Distal Femur Fractures Stabilized Using Titanium Lateral Locked Plates with Nonlocking Diaphyseal Fixation: A Retrospective Review

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Purpose: Multiple treatment modalities exist for treating distal femur fractures fixation that are dependent upon patient demographics, fracture characteristics, and surgeon preference. Lateral locked plating (LLP) is one of the most commonly used modalities for distal femur fractures but has been found to have nonunion rates as high as 30%. Less rigid constructs, including titanium plates and nonlocking diaphyseal fixation that allows axial micromotion, have been postulated as a solution. The aim of this study is to evaluate distal femur fractures stabilized with modern locked titanium implants using all nonlocking diaphyseal fixation. Our hypothesis is that this more flexible fixation will lead to lower nonunion rates compared to historical data, and that all nonlocking proximal diaphyseal fixation is safe, without increased failure rate.

Methods: A 6-year retrospective study identified patients undergoing operative fixation of distal femur fractures with titanium implants along with nonlocking diaphyseal fixation. Patient demographics and fracture characteristics were recorded. Fracture fixation data were recorded including plate/working length, proximal screw density, and number of diaphyseal screws. Follow-up data were recorded including incidence of infection, fracture union, and incidence of implant failure in setting of nonunion.

Results: 81 fractures met inclusion criteria with 16 fractures resulting in nonunion (19.75%). Comparing union and nonunion cohorts, nonunions were found to be younger with higher body mass index compared to union group ($P < 0.05$). Fixation constructs data found nonunions had a higher average plate length ($P = 0.047$) and higher average number of diaphyseal screws (4.25 vs 3.74, $P = 0.038$). Subgroup analysis found a nonunion rate of 4.2% (1 out of 24) in fractures with 3 diaphyseal screws fixation versus 26.3% (15 out of 57) with 4 or more diaphyseal screws ($P = 0.022$) with an odds ratio of 8.21(confidence interval [CI] 1.02-66.22). Within the nonunion group, plate breakage within the working length was the most common implant failure. No failures were noted with nonlocking diaphyseal screw fixation.

Conclusion: Our study found using a more flexible construct, including titanium distal femur lateral locked plate with nonlocking diaphyseal fixation, still produced a nonunion rate of 19.75% comparable to historic rates. Interestingly we found diaphyseal fixation with more than 3 screws led to higher rates of nonunion. Diaphyseal nonlocking screw fixation in distal femur fractures appears to be safe in all age groups as no failures were observed.