IMAGING IN THE MANAGEMENT OF SPINAL DISORDERS

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CONSULTANT SPINE RADIOLOGIST
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SPINE IMAGING MODALITIES

- PLAIN X-RAY
- MRI
- CT
- US
- FLUOROSCOPY
- NUCLEAR MEDICINE
- DEXA
SPINE IMAGING MODALITIES

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SPINE IMAGING MODALITIES

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BUT FIRST A QUIZ

- Name this country?
IS THIS A FRACTURE?
DEGENERATIVE SPONDYLOLISTHESIS

SUPINE

UPRIGHT
DIFFUSE IDIOPATHIC SKELETAL HYPEROSTOSIS (DISH)

- **Synonyms**
  - Forrestier disease
  - Ankylosing Hyperostosis (Rotes-Querol)

- **Diagnostic Criteria**
  - Four or more contiguous segments
  - Anterior hyperostosis
  - Normal disc
  - Normal facet joints
IMAGING FEATURES

- Hyperostosis
  - Non marginal
  - Extend to mid body
  - Vertical and “flowing”
  - Thick
  - Cortex and medulla
  - Smooth external surface
  - Fuses to anterior body
SPINAL PHYTES

- OSTEOPHYTE

- HYPEROSTOSIS

- SYNDENSMOPHYTE
OSSIFIED POSTERIOR LONGITUDINAL LIGAMENT SYNDROME (OPLL)
PRE-VERTEBRAL SOFT TISSUE
“7mm@C2-- 2cm@C7 RULE”

Newcastle, Australia, MARCH 2013
A 25 year old with neck pain.
NORMAL
DISC INFECTION

1. Loss of disc height

2. Destroyed cortical end plates

3. Pre-vertebral swelling
“DISCITIS”
TUBERCULOSIS

- Discovertebral
  - Transdiscal
  - Anterior
  - Loss of disc height
- Anterior abscess
  - Subligamentous ALL
  - Calcifies when chronic
- Anterior body erosion
  - “Gouge defect”
- Multilevel involvement
EPIDURAL ABSCESS
HIV AND MUSCULOSKELETAL DISEASE

- **SPINE**
  - **MUSCLE**
    - Myositis
    - Pyomyositis
    - Rhabdomyolysis
  - **BONE**
    - Infection
    - Osteoporosis (45-67%)
    - Anemic bone marrow
    - Lymphoma
    - Kaposi sarcoma

- **PERIPHERAL**
  - Osteoporosis
  - AVN hips
  - HOA
  - Myositis

Restrepo C S et al. Radiographics 2004;24:1029-1049
Figure 13a. NHL in a 40-year-old man.
PSEUDO-HAEMANGIOMA
BONE DENSITOMETRY (DEXA)

Thin x-ray beam at three sites:
- Distal radius (wrist)
- Femoral neck (femur)
- Lumbar vertebrae

Measure of bone mass: how much x-ray passes through the bones.

“Bone Mineral Density” (BMD)

“Score” calculated relative to age

Plotted on graph to give estimated fracture risk

Abnormal if >2 SD outside range
COMPRESSION FRACTURES
COMPRESSION FRACTURES
PATHOLOGICAL COMPRESSION FRACTURE

- OSTEOPOROSIS
- METASTATIC CARCINOMA
- MULTIPLE MYELOMA
MALIGNANT
INTRAVERTEBRAL VACUUM CLEFT SIGN
NUCLEAR IMPRESSION

End plate variation
Lumbar spine most common
No clinical significance

IMAGING FEATURES
“Cupid’s bow” on AP
Broad sweep on lateral

Differentiate from pathology
Schmorl’s nodes
Osteoporosis
SCHMORL’S NODES

- Focal intrabody disc herniation
- May be symptomatic adolescence
  “hot” bone scan edema on MRI
- Altered body shape
  elongated flattened irregular plates
NEWMAN CLASSIFICATION

- I: DYSPLASTIC
- II: ISTHMIC
- III: DEGENERATIVE
- IV: TRAUMATIC
- V: PATHOLOGICAL
- (VI: ACQUISISTA)
I. DYSPLASTIC

- **DEFINITION**
  - Congenital absence / hypoplasia of posterior elements

- **EPIDEMIOLOGY**
  - <1% of spondylolisthesis
  - Females 5:1
  - Characteristic posture / gait
  - May develop “Spondylolisthetic crisis”

- **IMAGING**
  - Vertical sacrum
  - “Domed” sacral base
  - Trapezoid L5
  - L5 Arch dysplasia
  - Grade 3 or greater
  - Wide range of motion (excessive–
IIA. ISTHMIC

- **DEFINITION**
  - Defect in the pars interarticularis
    - Type A: unhealed stress fracture
    - Type B: healed elongated pars
    - Type C: acute traumatic fracture
III. DEGENERATIVE

DEFINITION
- Facet arthrosis with remodelling of the joint surfaces and articular processes

EPIDEMIOLOGY
- L4
- Over 40 years
- Females 4:1
MYERDING CLASSIFICATION
Graded 1-4
Divide the sacral base into 4
Relate the L5 posterior body
THE DEFECT - SPONDYLOLYSIS
L5 DISC NORMAL    L5 DISC COLLAPSED
EOSINOPHILIC GRANULOMA
SACROILIITIS

- ARTICULAR CORTEX
  - BLURRED TO COMPLETE LOSS
  - MARKED EROSIONS

- JOINT SPACE
  - WIDENED TO NARROWED
  - SOME ANKYLOSIS

- SUBCHONDRAL BONE DENSITY
  - PROMINENT SCLEROSIS
INSUFFICIENCY FRACTURES

IMAGING FEATURES

- **MR**
  - **T1**
    - Marrow intermediate
    - Low signal fracture line
  - **T2**
    - Marrow intermediate to high
    - Low signal fracture line
    - High signal in fracture zone
  - **T2 FS**
    - High marrow signal
  - **STIR**
    - High marrow signal
  - **T1 FS Gad**
    - Enhancement
    - Often “flare” enhancement
The goal of imaging is to provide a picture that makes a diagnosis and impacts on therapy without saying a word.

Imaging is like a partner – sometimes helpful sometimes not!

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PROF BILL KIRKALDY-WILLIS 1982
ORTHOPEDIC SURGEON