Bridge Plating Ostosynthesis: Effect of Bridge Span on Interfragmentary Motion

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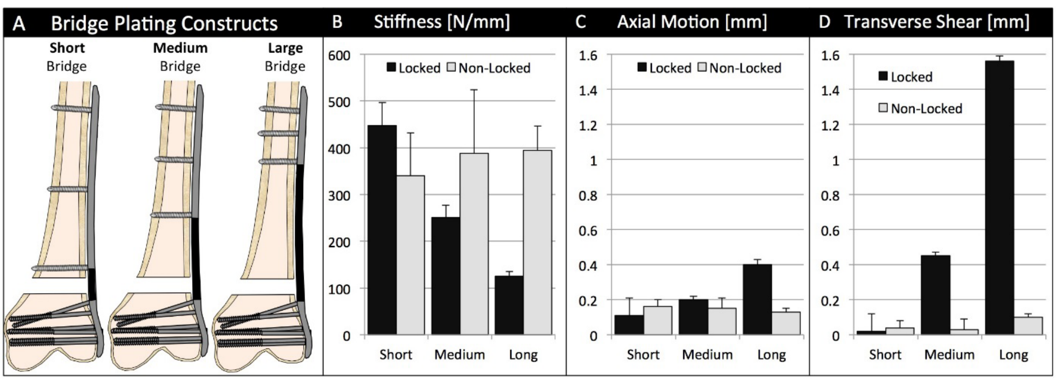
Purpose: A long bridge span has been recommended to decrease the stiffness of locked plating constructs. This biomechanical study determined the effects of the bridge span on interfragmentary motion in locked and non-locked plating constructs.

Methods: Distal femur plates were applied to bridge a simulated AO type 33-A3 fracture. Plates were applied to yield a short, medium, or long bridging span (Fig. 1A). For locked constructs, diaphyseal locking screw configurations had a short (25 mm), medium (87 mm), or long (150 mm) bridge span (Fig. 1A). For non-locked constructs, non-locked screw configurations had a short (40 mm), medium (72 mm), or long (138 mm) bridge span. The effect of the bridge span on fracture stability was assessed by the axial construct stiffness, axial interfragmentary motion, and shear motion at the fracture site.

Results: For locked constructs, increasing the bridge span from 25 to 150 mm decreased stiffness by 72% ($P < 0.001$) and increased axial fracture motion from 0.1 mm to 0.4 mm ($P < 0.001$). It also increased shear motion to 1.56 mm ($P < 0.001$), leading to shear-dominant fracture motion (Fig. 1B-1D). For non-locked constructs, increasing the bridge span from 40 mm to 138 mm had no significant effect on stiffness, axial motion, or shear motion.



Conclusion: For locked constructs, long bridge spans induce shear-dominant motion, which can delay fracture healing. For non-locked constructs, longer bridge spans do not increase axial interfragmentary motion or shear motion. Therefore, a long bridge span may not be an effective strategy to promote natural fracture healing by interfragmentary motion, regardless if used with locked or non-locked screws.

See pages 401 - 442 for financial disclosure information.