

Dynamic Locked Screws Versus Conventional Locked Screws in Comminuted Distal Femur Fractures: A Matched Cohort Study

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Background/Purpose: Locked bridge plating of comminuted supracondylar femur fractures has become extremely common. Despite promising results of early series, reports have demonstrated nonunion rates between 10% and 20%. Construct stiffness and eccentric plate positioning likely contribute to insufficient and asymmetric fracture site motion. A newer concept of “dynamic” locked screws, which allow for motion within the screw shaft, has been proposed to provide an improved mechanical environment for callus formation. Our hypothesis was that dynamic locked plating constructs allow for greater callus formation and higher union rates than standard locked plating constructs.

Methods: 34 patients with comminuted supracondylar femur fractures amenable to bridge plating technique were treated with locked plating between August 2011 and August 2013. Based on surgeon preference and implant availability, the patients were treated either with standard locking screws (SLS) or dynamic locking screws (DLS; Synthes, Paoli, PA) for proximal plate fixation. 17 patients were treated with DLS and 17 with SLS. Subjects in the DLS and SLS groups were matched post hoc based on working length (within 1 hole) and injury type (OTA classification). 24 subjects (12 pairs) were matched using these criteria. Three patients lost to follow-up and one patient who expired were excluded from the DLS group. In the SLS group, one patient lost to follow-up and one patient treated with membrane induction technique were excluded. Of the remaining 28 patients (average age 66.8 years; range, 27-98), 7 sustained high-energy mechanisms and 21 sustained falls from standing height. The groups did not differ in age, gender, mechanism, smoking status, diabetic status, open/closed fracture, or a history of ipsilateral knee arthroplasty ($P > 0.05$). Routine clinical and radiographic examinations were evaluated. Painless weight bearing and radiographic bridging of 3 cortices defined fracture union. Three observers, blinded to fixation type, made callus measurements on a 4-point ordinal scale (none, minimal, moderate, robust). Intraclass correlation was used to measure interobserver agreement. Radiographic callus analysis was performed between 12 and 18 weeks postoperatively. Coronal and sagittal plane alignment was measured on the immediate postoperative and final radiographs. Student t and Mann-Whitney U tests were used to analyze continuous and ordinal data between groups. Paired t , Wilcoxon signed ranks, and McNemar’s tests were used to analyze pairs.

Results: Intraclass correlation analysis showed excellent agreement among observers in both consistency (0.83) and absolute score (0.83). The mean callus score was 1.92 for DLS and 1.49 for SLS ($P = 0.21$). In the DLS group, one subject had delayed healing (union at 11 months) and one subject had failure of distal fixation. The SLS group had one nonunion with failure across the working length, and three had distal fixation failure. No difference in nonunion rate was seen between groups ($P = 0.32$). Coronal (3.3° vs. 4.7° , $P = 0.49$) and sagittal (5.4° vs. 3.0° , $P = 0.08$) plane alignment change were not different between the DLS

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and SLS groups, respectively. The DLS group tended toward higher callus ranks, but these findings were not significant in group ($P = 0.23$) and matched pairs ($P = 0.56$) testing.

Conclusion: Recent data demonstrate high nonunion rates for locked plating of supracondylar femur fractures. This has been attributed to overly stiff constructs and eccentric fixation. Novel screw technologies are available that allow for increased axial motion, particularly at the near cortex. This technique appears to be safe. However, we are unable to demonstrate a difference in callus formation and nonunion rates compared with standard locked plating.