Dual Versus Lateral Locked Plating in Elderly Cadaveric Bicondylar Tibial Plateau Fractures: Does Medial Comminution Matter?

Dencel Armando García Vélez, MEd; *Paraskevi Marousa Limberatos, BS; Krishna Vangipuram Suresh, BS; J. Gary Bledsoe, PhD; Mikel Headford, DO; Thomas Revak, DO, FAAOS*
Saint Louis University, St. Louis, Missouri, UNITED STATES

Purpose: Our objective was to compare the mechanical stability of lateral-only and dual plating constructs of unstable bicondylar tibial plateau fractures with/without medial bone loss in a cadaveric model with compromised bone density.

Methods: Six female and 4 male matched pair tibia specimens were obtained. Five specimens were randomized to each of the 4 treatment groups. Bicondylar tibial plateau fractures were created in cadaveric models reproducing AO/OTA 41 C1 (without medial bone loss) and C2 fractures (with medial bone loss). Groups 1 and 2 were 41 C1 fractures treated with either dual or lateral plating respectively. Groups 3 and 4 were 41 C2 fractures with medial metaphyseal bone loss with either dual or lateral plating respectively. Specimens were tested in a mechanical testing system machine loading both condyles. Specimens were loaded to 300 N and coronal alignment measurements were obtained. Specimens were then cycled from 100 N to 700 N for 5000 cycles at 2 Hz. Average axial displacement, maximal displacement, average force, and coronal alignment after 5000 cycles were recorded. Force to failure was recorded at 100 N/sec. Descriptive statistics and analysis of variance were utilized to describe specimen characteristics and determine differences between the 4 treatment groups. (α set to 0.05).

Results: The mean patient age at time of death was 86.1 $\pm$ 7 years (range, 78-93 years) with a mean bone mineral density (BMD) of 0.423 g/cm3 (osteoporotic). No significant differences were noted in average specimen age (P = 0.88) or BMD (P = 1.0) among all groups. No significant differences were noted among the groups for average axial displacement, failure force, maximal displacement, and change in proximal medial tibial angle (PMTA) (P>0.05). There were no differences between individual groups for average force, displacement, failure force, maximal displacement, and change in PMTA (P>0.05). During cycle testing, no catastrophic failures were noted. While stressing specimens, it was noted that specimens failed with a varus flexion deformity at the metadiaphyseal junction with loosening of the diaphyseal screw fixation regardless of fixation type. The condyles remained reduced without screw pullout of the proximal raft screws.

Conclusion: Although dual incisions with dual plating remain the "gold standard" for management of bicondylar tibial plateau fractures, lateral plating may limit surgical morbidity if accurate reductions and stable fixation are achieved. This biomechanical study showed that lateral locked plating alone may be a viable alternative to dual plating in older patients with poor bone quality with AO/OTA 41 C1/C2 fractures.