The Osborne-Cotterill Lesion: A Radiographic Analysis of Morphology

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INTRODUCTION:

The Osborne-Cotterill lesion (OCL) is an osteochondral fracture of the posterolateral capitellum associated with elbow instability. It is postulated to be an impaction injury from a dislocating radial head, an avulsion injury, and has been described in some literature as the Hill-Sachs of the elbow. The frequency, shape and clinical significance of OCLs has never been studied and management is contentious among elbow surgeons. This study is the first to analyse the incidence, anatomic variation, morphology and clinical impact of OCLs across a variety of instability patterns.

METHODS:

A pilot study of 30 normal MRI scans was performed to understand the normal radiographic anatomy of the capitellum, and establish a reproducible method for analysis. Patient cases were sourced from a local database of referrals for possible biceps tendon rupture. Each patient had an MRI scan performed with no history of elbow fracture or dislocation. Scans were reconstructed using "multiplanar reconstruction" (MPR) in imaging software SECTRA in the coronal, sagittal and axial planes of the distal humerus. The findings demonstrated that in the sagittal plane, the capitellum has a circular cross-section at medial 75% of its width, before it tapers to the lateral epicondyle. This can be demonstrated by using the imaging software to place a "circle of best fit" over the capitellar cross-section.

Patients included in the main study were from a single surgeon database of 250 patients with elbow instability. Exclusion criteria included: no CT scan for interpretation, imaging quality too poor for interpretation, CT scan more than 30 days after index injury and paediatric or skeletally immature patients.

CT scans were manually reconstructed in the plane of the distal humerus. Measurements were taken only at the medial 75% of the capitellum where the pilot study had demonstrated consistent circular cross-section, and excluding the lateral 25% of the capitellum from analysis. Placing a "circle of best fit" over the capitellar cross-section allows the observer to template the capitellum and reveal missing bone indicative of an OCL. Measurements were taken for parameters of interest including: area of bone loss, bone loss as a percentage of the capitellum, and maximal region of bone loss. Arc of bone loss angle of extent, anterior and posterior exit angle of the OCL were described relative to the "circle of best fit" orientated around the anterior humeral line. All measurements were standardised such that 0 - 180˚ was anterior and 180 - 360˚ was posterior. Radiographic findings were correlated with the clinical instability pattern and outcome.

Two observers took part in the study data collection and interpretation. Both were higher surgical trainees in Trauma and Orthopaedics. The first 50 cases were analysed by both observers and Cronbach's alpha test was used to measure inter-observer reliability for: area of the lesion, anterior and posterior exit angle and arc of the lesion.

RESULTS:

100 patients with elbow instability were included in the study. Injury patterns included posterolateral rotatory instability (PLRI) (N= 51), Posteromedial rotatory instability (PMRI) (N= 20), Axial instability (N = 19), Valgus instability (N = 9), and hyperpronation instability (N = 1). M:F = 51:49. 31 patients had no evidence of an OCL. 69 patients had an OCL including 41 PLRI (59.4%), 13 PMRI (18.8%), 12 axial (17.4%), 3 valgus (4.3%).

Morphology of OCLs: Average area bone loss was 13.6mm^2 (range 0 - 76mm^2). Bone loss as a percentage of capitellar area was 4.2% (range 0 - 22.5%). Average % bone loss by instability pattern: PLRI 5.3%, PMRI 2.8%, axial 3.6% and valgus 2.7%. This was not found to be statistically significant (P value = 0.116). 92% of OCLs were largest at the lateral most extent of the capitellum. Mean arc of bone loss angle = 64.9˚ (SD 26.4), mean anterior exit angle 179˚ (SD 24.6), mean posterior exit angle 244˚ (SD 21.8). Cronbach's alpha test for interobserver reliability, value was higher the 0.8 indicative of good interobserver reliability.

Morphology analysis demonstrated 3 distinct morphologies of OCL: posterior (N = 56 (81%)), intermediate (N = 11 (16%)) and anterior (N = 2 (3%)). 97% of OCLs were posterior and intermediate lesions. Instability patterns of posterior lesions were PLRI 62.5%, PMRI 23.2%, Axial 14.3%, valgus 0%. Instability patterns in intermediate lesions were: PLRI 63.6%, PMRI 0%, Axial 27.3%, valgus 9.1%. Only two cases were anterior lesions, both were valgus injury patterns. 93 patients had surgical intervention for elbow instability. Only 2 patients with an OCL had a surgical repair of the bony defect. In both cases this was due to a large avulsion fragment of the lateral epicondyle. In all other cases that underwent operative management (98%), elbow stability was achieved with appropriate fixation or replacement of radial head, coronoid, proximal ulna or olecranon fractures with or without LCL/ MCL repair.

DISCUSSION AND CONCLUSION:

This is the first study to objectively assess the distribution and morphology of the OCL. This study demonstrates a reproducible method for identifying, measuring and describing an OCL. Lesions were found to be predominantly posterolateral lesions, this is contradictory to the description of the OCL being the Hill-Sachs of the elbow as the vast majority do not involve the main articulation with the radial head. The lesion is most commonly associated with PLRI injury patterns. OCLs rarely impact on elbow instability. Indications for surgical fixation are limited to large avulsion fractures of the lateral epicondyle.