Comparison of a New Intramedullary Scaffold to Volar Plating for Treatment of Distal Radius Fractures

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OBJECTIVES: To compare the biomechanical properties of a new nitinol intramedullary scaffold implant with those of volar plates for the treatment of dorsally comminuted extra-articular distal radius fractures using an established model.

METHODS: A dorsal wedge osteotomy was performed on a bone model to simulate a dorsally comminuted extra-articular distal radius fracture. This model was used to compare stiffness of three different distal radius fixation devices - an intramedullary scaffold implant, a commercially available titanium volar locking plate and a stainless steel non-locking T-plate. Six constructs were tested per group. Tolerance for physiologic loading was assessed by applying 10,000 cycles of axial loading up to 100 N applied at 2 Hz. Axial and eccentric load stiffness were assessed before cyclic loading and axial stiffness again after. Groups were compared using ANOVA.

RESULTS: Initial axial stiffness (N/mm) was significantly ($P=0.011$) different only between the volar locking plate (427±43) and non-locking T-plate (235±69). After cyclic loading, axial stiffness was not significantly different between the volar locking plate (392±67) and intramedullary scaffold implant (405±108), but both were significantly ($P<0.001$) stiffer than the non-locking T-plate (187±53). Eccentric loading stiffness was not significantly different between the intramedullary scaffold implant (67±140) and volar locking plate (63±5), but both were significantly ($P<0.001$) stiffer than the non-locking T-plate (25±4).

CONCLUSION: Stiffness of the intramedullary scaffold implant and volar locking plate fracture model constructs was equivalent. Biomechanical testing suggests this novel intramedullary scaffold provides sufficient stability for clinical use, and further testing is warranted.