Surgical Fixation of Unstable Chest Wall Injuries:
A Comparison of Locking Versus Non-Locking Plates

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Purpose: There has been a substantial increase in the surgical treatment of unstable chest wall injuries recently. While a variety of fixation methods exist, most surgeons have used plate and screw fixation. Rib-specific locking plate systems are available; however, evidence supporting their use over less-expensive, conventional plate systems (such as pelvic reconstruction plates) is lacking. We sought to address this by comparing outcomes between locking plates and non-locking plates in a cohort of patients from a prior randomized trial who received surgical stabilization of their unstable chest wall injury.

Methods: We used data from the surgical group of a previous multicenter, prospective, randomized controlled trial comparing surgical fixation of acute, unstable chest wall injuries to nonoperative management. In this substudy, our primary outcome was hardware-related complications and reoperation. Secondary outcomes included ventilator free days (VFDs) in the first 28 days following injury, length of ICU and hospital stay, and general health outcomes (Short Form-36 [SF-36]).

Results: From the original cohort of 207 patients, 108 had been treated surgically and had data available on the type of plate construct used. 59 (55%) had received fixation with non-locking plates (primarily 3.5 or 2.7-mm pelvic reconstruction plates) and 49 (45%) had received fixation with locking plates (primarily rib-specific locking plates). There was a 15% rate (9 of 59 patients) of hardware loosening in the non-locking group versus 4% (2 of 49 patients) in the locking group ($P = 0.1$). In addition, the rate of reoperation for hardware complications was 3% in the non-locking group versus 0% in the locking group ($P = 0.5$). No patients in either group required revision fixation for loss of reduction or nonunion. There were no differences between the groups with regard to VFDs, length of stay, or SF-36 scores.

Conclusion: We found no statistically significant differences in outcomes between patients who received surgical stabilization of their unstable chest wall injury when comparing non-locking plates versus locking plates. However, the rate of hardware loosening was nearly 4 times higher in the non-locking plate group and trended toward statistical significance, although reoperation related to this was less frequent. This finding is not surprising, given the inherent challenges of rib fixation including thin bones, comminution, potential osteopenia, and a postoperative environment of constant motion. We believe that the increased cost of locking plate fixation in this setting is likely justifiable given these findings.