



A Study of Management of Unstable Intertrochantric Fractures with Proximal Femoral Nail in a Tertiary Care Hospital

Dr. Mohan Babu Tukade

Abstract: *Background:* Elderly patients typically suffer from intertrochanteric femoral fractures¹, which are the most frequently operated-on fractures and have the greatest rates of morbidity and mortality². Because of urbanization's increased sedentary lifestyle and longer life expectancy, these fractures are occurring more frequently. *Aim:* To evaluate the efficacy of PROXIMAL FEMORAL NAIL in the surgical management of unstable Intertrochanteric fractures of hip. *Material & Methods: Study Design:* A prospective hospital based observational study. *Study area:* Department of Orthopaedics, KLES JGMMC Medical College, Hubli, Karnataka. *Study Period:* March 2022 – Feb. 2023. Study population: Patients admitted with intertrochanteric fracture in department of Orthopaedics who underwent surgical treatment with proximal femoral nail. Sample size: study consisted of 25 subjects. *Sampling method:* Purposive sampling technique. *Study tools and Data collection procedure:* After the patient with intertrochanteric fracture was admitted to our hospital, all the necessary clinical details were recorded in the proforma prepared for this study. After the completion of the hospital treatment patients were discharged and called for follow-up to outpatient department at regular intervals (6weeks,12weeks, 6months,12months) for clinical and radiological evaluation. The patients were followed up till fracture union & yearly once from then-on. *Results:* Most of the patients were able to do partial weight bearing by 1-3 weeks and by the end of 3 months total 21 patients could do partial weight bearing and 1 patient didn't follow the postop protocol and did full weight bearing immediately after surgery. Out of total 25 cases 2 cases expired and 1 case lost follow-up. Breakage of nail was seen in a case of subtrochanteric fracture where there is nonunion of the fracture for which we have done revision nailing. *Conclusion:* From our study it can be concluded that Intramedullary implants for internal fixation of the proximal femur withstand higher static and a several-fold higher cyclical loading than DHS types of implants.

Keywords: Intertrochanteric femoral fractures, Intramedullary implants, internal fixation of the proximal femur

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INTRODUCTION

Elderly patients typically suffer from intertrochanteric femoral fractures¹, which are the most frequently operated-on fractures and have the greatest rates of morbidity and mortality². Because of urbanization's increased sedentary lifestyle and longer life expectancy, these fractures are occurring more frequently. In the younger population, trochanteric fractures are caused by high-velocity trauma, whereas in the older population, minor trauma is most frequently to blame. People of all ages are afflicted, but those in their fifth to seventh decades of life have been most heavily implicated. According to Gulberg *et al.*, there will be 2.6 million hip fractures worldwide by 2025 and 4.5 million by 2030³.

It can be challenging to achieve stable fixation in elderly individuals because of osteoporosis and low bone quality⁴. The key to treating these fractures is early mobilisation and stable fixing^{5,6}. Conservative techniques can be used to treat trochanteric fractures, and the fracture often heals. If the proper safety measures are not performed, the fracture develops a malunion, which results in a varus and external rotation deformity at the fracture site as well as hip shortening and restriction of movements of hip.

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Elderly patients struggle to remain immobile in bed; they frequently develop joint contractures, decubitus ulcers, hypostatic pneumonia, deep vein thrombosis, catheter infections, and cardiorespiratory failure. As a result, earlier mobilisation lessens a number of co-morbidities related to such fractures. When adopting a long-term immobilisation as part of conservative treatment, the death rate increases⁷. If these fractures are not repaired, the family may experience functional and financial difficulties.

Surgery is the only choice for treating intertrochanteric fractures unless the patient has severe dementia, a terminal illness with a life expectancy of fewer than six weeks, or unresolved life-threatening medical comorbidities.² A variety of implants, including fixed plate and screws, dynamic compression screws, and intramedullary implants, have been created with the goal of creating a stable synthesis in osteoporotic bone.

For the treatment of intertrochanteric femur fractures, many implants are available. Sliding hip screws may worsen pre-existing morbidities⁸ by causing additional blood loss and soft tissue dissection. Significant downsides include excessive medialization of the distal fragment (unstable fracture), cutting out of the screw, and collapse during weight bearing.^{9,10}

Although proximal femoral nails (PFNs), an intramedullary device, are more stable under loading and have shorter lever arms than plates, the distance between the hip joint and the nail is smaller than it would be for a plate, theoretically decreasing the likelihood of Varus collapse. Morbidities related to such fractures are greatly reduced by less surgical site incision, decreased blood loss, and decreased soft tissue damage.¹¹

Hence the present study was undertaken to evaluate the results of intramedullary hip screw in intertrochanteric femur fractures and include evaluation of the distribution of fracture types in different age groups & gender, 1st, 3rd month post-operative follow-up & 6 months post-operative walking ability. Clinical, radiological & functional outcome assessment. Short & long term complications like infections & implant failure in Intertrochanteric fractures treated by Intramedullary hip screw.

AIM: To evaluate the efficacy of PROXIMAL FEMORAL NAIL in the surgical management of unstable Intertrochanteric fractures of hip.

OBJECTIVES: To determine

- 1) The fracture distribution in different age groups and both the genders.
- 2) The rate of radiological union
- 3) Clinical, Radiological, Functional outcome assessment at 6 weeks, 3 months, 6 months
- 4) Short and long term complications

In management of intertrochanteric fractures with proximal femoral nail

MATERIAL & METHODS:

Study Design: A prospective hospital based observational study.

Study area: Department of Orthopaedics, KLES JGMMC Medical College, Hubli, Karnataka.

Study Period: March 2022 – Feb. 2023.

Study population: Patients admitted with intertrochanteric fracture in department of Orthopaedics who underwent surgical treatment with proximal femoral nail.

Sample size: study consisted of 25 subjects.

Sampling method: Purposive sampling technique

Inclusion criteria:

1. Adults.
2. Sex: Both the gender.
3. All closed unstable intertrochanteric fractures.

Exclusion criteria:

1. Age < 18 years (before the closure of physeal plate)
2. Major polytrauma
3. Associated lower extremity fracture other than that of femur
4. Malignancy elsewhere
5. Altered biochemical parameters which interfere with fracture healing

Ethical consideration: Institutional Ethical committee permission was taken prior to the commencement of the study.

Study tools and Data collection procedure:

After the patient with intertrochanteric fracture was admitted to our hospital, all the necessary clinical details were recorded in the proforma prepared for this study. After the completion of the hospital treatment patients were discharged and called for follow-up to outpatient department at regular intervals (6weeks,12weeks, 6months,12months) for clinical and radiological evaluation. The patients were followed up till fracture union & yearly once from then-on.

INTRAMEDULLARY HIP SCREW:

Hollow tubular Nail was chosen. The nail is made up of AISI 316L stainless steel.

In the present study we have used nails of standard length of 25 cm & long length nails ranging from 36-42 cm. The diameter of standard nail was ranging from 9-12 mm and long length nails was ranging from 9-11 mm. The nail is universal with 6 degrees of mediolateral valgus angulation and with neck shaft angle of 135 degrees.

Proximal portion of the nail has provision to accommodate two screws, the lag screw (hip screw) is of size 8mm and is available in different lengths ranging from 50mm to 120 mm. There is a cervical screw which is of size 6 mm and is available in different lengths ranging from 50mm to 110mm. This screw controls the rotation (ANTI ROTATION SCREW).

Threaded cap is available to prevent ingrowth getting trapped in the proximal threads of the nail.

Distal end of nail has two parallel holes to accommodate distal interlocking bolts. Amongst the distal holes of the nail the upper one is for static locking while the lower one is for dynamic locking.

Follow up: The patients are asked to follow up at 6 weeks, 3months, 6 months, 12 months and later on once a year from the date of surgery. At each follow up patient was assessed clinically as per Harris Hip score and x ray AP/Lateral views of hip with femur is taken. They were evaluated with HARRIS HIP SCORE¹² & X-rays.

Total Harris Hip Score:

SCORE	RESULT
90-100	EXCELLENT
80-89	GOOD
70-79	FAIR
<70	POOR

OBSERVATIONS & RESULTS:

Table 1: Age distribution

Age in years	No of patients (Total cases - 25)	% of patients
30-40	2	8
40-50	4	16
50-60	4	16
60-70	8	32
>70	7	28

The most common age group was in the range of 60 to 70 yrs.

Table 2: Sex distribution

Sex	No of patients	% of patients
Male	16	64%
Female	9	36%

64% of the total patients were males in this series.

Most common mode of injury was trivial fall in this series. Right side is involved in 56% of the patients.

Table 3: Type of fracture

Intertrochanteric fractures are classified according to BOYD AND GRIFFIN CLASSIFICATION

Type of Fracture	No. Of Patients	% OF PATIENTS
Type I	4	16%
Type II	14	56%
Type III	05	20%
Type IV	02	08%

56 % of the patients having type II BOYD & GRIFFIN fracture.

The more common co-morbidity being hypertension & diabetes. Closed Head injury was the most common associated injury in younger individuals involved in road traffic accidents. These cases were managed conservatively. 2 patients had distal radius fracture and were treated conservatively with closed reduction and below elbow cast application.

Table 4: Time of surgery

Time of Surgery	No. of Patients	% of Patients
Within 48 hours	19	76%
After 48 hours	06	24%

All the cases included in our study group were fresh fractures who underwent surgery at the earliest possible in our set up. 19 out of 25 patients were operated at an average within 48 hours from the day of trauma. But in some patients (6/25) operative procedure was delayed due to medical problems (Hypertension and Diabetes) and financial constraint of patients. Average time lapse for surgery was 4 days. Delay was due to pre-existing co- morbid conditions which were treated accordingly.

Mean duration of surgery was 50.3 min with a standard deviation of 11.9 min.

Majority of the cases closed reduction achieved in our series. Out of 2 cases 1 cases were subtrochanteric fractures and 1 case was reverse oblique intertrochanteric fracture.

Table 5: Type of IMHS

	No. of Patients	% of cases
Standard IMHS	11	44%
Long IMHS	14	56%

Table 6: LENGTH OF PROXIMAL SCREWS USED

Screw Length (in mm)	Cases with length of screw used as anti- rotation screw	Cases with length of screw used as lag screw(8 mm)

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	No. of cases	Percentage	No. of cases	Percentage
75	3	12%	0	00
80	06	24%	0	00
85	11	44%	2	8%
90	05	20%	4	16%
95	0	00	2	8%
100	0	00	12	48%
105	0	00	05	20%
110	0	00	0	00
Total	25	100%	25	100%

Length of Anti- rotations (Derotation screw) is 10-15 mm less than Lag screw.

Failure to achieve closed reduction was observed in subtrochanteric fractures 3 cases and 1 case of reverse oblique fracture.

Table 7: Partial weight bearing of patients

Duration in weeks	No. of patients (Total 22 cases)	% of patients
Within 1 st week	04	18.1%
1-3 weeks	12	54.5%
4-6 weeks	19	86.3%
7-10 weeks	21	95.40%

Most of the patients were able to bear to do partial weight bearing by 1-3 weeks and by the end of 3 months total 21 patients could do partial weight bearing and 1 patient didn't follow the postop protocol and did full weight bearing immediately after surgery.

Out of total 25 cases 2 cases expired and 1 case lost follow-up. Breakage of nail was seen in a case of subtrochanteric fracture where there is nonunion of the fracture for which we have done revision nailing.

Table 8: Late postoperative complications

Complication	No. of Patients	% of Patients
Anterior thigh pain	2	9.0%
Knee stiffness	2	9.0%
Shortening >1cm - <2cm	1	4.5%
Heterotopic ossification	1	4.5%
Malunion	1	4.5%
Nonunion	1	4.5%

Infections	0	0
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Table 9: Period of Follow-up

Period of Follow-up	No. of Patients	% Of Patients
3 months	23	92%
6 months	22	88%
15 months	10	40%

The total follow-up of 40% of patients is 15 months.

Table 10: Harris Hip scoring

SCORE	No. OF PATIENTS (Total 22cases)	% OF PATIENTS
90-100 -- Excellent	13	60%
80-89 -- Good	05	22%
70-79 -- Fair	02	9%
<70 -- Poor	02	9%

DISCUSSION:

The orthopaedic community has identified intertrochanteric femur fractures as a significant issue, not just for establishing fracture union but also for restoring optimal function in the quickest period possible with the fewest consequences. As a result, the goal of management has shifted to achieving early mobilisation, speedy recovery, and prompt return of patients to their premorbid homes and workplaces as a functionally and psychologically autonomous unit. Internal fixation surgery has become the treatment of choice for almost all trochanteric fractures because it enables early rehabilitation and provides the best likelihood of functional recovery.

Most of patients in present study were from age group of 5th to 7th decade of life. This signifies the fact that patients from these age groups are involved in low energy trauma like domestic fall (fall at home). Gallagher *et al*¹³ reported an eight-fold increase in trochanteric fractures in men over 80 years and women over 50 years of age. Cleveland *et al*¹⁴ pointed out there are higher incidences of multiple fractures, as of the same or opposite side, which may occur at different occasions. In our study the average age of the patients is 59.82 years as the young individuals less than 50 years are 06 involved in the road traffic accidents.

Most of patients from present study were males. There was a male preponderance in our patients. Cleveland *et al*¹⁴ in their study had 87.7% of female patients. H. B. Boyd and L. L. Griffin¹⁵ in their study of 300 cases found a marked sex difference. 226 (75.8%) of the patients were females and 74 (24.2%) were males. In this study of 25 patients, 64 % of patients were male and 36% were females. Males were affected more because of their exposure to trauma during their day-to-day life was greater.

Most of our patients were 60-70 years and above in them trivial trauma was main reason behind fracture while road traffic accident (RTA) young patients were affected. In the cases treated by IMHS there were 17 cases (68%) due to trivial trauma while there were 08 cases (32%) due to Road traffic accident (RTA). This may be attributed to the following factors as enumerated by Cummings and Nevitt¹⁶. Horn & Wang¹⁷ stated that mechanism of injury is not direct but due to failure of Stress resisting forces during sudden bending or twisting. A direct blow on the lateral side of thigh would result in contusion, comminution on the lateral surface of the greater trochanter and cause valgus deformity.

In our present study, we have 23(92%) intertrochanteric fractures with variable degree of comminution, 2(8%) cases were of subtrochanteric fractures which were treated by IMHS. Out of 25 intertrochanteric fractures 21 were of unstable fracture pattern & 4 were stable pattern i.e. Boyd & Griffin type I. We have studied 25 cases of different types of intertrochanteric and subtrochanteric fractures in our present study. Amongst the 25 cases operated by IMHS, 14 (56%) patients were found to have proximal femoral fractures on the right side while 11 (44%) patients were having fracture on the left side.

Majority of patients in present study series were operated within 48 hours following admission in hospital (19/25). But in some patients (6/25) operative procedure was delayed due to medical problems (Hypertension and Diabetes) and financial constraint of patients. Average time lapse for surgery: 4 days. This was similar to the period reported in studies by Lindsey *et al*¹⁸.

In present study we have included intertrochanteric fractures of type I, II, III and IV according to Boyd & Griffin. We used long length IMHS for unstable intertrochanteric fractures like Type III, IV and Type II fractures where the femoral canal is wide and diffuse osteoporosis is present.

In Indian population average diameter of medullary canal is found to between 9-10 mm.^{19,20} The long length of nails available are from 36-42 cm. The average length of longer IMHS used was 38 cm. Standard IMHS of 25cm was used in Stable intertrochanteric fractures and young patients with Type II fractures.

In present study series we have used lag screw in range of 85 mm to 105mm. Amongst them, in 2 cases (8%) we have used 85mm screw, in 4 cases (16%) we have used 90mm screw, in 2 cases (8%) we have used 95mm screw, 12 cases (48%) 100mm screw and in 05 cases (20%) we have used 105mm screw.

The Mean duration of surgery was 50.3 minutes with a standard deviation for 11.9 minutes. 92% of the cases were done closed reduction were the fracture haematoma was preserved. In 8% of failure to achieve closed reduction so open reduction was done and minimal amount blood loss was there. The average blood loss in our study was 50ml. Pajarinen *et al*²¹ the average operating time was 55 minutes and the average blood loss was 320ml. Liu *et al*²² the average operating time as 46.5 min with a standard deviation of 20.5 minutes and an average blood loss of 136ml.

In the present study there were no superficial or deep infections in post-operative period. All the patients were given IV 3rd generation cephalosporin till 3rd post-operative day and later were converted to oral antibiotics till suture removal. Suture removal was done on 12th post-operative day. In all the cases the wound healed by 12th day.

Simmermacher *et al*²³ had an infection rate of 2%. Schipper *et al*²⁴ study had superficial wound infection of 4.1%, deep infection of 2.5%. Punit J. Tank *et al*²⁵ had an infection rate of 3%. G. Al-yassari *et al*²⁶ had a superficial wound infection 1 case and delayed wound healing in 1 case. Verley GW, Milner SA²⁷ in their study of 177 patients of proximal

femoral fracture, in their surgeries they kept drain in the wound. They found out that those patients which drain was kept showed better wound healing in terms of ASEPSIS wound scoring system and had a reduced rate of infection.

Failure to achieve closed reduction in 3 cases (12%) where 2 cases of subtrochanteric fractures & 1 reverse oblique fracture are involved. Friedl *et al*²⁸ reported open reduction in 8% of the 31-A1, 13% of the -A2, and 52% of the -A3 fractures. Postoperative reduction was acceptable in 17 patients (77.27%) and unacceptable reduction was found in 05 patients (22.72%). Punit J. Tank *et al*²⁹ in their study acceptable reduction was achieved in 78% and poor reduction in 22%. Praveen Mereddy *et al*³⁰ Fracture reduction was good in 41 (66%), acceptable in 19 (33%) and poor in two patients (3%).

In present study, the cases that we operated by Intramedullary Hip Screw (IMHS) we have encountered „Z“ effect in 1 case i.e., 4.5%. Al-Yassari²⁶ reported an 8% incidence of cut-out and 1 case of fracture around the tip of the nail after a second fall in a total of 76 patients. Boldin *et al*³¹ in a series of 55 patients with unstable intertrochanteric fractures and subtrochanteric fractures followed up for 15 months on average had 3 cases with Z effect and 2 with reverse Z effect.

We have discharged our patients on an average of 4th post-operative day. There was a delay in discharge if there are any co-existing medical co-morbidities to be appropriately treated for. The patient was advised to review after 12 days for suture removal. During postoperative period as per pain and tolerance of patient, they were made to standup with help of support on 3rd post-operative day. Early mobilization of knee was permitted as soon as possible according to patient's tolerance preferring to start on the 2nd post-operative day. In the series of B. Mall³² (30 patients) average time of ambulation was 14 days. In the series of Dr. G.S Kulkarni³³ ambulation was usually started after 11-12 days after the stitch removal.

The post-operative complications which we encountered are anterior thigh pain in 2 patients (9%) due to distal locking. Knee stiffness seen in 2 patients (9%) due to lack compliance of patients for Knee ROM exercises. Shortening seen in 1 patient (4.5%) due to varus malalignment. Heterotopic ossification seen in 1 patient (2.22%). Malunion seen in 1 patient (4.5%) due to varus malalignment. Kumar *et al*³⁴ study had anterior thigh pain in 7.1%, varus development in 4.7%, heterotopic ossification in 2.3%. Punit J. Tank *et al*²⁹ observed malunion 1%, Nonunion 3%, Varus malalignment seen in 11%. J. Pajarinen's²¹ series had a Nonunion in 4.2%.

After 9 months of follow-up showing 21 patients (95.45%) union was achieved neck shaft angle maintained. 1 patient (4.5%) healed in Varus malalignment. 1 patient (4.5%) had nonunion. This value was around the same observed in the study by Leung³⁵. Nonunion rates were 2.2% as compared to 0.8 % by Halder *et al*³⁶ and 3.3% by Leung *et al*³⁵. The period of follow-up was 3 months in 23 patients (92%), 6 months in 22 patients (88%) and 15 months in 10 patients (40%). The average follow This was comparable to period of 6 months Lindsey *et al*¹⁸, Leung³⁵ is 7.5 months.

The Harris Hip score was excellent in 13 patients (60%), good in 05 patients (22%), Fair in 2 patients (9%), Poor in 1 patient (4.5%). The poor Harris hip score can be attributed to poor compliance by the patients by unprotected early weight bearing leading fracture collapse due to osteoporosis. The present study was comparable to Kumar *et al*³⁴ where excellent score was seen in 35.7%, Good in 42.8%, Fair in 14.2%, Poor in 7.1%.

In the present study out of 25 patients one patient died due to myocardial infarction within a week of surgery. 1 patient died due to Chronic renal failure within 3 weeks following surgery. This was around 8%. This value is small compared to that of other studies Leung *et al*³⁵ is 12%. This may probably be attributed to the small sample size and patients lost to follow up. In most studies it has been observed that presence of two or more pre-existing illnesses like diabetes, hypertension, heart disease etc. led to a significant decrease in long term survival. It probably also indicates that the surgery for fracture fixation is not the cause of death.

CONCLUSION:

From our study it can be concluded that Intramedullary implants for internal fixation of the proximal femur withstand higher static and a several-fold higher cyclical loading than DHS types of implants. The use of IMHS for extracapsular

fractures of the proximal femur has several distinct advantages, namely; lesser operative time with less operative blood loss, early return to daily activities, reduced complications like infection, sliding, and limb length discrepancy.

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