

Motion and Strength Analysis of Scapholunate Ligament Reconstruction Using a Two-Tine Staple in a Cadaver Model

Purpose

Previous studies have demonstrated benefits of two and four-tine staple fixation in scapholunate interosseous ligament (SLIL) reconstruction, including improved rotational control and avoidance of the articular surface.¹³⁻¹⁵ The purpose of this study was to compare scaphoid and lunate kinematics after SLIL fixation with traditional Kirschner wire (K-wire) fixation or two-tine staple fixation.

Methods

Eight fresh cadaver arms with normal scapholunate (SL) intervals were included and infrared motion capture was used to assess kinematics between the scaphoid and lunate as the wrists were moved through a simulated dart throwers motion. Kinematic data was recorded for each wrist in four states: SLIL intact, SLIL sectioned, K-wire fixation across SL interval and scaphocapitate joint, and with two-tine Nitinol staple fixation across SL interval. Strength of the SL staple fixation was evaluated using an axial load machine to assess load to failure of the staple construct.

Results

Range of motion of the scaphoid and lunate with the SLIL intact and SLIL sectioned were similar. K-wire fixation across the SL interval significantly decreased overall wrist range of motion as well as scaphoid and lunate motion in all planes except for scaphoid flexion. Conversely, scaphoid and lunate motion after staple fixation was similar to normal wrists except for a significant decrease in scaphoid extension. Under axial load simulating a ground level fall, three of eight arms demonstrated no failure and none of the failures were due to direct failure of the two-tine staple.

Conclusions

This study demonstrates an alternate technique for treatment of acute SLIL injuries using two-tine staple fixation across the SL interval which is effective in restoring and more closely maintains physiologic motion of the scaphoid and lunate compared to K-wire fixation.