



## Lumbar Spine Orthopedics and Neurology DX 611

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## Knowledge...



- Knowledge enhances awareness and improves the potential for accurate diagnosis...



## Key to Success



- "Diagnosis is the key to successful treatment!"



## You are the chiropractic physician of the future...



- Mastering the diagnosis and treatment of these neuromusculoskeletal conditions will determine your success in school, clinic, and throughout your career...



## Lumbar Spine Back Pain



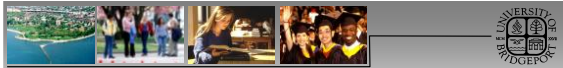
- Back pain is common from the second decade on.



## Low Back Pain Male Gender Prevalence



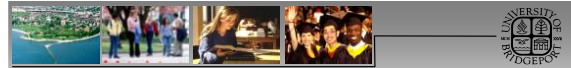
1. Spondyloarthropathies
2. Vertebral osteomyelitis
3. Benign and malignant neoplasms
4. Paget's disease



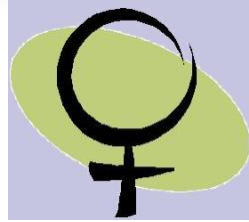
## Low Back Pain Male Gender Prevalence



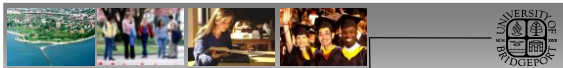
5. Retroperitoneal fibrosis
6. Peptic ulcer disease
7. Work-related mechanical disorders



## Female Gender Prevalence in Low Back Pain



1. Polymyalgia rheumatica
2. Fibromyalgia
3. Osteoporosis
4. Parathyroid disease



## Lumbar Spine Pain Generators

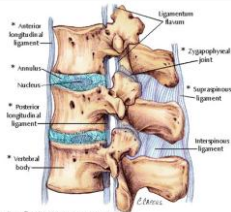
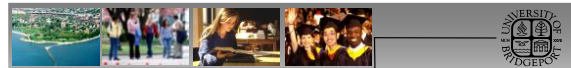


Fig. 1 \* indicates pain-generating structures

- Zygapophysial joint
  - Capsule
  - Nerve
- Ligament
- Muscle
- Osseous



## Characteristics of Lumbar Spine Pain

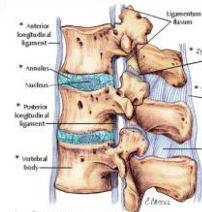
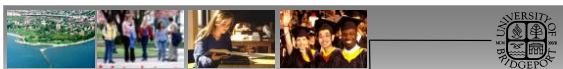
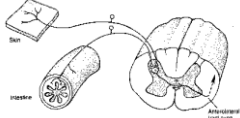


Fig. 1 \* indicates pain-generating structures

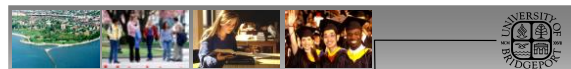
- Spinal pain
- Discogenic pain
- Nerve root pain
- Multiple levels of lumbar spinal stenosis



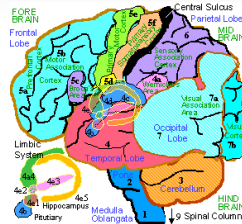
## The Dermatomal Rule "Referred pain"



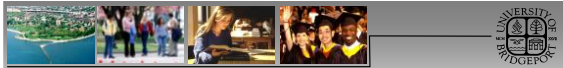
- Brain often "refers" pain from a viscus to the related somatic dermatomal area.



## Characteristics of Low Back Pain Viscero-somatic Convergence



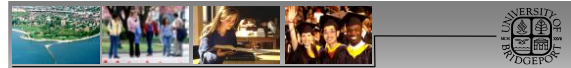
- Brain cannot distinguish between nociceptive activity originating in the viscus and that originating in the somatic structure due to convergence.



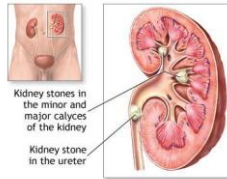
## Differential Diagnosis Low Back Pain Examples



- Dehydration
- Nephrolithiasis
- Gout
- Renal Carcinoma
- Metastasis

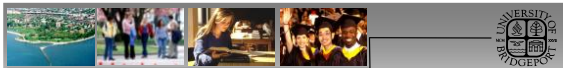


## Characteristics of Low Back Pain Viscero-somatic Convergence

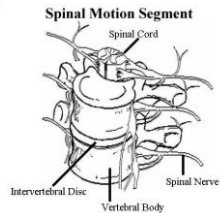


- Dehydration
- Gout
- Murphy test & kidney punch (Peri-nephritic abscess)
- Dr. John Benjamin Murphy (surgeon)

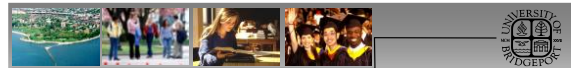
#ADAM



## Mechanical Low Back Pain Spinal Motion Segment



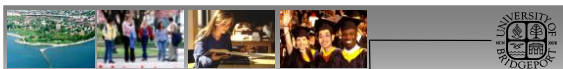
- As many as 90% of patients with back pain have a mechanical reason for their pain secondary to overuse or trauma



## Mechanical Low Back Pain Overuse



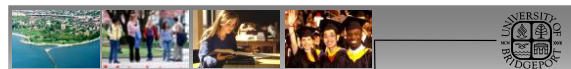
- Strain
- Myospasia
- Dehydration
- Discopathy



## Mechanical Low Back Pain



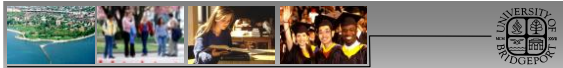
- A normal anatomic structure
- Pain secondary to trauma
- Deformity of an anatomic structure.



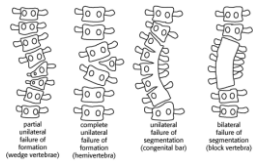
## Mechanical Low Back Pain Post-Traumatic Pain



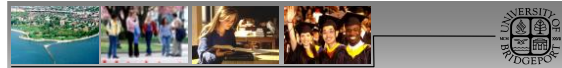
- Lumbar strain
- Lumbar sprain
- Lumbar fracture
- Lumbar strain/sprain



## Mechanical Low Back Pain Deformities of anatomic structures



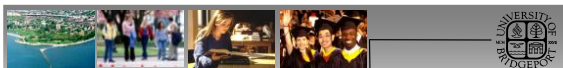
- Abnormal spine
  1. Wedged vertebra
  2. Hemivertebra
  3. Congenital bar
  4. Block vertebra



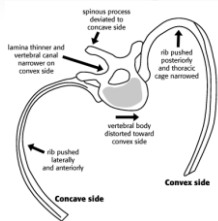
## Mechanical Low Back Pain Congenital Scoliosis



- Would you consider this condition as a structural or non-structural scoliosis?



## Mechanical Low Back Pain Congenital Scoliosis

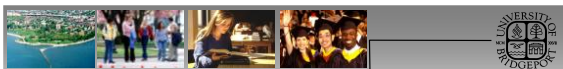


- Rib hump
- Deviation of spinous process
- Vertebral distortion
- Posterior convexity
- Anterior concavity



## Differential Diagnosis of Lumbar Pain

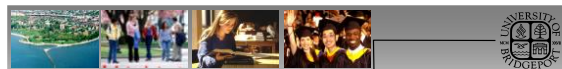
1. Disc injuries
2. Mechanical joint dysfunction
3. Myofascial conditions
4. Ligamentous conditions
5. Neural conditions



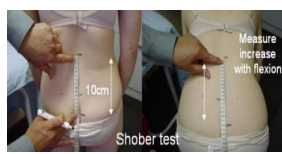
## Mensuration of Lumbar Flexion



- 80 degrees of lumbar flexion is WNL
- Movement must occur at lumbar spine and not the hips or thoracic spine

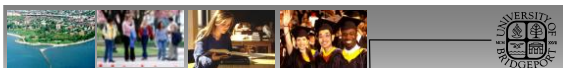


## Schober's Test



- Mark lumbosacral junction, 10 cm superior, and 5 cm inferior
- Have patient flex forward and measure the differences





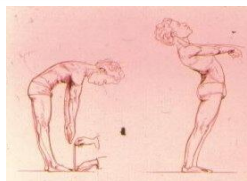
## Mensuration of Lumbar Flexion Schober's Test



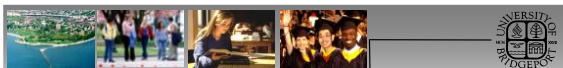
- Normal findings would indicate 4 cm of increase with superior pair of marks and zero change with inferior pair of marks.



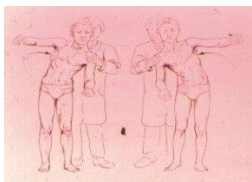
## Lumbar Range of Motion Flexion and Extension



- Flexion 80 degrees
- Extension 35 degrees



## Lumbar Range of Motion Lateral Flexion

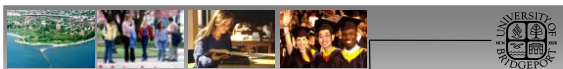


- Lateral Flexion 25 degrees

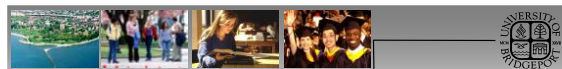
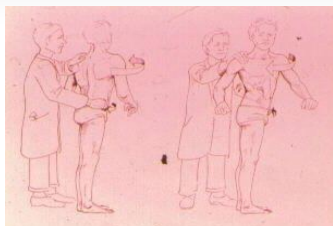


## Lumbar Range of Motion

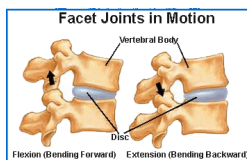
- Coupling of lumbar spine is the opposite of the cervical and thoracic spine
- Lumbar spinous processes move toward concavity with lateral flexion



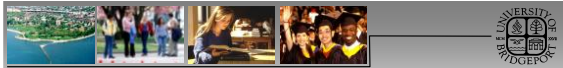
## Lumbar Range of Motion Lumbar Rotation



## Clinical Picture



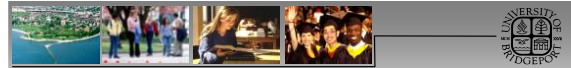
- What type of range of motion changes would you expect with mechanical low back pain due to posterior joint dysfunction?



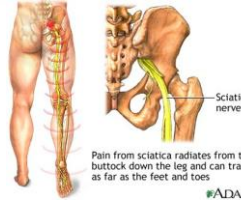
## Lumbar Spine Intervertebral Disc Disease



- Intervertebral disc disease and disc herniation are most prominent in the third and fourth decades of life.

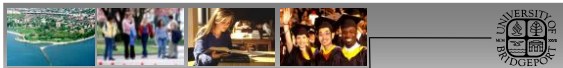


## Radiculopathy Low back pain that extends into thigh and leg

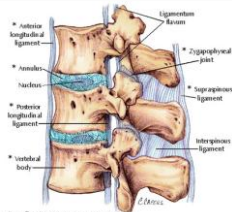


- Radicular pain often extends below the knee in the affected dermatome.

Pain from sciatica radiates from the buttock down the leg and can travel as far as the feet and toes  
©ADAM

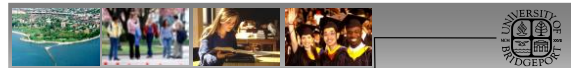


## Back and posterior thigh pain arises from many areas of the spine



- Facet joints
- Longitudinal ligaments
- Periosteum of the vertebrae.

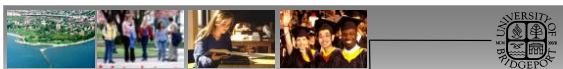
Fig. 1 \* indicates pain-sending structures



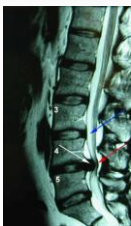
## Lumbar Radicular Syndrome



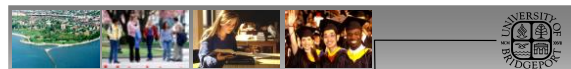
- Aging and trauma are believed to be the causes of discopathy



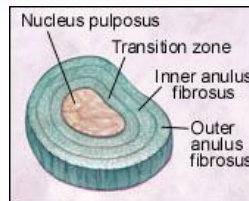
## Lumbar Radicular Syndrome



- At what ages would you suspect the most common exacerbation of severe discogenic radicular pain?

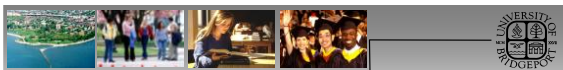


## Lumbar Radicular Syndrome Disc Anatomy

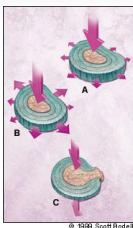


- Attaches vertebral bodies
- Provides flexibility
- Absorbs and distributes Spinal column loads

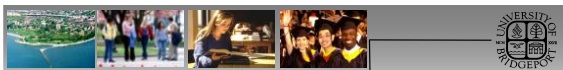
© 1999 Scott Bodell



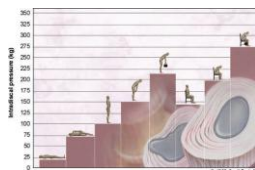
## Evolution of Disc Function



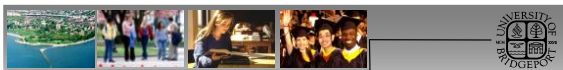
- Equal distribution
- Unequal distribution
- Dysfunction and disc herniation



## Posture and Disc Loading



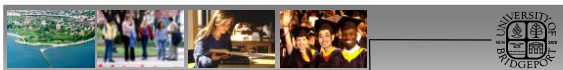
- Explains exacerbations and remissions of pain with change in posture.



## Specialized Imaging & Lumbar Disc Disease



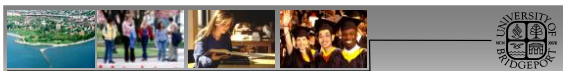
- Why utilize MRI examinations when we suspect lumbar disc disease?



## Specialized Imaging & Lumbar Disc Disease



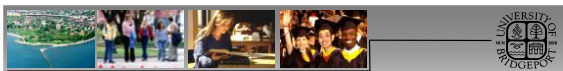
- Protruding herniated nucleus pulposus
- Thecal sac indentation
- Decreased hydration of disc



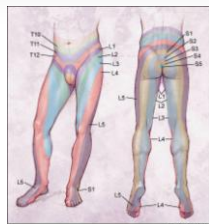
## Clinical Picture



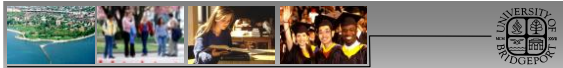
- Please describe the peripheral nerve findings that might present with this lumbar disc disease.



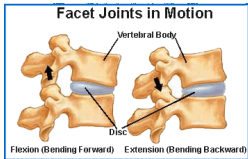
## Lumbar Radicular Syndromes Lumbar Disc Herniation



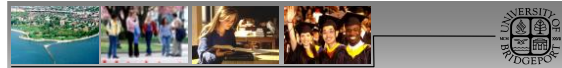
- Nerve root involvement
- Pain referral patterns
- Sensory & Motor deficits
- DTR's compromised



## Clinical Picture



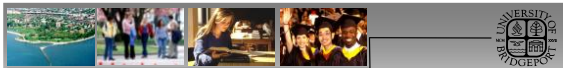
- What type of range of motion changes would you expect with lumbar herniated nucleus pulposus (HNP) pain?
- Why?



## Clinical Picture



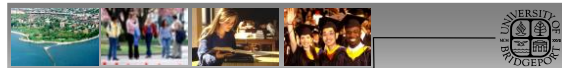
- Please describe what type of specialized tests might be indicated with this lumbar disc disease.



## Valsalva's Maneuver Neuro-orthopedic application



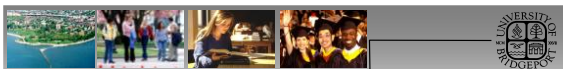
- Assessment for space-occupying lesion, tumor, intervertebral disc herniation, or osteophytes



## Lindner's Sign Assessment for Lumbar Nerve Root Irritation



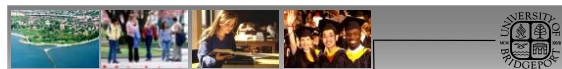
- Passive flexion of neck with chin to chest
- Supine, seated, or standing position



## Lindner's Sign



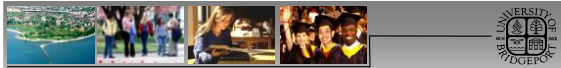
- Sign is present if procedure produces pain in lumbar spine & sciatic distribution



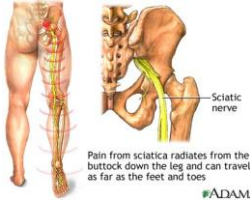
## Kemp's Test



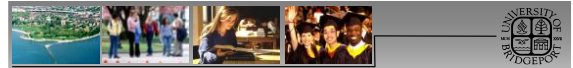
- May be performed in either a standing or sitting position
- A positive test involves radicular pain



## Kemp's Test Assessment



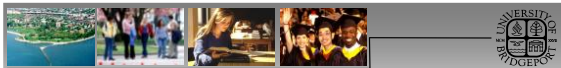
- Intervertebral nerve root encroachment
- Muscular strain
- Ligamentous sprain
- Pericapsular inflammation



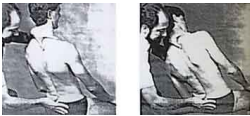
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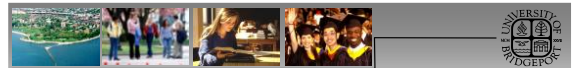
- Oblique bending toward symptomatic side increases pain with a lateral protrusion



## Kemp's Test

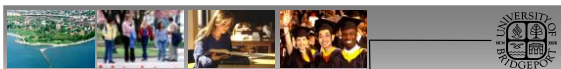


- Oblique bending away from symptomatic side increases pain with a medial protrusion



## Straight-Leg-Raising Test Dynamics

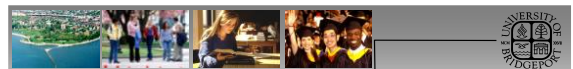
1. 0-35 degrees = no dural movement
2. 35-70 degrees = tension of sciatic nerve over intervertebral disc
3. Above 70 degrees presents very little additional deformation of nerve root



## Straight Leg Raise Test Nerve Root Tension Pain Reaction



- 0-35 = extradural
- 35-70 = disc lesion
- 70-90 = lumbosacral lesion

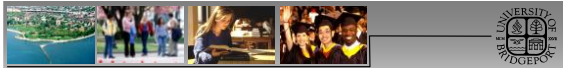


## SLR



- Dull pain in posterior thigh may be due to tight hamstrings
- Bowstring test differentiates

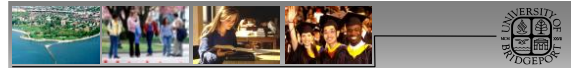




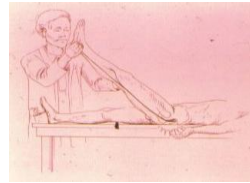
## Straight-Leg-Raising Test



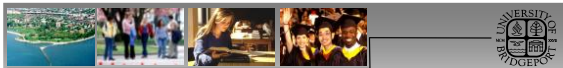
- Bilateral SLR testing
- Simultaneously perform Well-Leg-Raising test



## Straight-Leg-Raising Test



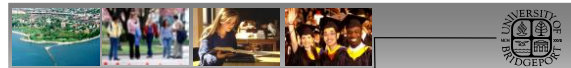
- Assessment for space-occupying mass in the path of a nerve root, sacroiliac inflammation and lumbosacral involvement



## Well-Leg-Raising Test



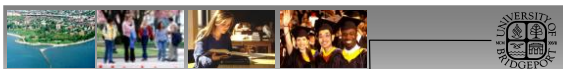
- SLR of unaffected LE
- Contralateral LE radicular pain is positive test for nerve root lesion



## Well-Leg-Raising SLR of unaffected limb presents



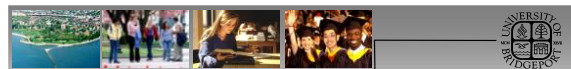
Increased pain with a medial protrusion due to the compression of the nerve root



## Well-Leg-Raising SLR of unaffected limb presents



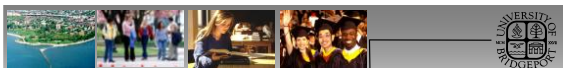
Decreased pain with lateral protrusion due to pulling away of the nerve root from the protrusion



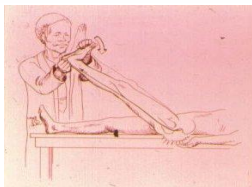
## Bragard's Sign



1. Perform SLR
2. Lower affected LE 5 degrees
3. Dorsiflex the ipsilateral foot



## Bragard's Sign



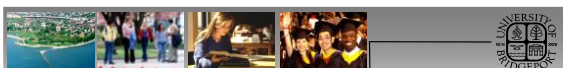
- Assessment for sciatic neuropraxia, intervertebral disc lesions, and spinal nerve irritation



## Fajersztajn's Test



- Assessment for lumbar nerve root lesion caused by IVD syndrome or dural sleeve adhesion
- Contralateral LE SLR
- Perform Bragard's



## Sicard's Test Assessment for Sciatic Radiculopathy



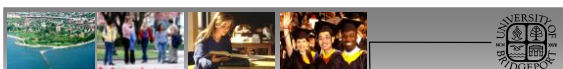
- SLR
- Lower affected LE 5 degrees
- Dorsiflex large toe
- Positive test with radicular pain



## Turyn's Test Assessment for Sciatic Radiculopathy



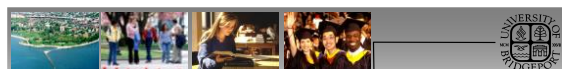
- Supine position
- Dorsiflexion of large toe without SLR
- Positive test with radicular pain



## Minor's Sign



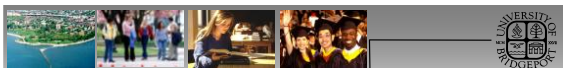
- Painful or antalgic behavior due to protective myospasms
- Crawling up thigh with listing



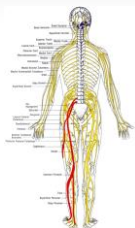
## Minor's Sign



- List will vary with medial vs. lateral discopathy



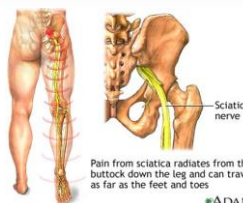
## Clinical Picture



- If a patient presented with leg pain below the knee, a level pelvis, and scoliosis, would you suspect discopathy?
- Why?



## Vanzetti's Sign



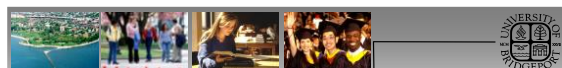
- In sciatica the pelvis is always horizontal in spite of scoliosis, but in other lesions with scoliosis the pelvis is inclined. (pelvic obliquity)



## Antalgic Lean Sign "Antalgia Sign"

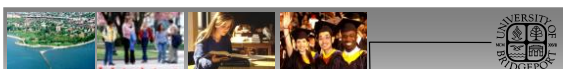


- Painful discopathy causes listing in order to reduce mechanical nerve root pain.



## Antalgia Sign

- Medial protrusion presents with antalgic list to the painful side of lesion
- Lateral protrusion presents with antalgic list opposite the side of painful lesion
- Central disc lesion presents with flexed antalgic list



## Antalgic Lean Sign



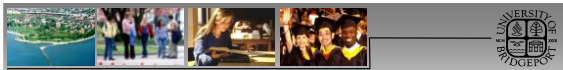
- Lateral disc protrusion produces a contralateral list
- Most common



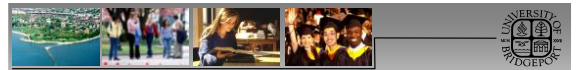
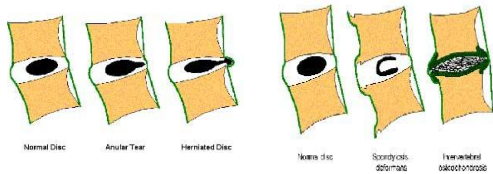
## Differentiate Lateral Disc from Medial Disc Protrusion



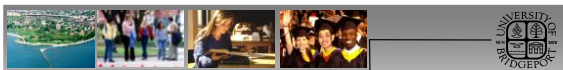
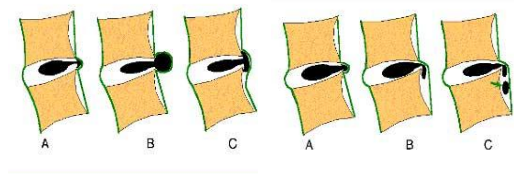
- Antalgic lean
- Well Leg Test
- Kemp's test



## Evolution of Discopathy



## Evolution of Discopathy



## Disc Injuries

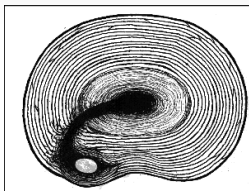
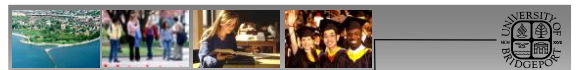
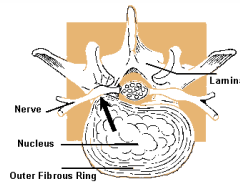


Figure 30 Disc material trapped in laminae of Annulus Fibrosus

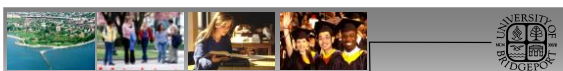
- Disc Protrusion is present when nuclear material does not extend beyond the annulus in a contained HNP.



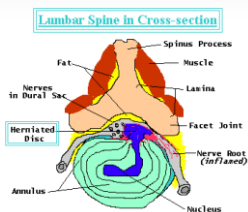
## Disc Extrusion



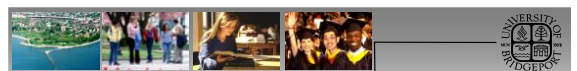
A focal herniation contained by the posterior longitudinal ligament that extends into the spinal canal



## Sequestered or Fragmented Disc



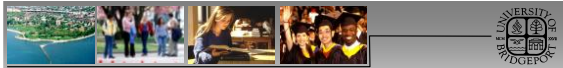
- A free fragment that has broken off or through the annular peripheral fibers in the vertebral canal (prolapsed)



## Lumbar Disc Degeneration



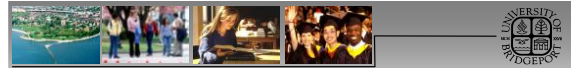
Disc degeneration may occur and remain asymptomatic



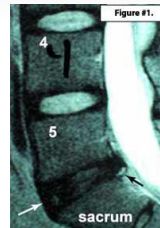
## Lumbar Discopathy



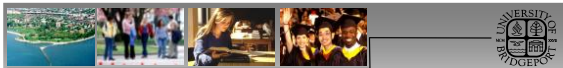
- At what age would you expect the most serious disc lesions that usually require surgical intervention?
- Why?



## MRI



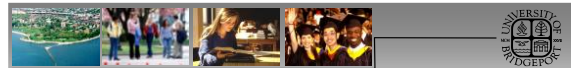
- Disc degeneration may be associated with changes within the disc itself, which may produce pain



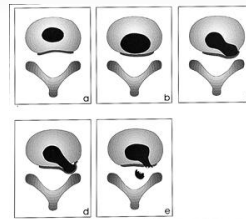
## Degenerative Disc Degeneration Mechanical Instability



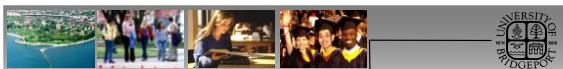
May give rise to mechanical instability that renders the spine vulnerable to trauma



## Lumbar Discopathy



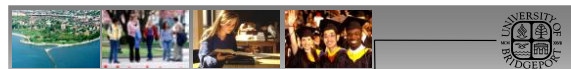
- Once you make the diagnosis of lumbar discopathy, what is your next clinical step?



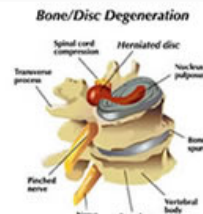
## Consultation with Patient Discopathy



- It is essential that you first make an accurate diagnosis of discopathy and then discuss the diagnosis and treatment with the patient prior to manipulation...

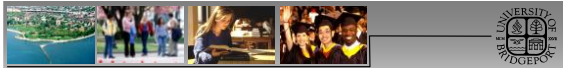


## Lumbar Spondylosis Osseous and Discal Involvement

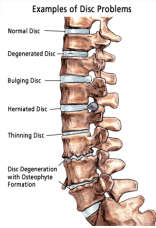


- Degenerative changes in discs and joints
- Bony overgrowths or spur formations, which are osteophytes

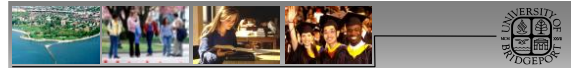




## Osteophytes



- Osteophytes located predominantly at the anterior, lateral, and, less commonly, posterior aspects of the superior and inferior margins of vertebral bodies.



## Lumbar Spondylosis



- Lumbar Osteophytosis
- Osteochondrosis
- Degenerative Joint Disease
- Vertebral Osteophytosis

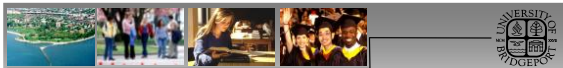
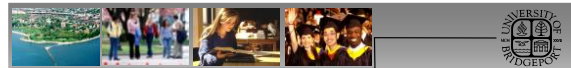
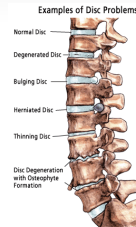


Figure 3. Sample of radiological features observable in NHANES II x-rays. Clockwise from upper left: disc space narrowing, osteophytes, fusion/osteocavities, Schmorl's nodes, dislocation.

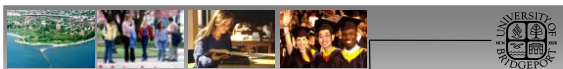


## Lumbar Spondylosis

Past teleologically misleading names

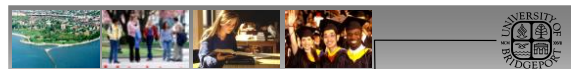


- Spondylarthropathy
- Osteoarthritis
- Spondylitis



## Causes of Lumbar Spondylosis

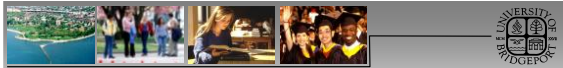
1. "Sprung back" hyperflexion injury
2. "Kissing spines" hyperextension injury
3. Capsular and ligamentous sprain injuries  
"Facet joint degeneration" or  
"zygapophyseal joint imbrication"



## Mechanical Joint Dysfunction

Documentation of the Subluxation: The P.A.R.T. System

- The P.A.R.T. documentation system for Medicare has been a topic of much concern and discussion among chiropractors. Recall that the subluxation may be documented by one of two methods: x-ray or physical examination, and that if the latter is used, it must be documented according to the P.A.R.T. system. The four components of P.A.R.T. are described below. CMS requires that at least two of the four components must be documented, and at least one of A or R.
- [http://www.acatoday.com/content\\_css.cfm?CID=1217#Initial](http://www.acatoday.com/content_css.cfm?CID=1217#Initial)



## Vertebral Subluxation Complex

### Textbook of Clinical Chiropractic: A biomechanical approach

- **Positional dyskinesia** (sprain/strain) Examples: Retrolisthesis or Anterolisthesis
- **Fixation dysfunction**  
Examples: Meniscoids, myospasia, adhesions, & inflammation
- **Compensatory hypermobility and instability**
- **Disc protrusions**

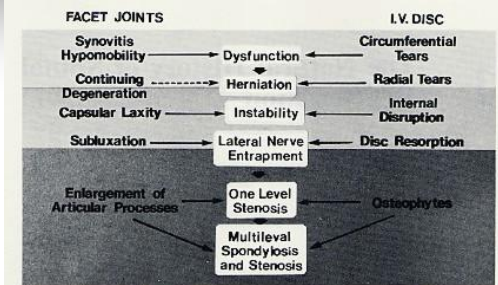
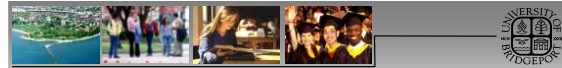
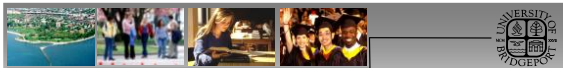


Fig. 1-1. The spectrum of pathological changes in facet joints and disk and the interaction of these changes. The upper light horizontal bar represents dysfunction, the middle darker bar instability, and the lower dark bar stabilization.

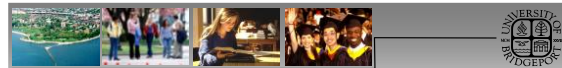


## Lumbar Facet Syndrome

### Low Back Pain Symptoms



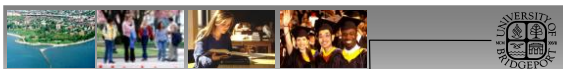
- Constant dull ache
- Intermittent sharp pain
- Catch with certain movement
- Increased pain with standing and extension



## Lumbar Facet Syndrome

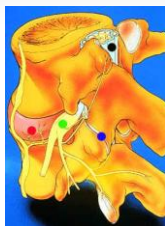


- What specialized orthopedic tests would you perform to evaluate a low back pain patient with this syndrome?

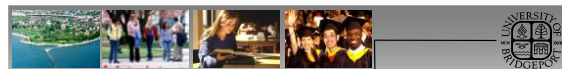


## Lumbar Facet Syndrome

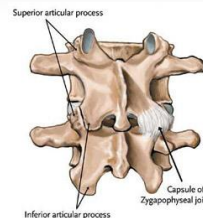
### Innervation



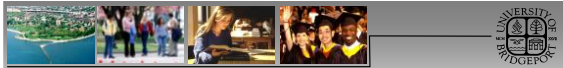
- Medial branch of the primary dorsal rami



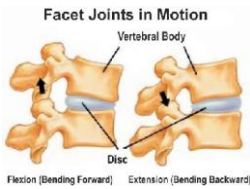
## Lumbar Facet Syndrome



- Palpation may reveal PVM hypertonicity and pain



## Lumbar Facet Syndrome



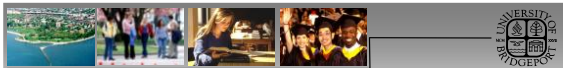
- Flexion should be WNL
- Extension should be reduced with localized pain



## Lumbar Facet Syndrome



- Extension and rotation increase pain
- Flexion reduces pain
- Kemp's produces localized pain

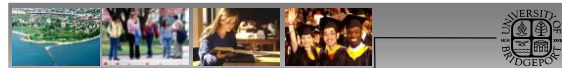


## Lumbar Facet Syndrome

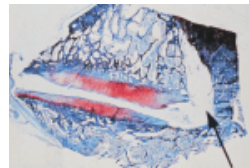


- Degenerative joint changes at zygapophyseal joints

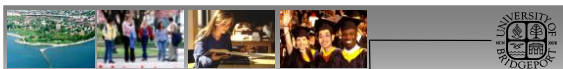
Farfan



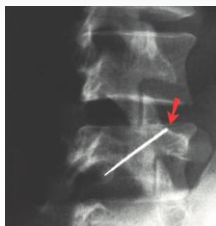
## Lumbar Facet Syndrome



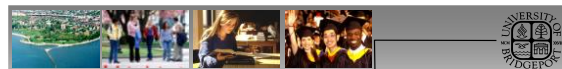
- Degeneration of cartilage
- Meniscoid entrapment



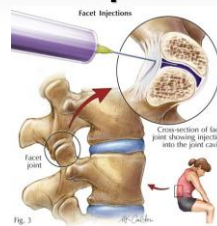
## Lumbar Facet Joint Imbrication



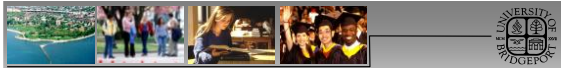
- Zygapophyseal joint imbrication with capsular degeneration



## Facet Joint Injection and Spinal Manipulation



- Reduces pain and edema prior to spinal manipulation

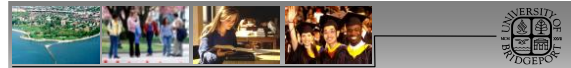


## Spondylolysis with Spondylolisthesis



- Separation at pars interarticularis
- Anterior slippage of superior vertebral body on inferior body

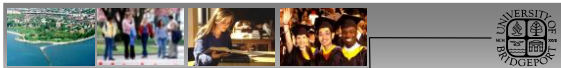
© NANC 2002



## Meyerding's Classification of Spondylolisthesis

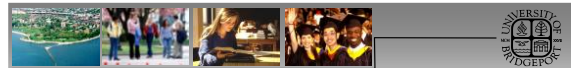


- Grade 1 = 0-25%
- Grade 2 = 26-50%
- Grade 3 = 51-75%
- Grade 4 = 76%-100%



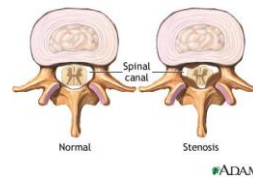
## Anterolisthesis or Spondylolisthesis

1. Degenerative (L4-L5 level)
2. Spondylolysis or Isthmic spondylolisthesis (L5-S1)
3. Congenital caused by inadequate development of the L5-S1 facet complexes

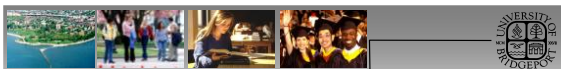


## Lumbar Central Canal Stenosis Structural Causes

Spinal stenosis is a narrowing of the spinal canal



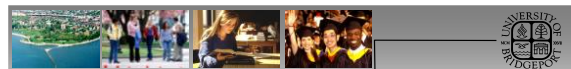
1. Osseous: inferior facet arthrosis
2. Discogenic: central disc herniation
3. Ligamentous: ligamentum flavum buckling in degenerative spinal disease



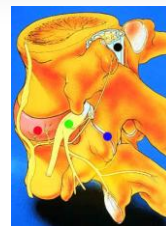
## Lumbar Central Canal Stenosis



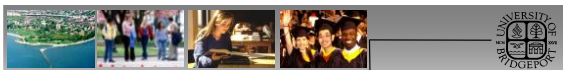
- Neurogenic claudication with pain upon walking
- Feel like legs are "giving way"
- Temperature changes and weakness in legs
- Night pain
- Sciatic tension signs are present



## Lateral Spinal Canal Recess Stenosis



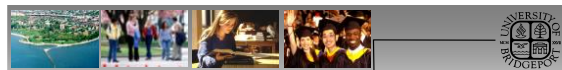
- Degenerative joint disease
- Encroachment of nerve root in canal
- Nerve root entrapment



## Lateral Spinal Canal Recess Stenosis Neurogenic Pain



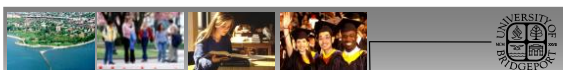
- Intermittent episodes of pain in the hips, buttocks, or posterior thigh
- Pain referred to foot or toes
- Sensorial deficits in calf are common



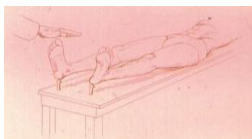
## IVD or Space Occupying Lesion Milgram's Test



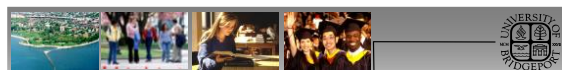
- Positive with either intrathecal or extrathecal pathology



## Milgram's Test Assessment for IVD or Space-Occupying Lesion



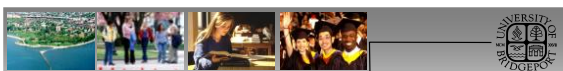
- Patient able to hold for 30 seconds
- Rules out intrathecal pathology



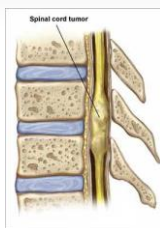
## Positive Milgram's Test



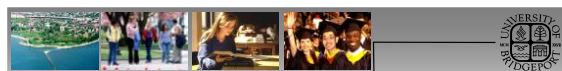
- Indicates intrathecal or extrathecal pathology
- The test is positive if the patient experiences low back pain



## Intrathecal Pathology



- Intrathecal pathology may involve a spinal tumor.

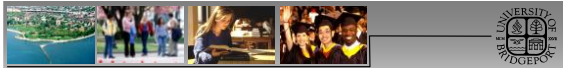


## Extrathecal Pathology



- Extrathecal pathology may involve a herniated disc or space occupying lesion

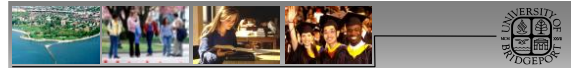




## Neurofibromatosis



- A complicated genetic disease that can affect both men and women in all races and ethnic groups.
- 1/4000 births U.S.

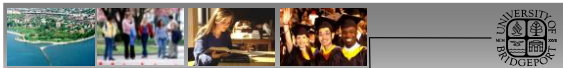


## Neurofibromatosis von Recklinghausen's Disease



- Tumors grow on and along various types of nerves.
- The disease can also affect non-nervous tissues like bones and skin and lead to developmental abnormalities such as learning disorders.

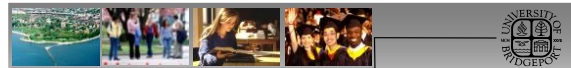
National Neurofibromatosis Foundation (NNFF).



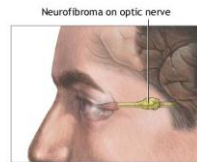
## Neurofibromatosis



- "Café au lait" skin markings
- Neurofibromas
- Skeletal deformities (scoliosis)

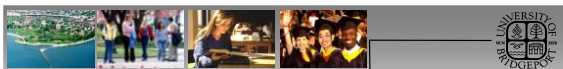


## Neurofibroma



- Tumor or growth located along a nerve or nervous tissue.
- Inherited disorder
- May cause neural deficits

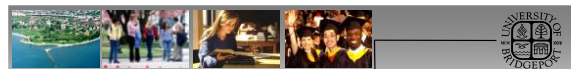
#ADAM



## Neurofibromatosis Lumbar Skin Markings



- "Café au Lait"



## Neurofibromatosis



- Faun's beard



## Neurofibromatosis



- Neurofibromas