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Original Research Article

Lateral Femoral Wall Thickness as a Predictor of Fracture Union, Mechanical Complications, and Functional Outcomes in Intertrochanteric Femur Fractures: A Prospective Study

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Conflict of interest: Nil

Abstract

Background: Intertrochanteric femur fractures are common injuries in the elderly and are associated with significant morbidity. The integrity of the lateral femoral wall plays a crucial role in maintaining fracture stability. This study evaluates the role of lateral femoral wall thickness in predicting radiological union, mechanical complications, and functional outcome.

Methods: This prospective study included 50 patients with intertrochanteric femur fractures treated surgically. Lateral femoral wall thickness was measured preoperatively, and patients were classified into compromised (<20.5 mm) and intact (≥20.5 mm) lateral wall groups. Union time, implant-related complications, and Harris Hip Score (HHS) at 6 months were assessed. Statistical analysis included univariate and multivariate analysis.

Results: Mean union time was significantly longer in the compromised lateral wall group (20.7 ± 2.9 weeks) compared to the intact group (12.6 ± 3.3 weeks; $p<0.001$). Implant-related complications were significantly higher in the compromised group (66.7% vs 3.1%; $p<0.001$). Mean HHS was significantly better in patients with intact lateral walls (88.3 ± 11.2 vs 67.0 ± 10.7; $p<0.001$). Multivariate logistic regression identified compromised lateral wall thickness as the only independent predictor of implant failure.

Conclusion: Lateral femoral wall thickness is a strong predictor of union, mechanical complications, and functional outcome in intertrochanteric femur fractures and should be routinely assessed during surgical planning.

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Introduction

Intertrochanteric femur fractures constitute a significant proportion of hip fractures, particularly among the elderly population.

With increasing life expectancy and prevalence of osteoporosis, the incidence of these fractures continues to rise. The primary aim of surgical treatment is to achieve stable fixation that allows early mobilization and minimizes complications. Despite advances in implant design, mechanical failures such as varus collapse, screw backout, and delayed union remain challenges, especially in unstable fracture patterns. The lateral femoral wall serves as an important buttress against lateral migration of the proximal fragment and varus collapse.

Hsu et al. described a lateral femoral wall thickness of 20.5 mm as a critical threshold to differentiate stable from unstable fracture patterns.

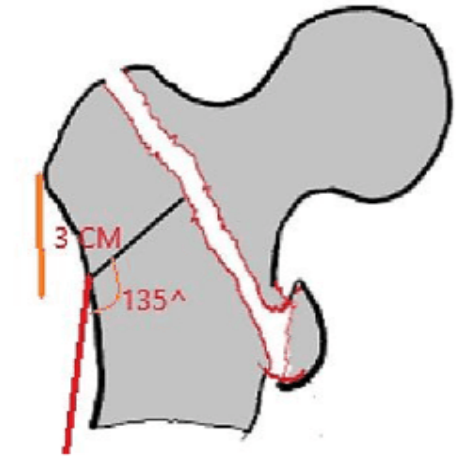

Figure 1:

The present study was undertaken to prospectively evaluate the impact of lateral femoral wall thickness on radiological and functional outcomes following surgical fixation of intertrochanteric femur fractures.

Materials and Methods

Study Design and Population: This prospective observational study was conducted at a tertiary care orthopedic center. Fifty consecutive patients with intertrochanteric femur fractures who fulfilled the inclusion criteria were enrolled.

Inclusion Criteria

- Age ≥50 years
- Radiologically confirmed intertrochanteric femur fracture
- Closed fractures
- Treated with intramedullary fixation (PFN or PFNA2)
- Minimum follow-up of 6 months

Exclusion Criteria

- Pathological fractures
- Open fractures
- Subtrochanteric fractures
- Previous surgery on the ipsilateral hip
- Polytrauma patients unable to follow rehabilitation protocol
- Inadequate radiological follow-up

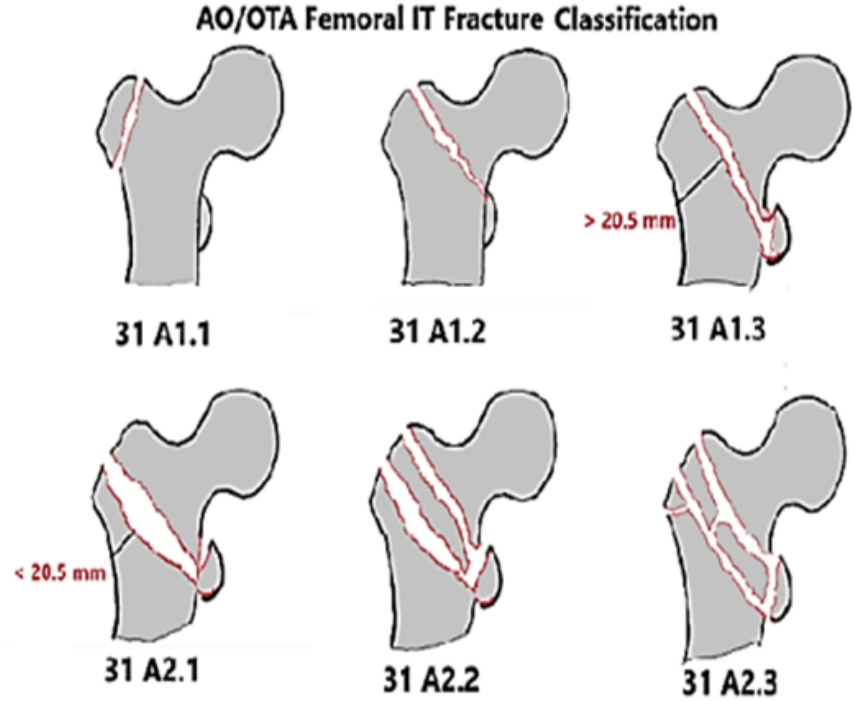

Figure 2:

Radiological Assessment: Preoperative anteroposterior radiographs were used to measure lateral femoral wall thickness according to the method described by Hsu et al. Patients were categorized into compromised (<20.5 mm) and intact (≥20.5 mm) lateral wall groups. Tip–Apex Distance (TAD) was measured postoperatively.

Outcome Measures: Primary outcomes included time to radiological union and implant-related mechanical complications. Functional outcome was assessed using the Harris Hip Score at 6 months.

Statistical Analysis: Continuous variables were expressed as mean ± standard deviation and compared using Student's t-test. Categorical variables were analyzed using chi-square test. Multivariate logistic regression was used to identify independent predictors of implant failure. A p value <0.05 was considered statistically significant.

Results

Among the 50 patients included, 18 had compromised lateral femoral walls and 32 had intact lateral walls. Baseline demographic parameters were comparable between groups.

Radiological union occurred significantly earlier in patients with intact lateral walls. Mean union time was 20.7 ± 2.9 weeks in the compromised group compared to 12.6 ± 3.3 weeks in the intact group (p<0.001). Implant-related complications were observed in 66.7% of patients with compromised lateral walls, whereas only 3.1% of patients with intact lateral walls developed complications (p<0.001). Functional outcome assessed by Harris Hip Score at 6 months was significantly better in the intact lateral wall group (88.3 ± 11.2) compared to the compromised group (67.0 ± 10.7; p<0.001).

Multivariate logistic regression analysis identified compromised lateral femoral wall thickness as the only independent predictor of implant failure (OR 88.18, p=0.0003).

Table 1: Comparison of outcomes based on lateral femoral wall status

Wall_status	n	union_time	union_sd	HHS	HHS_sd	complication_rate
Compromised (<20.5 mm)	18	20.71	2.92	66.99	10.66	66.67
Intact (≥20.5 mm)	32	12.57	3.26	88.29	11.22	3.12

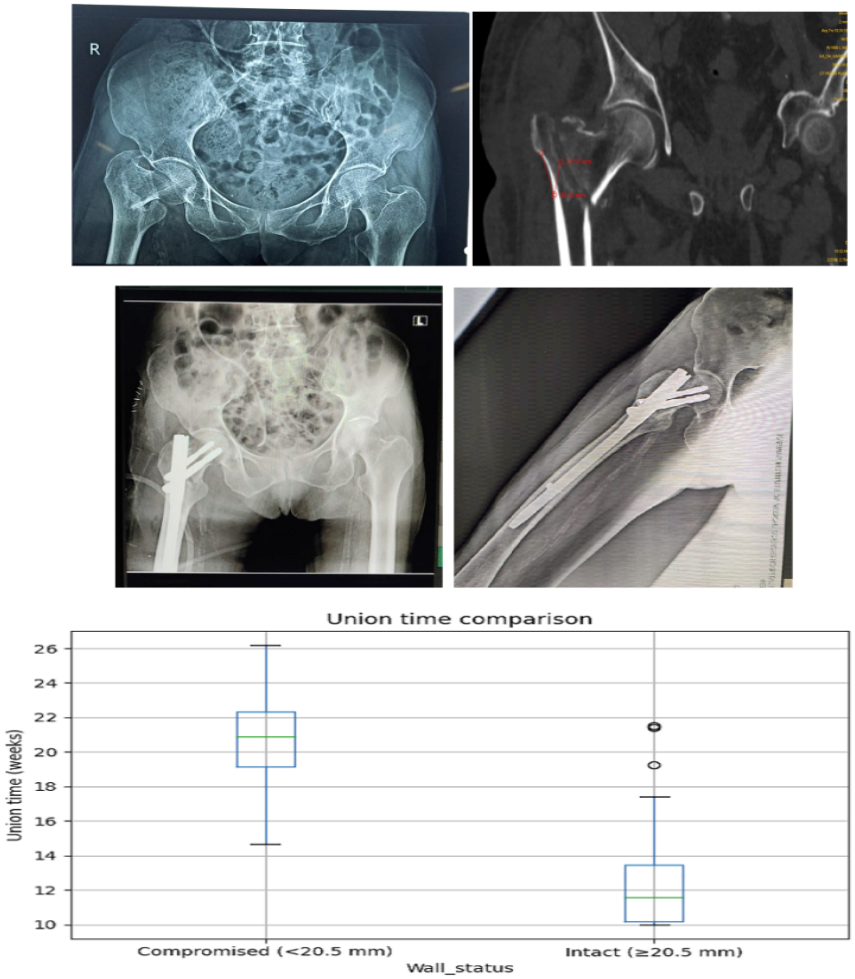

Figure 2: Comparison of union time between compromised and intact lateral wall groups

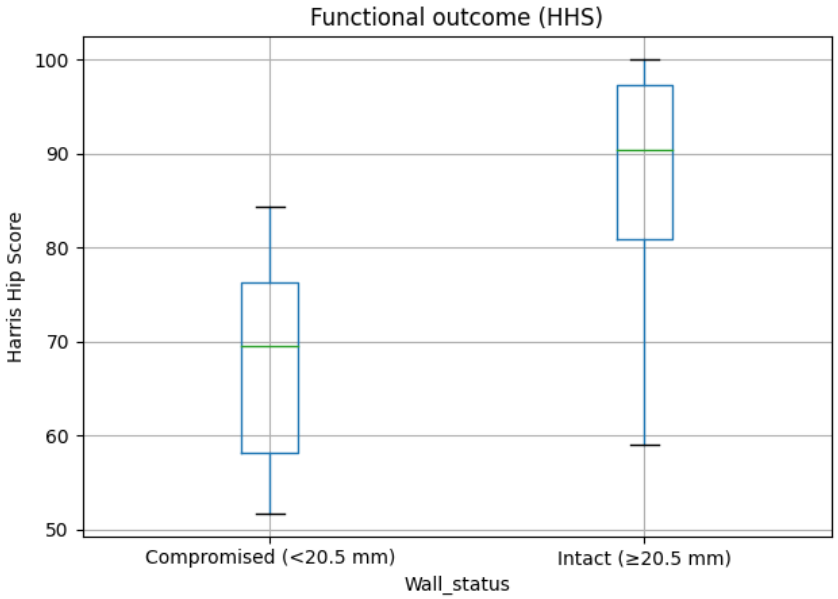

Figure 3: Functional outcome (Harris Hip Score) at 6 months

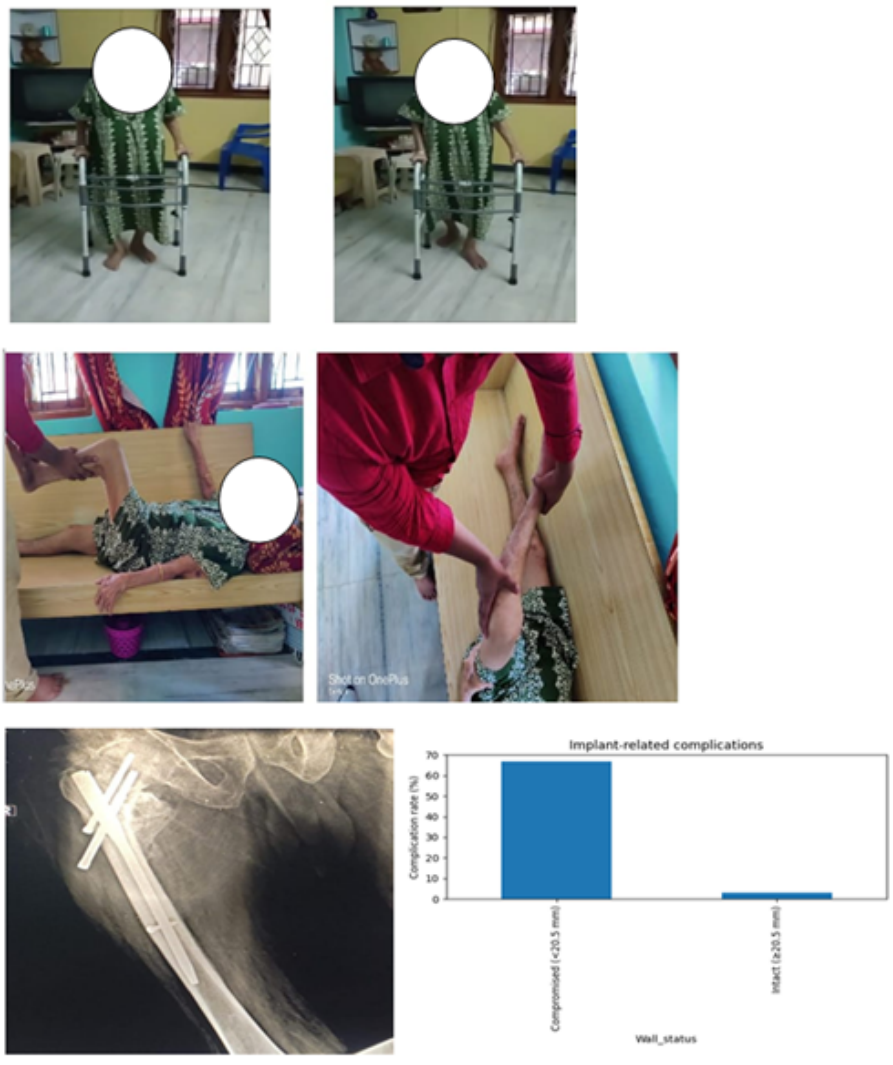

Figure 3: Implant-related complication rate according to lateral wall status

Discussion

The present study demonstrates that lateral femoral wall thickness is a critical determinant of fracture stability and outcome in intertrochanteric femur fractures. Patients with intact lateral walls achieved earlier union, fewer mechanical complications, and superior functional outcomes.

The high complication rate observed in compromised lateral wall fractures can be attributed to loss of the lateral buttress, leading to varus collapse and increased stress on the implant. These findings are consistent with previous studies emphasizing the importance of lateral wall integrity.

Multivariate analysis confirmed that lateral wall thickness outweighed other variables such as age and TAD, highlighting its dominant biomechanical role. Routine assessment of lateral wall thickness can therefore help identify unstable fractures and guide optimal surgical strategy.

Conclusion

Lateral femoral wall thickness is a strong independent predictor of radiological union, mechanical complications, and functional outcome in intertrochanteric femur fractures. Fractures with compromised lateral walls show delayed union, higher implant failure rates, and poorer functional results. Routine assessment of lateral wall thickness should be incorporated into preoperative planning to optimize outcomes.

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