Lec: 3  Fractures and dislocations around elbow in adult

These include fractures of distal humerus, fracture of the capitulum, fracture of the radial head, fracture of the olecranon & dislocation of the elbow.

**Fractures of distal humerus**

This is usually occurring as a high energy trauma in the young patient, these injuries are divided into 3 types according to AO classification:

- **Type I;** it is extraarticular supracondylar fractures.
- **Type II;** it is intraarticular unicondylar # (one condyle sheared off).
- **Type III;** it is intraarticular bicondylar # with varying degree of comminution.

Mechanism of injury; it is caused by fall on the point of the elbow, which drive the olecranon up between the humeral condyles splitting the either of the condyle or both condyles.

Clinical features; there is pain, considerable swelling, all elbow movements are painful; there is loss of the normal bony land marks of the elbow. Always we should examine for neurovascular impairment.

X-ray; for type I the fracture line run transversely or obliquely above the humeral condyles, for type II the # line run from the supracondylar region into the joint separating one of the condyles, in type III the # line occur as supracondylar # with intercondylar extension resulting in Y or T shape # line.
**Treatment:**

- Undisplaced #, need 2 weeks in posterior slab with elbow 90 degrees flexed after that movements started, checking x-ray obtained after 1 week to exclude displacement.
- Displaced #, these fractures are difficult to reduce closed also difficult to remain reduced after reduction (unstable #), so it is better to do open reduction & rigid internal fixation to allow early postoperative movements to decrease elbow stiffness.
- The bag of bones technique, this method used in severely comminuted # or because lack of experience & facilities. In this method the elbow rested in a collar & cuff or a hinge brace then movements started as soon as the patient wish, the aim is to restore good range of movements rather than anatomical reduction.
- Skeletal traction, by using pin through the olecranon, this is used for comminuted # the patient remain in bed with the humerus vertical & elbow movements encouraged.
- Elbow arthroplasty, in elderly patient with severely comminuted # it is best to do elbow replacement.

**Complications:**

1. Vascular injury
2. Nerve injury mainly medial & ulnar nerve
3. Elbow stiffness, these # always result in some degree of elbow stiffness
4. Heterotopic ossification (myositis ossificans) it is an ectopic bone formation in the soft tissue from severe soft tissue damage.

**Fractured capitulum**

It is an intraarticular # which occurs only in the adult

**Mechanism of injury:** it is caused by fall on hand with the elbow extended; the radial head is driven upward toward the capitulum which is sheared off from the lateral femoral condyle & displaced proximally.
**Clinical features:** following trauma there is fullness in front the elbow, there is tenderness over the lateral aspect of the elbow & elbow flexion is restricted.

**X-ray:** the lateral elbow view will show that the capitulum or part of it displaced proximally & the radial head no longer facing the capitulum.

**Classification:** the # divided into 3 types according to size of the fragment:
- Type-I, it is a large bony fragment with overlying cartilage.
- Type-II, it is small osteocartilaginous #.
- Type-III, it is a comminuted #.

**Treatment:** it depend on the size of the fragment, for type I this usually require open reduction & internal fixation with small screw, for type II& III it is best to excise the fragment.

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**Fractured head of radius**

This fracture is common in adult but it is rare in children because the radial head is largely cartilaginous in children.

**Mechanism of injury:** it is caused by fall on hand with the elbow extended & forearm pronated; the radial head will impact against the capitulum causing splitting or broken of the radial head. The radial head # sometime occurs with elbow dislocation.

**Clinical features:** there is tenderness over the radial head & pain on pronation & supination of the forearm.

**X-ray & classification:** according to Mason’s classification the # divided into 4 types:
- Type-I, it is undisplaced or minimally displaced #.
Type-II, it is displaced # in which a large fragment separated from the head & displaced distally.

Type-III, it is a comminuted # of the radial head.

Type-IV, it is radial head # associated with elbow dislocation.

**Treatment:** it depend on the grade.

- Type I undisplaced # this need aspiration of the hemoarthrosis & injection of local anesthetic, the arm rested in collar & cuff, the elbow movements encouraged.
- Type II displaced # need open reduction & internal fixation with small screw.
- Type III comminuted # need excision of the radial head.
- Type IV with elbow dislocation, this require reduction of the dislocation & fixation of type II or prosthetic replacement of the head for type III.

**Complications:** (1) stiffness (elbow & radioulnar joints) (2) elbow instability after radial head excision if there is also injury of the medial collateral ligament. (3) Myositis ossificans.

**Fractures of the olecranon**

This # enters the elbow joint and may damage the articular cartilage.

**Mechanism of injury:** there are 2 types of fractures:

- Comminuted fracture, this result from direct blow to the olecranon or from a fall on the elbow.
- Clear transverse #, this is an avulsion # result from sustain contraction of the triceps muscle as in fall on the hand with elbow bent, if the triceps aponeurosis remain intact the fracture fragment remain undisplaced or minimally displaced, if the aponeurosis rupture the fragments displaced widely.
**Clinical features:**

*In case of comminuted* # there is bruising & abrasion of the skin over the olecranon but the patient can extend the elbow against the gravity as the triceps aponeurosis is intact,

*In case of transverse* # if the aponeurosis was torn a palpable gap can be felt at the # site & the patient can’t extend the elbow against the gravity.

**Treatment:**

- If the *#* is comminuted, this requires immobilizing the elbow in a sling for 1-2 weeks followed by active exercise.
- If the *#* is transverse & not displaced, this requires 3 weeks of cast immobilization with the elbow 60 degrees flexion followed by active exercise.
- If the *#* is transverse & displaced, this requires open reduction & internal using tension band technique or plate & screws.

**Complications:** (1) elbow stiffness (2) nonunion (3) osteoarthritis of the elbow this can occur as a late complication.

**Dislocations of the elbow**

This is a dislocation of the ulno-humeral joint, it is common injury & it is more common in adult than in children. The dislocation is classified according to the direction of the displacement of the radioulnar complex into posterior or posterolateral dislocation (90% of elbow dislocation) & anterior dislocation.

**Mechanism of injury:** fall on outstretched hand with extended elbow this result in posterior dislocation, anterior dislocation result from *side-swipe* injury, in which the driver’s elbow protruding through the window is struck by another car.

**Clinical features:** pain, swelling & deformity. We should examine for neurovascular injuries.
X-ray: will show the dislocation & any associated fractures like fracture of the radial head, coronoid process or olecranon process or fracture of the medial epicondyle.

Treatment: Closed reduction under anaesthesia: Pull on forearm with slight elbow flexion, then correct sideways shift then increase elbow flexion & push the olecranon anteriorly (unless full elbow flexion is easy, the olecranon is not in trochlear groove). Confirm reduction by x-ray then immobilize the elbow for 3 weeks in back slab followed by exercise.

Dislocation associated with fractures:
1- Coronoid process fracture: if small fragment leave it; if large then open reduction & internal fixation (to avoid recurrent dislocation).
2- Medial epicondyle: it may be trapped inside the joint this requires ORIF.
3- Head of radius: ORIF or prosthetic radial head replacement.
4- Olecranon: occur with anterior elbow dislocation, needs ORIF.

Complications: Early-(1) vascular injury (brachial artery), (2)-nerves injury (median, ulnar).
Late - 1- elbow stiffness; 2- heterotopic ossification (myositis ossificans). 3- Recurrent dislocation: may need ligament repair.

4- Unreduced dislocation: up to 3 weeks, try closed reduction; otherwise open reduction (which may increase the stiffness) or ignore the dislocation & encourage movement. Other options: arthroplasty or arthrodesis.

5- Osteoarthritis.

Fractures of radius & ulna

Mechanism of injury: twisting force (fall on the hand) leads to spiral # of radius & ulna at different levels. A direct blow or angulation force leads transverse # at the same level.

*bleeding & muscle swelling may lead to increase pressure within the compartment leading to compartment syndrome & circulatory impairment.

Clinical features: pain, swelling & deformity. Look for neurovascular injury.

X-ray: usually transverse # at the same level or oblique or spiral # at different levels radius # usually higher). In children, often the # is incomplete & angulated (greenstick).

Treatment:

- In children: closed reduction & above elbow cast; at 2 weeks, checking x-ray, then continue casting for 8 weeks. If closed reduction fails, then ORIF is required, using small plates & screws, K-wires or flexible nails.

Flexible nails
In adults: closed reduction is difficult & liable for redisplacement in the cast; so ORIF is almost indicated from the beginning unless the # is undisplaced. Fixation is by plate & screws or intramedullary nail.

Open fracture need wound excision & external fixator.

Complications:

A. Early:
1- Nerve injury: by the # is rare; by the surgeon could be like the posterior interosseous branch of radial nerve at the neck of radius.

2- Vascular injury: radial or ulnar artery but the collaterals are enough

3- Compartment syndrome: due to # or postoperative especially if cast is applied without frequent checking of the circulation.

B. Late:
1- delayed union & nonunion: especially high energy # & open #.

2- Malunion: especially with closed reduction. In the form of the angulation & twisting

3- Cross union: is rare; the patient is unable to do pronation or supination.. Treatment: excision of the mature cross union & isolation of the bones by a strip of fascia.
Fracture of a single forearm bone

These are uncommon injuries, they are usually caused by direct blow, and the fracture of ulna is usually called nightstick fracture. They are important for 2 reasons;

1. It may be associated with dislocation of the proximal or distal radio-ulnar joint.
2. Delayed union & nonunion liable to occur.

Treatment: Undisplaced ulna # alone need 8weeks forearm below elbow cast.

Displaced ulna # needs ORIF.

Undisplaced radius # needs 8 weeks above elbow cast, with forearm supinated for upper third #, neutral for mid third # and pronated for lower third # to correct # rotation.

Displaced radius # needs ORIF using intramedullary nail or plate & screws.

Complications:

Delayed union & nonunion: because the intact bone may prevent contact of the two ends of fractured bone.