Stabilizing a TFCC injury with a functional fracture brace - a cadaveric study

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INTRODUCTION:

Ulnar sided wrist pain due to ulnocarpal instability has received increased scrutiny among researchers in the recent years, yet it remains a perplexing clinical problem to adequately address.[1,2,3] The diagnostic pathology can be primarily Triangular Fibrocartilage Complex (TFCC) tears or involvement of other structures contributing to ulnocarpal instability.[1,2] Although numerous biomechanical studies have been conducted to evaluate the function of the ulnar wrist and the function of the TFCC, there is still difficulty evaluating the results of clinical interventions beyond patient satisfaction surveys.

Restoration of the structural support provided by the TFCC is imperative to relieve symptomatology and to improve the biomechanical environment of the joint. Numerous soft tissue operations targeted towards reconstruction of the DRUJ have been described, but the mechanical stability following the majority of these procedures has been disappointing. In a cadaveric study, the application of an ulnar fracture brace (UFB) stabilized a complete disruption of the DRUJ and TFCC.[1] In a clinical study after DRUJ reconstruction, the application of a UFB significantly reduced pain with functional activities.[3] The purpose of this study is to measure the stabilizing effect of a UFB on an isolated TFCC disrupton and compare that to the TFCC surgical repair.

METHODS:

7 cadaveric upper extremities were fixed to an MTS machine with the elbows at 90°and the wrist at 0°. The volar half of the UFB (Sky Medical, Inc.) rested on (but not fastened to) a horizontal platform and the forearm rested in the volar half the UFB in pronation. A screw was placed on the dorsal side of the distal ulna and the screw was held in a universal joint attached to the MTS actuator. The MTS loaded the distal ulna in a dorsal-volar cycle with a recognizable neutral zone, Figure 1. Load-displacement curves for each examination were evaluated and neutral-zone (NZ) analysis of the load-displacement curve, as initially described by Panjabi, was used as a measure of laxity prior to support from the soft tissues, Figure 1. The first load cycles were applied with the radius held rigidly to the horizontal platform simulating the clinical examination of the DRUJ. A second load cycle was recorded with the carpal row stabilized to simulate the clinical examination of TFCC stability. Thus the contribution of the TFCC to ulnocarpal and radioulnar stability were both recorded.

METHODS (continued)

Following the completion of non-destructive testing, a standardized 2-3mm lesion of the ulnar side of the peripheral TFCC was created through an arthroscope to simulate a typical lesion that may require surgical repair. Following the creation of the tear, the series of non-destructive tests was repeated for each specimen. The dorsal half of the UFB was then applied to the arm, with a small window which allowed the distal ulnar screw to pass through the UFB, unobstructed to the MTS grip. The series of non-destructive tests was repeated following soft tissue compression in the UFB. For comparison, the TFCC lesion was surgically repaired the tests repeated.

Statistical analysis of the testing results was performed using SPSS 15.0 using values for each parameter normalized to the intact measure for the same arm.

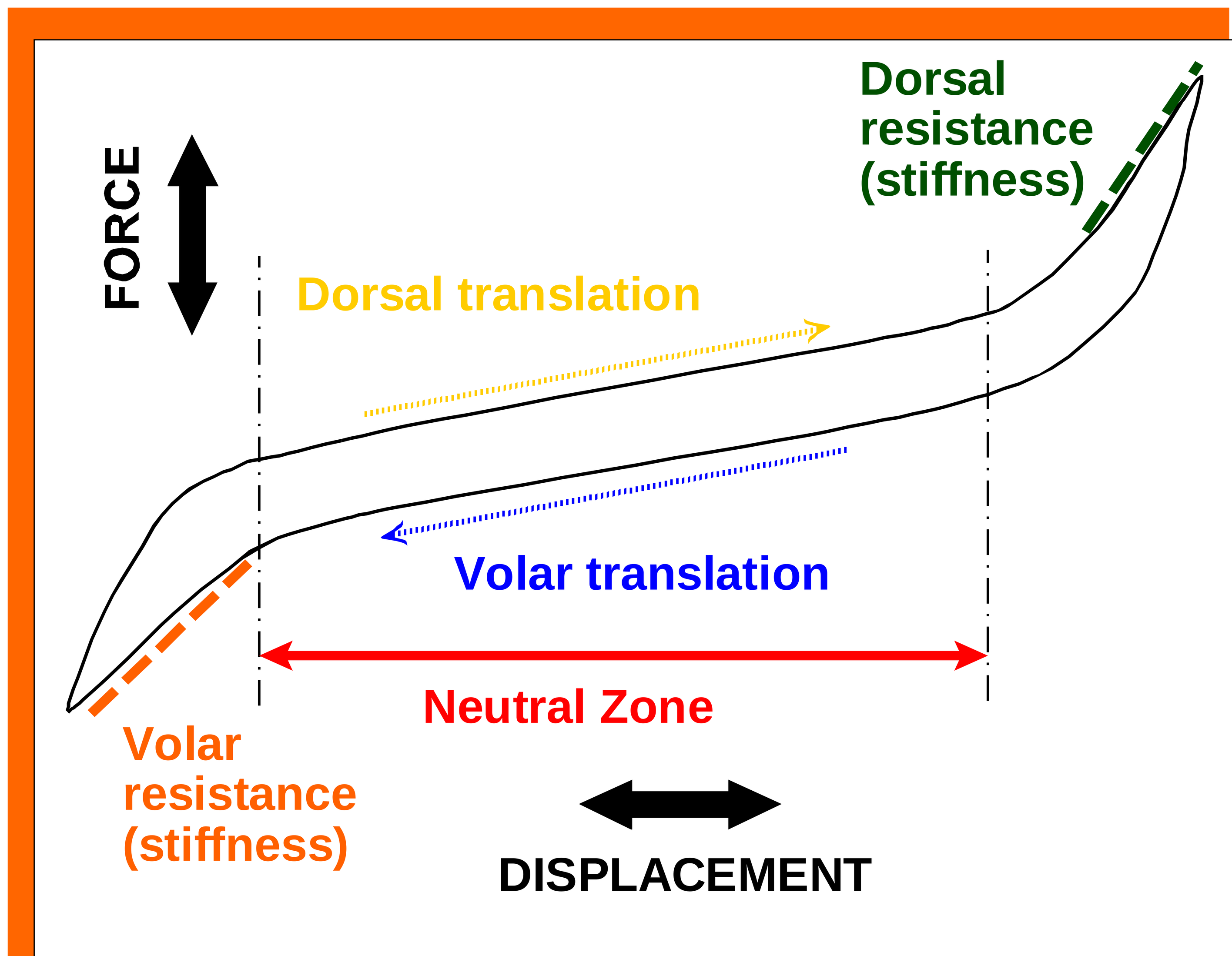

Figure 1: Estimates of stiffness and neutral zone (NZ) were made from the load-displacement curve.

RESULTS:

Dorsal resistance was defined on the load/displacement curve was the part of the cycle where the ulna was pulled dorsally while either the carpal row or distal radius was held tightly to the horizontal platform. Volar resistance was defined on the curve where the ulna was pushed in a volar direction.

The radio-ulnar resistance at each end of the NZ was only slightly effected by cutting the TFCC. The resistance to ulno-pizaform motion was significantly decreased with the TFCC cut. Soft tissue compression in the UFB significantly increased this resistance in the dorsal direction, Fig. 2, but the volar direction was not significantly increased. The repair of the DRUJ increased resistance to volar and dorsal motion , but no better than the UFB.

The neutral zone excursion (or "slack" in the ulno-carpal joints) was significantly reduced with the UFB. Neither the injury nor the UFB had much effect on the extent of movement in the DRUJ within the neutral zone, Figure 3, but the resistance to movement within the neutral zone was significantly increased with the UFB.

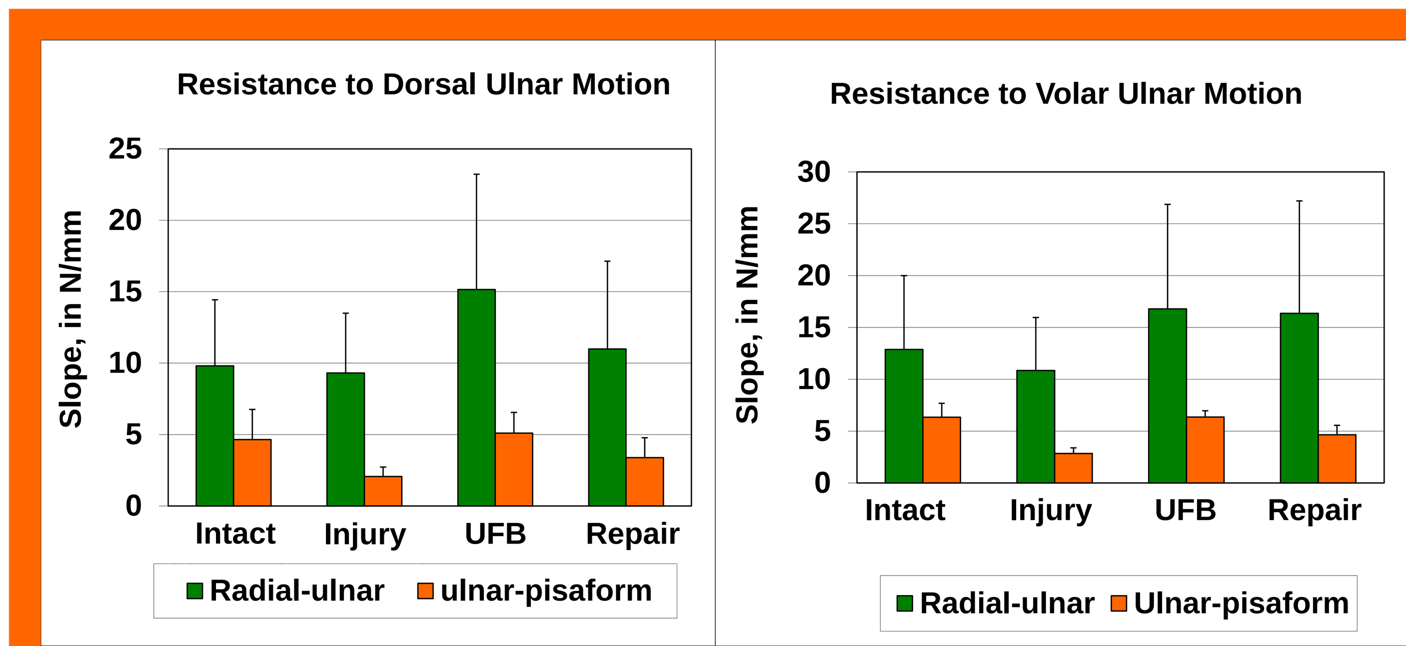

Figure 2 : stiffness after NZ with dorsal-volar translations

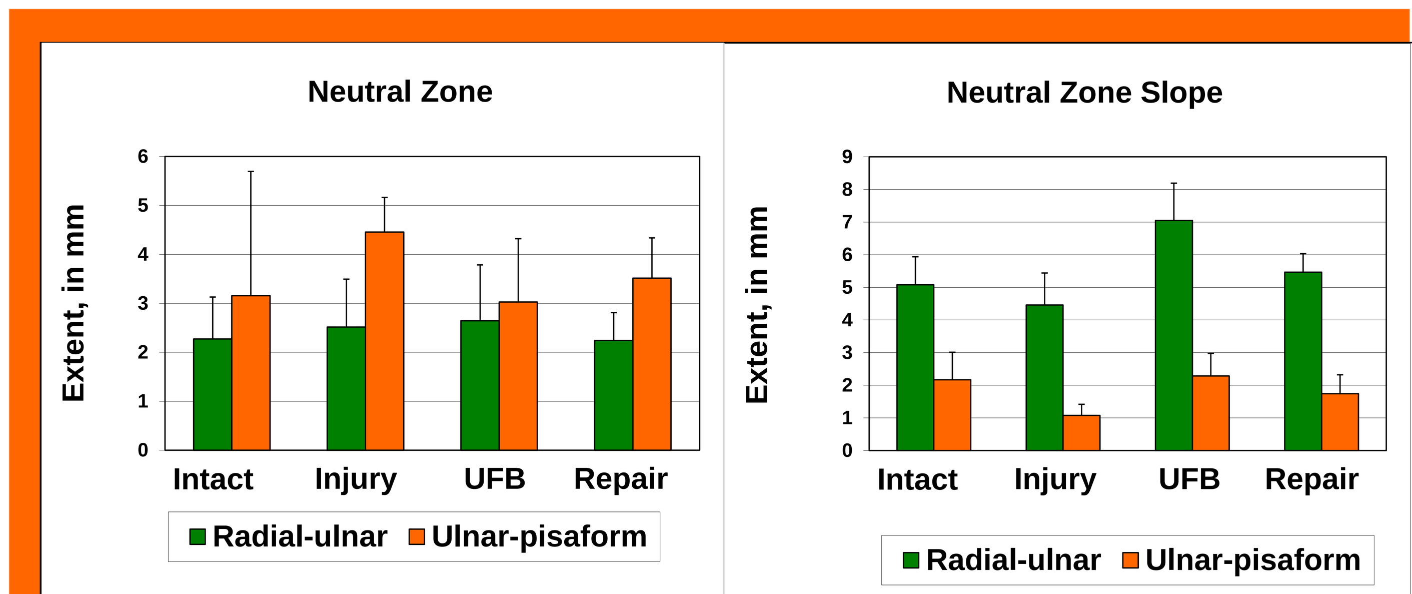

Figure 3: NZ alterations with injury, UFB and repair.

CONSLUCIONS:

1. .

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