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Title

A Cadaveric Study of Synovial Fluid Kinematics at the Scapholunate Joint

Purpose

Carpal bone kinematics have been extensively studied, however, only few studies have been done to investigate the synovial fluid kinematics in the scapholunate joint during repetitive wrist movements. We hypothesize that such repetitive wrist motions, such as radius ulnar deviation, could potentially cause the synovial fluid pressure to change accordingly. The objective of this study is to conduct an experimental study to measure synovial fluid pressure changes at the scapholunate joint of a cadaveric hand (n=1) under repetitive ulnar deviation.

Methods

A cadaveric hand with the elbow intact was mounted on a custom-made motion simulator at neutral position and the wrist was moved passively towards ulnar deviation. Intact synovial fluid was extracted from the scapholunate joint with the aid of an ultrasound. Hylan GF-20 (Synvisc, USA) was then injected until its synovial fluid cavity was completely filled. The used needle was then connected to a pressure transducer via a rigid tube primed with saline solution. The synovial fluid pressure was measured continuously when the cadaveric wrist was moved 20° towards ulnar deviation at 60 cycles per minute. Three sets of real-time data were recorded for 15sec using a Data Acquisition system. The average magnitude of synovial fluid pressure from each data set was calculated.

Results

The synovial fluid pressure change in the scapholunate joint was 179.2 Pa (± 20.9). The changes in pressure over time corresponded to the neutral to maximum ulnar deviation positions of the hand, suggesting the presence of synovial fluid pressure changes induced by the wrist movements.

Conclusion

Clinically, we postulated that the synovial fluid pressure generated during ulnar deviation may weaken the scapholunate interosseous ligament after a prolonged period of repetitive wrist motion.