



Outcome of Surgical Treatment of Subtrochanteric Femoral Fracture with Proximal Femoral Nailing in a Tertiary Hospital in Bangladesh

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Abstract

Background: Subtrochanteric fractures of the femur remain one of the most challenging fractures confronting orthopaedic surgeons. Bearing all the advantages of PFN, the present study was carried out to observe its efficacy on subtrochanteric fracture management in a tertiary level hospital like NITOR. The aim of this study was to evaluate the outcome of surgical treatment using proximal femoral nailing for subtrochanteric femoral fractures in patients treated at a tertiary hospital in Bangladesh. **Material & Methods:** This prospective observational study was conducted at the National Institute of Traumatology and Orthopedic Rehabilitation (NITOR) in Dhaka, Bangladesh, from January 2019 to December 2020. Employing purposive sampling, 31 cases were selected due to availability constraints. Data were collected using a structured questionnaire covering history, clinical examination, laboratory investigations, and follow-up findings. Inclusion criteria comprised individuals above 18 years with closed subtrochanteric fractures. Statistical analysis was performed using SPSS 23.0. **Results:** In our study of 31 subtrochanteric femoral fracture cases, 38.7% of patients were aged 60 to 79 years. According to Seinsheimer classification, 22.6% of fractures were type IIA. Among the cases, 48% were reduced by closed method, while 52% required open reduction. No complication occurred in 26 (83.9%) cases. 18 (58%) cases had no pain at last follow up. Out of 31 cases, 21 (67.7%) were excellent at the final outcome. **Conclusions:** Treatment of subtrochanteric fracture by proximal femoral nailing is an effective and safe method without any significant complication.

Keywords:- Subtrochanteric femoral fracture, Surgical treatment, Proximal femoral nailing, Outcome, Tertiary hospital.

INTRODUCTION

Subtrochanteric fractures of the femur remain one of the most challenging fractures confronting orthopaedic surgeons. These fractures pose a great problem because of the diversity of fracture patterns and difficulty in attaining anatomical reduction.^[1] The inherent instability of the fracture and the enormous muscle forces acting across the fracture fragments render treatment options difficult.^[2]

Subtrochanteric fractures are femoral fractures occurs below the lesser trochanter to 5 cm distally in the shaft of femur.^[3] The incidence of fractures of the proximal femur is markedly increasing because of increasing life expectancy and motor vehicle accidents.^[1] These fractures account for 10% to 34% of all hip fractures.^[4]

In younger patients, the fractures are high-energy injuries from road traffic accidents, falls from a height, or gunshot wounds.^[5] Significantly less force is required for a subtrochanteric fracture in patients with osteoporotic bone. In this typically older patient population, the most common mechanism of injury is a ground-level fall.

The subtrochanteric region of the femur is subjected to many stresses resulting from bending movements and compressive forces generated by body weight and hip muscles, and thus leading to the malunion and nonunion of fractures and mechanical failure of the implants.^[6] So, these fractures are the most difficult to manage in the femur. But improved understanding of the complex biology and biomechanics of the trochanteric region as well as the rapid development of orthopaedic

philosophy and implants has led to consensus on the treatment of subtrochanteric fractures.^[7]

The high incidence of delayed union malunion, and nonunion of fractures has left conservative, treatment, as advocated by DeLee et al,^[8] abolished in modern trauma care. For a long time, the solution for such fractures has been open reduction and internal fixation.

Recent development in mini-invasive surgery and orthopaedic implants such as mini-invasive percutaneous plate osteosynthesis (MIPPO), locking compression plate (LCP), and less invasive stabilization system (LISS) are current topics among trauma surgeons,^[9,10,11] but preliminary results of application of LISS or LCP through MIPPO technique on subtrochanteric fractures has not been as effective as on fractures of the distal femur or proximal tibia.^[6]

In 1997 the Arbeitsgemeinschaft für Osteosynthesefragen (AO) designed an innovative intramedullary implant, the proximal femoral nail (PFN) to reduce the risk of implant related complications. PFN is biomechanically stronger and more rigid, offering advantages of high rotational stability and the possibility of static or dynamic distal locking.^[12]

Bearing all the above-mentioned advantages of PFN, the present study was carried out to observe its efficacy on subtrochanteric fracture management in a tertiary level hospital like NITOR.

Objectives

- The aim of this study was to evaluate the outcome of surgical treatment using

proximal femoral nailing for subtrochanteric femoral fractures in patients treated at a tertiary hospital in Bangladesh.

MATERIAL AND METHODS

This prospective observational study took place at the National Institute of Traumatology and Orthopedic Rehabilitation (NITOR) in Dhaka, Bangladesh, spanning from January 2019 to December 2020. Employing purposive sampling, a total of 31 cases were selected for inclusion in the study due to availability constraints.

Inclusion Criteria:

- Age above 18 years.
- Only closed subtrochanteric fractures were included.

Exclusion Criteria:

- Open contaminated fractures.
- Multiple fractures and poly-trauma.
- Patients who cannot follow up for at least 6 months.

For data collection, a pre-tested structured questionnaire encompassing history, clinical examination, laboratory investigations, pre-operative, perioperative, post-operative complications, and post-operative follow-up findings was utilized. Additionally, a data sheet was developed to assess outcomes based on the Harris Hip Score. Data analysis was conducted using SPSS version 23.0, with categorical data represented by frequency and corresponding percentage, and quantitative data by mean and standard deviation (SD). Prior approval was obtained from the Institutional Review Board (IRB) at the National Institute of Traumatology

and Orthopedic Rehabilitation (NITOR), Dhaka, Bangladesh.

Ethical Issue: Written informed consent was obtained from each patient, ensuring confidentiality and the freedom to withdraw from the study at any stage. Participation in the research was voluntary, and no data were collected without the patient's consent.

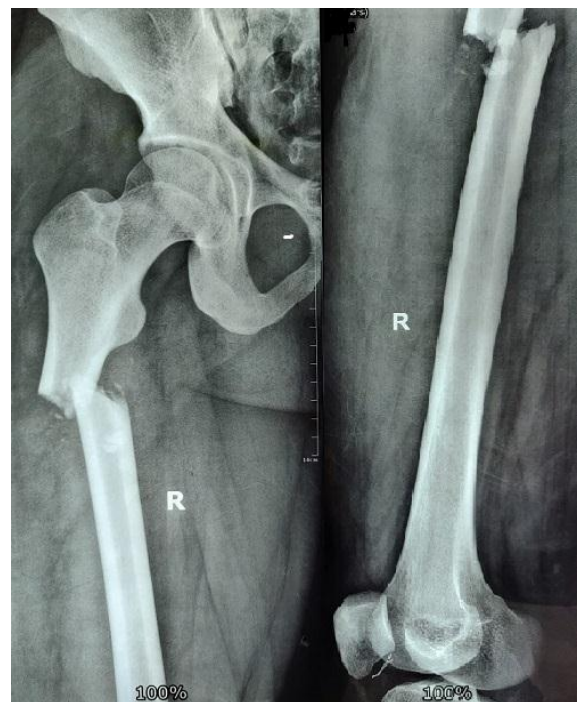


Figure: Preoperative X-ray

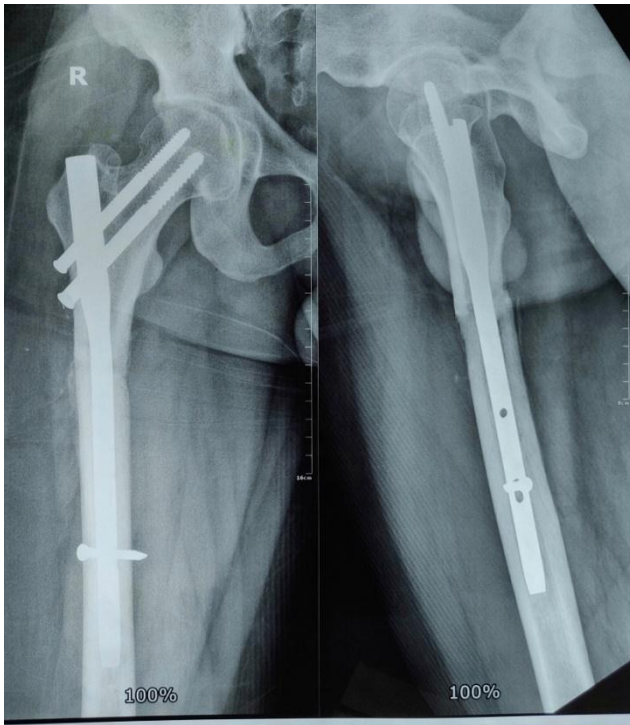


Figure: X-ray at final follow up (24 weeks)



Figure: X-ray at final follow up (24 weeks)

RESULTS

During this study, a total number of 31 patients of subtrochanteric fracture who full-filled the inclusion criteria for this thesis were selected. Patients were followed up for 24 weeks. In this series the following results were obtained.

[Table 1] showed distribution of patients by age. In this study, the highest number of patients 12 (38.7 %) were 60 to 79 year age group followed by 10 (32.3%) cases in 20 to 39 year age group and 9 (29%) cases in 40 to 59 year age group. The mean age was 50.5 ± 16.8 years with range from 20 to 78 years. Male was 25 (80.7%) and female 6 (19.3%) with a male-female ratio of 1:0.24.

According to Seinsheimer classification, there were 7 (22.6%) type IIA fractures, 5 (16.1%) type IIB fractures, 3 (9.7%) type IIC fractures, 8 (25.8%) type IIIA fractures, 5 (16.1%) type IIIB

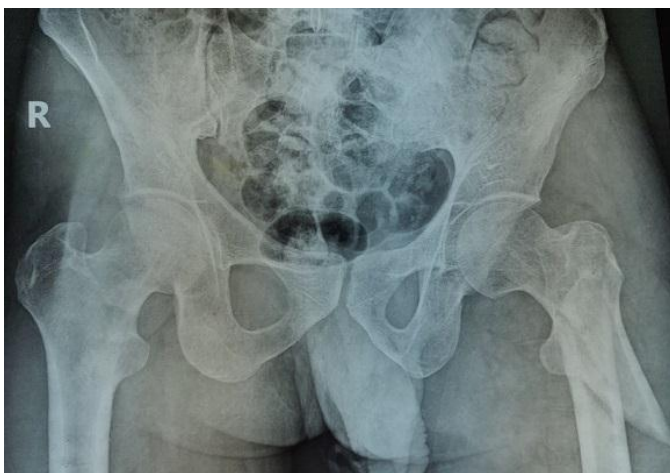


Figure: Preoperative X-ray



fractures, 1 (3.2%) type IV fracture and 2 (6.5%) type V fractures. [Table 2]

Among the 31 cases, 15 (48%) fractures were reduced by closed method. In the rest 16 (52%) cases, open reduction was done. [Table 3]

No complication occurred in 26 (83.9%) cases and 5 (16.1%) cases had complications. Among them, superficial wound infection were found in 2 (6.5%) cases, 1 (3.23%) patient had pulmonary infection, 1 (3.23%) had Z effect and 1 (3.23%) had reverse Z effect. [Table 4]

The mean radiological union time was 14.1 ± 2.4 weeks. In 12 (38.7%) cases, fracture was united

within 10 to 12 weeks. Radiological union was occurred within 13 to 15 weeks in 8 (25.8%) cases and within 16 to 18 weeks in 11 (35.5%) cases. [Table 5]

At last follow up after operation, 18 (58%) cases had no pain, 12 (38.7%) cases have complained slight pain and the rest 1 (3.2%) had mild pain. [Table 6]

After last follow up, the final outcome was assessed with HHS tool. Out of 31 cases, 21 (67.7%) were excellent, 5 (16.1%) were good, 3 (9.7%) were fair and the rest 2 (6.5%) were poor. [Table 7]

Table 1: Age and gender of the study population (N=31).

Variables		Frequency	Percentage
Age (In years)	20-39	10	32.26%
	40-59	9	29.03%
	60-79	12	38.71%
	Total	31	100.00%
	Mean \pm SD	50.5 \pm 16.8	
Gender	Male	25	80.65%
	Female	6	19.35%
	Total	31	100.00%

Table 2: Type of fracture of the study population (N=31).

Type of injury (Seinsheimer)	Frequency	Percentage
IIA	7	22.60%
IIB	5	16.10%
IIC	3	9.70%
IIIA	8	25.80%
IIIB	5	16.10%
IV	1	3.20%
V	2	6.50%
Total	31	100%

**Table 3:** Method of reduction of the study population (N=31).

Method of reduction	Frequency	Percentage
Closed	15	48.40%
Open	16	51.60%
Total	31	100.00%

Table 4: Complications of the study population (N=31).

Complication	Frequency	Percentage
No complication	26	83.87%
Complication	5	16.13%
Superficial wound infection	2	6.45%
Pulmonary infection	1	3.23%
Z effect	1	3.23%
Reverse Z effect	1	3.23%

Table 5: Time required for radiological union (N=31).

Radiological union (In weeks)	Frequency	Percentage
10-12	12	38.71%
13-15	8	25.81%
16-18	11	35.48%
Total	31	100.00%
Mean±SD	14.1±2.4	

Table 6: Pain status at last follow up (N=31).

Pain at last follow up	Frequency	Percentage
No pain	18	58.06%
Slight pain	12	38.71%
Mild pain	1	3.23%
Total	31	100.00%

Table 7: Final outcome according to HHS (N=31).

Final outcome	Frequency	Percentage
Poor	2	6.45%
Fair	3	9.68%
Good	5	16.13%
Excellent	21	67.74%
Total	31	100.00%

DISCUSSION

Subtrochanteric fractures are usually the result of high-energy trauma and often subjected to

significant displacement.^[4] Subtrochanteric fractures of the femur have peculiar anatomic and mechanical characteristics which poses problems in their management. Extramedullary

fixation with plating has the potential disadvantages of extensive surgical exposure, severe soft tissue damage and blood loss, thus leading to problems of fracture union and implant failure. In addition, the eccentric plating is prone to fatigue breakage due to their mechanical load bearing effect.^[13] Allowing a minimally open approach, intramedullary nailing is closely linked to “biological internal fixation” in addition to its mechanical benefits over plate fixation.^[14]

In this study, the mean age was 50.5 ± 16.8 years with range from 20 to 78 years. In the series of Kanthimathi et al,^[12] the mean age of the patients was 46 years and 49.1 years respectively. Younger patients are becoming more and more prone to subtrochanteric fractures probably because of increasing incidence of MVA. The number of male was 25 (80.7%) and female 6 (19.3%) with a male-female ratio of 1:0.24. In several studies with subtrochanteric fractures showed male were predominant with this fracture. Like, in the series of El-Mowafi et al.¹ and Kapila et al,^[15] percentage of male was 83.33% and 76% respectively.

According to Seinsheimer classification, there were 15 (48.4%) type II fractures, 13 (41.9%) type III fractures, 1 (3.2%) type IV fracture and 2 (6.5%) type V fractures. In the series of Shandilya et al.¹⁶ the most common fractures are type II (60%) and type III (36%) which is similar to the present study.

Among the 31 cases, 15 (48%) fractures were reduced by closed method. In the rest 16 (52%) cases, open reduction were done. Closed reduction was tried at first for anatomical reduction. If failed, then fracture site was

opened to achieve anatomical reduction of the fracture. In the series of Rao et al,^[17] and Kanthimathi et al,^[12] open reduction was needed in 20% and 22% cases. The number of closed reductions is less in the present study. As the learning of PFN technique is hoped to be improved, the rate of open reduction would reduce.

No complication occurred in 26 (83.9%) cases and 5 (16.1%) cases had complications. Among them, superficial wound infection was found in 2 (6.5%) cases, 1 (3.23%) patient had pulmonary infection, 1 (3.23%) had Z effect and 1 (3.23%) had reverse Z effect. The cases of superficial wound infection were managed by regular dressing and change of antibiotic according to culture and sensitivity of the wound swab. Pulmonary infection was managed by respiratory physiotherapy and change of antibiotic. Z effect was managed by reinsertion of the neck screw through a small incision. Reverse Z effect was managed by removal of hip pin. There was no other complication like wrong screw length, lateral cortex breakage, deep venous thrombosis, systemic infection has occurred. In the series of Akilan et al,^[4] they observed 2 cases of superficial wound infection and 2 cases of Z effect which is similar to the present study. Other complications like pain, LLD and malrotation is discussed later.

In 12 (38.7%) cases, fracture was united within 10 to 12 weeks. Radiological union was occurred within 13 to 15 weeks in 8 (25.8%) cases and within 16 to 18 weeks in 11 (35.5%) cases. The mean radiological union time was 14.1 ± 2.4 weeks ranging from 10 weeks to 18 weeks. In the series of Sachin et al,^[18] the average time required for radiological union was 11.74 weeks. As there was a delay in

operation, the mean radiological union was longer in the current study.

At last follow up after operation, 18 (58%) cases had no pain, 12 (38.7%) cases have complained slight pain and the rest 1 (3.2%) had mild pain. Meanwhile, there was no instance of moderate or severe pain in the present study. In the series of Ahmad et al,^[14] and Sachin et al,^[18] incidence of pain at last follow up was 19.5% and 20% respectively. But both the study had a longer follow up period. As in the present series the average follow up was shorter, it is hoped that pain would be less if follow up was longer.

After last follow up, out of 31 cases, 21 (67.7%) were excellent, 5 (16.1%) were good, 3 (9.7%) were fair and the rest 2 (6.5%) were poor. The functional results were consistent with the observations of Ahmad et al,^[14] In their study, excellent functional results were obtained in 75% of cases and 20% of cases reported good results, 5% as fair result. Other studies like Isaac et al,^[19] and Rao et al,^[17] overall satisfactory

result (excellent or good) was found in 80% and 84% of the cases respectively.

Limitations of the study

There are few limitations of this study.

1. As follow up period was short-term, long-term outcome couldn't assess.
2. Lack of supervised physiotherapy after discharge from hospital in some cases is another problem affecting the final outcome of the patient.
3. As it was a single centered study hence significant conclusion couldn't draw.
4. Due to Covid-19 pandemic situation some cases couldn't be included due to lack of proper follow up.

CONCLUSIONS

Treatment of subtrochanteric fracture by proximal femoral nailing is an effective and safe method without any significant complication.

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