

Elbow Injuries

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Background

There are three types of injury that may affect the elbow in children:

Pulled Elbow

- Thought to occur when annular ligament slips to the end of the proximal radius.
- Usually aged 1-5 years, children aged <1 year should be discussed with senior.
- In 50% of cases there will be no history of a pull on the arm.

Elbow Fracture

- Supracondylar fractures of the distal humerus are the most common elbow fracture in younger children aged 3-10 years, peaking at 6-7 years.
- Supracondylar fractures occur following a fall onto outstretched hand or directly onto the elbow.
- Other elbow fractures include lateral or medial epicondyle, radial head, or olecranon. These occur mostly in the older child and are less common.
- Lateral condyle fractures can be subtle clinically and are easily missed on x-ray. They tend to be unstable and often displace, even if immobilised

Dislocation

- Most common childhood dislocation, however this remains an uncommon injury affecting older children 6-15 years old (peak incidence at 12 years).

Assessment

Any child with an elbow injury demonstrating neurovascular compromise must be referred immediately to the CED Consultant +/- Orthopaedic Registrar on Bleep 8629.

All children presenting with an injury involving the elbow joint should be examined carefully from shoulder to fingertip for the possibility of pulled elbow, joint dislocation or fracture, **after adequate analgesia has been given.**

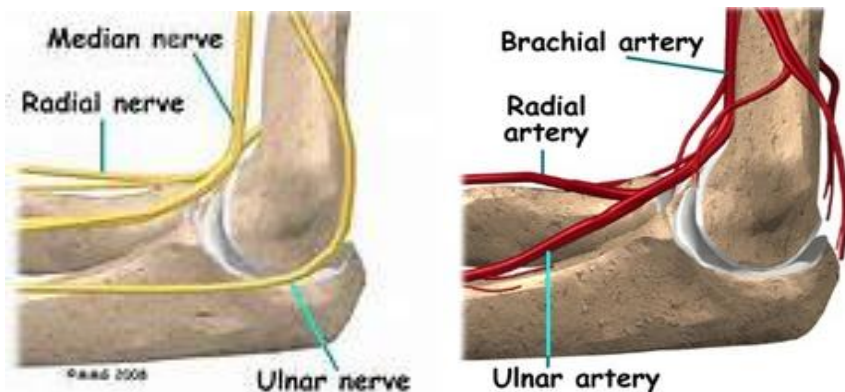
Use a LOOK, FEEL, MOVE approach.

LOOK - Observe arm for swelling, bruising or deformity.

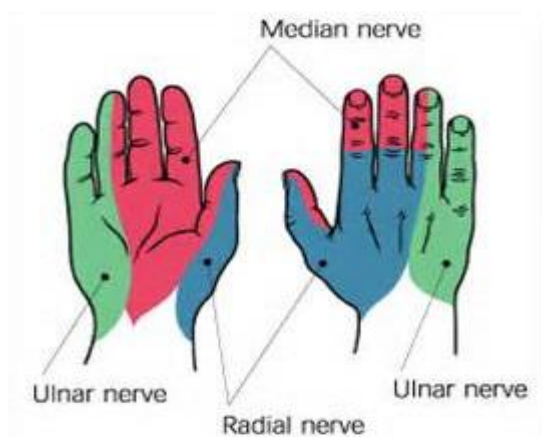
FEEL – Palpate from shoulder, trying to pinpoint bony tenderness. Check humerus, lateral and medial epicondyles, olecranon, radial head, radius and ulna.

MOVE – Test range of movement, can the child flex and extend the elbow fully on their own? Can you do so passively? Is there full power against resistance?

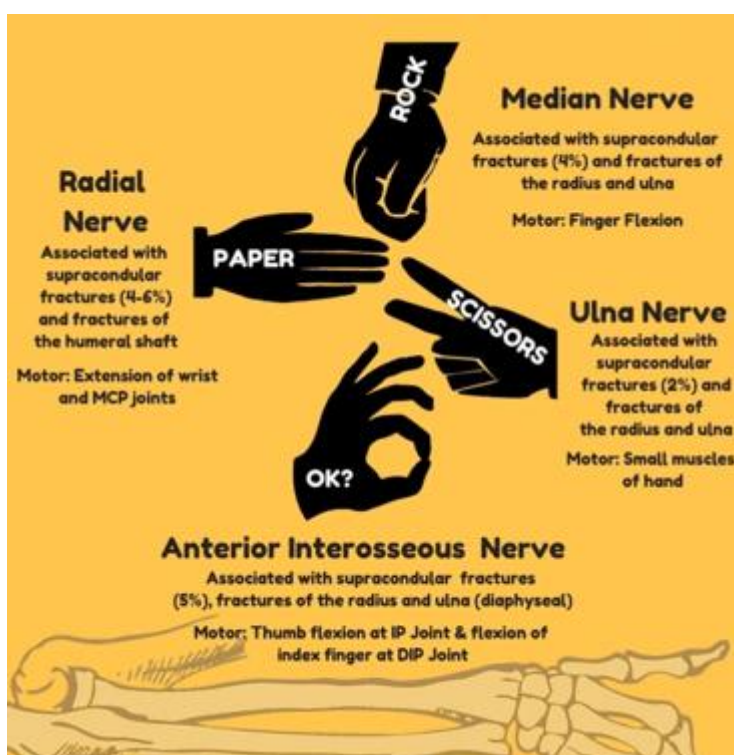
NEUROVASCULAR – If there is obvious deformity then range of movement does not need to be tested, however the radial, ulna and median nerve function must be checked as well as the radial pulse.



The nerve and arterial routes through the elbow joint.



Test that sensation is intact for each of the three nerves.



Test the motor function of the three nerves using the 'Rock, Paper, Scissors, OK' game:

Ensure the child can fully extend and flex all five digits and that thumb opposition is intact.

Management of specific injuries

Pulled Elbow

- Child not using affected arm, not usually distressed until examined.
- Elbow in extension and forearm in pronation.
- No deformity or bruising to elbow.
- No bony tenderness on palpation of clavicle, humerus, radius or ulna.
- Distressed on passive movements of elbow.

If there is possibility of trauma, an x-ray should be done to exclude a bony injury

Pulled Elbow Management

Once confirmed as a Pulled Elbow, simple manipulation can be performed as follows:



The clinician should hold the elbow with the non-dominant hand and place the thumb across the radial head. The clinician may then either:

1. Hyperpronate the forearm, or
2. Supinate the forearm then flex the elbow.

A palpable 'click' should indicate successful reduction.

There is some evidence that the hyperpronation method may have a higher success rate at the first attempt and be less painful.

Following successful manipulation the child should be observed until using the affected arm.

- If symptoms persist then senior advice should be sought and the child may be managed in a collar and cuff with elbow flexed for 2-3 days until reviewed in CED injury review clinic.

Elbow Fracture

Examine the whole upper limb including clavicle.

- Look for swelling, gross deformity, pain at elbow on supination or reduced movement.
- Bony tenderness at distal humerus +/- swelling indicates likely supracondylar fracture.
- Beware missing the lateral condyle fracture

Significant pain and deformity will require adequate analgesia and application of backslab *before* imaging.

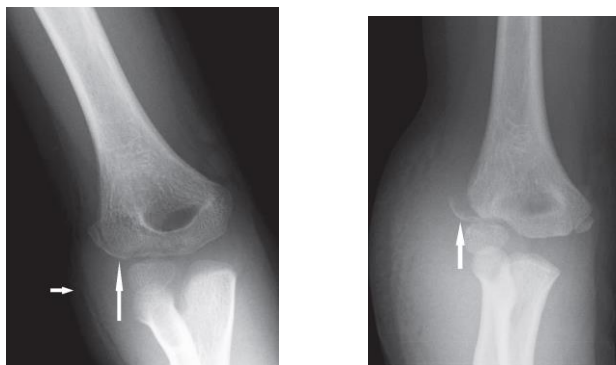


Do not manipulate the limb and ensure that neurovascular status is checked and documented.

Elbow Fracture Management

The majority of minor fractures around the elbow can be managed with a collar and cuff. If child is in significant discomfort, discuss with ENP / CED senior regarding backslab application. Be aware that elbow immobilisation will cause stiffening at the elbow joint, so unnecessary back slabs should be avoided.

- Positive fat pad sign with no visible fracture is managed in a collar and cuff in 90° elbow flexion and virtual fracture clinic follow up (refer on PANDA).
- Any significantly displaced fracture will need analgesia and backslab in a position of comfort – **do not attempt to manipulate the joint**
 - Keep child NBM and refer to the Orthopaedic Registrar (blp 8629) for admission and theatre.
 - If the Consultant Orthopaedic Surgeon wishes to change the management of the patient, an individual plan should be made after **consultant to consultant discussion**. This may need to be over the telephone if the CED consultant has gone home. Ultimately, responsibility for the patient lies with the Consultant Orthopaedic Surgeon after CED has referred the patient.
- **Undisplaced radial neck fractures** can be managed in a collar and cuff with virtual fracture clinic follow up (refer on PANDA).
- **Angulated radial neck fractures** – discuss with Ortho Registrar as may need manipulation. If dislocated look for ulna fracture.
- **Lateral condyle fractures** – age 6 – 10 years. Lateral soft tissue swelling on AP view. Cortical breach is posterior on lateral view. May only see small rim of bone as primarily cartilage. Internal oblique view helpful. Often displaces. Intra-articular so surgery likely. Refer to Ortho Registrar.



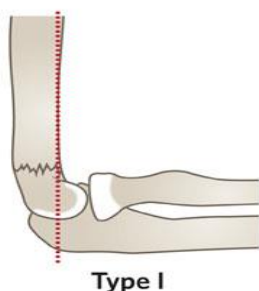
Lateral condyle fractures

- **Medial epicondyle fractures** – age 7 – 15 years. 50% associated with elbow dislocations. Displacement best seen on AP view. Look for medial soft tissue swelling. Always confirm normal position in a child > 6 years. If no epicondyle seen, look for entrapment in the joint. Refer to Ortho Registrar as will need surgery.
- **Olecranon fracture** – Look for associated fracture of medial and lateral condyles and radial neck or radial head dislocation. If displaced or associated with another injury, refer to Orthopaedics as will need surgery. If isolated and undisplaced – place in above elbow cast back slab in 45° flexion and refer to virtual fracture clinic.

- **Supracondylar fractures** –

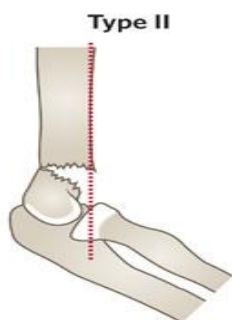
95% of supracondylar fractures will be from extension injury (FOOSH), the remaining 5% from flexion (direct fall onto elbow). Supracondylar fractures are classified using the Gartland system.

Type 1 – Undisplaced



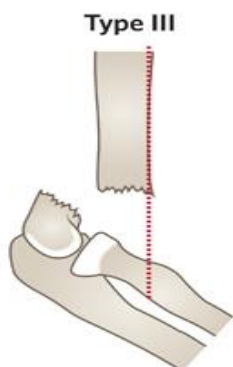
1. Collar and cuff in > 90° flexion
2. Virtual fracture clinic follow up

Type 2 – Displaced with posterior cortex intact



1. Discuss with CED Senior / refer to Orthopaedic Registrar bleep 8629
2. Most will have above elbow backslab (consider collar and cuff if comfortable) in 90° flexion with appropriate analgesia / sedation
3. Collar and cuff
4. Virtual fracture clinic follow up

Type 3 – Displaced with no cortical contact



1. Analgesia and check neurovascular status urgently
2. Discuss with CED Senior / refer to Orthopaedic Registrar bleep 8629
3. Above elbow backslab in position of comfort – do not attempt to move or manipulate the elbow
4. Keep NBM for admission and theatre

Elbow Dislocation

- Typically posterior and lateral displacement following forceful mechanism.
- Clinically appears similar to severe supracondylar fracture with swollen, deformed joint in slight flexion.
- X-ray elbow and wrist to exclude fractures and confirm dislocation.
- Dislocation is rare in isolation, commonly associated fractures include medial epicondyle (may be trapped in joint if displaced), radial head or lateral epicondyle.



Approximately 5% of elbow fractures or dislocations are associated with distal radius injury. Don't forget to examine the wrist.

Dislocation Management

In confirmed elbow joint dislocation without any associated fracture consider relocation with strong analgesia and Entonox if age appropriate – discuss with senior colleague. Consider procedural sedation with 70% nitrous oxide (see guidance), but this should not delay reduction.

Post successful reduction →

1. Re-x-ray
2. Apply collar and cuff in 90° flexion.
3. Arrange virtual fracture clinic follow up.



Any elbow dislocation **associated with a fracture** should be discussed with the Orthopaedic Registrar (bleep 8629) as reduction may need to be done in theatre. The child should be kept NBM in the meantime.

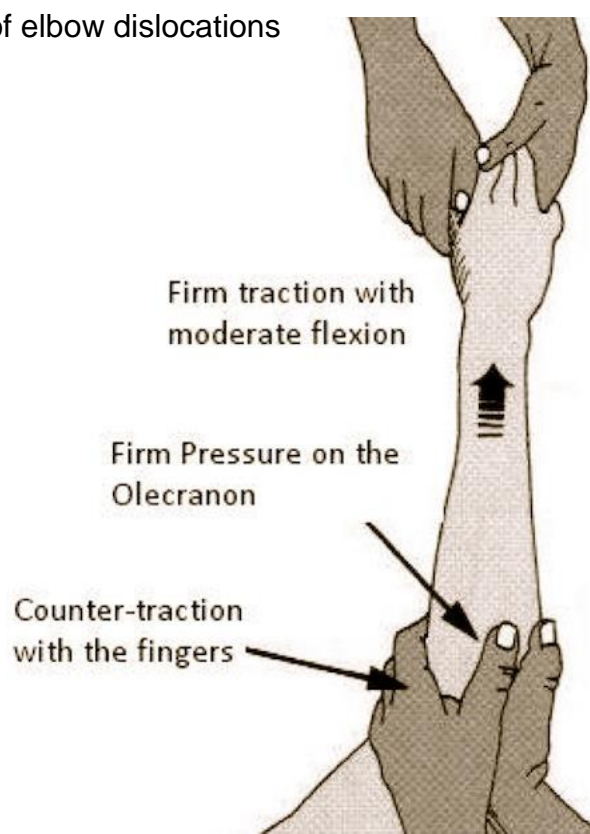


Avulsed medial epicondyle in the joint space.

Reduction of elbow dislocation

Posterior elbow dislocation – commonest 90% of elbow dislocations

1. Supine method:
 - a) Position patient supine on bed
 - b) One person stabilises humerus against the bed or with traction, or holds with both hands wrapped around humerus and thumbs applying pressure to olecranon.
 - c) Second person holds wrist with both hands and applies inline traction, keeping elbow slightly flexed and wrist supinated
 - d) Avoid hyperextending elbow
 - e) Reduction achieved when 'clunk' is felt





With the patient supine, instruct an assistant to stabilize the humerus. Grasp the wrist and apply in-line traction. Slightly flex the elbow, and hold the wrist supinated as traction is applied.

2. Prone method

- a) Place patient prone on the bed with arm hanging down
- b) One person holds humerus in hands with thumbs applying pressure to olecranon
- c) Other person applies longitudinal traction to the arms with elbow in flexion



1, Position the patient prone and hang the flexed elbow over the bed. Instruct an assistant to grasp the humerus with both hands and apply pressure on the olecranon with the thumbs (black arrow). Apply longitudinal traction on the humerus (white arrow).



Anterior elbow dislocation – uncommon injury

- a) Patient lies supine on bed
- b) Assistant grasps humerus with both hands and applies in line traction
- c) Apply in line traction to the forearm whilst applying volar pressure to proximal forearm
- d) Avoid hyperextension at the elbow



Elbow X-ray Interpretation

There are four important things to check on a paediatric elbow x-ray – **technically adequate film with AP and lateral; ossification centres; alignment; and soft tissue swelling and joint effusions (fat pads).**

Always seek senior advice if you are unsure.

OSSIFICATION

The ossification of the elbow begins at 3 months and continues until the child is 12 – 13 years old

CRITOL reminds us of the ages at which the ossification centres of the elbow should be present:

1. **C** Capitellum
2. **R** Radial Head
3. **I** Internal epicondyle
4. **T** Trochlea
5. **O** Olecranon
6. **L** Lateral epicondyle

The most important rule is **I** before **T**. The internal (medial) epicondyle appears before the trochlea and therefore it is important not to miss a displaced medial epicondyle if the child has a trochlea.

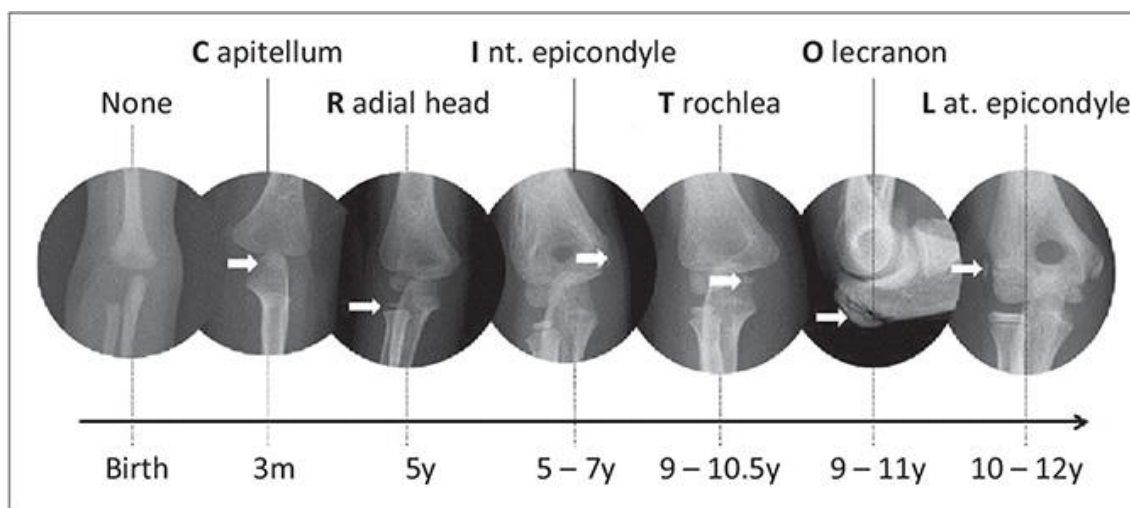
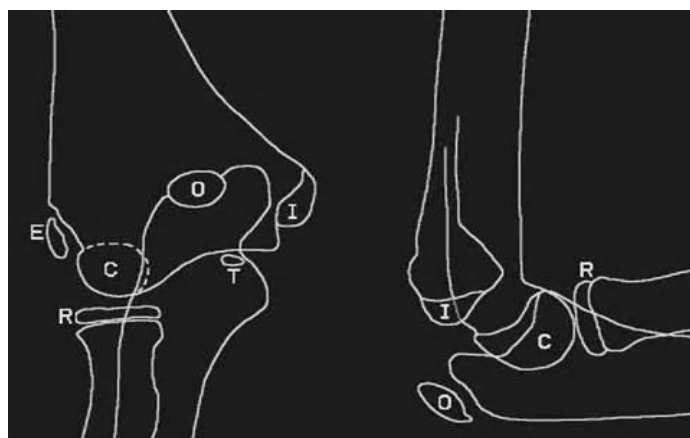


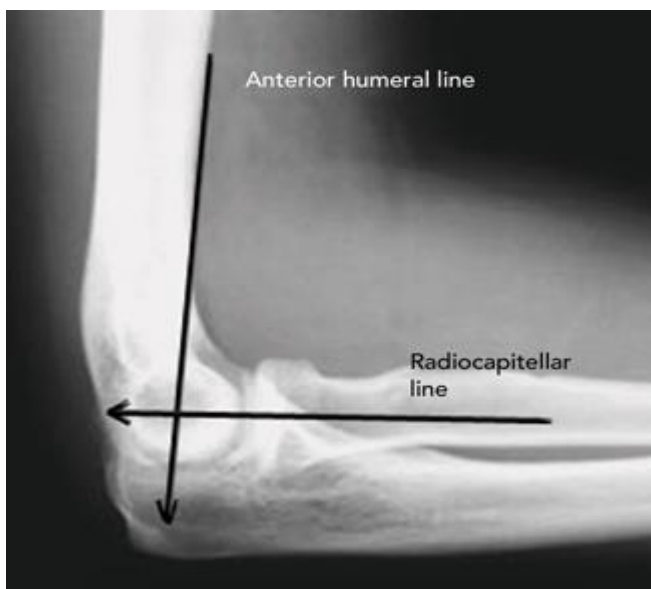
FIGURE 6: Timeline of the appearance of ossification centres.

Capitellum, Radial Head, Internal epicondyle, Trochlea, Olecranon, Lateral epicondyle

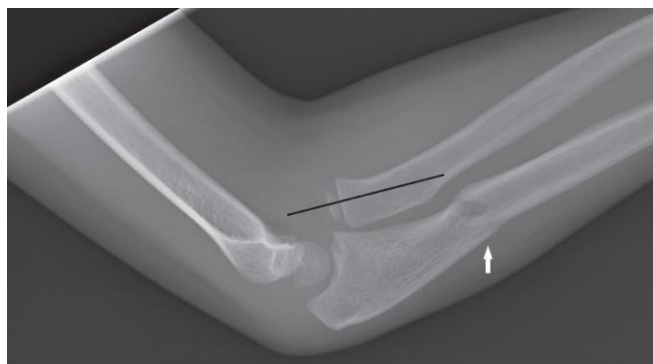


ALIGNMENT

Alignment of the elbow must also be checked. Look for the Radio-capitellar line and the Anterior humeral line and get used to doing this.

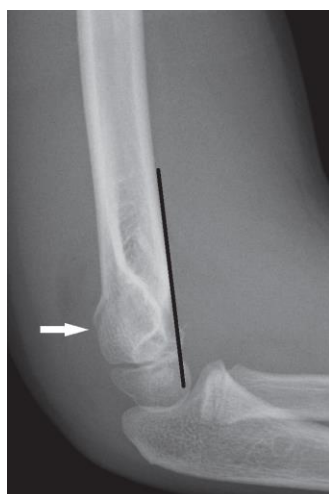


The **Radiocapitellar line** should pass through the centre of the capitellum no matter the position of the child's elbow.



This x-ray shows a radial head dislocation, note how the radiocapitellar line would miss the capitellum entirely

The **Anterior humeral line** should pass through the capitellum and at least one third of the capitellum should lie anteriorly. This is variable unless you have a true lateral view.



Disruption of the anterior humeral line indicates a fracture – in most cases, posterior displacement of the capitellum in a supracondylar fracture as is shown in this x-ray.

SOFT TISSUE SWELLING AND JOINT EFFUSIONS

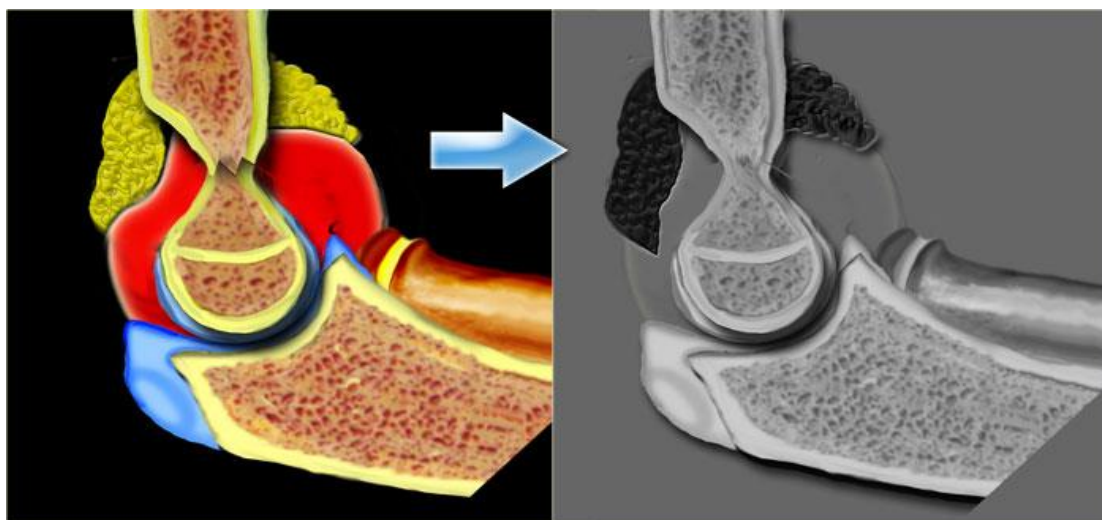
The 'fat pads'

Elevated fat pads will be seen on the lateral view of the elbow.

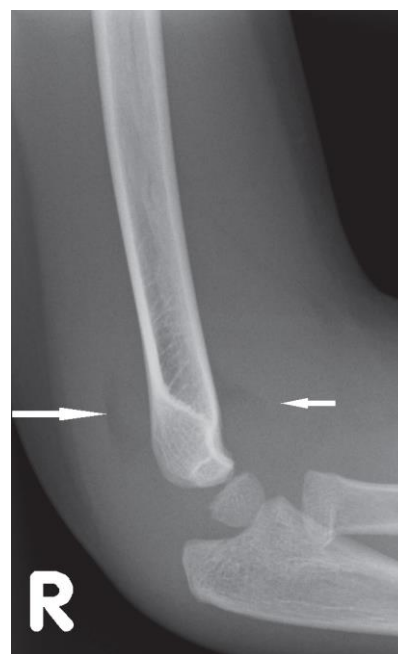
- An anterior fat pad is normal perpendicular to the humerus; however an elevated anterior fat pad creates the "sail sign".
- A posterior fat pad is an abnormal finding and suggests a fracture, even if none is visible on the x-ray.

Elevated anterior fat pad "sail sign" 76% positive for occult fracture.

Raised posterior fat pad >90% positive for occult fracture.



Anterior and Posterior fat pads. Be aware that these will not always be so visible so have a good look!



1. Look for visible fracture of distal humerus.
2. Look for visible fracture of radius or ulna.
3. If no visible fracture but positive fat pads – splint and follow up in virtual fracture clinic.