Biomechanical Evaluation of the New Docking Plus Ulnar Collateral Ligament Reconstruction Technique compared to the Docking Technique

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Introduction: Surgical techniques for ulnar collateral ligament (UCL) reconstruction have evolved since first described by Dr. Frank Jobe in 1974. A modified reconstruction technique has been developed named the docking plus technique and the authors biomechanically compare it to the commonly performed docking technique. We hypothesize that the docking plus technique for UCL reconstruction will demonstrate greater ligament stiffness as compared to the docking technique.

Methods: Ten matched pairs of human cadavers (age 52 ± 6 years) were loaded to failure at an elbow flexion angle of 30° at a compressive rate of 14 mm/s. The specimens underwent reconstruction with an autologous ipsilateral palmaris longus graft using the docking plus or docking technique. The reconstructed specimens were then loaded to failure at the same parameters as the native ligaments.

Results: The most common mode to failure in the native UCL was mid-substance rupture and avulsion from the ulnar ligament insertion, while the docking plus group failed by suture rupture and the docking group by suture pullout and mid-substance rupture. The average stiffness of the native UCL was 21.0 ± 9.0 N/mm, docking plus technique was 11.2 ± 6.6 N/mm, and docking technique was 5.3 ± 1.5 N/mm. The mean stiffness of the docking plus reconstruction was statistically greater (p=0.004) than the docking technique. The average ultimate moment for the native UCL was 35.0 ± 14.0 N·m, docking plus technique was 20.6 ± 7.3 N·m, and docking technique was 8.6 ± 5.1 N·m. The moment across the elbow joint at failure of the docking plus reconstruction was statistically greater (p=0.002) than the docking technique.

Discussion: The docking plus technique allows greater stiffness, a higher moment to failure immediate post reconstruction, and describes a way to maintain constant graft tension during fixation resulting in a biomechanically stronger UCL reconstruction. Further research is necessary to determine the clinical significance of a UCL reconstruction graft that is biomechanically stiffer which fails at a higher moment to see if better clinical outcomes are achieved.

References: