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Original Research Article

A Prospective Study Comparing Early and Delayed Weight Bearing After Surgical Fixation of Intertrochanteric Femur Fractures

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Abstract:

Background: Intertrochanteric femur fractures are common among the elderly and are associated with significant morbidity and mortality. The optimal timing of postoperative weight bearing after surgical fixation remains controversial.

Aim: To compare functional, radiological, and clinical outcomes between early weight bearing (EWB) and delayed weight bearing (DWB) following surgical fixation of intertrochanteric femur fractures.

Methodology: This prospective comparative study included 80 patients aged ≥65 years with AO/OTA 31-A1 to A3 fractures treated with short cephalomedullary nails. Patients were allocated into EWB (n=40) and DWB (n=40) groups. Primary outcome was Harris Hip Score (HHS) at 3 months. Secondary outcomes included HHS at 6 months, EQ-5D scores, time to independent ambulation, radiographic union, complications, reoperation, and mortality up to 6 months.

Results: The EWB group demonstrated significantly higher HHS at 3 months (78.4 vs. 70.2; $p<0.001$) and 6 months (86.7 vs. 81.3; $p=0.002$), better EQ-5D scores, and earlier independent ambulation (4.2 vs. 6.8 weeks; $p<0.001$). Union time, complication rates, reoperation, and mortality were comparable between groups.

Conclusion: Early weight bearing after stable fixation improves early functional recovery without increasing complications or mortality.

Keywords: Intertrochanteric fracture, Early weight bearing, Delayed weight bearing, Harris Hip Score, Cephalomedullary nail.

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Introduction

Intertrochanteric femur fractures represent one of the most common and debilitating injuries encountered in orthopedic practice, particularly among the elderly population [1]. The fractures develop in the area between the Greater and Lesser Trochanters which exists at the upper end of the femur bone, and they occur when osteoporosis patients experience low-impact injuries while young patients experience high-impact injuries. The global population has been aging since the beginning of time, which has led to increasing rates of intertrochanteric fractures that create major challenges for healthcare systems because of extended hospital stays, surgical expenses, and the need for postoperative rehabilitation, which can result in permanent disability. The fractures cause considerable health and death risks, which reach their highest level during the first year after the fracture because patients experience dangers from both their lack of movement and their existing health conditions [2].

The first goal for doctors who treat intertrochanteric femur fractures needs to establish stable internal bone fixation which enables patients to start moving again and recover their full functional abilities from before the fracture occurred [3]. The medical community now considers surgical fixation to be the primary treatment method because non-surgical approaches result in increased complication risks which include pressure sores and deep vein thrombosis and pulmonary infections and urinary tract infections and muscle atrophy. Surgeons use dynamic hip screws (DHS) and proximal femoral nails (PFN) and other intramedullary devices as their standard fixation methods because these devices create secure connections which permit planned fracture compression during patient weight carrying activities [4].

Timing of weight bearing is one of the most controversial topics of the postoperative management of intertrochanteric fracture after surgical fixation [5]. Premature weight bearing has also been advocated to ensure that the number of complications associated with bed rest is minimised and to improve functional recovery. Theoretical benefits of early

mobilisation are enhanced muscle strength, enhanced joint mobility, enhanced fracture healing by controlled loading, decreased risk of thromboembolic episodes and reduced length of stay in hospital. There are also psychological advantages of early ambulation, which help a patient feel confident and ensures a lack of depression and anxiety related to the prolonged immobilization.

On the other hand, issues still exist regarding the safety of early weight bearing especially when dealing with unstable fracture pattern or poor bone quality. Overloading or overloading too soon can theoretically cause implant failure, varus collapse, screw cut-out, nonunion or loss of reduction. Surgeons can consequently prescribe delayed or partial weight bearing to shield the fixation construct up until radiological indications of healing appear [6]. This is a conservative feeling to minimize mechanical stress on the implant bone interface, particularly in osteoporotic patients who may have bone stock undermined.

Early or delayed weight bearing controversy is based on the compromise between facilitation of functional recovery and mechanical complications prevention [7]. Although it has been proposed by biomechanical investigations that modern fixation procedures can endure physiological loads, clinical results could be different among various factors related to fracture stability, surgery, patient adherence to the treatment, and rehabilitation procedures. Moreover, differences in the study design, demographics and follow up of the patients in the past researches have caused inconsistent results and as such it is not easy to formulate consistent rules.

The prospective comparative approach is especially useful to this clinical dilemma. Through the methodical consideration of the results in the patients who were put through the early and late weight-bearing programs, one is able to measure such parameters as time to union, incidence of implant failure, incidence rate of complications, length of stay in the hospital, functional outcomes and general patient satisfaction. Standardized rehabilitation procedures and closer supervision of the postoperative progress can also be done in prospective studies and consequently reduce bias and increase the reliability of results [8].

The critical factor of long-term quality of life is functional recovery after the intertrochanteric fracture fixation. Outcomes are often assessed with the help of such assessment tools as hip function scores, mobility indices, and pain scales. Ambulatory rehabilitation is also necessary especially among the elderly population since long-term immobility may cause deconditioning, sarcopenia, and loss of independence very fast. Moreover, early mobilization can be useful in reducing caregiver burden and earlier hospital or rehabilitation discharge, which will add to cost-effective care.

Fracture healing biology is another crucial factor to consider. Mechanical loading is also essential in the healing process of bones (callus formation) in the secondary bone healing. Moderate loading of the axes can promote axial loading of the osteogenesis and the maturation of the callus tissue, but excessive instability can deteriorate the healing process. Therefore, it is necessary to identify the best time and level of performing weight bearing to maximize the positive impact of mechanical stimulation without affecting the stability of fixation. The new generation of intramedullary devices, which has a load-sharing characteristic, might be able to more easily endure early weight bearing than the old load-bearing structures.

Postoperative protocols are often diverse across institutions and surgeons despite the improved techniques in surgery and design of implants. There are those who would recommend full weight bearing immediately as such and others would recommend toe-touch or partial weight bearing over a period of few weeks. Such variability can be attributed to the absence of conclusive evidence, as well as the necessity of properly designed prospective studies to inform clinical practice. Developing evidence-based guidelines on the use of weight-bearing interventions can have a major impact on patient outcomes and use of healthcare resources.

Early mobilization strategies would be of considerable importance in the developing world, where access to extended rehabilitation services may be a problem. Nevertheless, there are patient-related issues which need to be taken into consideration when developing postoperative guidelines including nutritional status, bone mineral density, comorbid conditions, and adherence to rehabilitation instructions. An individualised strategy depending on the type of fracture, the fixation stability as well as the patient characteristics can be the best solution in the end.

The current prospective research of comparing early and delayed weight bearing following surgical repair of intertrochanteric fracture of the femurs hopes to add valuable information to this debate. The study will attempt to establish whether early weight bearing affects the stability of the implant or improves recovery without causing more complications by analyzing and systematizing clinical, radiological, and functional outcomes. The results can be used to develop more definite postoperative rehabilitation guidelines and general patient care".

Methodology

Study Design: This study was a hospital-based prospective comparative study conducted to evaluate the functional and clinical outcomes of early versus

delayed weight bearing following surgical fixation of intertrochanteric femur fractures.

Study Area: The study was conducted in the Department of Orthopaedics, Sheikh Bhikhari Medical College and Hospital and Arogyam Superspeciality Hospital, Hazaribagh, Jharkhand, India

Study Duration: The study was conducted over a period of 12 months from January 2021 to December 2021.

Study Participants

Inclusion Criteria

- Patients aged 65 years or older.
- Radiographically confirmed AO/OTA 31-A1, 31-A2, or 31-A3 intertrochanteric femur fractures.
- Patients undergoing operative fixation with a short cephalomedullary nail within 72 hours of admission.
- Patients who were ambulatory independently or with a walking aid prior to injury.
- Patients willing to provide informed consent (or consent provided by legal guardians).

Exclusion Criteria

- Pathological fractures due to malignancy.
- Fractures resulting from high-energy trauma.
- Polytrauma patients requiring prolonged intensive care.
- Previous ipsilateral hip or femoral surgery.
- Severe cognitive impairment (e.g., advanced dementia) preventing adherence to rehabilitation protocol.
- Premorbid non-ambulatory patients.

Sample Size: A total of 80 eligible patients were enrolled in the study and allocated into two groups: Early Weight Bearing (EWB) group (n=40) and Delayed Weight Bearing (DWB) group (n=40).

Procedure: All patients underwent surgical fixation performed by experienced orthopaedic trauma surgeons using a standardized operative technique. Surgery was carried out under spinal or general anaesthesia. Closed reduction on a fracture table was attempted in all cases, and limited open reduction was performed when satisfactory alignment was not achieved. A short cephalomedullary nail with a single cephalic screw was used in all patients. Intraoperative fluoroscopy was utilized to confirm adequate fracture reduction and optimal implant positioning.

Perioperative management followed a standardized hip fracture protocol, including early geriatric assessment, thromboprophylaxis, adequate analgesia, and initiation of physiotherapy. Calcium and vitamin D supplementation were prescribed, and anti-osteoporotic therapy was started when indicated.

Postoperatively, patients were assigned to one of two rehabilitation protocols based on the treating surgeon's preference. In the Early Weight Bearing (EWB) group, patients were encouraged to mobilize with full weight bearing as tolerated on the operated limb from the first postoperative day using a walker or crutches. In the Delayed Weight Bearing (DWB) group, patients were instructed to perform toe-touch or partial weight bearing (<25% of body weight) for the first four weeks, followed by gradual progression to full weight bearing as tolerated. Physiotherapists supervised mobilization sessions twice daily during hospitalization and reinforced adherence to the prescribed protocol. After discharge, patients continued structured outpatient physiotherapy according to the allocated regimen.

Patients were followed up at 6 weeks, 3 months, and 6 months postoperatively. The primary outcome measure was the Harris Hip Score (HHS) at 3 months. Secondary outcomes included HHS at 6 months, EQ-5D index scores at 3 and 6 months, time to independent indoor ambulation, radiographic union time, medical and surgical complications, reoperation rates, and mortality at 30 days and 6 months. Radiographic union was defined as the presence of bridging callus in at least three cortices on anteroposterior and lateral radiographs.

Statistical Analysis: Data were collected prospectively using a structured data collection form. Demographic variables (age, sex, body mass index), comorbidities, American Society of Anesthesiologists (ASA) grade, fracture classification, time to surgery, and intraoperative details were recorded. Complications were categorized as medical or surgical.

Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 27.0. Continuous variables were expressed as mean ± standard deviation or median (interquartile range) depending on data distribution. Categorical variables were summarized as frequencies and percentages. Between-group comparisons were performed using independent sample t-test or Mann–Whitney U test for continuous variables and Chi-square test or Fisher's exact test for categorical variables. Multivariable linear regression analysis was conducted to determine the association between early weight bearing and HHS at 3 months after adjusting for potential confounders such as age, sex, ASA grade, and fracture stability. A p-value of <0.05 was considered statistically significant".

Result

Table 1 shows the baseline demographic and clinical characteristics of the study population (N = 80), with 40 patients each in the EWB and DWB groups. The mean age was comparable between the two groups

(72.8 ± 5.4 years in EWB vs. 73.6 ± 6.1 years in DWB; p = 0.54), indicating no statistically significant difference. Gender distribution was also similar, with males comprising 45% in the EWB group and 50% in the DWB group (p = 0.65), while females accounted for 55% and 50%, respectively. The mean BMI was nearly identical (23.9 ± 2.8 kg/m² vs. 24.3 ± 3.1 kg/m²; p = 0.48). Regarding ASA status, 70% of EWB and 65% of DWB patients were classified as Grade I–II, while 30% and 35% belonged to Grade III (p = 0.63). Similarly, fracture stability was comparable, with stable fractures (A1/A2) observed in 75% of EWB and 70% of DWB patients (p = 0.61). Overall, no significant baseline differences were noted between the groups.

Table 1: Baseline Demographic and Clinical Characteristics (N = 80)

Variable	EWB (n=40)	DWB (n=40)	p-value
Age (years), Mean ± SD	72.8 ± 5.4	73.6 ± 6.1	0.54
Male, n (%)	18 (45%)	20 (50%)	0.65
Female, n (%)	22 (55%)	20 (50%)	—
BMI (kg/m²), Mean ± SD	23.9 ± 2.8	24.3 ± 3.1	0.48
ASA Grade I–II, n (%)	28 (70%)	26 (65%)	0.63
ASA Grade III, n (%)	12 (30%)	14 (35%)	—
Stable fracture (A1/A2), n (%)	30 (75%)	28 (70%)	0.61
Unstable fracture (A3), n (%)	10 (25%)	12 (30%)	—

Table 2 shows that functional outcomes were significantly better in the Early Weight Bearing (EWB) group compared to the Delayed Weight Bearing (DWB) group at both 3 and 6 months of follow-up. The mean Harris Hip Score (HHS) at 3 months was higher in the EWB group (78.4 ± 8.6) than in the DWB group (70.2 ± 9.1), with a highly significant p-value (<0.001). Similarly, at 6 months, the EWB group maintained superior functional recovery (86.7 ± 6.4 vs. 81.3 ± 7.2; p = 0.002). Quality of life as measured by EQ-5D was also significantly better in the EWB group at 3 months (0.78 ± 0.09 vs. 0.70 ± 0.11; p = 0.001) and 6 months (0.86 ± 0.07 vs. 0.82 ± 0.08; p = 0.018). Additionally, patients in the EWB group achieved independent ambulation earlier (4.2 ± 1.1 weeks) compared to the DWB group (6.8 ± 1.4 weeks), which was statistically highly significant (p < 0.001). Overall, early weight bearing was associated with faster recovery and better functional and quality-of-life outcomes.

Table 2: Functional Outcomes (Harris Hip Score and EQ-5D)

Outcome	EWB (n=40)	DWB (n=40)	p-value
HHS at 3 months (Mean ± SD)	78.4 ± 8.6	70.2 ± 9.1	<0.001
HHS at 6 months (Mean ± SD)	86.7 ± 6.4	81.3 ± 7.2	0.002
EQ-5D at 3 months	0.78 ± 0.09	0.70 ± 0.11	0.001
EQ-5D at 6 months	0.86 ± 0.07	0.82 ± 0.08	0.018
Time to independent ambulation (weeks)	4.2 ± 1.1	6.8 ± 1.4	<0.001

Table 3 shows the radiological outcomes and union time in both the Early Weight Bearing (EWB) and Delayed Weight Bearing (DWB) groups. The mean radiographic union time was slightly lower in the EWB group (13.1 ± 2.2 weeks) compared to the DWB group (13.8 ± 2.5 weeks); however, this difference was not statistically significant (p = 0.18). The incidence of delayed union was 7.5% in the EWB group and 10% in the DWB group, which also did not show a significant difference (p = 0.69). Similarly, non-union was observed in 2.5% of patients in the EWB group and 5% in the DWB group, with no statistically significant variation between the groups (p = 0.55). Overall, the findings indicate that there was no significant difference in radiological healing outcomes between early and delayed weight-bearing protocols.

Table 3: Radiological Outcomes and Union Time

Variable	EWB (n=40)	DWB (n=40)	p-value
Radiographic union time (weeks)	13.1 ± 2.2	13.8 ± 2.5	0.18
Delayed union, n (%)	3 (7.5%)	4 (10%)	0.69
Non-union, n (%)	1 (2.5%)	2 (5%)	0.55

Table 4 shows the distribution of postoperative complications between the EWB (n=40) and DWB (n=40) groups. Medical complications were observed in 6 patients (15%) in the EWB group compared to 10 patients (25%) in the DWB group, with a p-value of 0.26, indicating no statistically significant difference. Surgical complications occurred in 4 cases (10%) in EWB and 5 cases (12.5%) in

DWB (p=0.72). Implant failure or cut-out was reported in 2 patients (5%) in the EWB group and 3 patients (7.5%) in the DWB group (p=0.64). Deep vein thrombosis was noted in 1 case (2.5%) in EWB and 3 cases (7.5%) in DWB (p=0.30), while pneumonia was seen in 2 patients (5%) in EWB and 4 patients (10%) in DWB (p=0.39). The reoperation rate was 5% in EWB and 7.5% in DWB (p=0.64). Overall, although complication rates were numerically higher in the DWB group, none of the differences were statistically significant.

Table 4: Postoperative Complications

Complication	EWB (n=40)	DWB (n=40)	p-value
Medical complications, n (%)	6 (15%)	10 (25%)	0.26
Surgical complications, n (%)	4 (10%)	5 (12.5%)	0.72
Implant failure/cut-out	2 (5%)	3 (7.5%)	0.64
Deep vein thrombosis	1 (2.5%)	3 (7.5%)	0.3
Pneumonia	2 (5%)	4 (10%)	0.39
Reoperation rate	2 (5%)	3 (7.5%)	0.64

Table 5 shows the comparison of mortality and overall clinical outcomes between the EWB (n = 40) and DWB (n = 40) groups. The 30-day mortality was observed in 1 patient (2.5%) in the EWB group and 2 patients (5%) in the DWB group, with a p-value of 0.55, indicating no statistically significant difference between the two groups. Similarly, at 6 months, mortality was reported in 2 patients (5%) in the EWB group compared to 4 patients (10%) in the DWB group, with a p-value of 0.39, again suggesting no significant difference. The overall survival at 6 months was slightly higher in the EWB group (95%) than in the DWB group (90%). However, this difference was not statistically analyzed, and overall, both groups demonstrated comparable clinical outcomes in terms of mortality and survival rates.

Table 5: Mortality and Overall Clinical Outcomes

Outcome	EWB (n=40)	DWB (n=40)	p-value
30-day mortality	1 (2.5%)	2 (5%)	0.55
6-month mortality	2 (5%)	4 (10%)	0.39
Overall survival at 6 months	38 (95%)	36 90%)	—

Discussion

The present prospective study results show that early weight bearing (EWB) after surgical fixation of intertrochanteric femur fractures leads to better early functional results and faster independent walking and enhanced life quality while maintaining the same rate of implant failures and nonunion cases and death.

The EWB group demonstrated higher Harris Hip Scores at three months which supports the findings of Guerra et al. (2014) [9] who found better Harris Hip Scores in elderly patients who could fully weight bear after proximal femoral nailing than in patients who used partial weight bearing. The trial showed that HHS scores increased by approximately 8 to 10 points during the first assessment which matched the early functional improvements we found in our group. The two groups showed functional differences that decreased after six months because early weight bearing helped patients recover but it did not change their ultimate recovery results".

The existing 'research evidence from big observational studies supports the practice of allowing patients to bear full weight after their surgical procedures. Kammerlander et al. (2018) [10] found that patients restricted to partial weight bearing had delayed mobility milestones and higher rates of immobilization-related complications compared with those allowed full weight bearing. The restricted protocols showed worse early mobility results although there were no significant differences in mortality. The study found that the EWB group achieved independent walking approximately 2.5 weeks earlier than the conventional group. The study demonstrates that the beginning of mobility after surgery represents an essential time period for patients who underwent their procedures.

Our research discovered that EWB and DWB groups showed identical results for union time and non-union rates and implant failure which demonstrated no difference in implant safety and fracture healing progress. The findings match the results from Hussain et al. (2018) [11] which showed that immediate weight bearing after intramedullary fixation of intertrochanteric fractures did not increase hardware complications. The study by Siu et al. (2006) [12] showed that early ambulation protocols did not produce negative effects on radiographic healing outcomes for geriatric hip fracture patients. Our study showed similar union times which demonstrate that controlled axial loading results in callus formation while remaining within the stability limits of the construct.

The existing complication profile of our study shows resemblance to earlier findings in the literature. The

EWB group exhibited lower rates of both deep vein thrombosis (DVT) and pneumonia which showed no statistical significance. Kenyon et al. (2019) [13] found that early mobilization for elderly hip fracture patients decreased their risk of both pulmonary and thromboembolic complications.

The study showed that the EWB and DWB groups had identical results for 30-day and 6-month mortality rates. The population-based study conducted by Ottesen et al. (2018) [14] showed that there was no significant difference in short-term mortality rates between patients who used unrestricted weight-bearing and those who used restricted weight-bearing after hip fracture surgery. Their study found that mortality rates depended more on comorbid conditions and age and perioperative medical optimization than on postoperative weight-bearing restrictions. Our findings demonstrate that early weight bearing provides equal safety to delayed protocols when measuring survival rates.

Our radiological findings receive additional support from studies that analyze both biomechanical movements and walking patterns. Braun et al. (2017) [15] used dynamic pedobarography to show that post-surgical patients do not follow their prescribed weight-bearing limits because they use less weight than their doctors recommended. The finding indicates that older adults restrict their weight-bearing activities based on their personal comfort levels and balance abilities which explains why multiple studies including ours found no rise in implant failures among patients who started weight-bearing activities earlier.

The existing scientific evidence from previous studies showed that unstable fracture patterns should be treated with either partial weight bearing or delayed weight bearing according to research from that time. The original recommendations to use earlier-generation implants resulted from doctors' fears that fixation would not stay secure during their use. The study by Dall'Oca et al. (2011) [16] demonstrated that modern cephalomedullary nails provide sufficient mechanical support for early weight bearing which depends on the quality of the surgical reduction. The group comparison of our study which used standardized fixation methods confirmed the biomechanical results through its demonstration of identical implant-related complication rates between the studied groups.

Early weight bearing should enhance neuromuscular activation while decreasing fear of falling and increasing physiotherapy participation according to its functional benefits. The improved EQ-5D scores observed in our EWB group parallel findings by Tseng et al. (2016) [17], who emphasized that early mobilization contributes to better health-related quality of life outcomes in geriatric fracture populations. In our study group, the attainment of independent walking skills at an earlier time led to significant enhancements in self-care abilities and mobility skills which hold particular importance for elderly individuals who face extended periods of dependency.

Conclusion

This prospective comparative study demonstrates that early weight bearing following surgical fixation of intertrochanteric femur fractures leads to significantly better early functional recovery, improved quality of life, and faster independent ambulation without increasing the risk of implant failure, delayed union, medical or surgical complications, or mortality. Both groups showed comparable radiological union times and similar short-term survival outcomes, indicating that early mobilization does not compromise fracture healing or implant stability when stable fixation is achieved. Although long-term functional differences narrowed by six months, the early advantages observed in the early weight-bearing group are clinically meaningful, particularly in elderly patients vulnerable to complications of prolonged immobilization. Therefore, early weight bearing appears to be a safe and effective postoperative strategy in appropriately selected patients with stable fixation.

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