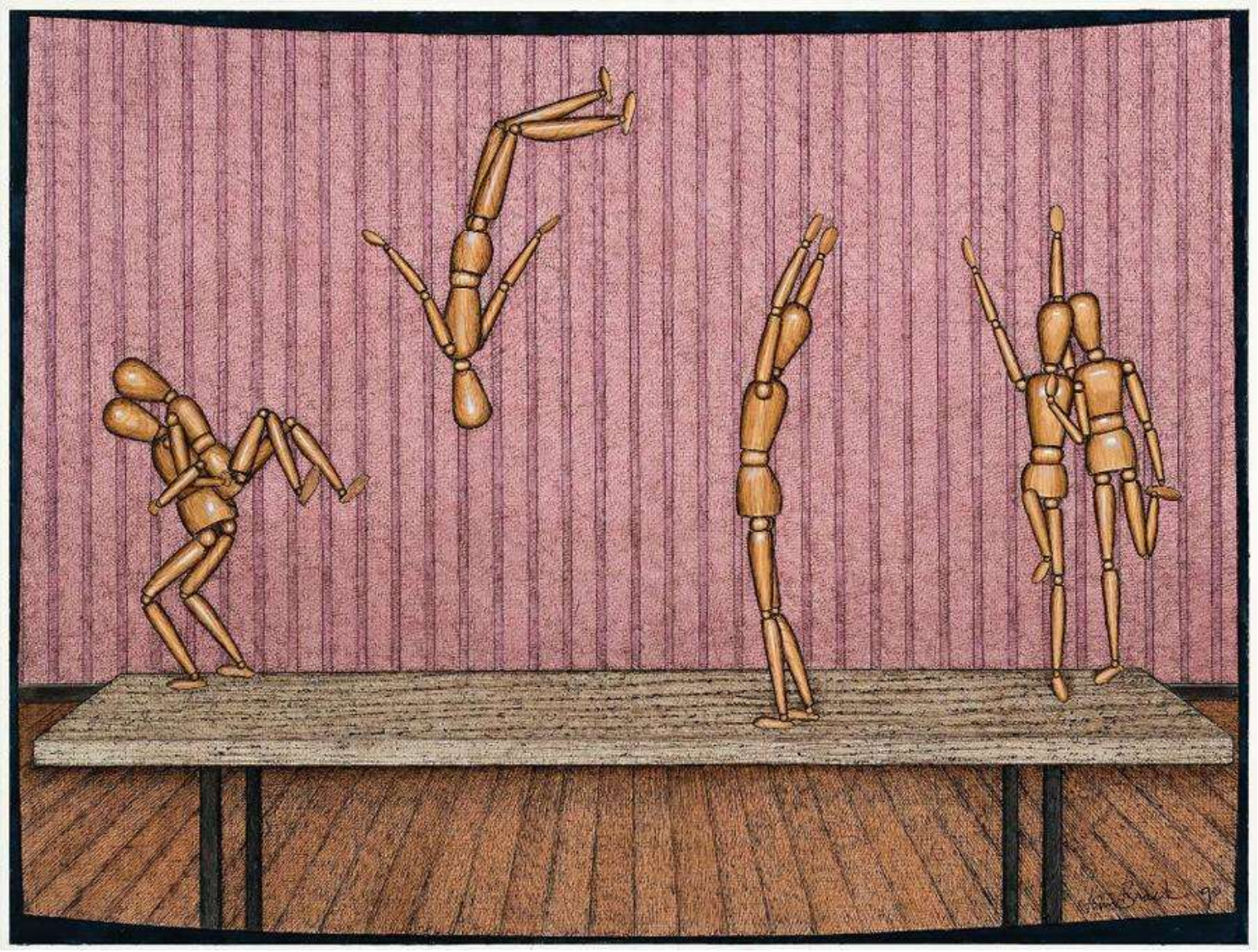
THE NORTHERN HOSPITAL

RADIAL NECK FRACTURES



"The Tumblers", watercolour, pen and ink on paper, 1990, John Brack

"I can't help suspecting that his exhibits may also be about one generation making way for the next. The cipher-like, unpainted dolls appear to denote psychologically unformed children. ... As for what they are doing, the gymnastics and ballroom dancing is an allegory for children learning social rituals, with each doll practicing how to behave and interact with others", (Christopher Heathcote).

Bracks's "unformed" manikins although seemingly "playful" also, like many of his works, seem to betray un unsettling sensation of the sinister. The children play perilously close to the edge of the table - a good recipe for a childhood injury - such as fracture of the radial neck!

RADIAL NECK FRACTURES

Introduction

Radial neck fractures are relatively uncommon injuries.

When they do occur, they are much more commonly seen in **children**, (in adults the same mechanism of injury usually results in a fracture of the *radial head*).

Mechanism

As for fractures of the radial head, fractures of the radial neck are most commonly the result of falls onto the outstretched hand with some added valgus stress. The forced is transmitted up the radial shaft to the capitellum.

These injuries may also be seen in association with posterior elbow dislocations.

Classification

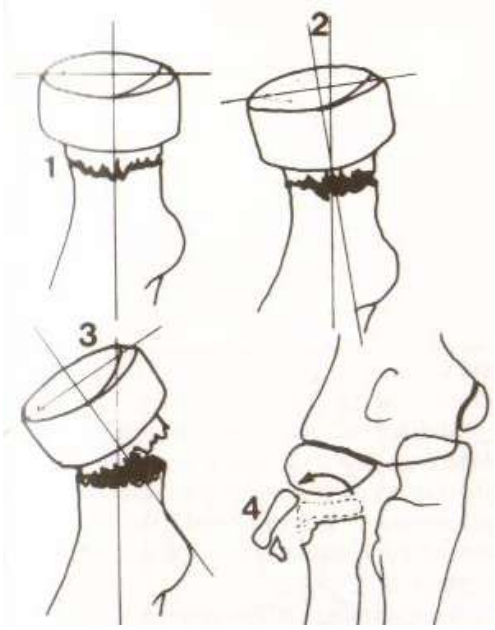
There is no formal classification for these fractures, however the following points are important as determinants of subsequent treatment:

1. The degree of displacement:

   - Angulation:

     ♥ *Undisplaced, Slight tilting, Gross tilting.*

     Completely off ended, especially in epiphyseal plate injuries in children.



   - Translation:

     ♥ Dorsal or volar

     ♥ Medial or lateral

2. The anatomical level of the fracture:

- Physeal (the most common type is the Salter-Harris II)
- Metaphyseal

3. Associated injury:

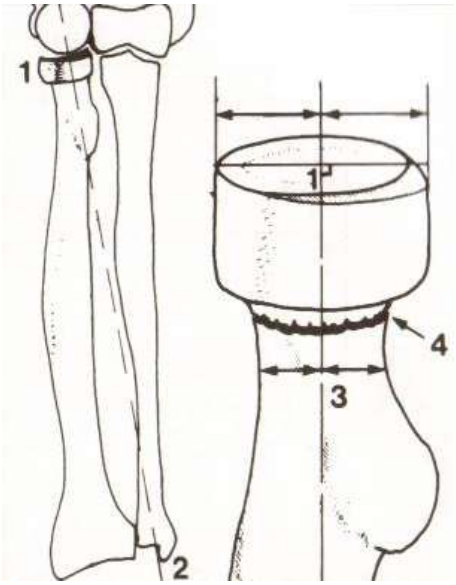
Note that there is a high incidence (around 50%), of *associated* injuries.

These may include:

- Ligamentous
- Elbow joint dislocation, (usually posterior).
- Avulsion of the medial epicondyle
- Fracture of the olecranon or proximal ulna.

Complications

1. It is important for normal *rotational function* that the correct anatomical relationship is preserved between the neck of the radius and the capitellum.



The axis of rotation of the radioulnar joint passes through the centre of the radial head (1) and the tip of the ulnar styloid (2). The axis passes through the centre of the neck (3) and lies at right angles to the plane of the head. Fractures through the neck (4) have the potential to disturb this relationship between the head and the neck.

Most of these injuries heel with appropriate treatment, but some may be left with a degree of rotational restriction.

2. In children, **epiphyseal injury** is an added important complication.

- Fracture may be either through the neck proper (just distal to the plate or metaphyseal) or through the epiphyseal plate itself.

- If not adequately treated this injury may lead to deformity as well as loss of function.

- Physeal injuries will usually be of the Salter-Harris type II.

- The ossification center of the upper epiphysis of the radius appears at the fifth year and fuses with the body between the ages of 16 and 18 years.

Clinical Features

As for radial head fractures look for:

1. Tenderness, swelling, pain and less commonly bruising over the region of the radial neck may be seen.

    - In minor fractures tenderness may not be immediately apparent, unless carefully looked for.

      This is best done by direct pressure over the radial head, whilst rotating the forearm, both ways.

3. There is reluctance to pronate/ supinate the radius.

4. Deformity is not a typical feature of these injuries, unless there are **associated** injuries.

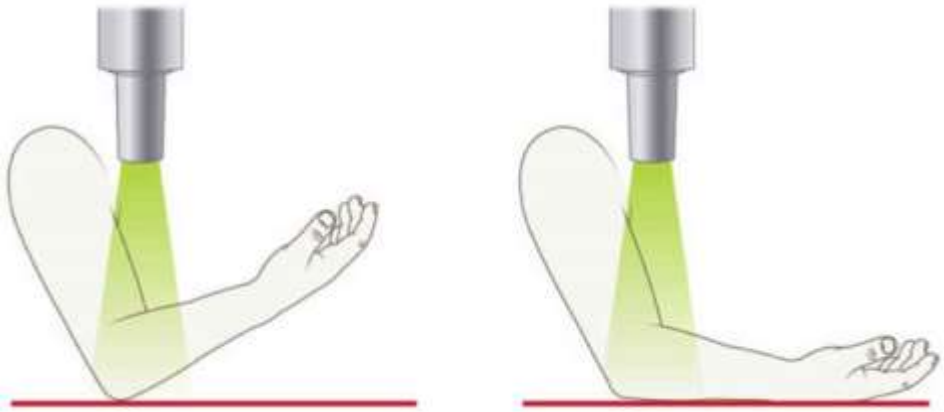
Investigations

Plain Radiography:

As for radial head fractures most radial neck fractures can be diagnosed with standard lateral plain radiographic views.

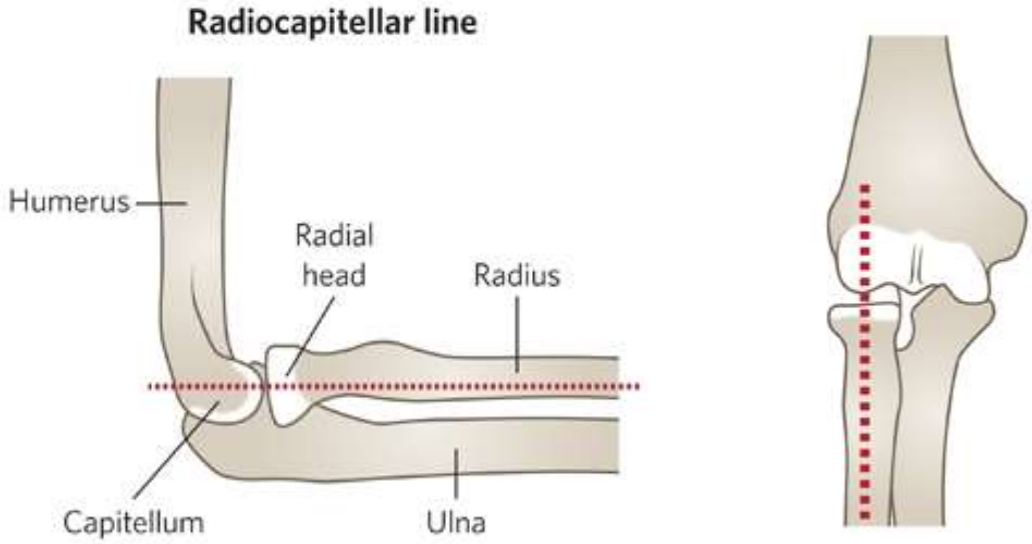
Antero-posterior (AP) and lateral view of the elbow should be ordered.

The degree of forearm rotation should be the **same** in each view (e.g. **mid-position**), in order to ensure that the views obtained of the proximal radius are **orthogonal, (i.e. perpendicular at their point of intersection).**



If the patient is unable to fully extend the elbow, the AP view of the elbow may not be a true AP view of the radius (left). In this situation, a separate AP view of the proximal radius may be needed to better assess the displacement (right), (RCH Fracture Guidelines).

The Radiocapitellar Line:



The **radiocapitellar line** is an important radiological feature when assessing for possible fractures around the elbow. **The radial head should always align with the capitellum in all views, (i.e. A-P and lateral).** *(RCH Fracture Guidelines).*

If no obvious fracture is seen, but clinical suspicion remains look for other indirect evidence of injury such as a positive **fat pad sign.**

Anterior and Posterior "Fat pads" shown by red arrows. The anterior fat pad is elevated off the humerus. A posterior fat pat is seen. (Radiograph courtesy Dr Rohan Laging).

If a fracture line cannot be definitely determined, yet clinical suspicion remains, evidence of soft tissue effusion should be looked for as an indication of possible underlying occult intra-capsular fracture.

Effusion is suggested by the "fat pad" signs, (see above).

- The **anterior fat pad** may normally be seen as a lucent line **adjacent** to the bone. It is abnormal if it is *elevated* away from the bone.

- The **posterior fat pad** is not normally seen. If it is present in any degree an effusion is present.

Management

1. Analgesia as indicated.

2. Conservative management:

   This is usually appropriate providing: [5]

   - The child is less than 10 years old
   - It is an isolated injury
   - Minimally angulation displacement, (≤30 degrees angulation)
     - ♥ Angulation refers to that between the radial head and radial shaft.
   - Minimally translational displacement (<10% translation)

   This can be done with:

   - An **above-elbow backslab** with a sling with elbow at **90 degree flexion** and the forearm in **mid-position** for a period of **3 weeks**
   - A repeat X-ray should be done at 1 week.

3. Fractures without the above criteria will require **orthopaedic review.**

   - Some angulation may be accepted, (up to 30 degrees in children and up to 20 degrees in adults), but significant angulation will need manipulation or open reduction if this fails.

     Fracture reductions of the radial neck should be performed under x-ray image intensification under general anaesthesia by an orthopaedic surgeon.

     Operative reduction may be indicated in cases of gross epiphyseal displacement.

Note also the following important considerations: [5]

- The closer the child is to skeletal maturity, the less time there is for remodelling (in this situation, angular deformity >15 degrees may not be acceptable)
- The true degree of angulation may be more than is shown on any one standard x-ray view translation may compound the effects of angulation
- Associated injuries mean the degree of angulation may increase
- Intra-articular physeal fractures (Salter Harris type III and IV) have their own criteria for reduction

Disposition:

Orthopedic review should be organized for **all** these fractures, including those treated conservatively in the ED.

Referral is important for these fractures for a number of reasons including:

- Displacement may worsen over the first few days.
- Healing is rapid and closed reduction (the desired method) becomes much more difficult after about 5 days.
- Many of these fractures are associated with other injuries around the elbow (e.g. olecranon) and these may not have been *evident* or *appreciated* initially.

References

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2. McRae R, Practical Fracture Management, 3rd ed 1994, p.147-149.

3. Apply's System of Orthopedics and Fractures, 7th ed 1993, p.585-585.

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5. RCH Paediatric Fracture Guidelines.

Dr. J. Hayes.

Reviewed March 2015