The Effects of Ulnar Styloid Fractures on Patients Sustaining Distal Radius Fractures

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Purpose To determine if ulnar styloid fractures (USF) affect clinical outcome following distal radius fracture (DRF) in adults under 65 years of age.

Methods This study involved 312 patients (aged 18−64) with surgically and nonsurgically treated DRFs. Patients were followed prospectively at baseline and 3, 6, and 12 months. The primary outcome was the Patient-Rated Wrist Evaluation (PRWE), and secondary outcomes were range of motion and grip strength. The USFs were classified by location (tip, middle, and base) and union status.

Results There were 170 patients with isolated DRFs and 142 with associated USF (64 tip, 32 middle, and 46 base fractures). The mean age of the entire cohort was 48 years with 218 (70%) women. All USFs were treated nonoperatively. There was a trend of higher PRWE scores in DRFs associated with USFs compared to isolated DRFs throughout the study. Associated ulnar styloid base fractures had higher but clinically insignificant PRWE scores than isolated DRFs at 6 and 12 months. Patients with an associated USF had a slower recovery of wrist flexion and grip strength compared to isolated DRF, but values were comparable at 12 months. United USFs and nonunited USFs had similar PRWE scores at all time points.

Conclusions Adults under 65 years old with DRFs and associated USFs initially have greater pain and disability than those with isolated DRFs; however, this difference dissipated over time and was not significant at one year. No long-term differences in measured impairments were observed, but the presence of an associated USF resulted in a slower recovery of grip strength and wrist flexion. Presence of a USF nonunion did not significantly affect outcomes.

Type of study/level of evidence Prognostic II.

Key words Distal radius fracture, functional outcome, patient-related wrist evaluation, ulnar styloid fracture.

ULNAR STYLOID FRACTURES (USFS) are commonly associated with fractures of the distal radius. Although there are numerous reports looking at distal radius alignment as a determinant of outcome,[1−27] there have been few reports on the contribution of USFs to patient-reported pain and disability following this injury.[28−32] Previous studies have demonstrated that the ulnar styloid is an important attachment site for components of the triangular fibrocartilage complex, with the dorsal and volar radioulnar ligaments being major stabilizers of the distal radioulnar joint (DRUJ) and attaching to the fovea and the base of the ulnar styloid.[33−37] This may have implications on DRUJ stability, and fractures through the base of the ulnar styloid and peripheral tears of the TFCC may increase the risk of DRUJ instability.[28,38] Despite a rationale that suggests ulnar styloid fracture may worsen prognosis for full

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TABLE 1. Patient Demographics

	USF (n = 142)	No USF (n = 170)	*P* Value
Age (y)	48 ± 14 (18–64)	49 ± 11 (22–64)	.96
Males (no. [%])	43 (30%)	51 (30%)	.88
Dominant hand injured (no. [%])	73 (52%)	71 (43%)	.78
Workers' compensation claim (no. [%])	9 (43%)	12 (57%)	.59
AO classification (no. [%])			.91
A	94 (45%)	113 (55%)	
B	11 (48%)	12 (52%)	
C	37 (49%)	39 (51%)	
Surgical treatment for DRF	57 (38%)	44 (26%)	.10

functional recovery, most studies report a negligible impact on outcomes.[38–42]

Previous studies may not have identified an association between USF and outcomes because they may have been underpowered (Kim, n = 70; Zenke, n = 118),[31,32,43] and possibly because the previous studies included elderly patients in whom it has been shown that radiographic parameters do not relate to outcomes (ie, age range: Kim 17-88, Souer 18-83, Zenke 25-94).[27] Additionally, if a less responsive outcome measure is used, such as the Disabilities of the Arm, Shoulder, and Hand (DASH) score, differences may not be detected when one exists.[44]

The purpose of this study was to determine whether associated ulnar styloid fractures had a clinical effect on patients less than 65 years old with either surgically or non–surgically treated DRFs. In this study the Patient-Rated Wrist Evaluation (PRWE) score was used to assess outcome, as it has been shown to be highly responsive in this population.[44,45] In addition, we attempt to reduce bias by including participants treated surgically and nonsurgically. By focusing on a population less than 65 years old, we could evaluate the role of ulnar styloid fractures in a population in whom radiographic parameters have been shown to influence outcomes.[27] Our primary outcome was the PRWE at one year. Secondary outcomes included range of motion, grip strength, and their association with radiographic variables such as union and location of the USF.

We hypothesized that patients with associated USFs would have longer recovery periods and higher reported pain and disability.

MATERIALS AND METHODS

This was a retrospective observational study of prospectively collected data involving 312 patients aged 18 to 64 years old who presented to a single tertiary care center between 2004 to 2008 with a distal radius fracture under the care of 1 of 9 fellowship-trained hand surgeons. Only patients enrolled in the prospective database with minimum one-year follow-up were included. Participants provided informed consent to have their information entered in the database. Ethics approval was obtained from the ethics board to use the data for this study. The follow-up protocol involved clinic visits and outcome measurements at 3, 6, and 12 months.

In this cohort of 312 patients, 170 had isolated DRFs and 142 had associated USFs. The patient characteristics, fracture type, and DRF treatment for those with and without USF were similar (Table 1). Twenty-one patients were on Workers' Compensation: 9 in the USF group and 12 in the isolated DRF group.

At the initial visit, all patient demographic data were obtained. At each visit, patients were asked to complete the PRWE. This questionnaire was used as it evaluates both pain and disability. In addition, a trained research assistant measured wrist range of motion using the N-K Computerized Hand Evaluation System (NK Biotechnical Corporation, Minneapolis, MN) and determined the grip strength (NK Digit grip dynamometer) at 3, 6, and 12 months post injury.

Radiographs were reviewed by 2 fellowship-trained hand surgeons. Dorsal/volar angulation, radial inclination, articular involvement, presence and location of ulnar styloid fracture (tip, middle, or base), and type of distal radius fracture (based on AO classification) were noted. Patients with associated ulnar head fractures were excluded from this study. We defined an acceptable reduction of the distal radius fracture as $> 15°$ radial inclination, $< 10°$ dorsal tilt, and ulnar variance $< +3$ mm.[27]

Outcomes were compared between patients with and without an associated USF. For those with an