

The influence of thumb rotation on the clinical examination of ulnar collateral ligament injuries of the metacarpophalangeal joint – A biomechanical study in cadavers

Authors: Stephanie W. Mayer, MD; David S. Ruch, MD; Fraser J. Leversedge, MD

Background: Injuries to the ulnar collateral ligament (UCL) of the thumb metacarpophalangeal (MCP) joint are common, and treatment decisions are often made based on clinical testing. Although it is advised to test with the thumb in neutral rotation, no previous studies have evaluated the influence of thumb rotation on UCL stability during a clinical stress test in a pertinent injury model.

Hypothesis: Variations in thumb rotation during valgus stress testing of the UCL of the thumb MCP joint will influence the tension on the volar plate and therefore will influence clinical assessment of UCL stability.

Methods: A standardized protocol for stress testing of the thumb UCL in 12 fresh-frozen upper extremity specimens was used. Sequential evaluation was done for the following conditions: (1) ligament intact (LI); (2) selected division of the proper collateral ligament (pCL); (3) division of both the pCL and accessory collateral ligament (aCL+pCL). Valgus stress testing was completed with the thumb MCP joint in both 0° and 30° flexion for the following positions of thumb rotation: pronation, neutral, and supination. The degree of laxity was measured radiographically as the angle between the metacarpal and proximal phalanx shafts with a goniometer. Statistical analysis was performed on the mean of each testing group, with P-values based on Wilcoxon signed ranks test of median difference equal to zero.

Results: Although there was a trend toward stability in pronation, significant laxity is still seen when a pCL injury is present and could still be differentiated from LI. An aCL+pCL injury could be misdiagnosed as a pCL injury if tested in pronation and 0° flexion. LI tested in 30° flexion and supination could be misdiagnosed as a pCL injury, but not an aCL injury. Thumbs with a pCL injury tested in supination and 0° flexion could be misdiagnosed with an aCL+pCL injury.

Summary: Accurate clinical examination of thumb UCL stability is critical for guiding treatment. We noted increased stability in pronation consistent with observed translation of the volar plate towards the ulnar aspect of the joint. Similarly, supination caused increased laxity of the volar plate and significantly greater instability on stress testing. For all parameters tested, thumb pronation increased MCP joint stability to valgus stress and supination decreased stability such that an inaccurate diagnosis of UCL injury was possible. Both the trends and statistically significant findings from these data demonstrated potential influence on clinical decision making for surgical versus non-surgical care of UCL injuries.