

Outcome of Unstable Intertrochanteric Fracture Treated with Proximal Femoral Nail Fixation

Dr. Anup Mostafa^{1*}, Dr. Md. Shafiul Ezaz², Dr. Md. Rayhan Ali Mollah³, Dr. Shahidul Islam Chowdhury⁴¹Assistant Professor, Orthopaedic Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh²MS Indoor Medical Officer, Dept of Orthopaedic Surgery, Ibn Sina Medical College Hospital, Kollyanpur, Dhaka, Bangladesh³Junior Consultant, Orthopaedic Surgery, Bangladesh Institute of Health Science General Hospital, Dhaka, Bangladesh⁴MS Examinee, Dept. of Orthopaedic Surgery, Dhaka Medical College Hospital, Dhaka, BangladeshDOI: [10.36347/sjams.2022.v10i04.036](https://doi.org/10.36347/sjams.2022.v10i04.036)

| Received: 13.03.2022 | Accepted: 23.04.2022 | Published: 30.04.2022

*Corresponding author: Dr. Anup Mostafa

Assistant Professor, Orthopaedic Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh

Abstract

Original Research Article

Background: Intertrochanteric femoral fractures are common fractures representing 45% of hip fractures. The best treatment option is still a matter of debate. Proximal Femoral Nail (PFN), a modern intramedullary implant offers several advantages. This study is to evaluate the outcome of fixation of unstable intertrochanteric fractures with Proximal Femoral Nail (PFN) in our setting. **Material & Method:** A prospective short-term interventional study was conducted at Dhaka Medical College Hospital, Dhaka, from January 2020 to December 2021. Patients with unstable intertrochanteric fractures meeting the selection criteria were the study population. A total of 38 patients were included in the study. All cases were treated with PFN and were evaluated by Harris Hip Score (HHS). **Results:** The mean age was 62.6±14.9 years with a female predominance (55.3%). The main cause of injury was fall on a slippery ground (57.9%). The most occurred fracture was Kyle type III (78.9%, n=30). The mean duration of injury to operation was 11.7±4.7 days. The mean duration of follow-up was 21.9±1.6 weeks, ranging from 20 weeks to 24 weeks. Superficial wound infection was the most common complication, found in 3(7.9%) cases. Mean radiological union time was 12.55± 2.31 weeks. Maximum Limb Length Discrepancy (LLD) was 1 cm in 7(18.4%) and in 29(76.4%) cases there was 0 cm of LLD. The mean Hip score was 87.0±16.1. Finally, evaluation of 38 cases, 20(52.6%) were excellent, 12 (31.6%) were good, 5 (13.2%) were fair and the rest 1 (2.6%) were poor according to the Harris Hip Scoring System. **Conclusion:** Proximal Femoral Nail (PFN) is an ideal implant for the treatment of the unstable intertrochanteric fracture. It is a simple, easy, minimally invasive, reliable, and effective method with shorter operative time, lesser blood loss, and reasonable time to bone healing with early mobilization of the patients.

Keywords: Intertrochanteric Fracture, Proximal Femoral Nail, dynamic hip screw.

Copyright © 2022 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Intertrochanteric fractures are the extracapsular fractures of the proximal femur between the greater trochanter and lesser trochanter. It makes up 45% of all hip fractures [1]. These fractures are common in the geriatric age group. The incidence of such fractures increased recently due to an increase in life expectancy worldwide [2].

Russell cited to Gullberg *et al.* stated that the estimation of the future incidence of hip fracture worldwide might double to 2.6 million by 2025 and 4.5 million by the year 2050 [3,4]. Trochanteric fractures are based on stability, reduction, role of posteromedial wall, lateral wall, which help in choosing implant for a

better outcome. Most classifications are based on these factors and help in selecting management protocols. Many classification systems have come from the last 6 decades, but none of them are found to be unanimously acceptable worldwide.

Thirty-five to forty percent of all intertrochanteric hip fractures are unstable three and four-part configurations with a displacement of the posterior-medial cortex [1]. Russell further revealed that in the elderly low energy mechanism like a simple fall in osteoporotic bone causes fracture wherein a young patient mechanism involves high energy trauma [3].

The Factors most significant for instability and fixation failure in Unstable intertrochanteric fractures

are: (i) loss of posteromedial support, (ii) severe comminution, (iii) subtrochanteric extension of the fracture, (iv) reverse oblique fracture, (v) shattered lateral wall and (vi) extension into the femoral neck area. It is universally agreed that the treatment of unstable intertrochanteric fractures is stable internal fixation as early as possible since malunion and varus angulation are common if left untreated or treated improperly, leading to substantial morbidity.

Stable intertrochanteric fractures are commonly treated with dynamic hip screw (DHS) fixation with failure rates of less than 2%. The passage of time and experience has repeatedly emphasized that such an unstable variety of fractures are not treatable by the standard sliding hip screw [5].

Recently intramedullary fixations devices have become increasingly popular because of their biomechanical advantage and high rates of failure are debatable in fractures that were treated with sliding hip-screw system devices [6].

The biological aspect of fracture treatment is achievable with percutaneous, minimally invasive approaches of intramedullary nailing devices that allow biological osteosynthesis patterns with a minimum of collateral damage to the local soft tissue surrounding the fracture site. The biomechanical advantages of nails led to the development of various implants which represent state-of-the-art treatment for unstable intertrochanteric fractures. Based on the known biomechanical advantages of intramedullary nailing in treating femoral shaft fractures, new generation cephalomedullary nails have come into focus for intertrochanteric fracture treatment [7].

The best treatment option for unstable intertrochanteric fractures is still a matter of debate. Management includes both non-operative and operative techniques. Non-operative treatment is indicated in non-ambulatory patients and patients with a high risk of perioperative mortality. But it is associated with pneumonia, urinary tract infection, decubitus ulcer, and Deep Vein Thrombosis (DVT)[8].

Intramedullary nails include Gamma nail, Smith & Nephew nail, Proximal Femoral Nail, etc., and they are indicated in both stable and unstable fractures. Nailing has a smaller lever arm with a reduction in bending stress and lower implant failure rate and makes no dissection at the fracture site. The nail occupies the medullary canal, preventing excessive sliding and medialization of the shaft even in A3 fractures (according to AO classification). It also includes all the other fracture patterns like reverse obliquity and

intertrochanteric fracture with subtrochanteric extension effectively [9].

Fracture fixation and compression are achieved using a single proximal interlocking screw and occasionally a derotation screw. The anatomical reduction is the prerequisite for success in using this device. This kind of nail may be a choice for unstable intertrochanteric fracture in a tertiary level hospital-like Dhaka Medical College Hospital.

OBJECTIVE

General Objective

To evaluate the outcome of Proximal Femoral Nailing for unstable intertrochanteric fracture fixation

Specific Objectives

1. To evaluate radiological outcomes including union, delayed union, and malunion.
2. To assess the functional outcome of the treatment according to Harris Hip Score.
3. To find out postoperative complications.

METHODOLOGY

Study Design

Short-term prospective interventional study

Place of Study

Dhaka Medical College Hospital, Dhaka, Bangladesh

Period of Study

January 2020 to December 2021 (24 months)

Study Population

Patients who were admitted with an unstable intertrochanteric fracture in the Dhaka Medical College Hospital, Dhaka during the study period

Selection Criteria

Inclusion Criteria

- Patients between 18 years to 80 years of age.
- Both sexes.
- Patients with closed fractures were included.
- Unstable intertrochanteric fracture of femur.

Exclusion Criteria

- Pathological fracture
- Ipsilateral femur fractures
- Poly-trauma.
- Patient who cannot follow up at least for 5 months.

Sample Size

Within the time frame, 53 patients fulfilled the selection criteria and were included in the study. However, due to the COVID-19 pandemic, 38 patients completed the follow-up schedule.

Sampling Technique

Purposive sampling (non-randomized) according to availability of the patients and strictly considering the inclusion and exclusion criteria

Study Procedure

After selecting a case according to inclusion and exclusion criteria, patients were evaluated preoperatively and preoperative Harris Hip Score (HHS) was measured. After preparing the patients for operation, an operation was done. Injection ceftriaxone was given preoperatively and followed by oral cefixime for 21 days. The patient was discharged from the hospital at the 4th POD after removing the drain. 1st follow-up was given at 14th POD to check any signs of infection, pain status, and distal neurovascular status. The stitch was removed on the same day. X-ray was done to check and callus formation. Next, follow up at 6th week after the operation. The range of emotions was tested. X-ray was done. Improvement was noted at the end of the 6th month, the last follow-up was given. X-ray was done to see the union status. The final assessment was done according to HHS.

Data collection procedure

Data were collected by using semi-structured data collection sheet containing history, clinical

examination, laboratory investigations, pre-operative, perioperative, postoperative complications, and postoperative follow-up findings. The datasheet was formulated to evaluate the outcomes according to Harris Hip Score.

Analytic framework

Data were collected, compiled, and tabulated according to key variables and functional assessment scoring. The analysis of different variables was done according to standard statistical analysis by using SPSS (Statistical Package for Social Science) version 26.

RESULTS

Age of the cases

Table-I: Distribution of cases according to age (n=38)

| Age (in years) | Frequency | Percentage |
|----------------|------------------|------------|
| 18-40 | 5 | 13.2 |
| 41-55 | 4 | 10.5 |
| 56-70 | 17 | 44.7 |
| 71-85 | 12 | 31.6 |
| Total | 38 | 100.0 |
| Mean± SD | 62.6± 14.9 years | |

Table I shows that 17 (44.7%) cases were from the 56-70 years age group while 4 (10.5%) cases were from the 41-50 years age group. The mean age of the cases was 62.6 (±14.9) years.

Male female ratio of the cases

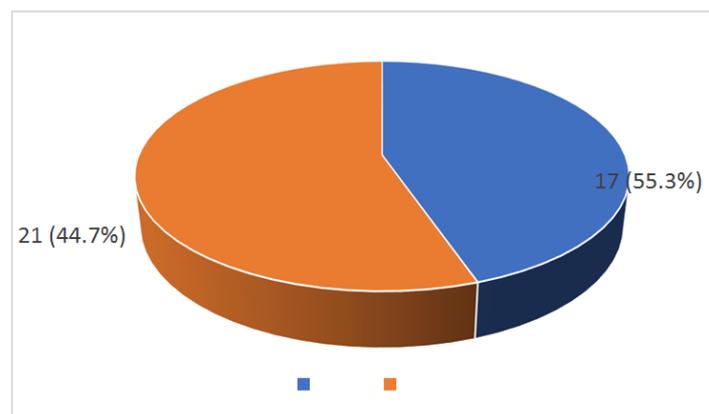


Fig-1: Gender distribution of study cases (n= 38)

The above pie chart shows the gender distribution of the study cases. The proportion of male

cases was 44.7% and female cases were 55.3% with a male-female ratio of 1:1.23.

Occupational status

Table-II: Distribution of cases according to occupational status (n=38)

| Occupational status | Frequency | Percentage |
|---------------------|-----------|------------|
| Housewife | 18 | 47.4 |
| Ex-service holder | 11 | 28.9 |
| Service holder | 6 | 15.8 |
| Businessmen | 2 | 5.3 |
| Student | 1 | 2.6 |
| Total | 38 | 100.0 |

The above table shows that 18 (47.4%) cases were housewives, and one case was a student (2.6%).

Side of injury

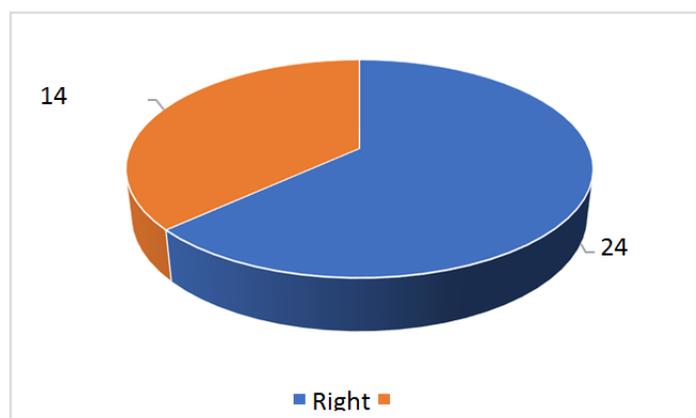


Fig-3: Distribution of cases according to the side of injury (n=38)

Among the 38 cases, 24(63%) were injured on the right side while 14 (37%) were injured on the left side.

Type of fracture

Table-III: Distribution of cases according to the type of fracture (n=38)

| Type of fracture | Frequency | Percentage |
|------------------|-----------|------------|
| Kyle type III | 30 | 78.9 |
| Kyle type IV | 8 | 21.1 |
| Total | 38 | 100.0 |

The most occurred fracture was Kyle type III (78.9%, n= 30). The remaining 8 (21.1%) fractures were Kyle type IV.

Duration of injury to operation

Table-IV: Distribution of cases according to the duration of injury to operation (in days) (n=38)

| Duration of injury to operation (in days) | Frequency | Percentage |
|---|-----------|----------------|
| 6-10 | 23 | 60.5 |
| 11-15 | 9 | 23.7 |
| 16-20 | 2 | 5.3 |
| 21-25 | 4 | 10.5 |
| Total | 38 | 100.0 |
| Mean± SD | | 11.7± 4.7 days |

Out of 38 cases in 23 (60.53%) operations were done between 6 to 10 days after injury. In 2 (5.3%) cases it was 16 to 20 days. The mean duration of

injury to operation was 11.7 ± 4.7 days, ranging from 6 days to 25 days.

Duration of hospital stay

Table-V: Distribution of cases according to the duration of hospital stay (n=38)

| Duration of hospital stay (in days) | Frequency | Percentage |
|-------------------------------------|---------------------|------------|
| 10-14 | 6 | 15.8 |
| 15-19 | 16 | 42.1 |
| 20-24 | 11 | 28.9 |
| 25-29 | 5 | 13.2 |
| Total | 38 | 100.0 |
| Mean \pm SD | 18.3 \pm 4.2 days | |

The mean duration was 18.3 ± 4.2 days ranging from 10 days to 29 days. The majority of the cases

stayed at the hospital in between 15 to 19 days (42.11%, n= 16). Duration of follow up.

Table-VI: Distribution of cases according to the duration of follow up (n=38)

| Duration of follow up (In weeks) | Frequency | Percentage |
|----------------------------------|----------------------|------------|
| 20 | 13 | 34.2 |
| 22 | 14 | 36.8 |
| 24 | 11 | 28.8 |
| Total | 38 | 100 |
| Mean \pm SD | 21.9 \pm 1.6 weeks | |

The mean duration of follow-up was 21.9 ± 1.6 weeks ranging from 20 weeks to 24 weeks. Among the 38 cases, 14 cases were followed up for 22 weeks

(36.84%) and 11 (28.95%) cases were followed up for 24 weeks after discharge from the hospital. Postoperative complications.

Table-VII: Distribution of cases according to postoperative complications (n=38)

| Complication | Frequency | Percentage |
|-----------------------------|-----------|------------|
| No complication | 34 | 89.5 |
| Superficial wound infection | 3 | 7.9 |
| Pulmonary infection | 2 | 5.3 |
| Bedsore | 1 | 2.6 |

*Multiple responses

The majority of the cases (n=34, 89.5%) had no complications. Superficial wound infection was the most common complication, found in 3 (7.9%) cases and 1 (2.6%) had bedsore.

DISCUSSION

The present study was conducted to evaluate the outcome of Proximal Femoral Nailing for unstable intertrochanteric fracture fixation. 38 patients with unstable intertrochanteric fracture were included in the study and were followed up for at least 20 weeks.

The mean age of the cases of the present study was $62.6 (\pm 14.9)$ years (Table I). Other studies which dealt with trochanteric femoral fracture found patients with higher age [10, 11]. Studies reported that the bone

mineral densities of Bangladeshi women are lower than the western population [12].

The male to female ratio was 1:1.23. The finding of a higher number of fractures among females is in line with most of the previous studies. As females are more susceptible to osteoporotic fracture, their incidence is higher in most of the studies.

The occupational status of the cases showed that the proportion of housewives was more than other professions. As the number of female patients was more in the present study, the higher proportion of housewives was understandable.

The commonly occurred fracture was Kyle type III (78.9%). The remaining 8 (21.1%) fractures

were Kyle type IV. According to the AO classification, these fractures coincide with 31-A2.3 and 31-A3. The study of Al-Yassari, *et al.* (2002) also found that 77% of cases had type 31-A2 fracture and 23% were type 31-A3 [8]. The epidemiological study also observed that the most common type of fracture according to the AO/OTA classification was a type 31-A2 [13].

The mean duration of injury to operation was 11.7 ± 4.7 days (Table IV), ranging from 6 days to 25 days. The average duration of injury to operation was shown 3 days in the study of Al-Yassari, *et al.* while the average duration of injury to operation was shown 4.5 days in the study of Domingo, *et al.* [8, 11]. This noticeable difference might be due to the different study places. The present study was conducted in DMCH which is a tertiary level hospital and patients from all over Bangladesh come here for better treatment. Therefore, the patient load is high in DMCH and patients have to wait for a longer period of time.

The mean duration of hospital stay was 18.3 ± 4.2 days ranging from 10 days to 29 days. Less than half of the cases stayed at the hospital in between 15 to 19 days (42.11%). Patients were usually discharged from the hospital on the 4th or 5th POD after removal of the drain. Long-term hospital admission was discouraged due to the high bed occupancy rate in DMCH.

The mean duration of follow-up was 21.9 ± 1.6 weeks ranging from 20 weeks to 24 weeks. Among the 38 cases, 14 cases were followed up for 22 weeks (36.8%), 13 cases (34.2%) were followed up for 20 weeks and the rest 11(28.9%) cases were followed up for 24 weeks after discharge from the hospital. No long-term follow-up was not done.

CONCLUSION

Proximal Femoral Nail (PFN) is an ideal implant for the treatment of the unstable intertrochanteric fracture. It is a simple, easy, minimally invasive, reliable, and effective method with shorter operative time, lesser blood loss, and reasonable time to bone healing with early mobilization of the patients.

REFERENCE

1. Grimsrud, C., Monzon, R.J., Richman, J., & Ries, M.D. (2005). Cemented hip arthroplasty with a novel cerclage cable technique for unstable intertrochanteric hip fractures. *The Journal of arthroplasty*, 20(3), pp.337-343.
2. Xu, Y.Z., Geng, D.C., Mao, H.Q., Zhu, X.S., & Yang, H.L. (2010). A comparison of the Proximal Femoral Nail antirotation device and dynamic hip screw in the treatment of unstable pertrochanteric fracture. *Journal of International Medical Research*, 38(4), pp.1266-1275.
3. Russell, T.A. (2015). Intertrochanteric fractures of the hip. *Rockwood and Green's fractures in adults. Eighth ed Philadelphia: Wolters Kluwer Health*, pp.2076-2129.
4. Gullberg, B., Johnell, O., & Kanis, J.A. (1997). World-wide projections for hip fracture. *Osteoporosis international*, 7(5), 407-413.
5. Haidukewych, G.J., Israel, T.A. and Berry, D.J., 2001. Reverse obliquity fractures of the intertrochanteric region of the femur. *JBJS*, 83(5), pp.643-650.
6. Ghilzai, A.K., Shah, S.K.A., Khan, M.A., Ghazi, M.A. and Najjad, M.K.R., 2018. Role of Proximal Femoral Nail in the treatment of unstable intertrochanteric fractures. *Biomedical Journal of Scientific & Technical Research*, 2(1), pp.2145-2149.
7. Ruecker, A.H., & Rueger, J.M. (2014). Pertrochanteric fractures: tips and tricks in nail osteosynthesis. *European Journal of Trauma and Emergency Surgery*, 40(3), pp.249- 264.
8. Al-Yassari, G., Langstaff, R.J., Jones, J.W.M. and Al-Lami, M. (2002). The AO/ASIF Proximal Femoral Nail (PFN) for the treatment of the unstable trochanteric femoral fracture. *Injury*, 33(5), pp.395-399.
9. Jong-Keon, O., Jin-Ho, H., & Dipit, S. (2010). Nailing of intertrochanteric fractures: review on pitfalls and technical tips. *Journal of orthopaedics, trauma and rehabilitation*, 14(2), pp.3-7.
10. Simmermacher, R.K.J., Bosch, A.M. and Van der Werken, C.H.R., (1999). The AO/ASIF-Proximal Femoral Nail (PFN): a new device for the treatment of unstable proximal femoral fractures. *Injury*, 30(5), pp.327-332.
11. Domingo, L., Cecilia, D., Herrera, A. and Resines, C., 2001. Trochanteric fractures treated with a Proximal Femoral Nail. *International orthopaedics*, 25(5), pp.298-301.
12. Reza, S., Rahman, M., Hossain, S., & Afroz, S. (2008). Bone mineral densities in normal Bangladeshi women. *Iranian Journal of Radiation Research*, 6(3), 157-160.
13. Mattisson, L., Bojan, A., & Enocson, A. (2018). Epidemiology, treatment and mortality of trochanteric and subtrochanteric hip fractures: data from the Swedish fracture register. *BMC musculoskeletal disorders*, 19(1), 1-8.