

Diagnostic Imaging in Sports



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Disclosures

- No financial disclosures or conflicts of interest to declare



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Breakdown of topics

- Hours 1, 2: Imaging modalities and interpretation
- Hour 3: Face/head trauma
- Hours 4, 5: Spine trauma
- Hours 6, 7: Upper extremity trauma
- Hours 8, 9: Lower extremity trauma



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Radiology References

- General MSK imaging recommendations
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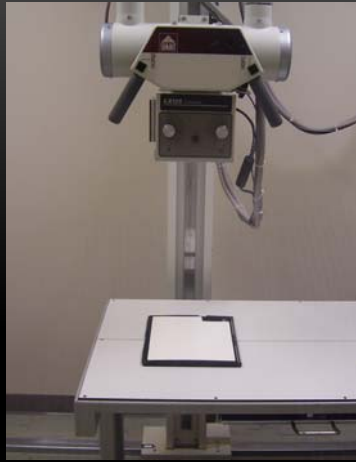


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Introduction to MSK Radiology



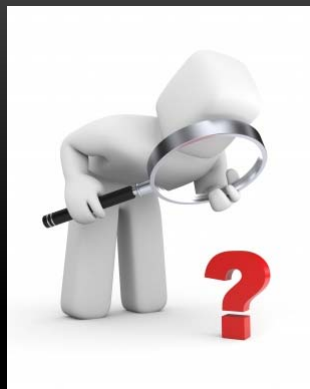
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How to Read MSK Imaging



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Utilizing a Search Pattern

- A systematic way of viewing films
- Decreases likelihood of missing pathology due to
 - Overlooking regions
 - “Satisfaction of Search”

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Utilizing a Search Pattern

- Start with the big picture
 - Sit back, look over the whole series
- Then do an item by item search pattern
 - Be sure to evaluate hard to see areas
 - Cervicothoracic, thoracolumbar
- Don't forget ALL the edges
 - You are responsible for EVERY inch (or cm) of the radiograph
- Use the DICOM tools (DICOM DEMO)

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Search Patterns


“ABC’S”

Alignment / anatomy

Bone

Cartilage

Soft tissue

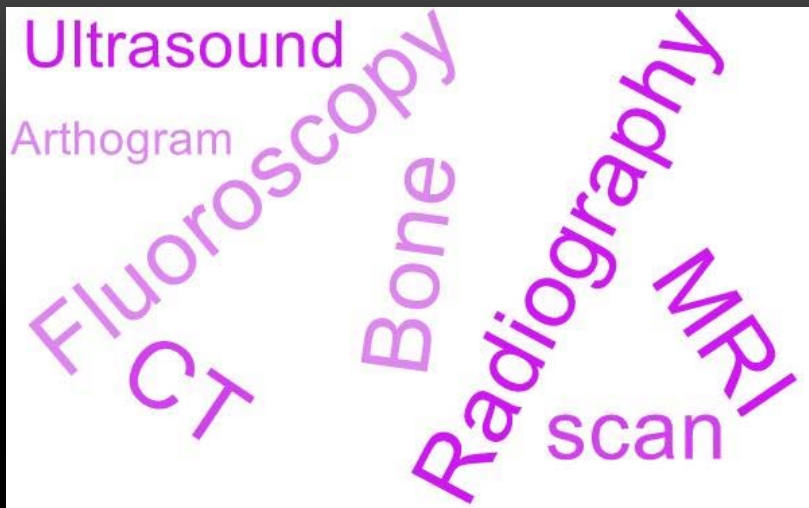


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Choices, Choices!!



Ultrasound

Arthogram


Fluoroscopy

CT

Bone

Radiography

MRI scan



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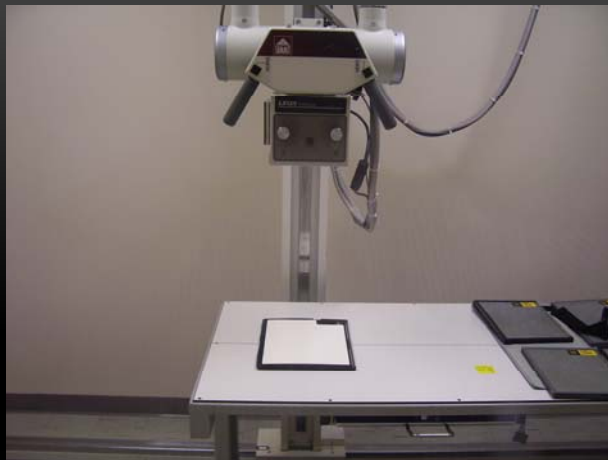
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The Right Tool for the Job



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Radiography



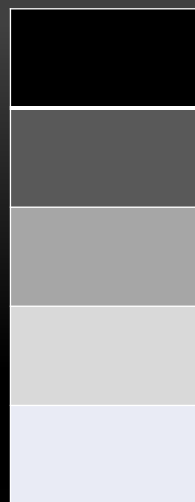
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How Do Radiographs Work??

- Different tissues absorb more/less radiation based on chemical composition
- This different absorption allows us to distinguish the interfaces between tissues

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The 5 Radiographic Densities



- Air
- Fat
- Water
- Bone
- Metal

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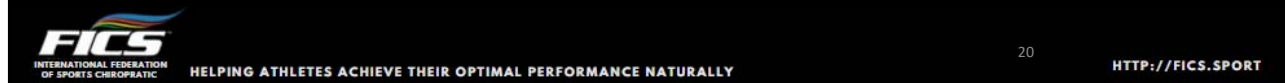
Radiography

Good For

- Bony anomalies
- Trauma / fractures
- Arthritic conditions
 - Degenerative changes
 - Later stage inflammatory (RA)
- Biomechanical evaluation

Poor For

- Bone density changes
 - 30-50% change required
- Most soft tissue (MSK)
 - Internal derangements
 - Marrow diseases
 - Bone malignancies
 - Bone/joint infections



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Radiography

- Must do the minimal diagnostic series
 - 1 view is no view*
 - There are always exceptions, e.g. AP Pelvis
- Perform standard views
 - As a minimum
 - You can always get creative AFTERWARD
- Know the indications for additional views
 - Don't just take/order the extra views for convenience



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Additional Radiographic Spinal Views

- Obliques
 - Cervical: neural foramina, posterior elements
 - Lumbar: pars interarticularis, posterior elements, SI jts
 - L5 pars and SI jts are better visualized with a Ferguson (AP angulated lumbosacral spot)
 - Ferguson view is ordered for any spondyloarthropathy
- Flexion/Extension
 - Stress radiographs for instability
- Extremities
 - Additional views will be discussed with relevant pathology

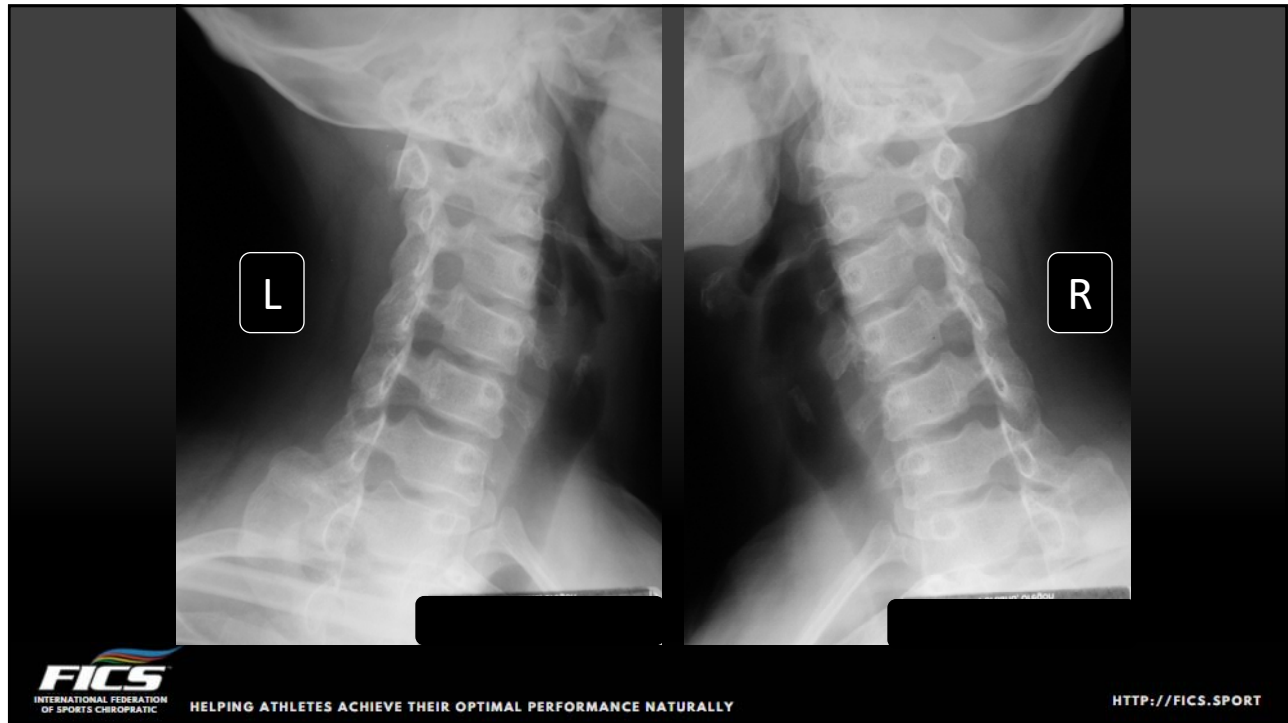


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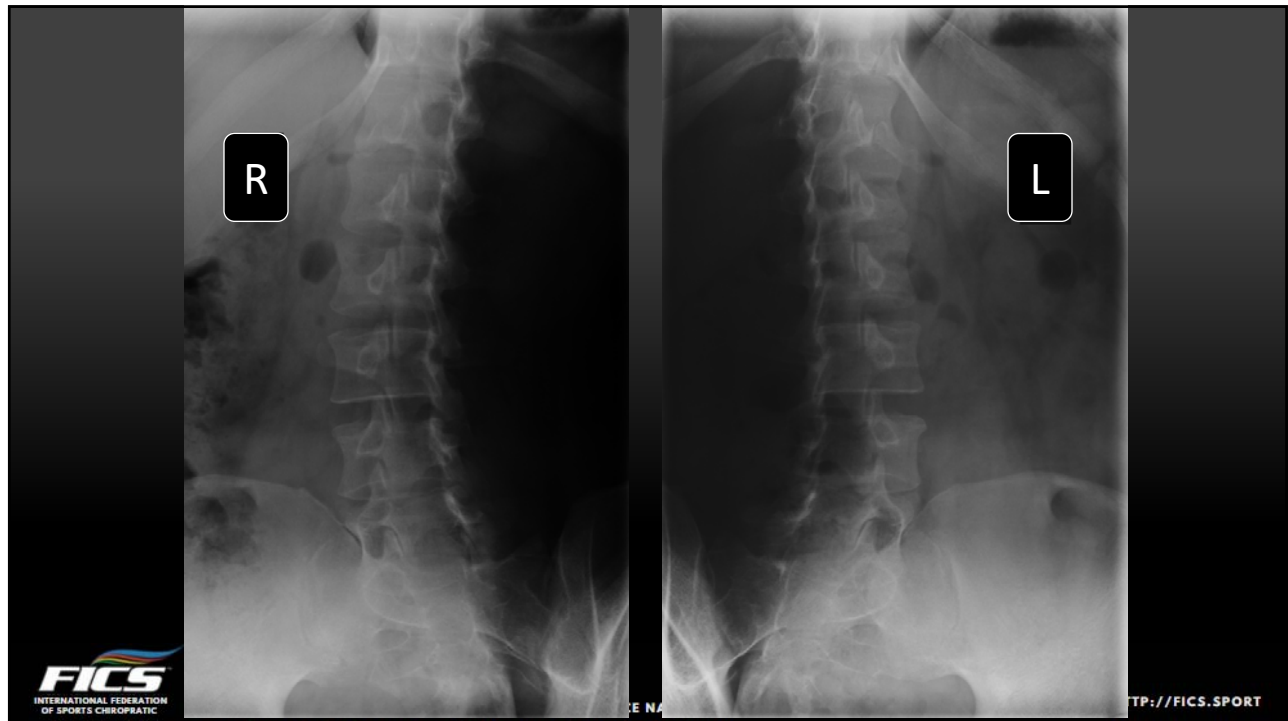
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Radiography: Stress Views

- Flexion/extension
 - Indicated when looking for instability
 - Of little use in acute spasm
 - For patients @ MMI (maximal medical improvement) with residuals to look for instability/permanent disability rating
- **SPECIAL OLYMPICS**
 - Children with Down's Syndrome must be cleared with flexion/extension before competing in certain events



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Spinal Instability

- Definition: instability is excess motion that can result in progressive biomechanical or neurologic insult
- Instability is (generally) assessed using flexion/extension radiographs
- Comes in 3 types
 - Translational instability
 - 3.5mm Cspine
 - 4mm or 4.5mm Lspine (depending on source)
 - Angular instability
 - 11° Cspine
 - 15° L1-L3, 20° L4/L5, 25° L5/S1
 - Upper cervical instability

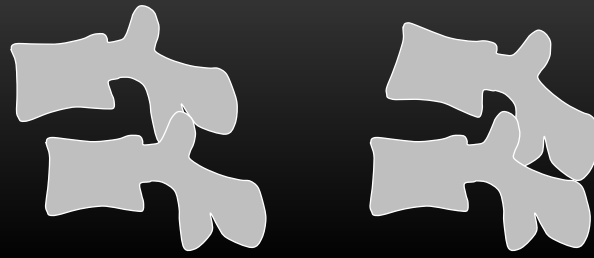
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Translational Instability



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Translational Instability



Flexion

Extension



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Angular Instability



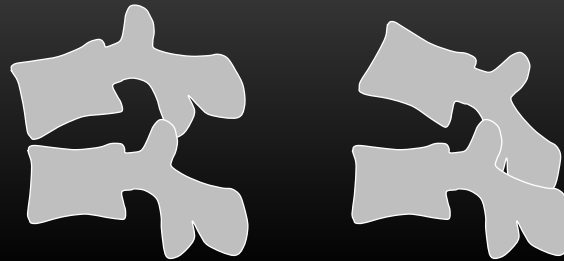
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Angular Instability



Flexion

Extension

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Upper Cervical Instability

- When there is excess sagittal plane motion at C1/C2
- 2 general structural deficiencies
 - Transverse ligament
 - Ligament is lax, torn, destroyed
 - ADI: Atlantodental Interval
 - ≤3mm in adults, ≤5mm in children
 - 16 is the cut off between child and adult
 - DDx: 26+, e.g. rupture, Marfan Syn, Down Syn, rheumatoid
 - Odontoid (dens)
 - The transverse ligament is intact, and holds the dens to C1
 - DDx
 - Os odontoideum
 - Type 2 odontoid Fx
 - Odontoid agenesis

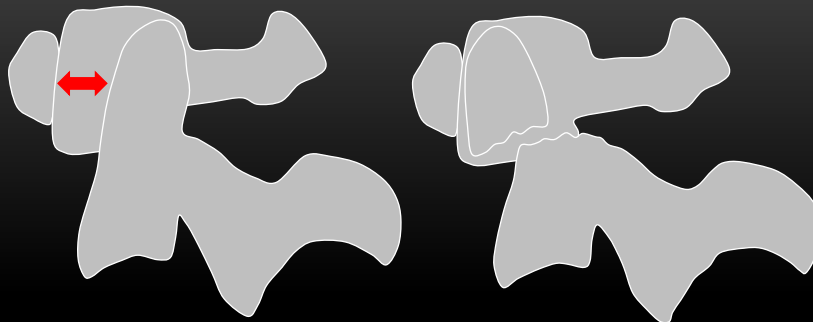
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Upper Cervical Instability



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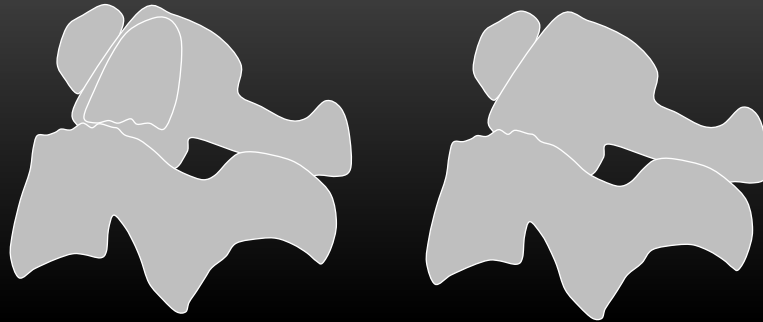
Upper Cervical Instability



- Anterior translation of C1
 - Look at the ADI to determine transverse ligament DDx vs odontoid DDx

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Upper Cervical Instability



- Posterior translation of C1
- Odontoid DDx

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End of Lecture

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