

Use of a First-Generation Locking Plate and Minimally Invasive Techniques About the Knee: Outcomes and Comparison to Newer Design Stainless Steel Implants

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Purpose: Locking plate technology was developed approximately 25 years ago and has been successfully used since. Newer designs and material properties have been used to modify the original design, but these changes have yet to be correlated to improved patient outcomes. The purpose of this study was to evaluate and compare the first-generation locking plate (FGLP) and screw system to subsequently design locking compression plates.

Methods: Between 2001 to 2018, 376 patients with 386 proximal tibia and distal femur fractures (both acute fracture and nonunions) who were treated with either a first-generation titanium, uniaxial locking plate with unicortical screws (FGLP), also known as a LISS (Less Invasive Stabilization System) plate (Synthes, Paoli, PA), or a second-generation stainless steel implant from one of several companies (SGLP) were reviewed. Inclusion criteria for analysis was a minimum of 1-year follow-up. At latest follow-up, outcomes were assessed using plain radiographic analysis, Short Musculoskeletal Function Assessment (SMFA), visual analog scale (VAS) pain scores, and knee range of motion (ROM). All outcomes between the FGLP and SGLP cohorts were compared using binary logistic regression analysis for dichotomous dependent variables and multivariate linear regression analysis for continuous dependent variables while controlling for demographic and injury characteristics. All statistics were run using IBM SPSS.

Results: A total of 274 patients with 285 (73.8%) fractures completed a minimum of 1-year follow-up (range 1-14 years, mean 3.0 years) and were available for analysis. There were 76 patients with 82 (28.8%) fractures fixed with a FGLP and 198 patients with 203 (71.2%) fractures fixed with an SGLP. The mean age at time of injury for all patients was 53.8 and the 50.9% of all patients were female. There was no difference in mean time to union for acute fractures and nonunion about the knee fixed with FGLP versus SGLP (acute fracture: 5.3 mos \pm 2.8 mos vs 3.8 mos \pm 1.5 mos, $P = 0.262$; nonunion: 6.1 mos \pm 2.9 mos vs 5.1 mos \pm 3.6, $P = 0.477$). At final follow-up, there was no difference between the FGLP versus SGLP cohorts with regards to mean standardized SMFA (19.9 \pm 18.5 vs 20.4 \pm 20.0, $P = 0.857$), mean knee ROM in extension and flexion (1.6°-111.9° vs 1.1°-122.3°; $P = 0.305, 0.338$), and mean VAS pain (2.7 \pm 3.1 vs 3.1 \pm 2.8, $P = 0.391$). There were no differences in infection rate, reoperation rate, hardware failure, hardware removal, or nonunion.

Conclusion: First-generation locking plates were not clinically outperformed by second-generation implants with altered metallurgy. Long-term outcomes demonstrate that this construct provides for a high rate of union and low incidence of complications, as well as good clinical and functional results.