

A Summary of Upper Limb Fractures in Children

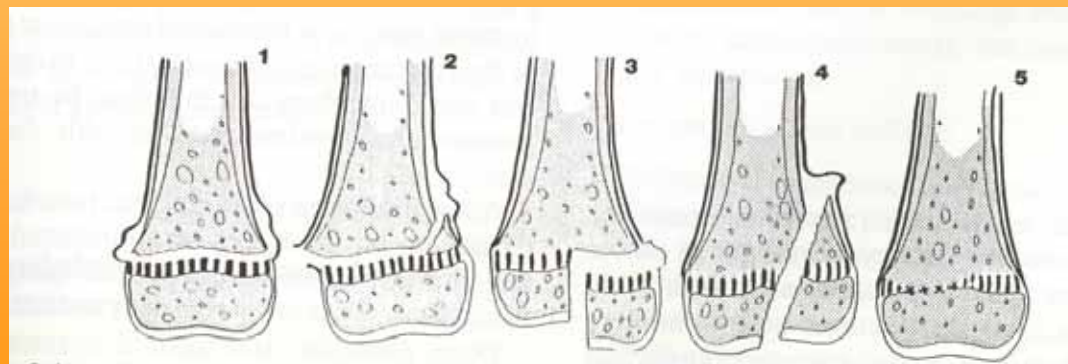
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Consulting in Central Districts

- Rules

- Bone is weak link
- Physis is weakest part of bone- physis injuries
- Ligaments are strong
- Children periosteum makes some fractures stable and with growth bones remodel



- **Clavicle fractures**

- Most common in childhood
- Middle 1/3 rarely displaced, heal & remodel rapidly
- Treat with broad arm sling/ duke of edinburgh
- Fractures of medial end- d/d steno clavicular dissociation (ct will show)
- Lateral end make sure not Salter Harris 1 or 2 of physis



- **Humeral Fractures**

- Proximal humeral epiphysis is very active contributing to 80% humeral growth
- Majority heal in 3 weeks and remodelling rapid
- Such a wide range of motion- malunion rarely leads to problem
- Treat with C&C
- Reserve operative treatment for gross displacement with only 2 years of growth remaining



- Shaft of humerus fractures
 - Rare- in 3-12 yo exclude pathological
 - 0-3 consider NAI
 - >12 yo (like adult)
 - Cast Brace and sling
 - MVA rare occurrence but may necessitate TX like adult

Options of surgical treatment



- pinning, external fixation, intramedullary rodding, screw fixation, and compression plating.
- Smooth intramedullary rodding
 - Two 2-mm rods placed in retrograde position through the epicondyles
- prognosis for healing and remodeling of humeral shaft fracture is excellent especially in young patients and proximal fractures.

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- Elbow Trauma
- When following history of trauma
 - Usually there is a fracture around elbow
- Beware of swollen elbow in young child with “soft” history
 - If history of trauma not clear
 - Systemic symptoms
 - FBC, ESR, CRP
 - Exclude septic elbow
- Careful examination of skin for puncture wounds
- Examine contra lateral elbow
 - normal carrying angle
 - neutral ligamentous laxity
 - ability to hyper extend

Table 8-1 Quick Motor Nerve Testing for the Upper Extremity

"Thumbs up"	"OK"
	
Radial nerve—Extension of wrist and thumb Median nerve—Flexion of digits 2-3	Ulnar nerve—Abduction of digits 3-5 Anterior interosseous nerve—Flexion of index and thumb DIP

- Supracondylar fractures- MOST SERIOUS
- Produced by forcible hyper extending the elbow
- The olecranon forms the fulcrum in the supracondylar region
- Collateral ligaments prevent dislocation
- More common in children with hyper extendible joints

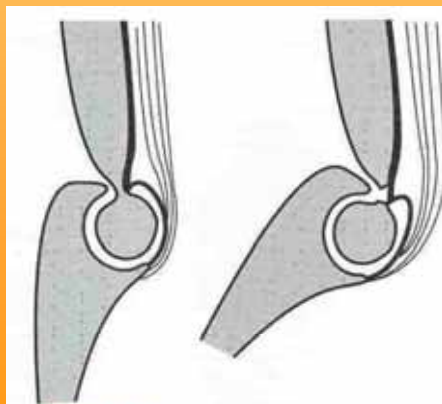


Figure 8-16. The olecranon forms a fulcrum in the supracondylar region, which causes a fracture when the elbow is forcibly hyperextended.



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Type I fractures

- Treated with cast immobilization for 3 weeks
- Check contra lateral elbow for hyperextension
- In a naturally lax child have a lower threshold for MUA
- Monitor with repeat x rays



Type II fractures

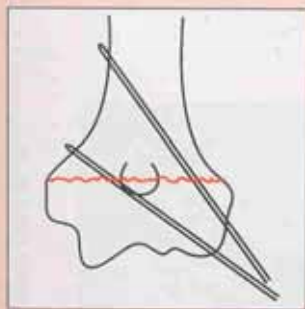
- These fractures need to be reduced to prevent hyperextension and angular deformity of the elbow
- Important to correct any varus or rotational deformity
 - IIA fractures can be reduced and held in a casting or splinting in hyperflexion
 - IIB fractures need reduction (both extension and rotational deformity)
(Most agree that IIB fractures need percutaneous pinning)
- Pinning maintains reductions and allows safe casting at <90 flexion

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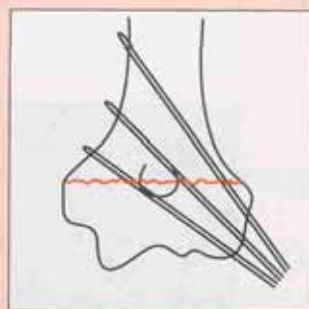
- Type III
- All fractures need reduction and internal fixation
- Frequently reduction is obtained closed
- Occasionally need to be opened due to soft tissue interposition or brachial artery injury
- Absent radial pulse by itself is not a indication for exploration

Divergent—2 pins



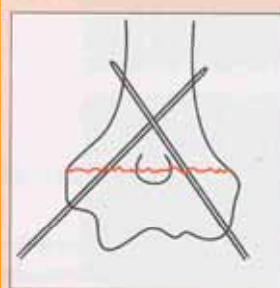
Two lateral pins adequate for most fractures

3 pins



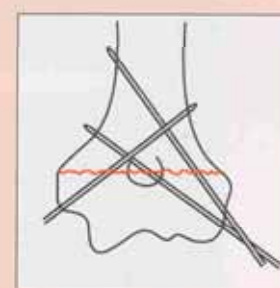
Three lateral pins for very unstable fractures

Crossed



Traditional fixation puts ulnar nerve at risk

Crossed and Divergent



A third pin can be added for unstable fractures. If necessary, the medial pin can be removed once the cast is on.

- Complications of elbow fractures
 - Volkman's Ischaemia
 - Brachial artery Injury
 - Neurological Injury
 - Anterior Interosseus
 - Radial Nerve injury
 - Malunion

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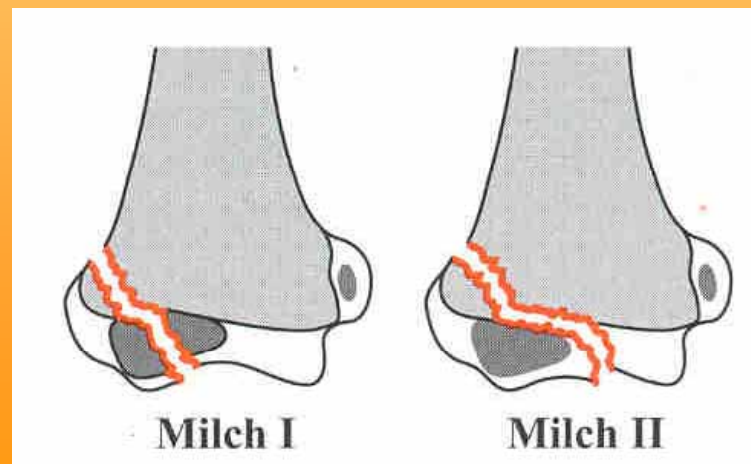
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- Post Op
- Repeat radiographs in 1 week
- Pins are removed at 3-4 weeks with most fractures
- In most cases there would be adequate healing to start motion at this stage
- If fracture clearly visible with little callous further splinting for 2-3 weeks
- Encourage active ROM
- Passive ROM is painful and unlikely to improve motion

Lateral Condylar fracture

- Milch classification is based on whether or not the capitellar ossification center is disrupted by the fracture line
- Useful in determining the prognosis/ risk of growth arrest
- Milch I more likely to cause growth disturbances
- Prevalence Milch II > Milch I



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- These intra-articular fractures need anatomical reduction
 - for good joint function
 - to ensure normal distal humeral growth
- Most fractures are fixed with open reduction and k wiring
- With experience and careful observation few minimally displaced fractures can be treated with cast only
- Minimally displaced - $<2\text{mm}$ in AP/LAT

- K wires left in for 4-6 weeks
- Mobilization too early can result in non union
- Long term follow up recommended due to risk of growth abnormalities






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Medial Condyle Fractures

- Very rare
- If neglected this intra-articular fracture like its lateral counterpart has a poor outcome
- Common mistake is to confuse a condylar fracture with a epicondylar ossification (epicondyle ossifies earlier at 5-9 y)
- Condylar fracture often associated with valgus instability and posteromedial subluxation

Table 8-6 Kilfoyle Classification of Medial Condyle Fractures

Type I	Type II	Type III
		
Extends from medial condylar metaphysis to physis (not into the joint)	Extends into medial condylar physis but is minimally displaced	Condylar fragment is rotated and displaced
Cast	Closed reduction and pin fixation	Open reduction and pin fixation

Medial epicondyle fractures

- Ossifies between the ages of 5-9
- Avulsed by valgus stress and contraction of the flexor muscles
- Traumatic elbow dislocations often associated

Assess for other injuries such as radial neck and ulnar nerve

Indications for treatment is still debatable

Support in orthopaedic literature for both operative and non operative management

Minimally displaced fractures (<5mm) can be treated with cast immobilization



Lateral Epicondylar fractures

- Ossification late 8-13
- Often irregular ossification center confused with fracture
- Extensor muscle origin may be responsible for avulsion fractures
- No consensus on the need for or the method of treatment
- Minimally displaced can be treated with immobilization 4-6 weeks

Pulled Elbow

- Common early childhood injury
- Clinical picture is characteristic
 - 1-4 y
 - Suddenly refuses to move arm
 - Hold elbow slightly flexed and forearm pronated
 - History of child being pulled along or lifted by the wrist is not always forthcoming
- Give consideration to other conditions
 - Septic elbow , olecrenon fracture, radial head and neck fracture, supracondylar fracture, septic wrist

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- X rays are usually normal
- Occasionally slight lateral or distal shift of radial head can be seen

Treatment

- Supinate the flexed elbow with a click as the subluxed radial head reduces
- Often the elbow must be flexed to 90 with firm supination to achieve reduction

Elbow Dislocation

- Elbow dislocation without fracture is uncommon in children
- Associated occult fractures (usually medial epicondyle) may prevent reduction
- The articular surface of the ulnar or capitellum may also fracture and prevent concentric reduction

Treatment

- Should be reduced as soon as possible to relieve pain and improve circulation
- Gentle traction with fingers behind the olecranon and flexion of elbow usually relocated the elbow
- Typically splinted for 2-3 weeks



Figure 1a: A complete elbow dislocation.

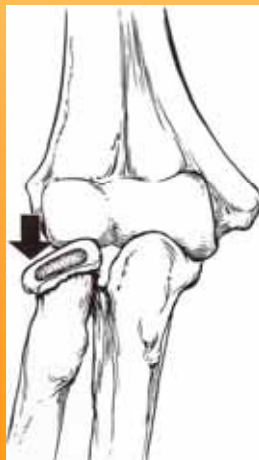
- Olecranon Fractures

- Uncommon
- If undisplaced and only fracture- 4 weeks in plaster
- 50% associated with radial head/neck fracture or medial epicondyle or lateral condyle
- If displaced and can't be closed reduced then Tension band wiring



Radial head /neck

- Radial head fractures are rare- the weak area is neck and thus neck fractures are more common
- Neck- 4 grades
- usually treated with closed reduction
- Tx
 - Isolated fractures of neck either acceptably displaced or reduced to acceptable position-treat in triangular sling and active ROM as tolerated



Forearm Fractures (2nd most common)

- Distal 1/3 fractures

- Buckle (Torus) treat below elbow plaster for 3 weeks

All other fractures treat with above elbow plaster

- Greenstick- if dorsal angulation > 20 degrees or clinically quite angulated consider reduction, otherwise will remodel
- Epiphyseal injuries- Healing and remodelling are rapid and significant degrees of displacement can be accepted (forceful late manipulation may lead to physeal damage).
- The incidence of growth plate arrest is very rare but due to the large numbers of cases, it is not uncommon to see it-relative overgroth of ulna="madelung deformity"



Undisplaced



Displaced requiring surgery



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- Middle third shaft of forearm
 - much less frequent, but difficult to Tx
 - Union & Remodelling much slower 6-8 weeks
 - Prone to refracture
 - Remodelling is really a case of smoothing the fracture outline than major realignment
 - Treat each case on its merit



Monteggia Fracture

- Fractured mid to upper ulna % dislocated radial head
- 1 of more common missed fracture
 - 2 rules
 - Line drawn on ap and lateral x-ray should pass through capitellum
 - Never accept evidence of an isolated fracture of radius or ulna without checking wrist or elbow

Tx

- Acute- easily reduce and POP
- Delayed necessitates open reduction



Galleazi Fracture

- Much less common than Monteggia
- Fractured distal radius and dislocated DRUJ
- More often in adolescents or Adults
- More likely to require anatomical reduction of radius (thus internal fixation)



Hand Fractures

- Most treated similarly to Adult fractures
- Scaphoid fractures are rare before 10yo
- Physeal injuries very common
- Mallet fingers and crush to distal phalanx very common (make sure do not miss physeal injury)



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If not sure
Just like
“who wants to be a millionaire”

Phone a friend

04379 18552

Gavin Nimon- GP advice line