



# The Weekly Probe

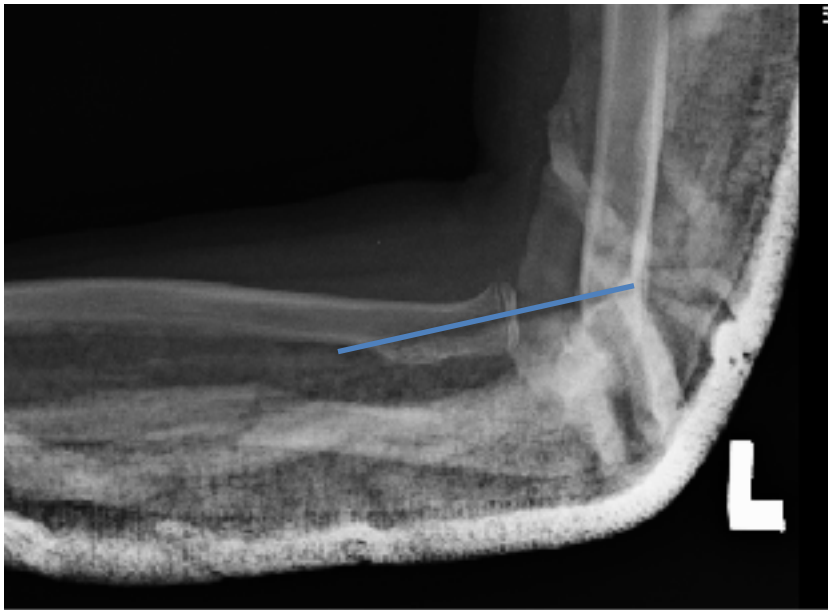
6<sup>th</sup> June 2017

Volume 14 Issue 19

LAST WEEK'S CASE – MONTEGGIA FRACTURE- DISLOCATION
PAEDIATRIC FRACTURES
NEXT WEEK'S CASE
JOKE OF THE WEEK

## LAST WEEK'S CASE – MONTEGGIA FRACTURE- DISLOCATION

A 7yo girl presents with forearm pain post fall. Slab and home?



The Xrays show the Monteggia fracture-dislocation.

Taking a step back when we see one fracture in a ring structure (such as a pelvis) or in 2 parallel bones (such as forearm or lower leg), then look for a second fracture, dislocation or significant ligamentous injury which alters the integrity of that structure.

In the case of the **Monteggia fracture-dislocation** there is a fracture of the ulnar shaft which first captures the eye. However it is associated with a concomitant dislocation of the radial head which can be missed.

The direction in which the apex of the ulnar fracture points is the same direction as the radial head dislocation (anterior, anteromed or anterolat)

**Mechanism** - Typically (as in this case), the Monteggia fracture-dislocations occur as the result of a fall on an outstretched arm. Another potential mechanism is a blow to the ulnar aspect of the forearm which is sustained when the patient uses their forearm in an attempt to protect their head etc from a blow from a blunt object.

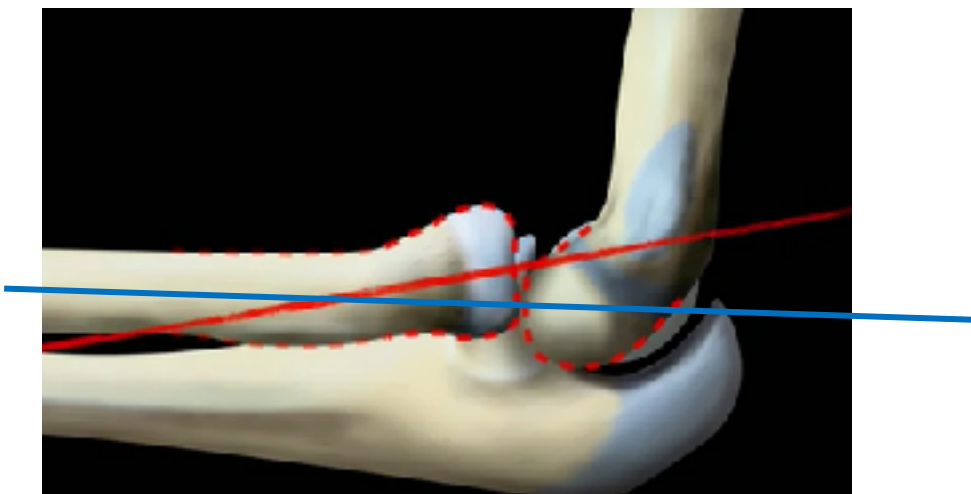
This is one way to remember the injury pattern – someone protecting themselves being hit by a mountie



### Radiographic features

Couple of pointers:

- remember to obtain proper views of the wrist, elbow and forearm ( up to 1/4 have associated distal radial fractures).
- a line drawn through the radial neck (red line below) should run through the capitellum of the humerus. This line should be used rather than that of the radial shaft (blue line below) (also see with X-rays first shown). For the image below, there is alignment of the radial shaft with the capitellum yet the radial neck is not aligned and the radial head is subluxed.
- The same alignment should be looked for on the AP film
- Different # types may be seen in the ulna including plastic bowing fractures - see Paediatric section below
- the radial head can spontaneously reduce.



## Treatment

The fracture type, location and the age of the patient will determine treatment. At minimum, the radial head and ulnar # needs closed reduction yet at times open reduction and internal fixation is required

### What's this?



The mid shaft radial # is the prominent feature of the above Xray yet as mentioned above, always look for another # or a dislocation. In this case the ulna is dislocated distally (dorsal dislocation). This is known as a Galeazzi fracture-dislocation.

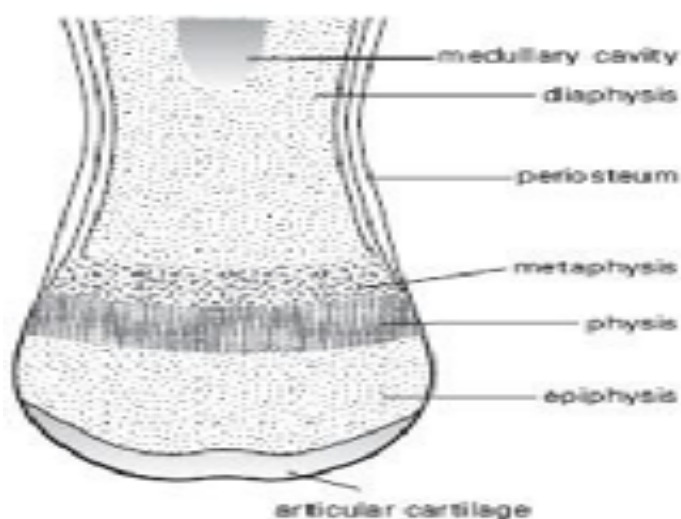
There a number of mnemonics to help remember how to differentiate between Monteggia such as GRIMUS (Galeazzi- Radius - Inferior (distal dsloc'n) - Monteggia - Ulna - superior (prox disloc'n)). Personally remembering the moutie is enough.

## PAEDIATRIC FRACTURES

There are number of key differences when comparing adult and paed's orthopaedic injuries, most which is based on the different anatomy and subsequent histopathology.

### Anatomy

- Bones are more elastic & stronger (more water – less mineral- larger canals) – bend & buckle rather than snap
- Periosteum thicker, more elastic & less firmly bound- remains intact – less likely comminuted # or non-union- heals faster – keeps reduc'n
- Ossification centers appear in the epiphysis in a predictable sequence
- Growth at epiphyseal growth plate (physis)- between the epiphysis and metaphysis

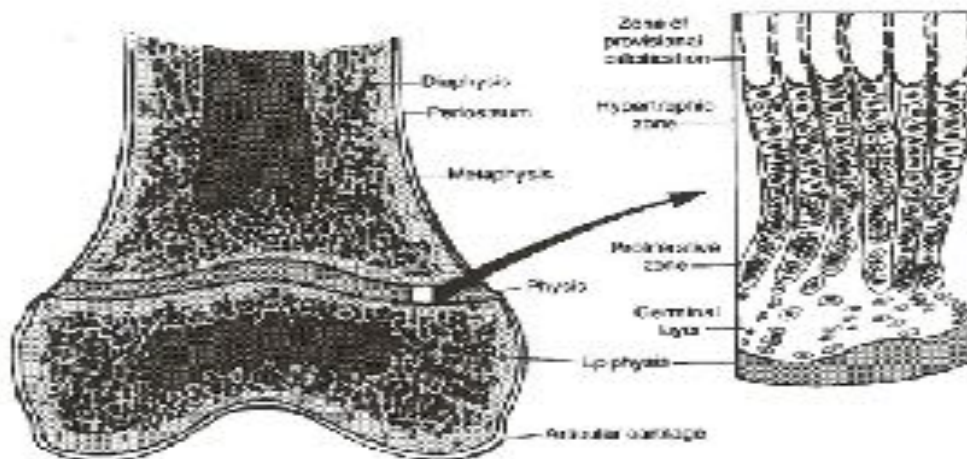


Looking more specifically at the physis, cells multiply at the germinal layer then they hypertrophy and migration to the hypertrophic zone before calcification. The physis is the weakest part of the bone and joint capsule & ligaments ~ 2-5 X as strong. Thus isolated dislocations are rare in pre-adolescent patients – eg shoulders- suspect physeal injuries

The type of fracture across the physis is described according to the Salter Harris classification. The degree of involvement of the germinal layer influences the severity of the injury. Thus as we progress from salter harris (SH) 1 to 5 (see below) there more germinal matrix involvement. As the hypertrophic region is the weakest part of the physis, fractures through this are more common ie SH 1 or 2. Being less calcified the metaphysis is another zone of weakness.

FIGURE 10-10: PATTERNS IN THE SB: GROWTH-PLATE INJURIES

51



### COMPLICATION

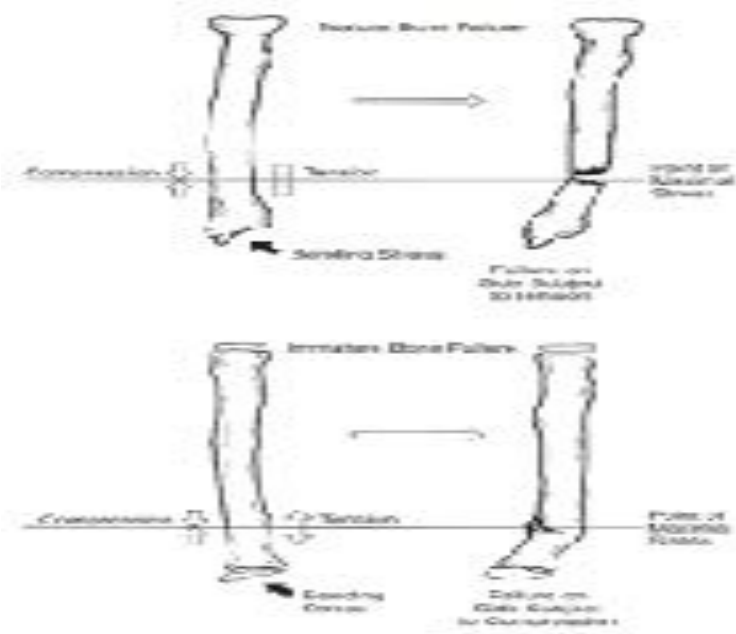
- Malunion
- Growth Arrest
- Less – Non-union
  - RSD
  - compartment syn
- Re- # 7-13%

### Remodelling

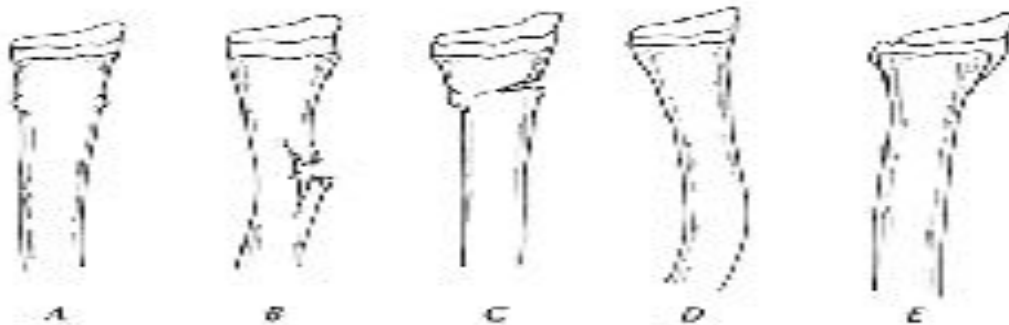
- corrects for angulation ~ 10 degrees per year- not rotation
- depends on time till physeal closure (esp < 8-10yo)

As the paediatric bone is less calcified than adult bones we often see different injuries / fracture patterns

- More likely to fail with compression injuries as the bone buckles under stress (c/w adults which more commonly fail on the side of tension)



## FRACTURE TYPES



### Torus (buckle) (A)

- Abrupt bend in cortical surface- 1 or both
- Esp metaphysis-diaphysis transition
- Displacement or nonunion uncommon
- ? Significance
- ? casting conventional yet some debate re role (see next week's Probe)

### Greenstick (B)

- Only 1 side #
- Under tension
- Esp diaphysis

### "Lead Pipe" (C)

- Greenstick + torus

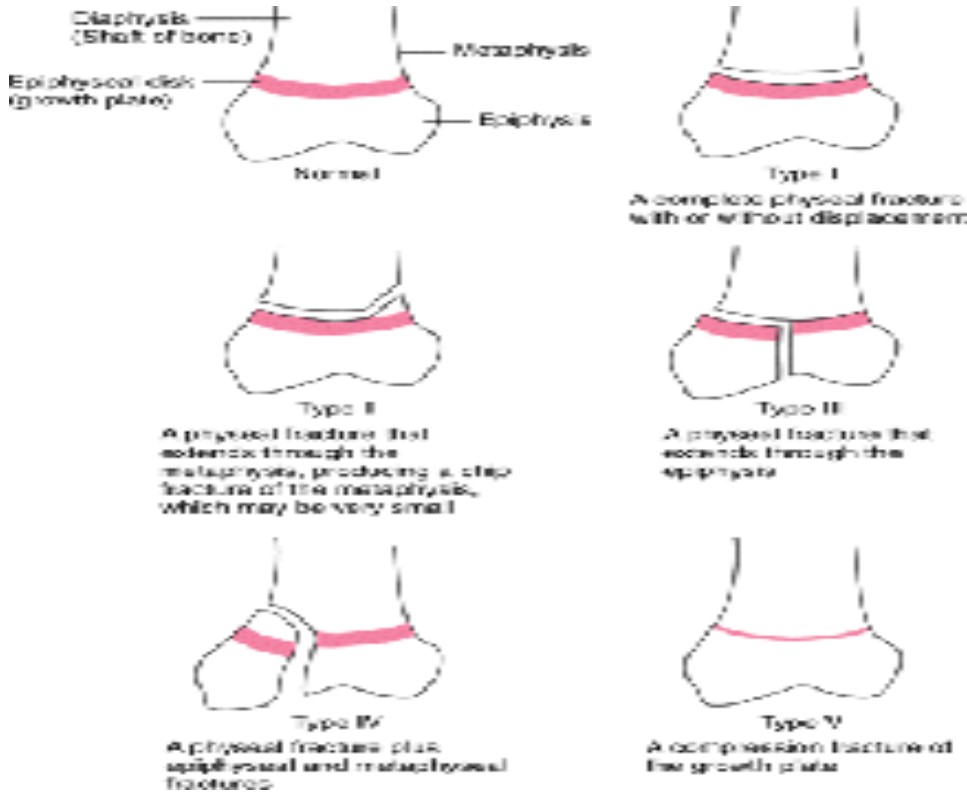
### Bowling (plastic deformation) (D)

- No cortical defect
- Esp radius, ulna, fibula
- Comparison Xray
- Little remodelling – reduction esp if > 20 degrees or >4yo
- No periosteal reaction – followup films NOT helpful

### Avulsion

- rather than tear tendons children will often avulse the bony / cartilaginous attachment
- commonly seen around the pelvis (ASIS, AIIIS) – tibial tuberosity (rather than tear quad or patellar tendon) – tibial spines (rather than tear ACL)

### Epiphyseal Growth Plate- Salter Harris classification



SH1 ~ 6%

- Esp < 5yo
- Subtle
- Swelling or tender along plate
- Comparison or delayed films
- Treat as #
- Eg SUFE (slipped upper femoral epiphysis)
  - 10-15yo – obese
  - Hip or knee pain
  - Xray- AP & frog leg
  - Can be subtle
  - Widening of growth plate
  - Slips posterolaterally
  - Line along sup border of femoral neck – normally intersects with femoral head
  - Ice cream falling off cone – line on right cuts through edge of epiphysis – the ice cream has fallen off the cone on the left so that the line does not cut through the epiphysis



SH2 – 75% (ie most common)

SH3 ~ 10% eg Tillaux # in adolescents

SH4 ~ 10% esp distal humerus, triplanar # in adolescent ankles

SH5 ~ 1% - via compressive force –esp knee and ankle – often diagnosed in retrospect

#### Osteochondral

- most commonly seen in adolescents
- especially anterolat and posteromedial talar dome with inversion + impaction injuries - intercondylar region of femoral condyles
  
- Complete- as in adult injuries
- Can be combination of # types

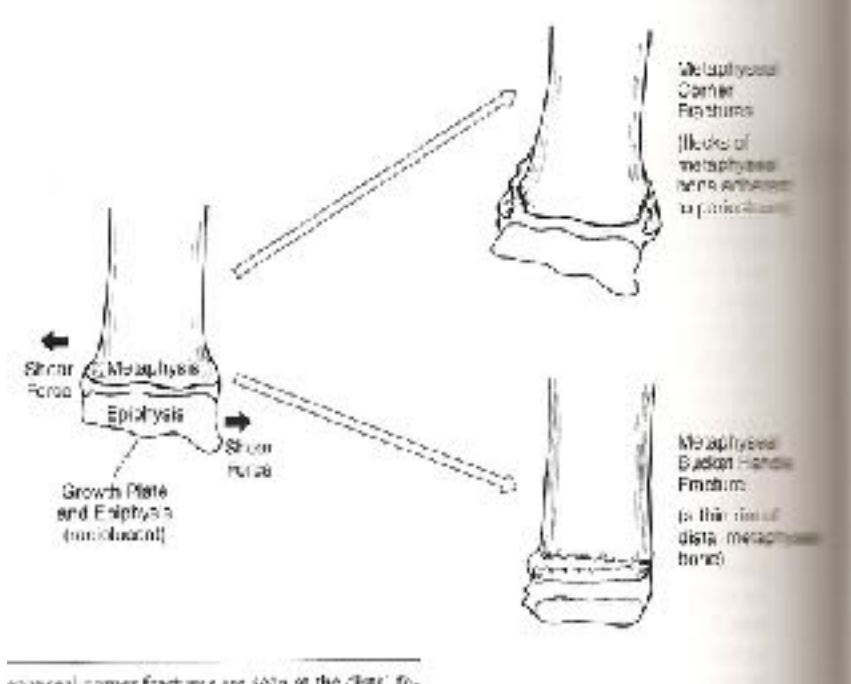
#### **NON- ACCIDENTAL INJURIES (NAI)**

With any injury in a child, NAI should be considered. Historical and other examination features should be considered yet certain injuries should raise your concern. These include:

- Tibia / femur – in non-ambulatory children
- Humerus- away from supracondylar region
- Sternum / sternoclavicular jt
- Scapular #
- Ribs
- Vertebral spines
- Hand or feet of non-wt bearing kids

Shearing forces on the distal ends of long bones may produce injury to the metaphysis - esp knees, wrists, ankles, elbows. Results in bucket handle or metaphyseal corner fractures

Paracortical / periosteal calcification from previous episodes of abuse may also raise your concern.



## NEXT WEEK'S CASE

Following on from the above section, what are your options for the treatment of a torus fracture in a 5yo girl who presents after falling on an outstretched left arm?

You are advised to evert the edges when closing a wound. What does this mean? How?

## JOKE / QUOTE OF THE WEEK

The mother-in-law arrives home from shopping to find her son-in-law Mick in a steaming rage and hurriedly packing his suitcase.

"What happened Mick?" she asked anxiously.

"What happened? I'll tell you what happened! I sent an email to my wife telling her I was coming home from my fishing trip. I get home and guess what I found? Your daughter, my wife, naked with Joe Murphy in our marital bed! This is unforgivable! The end of our marriage. I'm done. I'm leaving forever!"



“Ah now, calm down, calm down Mick!” says his mother-in-law. “There is something very odd going on here. My daughter would never do such a thing! There must be a simple explanation, I’ll go speak to her immediately and find out what happened.”

Moments later, the mother-in-law comes back with a big smile.

“Mick, I told you there must be a simple explanation ... She never got your email!”

Please forward any funny and litigious quotes you may hear on the floor (happy to publish names if you want)

#### THE WEEK AHEAD:

Thursday 15<sup>th</sup> June      JMO Education, midday – Staff Education Centre, level 2  
Dr Angela Chiew - Poisoning / Envenomation