A BIOMECHANICAL COMPARTIVE STUDY OF THE EXTERNALIZED LOCKING PLATE

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Introduction: Over recent years, the use of the locking plate as an external fixator has been gaining popularity in treating open tibia fractures. Several clinical and biomechanical studies have been done however the biomechanical data using different number of screws with the externalized locking plate (ELP) have not been assessed. We report our findings of axial and torsional stiffness of the ELP using different number of screws in comparison with the unilateral external fixator (UEF).

Methodology: 5 sawbones were stabilized with the ELP and 2 sawbones with the UEF. A fracture gap model of 1cm was be created for each sample to emulate a comminuted tibia fracture. Force required to displace the fracture site by 5mm was determined. For the ELP, each of the five sawbones underwent axial and torsional loading for 4 screw, 6 screw, 8 screw and 10 screw construct. Axial and torsional stiffness were tested using a customized jig for 10 cycles and stiffness recorded. First two cycles discarded for “system settling”, and the mean stiffness for each sample determined.

Discussion: sing One-Way ANOVA, there were significant difference between the groups with p valus <0.001. Using Tukey’s post-hoc analysis, the 4 screw construct of the ELP had superior stiffness as compared to the UEF, with the 10 screw construct having superior stiffness as compared to all other constructs in axial and torsional stiffness.

Conclusion: In conclusion, increasing the number of screws of the ELP provides increased axial strength. For hypothetical clinical application, it could be a suitable alternative for open tibial fractures as a one stage surgery compared to the UEF and the treating surgeon could initiate immediate partial weight bearing for a 10 screw construct with caution.