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# Sequential Sectioning of the Ulnar Collateral Ligament of the Elbow in Cadaveric Arms with Ulnohumeral Laxity Assessed by Dynamic Ultrasonography

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**Objectives:** Injury of the ulnar collateral ligament (UCL), whether acute or chronic, is potentially career-threatening for elite overhead throwing athletes. Dynamic ultrasound (DUS) allows for rapid, cost-effective, non-invasive, and non-radiating evaluation of the UCL and elbow joint both at rest and with applied stress. The purpose of this study was to determine the amount of cadaveric elbow valgus laxity with sequential UCL sectioning using DUS. Our objective was to quantify which portions of the UCL must be injured to cause the varying levels of laxity seen clinically on DUS testing. No prior study has used DUS to quantify valgus joint laxity with sequential cadaveric UCL sectioning. It was hypothesized that the change in laxity due to release of the anterior band of the UCL would be greater than that seen when the posterior and transverse bands were cut.

**Methods:** Twelve cadaveric elbows were dissected free of skin and subcutaneous tissue by an experienced orthopaedic surgeon. Baseline DUS at rest and with applied valgus stress was then performed by an experienced ultrasonographer. Sequential sectioning of the medial elbow soft-tissue stabilizing structures was then carried out with valgus stress applied to the joint at each sectioning interval utilizing a standardized device (Telos, Marburg, Germany). First the transverse band of the UCL was released, followed by the posterior band, then the anterior bundle of the anterior band, the remaining posterior bundle of the anterior band, and finally the complete flexor pronator mass.

**Results:** Mean ulnohumeral laxity in millimeters with 95% CIs was calculated for each step of the sequence. The deltas between each step of the dissection were also calculated with means and 95% CIs. Mean baseline laxity of the unstressed ulnohumeral joint at rest was 3.2 mm (CI, 2.2-4.2); with the addition of valgus stress, mean laxity was 4.7 mm (CI, 3.5-6.0). When the transverse band was cut, ulnohumeral laxity increased to a mean of 5.5 mm (CI, 4.0-7.0). With release of the posterior band, mean laxity was 6.4 mm (CI, 4.3-8.5). When the anterior bundle of the anterior band of the UCL was cut, mean ulnohumeral laxity was 8.4 mm (CI, 5.7-11.0) and when the entire anterior band was released, mean laxity was 10.9 mm (CI, 7.8-14.0). Complete release of the flexor pronator muscle mass resulted in mean ulnohumeral laxity of 15.5 mm (CI, 12.9-18.1). The largest deltas were observed with release of the anterior bundle of the anterior band (2.0 mm; CI, 1.0-3.0), the entire anterior band (2.6 mm; CI, 1.3-3.8), and flexor pronator mass (4.6 mm; CI, 1.3-3.8). Release of the transverse and posterior bands of the UCL resulted in deltas of 0.74 mm (CI, 0.1-1.3) and 0.9 mm (CI, 0.3-1.5) respectively.

**Conclusion:** DUS allows for rapid, cost-effective, non-invasive, non-radiating evaluation of the elbow joint and UCL both at rest and with applied valgus stress. Previous studies have indicated that DUS can identify abnormalities of the UCL associated with chronic degeneration and ligamentous injury including thickening of the anterior band of the UCL as well as hypoechoic foci/calcifications. The results of the current cadaveric study suggest that different changes in clinical laxity are seen on DUS with injury of particular bands of the UCL. Early identification and localization of injury to a particular band of the UCL may allow more appropriate selection of patients who will benefit from operative treatment.



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