

A Prospective Study to Evaluate the Various Methods of Trochanteric Fracture Fixation: A Comparative Study**Randhir Kumar¹, Govind Mohan Jee²**¹Senior Resident, Department of Orthopaedics, Darbhanga Medical College and Hospital, Darbhanga, Bihar, India²Professor and HOD, Department of Orthopaedics, Darbhanga Medical College and Hospital, Darbhanga, Bihar, India

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Conflict of interest: Nil

Abstract:**Aim:** The aim of the present study was to evaluate the various methods of trochanteric fracture fixation and their comparison in DMCH, Darbhanga, Bihar.**Methods:** This prospective study was conducted at Department of Orthopaedics for the period of 12 months on 50 patients who attended in OPD and emergency. Patients were included in the study as decided by inclusion and exclusion criteria and operative intervention for each group was decided on the basis of radiological examination.**Results:** Out of the 50 patients, 28 patients (56%) were male and 22 patients (44%) female. The age of patients recorded in our series ranged between 20-90 yrs. Mean age for PFN group was 57 years, mean age for DHS group was 59 years, and mean age for PFLCP group was 63 years. We found that intertrochanteric fracture due to domestic fall (60%) was most common mode of injury, followed by fracture due to road traffic injury (36%). According to AO classification 20 patients (40%) were stable and 30 patients (60%) were unstable. In our study we got most of patients with A3 type unstable fractures. In PFN group 8 patients, in DHS group 16 patients and in PFLCP group 6 patients were with A3 type fractures. While patients with A1 type fractures were least in numbers. In PFN group 3 patients, in DHS group 1 patient and in PFLCP group 1 patient were with A1 type fractures. In present study at 01 month and 3 months mean score showed significant improvement in PFN group. At 6 months, mean score showed highly significant improvement in PFN group. But at 1 year of follow up Harris Hip score showed insignificant difference in functional status of patients belong to either group.**Conclusion:** PFN had good to excellent outcomes. So PFN offers high rotational stability, compression at fracture site, create a shorter lever arm, so had decreased rate of mechanical failure, reduced hospital stay, early mobilization, less blood loss and less surgery time, early rehabilitation and faster union as compared to DHS and PFLCP.**Keywords:** trochanteric fracture, fixation, Harris hip scoreThis is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Trochanteric fractures are generally associated with bone fragility and caused by a low energy trauma: a significant increase of these fractures is expected on the next decades. [1,2] Improvements of anaesthesiology and surgical techniques have increased the rate of success and reduced the elevated risk of death within the first year after fracture, independently from the patients' age and health status. [2] Surgical fixation and early rehabilitation are the goals of an adequate treatment in order to allow a quick recovery for patients. The recent acquisition that an early timing (<48 hours from trauma) of surgical treatment may reduce

postoperative complications and mortality adds to our knowledge further implications. [3,4]

Surgical treatment of trochanteric fractures consists of intramedullary nail (IMN) fixation or extramedullary fixation with a sliding hip screw (SHS); however, there is a lack of conclusive evidence supporting any one fixation type. [5] The Gamma nail (Stryker) is a well-established IMN device that has shown good clinical and radiographic outcomes following trochanteric fracture fixation and may be advantageous with certain fracture patterns. [6-8] Despite the paucity of high-quality evidence supporting intramedullary over extramedullary fixation, the use of IMNs has

been increasing internationally. [9-13] This is concerning, as IMNs can cost up to 40% more than SHSs. [14] In fact, some postulate that the increasing use of IMNs may be related to higher reimbursement payments made to surgeons for IMN devices compared with SHSs. [9,15]

Intramedullary nails, sliding plate devices alone or in combination with trochanteric stabilization plates, proximal femoral locking plates, and angular blade plates are the options for managing unstable trochanteric fractures. [16] Sliding plate devices, whenever used for unstable intertrochanteric fractures with lateral wall comminution, result in gross medialization of the distal fragment with an excessive collapse of the proximal fragment, leading to implant failure with failure rates up to 50%. [17] Intramedullary devices like the proximal femoral nail (PFN) have been reported to have an advantage in such fractures as their placement allows the implant to lie closer to the mechanical axis of the extremity, thereby decreasing the lever arm and bending moment on the implant. [18] The intramedullary position of PFN and it being a load sharing device prevents the medialization of the distal fragment and excessive collapse of the proximal fragment, with less operative time and blood loss, and allows early weight-bearing with less resultant shortening on long-term follow-up. [19,20]

The aim of the present study was to evaluate the various methods of trochanteric fracture fixation and their comparison in DMCH, Darbhanga, Bihar.

Materials and Methods

This prospective study was conducted at Department of Orthopaedics, Darbhanga Medical College and Hospital, Darbhanga, Bihar, India for the period of 12 months on 50 patients who attended in OPD and emergency. Patients were included in the study as decided by inclusion and exclusion criteria and operative intervention for each group was decided on the basis of radiological

examination. During the period the patients who attended the hospital were enrolled as sample size.

Inclusion Criteria

- All Patients with close intertrochanteric fracture above 18 years
- Fractures within 2 weeks.
- Patient who ready to give informed consent for minimum 12 months of follow up.
- No medical contraindication to general anaesthesia or regional anaesthesia.

Exclusion Criteria

- Pathological fractures.
- Compound fractures.
- Polytrauma patients and patients with comorbidities (i.e. politic and paralytic limb).
- Patient is on chemotherapy or radiotherapy.

History was taken from each patient regarding mode of injury, time since injury. All patients were examined clinically and investigated thoroughly. A day before surgery the patients were subjected to pre anaesthesia check-ups, surgical site of each patient was prepared, and informed consent were taken from each patient or his/her attendants. Each patient received a single dose antibiotic half an hour before induction of anaesthesia. I.V antibiotic was given to all patients for 5 days. All the patients were operated by single surgeon under spinal epidural anesthesia. Drain was not used in PFN Group Wound dressings were done at 3rd post-operative day in routine or anytime when needed for proper care. Stitches were removed on 10-12th post op day. All patients were followed at an interval of 4 weeks till 3 months and patents were assessed clinically, and radiologically, then at the interval of 3 months for period of 1 year. Analysis of results was done at 1 month, 3 month, 6 month and 12 month as per Harris hip scoring system.

Harris Hip Scoring System

Harris Hip Scoring System	Rating
90-100	Excellent
80-89	Good
70-79	Fair
>70	Poor

Statistical analysis was done by SPSS 16.0 version software. The following tests and tools were used for the statistical analysis of the observations and results. ANOVA Test is done to compare the means of three groups and POST HOC

Analysis/Boneferroni Test was used to find out which group was significantly different from rest of the groups. P value <0.01 was considered significant.

Results

Table 1: Demographic data

Gender	N%
Male	28 (56)
Female	22 (44)
Mean age in years	
PFN	57
DHS	59
PFLCP	63

Out of the 50 patients, 28 patients (56%) were male and 22 patients (44%) female. The age of patients recorded in our series ranged between 20-90 yrs. Mean age for PFN group was 57 years, mean age for DHS group was 59 years, and mean age for PFLCP group was 63 years.

Table 2: Mode of injury

Mode of injury	PFN	DHS	PFLCP	Total (%)
RTA	6	4	6	18 (36)
Domestic fall	10	17	13	30 (60)
Assault	1	1	-	2 (4)

We found that intertrochanteric fracture due to domestic fall (60%) was most common mode of injury, followed by fracture due to road traffic injury (36%).

Table 3: AO classification of fracture and fracture pattern

AO classification	PFN	DHS	PFLCP
A1	3	1	1
A2	3	11	1
A3	8	16	6
Fracture pattern			
Stable (20)	6	12	2
Unstable (30)	8	16	6

According to AO classification 20 patients (40%) were stable and 30 patients (60%) were unstable. In our study we got most of patients with A3 type unstable fractures. In PFN group 8 patients, in DHS group 16 patients and in PFLCP group 6 patients

were with A3 type fractures. While patients with A1 type fractures were least in numbers. In PFN group 3 patients, in DHS group 1 patient and in PFLCP group 1 patient were with A1 type fractures.

Table 4: Evaluation of Harris Hip Score

Group and classification	1 Month		3 Months		6 Months		12 Months	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
PFN	45.4		73.0		87.3		93.7	
Stable	46.4	±8.6	75.5	±10.8	88.4	±4.9	86.4	±3.6
Unstable	42.8		68.5		68.5		92.6	
DHS (B)	36.6		61.4		82.7		91.8	
Stable	38.2	±5.9	63.8	±9.2	85	±6.6	94.2	±6.5
Unstable	37.3		59.8		81		89.2	
PFLCP (C)	36.6		53.9		76.1		88.3	
Stable	46.4	±5.9	56.4	±7.4	75.5	±8.3	88.6	±8.5
Unstable	36.5		51.4		75		88.0	

In present study at 01 month and 3 months mean score showed significant improvement in PFN group. At 6 months, mean score showed highly significant improvement in PFN group. But at 1 year of follow up Harris Hip score showed insignificant difference in functional status of patients belong to either group.

Discussion

Intertrochanteric fractures are one of the most common fracture of the hip especially in the elderly with osteoporotic bones, usually due to low-energy trauma like simple falls. [21] The incidence of intertrochanteric fractures varies from country to

country. Gulberg et al has predicted that the total number of hip fractures will reach 2.6 million by 2025 and 4.5 million by 2050. [22] The treatment of choice in fracture intertrochanteric femur is internal fixation. There are various forms of internal fixation devices used for trochanteric fractures i.e. DHS, PFN, PFLCP. The most commonly used device is the dynamic hip screw with slide plate assemblies. Dynamic Hip Screw (DHS) is still considered the gold standard for treating intertrochanteric fractures by many. [23] The advantages and disadvantages of the DHS have been well established in several studies done in the past, this is a collapsible fixation device, which

permits the proximal fragment to collapse or settle on the fixation device, seeking its own position of stability. Stable fractures can be very well treated with dynamic hip screw alone with good results proven by various studies. [24]

Out of the 50 patients, 28 patients (56%) were male and 22 patients (44%) female. The age of patients recorded in our series ranged between 20-90 yrs. Mean age for PFN group was 57 years, mean age for DHS group was 59 years, and mean age for PFLCP group was 63 years. Tyllionksi M et al [25] reported average age 71.3 years. Suranigi SM et al [26] had 17% male and 83% female in the study. We found that intertrochanteric fracture due to domestic fall (60%) was most common mode of injury, followed by fracture due to road traffic injury (36%). According to Cummings and Nevit [25], there was inadequate protective reflexes to reduce energy of fall, inadequate local shock absorbers and none strength in elderly patient. According to AO classification 20 patients (40%) were stable and 30 patients (60%) were unstable. The study conducted by Gadegone et al [27] in which patients with unstable trochanteric femoral fractures were fixed by PFN with augmentation by an additional screw from the trochanter to the inferior quadrant of the femoral head or cerclage wire to strengthen the lateral trochanteric wall. They reported that bone healing was observed in all cases over a 14.2-week period. They observed complications in nine patients including lateral migration of neck screws, the Z-effect, infection, and distal interlocking bolt failure. At the final follow-up in their study, the Salvati and Wilson hip function was 32 (out of 40) in 88% of the patients, and they concluded that stabilizing the lateral trochanteric wall with additional screws or cerclage wire improves the construct's stability. In another such study on unstable intertrochanteric fractures by Huang and Wu [28], they concluded that the use of cerclage cable for better fracture stabilization along with PFN led to superior outcomes in terms of Harris Hip Score, time for fracture healing and weight-bearing, with reduced incidence of postoperative complications and improved self-care by the patients.

In our study we got most of patients with A3 type unstable fractures. In PFN group 8 patients, in DHS group 16 patients and in PFLCP group 6 patients were with A3 type fractures. While patients with A1 type fractures were least in numbers. In PFN group 3 patients, in DHS group 1 patient and in PFLCP group 1 patient were with A1 type fractures. In present study at 01 month and 3 months mean score showed significant improvement in PFN group. At 6 months, mean score showed highly significant improvement in PFN group. But at 1 year of follow up Harris Hip score showed insignificant difference in functional

status of patients belong to either group. Kulkarni et al [27] concluded that the use of cerclage wires and lag screws for lateral wall reconstruction to augment the fixation of the intramedullary nail in unstable trochanteric fractures has been shown to be effective in decreasing complications and achieving a favorable radiological and functional outcome. There is minimal blood loss and soft tissue injury, and very little extra time is needed for the operation. Purushotham et al [28] conducted a prospective study and observed that in unstable intertrochanteric fractures, enhancing the proximal femoral nail with an extra screw or cerclage wire improves the efficacy and stability of the construct, which in turn facilitates union and shortens the time to union.

Conclusion

PFN had good to excellent outcomes. So PFN offers high rotational stability, compression at fracture site, create a shorter lever arm, so had decreased rate of mechanical failure, reduced hospital stay, early mobilization, less blood loss and less surgery time, early rehabilitation and faster union as compared to DHS and PFLCP. DHS Proximal femoral locking plate also seems to be a feasible alternative to PFN and DHS in certain complex comminuted unstable osteoporotic intertrochanteric fractures as it locks the fracture in reduced position achieved by surgeon without controlled collapse.

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