Introduction: Radioscapholunate arthrodesis is an accepted surgical treatment for isolated radiocarpal arthritis. A countersunk dorsal circular plate (Xpode, Trimed, Inc., Valencia, CA) offers some advantages over alternative fixation methods (3.5 mm oblique t-plate, DePuy Orthopedics Inc., Warsaw, IN). Biomechanical support of this method is lacking.

Materials and Methods: Twenty matched fresh frozen cadaver wrists were prepared for arthrodesis and the circular plates and t-plates applied in alternating extremities. The radius was rigidly held in polyvinyl chloride (PVC) piping using polymethyl methacrylate cement. A special C-clamp was placed distally onto the scaphoid and lunate. The construct was mounted onto a biaxial servo-hydraulic materials testing equipment (Instron Corp., Canton, MA) so that translational forces would be induced parallel to the radio-carpal joint. A 1mm palmar and dorsal translation relative to the fixed radial shaft was applied for 40 cycles to mimic flexion and extension, respectively. The construct was then loaded to failure in a dorsal direction.

Results: Nine wrists fixed with the circular plate and nine wrists fixed with the t-plate were analyzed. There was no statistical difference observed between the two plates (p>0.5) in the force required to translate the carpal bones in either flexion or extension. There was no significant difference between the circular plate and the t-plate in initial stiffness (p>0.2). On average, the circular plate load at failure was 1.21 times greater than the load at failure for the t-plate (p<0.05).

Discussion: When damage to the wrist joint is confined to the radiocarpal joint, limited radiosapholunate fusion can successfully alleviate pain while preserving some wrist motion. Many techniques are available to achieve this secure fixation12,13. While dorsal t-plate fixation has been shown to be an effective tool for radiosapholunate arthrodesis, the literature is full of reports of dorsally placed hardware having caused significant problems when used in other applications (i.e. fixation of a distal radius fracture)5,15,17. We explored the idea of using a dorsal countersunk circular plate to achieve secure fixation while maintaining a low profile. The goal of this study was to create a model of the fixation necessary to achieve radiosapholunate fusion and to compare how securely the t-plate and circular plate systems were able to hold the scaphoid and lunate bones in relation to the distal radius. Our results demonstrated that there was no significant difference in the amount of force required to cause this carpal bone translation nor the amount of initial stiffness. A significantly higher load to failure was noted, which may imply a slight advantage with the circular plate system compared to the t-plate system in achieving secure fixation for radiosapholunate arthrodesis. With a relatively high failure rate reported for radiosapholunate arthrodesis1,13, proper technique must be emphasized. This biomechanical study supports the use of circular plates as a viable option if radiosapholunate arthrodesis is to be performed. A theoretically lower complication rate may make the circular plate an attractive alternative for this application.