



# Ulnar Styloid Fractures: Is Their Neglect Truly Benign?

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## Introduction

Ulnar styloid fractures accompany 44-65% of distal radius fractures and are typically treated non-operatively. However, fractures involving the base of the styloid may disrupt the foveal insertion of the deep portion of the distal radioulnar ligaments (DRUL). This component of the triangular fibrocartilage complex (TFCC) is a major stabilizer of the distal radioulnar joint (DRUJ). **Thus, we hypothesize that ulnar styloid base fractures involving the ulnar fovea in a cadaveric model destabilize the DRUJ. Additionally, we predict that DRUJ stability can be restored with reduction and fixation of the styloid fragment.**

## Methods

DRUJ stability in pronosupination was evaluated in six fresh-frozen upper extremities (4 females) aged 52-68 years (Mean: 58.7) using a custom, fabricated jig, which allowed free rotation of the radius around the fixed ulna (Figure 1). Optical motion capture was used to record rotation and translation of the radius with respect to the ulna. Marker clusters were rigidly secured to the distal radius and ulna via threaded K-wires. Each specimen was subjected to 4 Nm of torque in both supination and pronation under four conditions: Intact, ulnar styloid osteotomy, ulnar styloid fixation, and DRUL transection. The styloid osteotomy was performed with a sagittal saw and osteotome under fluoroscopy and freed

the foveal insertion of the DRUL. Styloid fixation was performed with a headless compression screw under fluoroscopy to confirm anatomic alignment. Volar and dorsal DRUL transection was performed with a scalpel under direct visualization. Group differences were compared using a one-way repeated-measures ANOVA and Dunnett's multiple comparison post hoc tests.

Figure 1



Figure 1 illustrates a cadaveric specimen in the experimental jig undergoing 4 Nm of pronation torque. Note the LED markers attached to the radius, ulna, humerus, jig base, and right jig tower.

## Results

Ulnar styloid osteotomy and DRUL disruption significantly increased pronation of the radius compared to the intact condition by averages of 10.0 degrees and 21.0 degrees, respectively. In contrast, only DRUL disruption significantly increased supination of the radius compared to the native condition, by an average of 19.9 degrees. Pronation and supination after headless screw fixation were comparable to those seen after osteotomy. There were no observable differences in the translation of the radius for any of the conditions.

## Conclusion

Ulnar styloid fracture treatment is controversial. **Our study confirms that ulnar styloid fractures involving the fovea cause consistent instability in the DRUJ in pronation.** Based on these results we conclude that ulnar styloid base fractures involving the fovea should be reduced and fixed to return stability to the DRUJ. **In our experiment, fixation with a headless compression screw achieved anatomic reduction; however, it did not acutely return stability to the DRUJ as defined by limitation of pronation under 4 Nm of torque.** While headless compression screws may adequately fixate these fractures in conjunction with forearm immobilization until healing, this will need to be confirmed.

Table I

Wrist Condition:	Intact	Osteotomy	Fixed	DRUL Disruption
<b>Pronation (degrees)</b>	<b>97.8 ± 16.6</b>	<b>107.8 ± 20.3*</b>	<b>107.6 ± 19.4*</b>	<b>118.8 ± 27.4*</b>
Mean Difference		-10.0	-9.8	-21.0
95% CI of Difference		-16.7 to -3.3	-15.2 to -4.3	-40.0 to -2.0
<b>Supination (degrees)</b>	<b>135.5 ± 30.6</b>	<b>143.4 ± 30.3</b>	<b>143.7 ± 31.4</b>	<b>155.4 ± 36.5*</b>
Mean Difference		-7.9	-8.2	-19.9
95% CI of Difference		-18.0 to 2.3	-17.2 to 0.7	-32.5 to -7.4

Table I outlines the mean range of motion data for each condition averaged between all six cadavers. Each experimental condition is compared to the intact condition to determine the mean difference. Osteotomy and DRUL disruption increased pronation progressively; fixation did not restore stability. "\*" indicates statistical significance when compared to the intact condition. "CI" stands for "Confidence Interval."