

# Effects of Incremental Scaphoid Proximal Pole Excision on Carpal Kinematics

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## Abstract:

Nonunion of scaphoid proximal pole fractures is common, and current treatment using bone grafts is complex, with prolonged recovery. Proximal pole excision is a simpler alternative with faster recovery; however, concerns about possible aberrant arthrokinematics have limited its adoption. We therefore examined the effects of incremental scaphoid proximal pole excision on carpal sagittal kinematics.

The scaphoid, lunate, capitate, and metacarpals were tracked using motion capture as a robot moved the hand of three human cadavers between wrist flexion and extension angles of 40° at 5°/s. Preparations included sectioning the forearm and digits, removing selected soft tissue, mounting in a testbed, dorsally inserting bone pins with attached markers into the carpals, and applying a tonic wrist load. Data were collected at baseline, after cutting the scapholunate ligament, and after four excisions of approximately 2mm from the proximal pole. Scapholunate, capitulunate, and wrist angles were computed using Cardan angles. Effects of excision were assessed at 0, 15°, and 30° of wrist flexion and extension using Friedman's test ( $\alpha=0.1$ ).

Significant increases in scapholunate and capitulunate angles from baseline were observed at most wrist angles upon the second excision. Furthermore, at most wrist angles, scapholunate and capitulunate angles upon the fourth excision were significantly larger than upon the first. The magnitudes of the increases varied greatly between hands, however.

The findings suggest that up to 2mm of the scaphoid proximal pole can be excised without notably affecting carpal kinematics. Proximal pole excision may thus be a viable alternative to bone grafting under these conditions.

**Conflict of Interest:** RB is president of OrthoMechanica