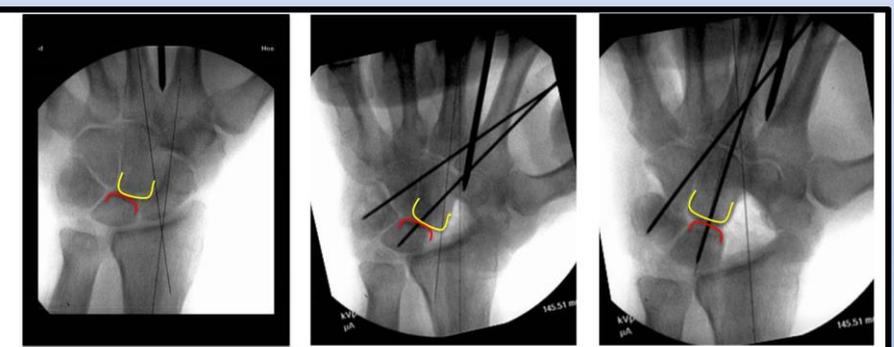


# The Effect of Capitate Position on Coronal-Plane Wrist Motion After Simulated Four-Corner Fusion

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## OBJECTIVES

Ferreres et al. hypothesized that over-reduction of the capitate on the lunate during four-corner fusion would stretch the extrinsic volar wrist ligaments, resulting in post-operative radial deviation posture of the wrist (1). The objective of this study was to examine the effect of altering the capito-lunate relationship on coronal-plane wrist motion after simulated scaphoidectomy and 4CF. We hypothesized that wrist resting posture and radial-ulnar motion would be altered following simulated fusion in an over-reduced position when compared to normal wrists.



Pre-operative Position    Method 1: Anatomic Position    Method 2: Capitate Covered

Figure 2: Example of pre-operative position and two methods of 4CF employed in each wrist



Figure 1: Example of forearm in pre-assembled jig

## MATERIALS AND METHODS

- Six human cadaveric forearms were disarticulated at the elbow and mounted on a custom jig as described by Pollock and colleagues (2) (Fig1).
- Weights were placed on tendons to simulate radial deviation (FCR and ECRL/ECRB) and ulnar deviation (FCU and ECU).
- Scaphoidectomy was performed and 2 variations of 4CF (anatomic position and the “capitate covered” position) were studied in random order (Fig. 2).
- The baseline position of the wrist was recorded with no load applied, followed by sequential loads of 44N, 89N and 125N split between the flexor and extensor tendons.
- Range of motion (ROM) was compared using one-way ANOVA and Bonferroni correction for multiple comparisons.

Figure 3: Baseline Wrist Position (no load applied)

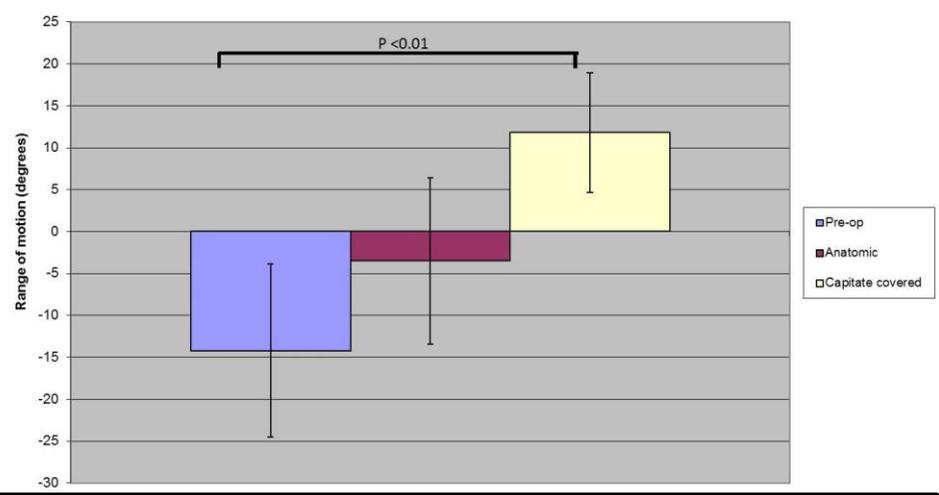


Figure 3: Pair wise comparisons with Bonferroni correction show sig difference of Capitate covered group from Pre-operative group.

Figure 4: Wrist Radial Deviation with Applied Loads

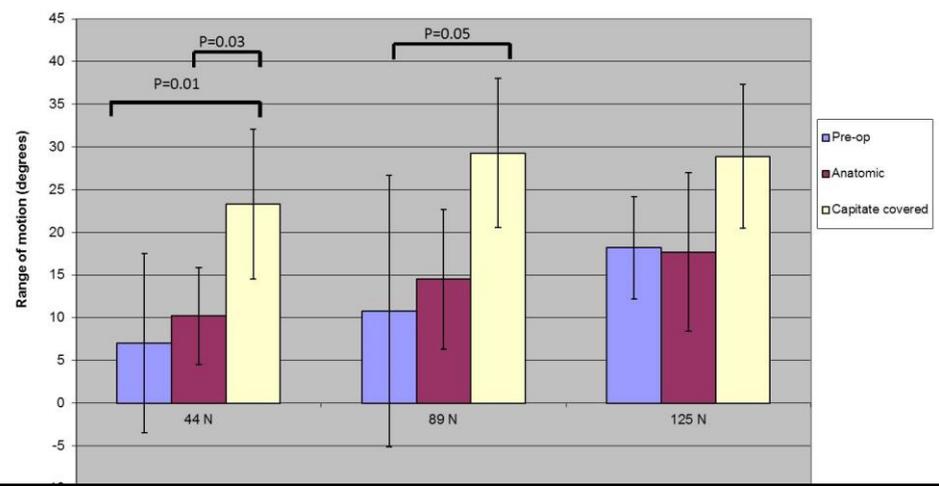


Figure 4: Pair wise comparisons with Bonferroni correction show sig differences as noted.

## RESULTS

- We found that in the baseline resting position (no radial or ulnar deviation) the capitate covered position resulted in a significant radial shift of approximately 25 degrees (Figure 3).
- Under 44N and 89N radial load, the capitate covered position had significantly greater radial deviation than the pre-operative radial deviation at the same radial load (Figure 4).
- Wrists fused in the “anatomic” position did not differ significantly from the pre-operative wrists in posture or range of motion.

## CONCLUSIONS

We have demonstrated a significant difference in resting wrist posture as well as a radial shift in range of motion when the capitate is over-reduced in the coronal plane. We recommend leaving the capitate in its anatomic position with respect to the lunate. Future investigations may identify if capitate position on the lunate correlates with load transfer, radiolunate degenerative disease, patient satisfaction, union rate or clinical range of motion.

## REFERENCES

1. Ferreres A, Garcia-Elias M, Plaza R. Long-term results of lunocapitate arthrodesis with scaphoid excision for SLAC and SNAC wrists. *J Hand Surg Eur Vol.* 2009;34(5):603-608
2. Pollock PJ, Sieg RN, Baechler MF, et al. Radiographic evaluation of the modified brunelli technique versus the blatt capsulodesis for scapholunate dissociation in a cadaver model. *J Hand Surg Am.* 2010;35(10):1589-1598.