# Immediate Weight-Bearing for Distal Femur Fractures Fixed with a Lateral Locking Plate Leads to Decreased Short-Term Complications without Increased Failure Rates

Sally Trout[1], Priya Duvvuri, Hadi Hasnain Aziz, Surya Indukuri, Lewis John Collins[2], Michael Scott Linn, Jason M McKean, Ariel Goldman
[1]Northwell Health, [2]University Orthopaedics

INTRODUCTION: Distal femur fractures are challenging injuries to treat. Historically, after operative fixation, one to three months of non- or partial weight-bearing is prescribed. Allowing immediate weight-bearing, particularly in elderly patients, is desirable due to the well-known benefits of early mobilization. This study aims to compare the clinical and radiographic outcomes of full versus modified weight-bearing of distal femur fractures treated with lateral locked plating.

METHODS: Data was retrospectively analyzed for all patients who underwent lateral locked plate fixation for an acute distal femur fracture at one of four area hospitals between October 2011 and April 2022. All surgeries were performed by a fellowship-trained orthopaedic trauma surgeon. AO/OTA Class 33-A, B, C and periprosthetic fractures with well-fixed components were included. Patient demographics, comorbidities, weight-bearing status, 30-day complications (readmission, return to operating room, myocardial infarction, pulmonary embolism, deep vein thrombosis, cerebrovascular accident, surgical site infection, pneumonia, mortality), and 1-year mortality were recorded. Hardware displacement, fracture displacement, implant failure, malunion, nonunion, and time to union were assessed for all patients with an adverse event, 3-month event-free follow up, or follow up to fracture union. Statistical analysis was performed using heteroscedastic t-tests and Chi-squared or Fisher's Exact tests. Binary logistic regression and multiple linear regression were used to determine the relationship between covariates and radiographic and clinical outcome measures.

RESULTS:
A total of 124 patients met inclusion criteria. Immediate weight-bearing was permitted in 76 patients (61.3%) (WBAT). The WBAT group was older (83.2 ± 10.5 vs. 68.9 ± 15.8 years, p < 0.001) and had a lower body mass index (28.1 ± 6.4 vs. 30.8 ± 7.9, p = 0.016) than the restricted weight-bearing group (RWB). There were more peri-implant fractures in the WBAT group (64.4% vs. 41.6%, p = 0.013). All open fractures were in the RWB group (12.5% vs. 0%, p = 0.003). Intraarticular fractures were significantly more likely to be RWB (55.2% vs. 20.0%, p < 0.001). The incidence of any complication within 30 days was lower in the WBAT group (7.9% vs. 25.0%, p = 0.008) but there was no difference in the types of complications encountered. There was no difference between RWB and WBAT for 30-day (6.3% vs. 2.6%, p = 0.374) or 1-year mortality (18.9% vs. 25.5%, 0.468), hardware displacement, implant failure, fracture displacement, malunion, nonunion, or time to union (10.5 ± 3.2 vs. 11.3 ± 3.5 weeks, 0.381).

Binary logistic regression found that age at time of fracture (OR = 0.885, p = 0.049) and Charlson Comorbidity Index (CCI) (OR 0.478, p = 0.012) significantly predicted mortality at 1 year. Patients who were WBAT (OR 0.207, p = 0.041) and those with lower body mass index (BMI) (OR 1.095, p = 0.040) had significantly lower 30-day complications while CCI (OR 1.547, p = 0.023) predicted increased rates of complications.

DISCUSSION AND CONCLUSION: Immediate weight-bearing after fixation of distal femur fractures with a lateral locking plate is associated with fewer early complications than restricted weight-bearing. Weight-bearing status, increasing BMI, and higher CCI were independent predictors of 30-day complications. Immediate weight-bearing was not associated with an increase in fixation failure.

Table 1. Patient and Fracture Characteristics

| | Overall (N=124) | Restricted WB (N=48) | WBAT (N=76) | p-value |
|---|---|---|---|---|
| Age at Fracture (years)* | 77.7 ± 14.5 | 68.9 ± 15.8 | 83.2 ± 10.5 | <0.001 |
| Female Sex | 101 (81.5%) | 34 (70.8%) | 67 (88.2%) | 0.016 |
| BMI* | 29.2 ± 7.1 | 30.8 ± 7.9 | 28.1 ± 6.4 | 0.037 |
| Charlson Comorbidity Index* | 4.1 ± 1.8 | 3.7 ± 2.2 | 4.3 ± 1.4 | 0.109 |
| Peri-Implant fracture | 69 (55.6%) | 20 (41.6%) | 49 (64.4%) | 0.013 |
| Open Fracture | 6 (4.8%) | 6 (12.5%) | 0 (0%) | 0.003 |
| Intra-Articular Fracture** | 22 (37.2%) | 16 (55.2%) | 6 (20.0%) | <0.001 |
| Time from presentation to OR (days)* | 1.7 ± 1.9 | 1.7 ± 2.0 | 1.7 ± 1.9 | 0.883 |
| Length of Follow-Up (months)* | 7.8 ± 10.7 | 9.6 ± 12.1 | 6.6 ± 9.7 | 0.131 |
| Other Injuries* | 10 (12.4%) | 5 (10.6%) | 5 (7.1%) | 0.520 |

*Continuous variables are represented by the mean ± standard deviation
**Represents the proportion of native distal femur fractures, 59 total with 29 RWB and 30 WBAT

Table 2. Fracture Classification

| Classification | | Overall (N=124) | Restricted WB (N=48) | WBAT (N=76) |
|---|---|---|---|---|
| AO/OTA* | All | 59 | 29 | 30 |
| | A1 | 0 | 0 | 0 |
| | A2 | 9 (15.3%) | 2 (6.9%) | 7 (23.3%) |
| | A3 | 27 (45.8%) | 10 (34.5%) | 17 (56.7%) |
| | B1 | 1 (1.7%) | 1 (3.4%) | 0 |
| | B2 | 0 | 0 | 0 |
| | B3 | 0 | 0 | 0 |
| | C1 | 2 (3.4%) | 1 (3.4%) | 1 (3.3%) |
| | C2 | 11 (18.6%) | 10 (34.5%) | 1 (3.3%) |
| | C3 | 9 (15.3%) | 5 (17.2%) | 4 (13.3%) |
| Su** | All | 57 | 17 | 40 |
| | 1 | 14 (24.6%) | 4 (23.5%) | 10 (25.0%) |
| | 2 | 20 (35.1%) | 8 (47.1%) | 12 (30.0%) |
| | 3 | 23 (40.4%) | 5 (29.4%) | 18 (45.0%) |

*Percentage values represent the proportion of each fracture type relative to the total number of native distal femur fractures
**Percentage values represent the proportion of each fracture type relative to the total number of periprosthetic fractures around a total knee arthroplasty

Table 3. Clinical Outcomes

| | Overall (N=124) | Restricted WB (N=48) | WBAT (N=76) | p-value |
|---|---|---|---|---|
| 30-day complications | 18 (14.5%) | 12 (25.0%) | 6 (7.9%) | 0.008 |
| Readmission | 9 (7.3%) | 5 (10.4%) | 4 (5.2%) | 0.306 |
| Return to OR | 3 (2.4%) | 2 (4.2%) | 1 (1.3%) | 0.559 |
| Pulmonary embolism | 5 (4.0%) | 4 (8.3%) | 1 (1.3%) | 0.073 |
| Deep venous thrombosis | 3 (2.4%) | 2 (4.2%) | 1 (1.3%) | 0.559 |
| Surgical site infection | 3 (2.4%) | 3 (6.3%) | 0 (0%) | 0.056 |
| Pneumonia | 2 (1.6%) | 0 (0%) | 2 (2.6%) | 0.522 |
| Mortality | 5 (4.0%) | 3 (6.3%) | 2 (2.6%) | 0.374 |
| One Year Mortality | 20 (22.7%) | 7 (18.9%) | 13 (25.5%) | 0.468 |

Table 4. Radiographic Outcomes

| | Overall (N=82) | Restricted WB (N=34) | WBAT (N=48) | p-value |
|---|---|---|---|---|
| Hardware displacement | 2 (2.4%) | 0 (0%) | 2 (4.3%) | 0.501 |
| Implant failure | 4 (4.9%) | 2 (5.5%) | 2 (4.3%) | 1.000 |
| Fracture displacement | 12 (14.6%) | 2 (5.5%) | 10 (21.7%) | 0.058 |
| Malunion | 4 (5.3%) | 1 (2.9%) | 3 (7.3%) | 0.622 |
| Nonunion | 3 (4.0%) | 3 (8.8%) | 0 (0%) | 0.089 |
| Time to union (weeks)* | 10.9 ± 3.4 | 10.5 ± 3.2 | 11.3 ± 3.5 | 0.381 |

*Continuous variables are represented by the mean ± standard deviation