

ORTHOPAEDICS



FOR PRIMARY
HEALTH CARE



LION
LEARNING INNOVATION VIA
ORTHOPAEDIC NETWORKS

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Fractures of the shoulder, humerus and elbow

by Anria Horn

Learning objectives

1. Common paediatric upper limb fractures; recognising patterns.
2. Fractures around the elbow
3. Non-operative management

Common upper limb fractures

- Children tend to sustain fractures in predictable locations.
- The most common mechanism of injury for all upper limb fractures is a fall on an outstretched hand (FOOSH).
- The most common fractures are clavicle > distal radius (+/- ulna) > supracondylar.
- The growth plate is a weak spot in children's bones and fractures often occur through and around them.
- It is important to know what normal growth plates and ossification centres look like.

Clavicle fractures

- These are the most common fractures in children.
- Exclude neurovascular injury as close proximity to brachial plexus and large vessels.
- Common birth injury.
- Conservative management indicated for all clavicle fractures in children. This involves a collar and cuff or arm sling.

- Exceptions: Open clavicle fractures, vascular injury (both exceedingly rare).

Humerus fractures: Proximal and diaphyseal

- Rule out axillary nerve (proximal humerus) or radial nerve (midshaft) injury.
- Spiral humerus fractures in small children are suspicious for NAI.
- These fractures can largely be treated with simple immobilisation in the form of a collar and cuff or U-slab.
- Three weeks of immobilisation is usually adequate.



A large degree of angulation can be accepted. Remodeling is robust and as a non-weight bearing limb a small amount of residual deformity is acceptable.

Fractures around the elbow

There are many ossification centres around the elbow appearing at different times as the child matures. These ossification centres may look like fractures to the inexperienced eye. The acronym CRITOE/CRMTOL is useful to remember the ossification centres and when they appear.

Appearance of ossification centres:

- C - Capitellum (1-2 yrs)
- R - Radial head (3-4 yrs)
- I/M - Internal/medial epicondyle (5-6 yrs)
- T - Trochlea (7-8 yrs)
- O - Olecranon (9-10 yrs)
- E/L - External/lateral epicondyle (11-12 yrs)

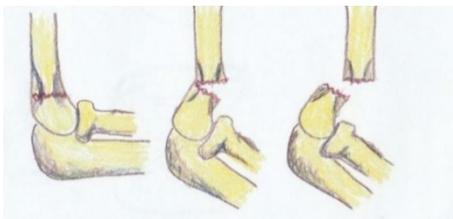
NB: Never use a circular cast for elbow fractures; always use a back slab.

Supracondylar fractures

- Weak spot above the humeral condyles at the level of the olecranon and coronoid fossae.
- Typically FOOSH.
- Clinical: Diffusely swollen elbow. Exclude vascular and neurological injury.
- Arteries: Brachial artery. Check radial pulse and hand perfusion.
- Nerves: Median > ulnar > radial.
- X-rays: AP and lateral elbow. Contralateral only in cases of uncertainty.



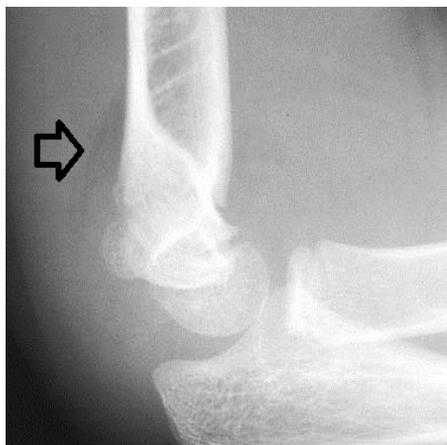
CRITOE/ CRMTOL



Grade I Grade II Grade III

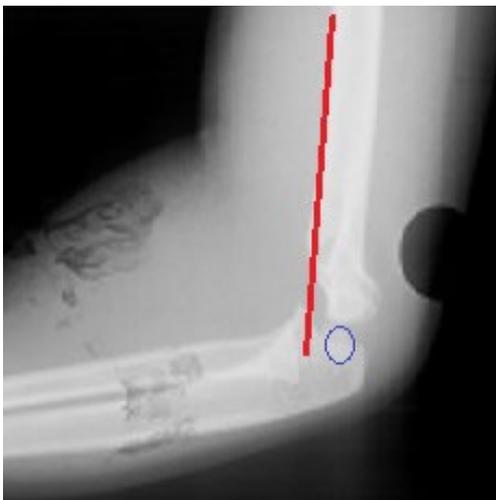
Grade I

- Undisplaced fracture.
- May only see fat pad sign. This is indicative of fluid (blood) in the joint.
- Treatment: Simple immobilisation in above elbow back slab for 3 weeks.



Grade II

- Partially displaced, posterior periosteal hinge intact.
- If the anterior humeral line crosses the capitellum, no reduction is required and management is as for Type 1.
- For displaced Type 2 fractures, closed reduction with or without wire fixation is indicated.

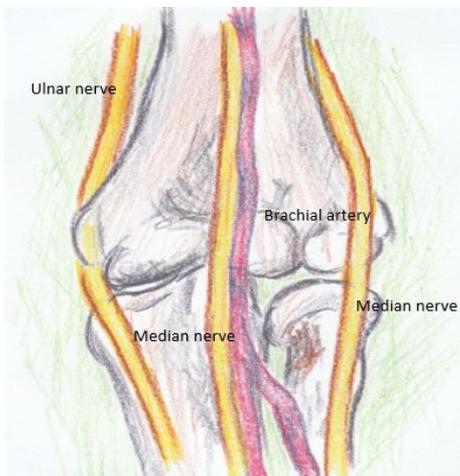


Lateral X-ray of Type 2 supracondylar fracture with the anterior humeral line not crossing the capitellum

Grade III

- Completely displaced fracture.
- High risk of neurovascular injury. Orthopaedic emergency!
- Needs urgent reduction and referral for operative management.

Elbow anatomy





Displaced Type 3 supracondylar fracture

Complications

- Compartment syndrome of the forearm. Also known as Volkmann's ischaemia.
- Neurological injury. Median nerve most commonly injured.
- Malunion leading to gunstock deformity.



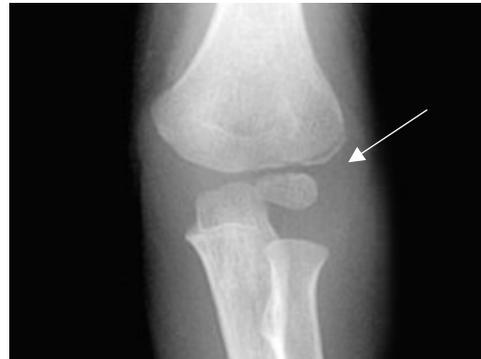
Gunstock deformity (cubitus varus)

Lateral condyle fractures

- These fractures are commonly missed so look out for them!
- All these fractures need to be immobilised and referred for possible surgical fixation.



Widely displaced lateral condyle fracture



Minimally displaced lateral condyle fracture

Dislocations and medial epicondyle fractures



Elbow dislocations should be reduced once identified.

Steps to reduction:

1. Neurovascular examination documented.
2. Sedation and analgesia.
3. 2 people involved.
4. Longitudinal traction for 3–5 minutes.
5. Elbow flexion with downward pressure on distal humerus.
6. Immobilisation in above elbow back slab.
7. Control X-rays.

The medial epicondyle is often avulsed at the time of dislocation.



Medial epicondyle avulsion following elbow dislocation

Following reduction it may be incarcerated in the joint. Actively exclude this!

Medial epicondyle fractures may be treated conservatively regardless of displacement.



Medial epicondyle incarcerated in joint

NB: All irreducible elbow dislocations or incarcerated epicondyles should be urgently referred.

Proximal radius and ulna fractures

Less common than distal humerus fractures. Look out for them!

Proximal radius fractures occur through the growth plate or the radial neck.



Fractures of the radial neck and head can be managed conservatively if $<30^\circ$ degrees angulation.

Proximal ulna or olecranon fractures are very rare in children.

As they are usually intra-articular, they should be referred following immobilisation in an above elbow back slab.

References

Evol K, Koval K, Zuckerman J. 2010. Handbook of Fractures, 4th Edition. Lippincott Williams & Williams. Philadelphia, USA.

Assessment

Regarding supracondylar fractures of the humerus in children, which statement is incorrect?

- A. Supracondylar fractures are usually caused by a FOOSH
- B. Neurovascular injury is common and the ulnar nerve is most frequently involved.
- C. Grade I fractures only needs simple immobilization
- D. There is a weak spot above the condyles at the level of the olecranon and coronoid fossae.
- E. Displaced grade 2 fractures are treated as Grade 3 fractures with reduction and percutaneous wiring.

(B) is incorrect, as the median nerve is most commonly injured.

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ABOUT THE BOOK

Informed by experts: Most patients with orthopaedic pathology in low to middle-income countries are treated by non-specialists. This book was based on a modified Delphi consensus study* with experts from Africa, Europe, and North America to provide guidance to these health care workers. Knowledge topics, skills, and cases concerning orthopaedic trauma and infection were prioritised. Acute primary care for fractures and dislocations ranked high.

Furthermore, the diagnosis and the treatment of conditions not requiring specialist referral were prioritised.

* Held et al. Topics, Skills, and Cases for an Undergraduate Musculoskeletal Curriculum in Southern Africa: A Consensus from Local and International Experts. JBJS. 2020 Feb 5;102(3):e10.

THE LION

The Learning Innovation via Orthopaedic Network (LION) aims to improve learning and teaching in orthopaedics in Southern Africa and around the world. These authors have contributed the individual chapters and are mostly orthopaedic surgeons and trainees in Southern Africa who have experience with local orthopaedic pathology and treatment modalities but also in medical education of undergraduate students and primary care physicians. To centre this book around our students, iterative rounds of revising and updating the individual chapters are ongoing, to eliminate expert blind spots and create transformation of knowledge.

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The information in this book is meant to supplement, not replace, Orthopaedic primary care training. The authors, editor and publisher advise readers to take full responsibility for their safety and know their limits. Before practicing the skills described in this book, be sure that your equipment is well maintained, and do not take risks beyond your level of experience, aptitude, training, and comfort level.

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