Paediatric fractures in the Emergency Department

October 2012
What this presentation covers

• Paediatric bone anatomy
• Buckle injury of distal radius
• Supracondylar fractures
Cast immobilisation
Children are different

Adult

Child

Diaphysis

Metaphysis

Diaphysis

Metaphysis

Epiphysis

Physis (growth plate)
Growth plate

Physis (growth plate)

Metaphyseal artery

Epiphyseal artery

Zone of provisional calcification
Hypertrophic zone
Proliferative zone
Germinal zone

The Royal Children's Hospital, Melbourne, Australia
Epiphysis

4 months

4 years

Secondary ossification centres

16 years

© The Royal Children's Hospital, Melbourne, Australia

Victorian Paediatric Orthopaedic Network
Contribution to growth

- Humerus: 40%
- Ulna: 20%
- Radius: 40%
- Femur: 70%
- Tibia: 18%
- Fibula: 12%
Buckle injury of distal radius

Buckle injury video link
How are they classified?

• Occur in the metaphyseal region of the distal radius

• Compression injury and stable

• Need to be distinguished from complete fractures, greenstick fractures and growth plate fractures
How common are they?

- Fall on outstretched hand
- Peak incidence at the beginning of the adolescent growth spurt
What do they look like clinically?

• Pain and tenderness over distal radius

• Minor swelling but no deformity

• Wrist may be able to be moved
What radiological investigations should be ordered?

- If pain well localised, order wrist x-ray (AP and lateral)

- If pain not well localised, forearm x-ray should be ordered to exclude a more proximal fracture or radial head dislocation
What do they look like on x-ray?
Greenstick fractures

Fracture on the tension (convex) side and compression side remains intact
Ensure both cortices are intact!

Complete Fracture
When is reduction required?

- Buckle injuries do not need manipulation
- They are not displaced and stable
Do I need to refer to orthopaedics now?

• Buckle fractures need no referral
• Metaphyseal fractures are referred if
  v Open fracture
  v Fractures with associated neurovascular compromise
  v Inability to achieve an acceptable reduction
  v An associated arm fracture
What is the usual ED management of this fracture?

- No reduction required
- Below-elbow fibreglass/plaster backslab or removable wrist splint for 3 weeks
What follow-up is required?

• No follow-up is required by GP or fracture clinic
• Radiographic follow-up is not required
• Instruct parent to remove backslab or splint in 3 weeks
• Ensure parents understand signs for concern
What advice should I give to the parents?

- Excellent outcome
- Rapidly back to normal function
- Buckle injury fact sheet
What are the potential complications associated with this injury?

- Not recognising injury is in fact a complete fracture or greenstick fracture
  - Inadequate splintage (requires a complete cast) and potential loss of position
  - Follow-up in fracture clinic required
Supracondylar fractures
How are they classified?

• Extension injuries - 95%
  v Distal fragment displaced posteriorly

• Flexion injuries - 5%
  v Distal fragment displaced anteriorly
Gartland classification of extension injuries

Type I: Undisplaced

Type II: Angulated with posterior cortex intact

Type III: Displaced distal fragment, no cortical contact
How common are they?

• Most common elbow fracture in children

• Peak age 5–8 years

• Usual mechanism is a fall onto the outstretched hand
What do they look like clinically?

- Pain, swelling, and limited elbow range of motion
- Displaced fracture in extension seen as an S-shaped deformity
- Radial pulse should be felt and documented
What do they look like clinically?

- Always examine for associated injuries
- Conduct neurological examination

![Diagram showing gestures for neurological examination]

- Make a fist: Tests AIIN and median nerve
- Thumbs up: Tests radial nerve
- Make a star: Tests ulnar nerve
What radiological investigations should be ordered?

• Clinically deformed fractures should be immobilised in about 30 degrees short of full extension, prior to x-ray evaluation.

• AP and lateral x-rays of the distal humerus (not elbow) should be obtained.

• Important to identify other injuries in the forearm.
What do they look like on x-ray?

- Gartland classification based on lateral x-ray, identifying where capitellum sits in relation to a line drawn down the anterior aspect of the humerus.
Type I supracondylar fracture
Type II supracondylar fracture
Type III supracondylar fracture
When is reduction required?

<table>
<thead>
<tr>
<th>Type I</th>
<th>Do not require reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type II</td>
<td>Need some reduction</td>
</tr>
<tr>
<td>Type III and flexion supracondylar fractures</td>
<td>Reduction and percutaneous K-wire fixation</td>
</tr>
</tbody>
</table>

Patients should be kept nil orally until a decision about the timing of surgery is made.
Do I need to refer to orthopaedics now?

- Absence of pulse or ischaemia
- Open or impending open fracture (large anterior bruise)
- Associated nerve injuries
- Gartland type II & III fractures
- Associated same arm forearm or wrist injury
- Flexion supracondylar fractures
What is the usual ED management of this fracture?

<table>
<thead>
<tr>
<th>Type</th>
<th>Management</th>
</tr>
</thead>
</table>
| Type I | • No reduction required  
          • Immobilise in above-elbow backslab                                |
| Type II| • Refer to ortho for advice  
          • Gentle reduction in ED or in theatre                                |
| Type III| • Refer to ortho                                                          |
Above elbow backslab
What follow-up is required?

• Type I
  - GP in three weeks
  - Repeat x-ray not required

• Type II
  - Fracture clinic one week post-injury
What advice should I give to the parents?

- **Type I**
  - Sling for 3 weeks
  - Backslab and sling worn under clothing
  - Elevate limb (for the first 48 hours)
  - Marked elbow stiffness following removal of backslab
  - Movement returns with time and physiotherapy is **not** required
What are the potential complications?

Volkmann’s

Gunstock Deformity
Supracondylar elbow fracture (undisplaced)

Your child has a simple fracture just above the elbow. These elbow fractures require only a backslab (partial cast) and sling. The backslab and sling should be placed under loose-fitting clothing, not through the sleeve (Figure 1).

The first days
In the first few days there may be swelling of the elbow, hand and fingers. During this time it is important to rest as much as possible with the elbow and hand supported on pillows (above and below the heart) raised. The sling may be removed when your child is lying down. Encourage your child to bend and straighten the fingers regularly. Check their fingers for movement, feeling and circulation.

The backslab will be painful initially. Give a simple pain medication such as paracetamol (e.g., Paracetamol™) as needed following the directions on the packet, or as directed by your doctor. (Also see Orthopaedic fact sheet fractures in children; caring for your child in an arm cast).

Follow-up
The local doctor will remove your child’s cast and remove the backslab. Three weeks after the injury, an x-ray is not required.

After the cast is removed
When the backslab is removed, the skin may be dry and itchy. Bathe with warm water and soap, and apply a gentle moisturiser. Your child should begin moving the elbow. There will be marked elbow stiffness for a prolonged period (months). Usually full mobility returns with time but this may take up to one year. Physiotherapy is not recommended. Your child should avoid sports and heavy arm use (such as climbing) for one month after removal of the backslab.

When to seek urgent help
Severe pain and swelling, change in colour of the fingers (white or blue), numbness or pins and needles, and inability to move the fingers, are concerning signs that the cast may be too tight. If any of these signs occur, rest and elevate the limb for thirty minutes (Figure 2).

Take your child immediately back to the hospital emergency department, when, even after elevating the limb for 30 minutes:
* the fingers remain white or blue
* the child complains of pins and needles, or numbness in the fingers
* the child is not able to move their fingers, or complains of pain when you move them
* there is severe pain that is not relieved by the recommended medication at the recommended dose.

Take your child to the hospital you attended, or the local doctor if:
* the backslab is cracked, soft, loose or tight, or has rough edges that hurt
* you are worried that an object has been pushed inside the backslab
* there is increasing pain

Contact your child’s doctor if you have ongoing concerns regarding:
* the shape of your child’s arm
* how your child is using their arm.
Find out more

www.rch.org.au/clinicalguide/fractures