Injuries around the elbow

Introduction

The elbow joint is a complex hinge which is important for the range of motion and mobility of the upper limbs. Injuries of the elbow fall into two groups: those of children and those of adults. This article offers an overview of common elbow injuries.

Elbow injuries in children

The elbow is second only to the distal forearm for frequency of fractures in children. Boys are injured more often than girls and more than half the patients are under 10 years old.

X-ray interpretation also has its problems. This is because the bone ends are largely cartilaginous and therefore radiographically incompletely visualized. The secondary ossification centres can be seen on X-ray and should not be mistaken for fracture fragments. The mnemonic CRITOE helps remember the ages at which ossification centres appear (*Table 1*).

Variations occur and if there is any difficulty in interpreting the radiographs, films of the other side should be taken for comparison.

Table 1. CRITOE mnemonic highlighting age at which ossification centres appear

Centre	Age
Capitellum	2 years
Radial head	4 years
Internal (medial) epicondyle	6 years
Trochlea	8 years
Olecranon	10 years
External (lateral) epicondyle	12 years

Mr AR Jenabzadeh *is Clinical Research Fellow and* **Mr FS Haddad** *is Clinical Director and Orthopaedic Consultant at University College London Hospitals, London NW1 2BU*

Correspondence to: Mr AR Jenabzadeh

Supracondylar fractures

Supracondylar fractures are the most common elbow injuries, occuring in 60% of cases. The fracture line lies just proximal to the trochlea and capitellum. The distal fragment may be displaced posteriorly (hyperextension injury; 95% of all cases) or anteriorly (flexion injury; rare).

It generally results from a fall on an outstretched hand. There is tenderness, swelling and deformity over the distal humerus, and the child generally resists examination.

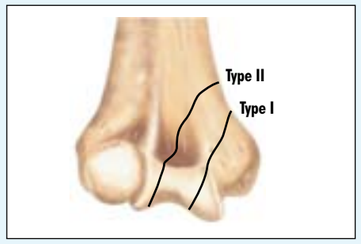
Supracondylar fractures can be classified according to severity of displacement (Wilkins, 1984). Type I is an undisplaced fracture. Type IIa is a greenstick fracture with posterior tilting of the distal fragment. Type IIb is a more severe greenstick fracture with both angulation and malrotation. Type III is a completely displaced fracture.

Type I fractures are immobilized in a cast. Type IIa fractures can be reduced under general anaesthetic with the arm then held in a collar and cuff. Type IIb and III fractures should be reduced under general anaesthetic and held by percutaneous wires. If this fails, open reduction and internal fixation is required.

Medial and lateral condylar fractures

This accounts for less than 5% of all distal humeral fractures. The lateral side is more commonly fractured than the medial side. The child (generally 3–4 years of age) falls on the hand with the elbow extended and forced into varus or valgus. The child usually presents with a swollen painful elbow, and a loss of the normal carrying angle.

Figure 1. Medial condylar fractures.



Milch (1964) classified these fractures into two groups for both medial (*Figure 1*) and lateral (*Figure 2*) epicondylar fractures. The lateral trochlear ridge is the key to classifying trochlear fractures.

In type I fractures, the lateral trochlear ridge remains intact with the intact condyle, providing medial to lateral elbow stability. In type II fractures, the lateral trochlear ridge is part of the fractured condyle. This is a less stable fracture as it may allow for radioulnar translocation if capsuloligamentous disruption occurs on the contralateral side.

The aim of treatment is the restoration of articular congruity to maintain normal elbow motion and to reduce the risk of posttraumatic arthritis. This is done nonoperatively for non- or minimally displaced fractures. Operative treatment is reserved for open or displaced fractures. This consists of screw fixation and/or collateral ligament repair if necessary.

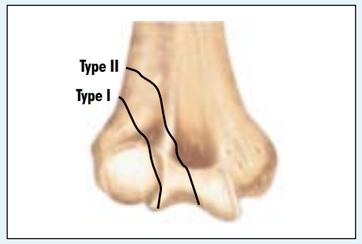
Fractured neck of radius

Following a fall the child complains of pain in the elbow. There may be tenderness over the radial head and pain on rotating the forearm. In children, up to 30° of radial head tilt and up to 3 mm of transverse displacement are acceptable. Beyond this reduction is required, either by closed manipulation or open reduction and internal fixation is unnecessary.

Pulled elbow

This injury is seen in children between the ages of 2–6 years. There is a usually a clear history of a traumatic incident involving traction of the arm (e.g. parent suddenly pulls on a child's hand to prevent them from running out onto a road).

Figure 2. Lateral condylar fractures.



The radial head stretches and slips out from under cover of the annular ligament. The child is fretful and refuses to move the joint.

Reduction can easily be achieved by:

1. Placing the wrist in full radial deviation and forcibly supinating the arm
2. Rapidly pronating and supinating the forearm.

If these measures fail, the arm should be rested in a sling when spontaneous reduction usually occurs within 48 hours.

Elbow injuries in adults

Elbow fractures in adults pose a different problem from those in children. Fusion in the epiphyses alters the mechanical properties, and consequently leads to differences in the pattern of injury.

Fractures of the distal humerus

Three types of distal humeral fractures have been described (Muller et al, 1991):

1. Type A is an extra-articular supracondylar fracture. These are rare fractures which usually require open reduction and internal fixation
2. Type B is an intra-articular unicondylar fracture
3. Type C includes bicondylar fractures with varying degrees of comminution.

Intra-articular fractures (types B and C) are high-energy injuries. Sometimes the fracture extends into the metaphysic as a T- or Y-shaped break.

Undisplaced fractures can be treated with a posterior slab with the elbow at 90°. Open reduction and internal fixation is the treatment of choice for displaced type B and C fractures

Fractured capitellum

This articular injury occurs when the patient falls on an outstretched hand. The anterior part of the capitellum is sheared off and displaced proximally. Undisplaced fractures are treated by simple splintage. Displaced fractures are openly fixed with a small screw or, if this proves too difficult, the fragment is excised.

Fractured head of radius

This injury is caused by a fall on the outstretched hand. The radial head impacts against the capitellum. There is well-localized tenderness over the radial head and pain on pronation and supination. Four types of fracture are identified (Mason, 1954) (*Figure 3*). Type I is a vertical split in the radial head. Type II has a single fragment of the head broken off and displaced. Type III is a comminuted fracture. Type IV is a radial head fracture with an elbow dislocation.

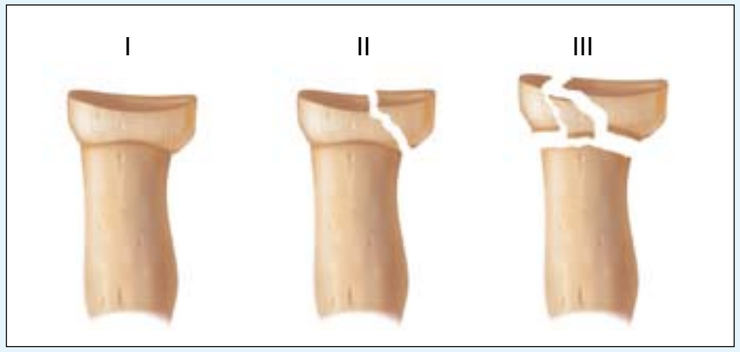
Type I fractures can be treated nonoperatively. Type II should have the fragment reduced and held with a small screw. In type III fractures attempts should be made to reconstruct the radial head, but if this is not possible it should be excised and replaced with a silicone or metal prosthesis. Type IV is the same as management of type III with relocation of the joint.

Olecranon fracture

Two types of injury are seen:

1. A comminuted fracture as a result of direct trauma
2. A clean transverse break, as a result of traction when the patient falls onto the hand while the triceps muscle is contracted.

Figure 3. Mason classification of radial head fractures.



Clinically the patient may still be able to extend the elbow against gravity. Displaced fractures (2 mm) are an indication for operative treatment with tension-band wiring.

Elbow dislocation

This accounts for 11–28% of elbow injuries, seen at all ages. In 90% of cases the radioulnar complex is displaced posterolaterally. The patient supports his/her forearm with the elbow in slight flexion with obvious deformity, pain and swelling.

In uncomplicated dislocations the elbow can be manipulated back to position under sedation and analgesia. Surgery is indicated for cases of soft tissue and/or bony entrapment in which closed reduction is not possible. Dislocations may be complicated by associated fractures (e.g. coronoid process, medial and lateral epicondyles and radial head) and these should be carefully looked for. **BJHM**

Conflict of interest: none.

Mason ML (1954) Some observations on fractures of the head of the radius with a review of 100 cases. *Br J Surg* **42:** 123–32

Milch H (1964) Fractures and fracture dislocation of the humeral condyles. *J Trauma* **4:** 592–607

Muller ME, Allgower M, Schneider R et al (1991) *Manual of Internal Fixation.* 3rd edn. Springer Verlag, Berlin, Heidelberg, New York

Wilkins KE (1984) Fractures and dislocations in the elbow region. In: Rockwood CA Jr, Wilkins KE, King RE, eds. *Fractures in Children.* vol 3. JB Lippincott and Co, Philadelphia

KEY POINTS

- Mechanism of injury is usually a fall on an outstretched hand or directly onto the point of the elbow.
- The aim of treatment is to try and get an anatomical reduction with as good a functional range of movement as soon as possible.
- A careful neurovascular examination is crucial and must be documented at presentation and after manipulation or reduction.
- Complications must be remembered. These include: stiffness, neurovascular injury, compartment syndrome leading to Volkmann's ischaemic contracture, growth disturbances, myositis ossificans, posttraumatic arthritis and non-union.