Biomechanical Evaluation of Isolated Scapholunate Ligament Disruption on Dynamic Scapholunate Instability

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Introduction: Prolonged wrist immobilization is generally advocated following repair of the scapholunate (SL) interosseous ligament and inevitably leads to wrist stiffness. Treatment of dynamic instability depends on a thorough understanding of the behavior of the SL joint after SL ligament injury. The aim of this study was to evaluate the effect of isolated SL ligament sectioning on scaphoid and lunate motion in a young cadaver model.

Methods: Ten fresh frozen young male radiographically normal cadaveric wrists (range 29-44) were studied. Optoelectronic motion sensors were placed on the scaphoid, lunate, distal radius and 3rd metacarpal for tracking movement of these bones. The limbs were secured to a custom testing frame and wrist flexor and extensor tendons were loaded with 100N each to simulate tendon loads during forceful gripping. Cyclic testing of the wrist was performed in flexion/extension (FE), radial/ulnar deviation (RUD) and the dart-throwing motion (DTM) using a servohydraulic material testing machine. Kinematic data was analyzed to determine differential movement of the scaphoid and lunate in the coronal and sagittal planes of the wrist. The SL ligament was divided and after cycling the wrist through 1000 cycles of flexion/extension, measurements were repeated.

Scaphoid and lunate motion before and after ligament sectioning were compared using repeated measures ANOVA with statistical significance set at p<0.05.

Results: • Dividing the SL ligament did not result in significant changes in the rotational movements of the scaphoid in the coronal or sagittal planes during wrist FE, RUD and DTM (p≥0.207).

• During FE and DTM, the lunate tended to assume a more flexed position after dividing the SL ligament (p=0.032 and p=0.003 respectively), but motion in the coronal plane was unchanged (p≥0.351).

• The scaphoid motion in the coronal planes was not significantly changed during FE, RUD and DTM after dividing the SL ligament (p≥0.174).

• Additionally, sectioning the SL ligament did not increase the gap between the scaphoid and lunate.
**Discussion:** Isolated disruption of the SL ligament does not significantly change scaphoid and lunate rotational movements nor does it increase gapping after 1000 cycles. Further studies are required to determine if early limited wrist motion can be permitted after surgical repair of the SL ligament and protection with an interosseous screw.

**Significance:** Isolated disruption of the SL ligament does not significantly change scaphoid and lunate rotational movements nor does it increase gapping after 1000 cycles.

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