Government of **Western Australia**
Child and Adolescent Health Service

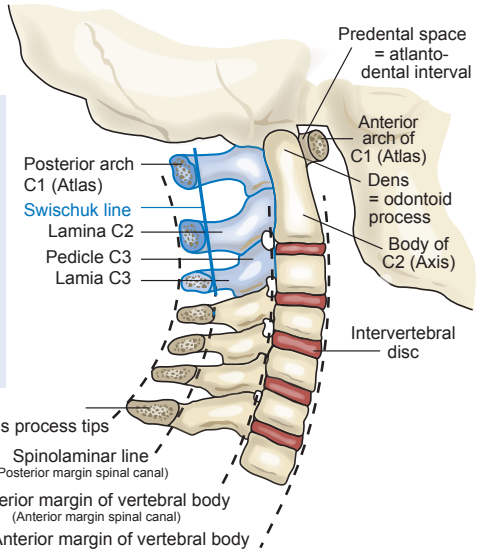
Evaluating Paediatric C-Spine X-Rays

Perth Children's Hospital

- < 8 y: more likely to injure C1-C3
- > 8 y: Injury pattern similar to adults (lower C-Spine)
- Higher risk in some syndromes: T21, achondroplasia, Klippel-Feil, …
- Normal findings that can mimic fractures or ligamentous injuries:
  - Absent lordosis
  - Pseudosubluxation of C2
  - Oval form and anterior wedging of vertebral bodies
  - Incomplete ossification of synchondroses
  - Pseudowidening of prevertebral soft tissue
  - Pseudospread of the atlas

A - Alignment

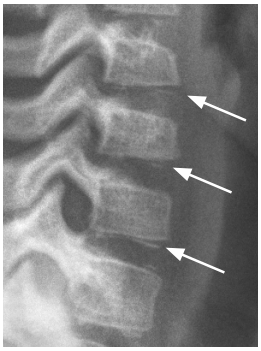
Assess for dissociation, dislocation and subluxation



C2-pseudosubluxation vs. hangman's fracture-> Swischuk-line

- Use only if C2- subluxation relative to C3
- Draw from posterior vertebral arch margin of C1 – C2
- Distance to posterior vertebral arch margin = max. 1.5 (-2) mm

B- Bones



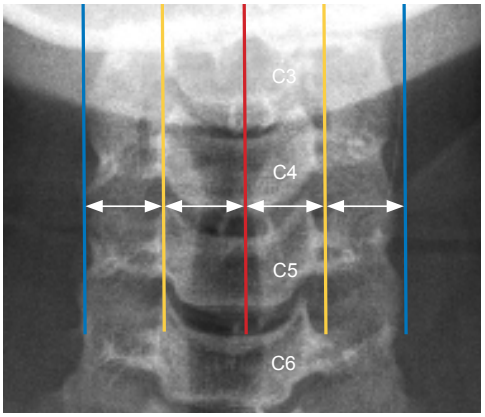
- Check form, contour, height, size, symmetry, congruence of facet joints
- Compare to neighbouring structures
- Max. angulation between lower margins of adjacent vertebral bodies 7° < 8y, 11° > 8y
- Ring apophyses can mimic avulsion fractures (arrows)

C- Cartilage

- Check height and symmetry of intervertebral disks

S – Spacing & Soft tissue

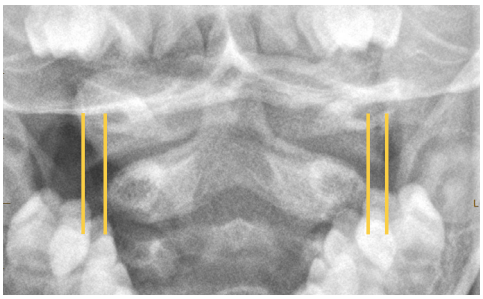
- Check atlanto-dental interval (ADI = predental space) = max. 5 mm <8 y, max. 3 mm > 8y
  => ligamentous lesion of transverse or alar ligaments
- Prevertebral space < ½ vertebral body above glottis
  < 1/1 vertebral body below (< 7 mm at C2, <2 cm at C7)
  ⚠ *Varies widely with respiration*



A-P View

- Alignment spinous process, uncovertebral & transverse process line
- Bones & Cartilage as in lateral view
- Spacing and Soft tissue: Equal distances between spinous processes (2 mm acceptable)
- Soft tissue swelling?
- Emphysema?

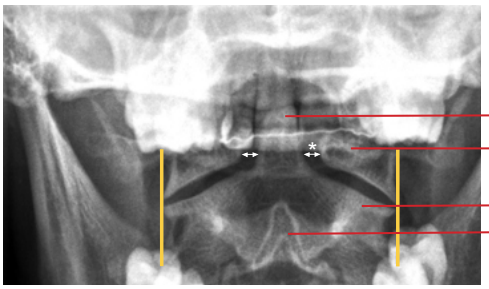
Transverse process lines
Uncinate lines
Spinous process line



4 years

Dens

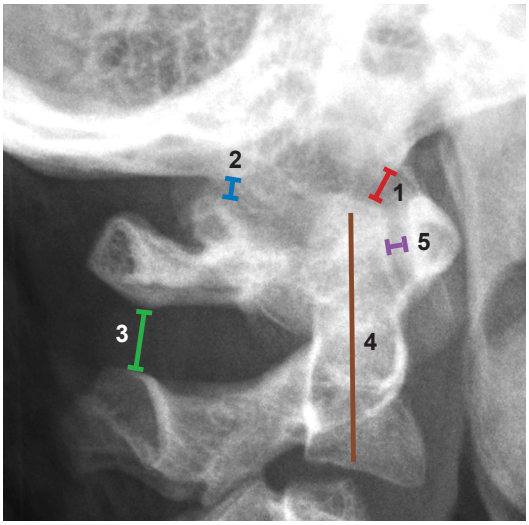
- Symmetry & lateral alignment of lateral masses of C1 & articular masses of C2
- Facet joints C1/C2 symmetrical
- *OLMI (odontoid lateral mass interspace) symmetrical (max. 6 mm either side)
- Lateral overhang up to 6 mm < 6 y normal = Pseudospread of the atlas
- No overhang > 6 y (⚠ *Jefferson fracture after heavy axial load*)
- Spinous process C2 centered to dens (if image not rotated)



14 years

Measurements upper C-Spine

- **Basion-dens-interval (1):** Max. 12 mm
- **Atlanto-condylar- / Condyle-C1-Interval (2):** Max. 5 mm
  => Atlanto-occipital dislocation?
- **Gap spinous process C1-C2 (3):** Max. 12 mm
  => ligamentous lesion C1-C2?
- **Tilting of the dens (4):** slight posterior tilt normal, anterior tilt pathological
  => fracture through subdental synchondrosis?
- **Atlanto-dental inerval (5):**
  Max. 5 mm <8 y, max. 3 mm > 8y
  => ligamentous lesion of transverse or alar ligaments?



Ref:M24000120

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The Child and Adolescent Health Service acknowledges the traditional custodians of the various lands on which we work and we pay our respect to Elders past and present.

