

Radiographic Characteristics of Volar Barton Distal Radius Fractures*Michael Daly, MD, MSc¹; Taylor Horst, MD²; Chaitanya Mudgal, MD³;**¹Massachusetts General Hospital, Harvard Combined Orthopaedics Residency Program, Boston, Massachusetts, USA;**²Massachusetts General Hospital, Division of Hand and Upper Extremity, Boston, Massachusetts, USA;**³Massachusetts General Hospital Boston, Massachusetts, USA*

Purpose: This study has three purposes: (1) to critically analyze fracture geometry on preoperative CT scans of surgically treated volar Barton distal radius fractures, (2) to determine the frequency of the presence of a dorsal cortical break (fracture line extending through the dorsal cortex of the metaphysis of the distal radius), and (3) to assess whether the presence of a dorsal cortical break is associated with age or gender.

Methods: We retrospectively reviewed the medical records of all patients with distal radius fracture treated surgically by a single fellowship-trained orthopaedic hand surgeon between January 2007 and January 2015 at a large, academic tertiary care center. Patients 18 years of age and older with a volar Barton distal radius fracture (OTA 23-B3 or OTA 23 type C) were included if they had a preoperative CT scan and underwent surgery (CPT codes 25608 or 25609). We examined CT scans and recorded the number of fracture fragments (including the shaft fragment), characteristics of the volar piece (presence of a longitudinal split, % involvement of the scaphoid and/or lunate facets as measured from the volar articular rim), presence of central articular depression, and whether there was a dorsal cortical break and, if present, the location of the dorsal cortical break as measured from the dorsal articular rim (Fig. 1). Our main outcome measure was dorsal cortical break versus no dorsal cortical break; our main predictor was age. We analyzed baseline variables using nonparametric bivariate statistics for unadjusted comparisons.

Results: Of 194 patients treated operatively by a single surgeon over an 8-year period, we identified 26 adult patients (mean age, 49 years; 69% female) who sustained a volar Barton distal radius fracture and had a preoperative CT scan available for analysis. All 26 (100%) were treated with precontoured volar plates; 1 patient was treated with both a precontoured volar plate and a supplemental radial-sided plate. Including the shaft as a fragment, 20 (76%) had 3 or more discrete fracture fragments. When analyzing radiographic characteristics of the volar fracture fragment by itself, we found 13 (50%) had a longitudinal split. The main fracture line of the volar piece starts within the radiocarpal joint, involving an average of 44.2% of the scaphoid fossa (Fig. 1A) and 12.8% of the lunate fossa (Fig. 1B) as measured from the volar rim of the distal radius. The main fracture line of the volar piece extends proximally, exiting an average of 20.7 mm from the volar articular margin of the distal radius (Fig. 1C). On sagittal CT reconstructions, depression of the central articular surface was evident in 18 patients (69%) (Fig. 1D). 19 fractures (73%) had a dorsal cortical break. Of those with a dorsal cortical break, the fracture line exited the dorsal metaphyseal cortex an average of 10.4 mm from the dorsal articular rim of the distal radius (Fig. 1E). Comparing those with and without a dorsal cortical break, there was no difference in age (51 ± 20 years versus 42 ± 20 years, odds ratio [OR] 1.02 [95% CI 0.98-1.07],

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.

$P = 0.29$, Wilcoxon rank sum test) or gender (68% vs 57% female, OR 0.61 [95% CI: 0.07-5.67], $P = 0.66$, Fisher's exact test).

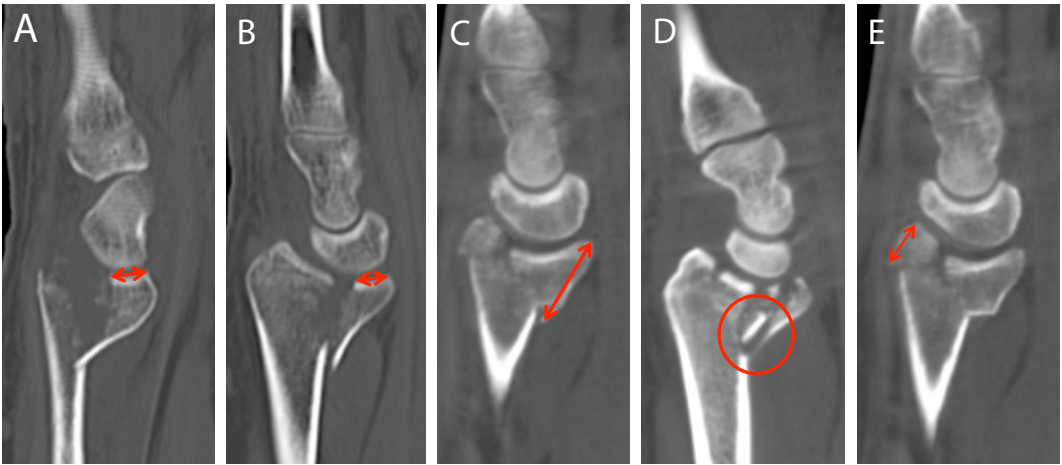


Figure 1. Radiographic characteristics of volar Barton distal radius fractures on preoperative CT scans. The main fracture line of the volar piece starts within the radiocarpal joint, involving variable amounts of the scaphoid fossa (A) and/or lunate fossa (B) as measured from the volar articular rim of the distal radius. (C) Maximal length of the main volar fragment. (D) Articular depression. (E) Dorsal cortical break — when present, we measured the distance from the dorsal cortical break to the dorsal articular rim of the distal radius.

Conclusion: The majority (73%) of patients with surgically treated volar Barton distal radius fractures in our series had a dorsal cortical break, which occurred an average of 10.4 mm from the dorsal articular rim of the distal radius. The presence of a dorsal cortical break was not statistically associated with age or gender, suggesting these fracture patterns may not be associated with osteoporosis as previously postulated by Harness et al in 2004. Our findings expand and refine our understanding of the radiographic pathoanatomy of volar Barton fractures of the distal radius, and suggest further study is warranted.