Vertical overhead motion in the rehabilitation of elbow lateral collateral ligament injuries: a biomechanical study

Ranita Manocha

Supervisors: Dr. Graham JW King & Dr. James A Johnson

Background The elbow is the second most commonly dislocated major joint. Dislocation often disrupts the primary varus stabilizer of the elbow, the lateral collateral ligament (LCL). As many activities of daily living cause varus stress, LCL injury causes functional impairment. Following such injuries, therapists often prescribe exercises with the arm overhead as this is thought to enable the triceps and gravity to compress the elbow joint, improving joint stability. This effect has yet to be proven biomechanically.

Objective To quantify the effects of muscle activation and arm position on elbow stability during simulated rehabilitation exercises following LCL injury. Methodology Seven cadaveric specimens were tested in a custom simulator that permitted elbow motion via motors and actuators attached to tendons. A complete LCL injury was simulated. Specimens were examined in three arm positions (vertical overhead, vertical dependent, and varus) and two forearm positions (maximum pronation and supination) in both passive and simulated active elbow extension. An electromagnetic tracking device measured ulno-humeral kinematics. Results Following complete LCL injury, vertical overhead positioning enhanced elbow stability relative to other arm positions. Simulated active motion improved stability relative to passive motion. Conclusion There is a biomechanical basis for overhead exercises following LCL injuries. Initiating earlier range of motion in this “safe position” might decrease elbow stiffness, a common occurrence following elbow injury. Cadaveric studies can be helpful in defining optimal rehabilitation strategies.