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RESEARCH ARTICLE
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COMPLICATIONS ASSOCIATED WITH THE USE OF PFN A-II IN UNSTABLE INTERTROCHANTERIC FRACTURES.

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Abstract:
Background: Hip fractures are the most devastating injuries an all-age groups, with 90.0% of hip fractures in >50years' age group. Due to increased general life expectancy of population and incidence of road traffic accidents, there is increased incidence of fractures of proximal femur. **Objective:** To recognise complication associated with the use of PFN A-II in unstable intertrochanteric fractures. **Methods:** In our prospective study, we had included 30 elderly patients with unstable intertrochanteric fractures treated in Department of Orthopedics, Shaheed Hasan Khan Mewati Government Medical College Nalhar, Nuh. **Result:** The mean age of the total studied cases was 70 ± 7 years. The majority of the cases were males (63.3%) followed by females (36.7%). The cases were affected by slip and fall (40.0%), road traffic accidents (33.4%) followed by fall from height (23.3%) and 1 case was due to assault (3.3%). The cases affected their right side (56.7%) whereas the left side was affected in 43.3% of cases. The mean duration of surgery was 50.7±8.3051 minutes and the mean duration for the union was 11.57±1.19 weeks and the mean blood loss was 70.16±12.069 ml. 90% had no complications and 1 had varus collapse, 1 had experienced infection, 1 had anterior cortex impingement, no patient had helical blade backout /cut out and medial migration of blade.
Conclusion: PFN A-II being a intramedullary load sharing device with a better biomechanical advantage offers biological indirect reduction, concomitantly allowing early mobilization and weight bearing with comparatively lesser complications and less blood loss.

Keywords: Complication, PFN A-II, Unstable Intertrochanteric Fractures

INTRODUCTION: Before the introduction of suitable fixation devices, the treatment was predominantly conservative but this approach has now fallen into disrepute because of the high complication rate.[1] The common problems of prolonged immobilization, i.e., decubitus ulcers, Urinary tract infections, joint contractures, pneumonia, and thromboembolism contribute to the high mortality rate.[2] The increased incidence of varus deformity and shortening results in poor function, making operative management the preferred treatment. Operative treatment for hip fractures was introduced in the 1950s with the expectation of improved functional outcomes and reduced complications.[3] Since then, a variety of treatment options have evolved like Extramedullary,

Intramedullary implants, External fixator and Arthroplasty. Internal treatment of these fracture has gained widespread acceptance but the problems i.e., Malunion, non- union, implant failure, refracture and infection encountered after surgical correction, have prompted continued development of new devices and treatment programmes.[4]
It is crucial to use a less invasive implant that allows early weight-bearing and has low complication rates. The selection of an implant is mainly decided by the fracture pattern (stable or unstable). Though there are many implant designs for the fixation of these types of fractures, most of them have many demerits such as mechanical disadvantages, less hold on the osteoporotic bone, and early failures. PFNA devices have been introduced recently as an intramedullary option and PFNA-2 is its newer design.[18] These devices were developed to achieve better fixation strength, particularly in the presence of osteoporosis.

Material and Methods: This Prospective observational study was conducted among elderly population with intertrochanteric fracture admitted in Department of Orthopaedics, Shaheed Hasan Khan Mewati Govt. Medical College, Nalhar, Nuh. Duration of study was 18 months. Prior to the study's initiation, ethical approval was acquired from the institutional ethical committee.

Sample Size:
Cases satisfying the inclusion criteria were admitted in SHKM GMC, Nalhar. As per previous record of four years (2017 -2021) the prevalence of intertrochanteric fractures in elderly is 2% in our setup.
Allowable error in our study was 5%.
We used following formula for sample size calculation.
$N= Z^2PQ/L^2$
N =sample size
Z-=confidence level at 95% (standard value of 1.96) Q= 1-P
L= allowable error
On calculation we found a sample size of 30.118
So, this study will be undertaken with a sample size of 30 patients.

Sampling: All the patients presenting to emergency and OPD of SHKM GMC, NUH with fractures around the hip were assessed and the patients fulfilling the criteria were included in the study.
Inclusion criteria:
1. Patients > 60 years
2. Unilateral unstable inter-trochanteric fracture femur (AO Type 31A2 & A3)
3. Ambulatory prior to fracture,
4. Mentally sound and asymptomatic contra-lateral lower limb
5. Patients willing to give informed written consent to participate in the study.

Exclusion Criteria:
1. Pathological fracture
2. Open fracture
3. Polytrauma
4. Age<60yrs
5. Fracture with subtrochanteric extension
6. Fracture requiring open reduction.

Screening of patients
A total 45 patients were screened during study period, 7 refused to participate in the study and 8 were not fit according to inclusion criteria and finally 30 patients were found fit according to inclusion criteria.

Data collection

Detailed history was taken and physical examination was done. The detailed procedure was explained to the patient via patient information sheet. The patients' details were recorded as per Predesigned Study Performa.

Outcome Measures

Any complication during or after the surgery

Methodology

Written consent was taken from all potentially eligible subjects and excluded from the study if they did not match with inclusion criteria of the study. A detailed history and Clinical diagnosis of intertrochanteric fracture was done with the limb in external rotation, with shortening and a history of trauma. Emergency treatment in the form of analgesics was given. Haematological investigations were also done.

Anteroposterior X-ray of the pelvis with both the hips in 15-degree internal rotation and the lateral view of the injured hip were taken. Classification of fracture was done using AO/OTA classification of per trochanteric fracture (figure 2). The preoperative neck-shaft angle and the medullary canal diameter were calculated with the help of the radiographs of the normal opposite hip.

All the surgeries (CRIF with nailing under image intensifier) were done under the regional anaesthesia after the patient was fit for the surgery. The diameter for PFN was measured from diameter of femur at level of isthmus. A standard length Short PFN A-II (180/240mm) was used in all cases. The average blood loss was measured using the method by Brecher et al.[50]

Postoperative restoration protocol was uniform. The isometric quadriceps exercise, knee- bending, sitting by-side of the bed and the exercise of abductor strengthening were advised directly after surgery. Non-weight bearing/Toe touch walking (NWB/TTW) was permitted with help of walker/ axillary crutches from second/third postoperative day depending upon general condition and pain tolerance of the patient. Patients were discharged after 5–7 days following the surgery with training to walk NWB/TTW with the help of walker or axillary crutches. Subjects were followed up at 2weeks, 6 weeks, 12 weeks, 6 months and 9 months.

Patients were assessed radiologically with Xray hip – AP/Lateral of the operated side with respect to TAD, NSA and signs of union.Union was decided based on the obliteration of the fracture line with the bridging callus to allow the unprotected function of limb. The patients were functionally assessed on Harris Hip Score. The postoperative pain and Gait were also assessed as per Harris Hip Score criteria at the end of all follow-ups.

Grading of Harris Hip Score:-

- <70 Points - Poor
- 70-79 Points - Fair
- 80-89 Points - Good
- 90-100 Points - Excellent

Statistical analysis

Data was analyzed using Statistical Package for Social Sciences, IBM manufacturer, Chicago, USA, ver 25.0 (SPSS Inc., Chicago). Results for continuous variables are shown as mean ± standard deviation (SD), whereas results for categorical variables are shown as number (percentage). P values were calculated with appropriate statistical tests. Values of $p < 0.05$ were considered as significant.

Results: The majority of cases were in the age range between 60 to 69 years (53.3%) followed by 70 to 79 years (30.0%) and the least cases were of above 80 years of age (16.7%). The mean age of the total studied cases was 70±7 years

Table 1: Distribution of the studied cases based on their age.

Age in years	No. of cases (n=30)	Percentage
60-69	16	53.3
70-79	9	30.0
≥80	5	16.7
Mean age	70±7 years	

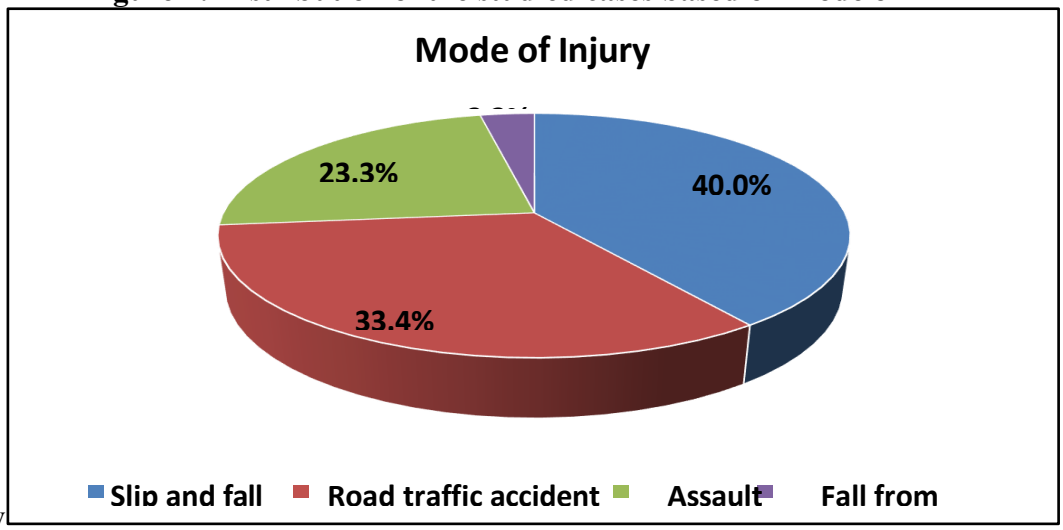
Majority of the cases were males (63.3%) followed by females (36.7%)

Table 2: Distribution of the studied cases based on their gender

Gender	No. of cases (n=30)	Percentage
Male	19	63.3
Female	11	36.7

Majority of the cases were affected by slip and fall (40.0%), road traffic accidents (33.4%) followed by fall from height (23.3%) and 1 case was due to assault (3.3%).

Figure 1: Distribution of the studied cases based on mode of injury

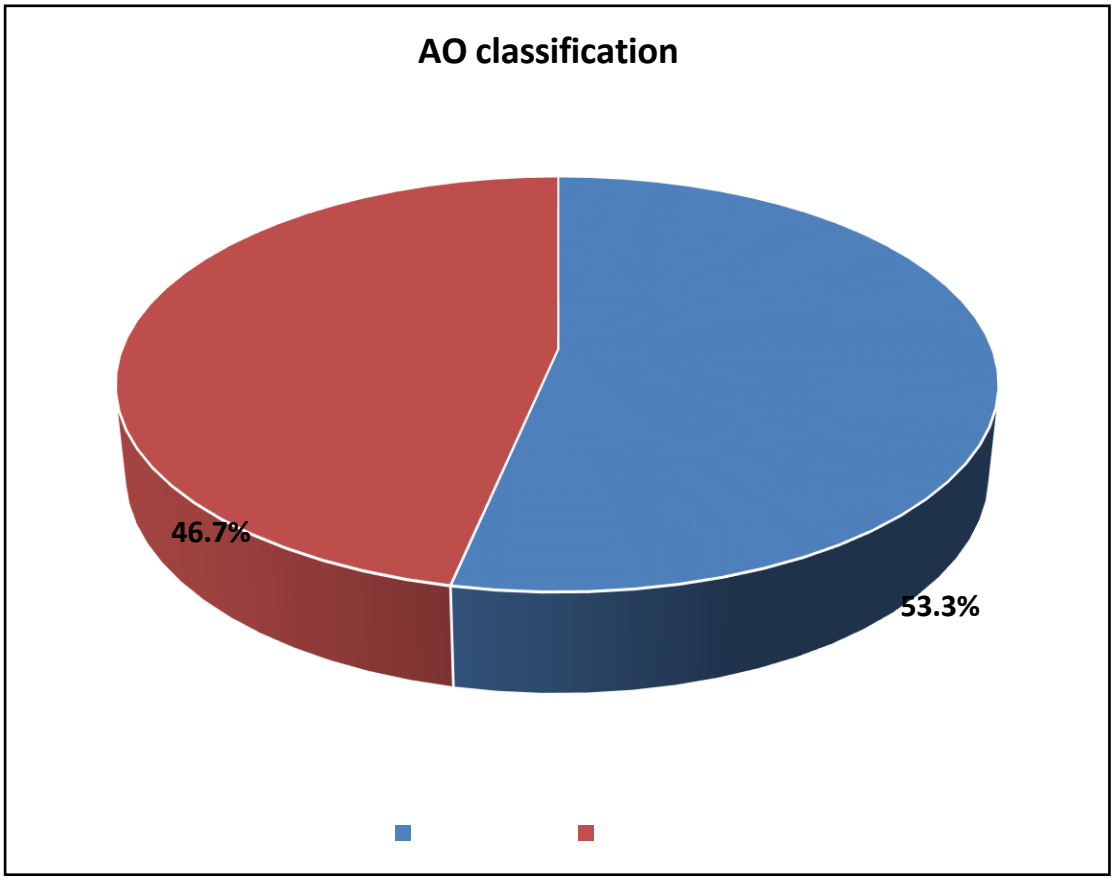


Cases affected their right side (56.7%) whereas the left side was affected in 43.3% of cases.
Table 3: Distribution of the studied cases based on side of injury

Side affected	No. of cases (n=30)	Percentage
Right	17	56.7
Left	13	43.3

53.3% of cases were of AO31-A2 fracture type and 46.7% were of AO31-A3 fracture type.

Figure 2: Distribution of the studied cases based on AO classification



Mean duration of surgery was 50.7±8.3051 minutes and the mean duration for the union was 11.57±1.19 weeks and the mean blood loss was 70.16±12.069 ml.

The mean neck shaft angle of the normal side was 125.26±2.88º and for operated side was 124.08±4.48 º

The majority of patients (53.34%) had a TAD between 20-25mm, while the smallest group (6.66%) had a TAD between 25-30mm. The total number of patients is 30, making up 100% of the sample. TAD <25mm was considered satisfactory.

The below table shows the functional outcome of the studied cases based on Harris Hip Score and it was found that post-operatively at 2 weeks follow up it was 52.7 ± 6.22, at 6 weeks follow up it was 65.26±7.21, at HHS at 12 weeks 83.26 ± 7.12 , at 6 months 85.46 ± 7.195 and at 9 months 91.16 ±
5.89.

Patients with a Harris hip score of 90-100 were considered to have an excellent result (36.6%), those with a score of 80-89 were considered good (56.7%) and those with a score of 70-79 were considered fair (6.7%) in terms of outcome.

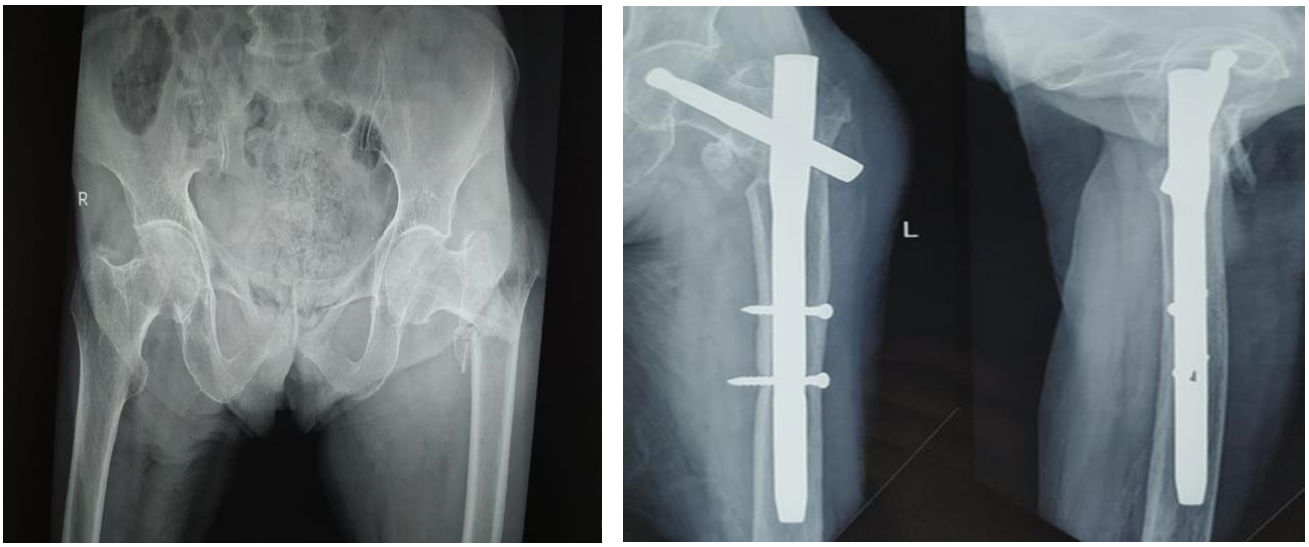
The following table shows the distribution of cases based on complications and it was found that 90% had no complications and 1 had varus collapse, 1 had experienced infection, 1 had anterior cortex impingement, no patient had helical blade backout /cut out and medial migration of blade.

Table 4: Distribution of the studied cases based on complication

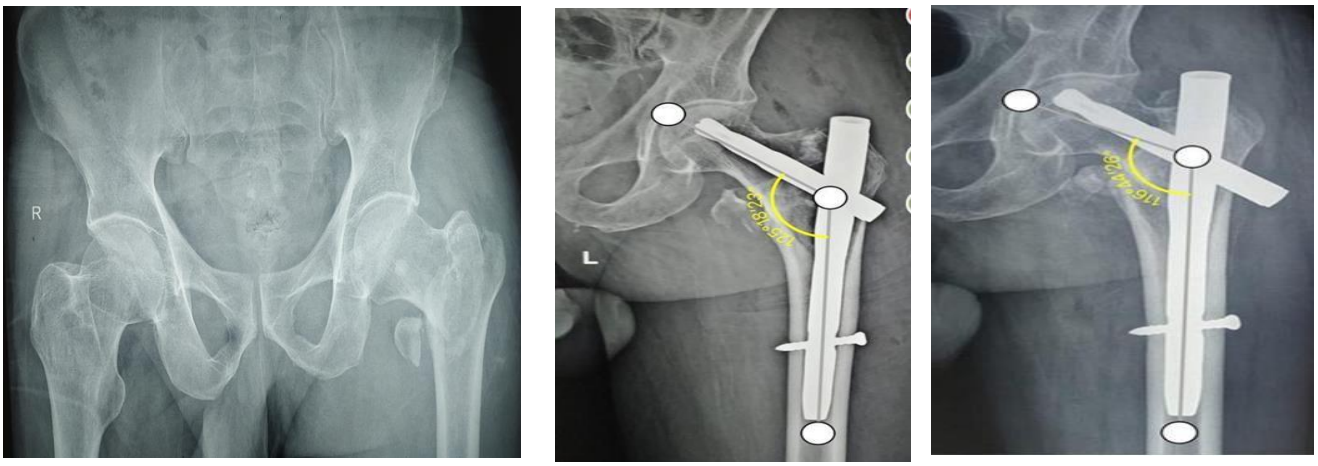
Complications	No. of cases (n=30)	Percentage
Varus collapse (change in NSA>5 degree)	1	3.3
Infection	1	3.3
Anterior cortex impingement	1	3.3

Helical blade back out	0	0.0
Helical blade cut out	0	0.0
Medial migration of blade into hip joints	0	0.0
No complications	27	90.00

Complications



Anterior Cortex Impingement (Fair HHS-79) managed with early implant removal following union



Varus Collapse /malunion (Fair HHS-78) managed with early implant removal following union

Discussion:

The present observational study was conducted over 30 intertrochanteric fracture patients. All patients in the present study belonged to ages more than and equal to 60 years the majority of cases were in the age range between 60 to 69 years (53.3%) followed by 70 to 79 years (30.0%) and the least cases were of above 80 years of age (16.7%). The mean age of the total studied cases was 70 ± 7years. Our findings were also comparable to a study conducted by **Wasudeo M et al**[3] of 67 years, and **Jamshad OP et al** [4] the mean age of patients was 65.6 years.

In the present study, the majority of the cases were males (63.3%) followed by females (36.7%). Males are affected more than females. In contrast to these findings females are affected more with IT fractures in the study performed by **Kumar et al** [5] in which it was noted that out of the 50 patients, 20 patients (40%) were males and 30 patients (60%) females and in **Jamshad OP et al**[4] study the majority were female patients (62.85%).

In this study commonest mode of injury for IT fracture was slip and fall (40.0%), road traffic accidents (33.4%) followed by fall from height (23.3%) and 1 case was due to assault (3.3%). In **SujanaTheja J S et al**[6] study fracture because of domestic fall occurred in 60%, 8.3% met with road traffic accident, 31.7% had fall at workplace. In **Pulin Bihari Das et al**[7] study, 70% fractures were because of domestic fall, 26% were because of road traffic accident, and 4% fractures were of the other etiology.

Among all 30 cases, the right side IT fracture was reported in 56.7% and the left side was affected in 43.3% of cases. Similarly, in a study by **SujanaTheja J S et al**[6] the right side was affected in 31 cases while the left was in 29 cases. The contrast, a study done by **Kumar et al**[5] observed more IT fractures on the left side (29 cases) than on the right side (21 cases), in **Pulin Bihari Das et al**[7] study, 60% of patients had the fractures on left side.
In the present study, the mean duration of surgery was 50.7±8.30 minutes and the mean duration for the union was 11.57±1.19 weeks the mean blood loss was 70.16±12.06ml. Similarly, in **Kaushal A et al**[8]**,** study the average time of surgery was 90.25 min and mean intraoperative blood loss, in the PFNA-2 group was 68.25 ± 5.20 m. In **Mir WA et al**[9] study the average time to union was 12.27 weeks; and in **Yadav RL et al**[10] study the average time of union was 12.3 weeks. In **Garabadi M and Grover A**[11] **study,** the average time for union was 3 months.
In the present study, 90% had no complications and only 3 cases had some complications (1 case experienced infection, 1 had Anterior cortex impingement and 1 had varus collapse). Infection was superficial and healed with antibiotics. Other two patients had Fair functional outcome and were treated conservatively and early implant removal following union. In study of **Mundla MKR et al**[12] there were fewer delayed complications in PFN group. In **Garabadi M and Grover A**[11] study 2 patients had non-union at the end of 1 year of follow- up, and no patients had infection or cut out of the blade. 8 patients had migration of the blade, 2 patients had varus collapse, and no fractures below the tip of the nail were seen during the follow-up period. In **Yadav RL et al**[10] study, post-operative complications were in 6 patients in which 2 had pull out of blade and 2 had medial penetration, with no incidence of varus collapse and cut out. In **Vincent DA et al**[13] study 2 patients presented with minor complications such as superficial skin infection treated conservatively.

Conclusion: PFN A-II being a intramedullary load sharing device with a better biomechanical advantage offers biological indirect reduction, concomitantly allowing early mobilization and weight bearing with comparatively lesser complications and less blood loss.

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