

Working Length and Proximal Screw Constructs in Plate Osteosynthesis of Distal Femur Fractures

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Purpose: This work was undertaken to evaluate the working length, proximal screw density, and diaphyseal fixation mode and the correlation to fracture union after locking plate osteosynthesis of distal femoral fractures using bridge-plating technique.

Methods: In this retrospective medical record review, patients undergoing operative fixation of distal femur fractures with a distal femoral locking plate utilizing bridge-plating technique for the metadiaphyseal region were included. Primary variables included fracture union, secondary surgery for union, plate working length, and diaphyseal screw technique and configuration. Secondary variables included patient demographics, patient comorbidities (tobacco use and diabetes mellitus), injury mechanism, plate metallurgy, OTA fracture type, Gustilo type for open fractures, periprosthetic fracture, and coronal plane fracture alignment.

Results: 99 patients with distal femur fractures with a mean age 60 years (36 male and 63 female) met inclusion criteria. Mean follow-up was 576 days with 89% follow-up until declared union or 1 year and overall 63% 1-year follow-up. None of the clinical parameters (patient demographics, comorbidities, fracture type, mechanism of injury) were statistically significant indicators of union. Plate metallurgy (50 stainless steel and 49 titanium) was not a statistically significant indicator of union. The mean working length (distance between the first screw on either side of the fracture) was 90.5 mm and it was not statistically significant for fracture union. Screw density (number of screws proximal to fracture divided by length of plate proximal to fracture), number of proximal screws, and screw cortices were not significantly related to fracture union. Diaphyseal screw technique did show statistical significance (1 non-locking, 45 locking, 53 hybrid). Hybrid technique had a statistically significant higher chance of union when compared to locking ($P = 0.03$). All proximal locking screw constructs were 2.7 times more likely to lead to nonunion.

Conclusion: Stiffer plating constructs when using bridge-plating techniques in distal femur locking plates was associated with a 2.7× higher likelihood of nonunion. Surgeons should consider avoiding the use of all locking screws for diaphyseal fixation in distal femoral locking plates. However, other factors associated with more flexible fixation constructs such as increased working length, decreased proximal screw number, and decreased proximal screw density were not significantly associated with union in this study. Larger prospective studies are necessary to determine plate type, length, and screw construct to promote the ideal stress-strain environment for fracture healing in distal femur fractures.

- The FDA has not cleared this drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off label" use). For full information, refer to page 600.