

Dual Plate Fixation for Distal Femur Fractures: A Multicenter Case Series

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INTRODUCTION:

The optimal mode of fixation for treatment of distal femur fracture remains controversial. Biomechanical studies have demonstrated that dual-plate fixation (DPF) provides increased stiffness compared to other constructs, however large clinical studies of DPF outcomes are lacking. The purpose of this study was to report on outcomes of patients with distal femur fractures treated with DPF in a large multicenter retrospective case series.

METHODS:

All adult patients with distal femur fractures who underwent DPF between 2012 and 2020 at one of eight level one trauma centers were identified. Patient demographics, injury characteristics, fracture classification, surgical details, implant, radiographic, and clinical outcomes were collected.

RESULTS:

Patient demographics, injury characteristics, and surgical details are summarized in Table 1. The cohort included 54 patients, with a mean follow up of 18 months. The radiologic and clinical outcomes of DPF are summarized in Table 2.

Of the 8 nonunion patients, 7 (88%) had suffered open injuries and had a bone void. Four of the eight (50%) treated with titanium lateral plates each went on to nonunion. No demographic, injury, or surgical characteristics were significantly associated with risk of nonunion requiring reoperation. There was no association between the number of total proximal screws, cortical screws, locking screws, or far cortical locking screws with the risk of nonunion.

DISCUSSION AND CONCLUSION:

This multicenter case series of 54 patients is the largest series to date reporting on the DPF for distal femur fractures. Despite a high proportion of open and comminuted fractures, we found a low rate of reoperation, radiologic deformity, or significant functionally limiting pain, suggesting that DPF provides a reliable treatment option across a variety of fracture morphologies.

Table 1: Dual Plate Fixation Cohort Patient, Injury, and Surgical Characteristics

| Total Patients (N) | | 54 |
|--------------------------|------------------------|--------------------|
| Age (mean, range) | | 53.3 years (16-85) |
| Female Sex | | 29 (54%) |
| Tobacco Use | | 18 (33%) |
| Diabetes | | 10 (18%) |
| BMI (mean, range) | | 29.1 (18-64) |
| Mechanism of injury** | | |
| | High energy | 39 (72%) |
| | Low energy | 15 (28%) |
| Periprosthetic | | 10 (18%) |
| Intra-articular | | 38 (70%) |
| OTA classification | | |
| | A1 | 0 (0%) |
| | A2 | 6 (11%) |
| | A3 | 8 (15%) |
| | C1 | 13 (24%) |
| | C2 | 12 (22%) |
| | C3 | 15 (28%) |
| Gustilo-Anderson | | |
| | Closed | 29 (54%) |
| | Type I | 3 (6%) |
| | Type II | 5 (9%) |
| | Type IIIA | 16 (30%) |
| | Type IIIB | 0 (0%) |
| | Type IIIC | 1 (2%) |
| Comminution | | |
| | Medial | 32 (59%) |
| | Lateral | 26 (48%) |
| Lateral Plate Material | | |
| | Stainless Steel | 47 (83%) |
| | Titanium | 7 (13%) |
| Reduction | | |
| | Closed or Percutaneous | 6 (11%) |
| | Open | 48 (89%) |
| Bone Void after Fixation | | 17 (31%) |

Table 2: Dual Plate Fixation Cohort: Clinical and Radiographic Outcomes*

| Total Patients (N) | | 54 |
|---------------------|---------------------------------|---------------------|
| Radiologic Outcomes | | |
| | Varus Collapse | 6 (11%) |
| | Hyperextension deformity | 4 (7%) |
| | mRUST score at 3 months | 8.77 +/- 3.5 (1-14) |
| | RUST above 12 | 27 (50%) |
| Reoperation | | 15 (28%) |
| | Nonunion | 8 (15%) |
| | Arthrofibrosis | 4 (7%) |
| | Infection | 3 (6%) |
| Pain | | |
| | Absent | 13 (24%) |
| | Mild, not functionally limiting | 25 (46%) |
| | Severe, functionally limiting | 6 (11%) |
| | Not reported | 10 (19%) |
| Ambulatory | | |
| | No | 6 (11%) |
| | Yes | 40 (74%) |
| | Not reported | 8 (15%) |

* Categorical variables reported as N (%), continuous variables reported as mean +/- standard deviation (range).

** High energy injuries include automobile or motorcycle collisions, vehicle versus pedestrian, bicycle, or scooter, falls from height, gun shot wounds, and explosive injuries. Low energy injuries include ground level falls.