

**Soft-Tissue Attachments Predict Intra-Articular Proximal Ulna Fracture Geometry**

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**Purpose:** Comminuted intra-articular proximal ulna fractures are difficult to classify and treat. Similar to other joints, the proximal ulna has a unique ligamentous and tendinous anatomy, which may predict fracture line propagation. The purpose of this study was to evaluate how intra-articular fractures of the proximal ulna relate to soft-tissue attachments to define fracture geometry relevant for preoperative planning.

**Methods:** This retrospective cohort study evaluated preoperative CT scans from 140 patients with complex proximal ulna fractures. Median age was 57 years (interquartile range 27) and 60% (84/140) were female. For evaluation, the proximal ulna articular surface was divided into 5 zones based on soft-tissue attachments—the olecranon process (triceps tendon), the lateral and medial intermediate facets (strong capsular insertions of the medial and lateral ulnar collateral), the lesser sigmoid notch (annular ligament and lateral ulnar collateral ligament), and the coronoid process (medial ulnar collateral ligament).

**Results:** Each zone was involved at differing rates: the olecranon process (94/140, 67%), the lateral (78/140, 56%) and medial intermediate facets (83/140, 59%), the lesser sigmoid notch (42/140, 30%), and the coronoid process (53/140, 38%). All fracture lines occurred between zones (ie, between soft-tissue attachments). The most common fracture pattern was the comminution of the olecranon process, lateral, and medial intermediate facets (44/140, 31%). Dislocated elbows on average involved significantly more zones than the subluxation and normal alignment groups (4.22 compared to 3.82 and 3.14 zones, respectively). Fractures with concomitant radial head fracture on average involved significantly more zones than fractures without a radial head fracture (4.29 compared to 3.22 zones).

**Conclusion:** In our study, we found that comminuted intra-articular fractures have fracture lines that occur between strong soft-tissue attachments at the elbow. This results in up to 5 key articular fragments. Both elbow dislocations and concomitant radial head fractures were linked with greater disruption of the proximal ulna attachments and further intra-articular comminution.