Differential Diagnosis:
Back Disorders
Spinal Disorders

- Congenital OR Acquired:
  - Developmental
  - Traumatic
  - Infection
  - Inflammation
  - Tumor
  - Degenerative
  - Metabolic
  - Psychological
CONGENITAL

- May present early with obvious deformity
  or

- May present later accidentally or symptomatically

- Usually Painless
Congenital Anomalies: Sacralisation

Plate 5

Transitional Lumbosacral Vertebrae (Sacralization of L5)

Enlarged left transverse process of last presacral vertebra forms diarthrodial joint with lateral mass of sacrum.

Complete bony fusion.
X Ray of incomplete hemi-Sacralisation
X Ray of R Hemi-Sacralisation
X Ray of complete Sacralisation
Lumbarisation
Congenital anomalies: Aetiology

OSSIFICATION OF VERTEBRA: Primary centres (black)
Cartilage model (stipple)

Fuse 4-5 years
Fuse 1 year

Primary centres
Aetiology

Failure of formation: part of ossification centre fails to grow whilst the other part grows so a WEDGE vertebra forms (anterior or lateral)

Failure of Segmentation: part of ossification center fails to separate from above or below ossification center so a BLOCK vertebra forms
Failure of Formation

Congenital Scoliosis
Closed vertebral types
(MacEwen classification)

Partial unilateral failure of formation (wedge vertebrae)

Complete unilateral failure of formation (hemivertebra)
Failure of Segmentation

Unilateral failure of segmentation (congenital bar)

Bilateral failure of segmentation (block vertebra)
Congenital Kyphosis: Wedge Vertebra
Klippel-Feil syndrome
Klippel-Feil Syndrome

- Characterised by both failure of formation (Wedge vertebra=congenital scoliosis or kyphosis)
- Failure of segmentation=Block vertebra
- Short neck and high scapula are very characteristic
Congenital Scoliosis
Congenital Kyphosis
Scoliosis

Many causes:

Most common is **Idiopathic**.

Other causes include: **congenital**, **neuropathic** (e.g. polio), **Myopathic** e.g. (muscular dystrophy), **connective tissue disease** e.g. (Marfan’s syndrome), **tumour**, **trauma**, **infection** (T.B.)
Idiopathic Scoliosis
Idiopathic Scoliosis is associated with rotation of vertebrae.
Scoliosis: Important Points

- Observation of deformity during back flexion is most accurate
- Leg length asymmetry is a cause of scoliotic deformity
- Rib hump elevation may be measured by a scoliometer
Some causes of Scoliosis
X Ray of Idiopathic Scoliosis
Cob’s angle: lateral bending
Principles of Scoliosis management

- **Mild cases** (< 25 Degrees) = Programme of **exercise** and intermittent traction

- **Between 25 and 40** = **Orthosis** or Plaster of Paris cast

- **>40-50 degrees** = consider **Surgery**
Traction for Scoliosis
Scoliosis: correction with a cast
Scoliosis: Principles of Surgery
Scoliosis: Principles of Surgery

- Usually extensive surgery
- Blood transfusion is required
- Bone graft is always done
- Correction is done by Instrumentation

Either:

- **Posterior** Approach (more common and for less rigid deformities)
- **Anterior** Approach (includes Thoracotomy or Thoracoscopic approaches)
Scoliosis: Principles of surgery

Correction is done by release of tight structures, distraction, compression and rotation with instrumentation.

Instrumentation includes rods, hooks, plates and pedicular screws.

Bone graft to insure spinal fusion in corrected position is mandatory.
Spondylolysis = Defect in the pars inter-articularis: Lateral view
Spondylolysis = Defect in the Pars- Interarticularis: superior view
Spondylolysis: dog Appearance
Spondylolysis: Decapitated dog

Plate 8

Spondylolysis and Spondylolisthesis

Superior articular process (ear)
Pedicle (eye)
Transverse process (head)
Isthmus (neck)
Spinous process and lamina (body)
Inferior articular process (foreleg)
Opposite inferior articular process (hindleg)

Posterior oblique radiographic view mimics shape of Scotty dog. In simple spondylolysis, dog appears to be wearing collar.

In spondylolisthesis, “Scotty dog” appears decapitated.
Spondylolysis: Dog Appearance

Schematic drawing of an oblique roentgenogram of the lumbar spine, showing the characteristic “scotty dog” look of its posterior elements. Note that the defect in the pars interarticularis appears to be a collar around the dog’s neck.
Spondylolysis: 45 degrees Oblique view of spine
Spondylolysis : Lateral view of spine
Spondylolysis : C.T. Scan
Spondylolysis: Aetiology

Isthmic
- Congenital defect of Pars Inter-Articularis
- Traumatic (Fracture of the pars)
- Pathological defect due to infection or tumour

Dysplastic
- Developmental or degenerative deformity of the facet joints
Clinical Picture

- Spondylolysis may cause deep seated low back pain due to micro movement at site of defect
- Spondylolysis may be diagnosed incidentally during x ray of spine or KUB
- Spondylolysis result in Spondylolisthesis
- Spondylolisthesis causes traction on nerve roots and radicular pain
Spondylolisthesis

Grade I

Grade III

Increased stress on sacral nerve roots
Spondylolisthesis

- Usually L4-5 or L5-S1
- Graded in 4 grades 1-4
- Grade 1 is 25% slip on the vertebra below
- Grade 4 is 100% slip on the vertebra below
- Pain is more on standing than walking
Management of Spondylolysis

NOT every spondylolysis is symptomatic

Treatment is usually conservative by exercise and analgesics (NSAIDs)

Rarely surgery is indicated for repair of defect (Fixation and bone graft)
Management of Spondylolisthesis

- Usually **conservative** for grades 1 and 2
- **Surgical** for grades 3 and 4 and lower grades when they fail to respond to conservative treatment
- Fusion of the spine at the site (Fusion in situ with instrumentation or Fusion following reduction by instrumentation)
- Bone graft is used
Degenerative Disorders: O.A. of Spine

Degenerative Arthritis
(Osteoarthritic and Spondylitic)

Degeneration of lumbar intervertebral discs and hypertrophic changes at vertebral margins, with spur formation. Osteophytic encroachment on intervertebral foramina compresses spinal nerves.

Osteoarthritic facet joints
Spondylitic arthritis
Spinal Stenosis

- Congenital ( Rare ) OR
- Acquired

Is a cause of Backache, Sciatica and Intermittent Claudication

Intermittent claudication ( Neurogenic Claudication ) is characterised by progressive weakness of the legs during walking forcing patients to stop and take a rest (usually in flexed back position or squatting) till pain goes away
Spinal Stenosis

Characteristic posture with neck, spine, hips, and knees flexed relieves pressure on cauda equina and resulting pain. Back is flat or convex with absence of normal lordotic curvature.

Methazamide-enhanced CT scan shows severe compromise of spinal canal with compressed dural compartment.

Central spinal canal narrowed by enlargement of inferior articular processes of superior vertebra. Lateral recesses narrowed by subluxation and osteophytic enlargement of superior articular processes of inferior vertebra.

Properly spaced lumbar vertebra with normal thickness of intervertebral disc.

Vertebrae approximated due to loss of disc height. Subluxated superior articular process of inferior vertebra encroaches on foramen. Internal disruption of disc shown in cut section.
Myelography in Spinal Stenosis
Spinal Stenosis

- C.T. scan of spinal Stenosis
- Hypertrophy of Facet Joints and Ligamentum Flavum are seen
- Fractured osteophyte of Facet Joint is seen on left side
- Calcified bulge of Intervertebral Disc and air shadow anteriorly
MRI in Spinal Stenosis
Management of Spinal Stenosis

- Initially **conservative**
- Conservative management includes exercise, NSAIDs and neurotrophic vitamins
- **Surgery** is indicated for intractable symptoms
- Surgery includes **Decompression** of stenosed part and stabilisation by instrumentation
Ankylosing Spondylitis

Ossification of anterior longitudinal ligament and intervertebral discs

Ossification of radiate ligaments of head of rib

Chest expansion decreases
Ankylosing Spondylitis

- Is inflammatory disorder affecting mainly young men.
- It is characterised later by severe spine stiffness.
- Early symptoms include reduced chest expansion due to ankylosis of costo-chondral ligaments.
- Late X Ray sign is Bamboo Spine.
Ankylosing Spondylitis

- Haziness of Sacro-iliac joints is an early radiological sign.
- Positive HLA-B27 is significant diagnostic criteria.
- Severe neck and spinal flexion are late findings.
- **Early** management is *Conservative* by exercise and NSAIDs.
- **Late** management is by *Surgery* to reduce severe spinal flexion.
Progressive Spinal Deformity in Osteoporosis

Age 55 years

Age 65 years

Age 75 years

Compression fractures of thoracic vertebrae lead to loss of height and progressive thoracic kyphosis (dowager's hump). Lower ribs eventually rest on iliac crests, and downward pressure on viscera causes abdominal distention.
Spinal Osteoporosis

- One of the most serious sequel to osteoporosis
- Micro-fractures of vertebrae cause chronic backache
- Osteoporotic vertebral fractures are common following minor trauma
- Severity is measured by DEXA exam (Dual Energy X ray Absorptionometry)
Principles of Osteoporosis Management

Exercise can improve bone mass before menopause or old age and may delay the process at that time.

Post menopausal therapy includes:

- Inhibition or reduction of osteoclastic activity to reduce bone resorption
- Stimulation or increasing of osteoblastic activity to increase bone formation
Backache in Pregnancy

- Very common
- Difficult to treat
- NSAIDs should not be given in first trimester
- Mechanism of pain is faulty mechanics of spine due to lax abdominal muscles and shift of center of gravity
Current time cause of Backache

Mechanical Causes of Low Back Pain

Deterioration of musculoskeletal condition

Good posture
- head erect
- chest high
- abdomen in back flat
- buttocks in ideal weight
- Good muscle tone (regular exercise)

Poor posture
- head forward
- chest flat
- abdomen protruding
- swayback
- buttocks protruding
- Overweight
- Poor muscle tone (lack of regular exercise)