

## Elbow injuries and fractures

The humerus of the upper arm and the paired radius and ulna of the forearm meet to form the elbow joint, a hinge joint in the upper arm. The bony prominence at the tip of the elbow is the olecranon process of the ulna. The antecubital fossa lies over the anterior aspect of the elbow.

Injuries to the elbow are common, usually occur secondary to indirect trauma and are often accompanied by injury to shoulder or wrist joints<sup>[1]</sup>. It is important to assess injuries promptly and accurately, taking into account age and the mechanism of injury, particularly because of the risk of accompanying vascular involvement. The elbow extension test is a useful screening tool for bony injury – although not infallible<sup>[2]</sup> <sup>[3]</sup>.

In addition to injuries listed in the table below, see also the separate [Forearm Injuries and Fractures](#) (deals with Monteggia's fractures), [Radial Head Subluxation](#) (nursemaid's elbow), [Tennis Elbow and Golfer's Elbow](#) and [Olecranon Bursitis](#) articles.

### The mechanism of injury

There are a variety of possible injuries because of the presence of three bones and the range of mechanisms of injury.

Radial head and neck fractures	Fall on to an outstretched hand
Olecranon fractures	Elderly - indirect trauma by pull of triceps and brachioradialis Children - direct blow to elbow
Fractures of the coronoid process	Fall on to an extended elbow as for elbow dislocation
Fractures of the distal humerus	Fall on to an extended outstretched hand
Intercondylar fractures	Direct or indirect blow to elbow
Condylar fractures	Direct blow to a flexed elbow
Capitellum fracture	Fall on to an outstretched hand, or direct trauma
Elbow dislocation	Fall on to an extended elbow Common in sport in the young

## Radial head and neck fractures

### Mechanism of injury

These are most commonly caused by a fall on to an outstretched arm. Radial head fracture is the most common fracture around the elbow joint in adults, whereas radial neck fractures occur more commonly in children.

### Clinical features

- The patient presents with swelling over the lateral elbow with limited range of motion, particularly forearm rotation and elbow extension ± elbow effusion and bruising. Pain is increased with passive rotation.
- The most reliable clinical sign is point tenderness over the radial head.

- Needs careful assessment for nerve and vascular involvement, especially with brachial artery, median and ulnar nerves.
- It is important to detect crepitation or a mechanical blockage of motion from displaced fracture fragments. This often requires aspiration of a haemarthrosis with the instillation of local anaesthetic for pain relief.
- If there is significant wrist pain and/or central forearm pain, there may be acute longitudinal radioulnar dissociation with disruption of the distal radioulnar joint.

## Investigations

- AP and lateral X-ray views of the elbow are usually sufficient.
- Findings may be quite subtle and the only clue may be the fat pad sign (triangular radiolucent shadows anterior and posterior to the distal humerus on lateral X-ray, indicating haemarthrosis and displacement of intra-articular fat pad - often associated with intra-articular skeletal injury).
- Image of elbow fat pad sign (Hellerhoff (own work), via Wikimedia Commons):



## Management

- Refer for urgent surgical treatment if there is elbow fracture, dislocation or evidence of nerve or vascular involvement.
- Complex fractures require open reduction and internal fixation.
- Otherwise, give sufficient analgesia and consider joint aspiration and instillation of anaesthetic (usually in expert hands).

- Immobilise the elbow in a long arm posterior splint with the elbow at 90°.
- In non-displaced fractures, remove the posterior splint and replace with a sling for comfort only; monitor for displacement and institute active range of movement exercises, including rotation, flexion and extension at least 3-4 times daily.
- A Cochrane review from 2011 found that there was a lack of reliable evidence to answer the question of whether early mobilisation improved function without increasing complications in adults with elbow fractures<sup>[4]</sup>.

### **In children**

- Can be difficult to diagnose, as radial head ossification does not occur until the age of 4 years.
- There may be an associated ulnar shaft fracture (equivalent to adult Monteggia's fracture).
- Ultrasound or MRI scanning may be needed to confirm the diagnosis.

## **Olecranon fractures**

### **Mechanism of injury**

These are low-energy fractures which occur most commonly in the elderly and result from indirect trauma caused by a sudden pull of the triceps and brachioradialis muscles.

However, in younger patients, olecranon fractures usually follow a direct blow to the point of the elbow and are often comminuted, and there may be an associated ulnar shaft fracture.

### **Clinical features**

- The patient presents with swelling and tenderness over the olecranon with haemarthrosis and limited range of motion.
- There is an inability to extend the elbow against gravity, indicating dysfunction of the triceps lever.
- There is a need to check for ulnar nerve damage and examine distal pulses.

## Investigations

- True lateral X-ray of the elbow should reveal the fracture.

## Management

- Immobilise the elbow in a long arm posterior splint with the elbow in 60–90° flexion, well moulded posteriorly.
- Support the arm with collar and cuffs or a standard arm sling.
- Refer displaced fractures for surgery. In non-displaced fractures, splint for 5–7 days, remove and repeat X-ray to confirm non-displacement.
- If still stable, gentle supination and pronation exercises are appropriate, using a sling or removable posterior splint for comfort.
- Flexion and extension exercises after two weeks.

## Fractures of the coronoid process

### Mechanism of injury

The mechanism of injury is as for elbow dislocation and such fractures are associated with elbow dislocation in about 40% of cases.

### Clinical features

- Patients present with tenderness over the antecubital fossa and swelling about the elbow.
- Check strength of the radial pulse with the elbow at 90°.

## Investigations

- Lateral X-ray of the elbow should demonstrate a coronoid fracture.

## Management

- Non-displaced fractures should be immobilised in a long arm posterior splint with the elbow at 90° and the forearm in full supination. After three weeks, start active range of movement exercises using a sling for comfort.

- Displaced fractures or those involving >50% of process need surgical repair.

## Fractures of the distal humerus

### Mechanism of injury

- Supracondylar/transcondylar - most are extension-type injuries from a fall on to an outstretched arm.
- Transcondylar fractures are more common in the elderly.
- Supracondylar fractures are more common in children.

### Clinical features

- The patient usually presents with elbow swelling and pain.
- Undertake careful examination for neural or vascular involvement due to risk of damage to the brachial artery and nerve.
- Marked swelling of the forearm or palpable induration of forearm flexors, with pain on passive extension of the fingers, suggests acute volar compartment syndrome requiring emergency fasciotomy.
- Up to 18% of humeral shaft fractures have an associated radial nerve palsy<sup>[5]</sup>.

### Investigations

- AP and lateral X-rays of the elbow.

### Management

- All but non-displaced or minimally displaced fractures without neural or vascular involvement should be referred for surgical repair - although a Cochrane review found a lack of consensus on best surgical management<sup>[6]</sup>.
- Immobilise the elbow in a long arm posterior splint with the elbow at 90° to the forearm in neutral rotation.
- Check distal pulses after the splint has been applied and, if absent, extend the elbow to the point where pulses return.

- Frequent checking of neural and vascular function is essential during the first 7-10 days, and ice and elevation are important in reducing swelling.
- Re-examine within 24-48 hours.
- After two weeks, patients should remove the splint and perform gentle exercises, continuing to use a splint for approximately six weeks, and then starting vigorous exercises.

## Intercondylar fractures

These are T- or Y-shaped fractures with varying displacement between the condyles and the humerus.

### Mechanism of injury

Commonly caused by a direct or indirect blow to the elbow. The olecranon is forced as a wedge between the two condyles of the humerus.

### Clinical features

- The patient usually presents with marked tissue swelling, holding their forearm in pronation.
- The injured forearm may appear shortened.
- Crepitus of movement may be felt when condyles are pressed together.

### Investigations

- AP and lateral views should reveal the intercondylar fracture.

### Management

- Most fractures require surgery because they are displaced<sup>[7]</sup>.
- Refer for orthopaedic opinion.
- Rarely, non-displaced fractures can be treated similarly to non-displaced supracondylar fractures, as above.

# Condylar fractures

## Mechanism of injury

- Lateral condyle fractures are more common than medial.
- Lateral fractures are usually due to a sudden varus stress on an elbow in extension.
- Medial fractures are due either to impact to the olecranon with a flexed elbow or sudden valgus stress on an elbow in extension.

## Clinical features

- Patients usually present with swelling, limited range of movement and tenderness over the injured condyle.
- Crepitus with motion is frequently present.

## Investigations

- AP and lateral X-rays reveal a widened intercondylar distance and there may be displaced fracture fragments.

## Management

- Aspiration of joint haemarthrosis relieves discomfort.
- Displaced fractures require surgical correction [8].
- Undisplaced fractures can be treated with a long arm posterior splint with the elbow at 90°.

# Capitellum fracture

## Mechanism of injury

These fractures are usually caused by a fall on to the outstretched hand or by direct trauma.

## Clinical features

- These fractures involve the distal humeral articular surface.
- Present with anterior elbow pain and effusion.



## Investigations

- Lateral and AP radiography usually reveals the fracture.

## Management

- Undisplaced fractures may be splinted but more usually they are displaced and require surgical fixation.

## Elbow dislocation

Elbow dislocation is the second most common major joint dislocation [5]. The 'terrible triad of the elbow' refers to a combination of elbow dislocation and radial head and coronoid process fracture - it is notoriously difficult to manage although a systematic review found that whilst complications are common, functional outcomes are generally satisfactory [9].

## Mechanism of injury

- Often due to a fall on to an extended elbow.
- Those without fracture are termed simple, whereas dislocations with fracture are termed complex.
- They are classified according to position of the ulna in relation to the humerus after injury.

## Clinical features

- Often associated with injury to brachial artery and nerve, so undertake a full examination of distal pulses, and median and ulnar nerve function [10].
- The patient usually presents with severe pain, with the elbow flexed and swelling and deformity apparent.

## Investigations

- AP and lateral X-rays of the elbow to confirm dislocation and exclude fractures.

## Management

- Prompt reduction is essential. This is usually performed under IV sedation and with adequate analgesia.
- Posterior dislocation:
  - First try countertraction on the humerus while applying longitudinal traction on the wrist and forearm.
  - Continue distal traction as the elbow is flexed.
  - May need downward pressure on the proximal forearm.
  - If this fails, place the patient face down with the elbow hanging off the side of the table and place a small pillow under the humerus just proximal to the elbow joint; hang a 2.5–10 kg weight from the wrist or apply gentle longitudinal traction.
  - Usually reduces within several minutes but may need forward pressure on the olecranon.
- Anterior dislocation:
  - Basically the reverse of the above, applying posterior and downward pressure to the forearm whilst applying anterior pressure from behind to the distal humerus.
  - After reduction, test joint mobility and stability and check neural and vascular function. Repeat X-ray and immobilise the elbow in a posterior splint with the elbow at 90°.

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## Further reading

- [Shearman C and El-Khoury G](#); Pitfalls in the Radiologic Evaluation of Extremity Trauma: Part I. The Upper Extremity, *Am Fam Phys* 1998 March 1;57(5):995–1006.
- [Galbiatti JA, Cardoso FL, Ferro JAS, et al](#); Terrible triad of the elbow: evaluation of surgical treatment. *Rev Bras Ortop.* 2018 Jun 11;53(4):460–466. doi: 10.1016/j.rboe.2018.05.012. eCollection 2018 Jul–Aug.

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