Back To Chiropractic CE Seminars

Back to Basics: X-Ray ~ 6 Hours

CERVICAL, THORACIC & LUMBAR SPINE

Back to Basics

Jennifer Pedley, MS, DC, CCSP, DACBR
Chiropractic Radiologist

www.jprad.com

- Radiographic Positioning & Factors
  - Cervical spine
  - Thoracic spine
  - Lumbar spine
- Radiographic Evaluation— *tools you can use*
  - Cervical spine
  - Thoracic spine
  - Lumbar spine

Cervical Spine Views

3 Views-

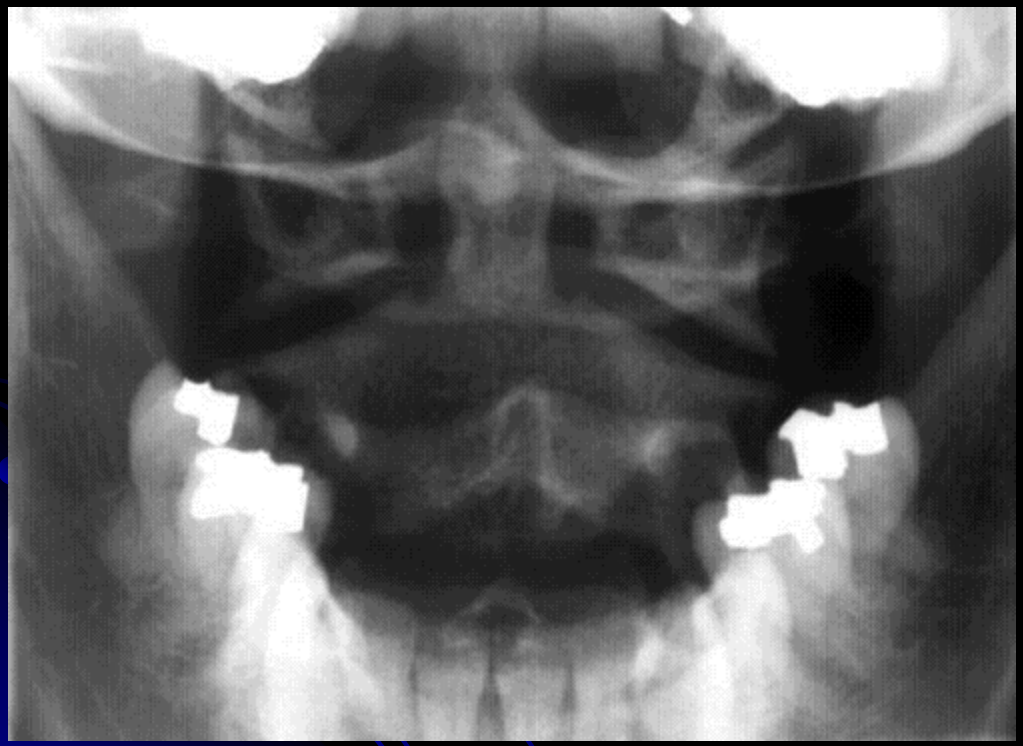
- APOM, AP lower cervical, and neutral lateral performed first; standard views

- If needed, Followed by extended and flexed lateral views>>> evaluate for ligamentous laxity and/or instability
  - Oblique views are helpful in evaluating the intervertebral foramina

APOM

- **FFD** 40”
- **CR** uvula; if needed, 5 degree with cephalad tube tilt
- **Collimate** 5x5

AP OPEN MOUTH



Structures Visualized:

- Dens
- C1 lateral masses
- Occipital Condyles
- C2 body
- C2 SP

AP Lower Cervical

- **FFD** 40-3”
- **Tube Tilt** 15° cephalad
- **CR** C3/4 (thyroid cartilage)
- **Collimate** 7x10

Tube Tilt Rule

- For every 5 degrees of tube tilt, move xray tube one inch closer to the patient

- 15 degree tube tilt= move tube closer by 3 inches (40 inches to 37 inches)

AP LOWER CERVICAL

Structures Visualized

- **Vertebral Bodies**
- **TP's**
- **SP's**
- **Upper Ribs**
- **Upper Lung Fields**
- **Uncinate Processes**
- **Tracheal Air Shadow**

NEUTRAL LATERAL

- **FFD** 72”
- **CR** C3
- **Collimate** 7X10

LATERAL CERVICAL

Structures Visualized

- **Vertebral bodies C2-T1**
- **Disc Spaces**
- **ADI**
- **SP's, Lamina, Pedicles,**
- **Articular Pillars and Facets**
- **Tracheal Air Shadow**
- **George's Line & Spino-laminar line**
- **Sella Turcica**
- **C1 Arches**

LATERAL EXTENDED

- **FFD** 72”
- **CR** C3
- **Collimate** 8x10
- May need to be landscape in patients with greater range of motion

LATERAL FLEXED

- **FFD** 72”
- **CR** C3
- **Collimate** 8x10
- May need to be landscape in patients with great range of motion

Posterior vs. Anterior Obliques-

Posterior

- Visualize the opposite IVF's
- Example: Left posterior oblique radiograph, visualizes the right IVF.

Anterior

- Visualize the same side IVF's
- Example: Right anterior oblique radiograph, visualizes the right IVF.

LEFT ANTERIOR OBLIQUE

- FFD 72”
- CR C3
- Tube tilt 15 ° caudad**
- Collimate 7-8x10

LEFT POSTERIOR OBLIQUE

- **FFD** 72-3”
- **CR** C3

- **Tube tilt** 15 ° cephalad***

- **Collimate** 7-8x10

CERVICAL OBLIQUE

Structures Visualized

- IVF's- should be open and about the same size at every level.
- Vertebral Bodies
- C1 arches
- Ribs
- SP's
- Facets

Evaluation: ABC’S

- Alignment
- Bone
- Cartilage
- Soft tissue

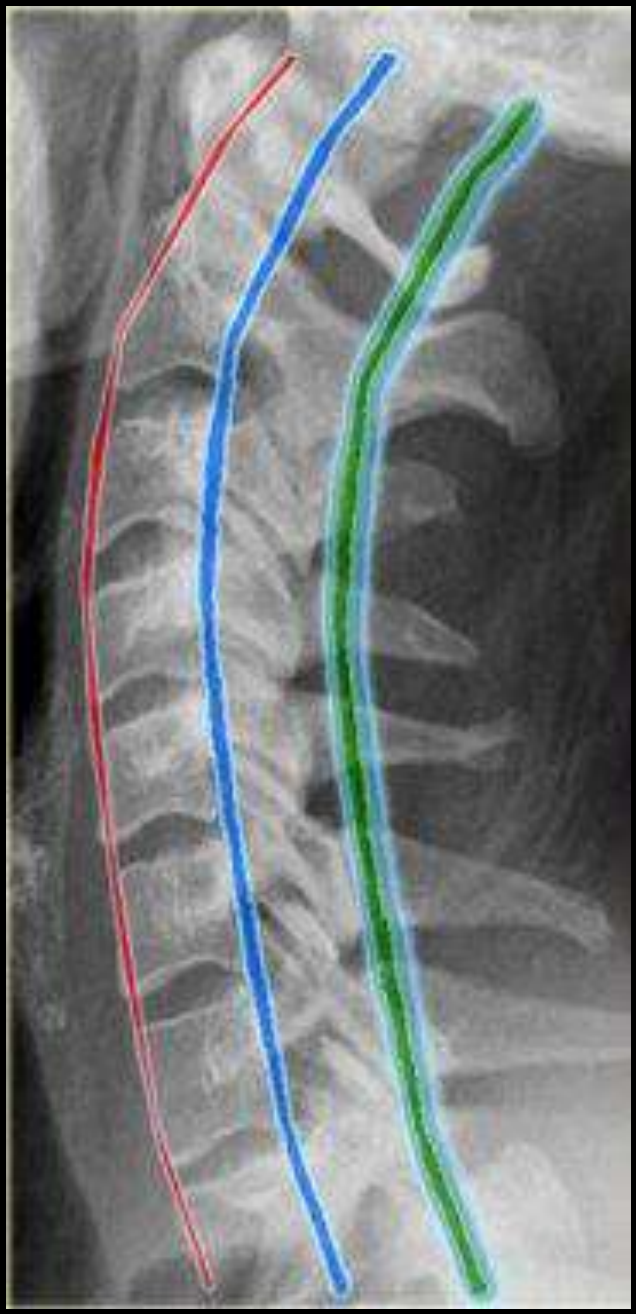
Alignment- ABC’s

- Lines of interest
- Posture
- Lordosis

Lines of Interest

- Spinolaminar line (green)
- Posterior cervical line (blue)
- Anterior cervical line (red)

These lines should draw in a smooth arc. If there is disruption of these lines, then further evaluation of the bony structures is required.



Radiographic Signs of Instability- (Evaluate on the lateral radiographs)

- Vertebral body displacement >3-3.5mm
- Greater than 11 degree angulation
- Widened interlaminar & interspinous space
- Widened facet joints
- Widened interpediculate distance (AP view)
- Atlanto-dental interspace >3mm adults; >5mm in children

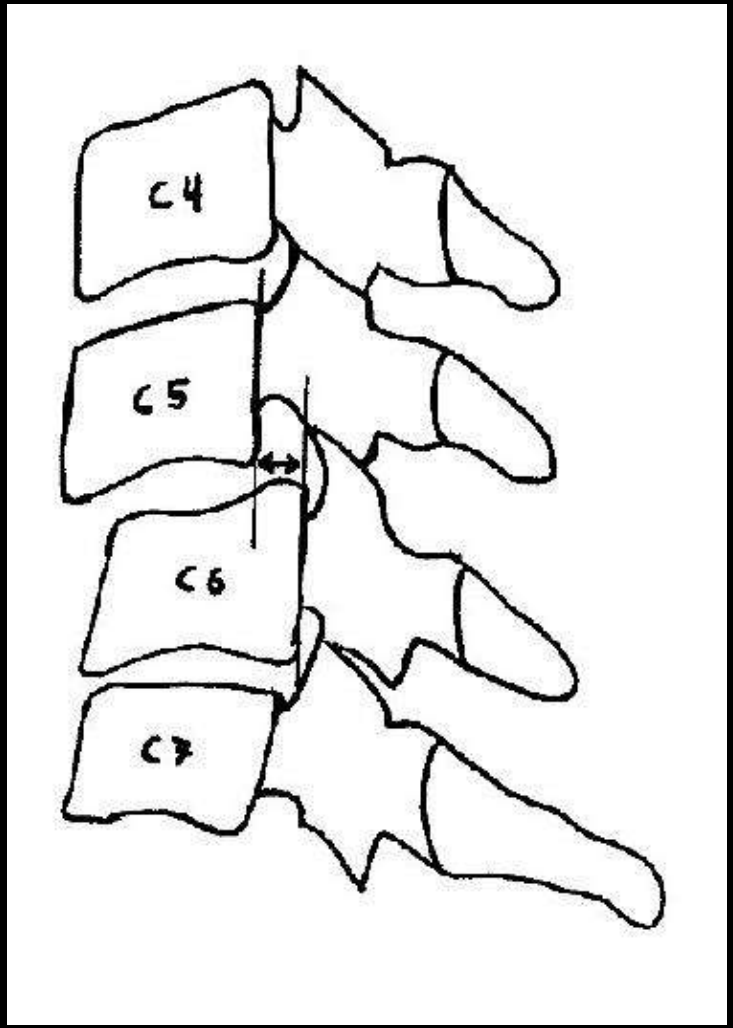
These findings indicate skeletal, ligamentous and articular disruption.

AMA Guides, 5th ed.; Resnick D. Diagnosis of Bone and Joint Disorders, 4th ed. 2002; 2936.

Measuring Intersegmental Translation- compare to the level below

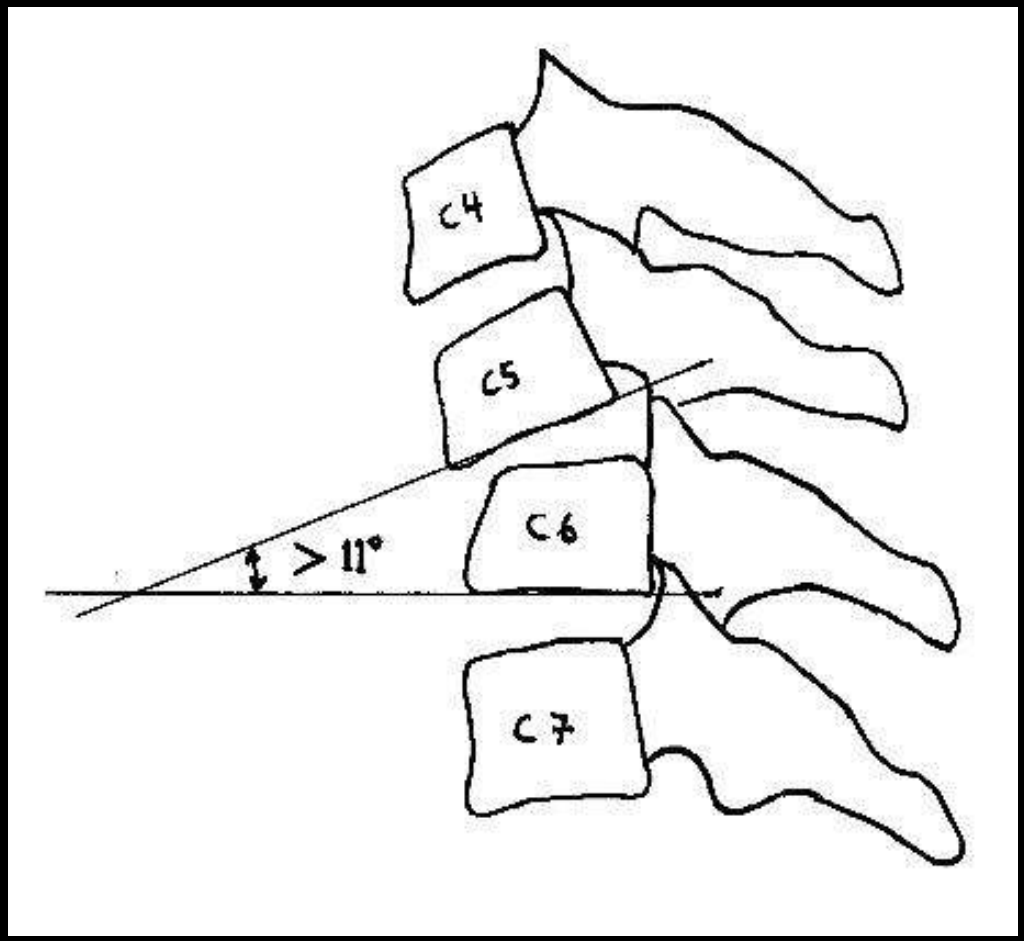
Greater than 3-3.5 mm of vertebral body motion= ligamentous instability

Need to compare the flexed and extended lateral to the neutral lateral radiograph.



Measuring Angulation

- Lines drawn on the Inferior endplates.
- Greater 11 degrees= ligamentous instability



Other Evaluation Tips

- Spinous processes should be equidistant
  - If widening or increased distance, indicator of interspinous ligament injury/disruption.
- Facet joints imbricated (stacked on top of each other☺)

More Evaluation

ADI-atlantodental interspace:

- V-shaped is normal

- Indicator of ligamentous instability (Transverse Ligament) with widening of the ADI on the Neutral lateral, or on the Flexed lateral, or on the Extended lateral.
  - Greater than 5mm in children & greater than 3mm in adults

Radiographic Signs of Instability

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Evaluation

- Cervical Gravity Line: Vertical line through apex of odontoid, should intersect C7

Cervical Gravity Line

- Gravity line anterior to C7
  - Anterior shift in weightbearing
- Gravity line posterior to C7
  - Posterior shift in weightbearing

Evaluation

- Cervical Lordosis Angle: Normal 35-45 degree
  - In this case, mild anterior shift in weightbearing

Yochum, T & Rowe, L. 2005.

Lordosis Angle

- Hypolordosis- loss of or straightening of the normal lordosis, less than 35 degrees.

- Hyperlordosis- increased lordosis, greater than 45 degrees.

Bone- ABC's

- Cortex
- Shape and size of the vertebral bodies
  - Should be same size at every level
    - Example: compression deformity= trauma or pathologic from age related osteoporosis, primary bone tumor or mets
- Pedicles and spinous process
  - Make sure they are there!!
  - Equidistant to each other
- Intervertebral foramina

Bone- continued

- Lateral masses of C1 and Dens of C2
  - Normal in shape and size with intact cortex

Cartilage-ABC's

Joints:

- Facet & Uncovertebral joints
  - Shape, size and density
    - Example: Sclerosis, narrowing and hypertrophied= degenerative joint disease
- Intervertebral discs
  - Size
    - Example: Disc narrowing with/without spondylophytes= degenerative disc disease

Soft Tissue- ABC's

- Prevertebral or anterior soft tissues of the cervical spine
- Normal calcifications within the soft tissues
- Tracheal air shadow & Upper lung fields

Lateral cervical spine

- Evaluate the anterior and posterior soft tissues
- Prevertebral (anterior) soft tissues:
  - Retropharyngeal: >7.0-mm
  - Retrotracheal: >22.0-mm

www.radiologyassistant.nl

Prevertebral Soft Tissues

- Why do we need to look at them?
  - Widening of the anterior/ prevertebral soft tissue and/or increased density= Differential diagnosis is edema due to trauma, infection, or a mass/tumor.

Posterior Soft Tissues

- Don’t miss fractures of spinous process when evaluating the soft tissues

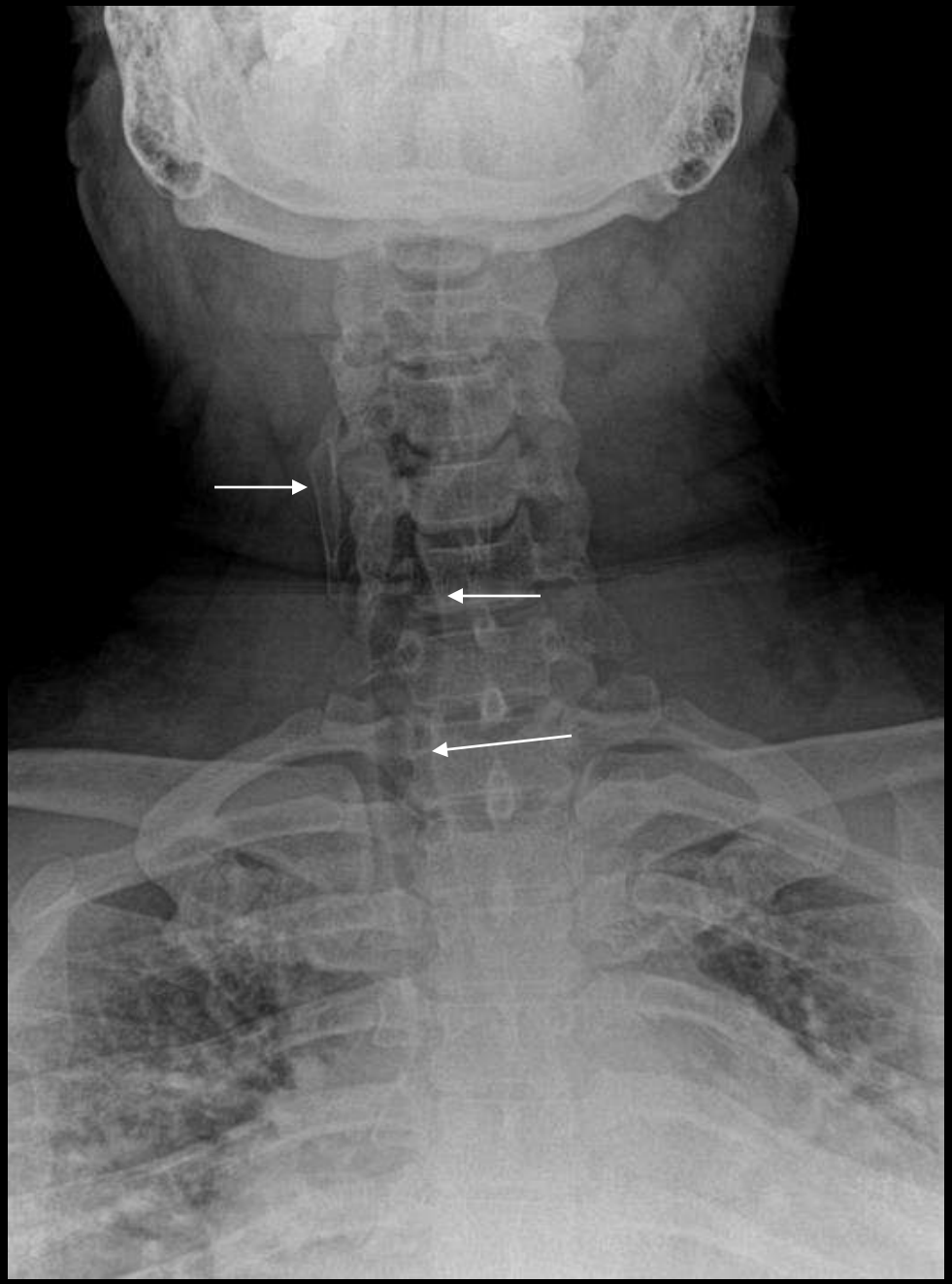
- Normal nuchal bones- calcification within the ligamentum nuchae, normal physiologic variant.

Soft tissues-continued

- Normal calcification of the thyroid cartilage

- AP radiograph of cervical spine
  - Tracheal air shadow
  - Upper lung field
  - Lateral soft tissues
    - Atherosclerosis of carotid arteries

- Tracheal deviation to the right.
- The normal tracheal cartilage calcification is also deviated to the right.



Atherosclerosis of bilateral carotid arteries

2 Views of the Thoracic Spine

- AP and Lateral views
- PA chest view is optional
  - With full inspiratory effort

AP Thoracic Projection

- **FFD** 40”
- **CR** T6
- **Collimate** 7x17

Lateral Thoracic View

- **FFD** 40”
- **CR** T6

- **Collimate** 10x17

- **Take image during expiration to blur out the ribs**

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AP and Lateral Thoracic Views

Evaluation: ABC’S

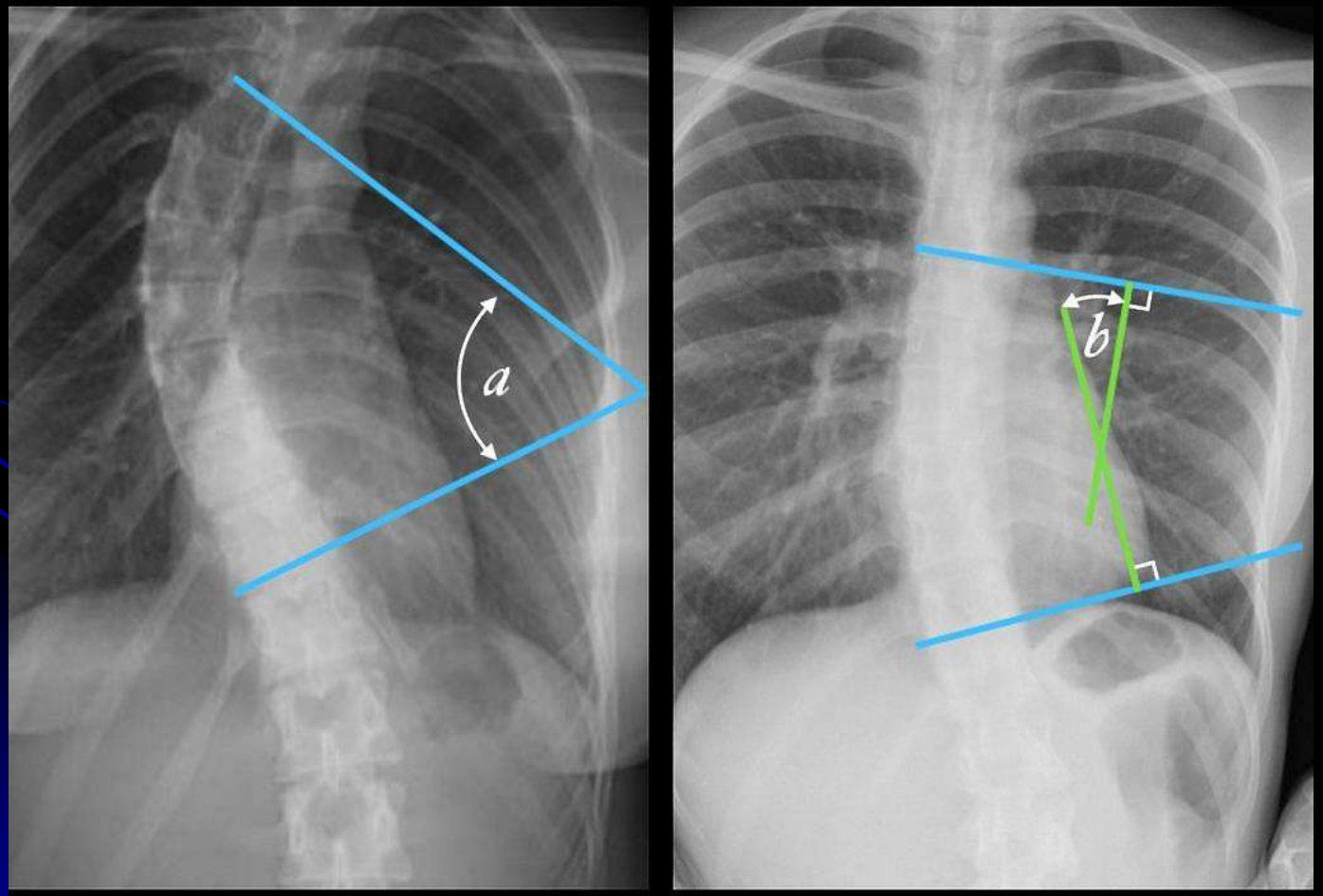
- Alignment
- Bone
- Cartilage
- Soft tissue

Alignment-ABC's

- Posture
  - Convexities
  - Scoliosis
    - If 10-15 years of age, curve less than 20 degrees maybe monitored, assess for progression of 5 degrees or more in a 3 month timeframe.
    - Curves 20-40 degrees may be surgical

Scoliosis

- Cobb-Lippman method of mensuration



Alignment-continued

- Kyphosis
  - Normal= 20-40 degrees (increases with age)
  - Hypokyphosis: less than 20 degrees
  - Hyperkyphosis: more than 40 degrees

Bone- ABC's

- Shape and size of vertebral bodies
  - Compression deformity=fracture or normal morphology
- Intervertebral foramina
  - Equal in size
  - Stenosis: degenerative posterior osteophyte, degenerative disc disease, facet degeneration, and/or degenerative retrolisthesis.
- Pedicles
  - Missing pedicle= aggressive pathology such as tumor or metastatic disease

Bone-continued

- Spinous processes
  - Make sure they are present, normal cortices, normal size
- Intervertebral foramina
  - Make sure they are clear and equal size
  - Stenosis= posterior osteophyte, degenerative disc disease, degenerative retrolisthesis, facet degeneration

Cartilage-ABC's

- Disc spacing
  - Degenerative disc disease= disc narrowing with or without spondylophytes
- Facet joints
  - Hypertrophied and sclerosis= degenerative joint disease
- Normal costochondral cartilage calcification of the lower ribs

Soft tissues- ABC's

- Chest
  - Lung fields: check for radiopacities/nodules/tumors
  - Tracheal air shadow
    - No deviation; should be midline
  - Aortic knob
    - Atherosclerosis-age related
    - Normal in size

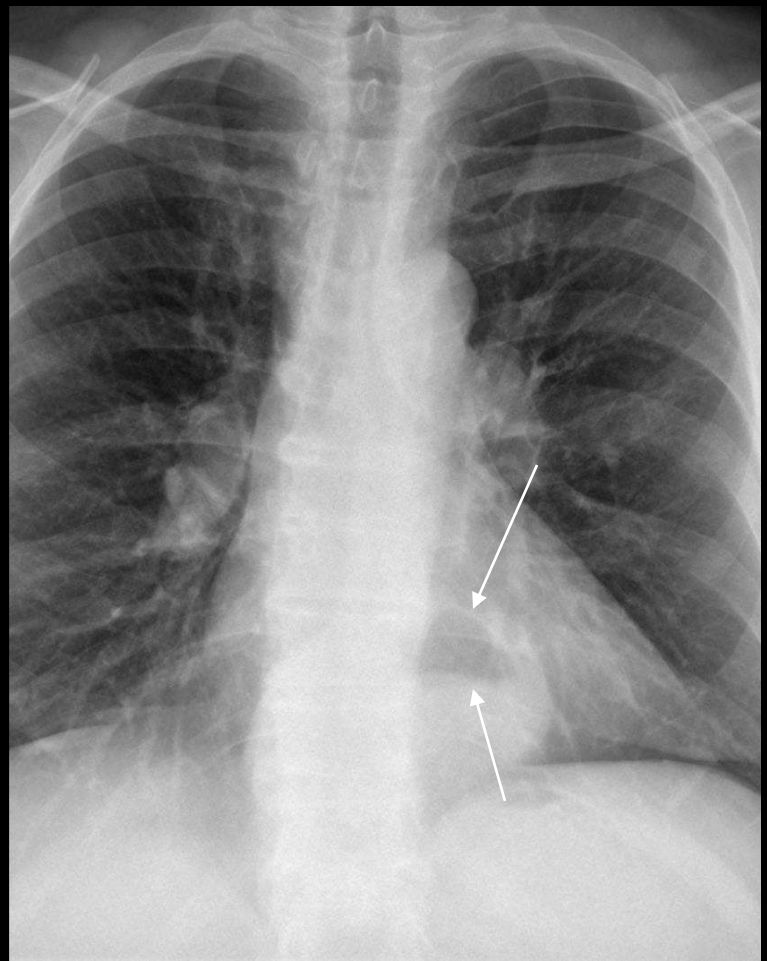
Soft tissue- continued

Hemidiaphragm

- Megenblase should not be superior to the left hemidiaphragm= Hiatal hernia
  - Meganblase above the hemidiaphragm is hiatal hernia.

Hiatal Hernia

- Air above the left hemidiaphragm



2-3 Views of the Lumbar Spine

- AP
- Lateral
- Angulated PA or AP lumbosacral spot view

or

- Lateral lumbosacral spot view

AP Lumbar Spine

- **FFD** 40”
- **CR** 1” above iliac crest
- **Collimate** 10 x17

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Lateral Lumbar View

- **FFD** 40”
- **CR** 1” above iliac crest
- **Collimate** 11x17

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AP and Lateral Views

www.uwmsk.org

AP Angulated Lumbosacral

- **FFD** **40”-5”**
- **CR** **1” below ASIS**
- ***Tube tilt*** ***25-35 °***
  - ***cephalad*** (25 degrees caudad for PA angulation)
- **Collimate** 10x12

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AP (PA) Angulated Lumbosacral

Structures Visualized

- L5-S1 Disc Space
- Sacroiliac (SI) Joints: Best radiograph to evaluate for the SI joints
- Sacrum Sacral Foramen
- L5 TP's and SP's
- L5 Vertebral Body

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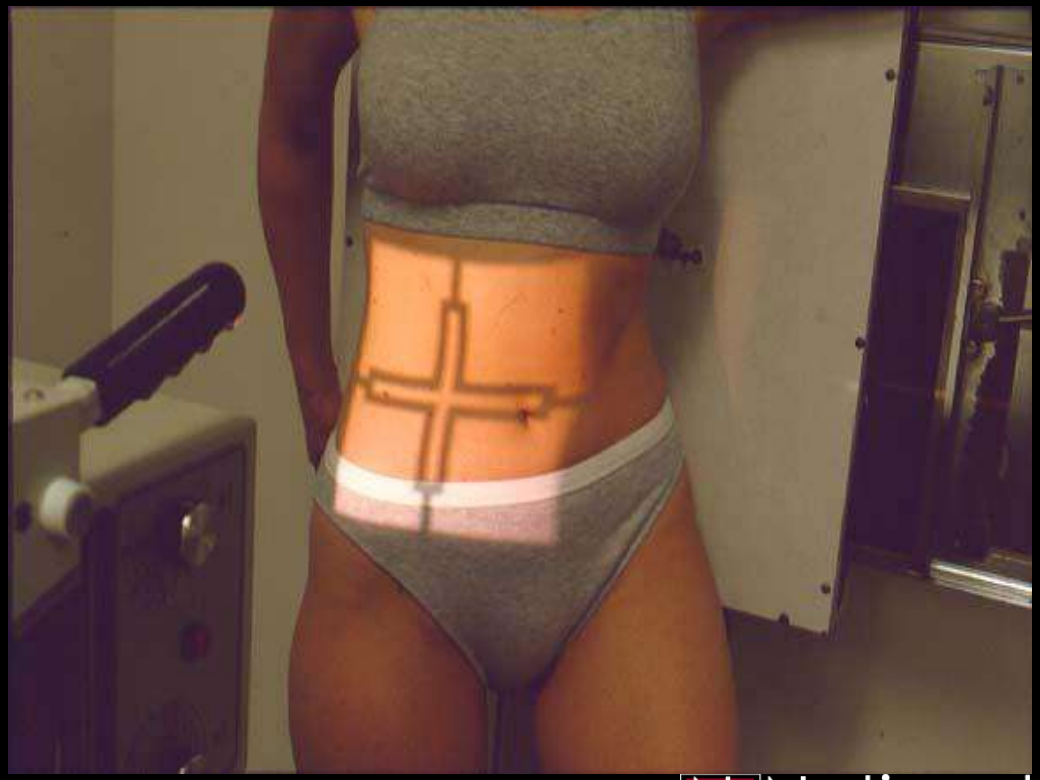
(Left) Posterior Oblique View

- **FFD** 40”
- **CR** 1” above iliac crest
- **Collimate** 11x14



Scotty Dog

- Nose =Transverse process
- Eye =Pedicle
- Ear =Superior facet
- Front leg =Inferior
- Collar thru the neck= Fracture

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Evaluation: ABC’S

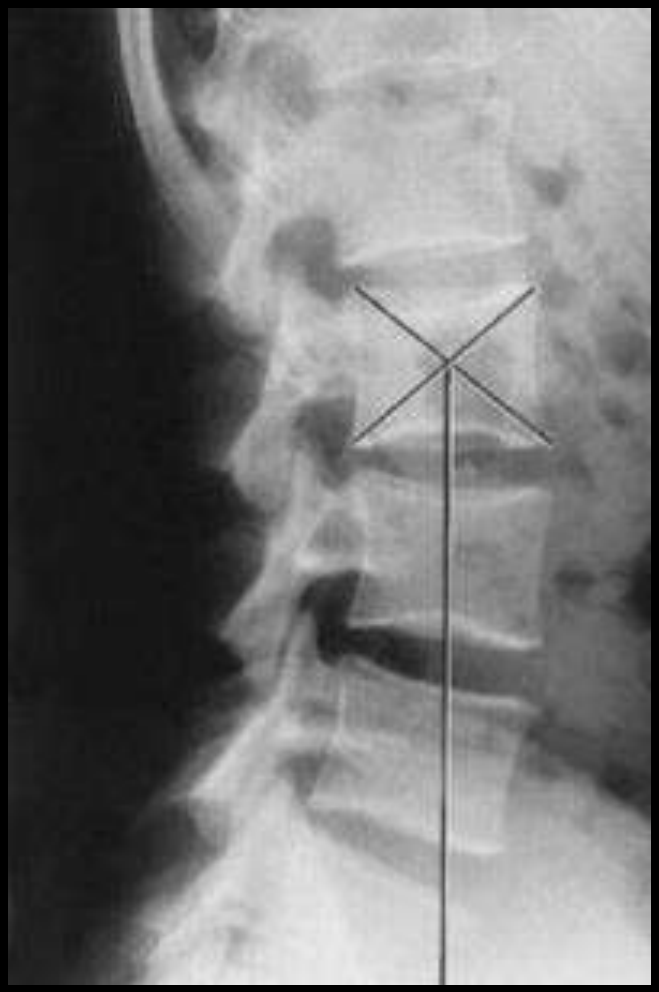
- Alignment
- Bone
- Cartilage
- Soft tissue

Alignment-ABC's

- Anterior and posterior vertebral body line (lateral radiograph)
  - Evaluate for anterolisthesis/retrolisthesis of the lumbar segment, compare to the level below.
    - Cause of anterolisthesis= degenerative changes or pars interarticularis defect or fracture
    - Cause of retrolisthesis= most commonly degenerative changes
- Posture
  - Gravity Line
    - Anterior shift in weightbearing
    - Posterior shift in weightbearing

Evaluation

- Ferguson Gravity Line: from center of L3, should intersect anterior 1/3 of sacrum



Evaluation

- Ferguson Gravity Line
  - Anterior shift in weightbearing= increased stress on facet joints
  - Posterior shift in weightbearing= increased stress on the IVF, pars interarticularis, facet joints & posterior disc.

Evaluation

- Normal Lordosis: 50-60 degrees

Alignment- continued

- Lordosis
  - Normal lordosis: 50-60 degree
  - Hypolordosis: loss of the lumbar lordosis with straightening.
  - Hyperlordosis: increased lumbar lordosis

- Scoliosis/convexities
  - If 10-15 years of age, curve less than 20 degrees maybe monitored, assess for progression of 5 degrees or more in a 3 month timeframe.
  - Curves 20-40 degrees may be surgical

Bone- ABC's

- Shape and size of vertebral bodies
  - Compression deformities
- Pedicles and spinous process
  - Make sure they are present and in the correct location
  - Fractures of pedicles
  - Spina bifida occulta, normal variant.

Normal spina bifida occulta

- No fusion at the junction of the lamina and spinous process
- Posterior cleft

Bone-continued

- Pars interarticularis
  - Defect/fracture
  - Classification of pars interarticularis defects/fractures
    - Grade of spondylolisthesis (anterolisthesis)

Cause of Anterolisthesis

Types/Causes

- Type 1: Dysplastic (congenital)
- Type 2: Isthmic
  - 2a= fatigue fracture of the pars interarticularis
  - 2b= elongation of the pars
  - 2c= acute fracture of the pars
- Type 3: Degenerative disc disease or degenerative facet joints
- Type 4: Traumatic, fractures to the neural arch
- Type 5: Pathologic, bone disease

Grade of Spondylolisthesis

- Grade 1 spondylolytic spondylolisthesis at L5
- Meyerding Classification:
  - Grade 1-4

Dr. Terry Yochum, DC, DACBR

Bone- continued

- Intervertebral foramina
  - Make sure they are clear and equal size
  - Stenosis= posterior osteophyte, degenerative disc disease, degenerative retrolisthesis, and/or facet degeneration.

Bone-continued

- Lower ribs
  - Normal costochondral cartilage calcification
- Sacrum/Ilium
- Hips-femur and acetabulum if included in the AP lumbar study

Cartilage-ABC's

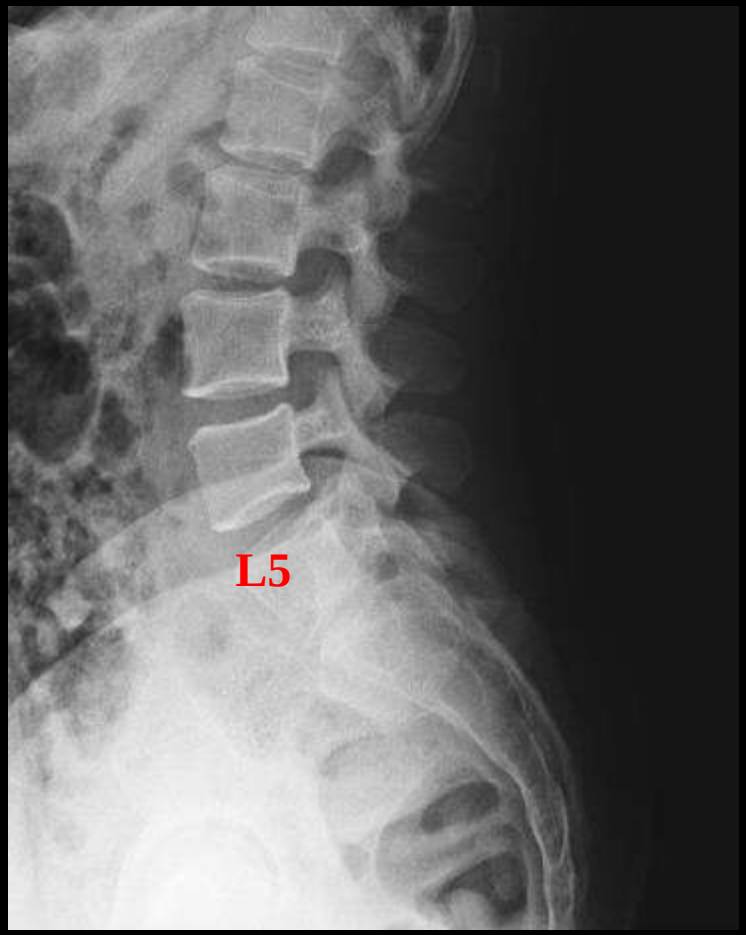
- Facet joints
  - Degenerative changes
- Sacroiliac joints
  - Degenerative changes= bony proliferation, sclerosis and joint narrowing.
  - Inflammatory (ankylosing spondylitis)=bilateral erosive changes, widening of the joint; or complete fusion

Cartilage-continued

- Transitional segments
  - L5= sacralization
  - S1=lumbarization
  - Classification

- Intervertebral discs
  - Disc spacing= narrowing with/without spondylophytes is degenerative changes.

TRANSITIONAL SEGMENT AT L5

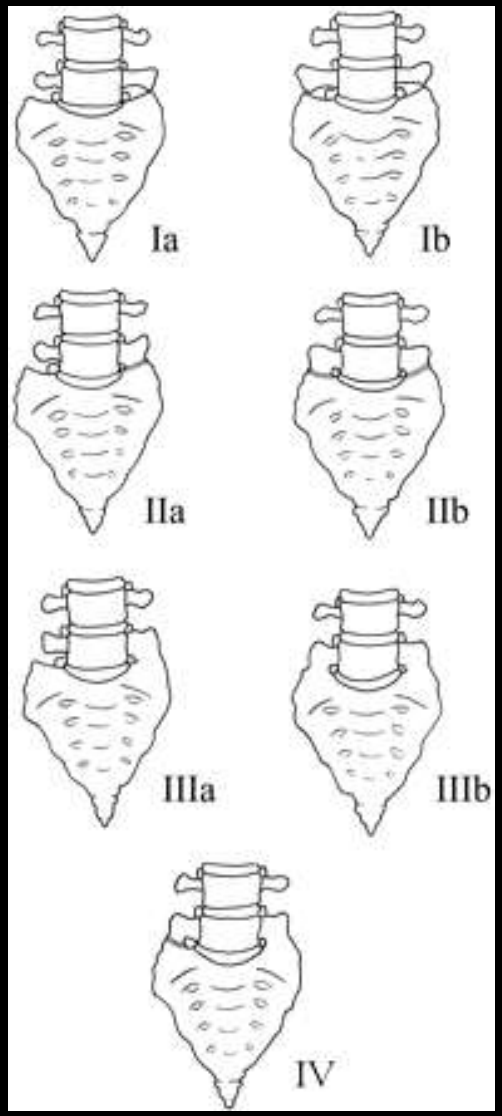


Transitional Segment at L5

- Sacralization of L5
  - Bilateral pseudoarthrosis, articulation to the sacrum,
  - IIb Castellvi
- Complication
  - Increased stress above and below
  - Early degenerative disc disease at L4-L5.

Castellvi Types

- Type II and IV- associated with low back pain= Bertolotti's syndrome- inflamed transitional segment.
  - Clinically misdiagnosed as sacroilitis.

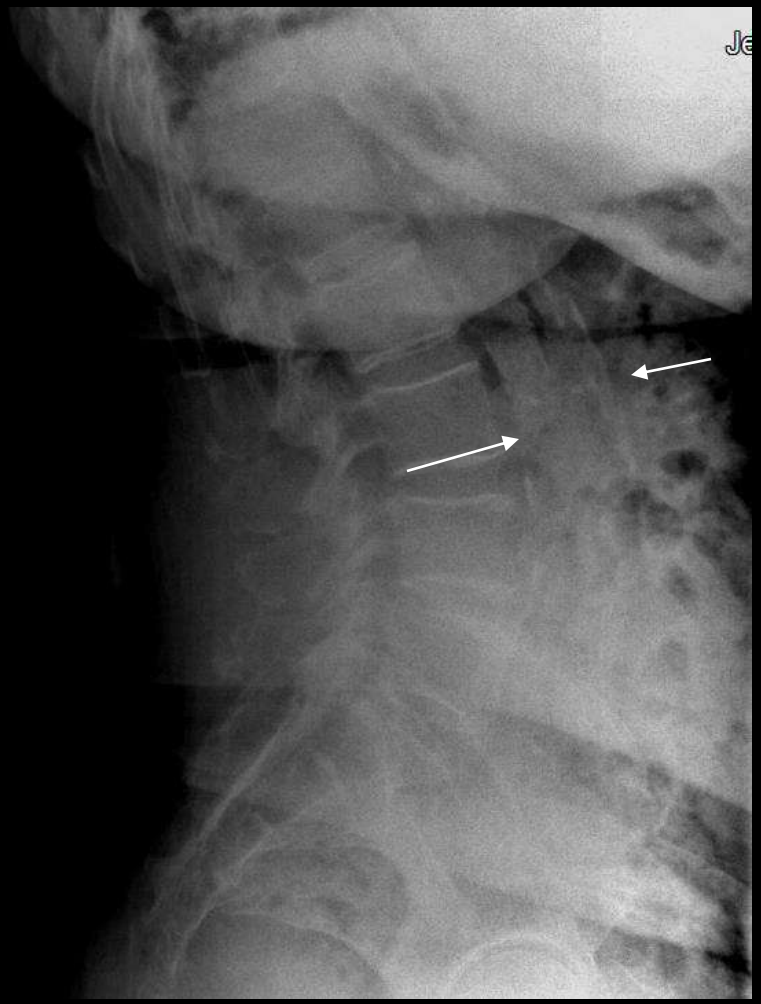


Soft tissues- ABC's

- Anterior soft tissues
  - Atherosclerosis of abdominal aorta, iliac arteries
    - Calcification of abdominal aorta: width of abdominal aorta should not exceed 2.0 cm (lateral radiograph)
  - Gallstones: right upper abdominal quadrant, AND anterior to the spine
  - Kidney stones: right or lower abdominal quadrant, but overlies or adjacent to the spine.
- Lower lung field
  - Check for radiopacities or tumors/masses
- Bowel gas

Atherosclerosis of abdominal aorta

- Widening of abdominal aorta, greater than 4.5 cm

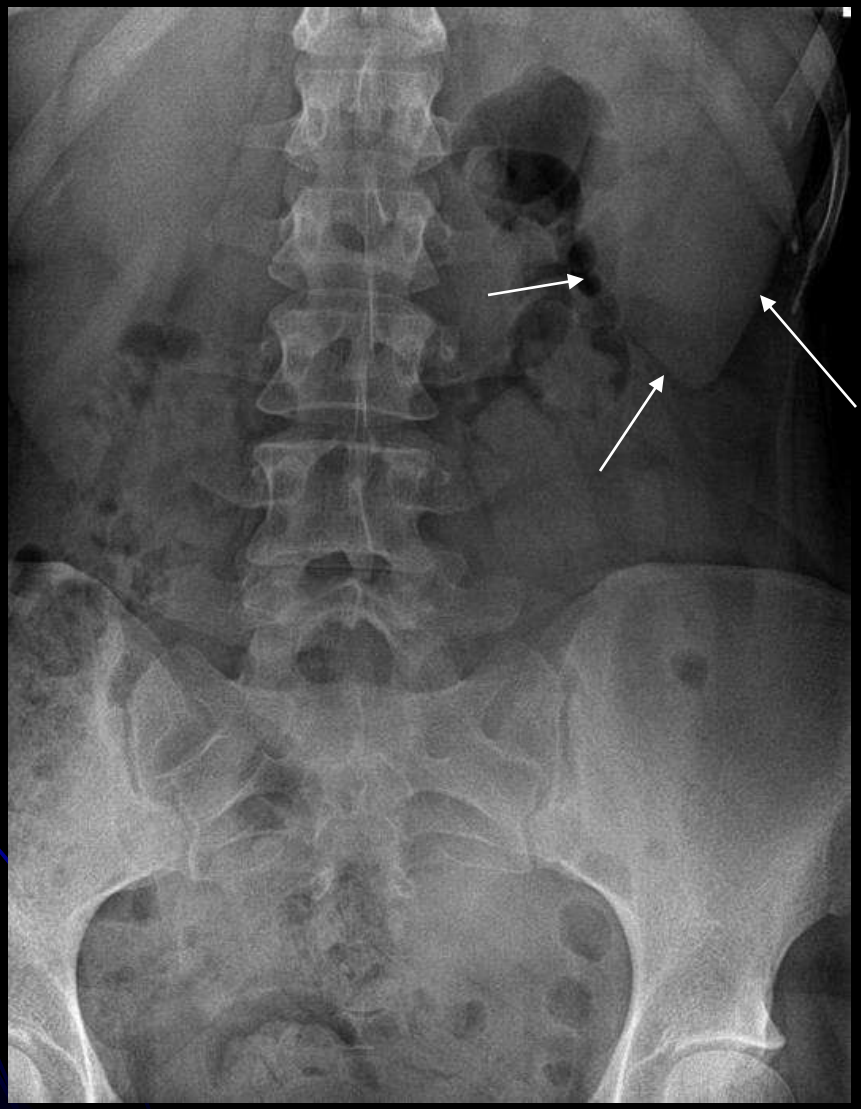


Soft tissues-continued

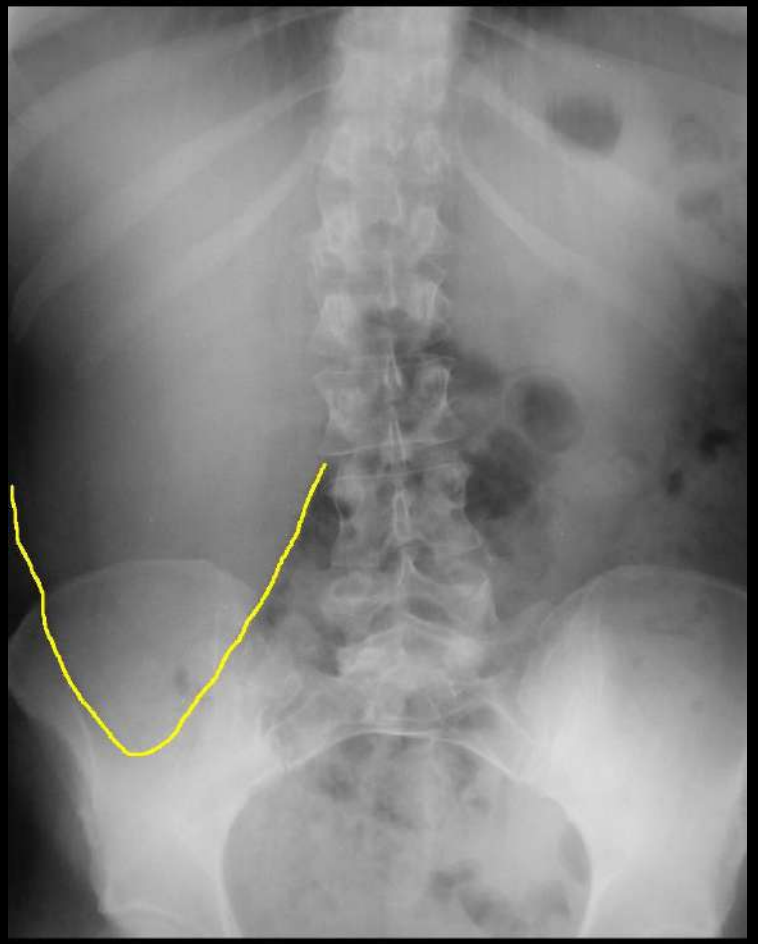
- Organ shadows
  - Kidney: calcifications/stones
  - Liver: Enlarged (hepatomegaly)
  - Spleen: Enlarged (splenomegaly); extending inferiorly from the left 12th rib.

- Pelvic basin
  - Bladder shadow: Distended= prostate pathology
  - Uterine fibroids (benign calcifications)
  - Vas deferens calcification= V-shaped tubular calcification within the mid portion of pelvic basin
    - Associated with diabetes

Splenomegaly



Hepatomegaly



Vas Deferens Calcification

Soft tissues-continued

- Surgical artifact within the abdomen and pelvic basin
  - Cholecystectomy (gallbladder removal)
  - Vascular clips
  - Intrauterine device

More Cases

- Cervical spine with congenital anomalies; degenerative changes; trauma.

Case

- Neck pain following motor vehicle accident.

Findings/Diagnosis

- Hypolordosis of cervical spine with anterior shift in weightbearing
- Cervical spine tilts to the left.

- Congenital block vertebrae at C2-C3, C4-C5 & C6-C7.

Case

Donated by Dr. Christopher Watkins, DACBR

Findings

- Generalized osteopenia
- Multilevel degenerative disc disease with anterior intercalary bone at C5-C6 level
- Multilevel facet arthrosis
- Degenerative retrolisthesis at C3

Donated by Dr. Christopher Watkins, DACBR

Intercalary Bone

- Calcification of the annular fibers
- Sign of degenerative disc disease

Donated by Dr. Christopher Watkins, DACBR

Case

www.auntminnie.com

Findings

- Thick ossification of the ALL
- Mild facet degeneration and disc narrowing
- Hypolordosis

Diffuse Idiopathic Skeletal Hyperostosis- DISH

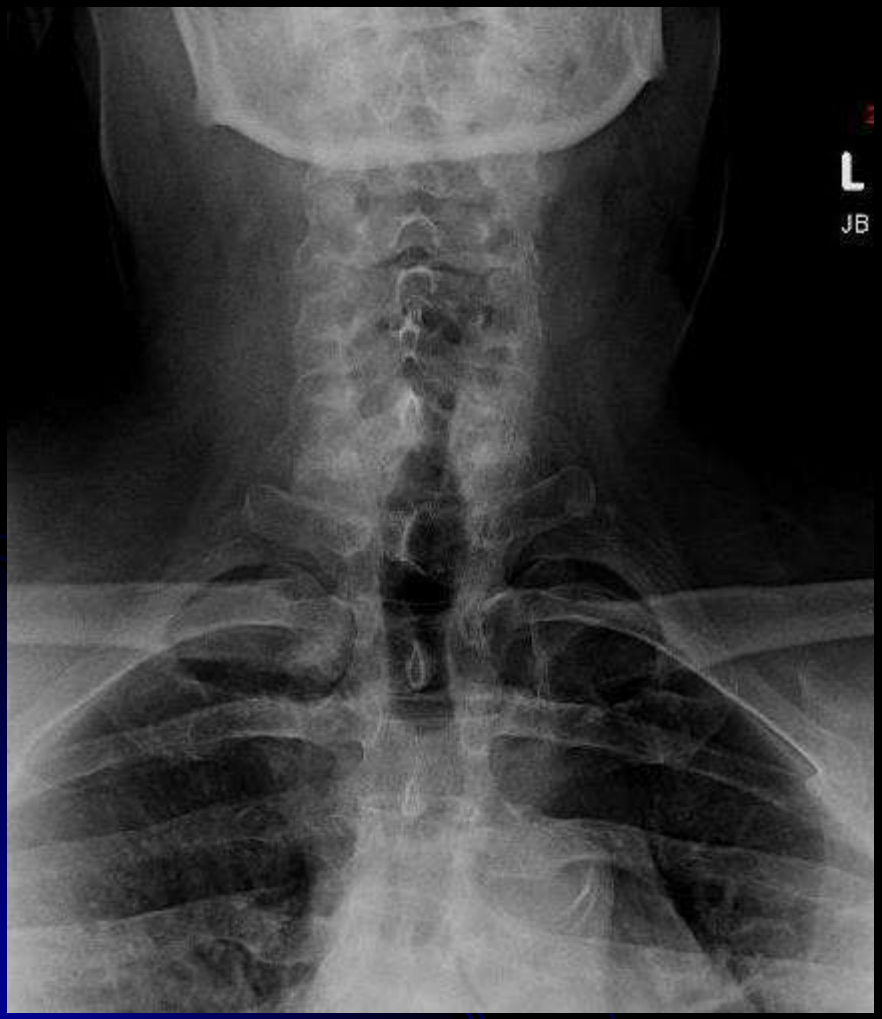
- Common in thoracic and lumbar spine.
  - Right sided in the thoracic spine.

- OPLL
- Complications
  - Dysphagia

Case

- Chronic pain

Misdiagnosed as DISH



Findings/Diagnosis

- Severe osteopenia
- Anterior shift in weightbearing
  - Cervical & upper thoracic tilt to the left

- Facet fusion
- Anterior spinal fusion, thin ossification of the annulus fibrosus.

AP open mouth

- Fusion at the C1 lateral masses to C2.
- Occiput low on right; rotation of C2.

2 years ago-Lumbar Spine Xrays

L5-transitional

Findings

- Transitional segment at L5 (Sacralization)
- **Pelvic unleveling low on right; femoral height- low on the right.**

- Degenerative changes of lumbar spine
- Bilateral hip arthrosis
- Atherosclerosis of abdominal aorta

Findings

- Fusion of bilateral sacroiliac joints>>>>
  - misdiagnosis

AS: Follow-up

- Rheumatologist & Laboratory studies
- Chiropractic care/management


Medscape
Source: Appl Radiol © 2009 Anderson Publishing, Ltd.

Hydroxyappatite Deposition Disease of the longus colli tendon

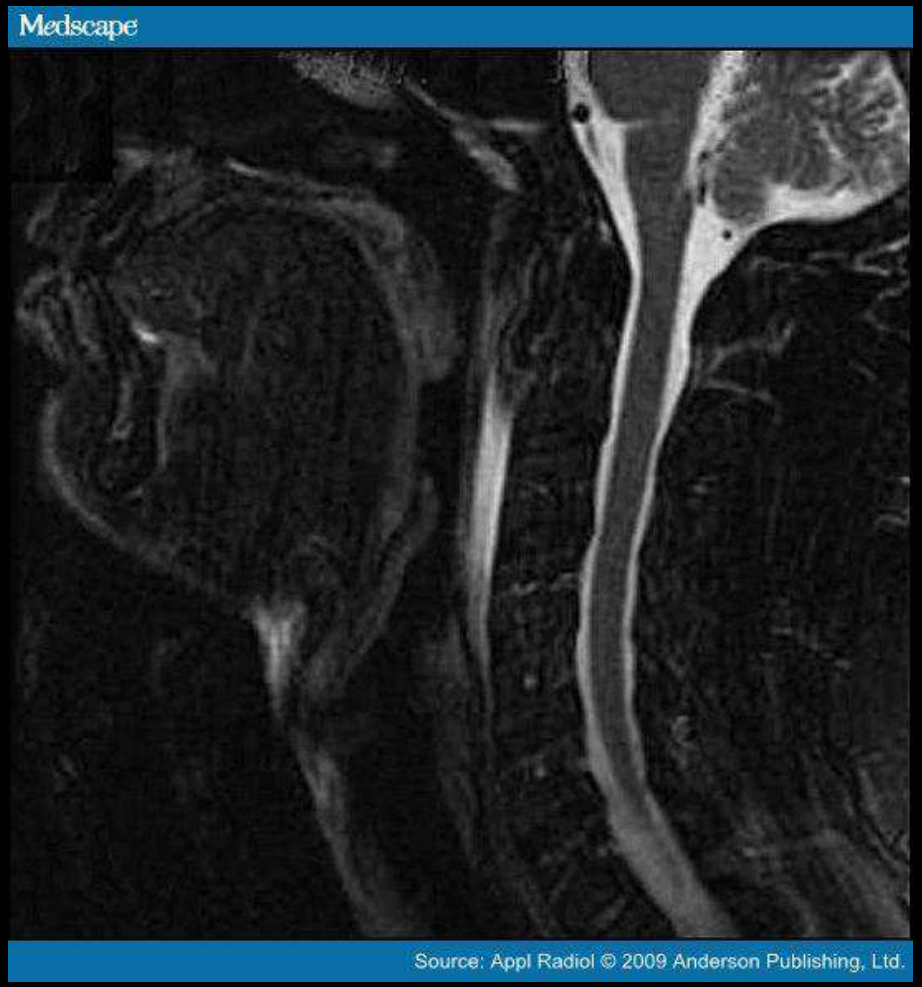
Aka calcific tendinitis

S/S: px, stiff neck, muscle spasms, painful swallowing

- Occurs due to trauma

- **Self limiting 1-2 weeks**

Sagittal Reformatted CT and Sagittal T2 weighted MR images



Case

Hx: suboccipital pain, headaches, and neck stiffness.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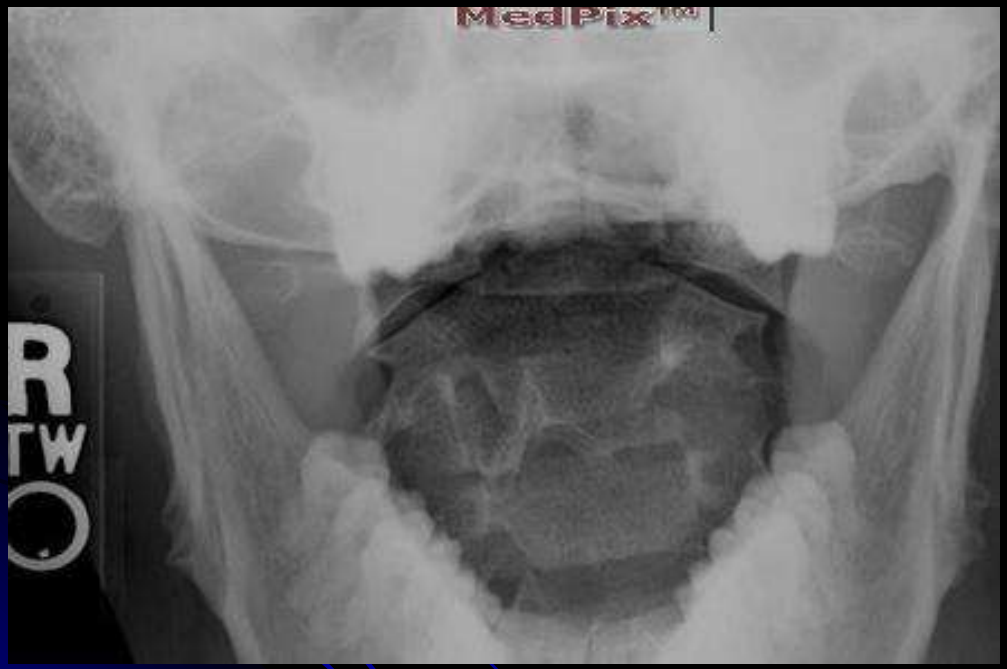
APOM & Lateral Flexed Views



- **Increased lateral paraodontoid space and ADI**
- **Offset** of the lateral edge of the lateral masses
- **Posterior arch fracture**
- **Type 2 odontoid fracture**
- Moderate prevertebral soft tissue swelling
- Associated with rupture of the transverse ligament

Jefferson Burst Fracture of C1

- 2 or more breaks of the ring of the atlas
  - Mc to fracture adjacent to the lateral masses; bilateral>unilateral
- Compressive injury

Posterior Arch fracture of C1

- Severe hyperextension
  - Posterior arch is compressed between the occiput and the posterior arch of C2
- **Stable fracture**
  - Possible vascular injury, vertebral artery
- MC fracture of the atlas
- Check for other fractures and spinal cord injury
  - CT vs MRI

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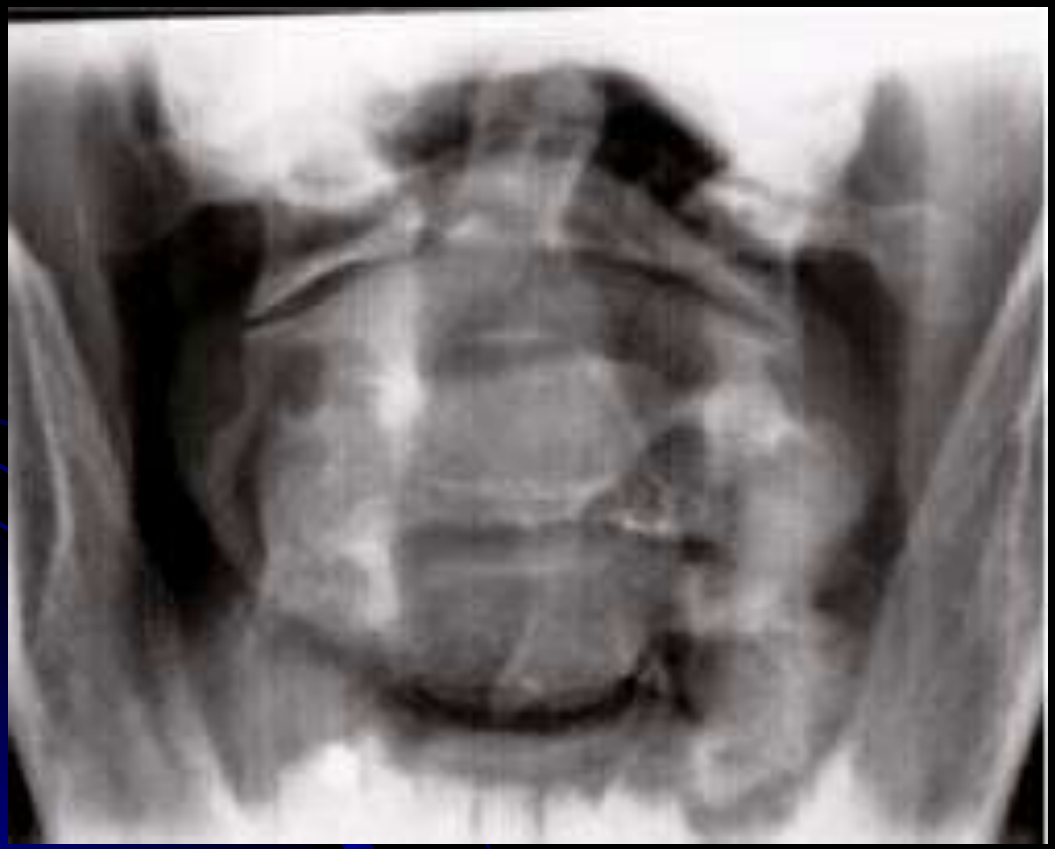
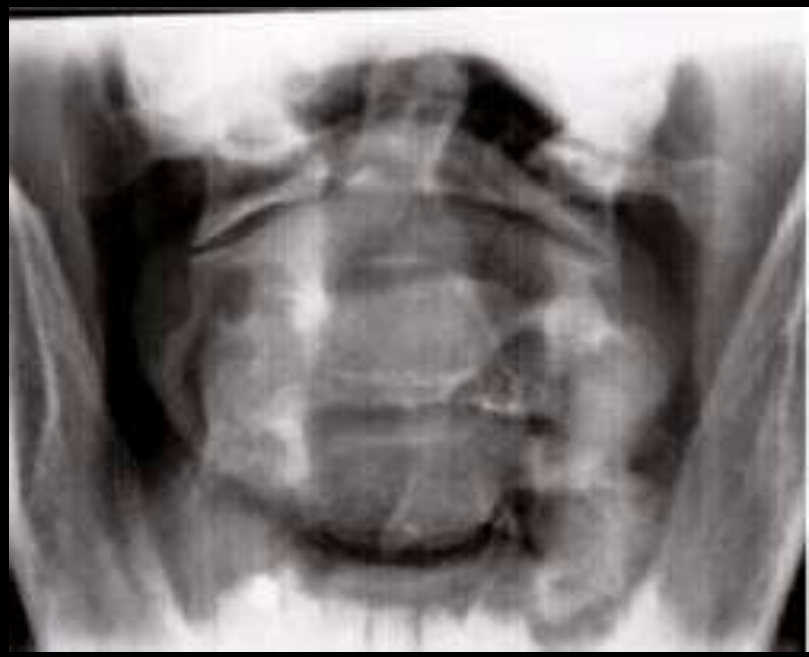
Case

APOM & Lateral Neutral Views



Findings

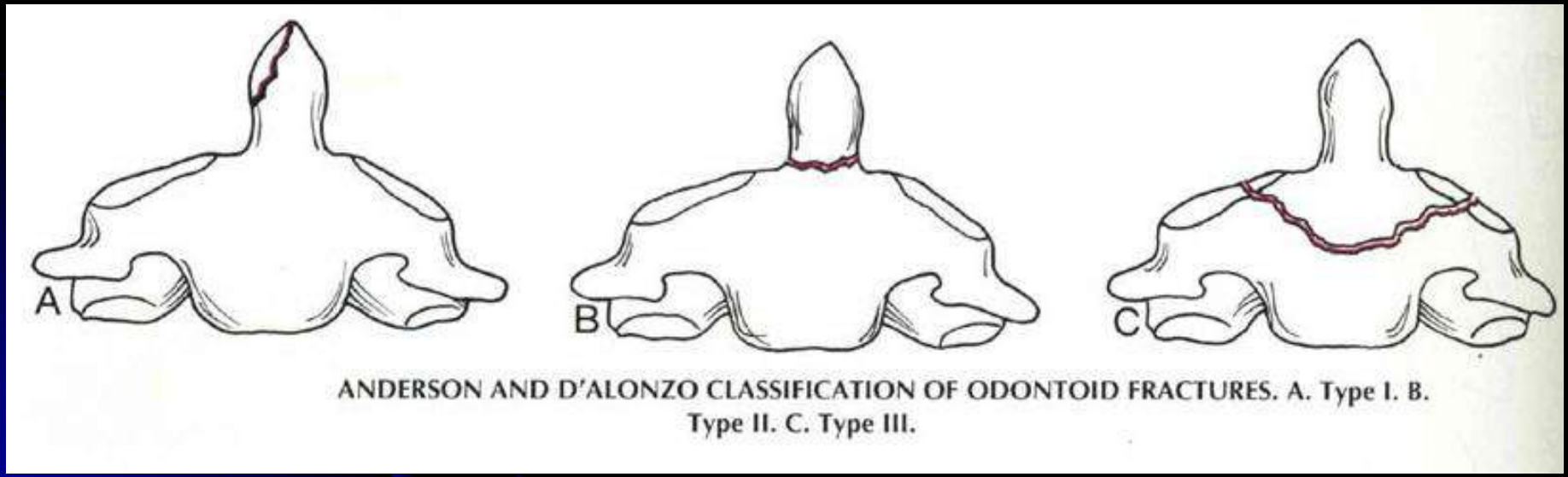
- Flattening and reversal of the cervical lordosis
- Generalized osteopenia
- Degenerative disc disease & Facet arthrosis
- Fracture and Angulation of the dens
- Soft tissue swelling of upper cervical



Odontoid Fracture: Type 2

- Type 2: fracture at the junction of the **base** of the dens and body of the axis
- **Lateral tilt of the dens**
- Most common fracture of C2
- Complication- **non-union**

- Type 1- Avulsion; majority are stable
- Type 2- Nonunion complication
- Type 3- Vertical fracture through the body of C2; heals rapidly.

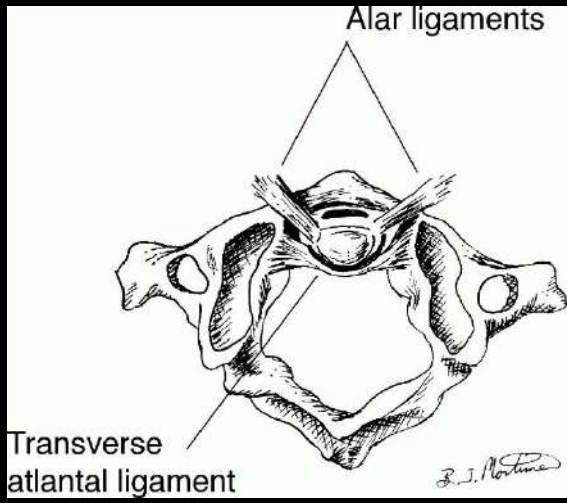


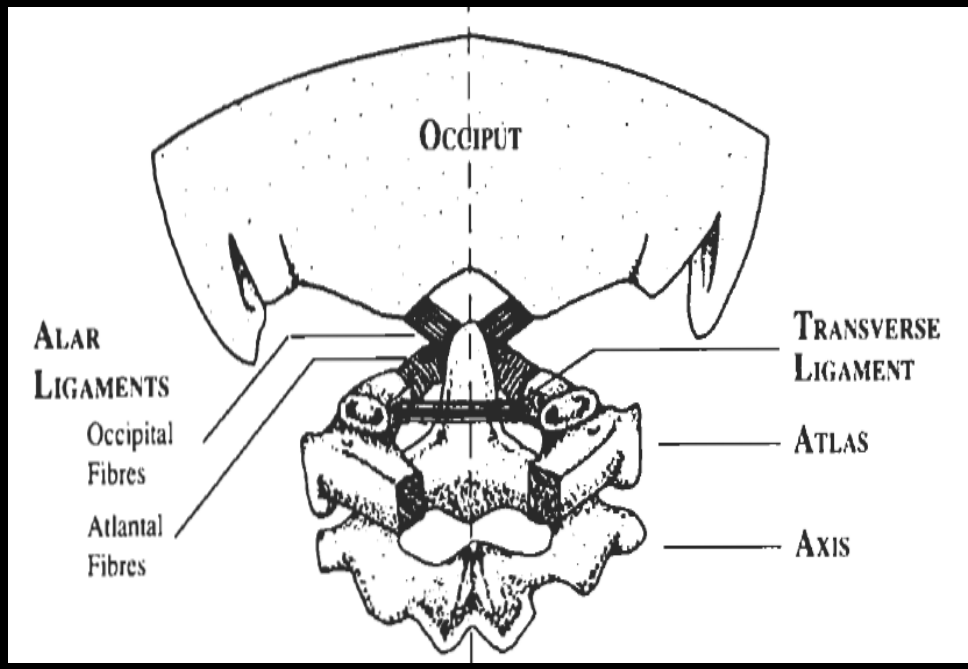
ANDERSON AND D'ALONZO CLASSIFICATION OF ODONTOID FRACTURES. A. Type I. B. Type II. C. Type III.

Yochum T and Rowe L. Essentials of Skeletal Radiology, 2nd ed.; 1996.

Type 1 Odontoid Avulsion Fracture

- Type 1= oblique fracture/avulsion of the odontoid by the alar ligament
- Associated with rotation and whiplash forces
- Alar ligament limits rotation and lateral flexion, ***contralateral*** side of the craniovertebral complex.





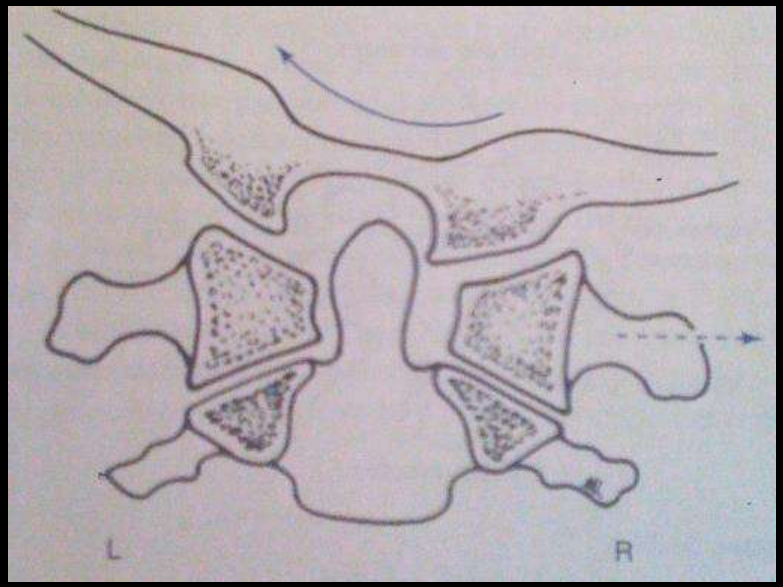
JOSPT, July 1992; Vol 1, No 16

Radiographic Evaluation of the Alar Ligament

- Flexed and extended lateral views are normal
  - Widened ADI is a sign of transverse ligament injury
- APOM view
  - Majority are normal
- **Evaluate Alar ligaments** by APOM with right and left lateral (side) flexion
  - Right lateral flexed position= evaluates the left alar ligament
  - Example: In right lateral flexion, C1 displaces laterally away from dens on the right pass the C2 vertebral body margins= **left alar ligament disruption**.

Making Sense of It

- Normal motion: right lateral flexion of CO-C1 & C1-C2, approximate right condyle to dens and increased ADI on the right
  - Opposite slide & roll due to convex condyles and concave lateral masses of C1.
- Disrupted alar ligament on the left would allow more rolling of the condyle to the left and more right lateral sliding of C1 pass the C2 margins.
- Intact alar ligament would rotate the C2, deviating the spinous process away from lateral flexed side.



Bergmann & Peterson, Chiropractic Technique,2nd Ed; 2002

Alar Ligament Rupture

- Atlanto-occipital instability
- CT
- MRI

Alar Ligament on Coronal T1 weighted MR image

Protocol:

High resolution MR with Proton Density weighted images; 2.0-mm slice thickness

Pfirrmann, et al. Radiology. Jan 2001; 218 (1). 133-137

Odontoid Fracture Type 3

- Horizontal or vertical fracture through the body of C2
- Disruption of the ***ring shadow*** of C2 on the lateral projection
  - Junction of the body and lateral masses

Resnick, D. Diagnosis of Bone and Joint Diseases, 4th ed. 2002

Normal Ring Shadow of C2

www.hawaii.edu

Case

- Trauma with hyperflexion and hyperextension; MVA.

Case

www.medpix.com

Findings

- Flattening of the cervical spine
- Posterior ponticle
- Fracture or avulsion of the C7 spinous process
- What other fracture is present?

www.medpix.com

Clay Shoveler's Fracture & Teardrop Fracture

- C6, **C7** & T1
- Avulsion of trapezius and rhomboid tendon on the spinous process
- MVA, wrestling, & diving>>abrupt flexion
- **AP view: double spinous process**
- **Fragment typically displaces caudally**; **stable**

www.medpix.com

Clay Shoveler's Fracture at C7
Sagittal Reformatted CT Image

www.hawaii.edu

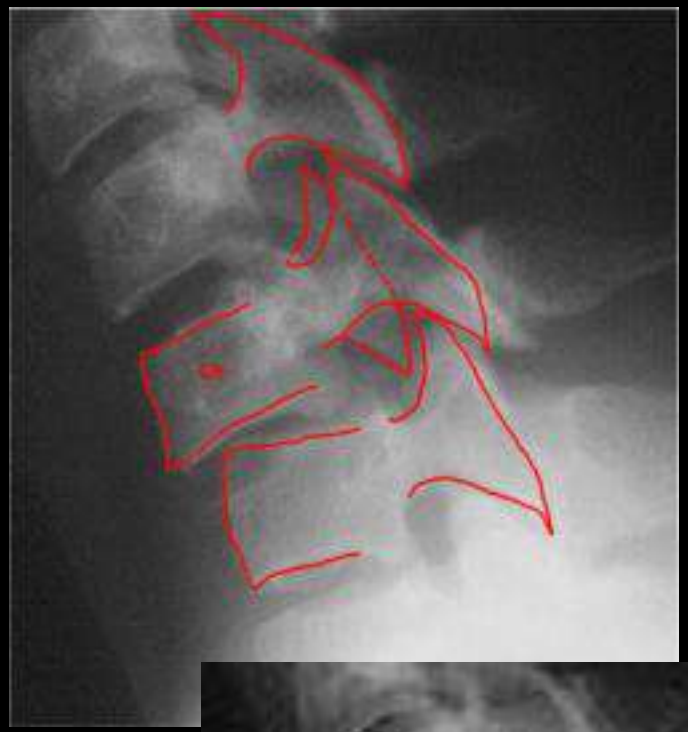
Case

Findings

- Anterior head carriage
- Anterior translation and flexion of the C6 body
- Widened interspinous
- Mild facet arthrosis

Unilateral Facet Dislocation

- MOI: Flexion & Rotation
- Anterior displacement of body
- Bow tie sign with dislocated articular mass/pillars
- AP view upward rotation of spinous process



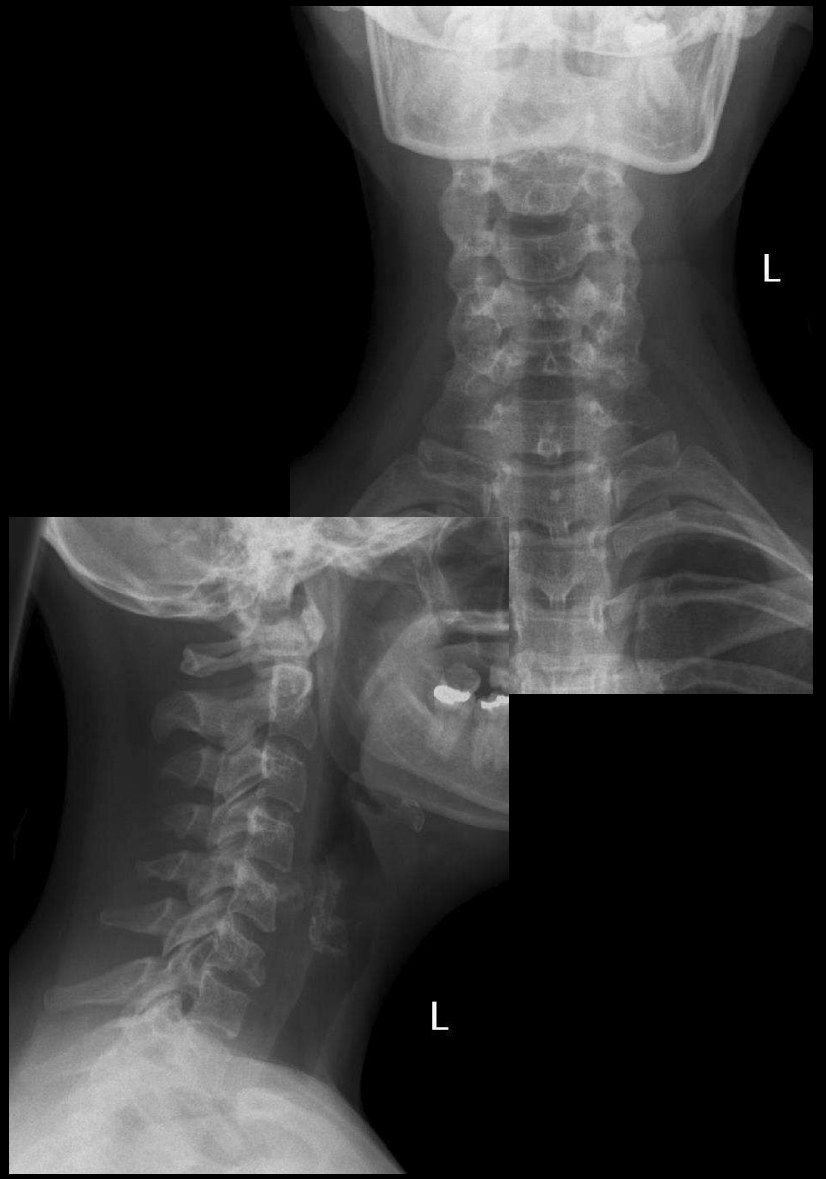
Unilateral Facet Dislocation

- Rupture of interspinous ligament and capsule
- Mild injury to PLL and anulus fibrosus
- Bilateral oblique views to identify the dislocated facet joint

Case

Findings and Diagnosis

- Anterior head carriage & Postural alterations
- Uncovertebral arthrosis
- Facet arthrosis, primarily on the left
- Perched/dislocation of C6 facet joint
- Teardrop fracture of C6



Teardrop Fracture at C6

- Hyperflexion plus compressive force

Hyperflexion Teardrop Fracture

- Triangular fracture fragment along the anteroinferior margin of C5 or C6
- **Rupture** of the posterior ligaments
- Facet dislocation with widened interlaminar and interspinous spaces
- Cervical cord injury

Sagittal T1 and T2 Weighted Images

(Different Case of Hyperflexion Injury)

- C5-C6 level
  - Disruption of disc
- Increased signal within the posterior soft tissues and spinal cord due to edema

www.radiologyassistant.nl

Case

Donated by Dr. Christopher Watkins, DACBR

ANOTHER PATIENT- Skateboarder

AP open mouth

Findings

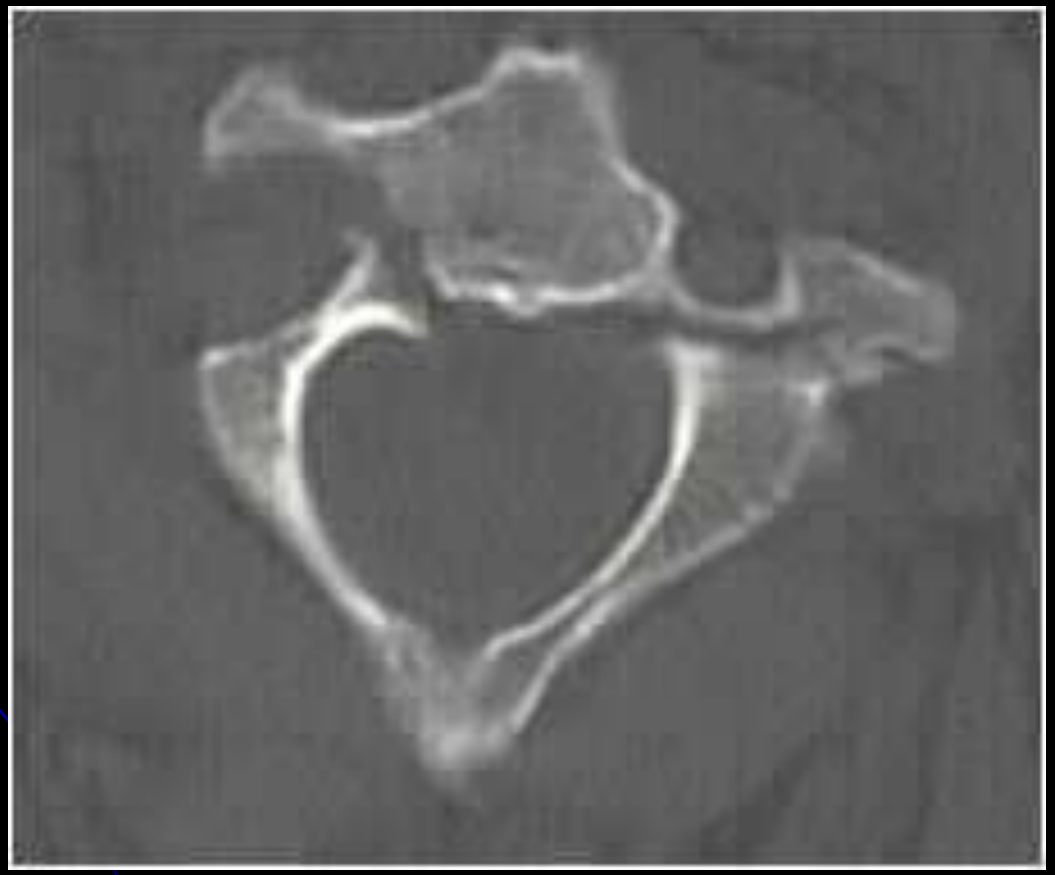
- Pedicle fracture of C2
- Facet dislocation & body displacement of C2
- Disruption of spinolaminar line, C1 & C2
- Osteopenia
- Degenerative disc disease & Facet arthrosis

Hangman's Fracture

- C2 traumatic spondylolisthesis
- Hyperextension and compression Injury

Donated by Dr. Christopher Watkins, DACBR

Axial CT of Hangman's Fracture



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Back To Chiropractic CE Seminars

marcusstrutzdc@gmail.com

707.972.0047