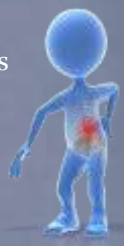
Low Back Pain

Causes and Cures

Structures that Can be Damaged

- Intervertebral discs
- Facet (zygopophyseal) joints
- Inter body joints
- Spinal nerve roots
- Nerve compression
- Pathological conditions
- Video – Causes of back pain



Disc Formed by

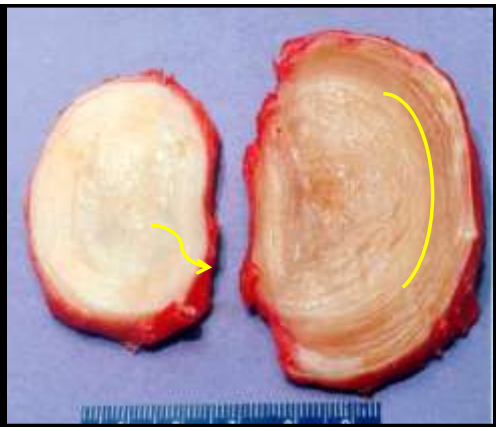
- Nucleus pulposus
- Annulus fibrosis
- Vertebral end plate

Annulus Fibrosis

- 10-20 sheets of collagen fibres (fibres run at a 65-70 degree angle)
- Arranged in concentric rings
- Layers arranged parallel to adjacent layer
- Layers known as lamellae
- Thicker anteriorly and laterally
- Nerve supply - outer 1/3 by sinu-vertebral nerve

Nucleus Pulposus

- 70-90% water
- Deforms under pressure



Vertebral End Plate

- Covers the vertebral body
- Disc attaches to it and the ring apophysis
- Nutrition of disc occurs across it

Functions of the Disc

- Transfer weight
- Allows movement
- Shock absorber

Disc damage may occur with

- Flexion especially if combined with rotation
- Compression in a flexed and rotated position.
- Minor repetitive damage
- Major incident

The Disc and Movement - Flexion

- Vertebral body lowers anteriorly and raises posteriorly
- AF buckles anteriorly and compresses the NP
- NP migrates posteriorly and places a stretch on the posterior annulus
- Posterior AF weakest therefore potential damage.

The Disc and Movement - Extension

- Vertebral body narrows posteriorly and widens anteriorly
- Migration of the nucleus anteriorly
- Stretch on the anterior AF

Disc and Movement – Right Side Flexion

- Approximation of V body on R side with widening on L.
- Compression of NP on right with migration to the L.
- Opposite occurs on the opposite side

Disc and Movement - Rotation

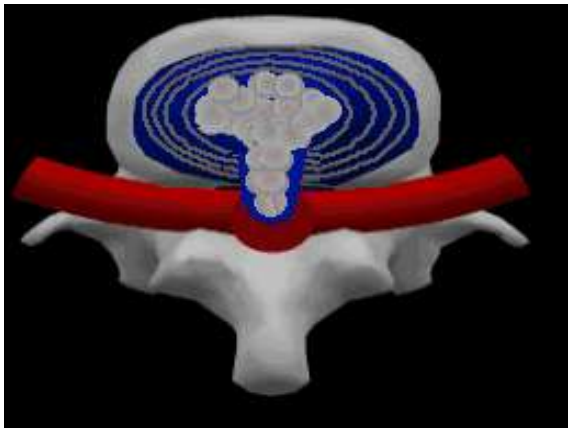
- 1/2 fibres in the AF stretched while the other 1/2 are relaxed
- Rotation is a movement that can damage the disc

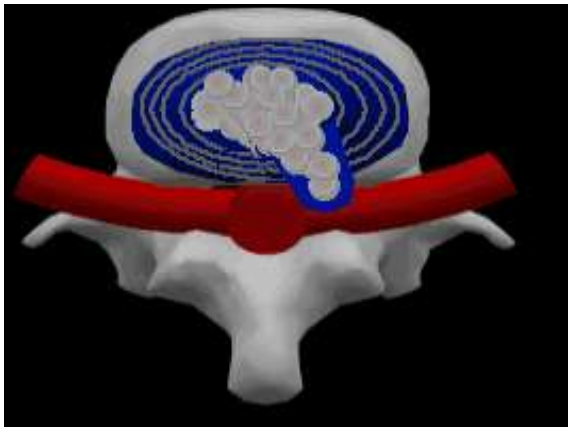
Compression

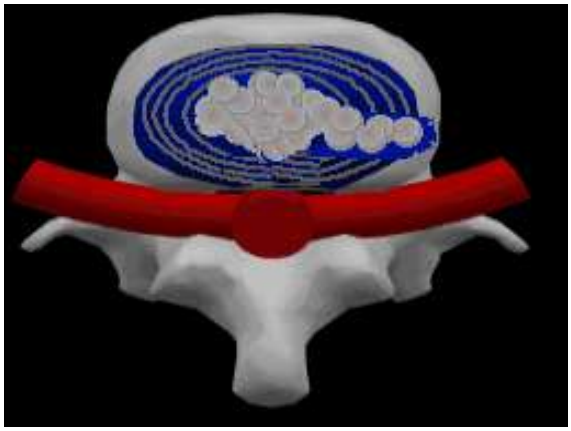
- If the disc is compressed from above then there is equal compression on both sides and potential for peripheral bulging.
- If the compressive force is angled in a particular direction then the bulge in the AF may occur in that direction.

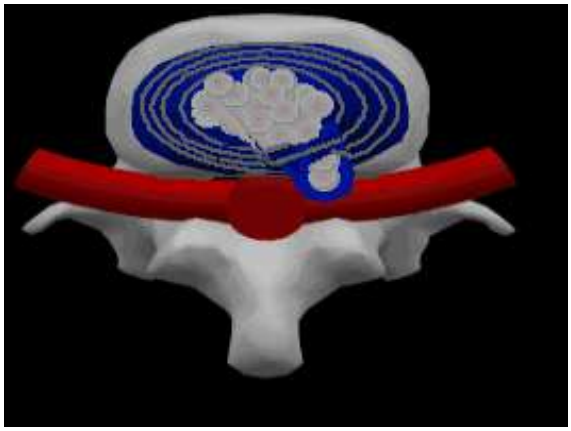
Creep

- Loss of fluid from disc over 16 hour day.
- 10% loss of disc height
- Rehydration occurs over night
- Disc more susceptible to injury in the a.m.









FISSURES

- There are two types of fissures that are seen in the IV discs:
  - Circumferential
  - Radial
- These may occur separately or in combination with each other

Effects of Fissures

- Fissures lead to "sloppiness" of the mobile segment and this places strains on accompanying joints, ligaments and muscles.

ARTICULAR TRIAD

IV discs 2 facet joints

ARTICULAR TRIAD

It is the interaction between these 3 that gives the spine its movement. If there is failure of any one element (by trauma or degeneration) it will inevitably lead to degenerative changes in the other elements, (Twomney and Taylor 1994)

DISC DEGENERATION

Nucleus becomes more fibrous.

↓

Loses ability to exert radial pressure on the annulus

↓

Vertical load more on AF placing it under greater strain

↓

Fissuring annulus

↓

Fissures initially central close to NP

↙ ↘

Circumferential fissures Radial fissures

Pathological Conditions

A brief look – see reading hand-out for more information

LUMBAR VERTEBRAL STENOSIS

- Transverse section of the canal
  - upper - oval
  - lower-triangular or trefoil

Signs And Symptoms Of Spinal Stenosis

- Usually found in older age group
- Central LBP
- Increased by walking - differentiate between intermittent claudication
- Increased by standing
- Decreased by sitting or standing flexed
- Limited extension
- Stiff on palpation

Spinal Canal Narrowed by:

- Congenital changes
- Disc degeneration with associated decrease in disc space
- Hypertrophy of facet joint and capsule
- Osteophyte formation at V. bodies/facet jt
- Central disc bulging
- Spondylolisthesis
- Tumour

Spondylosis

- Term used to describe certain changes within the discs and facet joints.
- Often thought of as a disease but now thought to be 'normal' age related changes.

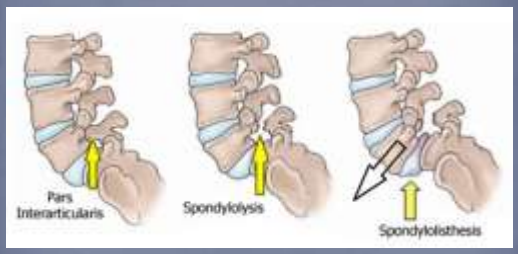
Associated X-ray Changes

- Disc space narrowing
- Osteophytes at the margins of the vertebral bodies and intervertebral discs
- Facet joint erosion

Spondylolisthesis / Spondylolysis

- Caused by a defect in the pars articularis
- The forward slip (olisthesis) of a vertebral body on its subjacent fellow.
- Spondylolsis - pars defect is present without the slip

Pars Inter-Articularis Fracture



Etiology

- Congential
- Direct trauma
- Indirect trauma (stress fracture)

5 Types of Spondylolysthesis

- Congenital
- Spondylolytic
- Traumatic
- Degenerative
- Pathological

Signs and Symptoms

- May be asymptomatic
- May have localised LBP with either spondylolysthesis or spondylolysis
- Symptoms may depend on degree of slip

Signs and Symptoms

- May be neurological changes
- Pain increased by walking, reaching above head, standing.
- Pain decreased by sitting/standing in slight flexion

Signs and Symptoms

- Palpation - may feel a step deformity
- Problems do not always arise from the level with the pars defect.
- May be symptoms arising from the level above or below

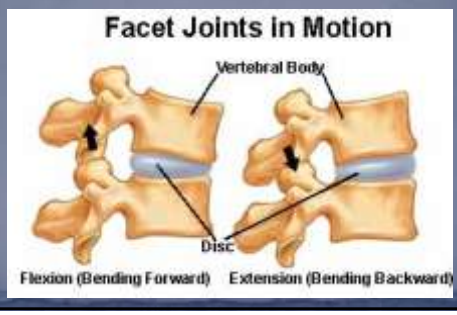
Intervertebral Canal Narrowed by:

- Disc bulging
- Disc narrowing
- Facet joint changes - thickening of ligamentum flavum sclerosis of bone on the facet joints.
- Osteophytes at vertebral bodies and facet joints
- Spondylolisthesis

Facet Joint Dysfunction

- Capsule - fibrous, anteriorly replaced by the ligamentum flavum.
- Reinforced dorsally by multifidus - stabiliser
- Meniscoid - 3 fat pads
- Nerve supply -post primary rami
- Orientation of facet joints controls movement

Flexion and Extension



Facet Joints - Flexion

- Anterior sagittal rotation and translation
- Upward slide of the inferior articular facet 5-7 mm
- Stretch on the capsule
- Facet joints play a major role in stability of the spine 39%

Facet Joint - Extension

- Posterior sagittal rotation and translation
- Downward movement of the inferior articular process
- May get bony opposition of vertebral body and spinous process
- Compression of facet joint

Facet Joint - Rotation

- Compression of the facet joint on the side away from which rotation occurs
- Stretch on the side to which rotation occurs

Facet Joint – Lateral Flexion

- Downward slide of the inferior articular process on the side to which the movement occurs - compression
- Upward slide on the opposite side - stretch

Injury to Facet Joint

- Capsular tears
- Capsular avulsion
- Subchondral avulsion
- Intra-articular haemorrage
- Fracture
- Often occurs with extension and rotational movements.

Pain Referral From Facet Joint

- Predominately to the thigh and buttock
- Pain can be referred below the knee to the foot
- Distance of radiation is proportional to intensity of pain

Degenerative Changes In The Facet Joints

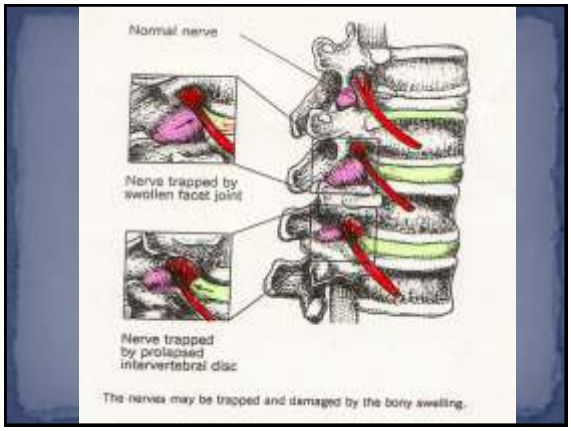
- Occurs in the superior surface of the facet joint first
- Erosion and fibrillation of articular cartilage
- Osteophytes

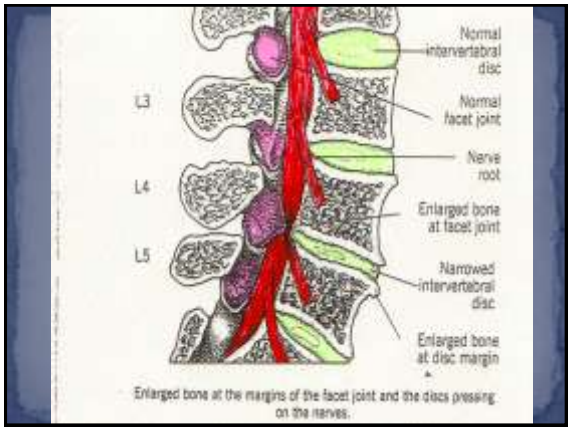
Degenerative Changes In The Facet Joints

- Enlargement of facet joints
- Capsule thickens and becomes stiff, may eventually tear and there is thickening of the ligament flavum.

Nerve Compression

- Nerve compression can occur from any or all of the conditions already identified
- Nerve compression occurs as the nerve passes beside the facet joints
- Osteophytes can also impinge nerves
- Pain from impingement can radiate both up and down the course of the nerve





Spinal Conditions Reading

- Check Morphopedics for more info
- Additionally, look at Spine Universe for more information on these and other spinal conditions.
- http://www.spineuniverse.com/conditions

Any Questions?

Check out the reading hand-out for further information on pathological conditions of the spine