**Radiology – Dr. Ameer – Lecture 2 – Spine**

**Imaging Techniques:**
- Plain film...........trauma
- MRI...........can see spinal cord & nerves.
- CT.............spinal trauma; burst fractures
- Radionuclide bone scan.....metastases
- Myelography.

**PLAIN FILM**

**Normal appearance:**
Vert. body is rectangular in shape in the lateral view.
Disc spaces; normally have the same height at all levels in the C. & D. spine. In the L.Spine increases in height going down.

**Signs of abnormality on plain radiographs**
1. Disc space narrowing
2. Collapsed verteb. body .....lost height. Seen in the lateral view, or sagittal MRI. Look at the adjacent disc and pedicles.
3. Pedicles
4. Dense vertebrae
5. Lytic lesion in the vertebrae
6. Paravertebral shadow

**Disc space narrowing**

*Causes;*
1. DDD
2. Infection.

**Causes of Collapsed vertebra**
1. Metastases & M.M.
   - Discs.....Normal
   - Pedicles....destroyed in Metastases.
2. Infection........
   - adjacent disc narrow or obliterated.
   - Pedicles intact.
3. Osteoporosis & osteomalacia...
   - Disc normal or slight increase in height
   - Pedicles intact
4. Trauma.. Wedge shape with concave sup. surface.
   Normal disc.
   Associated fracture of pedicles, neural arch
5. Eosinophil granuloma in children & young adults ........“vertebra plana”
   the adjacent discs & pedicles are intact.

### Pedicles

On plain films....
   best assessed in the frontal view, except in the C. spine....oblique view.
   very well seen in CT

Destruction or sclerosis of one or more is reliable sign of metastases.

### Dense vertebrae

Sclerosis may affect one or more vert.

**Causes:**
1. Metastases:......Ca prostate, & breast.
2. Lymphoma
3. Paget’s dis.   Enlarged verteb with coarse trabecular pattern.
4. Hemangioma; vertical striation in a normal size vertebra

### Lytic lesion within a vertebra

May affect one or more vertebrae

**Causes:**
1. Metastases....Lung, breast, kidneys.
2. M.M or Plasmacytoma.
3. Lymphoma.
4. Infection....Lysis of two adjacent vert with narrowed the intervening disc.

### Paravertebral shadow

Dorsal region is the easiest place to recognize it

Lumber spine ....large enough to displace psoas shadow.

C. Spine; Lateral view shows ant. displacement of the pharyngeal air.

**Causes;**
1. Infection
2. Malignant neoplasm.
3. Hematomas following trauma.

### Myeloma/Metastases/Lymphoma

M.M. cause lytic lesions only.
Multiple lytic lesions are either M.M. or Metastases.
Metast. & M.M. both cause collapse verteb.
Metastases often involve both verteb bodies & pedicles.
Lymphoma & metastases may cause lytic. Sclerotic or mixture of both.
MRI is the most accurate test for all.
MRI will show compression of the spinal cod or nerve roots by soft tissue mass.

**Infection**
Common infecting organisms. TB & Staph.
The hallmark is destruction of two vertebral bodies with the intervening disc.
Collapse of verteb. bodies leading to gibbus formation.
Paravertebral soft tissue shadow which may calcify in TB.
Plain film, CT & MRI all can show the changes. MRI is the best.
Needle biopsy under CT or fluoroscopy

**Spinal Trauma**
Plain films: Look for
   - Fractures & alignment.
CT in Major trauma:
   - no manipulation
   - difficulties in monitoring patients in MRI.
In unconscious patients:
   - CT of C. spine with CT of head....
   - Reconstruction of the images in sagittal and coronal planes.
Look for fracture C1,C2 (atlanto-axial interval) & C7-T1
CT can show # laminae & pedicles
   - bony fragments inside the spinal canal (burst #)
MRI

**Spinal Stability**
The spine is divided into 3 columns:
Ant.........ALL & ant 2/3 verteb body
Middle......post 1/3 of verte. body & PLL
Post.........Pedicles, laminae & spinus pro.
   - The spinal stability depends on the integrity of the middle and post. columns.
   - Fractures of ant. 1/3 stable # like the commonly seen wedge fractures of osteoporosis
Jefferson #.... Lat. Masses of atlas
Hangman’s #......arch of C2 ...Severe hyperextension.
Tear drop #....
   - On the ant. surface of verte. body ...
as a result of severe flexion injury.....may indicate a serious injury

Whiplash injury

**MRI in Spinal trauma**

Valuable in pat. with neurological deficits as it may demonstrate a potentially treatable abnormality like disc protrusion or hematoma.

MRI can show hemorrhage & contusion of the spinal cord.

SCIWORA syndrome.......Spinal Cord Injury Without Radiological Abnormality ..in children

**The signs of spondylosis on plain films**

Disc space narrowing

Osteophyte formation and sclerosis, which frequently occur on the adjoining surfaces of the vertebral bodies.

Osteophytes on the posterior surface of the vertebral bodies narrow the spinal canal and may encroach on the exit foramina of the spinal nerves

**MRI in the spondylosis**

Dehydration (Reduced signal in T2)

Reduction in the height of the disc & may bulge.

**MRI Lumber disc herniation**

Majority occur posterolaterally at L4-L5 & L5-S1 levels.

> 1/3 of demonstrably herniated discs are asymptomatic. So the criteria for surgery must be clear-cut evidence of compression of the clinically affected nerve roots.

Failed back syndrome Scarring Vs recurrent disc. Scarring enhances, while disc herniation does not.

**Cervical disc herniation**

Majority occur at the lower three disc levels.

MRI can identify disc herniation encroaching on the spinal cord & or nerve roots.

**Spinal stenosis**

A narrow spinal canal may lead to cord or nerve root compression esp. when spondylotic changes supervene

Symptomatic spinal stenosis is encountered in the C.& L. regions.

MRI is the ideal method of demonstrating the size and the shape of the spinal canal and thus diagnosing SCS

**Ankylosing Spondylitis**

Affects principally SI joints and the spine.

Both SI joints are invariably affected by the time spinal involvement has occurred.
The earliest changes are haziness of the SI joints followed by erosions. Finally there will be obliteration of the joint space with bony ankylosis.

In the spine; squaring of the vertebral bodies with ossification of the lig. & vertical bony bridges bamboo spine

**Spina bifida**

Incomplete closure of the spinal canal.

Usu. seen in the L.S. spine.

May be associated with Spinal cord abnormality.

Malformatin of the vertebral bodies

(Spinal dysraphism)......Dx antenatally by US.

Spina bifida occulta of no significance

**Spondylolysis & spondylolisthesis**

Defect in the pars interarticularis

Foreward slip of one vertebral body on the one below. Occurs most frequently at L.S. junction & bet. L4 & L5.

Seen in the lateral view.

**Spinal cord Compression**

MRI can show the site, size & extent of the compression.

Extra-dural lesions; metast, TB, Cervical disc herniation. Lumber disc prolapse causes no cord compression as the cord doesnot extend below L1

Intradural but extramedullary( within the dura but not the cord) like neurofibroma and menigioma.

Intramedullary lesions tumors like ependymoma or hemorrhage.

**Other lesions of the spinal cord**

Syringomyelia

Demyelinating plaques of MS

[See the slideshow for some images at the end.]

[There is an accompanying slideshow which contains images. Refer to it if interested.]