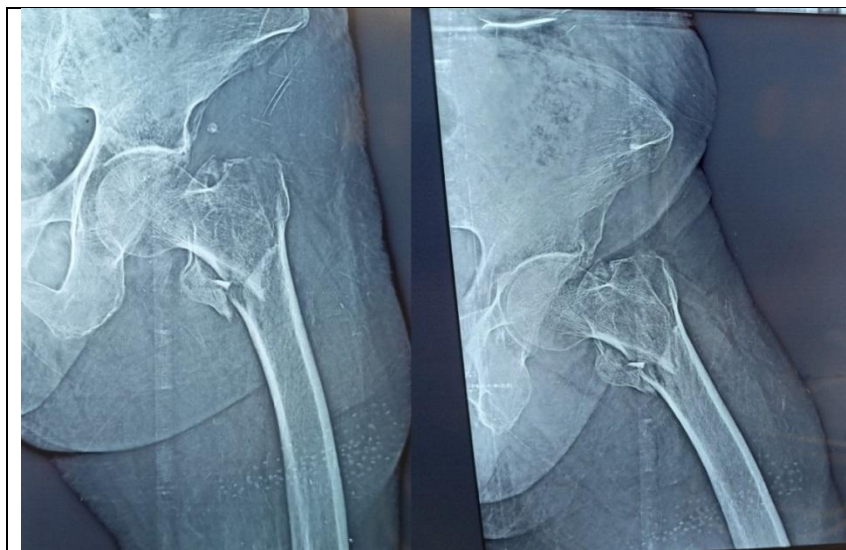
Data is expressed as the mean ± SD, \*: significant p value

**Table [5]:** Pain among studied groups during follow-up period and Complications

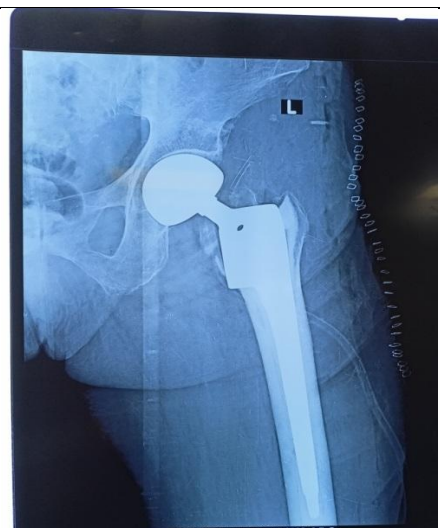
|               |                       | PFN [n=15] | Hemiarthroplasty [n=15] | Test  | p     |
|---------------|-----------------------|------------|-------------------------|-------|-------|
| 3 month       | Extreme pain          | 3[20%]     | 1[6.7%]                 | 1.170 | 0.557 |
|               | Moderate pain         | 8[53.3%]   | 9[60%]                  |       |       |
|               | No pain               | 4[26.7%]   | 5[33.3%]                |       |       |
| 6 month       | Extreme pain          | 2[13.3%]   | 1[6.7%]                 | 0.424 | 0.809 |
|               | Moderate pain         | 8[53.3%]   | 8[53.3%]                |       |       |
|               | No pain               | 5[33.3%]   | 6[40%]                  |       |       |
| 12 month      | Extreme pain          | 1[6.7%]    | 0[0%]                   | 1.313 | 0.519 |
|               | Moderate pain         | 8[53.3%]   | 10[66.7%]               |       |       |
|               | No pain               | 6[40%]     | 5[33.3%]                |       |       |
| 24 month      | Moderate pain         | 8[53.3%]   | 8[53.3%]                | 0     | 1.000 |
|               | No pain               | 7[46.7%]   | 7[46.7%]                |       |       |
| Complications | Bed sores             | 2[13.3%]   | 1[6.7%]                 | 1.710 | 0.635 |
|               | Deep Infection        | 0[0%]      | 1[6.7%]                 |       |       |
|               | Superficial infection | 1[6.7%]    | 2[13.3%]                |       |       |



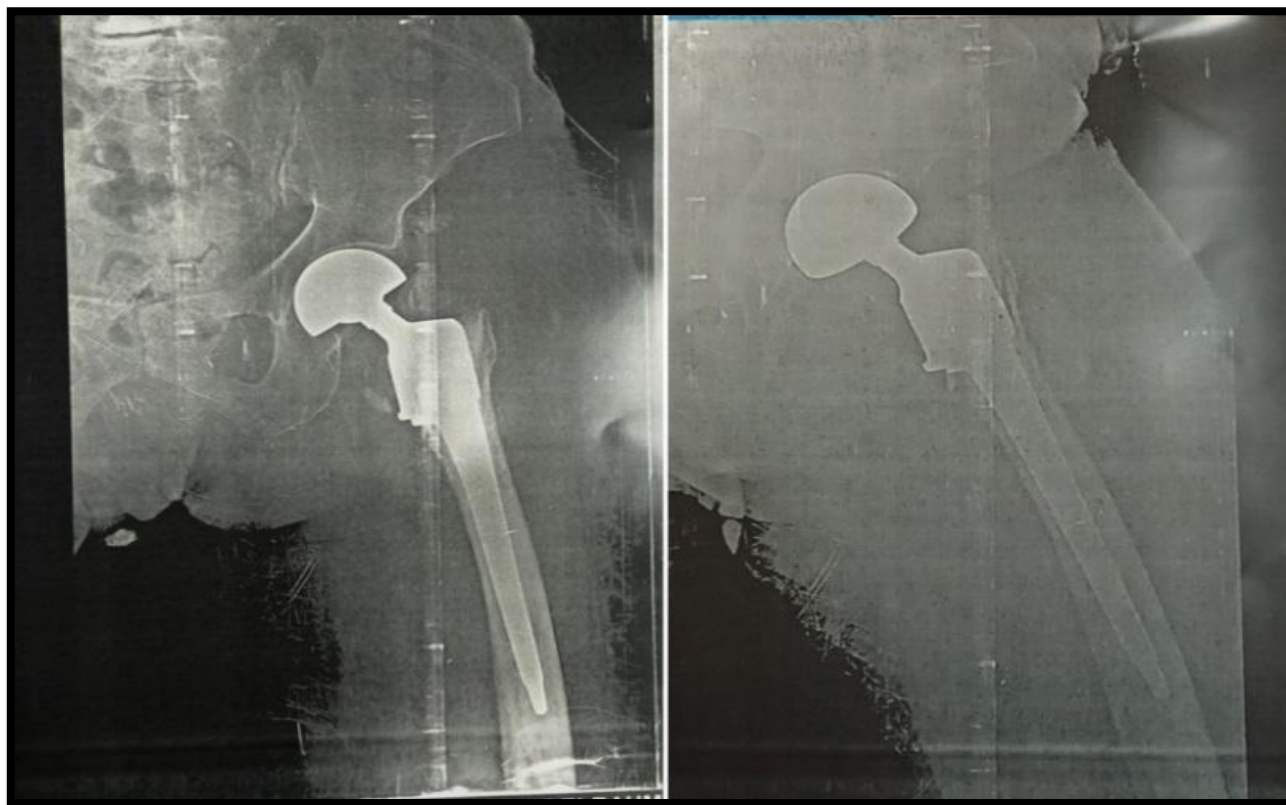
**Figure [1]:** [A] Preoperative, [B] Postoperative 3 months, [C] Postoperative 6 months and [D] Postoperative 2 years AP and lateral views



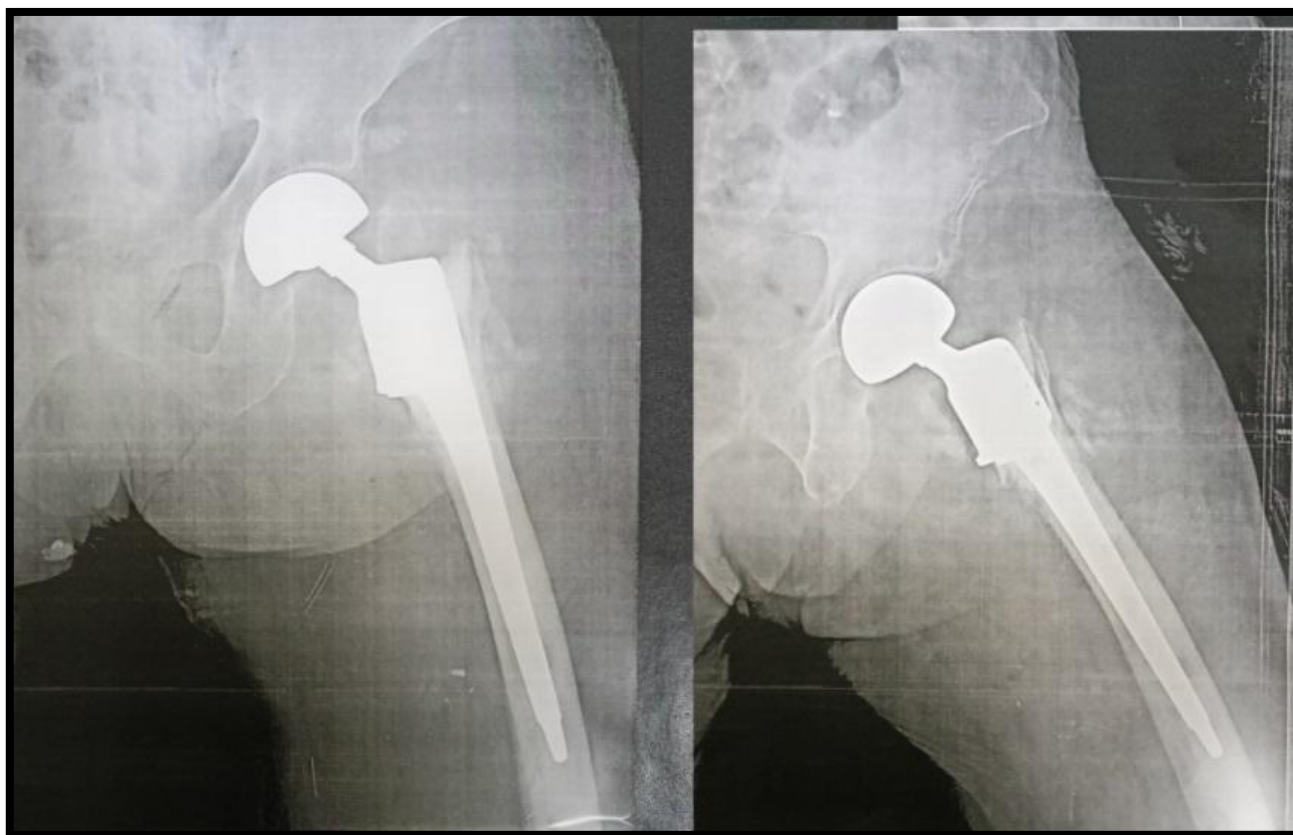
**Figure [2]:** Preoperative AP and lateral views



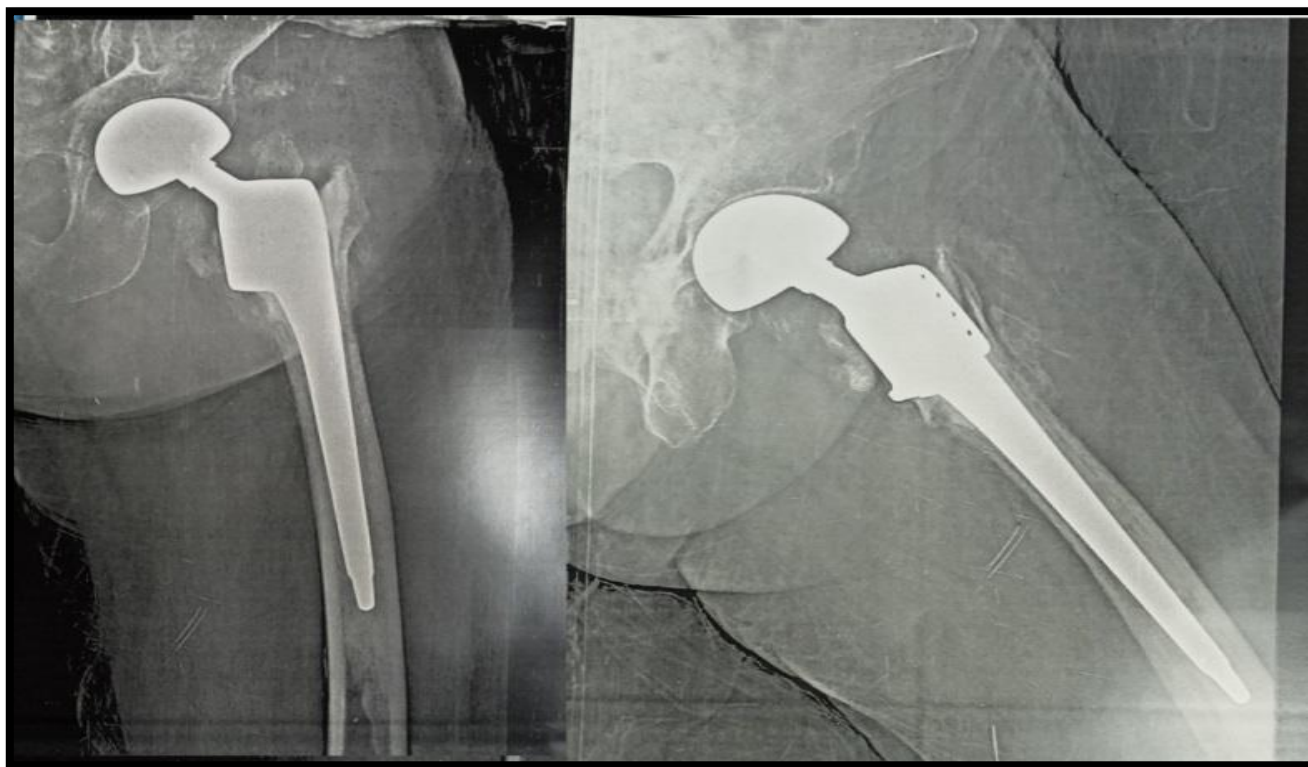
**Figure [3]:** Immediate postoperative AP view



**Figure [4]:** Postoperative 3 months AP and lateral views



**Figure [5]:** Postoperative 6 months AP and lateral views



**Figure [6]:** Postoperative 1 year AP and lateral views



**Figure [7]:** Postoperative 1.5 years AP and lateral views

## DISCUSSION

Intertrochanteric fractures are still a big challenge for orthopaedic surgeons due to the multitude of co-morbidities and high one year mortality rate associated with them. In order to reduce disability and mortality rate, early surgical procedure, which allows

early mobilization, restores the function of the limb, has become the general consensus for the intertrochanteric fractures treatment [9].

The mean age for the PFN group was  $65.07 \pm 3.41$  years, while the mean age for the Hemiarthroplasty group was  $66.53 \pm 2.75$  years. In terms of gender, there is a slightly higher proportion of females in the PFN group [60%] compared to the Hemiarthroplasty group

[53.3%] with no statistically significant differences [P value>0.05]. In the PFN group, 53.3% of the fractures occurred on the left side, while in the Hemiarthroplasty group, 46.7% of the fractures occurred on the left side. In the PFN group, 20% of the fractures resulted from direct trauma, whereas in the Hemiarthroplasty group, 13.3% of the fractures resulted from direct trauma. Most fractures in both groups were caused by falls from a standing height, with 80% in the PFN group and 86.7% in the Hemiarthroplasty group. The most common Singh's index score was 1, with 40% of the patients having this score in PFN group, and 53.3% in hemiarthroplasty group. There were no significant differences between the studied groups regard side of fracture, mode of trauma and Singh index score.

Since the focus in this study was on the results of patients over 60 years of age, these patients are more likely to have an additional disease. In terms of comorbidities distribution among studied groups, it can be observed that the prevalence of cardiovascular comorbidities was similar between the two groups, with 4 individuals [26.7%] in each group having cardiovascular issues. Similarly, the prevalence of diabetes in PFN group was [26.7%] and [33.3%] in the Hemiarthroplasty group. Additionally, the prevalence of hypertension [HTN] was 46.7% in the PFN group and 40% in the Hemiarthroplasty group with no statistically significant differences between the studied groups [P value>0.05].

Such findings are in agreement with **Çiloğlu et al.** who compared the outcomes of PFN and a distally-fixed non-modular monoblock fluted long-stem hemiarthroplasty in 150 elderly patients with an osteoporotic intertrochanteric fracture and demonstrated that cardiovascular disease, DM, hypertension and pulmonary disease presented in 6.6%, 22.6%, 21.3% and 16%, respectively among patients in the PFN group and in 6.67%, 26.6%, 21.3% and 17%, respectively among hemiarthroplasty group [8].

Similarly, **Agar et al.** study on 171 elderly patients with an intertrochanteric fracture reported that in the hemiarthroplasty group, 83 patients had pre-existing comorbidities [68 patients had cardiovascular disease, 27 patients had diabetes mellitus, 19 patients had a respiratory disease, and 29 patients had the neurological disease], and 11 patients had no additional disease. In the PFN group, 72 patients had a comorbid disease [cardiovascular disease in 53 patients, diabetes mellitus in 24 patients, respiratory disease in 18 patients, and neurological disease in 24 patients], and 5 patients had no additional disease with no statistically significant difference between the groups [3].

Regarding the preoperative ASA [American Society of Anaesthesiologists] score grading among the studied groups, the distribution of ASA score grades was similar between the two groups. In the PFN group, 73.3% of the patients had an ASA score of 2, while in the Hemiarthroplasty group, 60% of the patients had an ASA score of 2. The proportions of patients with ASA score 1 and 3 are also fairly comparable between the groups. Similarly, **Agar et al.** reported no significant difference between the patient classifications of fractures and ASA scores [3]. Furthermore, **Çiloğlu et al.** compared the outcomes of PFN and a distally-fixed non-modular monoblock fluted long-stem hemiarthroplasty in 150 elderly patients with an osteoporotic intertrochanteric fracture and found that the most common Singh's index score was 2, with 40% of the patients having this score in PFN group, and 42.7% in the hemiarthroplasty group [8].

The present study revealed that the mean duration of surgery was significantly shorter in the PFN group [57.33±4.95 minutes] compared to the Hemiarthroplasty group [62.33±5.94 minutes] [p = 0.041]. Moreover, the mean blood loss during surgery was significantly lower in the PFN group [88.67±24.46 ml] compared to the Hemiarthroplasty group [354.67±136.74 ml] [p<0.001]. In the PFN group, all patients [100%] did not require any blood transfusion, whereas in the Hemiarthroplasty group, 20% of the patients received one unit of transfusion.

Such findings are in agreement with **Agar et al.** who compared the outcomes of unstable intertrochanteric femur fractures treated with cementless calcar-replacement bipolar hemiarthroplasty [n=94] and proximal femoral nail [n=77] in elderly patients and revealed a statistically significant decrease in the intraoperative bleeding amount among the PFN group compared with the hemiarthroplasty group [P value<0.001], moreover, the rate of no transfusion was higher in the PFN group than in the hemiarthroplasty group, and the rate of transfusion of 2 units or more was higher in the hemiarthroplasty group. Additionally, the operation time in the PFN group was significantly shorter compared with the hemiarthroplasty group [P value<0.001] [3].

Regarding the Harris Hip score analysis, the difference between the patients treated with cemented hemiarthroplasty and PFN was statistically significant in Favor of the hemiarthroplasty group within the first 3 months [65.47±8.22 vs. 41.8±8.8, respectively] [P value < 0.001]. However, this difference diminished at the 6th month time point and 12-month time point with no statistically significant differences [P value > 0.05] and reversed at the 24-month time point [82.6±9.13 vs. 79.33±10.53, respectively] [P value=0.04] indicating a better functional outcome of PFN in the long term. Additionally, **Çiloğlu et al.** compared the outcomes of PFN and a distally-fixed non-modular monoblock fluted long-stem hemiarthroplasty in 150 elderly patients with an osteoporotic intertrochanteric fracture and demonstrated that although the Harris hip score was significantly higher in the first year for the hemiarthroplasty group, no significant difference was seen between the 2 groups at 24 months [8]. Moreover, a previous study by Ramesh et al. on 40 patients who presented with intertrochanteric fracture of femur and were treated with short proximal femoral nail indicated that patient were functionally evaluated by modified Harris Hip Score at regular follow-ups and 87.5% of cases showed good to excellent results [excellent=16, good=19], and the rest 12.5% of cases showed fair results [10].

Regarding the pain assessment among studied groups, the distribution of pain grades was not significantly different between the studied groups in different follow up periods. A previous study by **El Ganzoury et al.** who compared the treatment using the Cemented Bipolar Hemiarthroplasty and the PFN for the management of unstable intertrochanteric fractures of 50 patients reported that at one year post-operatively, both PFN and hemiarthroplasty showed similar results in term of post-operative complication, radiological and clinical outcome. Although PFN was favoured by less operative time and blood loss, reoperation rate was higher but statistically insignificant [11].

Regarding post-operative mobility scores, at 3 months, the mobility score was significantly higher in the Hemiarthroplasty group compared to the PFN group [p = 0.035]. Similarly, at 6 months and 12 months, the mobility scores were significantly higher in the Hemiarthroplasty group [p = 0.04 for both time points]. In contrast,

at 24 months, the PFN group exhibited significantly higher mobility scores than the Hemiarthroplasty group [ $p < 0.001$ ]. Contrarily, a retrospective study by **Celen and Gazi**, on 98 elderly [ $\geq 65$  years] patients who presented with unstable intertrochanteric fractures and were treated with either hemiarthroplasty or PFN demonstrated that there was no statistically significant difference between the two groups in terms of mobility scores <sup>[12]</sup>.

Results of the present study revealed that the postoperative complications were determined in 4 patients in the Hemiarthroplasty group [two superficial infections, one deep infections, and one bedsore], and in 3 patients in the PFN group [one superficial infection, and two bedsores] with no significantly different between the studied groups. Similarly, **El-Soufy et al.** study on the surgical treatment for unstable intertrochanteric fractures in 18 elderly patients treated with bipolar hemiarthroplasty showed that most of the studied group 14 patient [77.8%] didn't have any postoperative complications, while 4 patients [22.2 %] of them had postoperative complications. Two of them had surgical site infection [SSI], both treated by oral antibiotics and serial debridement. One case had postoperative dislocation treated by close reduction under GA and skin traction for two weeks, also she had hematoma formation. While the other case has been died due to cardiac causes as it had history of IHD <sup>[13]</sup>.

**Study limitation:** Small scale study, short follow-up duration in the treatment of unstable intertrochanteric fractures in elderly.

**Future directions:** Larger scale studies with longer follow-up duration in the treatment of unstable intertrochanteric fractures in elderly are required as well as the long-term functional outcomes and quality of life associated with the use of PFN or calcar replacement hemiarthroplasty.

**Conclusions:** Proximal femoral nail [PFN] and calcar-replacement hemiarthroplasty are two safe and effective fixation methods for treating the elderly with intertrochanteric fractures. Both PFN and calcar-replacement hemiarthroplasty achieve stable fracture fixation, reduce pain, less post-operative complications and restore function of the hip joint. The calcar replacement hemiarthroplasty was superior in achieving a significantly better functional outcome in the early postoperative period by allowing early weight bearing and return to pre-morbid mobility. The internal fixation with PFN was superior in achieving a significantly better functional outcome of surgery in the long term [at 24 months follow up] and it was associated with lesser number of implant related complications, lesser mean duration of surgery, and lesser intraoperative mean blood loss.

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