

Complex Fracture and Dislocation of the Elbow: The Rationale

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DEFINITION

Complex fracture and dislocation of the elbow is defined as an injury that destabilized the elbow because of damage to the articular surface and to the ligamentous structures. The clinical presentation is one in which the instability is usually obvious as a dislocation, subluxation, or incongruity with malalignment in either the lateral or the anteroposterior plane.

CONTRIBUTION TO NORMAL STABILITY

* Primary constraints to elbow instability

- Intact bony surface (Radial head, Coronoid, Olecranon)
- Anterior band of the medial collateral ligament (AMCL)
- Lateral ulnar collateral ligament (LUCL)

* Secondary constraints to elbow instability

- Radial head : if MCL deficient or Essex-Lopresti lesion
- Capsule : important in extension
- Muscle : dynamic stabilizer

A. Radial head

- Important secondary stabilizer to valgus stress
- Provides some resistance to posterolateral rotatory instability in a secondary capacity

B. Olecranon

- Major determinant of elbow stability is ulnohumeral joint.
- Extent of resection linearly correlated to instability
- 50% resection is critical to stability, but dynamic force may alter the situation
- 70% resection results in detachment of the collateral ligaments

C. Coronoid

- At least 50% of the coronoid must be present for the ulnohumeral joint to be functional.

D. Ligamentous contribution

- The medial and lateral collateral ligaments contribute to varus-valgus stability with the elbow articulation intact and in flexion and extension (collateral ligaments 50% + articular surface 50 %). But, in full extension the ulnohumeral joint and anterior capsule render the joint stable to varus-valgus stress, even in the absence of collateral ligaments.

CLINICAL MANAGEMENT: THE RATIONALE

A. Fracture of the radial head with attenuation or tear of MCL

- Occurs in about 1~2 % of the fractures of the radial head
- Primary goal is to restore the stabilizing function of the radial head by osteosynthesis if possible
- A prosthesis is considered if osteosynthesis is not possible
- If the radiohumeral joint cannot be reconstructed, it is appropriate to address the injury of MCL directly to repair it as soon as possible

B. Fracture of the radial head with dislocation of the elbow

- Reduce the dislocation and determine the stability assuming the coronoid is intact
- Mason Type I
- Mason Type II : ORIF
Resection of radial head result in chronic instability with injuries of the collateral ligaments.
Repair of the collateral ligaments is not always necessary.
If elbow is still unstable, add repairing or reconstruction of the ligaments.
- Mason Type III : Most difficult injury to treat
Entire comminuted radial head should be excised if can not be fixed
If unstable, direct repair of the collateral ligaments should be carried out
If unstable after repairing the ligaments, a prosthesis/allograft is considered.
If stability remains a problem, an external fixator is applied.

C. Fracture of the olecranon

- Mayo Classification Type III : unstable because of the injury of a collateral ligament and a displaced fracture of the olecranon
- If the olecranon is rigidly fixed, then the unstable injury is converted to a stable one
- Hence, the technique of rigid fixation is of paramount importance
- Not uncommonly, one fragment may also involve the coronoid

D. Fracture of the coronoid

- The coronoid is the most important portion of the ulnohumeral joint
- Coronoid fracture is related to the posteriorly directed forces of both the biceps and triceps
- Coronoid serve as a site of attachment for the collateral ligaments

Classification (Regan & Morrey)

Type I (Tip) :

Type II (< 50%) : If posterior displacement occur with less than 40 to 45 degrees of flexion, the articulation is inadequate, and the ulnohumeral joint must be stabilized. Neutralization is tried by an external fixator if concerns about stability of osteosynthesis.

Type III (> 50%) : ORIF, Hinged external fixator if necessary
Prevent posterior displacement of the ulna against the trochlea

E. Fracture of the radial head and coronoid with dislocation of the elbow (Terrible triad)

- Most difficult to treat
- Radial head must be fixed or replaced
- Coronoid fracture is fixed, if possible
- The elbow may need to be protected by a hinged external fixator. This allows motion but eliminates force on the radial head and the coronoid

“THREE PRINCIPLES” IN COMPLEX FRACTURE/DISLOCATION OF THE ELBOW

1. Restore the essential element, the ulnohumeral joint.
2. Radial head is an important secondary stabilizer, so if the collateral ligaments have been injured the radial head must be fixed or replaced.
3. The stability of the ulnohumeral joint may be enhanced with the use of an external fixator that allows flexion.