**Introduction:** Injuries to the wrist are difficult to diagnose and treatment can be disappointing. A frequent site of injury is in the region of the scaphoid and lunate. While the ligamentous anatomy in this area of the wrist has been described, the functional role of the ligamentous stabilizers remains incompletely understood. This biomechanical study evaluated the function of the scapholunate interosseous ligament (SLIL), the radioscaphocapitate ligament (RSC) and the scaphotrapeziotrapezoid ligament (STT) in stabilizing the scaphoid and lunate. The hypothesis of this study is that sectioning a particular ligament or combination of ligaments creates a change in the position of the scaphoid and lunate unique to that ligament deficit at specific wrist positions.

**Methods:** Sixteen fresh frozen cadaver forearms were tested. Each specimen was placed in a wrist joint motion simulator, which produces repetitive cyclic flexion/extension motion of the wrist (30° extension to 50° flexion) and wrist radial/ulnar deviation (10° radial deviation to 20° ulnar deviation) by applying physiologic forces to the wrist flexors and extensors. The motions of the scaphoid, lunate, third metacarpal and distal radius were continuously measured with Fastrak electromagnetic sensors. The motion of the third metacarpal bone was used to indicate global wrist motion. Motion data were collected and analyzed in the intact specimen, and after cutting the SLIL, RSC, and STT ligaments in two different sequences. In 8 forearms, the sequence was: SLIL, STT, and RSC. In the other 8 arms, the sequence was: RSC, SLIL, and STT. To simulate a patient's continued use of an injured wrist, each wrist was cyclically moved 1000 cycles after all ligaments were sectioned. Differences in motion were analyzed using a repeated measures 1 way ANOVA (Duncan's method, p<.05). Three dimensional animated models were created, based upon serial CT scans to aid in analyzing the data. The minimum distance between the scaphoid and lunate (excluding the cartilage) was calculated.

**Results:** Sectioning the RSC ligament alone did not change the kinematics of the scaphoid or lunate (fig 1) for either wrist motion. However, sectioning the SLIL alone did produce significant changes in the motion of the scaphoid and lunate in wrist flexion (fig 2). In wrist radial/ulnar deviation, only after both the SLIL and STT were sectioned, were significant changes in scaphoid and lunate motion observed (fig 3). Sectioning the RSC and SLIL resulted in different alterations in carpal bone motion (fig 1). Sectioning all ligaments plus 1000 cycles of wrist flexion/extension resulted in further significant changes in scaphoid and lunate motion during both wrist flexion/extension and radial/ulnar deviation.

**Discussion:** This study demonstrates that clinical rupture of only the RSC ligament will not likely be detectable clinically, and at least in the short term, will have minimal effect on carpal motion. Sectioning the SLIL alone does cause changes in carpal motion. This is best detected during wrist flexion and extension as an increase in scaphoid ulnar deviation and as an increase in lunate extension. This suggests that the SLIL is a primary stabilizer of the scaphoid and lunate.

Limitations to this study include the disadvantages similar to all cadaver studies. Additionally, loading by the simulator is an estimation of the "in vivo" loading condition.

Clinical applications from this study include: 1) continued patient use after ligament injury can bring about further carpal bone positional changes that represent additional damage to the wrist; 2) injury to a specific ligament or combination of ligaments produces changes to scaphoid and lunate motion that are unique to that ligament injury and wrist position.

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