Improving the Exposure of the Olecranon Osteotomy by Lateral Collateral Ligament Release

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INTRODUCTION:

Intraarticular distal humerus fractures with anterior articular involvement present a challenge to the upper extremity surgeon. Traditional approaches to the elbow, such as the olecranon osteotomy, provide limited exposure of the anterior articular surface and make visualization and fixation of anterior trochlear and/or capitellar fragments difficult, if not impossible. Nonetheless, anatomic reduction and stable fixation of these anterior fragments are essential for restoration of maximal elbow motion. A recently published technique developed at our institution proposed releasing the lateral ulnar collateral ligament (LUCL) from its humeral origin following olecranon osteotomy to improve exposure of the anterior joint surface. The aim of the present study was to quantify the amount of additional articular surface visible following this technique.

METHODS:

An olecranon osteotomy approach to the elbow was performed in 10 human fresh frozen cadavers. The elbow was maximally flexed and the margin of visible distal humerus articular surface was marked with ink (Figure 1). The LUCL was then released from its humeral origin, enabling the elbow joint to be booked open (Figure 2), and the additional visible articular surface was marked. The elbow was then disarticulated and the distal humerus excised en bloc. The region of articular surface initially visible after olecranon osteotomy alone was painted blue. The additional region visible after LUCL release was painted red (Figure 3). The articular surface of each specimen was scanned using a 3D scanner, and the area of the painted surfaces were quantified in square millimeters for three regions of interest: the total articular surface, the trochlea, and the capitellum. Raw surface area measurements were converted into percentages, and means and standard deviations were calculated across the 10 specimens. Comparisons were made using a two-tailed t-test, with $p < 0.05$ denoting significance.

RESULTS:

The mean percent of total distal humerus articular surface, trochlear surface, and capitellar surface visible after olecranon osteotomy alone was 50.4 +/- 7.9%, 62.8 +/- 8.2%, and 20.3 +/- 7.9%, respectively (Figure 4). After olecranon osteotomy plus LUCL release, 100% of the total articular surface, trochlear surface, and capitellar surface were visible, which was significantly greater than the percent visible after olecranon osteotomy alone for each of the three regions ($p < 0.01$). The olecranon osteotomy alone exposed significantly more of the trochlea than capitellum (62.8 +/- 8.2% vs. 20.3 +/- 7.9%, $p < 0.01$).

DISCUSSION AND CONCLUSION:

The standard olecranon osteotomy approach enables visualization of the posterior 63% of the trochlea and posterior 20% of the capitellum. Thus, the olecranon osteotomy alone fails to grant the surgeon access to the regions of articular surface necessary to fix distal humerus fractures with anterior comminution. Adding an LUCL release to a standard olecranon osteotomy permits significantly more visualization of the anterior articular surface, and in fact provides access to 100% of the distal humerus articular surface. Thus, the expanded exposure of the olecranon osteotomy by LUCL release may be useful for improving visualization and fixation of complex intraarticular distal humerus fractures involving the anterior articular surface.