

# The Surgical Treatment of Uni- or Bi-columnar Distal Humerus Fracture With Concomitant Capitellar Shear Fragment Utilizing Olecranon Osteotomy with Lateral Release

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**INTRODUCTION:** Coronal shear capitellum fractures are a small but important subset of injuries that can occur in isolation or conjunction with more complex distal humerus fracture patterns. While an olecranon osteotomy (OO) is commonly utilized to expose the distal humerus during open reduction internal fixation (ORIF), it frequently does not provide adequate visualization of the anterior distal humerus. The aims of this study were to 1) quantify the exposure of the distal humerus with an isolated OO alone and with the addition of a lateral ulnar collateral ligament release (LR) in a cadaveric model, and 2) determine clinical outcomes for patients undergoing OO+LR during ORIF of distal humerus fractures with a capitellar shear component.

**METHODS:** A standard posterior approach with OO was performed in 10 fresh-frozen cadaveric elbows. The extent of visible articular surface was marked with blue ink. LR was then performed, and the additional exposure of the articular surface was marked with red ink. The specimens were then skeletonized, and using a 3D scanner, the surface area exposed was quantified (Figure 1). For the clinical arm of the study, 71 patients with distal humerus fractures between 2015-2023 were identified from our database. Three patients with isolated coronal shear capitellar fractures (Type B3) were excluded. Among 68 remaining patients, 12 patients (17.6%) had uni- or bi-columnar distal humerus fracture with the concomitant capitellar shear fragment. All cases utilized the olecranon osteotomy and lateral ligament release to visualize the articular surface. The satisfactory fracture reduction was defined by 1) restoration of medial and lateral column, 2) recreation of the anatomic bow with the anterior humeral cortex bisecting the one-third of central capitellum, and 3) less than 2 mm articular step-off. Outcomes were assessed, including the range of motion (ROM), quality of fracture reduction, complications, revision surgery, and outcome scores, including Quick Disabilities of the Arm, Shoulder, and Hand Score (qDASH) and Mayo Elbow Performance Score (MEPS).

**RESULTS:**

Across the 10 cadaveric specimens, the posterior 50% of the total articular surface was exposed with the OO alone, and 100% was exposed after OO+LUCL release. 63% of the trochlea was exposed with OO alone, and 100% with OO+LR. 20% of the capitellum was exposed after OO alone, and 100% was exposed with OO+LR (Figure 2). There were 12 patients with a mean age of 51 years (range, 27-69) and a mean follow-up duration of 19 months (range, 12-35) in the clinical study cohort. Fractures were classified as AO/ASIF type B1 in 4 patients and type C3 in 8 patients. Four patients required perpendicular plating, and 8 required a three-plate construct composed of parallel plates with posterolateral plating. All elbows were well-reduced on post-operative radiographs. The average ROM was 125° arc of flexion-extension. The mean quick DASH score was 20 (range, 9-35), and the mean MEPS was 81 (range, 70-85). Three patients underwent a contracture release after the index procedure due to heterotopic ossification and limited motion. No patients demonstrated joint instability or avascular necrosis postoperatively.

**DISCUSSION AND CONCLUSION:**

Coronal shear capitellum fractures can be difficult to visualize using a standard posterior approach and OO alone in the setting of complex distal humerus fractures. In a cadaveric model, we found the addition of a lateral ligament release to an olecranon osteotomy grants complete access to the distal humerus articular surface to facilitate anatomic reduction, whereas access to the capitellum is limited with OO alone. The LR provides visualization of the anterior articular surface and allows for an anatomic reduction of the fracture fragments. Patients with distal humerus and capitellar shear fractures managed with OO+LR had good function in the short-to-mid-term period. Devascularization with the fracture fragments and lateral instability are potential concerns. Future studies will investigate long-term outcomes for OO+LR and directly compare clinical outcomes with OO vs. OO+LR.

