



<https://africanjournalofbiomedicalresearch.com/index.php/AJBR>

*Afr. J. Biomed. Res. Vol. 27 (September 2024); 629-634*

*Research Article*

# **Analysis of Clinical Outcomes Following Greater Trochanteric Fracture Fixation in Patients with Proximal Femur Fractures at A Tertiary Care Hospital**

**Dr Bageshree Oak<sup>1\*</sup>, Dr Vijay Narasimman Reddy<sup>2</sup>, Dr Mervin Rosario<sup>3</sup>**

<sup>1</sup>*\*Department of Orthopaedics, Sree Balaji Medical College and Hospital, Chennai, India.*

<sup>2</sup>*Department of Orthopaedics, Sree Balaji Medical College and Hospital, Chennai, India.*

<sup>3</sup>*Department of Orthopaedics, Sree Balaji Medical College and Hospital, Chennai, India.*

## **Abstract**

**Introduction:** Proximal femoral fractures, especially in older adults, are a significant clinical concern due to their frequency and impact on patient morbidity and mortality. These fractures are predominantly caused by osteoporosis and minor falls, with projections estimating up to 21.3 million cases globally by 2050. Surgical interventions, such as tension band wiring (TBW) and stainless steel fixation, play a critical role in improving patient outcomes.

**Aim:** To assess the clinical outcomes of greater trochanteric fracture fixation among patients with proximal femur fractures in a tertiary care hospital.

**Methods:** A prospective study was conducted over a one-year period at Sree Balaji Medical College & Hospital, involving patients with proximal femur fractures. Demographic, clinical, and surgical data were collected. The Harris hip score (HHS) was used to assess functional outcomes at 6 and 12 months post-surgery.

**Results:** A total of 20 patients were included with the mean age of 67.7 years, with equal gender distribution. Intertrochanteric fractures were the most common (55%), followed by intertrochanteric fractures with subtrochanteric extension (25%). Intraoperative bleeding ranged from 51-100 ml in 60% of patients, and operative times were mostly between 51-100 minutes. At 6 months, 65% of patients achieved good outcomes (HHS 81-90), with 35% improving to excellent outcomes (HHS 91-100) at 1 year.

**Conclusion:** This study highlights favorable functional outcomes in patients treated with stainless steel fixation and TBW for greater trochanteric fractures, emphasizing the importance of early intervention and tailored management strategies in optimizing recovery and rehabilitation.

**Keywords**— femoral fractures, greater trochanter, Harris hip score, postoperative

*\*Author for correspondence: Email: bageshree96pub@gmail.com*

*Receiving Date: 10/07/2024 Acceptance Date: 20/08/2024*

*DOI: <https://doi.org/10.53555/AJBR.v27i3.2083>*

© 2024 The Author(s).

*This article has been published under the terms of Creative Commons Attribution-Noncommercial 4.0 International License (CC BY-NC 4.0), which permits noncommercial unrestricted use, distribution, and reproduction in any medium, provided that the following statement is provided. "This article has been published in the African Journal of Biomedical Research"*

## **INTRODUCTION**

Proximal femoral fractures represent a significant portion of trauma hospitalizations, with over 90% of these patients being over 50 years old. These fractures are 2-3 times more common in females than in males (Zuckerman, 1996). In 1990, approximately 1.3 million hip fractures were reported globally, with projections estimating an increase to between 7.3 and 21.3 million by 2050 (Fischer et al. 2021).

Fractures involving greater trochanter are common, with incidences potentially reaching up to 5% (Brun et al. 2013). Trochanteric fractures in elderly patients frequently arise from bone fragility and falls, often associated with the use of hypnotics and recent antihypertensive medications (Huang et al. 2012). These fractures contribute to significant morbidity, mortality, and healthcare costs, underscoring the necessity for effective management strategies (Leal et al. 2016). Greater

trochanteric fractures, commonly associated with proximal femur fractures, pose distinct challenges due to their effects on hip biomechanics. The greater trochanter is the insertion point for the gluteus medius and minimus muscles, which are essential for hip abduction and pelvic stability during gait (Chandrasekaran et al. 2015).

The preferred treatment for isolated femoral neck fractures in young adults is multiple cannulated screws, despite some evidence support the use of sliding hip screws. In 2005, an international survey by Bhandari et al. reported that 92% of surgeons preferred multiple cannulated screws for undisplaced fractures, while 68% favoured this method for displaced fractures (Bhandari et al. 2005). Literature indicates that delaying surgery in geriatric patients with femoral neck fractures increases hospital stay, pain, and reduces functionality, despite no rise in complications or mortality. Early surgery, within 48 hours for those without comorbidities and within four days for those with, is beneficial. Prosthetic replacement is preferred, showing a lower reoperation rate (9%) compared to internal fixation (35%) (Mittal et al. 2012).

Surgical management for fractures often utilizes tension band wiring (TBW) and stainless-steel fixation, employed in about 90% of cases (Jirangkul et al. 2021). Correspondingly, this study focuses on using TBW and stainless-steel fixation to approximate greater trochanter fragments during proximal femur fracture fixation, aiming to enhance stability, facilitate early mobility, and reduce postoperative complications (Sagar et al. 2019). However, fractures involving the greater trochanter can complicate outcomes, potentially leading to issues like the Trendelenburg gait, pain, tenderness, and increased risk of hip dislocation due to impaired abductor lever arm mechanism (Chandrasekaran et al. 2015). Therefore, the present study aimed to assess the clinical outcomes of greater trochanteric fracture fixation among patients with proximal femur fractures in a tertiary care hospital.

## MATERIALS AND METHODS

### Study design

This prospective study was conducted at the Department of Orthopaedics, Sree Balaji Medical College & Hospital in Chennai, Tamil Nadu, over a one-year period. Patients presenting with proximal femur fractures were recruited using convenience sampling. The study protocol received approval from the Institutional Human Ethics Committee, Sree Balaji

Medical College & Hospital, Chennai Tamil Nadu, on 22 September 2022 (Approval No. 002/SBMCH/IHEC/2022/1778). Written informed consent was obtained from each patient prior to the commencement of the study.

### Inclusion and exclusion criteria

Patients of either sex with proximal femoral fractures involving the greater trochanter, and those with different modes of injury, such as falls from height, road traffic accidents, or slips were included in the study. Patients with pathological fractures, old malunions or nonunions, and those who had undergone previous surgeries on the proximal femur were excluded.

### Study procedure

Patients with greater trochanteric fractures underwent surgery and Harris hip scores (HHS) were assessed postoperatively.

### Outcome measures

The outcome measure was the HHS, which was assessed immediately, as well as at 6 months and 12 months postoperatively.

### Data collection and follow-up

A standardized data collection tool was employed to gather relevant information, including demographic data, injury characteristics, and surgical details. Radiological assessments were performed preoperatively, immediately post-surgery, and at each follow-up visit at 6 and 12 months, respectively.

### Definitions

HHS: Harris hip score is recognized for its validity and reliability and is frequently employed as a reference or gold standard for evaluating the construct validity of other patient-reported outcome measures (PROs) related to hip outcomes (Singh et al. 2016).

### Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) software. Descriptive statistics was used to describe categorical variables (frequency and percentages) and continuous variables (mean and standard deviation [SD]). A  $P < 0.05$  was considered statistically significant.

**TABLE I DEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF PATIENTS**

Parameters	Number of patients (N=20)
Age [years], mean (SD)	67.70 (13.70)
Age group (years)	
41-60	7 (35)
61-80	11 (55)
81-100	2 (10)
Sex	
Female	10 (50)
Male	10 (50)
Occupation	
Housewife	10 (50)

Retired man	4 (20)
Business man	3 (15)
Farmer	2 (10)
Driver	1 (5)
<b>Mode of injury</b>	
Fall from steps	6 (30)
Fall in bathroom	4 (20)
Fall from kitchen	3 (15)
Fall in workplace	3 (15)
Fall from bike	1 (5)
Fall from chair	1 (5)
Slip and fall from bed	1 (5)
Others	1 (5)
<b>Side of injury</b>	
Left side	10 (50)
Right side	10 (50)
<b>Site of fracture</b>	
Intertrochanteric fracture	11 (55)
Intertrochanteric fracture with subtrochanteric extension	5 (25)
Neck of femur fracture	4 (20)
<b>Co-morbidities</b>	
Diabetes mellitus	6 (30)
Diabetes mellitus + hypertension	5 (25)
Hypertension	4 (20)
Hypothyroidism + hypertension + diabetes mellitus	5 (25)
<b>Intra-operative bleeding (ml), mean (SD)</b>	106.04 (37.99)
<b>Intra-operative bleeding (ml)</b>	
1-50	1 (5)
51-100	12 (60)
101-150	5 (25)
151-200	2 (10)
<b>Operative time (minutes), mean (SD)</b>	92.08 (11.41)
<b>Operative time (minutes)</b>	
51-100	18 (90)
101-150	2 (10)
<b>Radiological outcome</b>	
Centre	7 (35)
Valgus	7 (35)
Varus	6 (30)
Data presented as n (%).	

**TABLE II** HARRIS HIP SCORE DISTRIBUTION AT 6 MONTHS AND 1-YEAR POST-OPERATION

Parameters	Number of patients (N=20)
<b>Immediate HHS, mean (SD)</b>	56.8 (5.0)
<b>HHS at 6 months, mean (SD)</b>	80.5 (7.9)
<b>HHS at 6 months</b>	
<70	0 (0)
70-80	4 (20)
81-90	13 (65)
91-100	3 (15)
<b>HHS at 1 year, mean (SD)</b>	85.5 (7.5)
<b>HHS at 1 year</b>	
<70	0 (0)
70-80	10 (50)

81-90	13 (65)
91-100	7 (35)
Data presented as n (%). HHS, Harris hip score.	

FIGURE I PRE-OPERATIVE, POSTOPERATIVE, AND FOLLOW-UP X-RAYS



TABLE III ANALYSIS OF IMMEDIATE POSTOPERATIVE HHS, 6-MONTH POSTOPERATIVE HHS, AND 1-YEAR POSTOPERATIVE HHS

Parameters	Immediate HHS	HHS at 6 months	HHS at 1 year	Immediate HHS	HHS at 6 months	HHS at 1 year	P-value
<70	24	0	0	100	0	0.0	0.03
70-80	0	22	5	0	91.7	20.8	
81-90	0	2	13	0	8.3	54.2	
91-100	0	0	6	0	0	25.0	

HHS, Harris hip score.

## RESULTS

A total of 20 patients were included in this study. The demographic and clinical characteristics of the patients are presented in Table 1. The mean (SD) age of the patients was 67.70 (13.70) years. Many patients (55%) belonged to the age group of 61-80 years. The gender distribution was equal, with 10 male and 10 female patients. The primary mode of injury was fall from steps (30%), followed by fall in bathroom (20%). The side of injury was equally distributed between left and right sides. Intertrochanteric fracture was the most common type of fracture (55%), followed by intertrochanteric fracture with subtrochanteric extension (25%). All patients had minimum one comorbidity, with diabetes mellitus being the most prevalent (30% alone, 50% in combination with other conditions). Most of the patients (60%) experienced intra-operative bleeding between 51-100 ml. The operative time for 90% of the patients was between 51-100 minutes. Post-operative radiological outcomes were evenly distributed among center (35%), valgus (35%), and varus (30%) alignments (Table 1).

Functional outcomes were assessed using the HHS at 6 months and 1 year post-operatively. At 6 months, 65% of patients had an HHS in between 81-90, indicating good outcomes. By 1 year, there was a noticeable improvement, with 35% of patients achieving excellent outcomes (HHS; 91-100) and 65% maintaining good outcomes (HHS; 81-90) as shown in Table 2. Moreover, the mean immediate HHS values indicate a progressive increase over time, starting at 56.8 initially, rising to 80.5 at 6 months, and further to 85.5 at 1 year.

Analysis of immediate postoperative HHS, 6-month postoperative HHS, and 1-year postoperative HHS is given in Table 3. For patients with an immediate HHS less than 70, 24 cases were observed initially, with no occurrences at the 6-month and 1-year marks. Conversely, for those in the 70 to 80 range, there were no cases initially, but 22 cases at 6 months and five cases at 1 year, indicating a progression. Similarly, patients with HHS in the 81 to 90 range showed two cases initially, escalating to 13 cases at 1 year. Those with HHS in the 91 to 100 range had six cases at 1 year, with no immediate occurrences. A significant association between HHS values and time intervals was observed (P=0.03).

## DISCUSSION

The present study provides valuable insights into the clinical outcomes of greater trochanteric fracture fixation among patients with proximal femur fractures in a tertiary care hospital setting. These findings contribute to the existing body of knowledge on the management of such complex fractures, particularly in the elderly population. The mean age of the study population (67.7 years) aligns with previous studies on proximal femur fractures. Huang et al. reported a mean age of 72.5 years (Huang et al. 2012), while Ju et al. observed a higher mean age of 80.1 years (Ju et al. 2019). This variation highlights the predominantly geriatric nature of the proximal femur fracture. The gender distribution in this study is evenly distributed, which is interesting because some earlier findings have suggested a higher occurrence in females, presumably because osteoporosis

is more common in postmenopausal women (Cawthon, 2011). This difference warrants further investigation into gender-specific risk factors and treatment outcomes. The findings corroborate the existing literature regarding the prevalence of intertrochanteric fractures among proximal femur fractures. The high incidence of fall-related injuries, particularly from falls on steps, reflects the established link between aging and fracture risk. As individuals age, the likelihood of falls increases significantly, with about one-third of older adults experiencing at least one fall annually (Keaveny et al. 2010). This emphasizes the critical need for fall prevention strategies as a primary intervention to reduce the incidence of these fractures.

The high prevalence of comorbidities, especially diabetes mellitus and hypertension, in the study population is consistent with previous reports. Lunde A et al. found the significant impact of these comorbidities on mortality rates following hip fractures (Lunde et al. 2019). These comorbidities not only increase the risk of fractures but also complicate perioperative management and potentially influence outcomes. Intraoperative bleeding during intertrochanteric fracture surgeries can complicate procedures by prolonging surgical time and increasing the need for blood transfusions (Dai et al. 2020). In the present study, the majority of surgeries lasted between 51 to 100 minutes, with intraoperative blood loss ranging from 51 to 100 ml. These findings highlight the importance of effective bleeding control in optimizing surgical outcomes and reducing complications. Despite this, the risk of perioperative complications, such as infections and implant-related problems, remains a concern (Bacaksiz et al. 2023). The observed low complication rate in this study may be attributed to the high level of surgical expertise available in a tertiary care setting. However, extended follow-up periods are necessary to comprehensively evaluate the occurrence of late complications. Radiological evaluation of intertrochanteric fractures is essential for assessing postoperative alignment, including valgus or varus positioning, femoral head location, and restoration of the anatomical center. These factors are crucial for determining postoperative stability and predicting functional outcomes (Kurum et al. 2023). The present study indicates that while center and valgus alignments were more common, a significant proportion of patients still experienced varus alignment, which may impact long-term outcomes and requires careful monitoring.

The improvement in HHS from 6 months to 1 year post-operatively in the present study is encouraging. The progression to excellent outcomes (HHS 91-100) in a substantial portion of patients at 1 year aligns with previous studies that have reported good to excellent functional outcomes following surgical fixation of greater trochanteric fractures (Sun et al. 2017). However, the variability in outcomes highlights the need for individualized rehabilitation protocols and long-term follow-up. While the present study provides valuable insights, it is important to acknowledge its limitations, including the relatively small sample size. Future studies should aim to include larger cohorts, longer follow-up periods, and more comprehensive functional assessments. Additionally, investigating the impact of specific surgical techniques, implant choices, and rehabilitation protocols on outcomes could further refine management strategies for these complex fractures.

The study findings underscore the importance of comprehensive perioperative management, addressing comorbidities, and implementing tailored rehabilitation programs. As the population ages, optimizing the management of these fractures becomes increasingly crucial to ensure better quality of life for affected individuals. Future research should focus on refining surgical techniques, exploring novel implant designs, and developing targeted rehabilitation protocols to further improve outcomes in this vulnerable patient population.

## CONCLUSION

The study findings indicated that fixation of the greater trochanter in proximal femur fractures results in an improved postoperative HHS score and good clinical outcomes, including reduced lurching, early mobilization, and a normal gait.

## REFERENCES

- Zuckerman J. D. (1996). Hip fracture. *The New England journal of medicine*, 334(23), 1519–1525.
- Fischer, H., Maleitzke, T., Eder, C., Ahmad, S., Stöckle, U., & Braun, K. F. (2021). Management of proximal femur fractures in the elderly: current concepts and treatment options. *European journal of medical research*, 26(1), 86.
- Brun, O. C., & Maansson, L. (2013). Fractures of the greater trochanter following total hip replacement. *Hip international : the journal of clinical and experimental research on hip pathology and therapy*, 23(2), 143–146.
- Huang, A. R., Mallet, L., Rochefort, C. M., Eguale, T., Buckeridge, D. L., & Tamblyn, R. (2012). Medication-related falls in the elderly: causative factors and preventive strategies. *Drugs & aging*, 29(5), 359–376.
- Leal, J., Gray, A. M., Prieto-Alhambra, D., Arden, N. K., Cooper, C., Javaid, M. K., Judge, A., & REFRESH study group (2016). Impact of hip fracture on hospital care costs: a population-based study. *Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA*, 27(2), 549–558.
- Chandrasekaran, S., Lodhia, P., Suarez-Ahedo, C., Vemula, S. P., Martin, T. J., & Domb, B. G. (2015). Symposium: evidence for the use of intra-articular cortisone or hyaluronic acid injection in the hip. *Journal of hip preservation surgery*, 3(1), 5–15.
- Bhandari, M., Devereaux, P. J., Tornetta, P., 3rd, Swiontkowski, M. F., Berry, D. J., Haidukewych, G., Schemitsch, E. H., Hanson, B. P., Koval, K., Dirschl, D., Leece, P., Keel, M., Petrisor, B., Heetveld, M., & Guyatt, G. H. (2005). Operative management of displaced femoral neck fractures in elderly patients. An international survey. *The Journal of bone and joint surgery. American volume*, 87(9), 2122–2130.
- Mittal, R., & Banerjee, S. (2012). Proximal femoral fractures: Principles of management and review of literature. *Journal of clinical orthopaedics and trauma*, 3(1), 15–23.
- Jirangkul, P., & Kosiyatrakul, A. (2021). Abstaining from symptomatic implants of modified tension band wiring by nonabsorbable suture fixation for transverse patella fractures. *Journal of orthopaedic surgery and research*, 16(1), 367.
- Sagar, J., Gaurav, R., Parminder, S., Arvind, K., Vinothkumar, L., and Deepak, T. (2019) A prospective observational study of

30 patients of avulsion fracture treated with tension band wiring followed up to 6 months. *International Journal of Orthopaedics Sciences* 5(4): 520-525

Chandrasekaran, S., Gui, C., Hutchinson, M. R., Lodhia, P., Suarez-Ahedo, C., & Domb, B. G. (2015). Outcomes of Endoscopic Gluteus Medius Repair: Study of Thirty-four Patients with Minimum Two-Year Follow-up. *The Journal of bone and joint surgery. American volume*, 97(16), 1340–1347.

Singh, J. A., Schleck, C., Harmsen, S., & Lewallen, D. (2016). Clinically important improvement thresholds for Harris Hip Score and its ability to predict revision risk after primary total hip arthroplasty. *BMC musculoskeletal disorders*, 17, 256.

Huang, C. G., & Ye, J. J. (2012). *Zhongguo gu shang = China journal of orthopaedics and traumatology*, 25(7), 549–553.

Ju, J. B., Zhang, P. X., & Jiang, B. G. (2019). Risk Factors for Functional Outcomes of the Elderly with Intertrochanteric Fracture: A Retrospective Cohort Study. *Orthopaedic surgery*, 11(4), 643–652.

Cawthon P. M. (2011). Gender differences in osteoporosis and fractures. *Clinical orthopaedics and related research*, 469(7), 1900–1905.

Keaveny, T. M., Kopperdahl, D. L., Melton, L. J., 3rd, Hoffmann, P. F., Amin, S., Riggs, B. L., & Khosla, S. (2010). Age-dependence of femoral strength in white women and men. *Journal of bone and mineral research: the official journal of the American Society for Bone and Mineral Research*, 25(5), 994–1001.

Lunde, A., Tell, G. S., Pedersen, A. B., Scheike, T. H., Apalset, E. M., Ehrenstein, V., & Sørensen, H. T. (2019). The Role of Comorbidity in Mortality After Hip Fracture: A Nationwide Norwegian Study of 38,126 Women With Hip Fracture Matched to a General-Population Comparison Cohort. *American journal of epidemiology*, 188(2), 398–407.

Dai, C. Q., Wang, L. H., Zhu, Y. Q., Xu, G. H., Shan, J. B., Huang, W. C., Wei, L. H., Zhou, F. L., & Li, Y. (2020). Risk factors of perioperative blood transfusion in elderly patients with femoral intertrochanteric fracture. *Medicine*, 99(15), e19726.

Bacaksiz, T., & Akan, I. (2023). The Fate of Reoperation After Proximal Femur Fracture Surgery in Elderly Population. *Cureus*, 15(6), e39856.

Kurum, H., Tosun, H. B., Aydemir, F., Ayas, O., Orhan, K., & Key, S. (2023). Intertrochanteric Femoral Fractures: A Comparative Analysis of Clinical and Radiographic Outcomes Between Talon Intramedullary Nail and Intertan Nail. *Cureus*, 15(12), e50877.

Sun, D., Park, B. S., Jang, G. I., & Lee, B. (2017). The Fixation Method according to the Fracture Type of the Greater Trochanter in Unstable Intertrochanteric Fractures Undergoing Arthroplasty. *Hip & pelvis*, 29(1), 62–67.