Low Back Pain

- **Dr.Shaghayegh fouladvandi ; PT, Msc, DPT**

Lumbosacral Pain

- 60-90% life time incidence
- 5% annual incidence
- Peak in 40’s
- 12-26% in children and adolescents
- cost in US upwards of 100 billion per year

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Lumbosacral Pain

- 15-25% of workman's comp= LBP
- 30-40% of workman's comp payments
- Return to work rates
  - 50% if disabled for 6 months
  - 25% if disabled 1 year
  - 0% if disabled > 2 years

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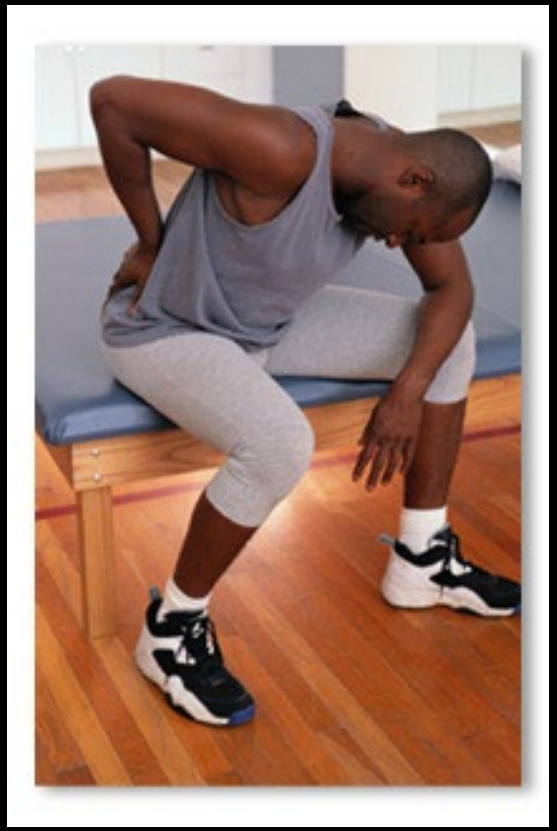
Lumbosacral Pain

- 90% resolve in 6-12 weeks
  - Croft et al (1998) found that 90% did not seek care after three months
- 40-80% in 1 week
- 75% sciatica clear in 1-6 months
  - 70-90% recur



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Diagnosis: Low Back Pain ?

- A physiologic cause of back pain can not be definitively determined in 85% of patients

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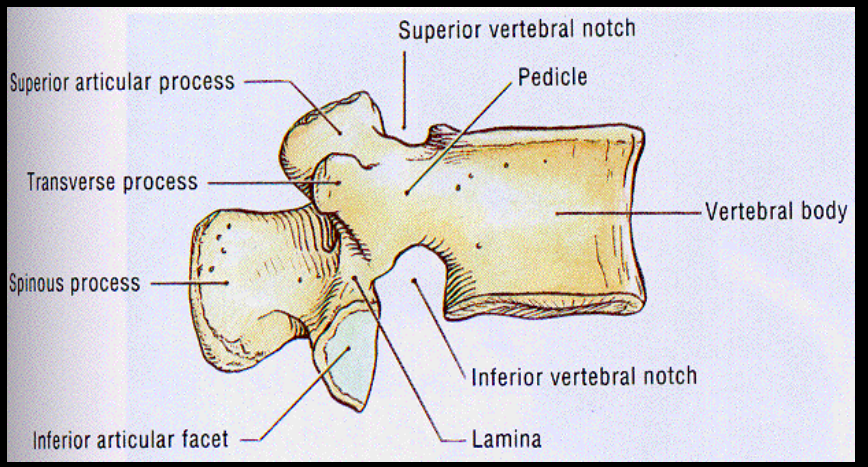
Anatomy

- Vertebra
  - Body, anteriorly
    - Functions to Support weight
  - Vertebral arch, posteriorly
    - Formed by two pedicles and two laminae
    - Functions to protect neural structures



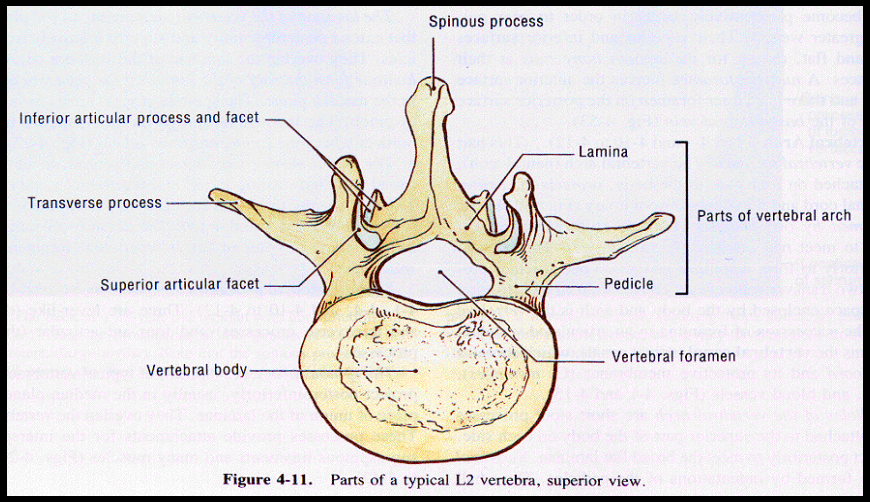


Figure 4-11. Parts of a typical L2 vertebra, superior view.

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Vertebral Arch

- Pedicles (Latin for Little Feet)
  - Attached anteriorly to body
  - Continuous posteriorly with laminae
  - Intervertebral foramen
    - Superior vertebral notch
    - Inferior vertebral notch
- Laminae (Latin for Thin Plates)
  - Meet posteriorly to form spinous process

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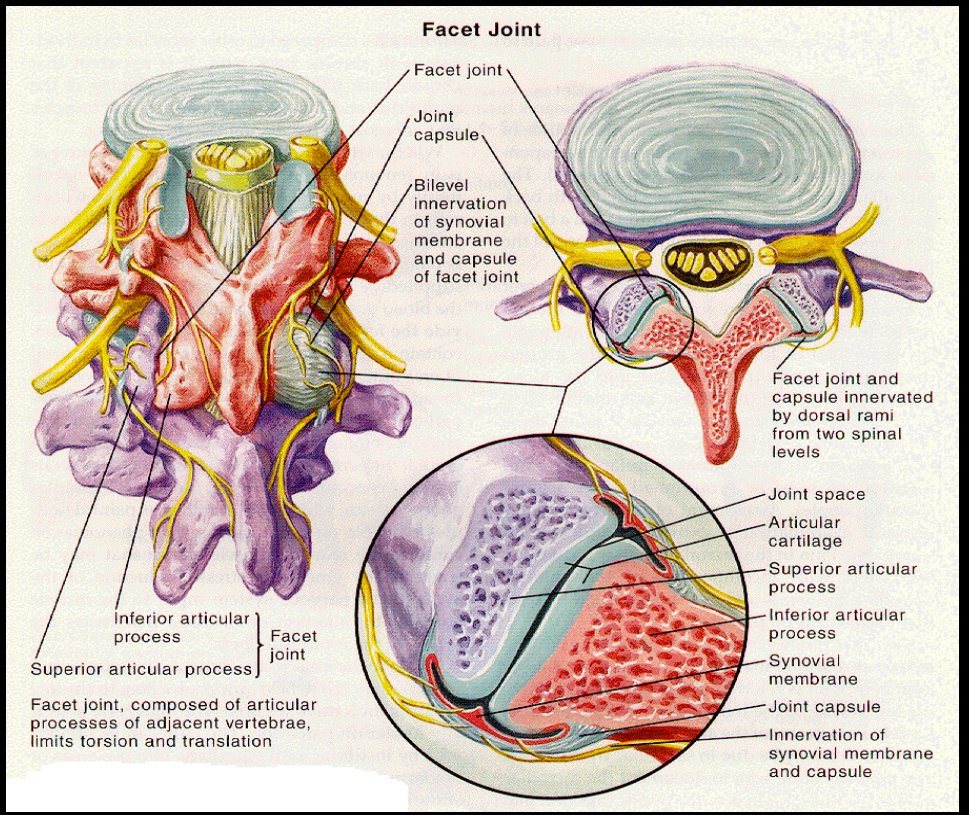
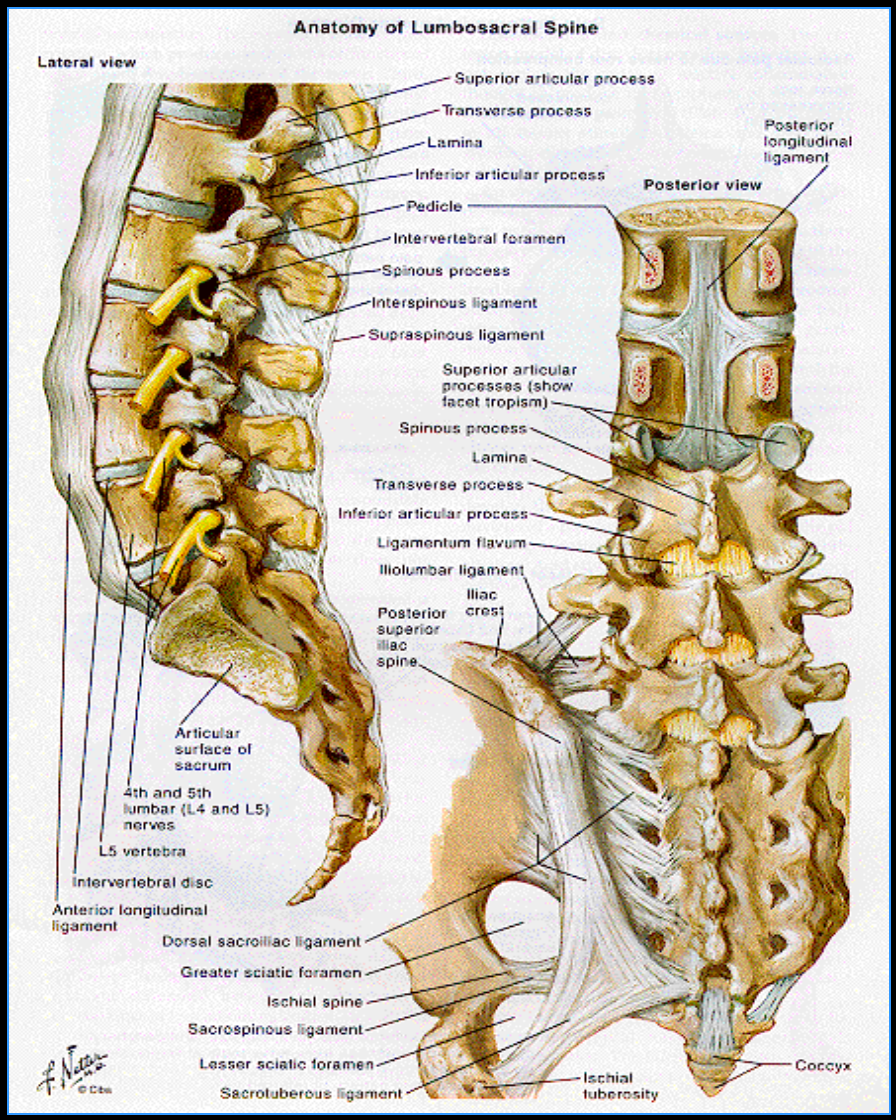
Facet Joint

- Formed by articulation of inferior and superior processes of subsequent vertebrae
- Orientation in lumbar spine is toward sagittal plane, allowing flexion and extension but limiting rotation of the lumbar vertebrae
- Helps to prevent anterior movement of superior vertebra on inferior vertebra
- Articular surfaces are made up of non-innervated articular cartilage
- Capsule and synovial membrane are innervated with pain receptors



Ligaments

- Anterior longitudinal ligament
- Posterior longitudinal ligament
- Interspinous ligament
- Supraspinous ligament
- Ligamentum flavum



Intervertebral Disc

- Most common site of back pain
- Normally comprises ~ 25% of length of spine
- Consists of a central nucleus pulposus
  - Reticulated and collagenous substance
  - Composed of ~ 88% water
- Annulus fibrosus
  - Consists of concentric lamellae of fibrocartilage fibers arranged obliquely
  - With each layer, they are arranged in opposite directions

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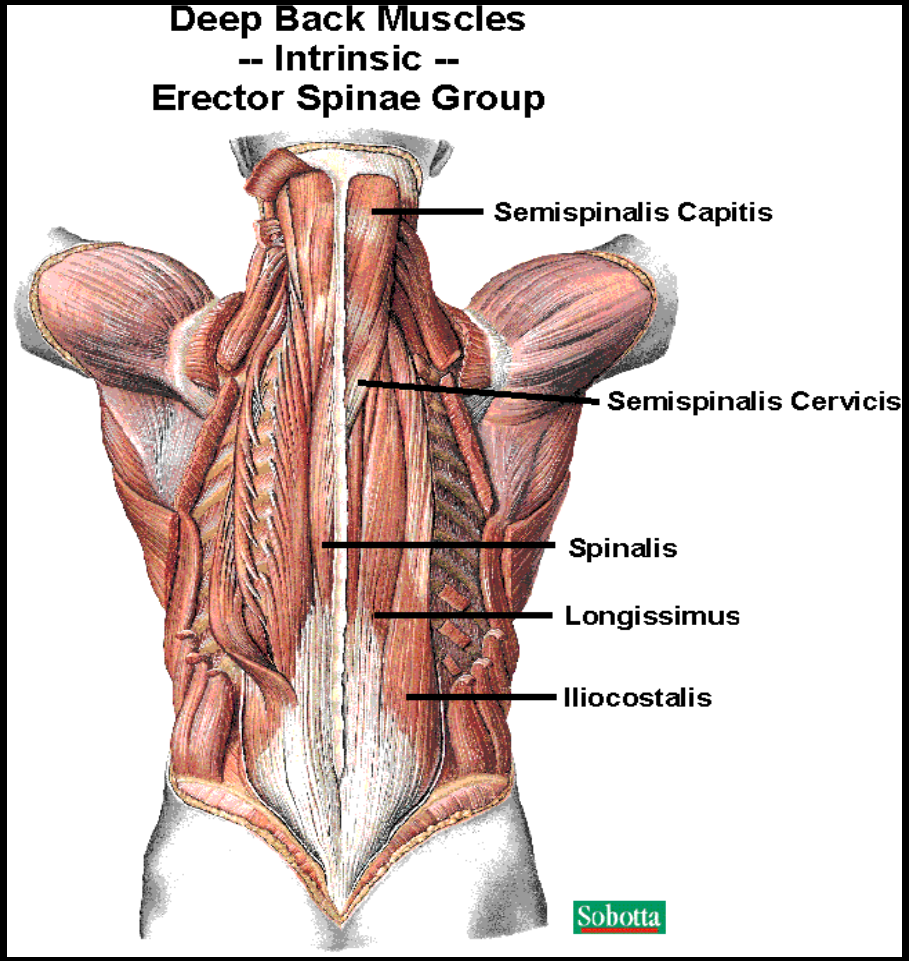
Muscles

- Psoas Major/minor
- Quadratus lumborum
- Intertransversalis
- Interspinals
- Multifidus
- Longissimus thoracis
- Iliocostalis lumborum
- Erector spinae



Differential Diagnosis

- MSLBP/Mechanical/...
- Osteoarthritis - Facet/disk/SI
- Facet Syndrome
- Diskitis
- Fracture –
  - Stress
  - Compression
  - Other
- Spinal Stenosis
- Tumor
- Discogenic

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Differential Diagnosis

- Non-back pain
  - retroperitoneal process (Pancreatic, Renal, Duodenal, Gyn, Prostate)
  - AAA
  - Zoster
  - Diabetic radiculopathy
- SI joint
- Rheumatologic disorders
  - Reiters
  - Ankylosing Spondylitis

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Differential Diagnosis

Young	Middle Age	Older
MSLBP	MSLBP	OA/DJD
Diskitis	Annular Tear	Facet
Pars Defect	HNP	DDD
HNP	Tumor	HNP
Scheurmann's Kyphosis	SI Dysfunc	Spinal Stenosis
	Spondylo-Arthropathy	Tumor
		Referred
		AAA
		Retroperitoneal
		Prostate

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Common Causes of Low Back Pain

- Muscular spasm, strain
- Ligament sprain
- Spondylosis
- Herniated nucleus pulposus
- Facet joint dysfunction
- Spondylo-lysis or -listhesis
- Seronegative spondyloarthropathies

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Clearing up the terms

- Spondylosis
  - Degenerative joint disease affecting the vertebrae and intervertebral disc
- Spondylolysis
  - Fracture in pars interarticularis
- Spondylolisthesis
  - Displacement of one vertebra on another

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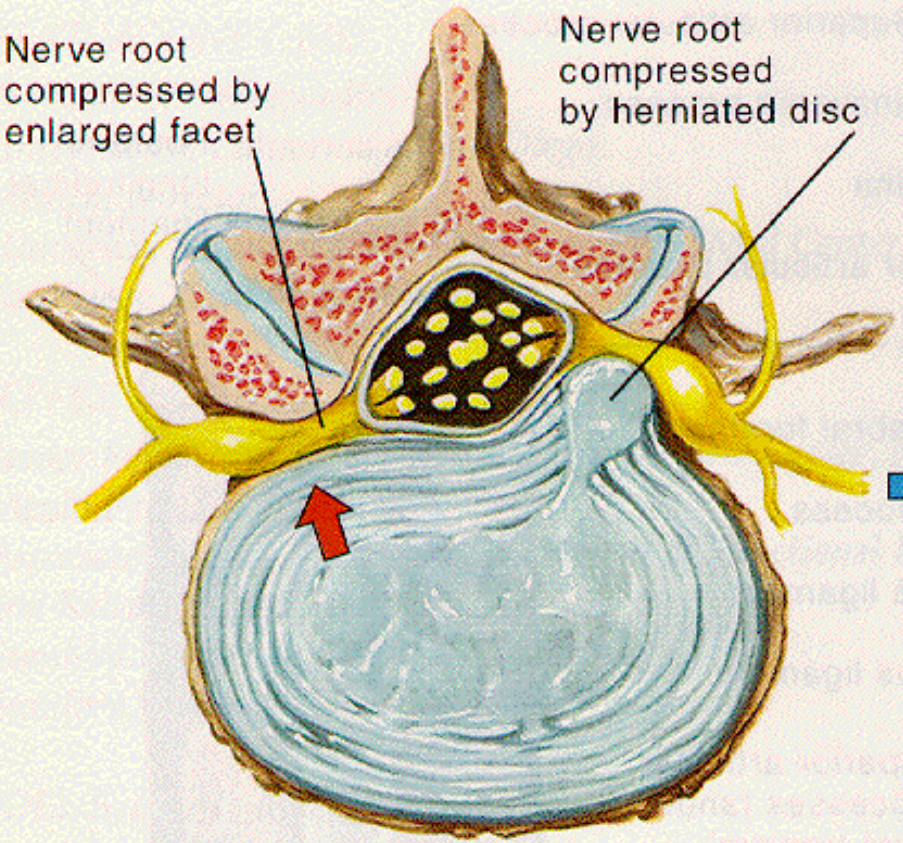
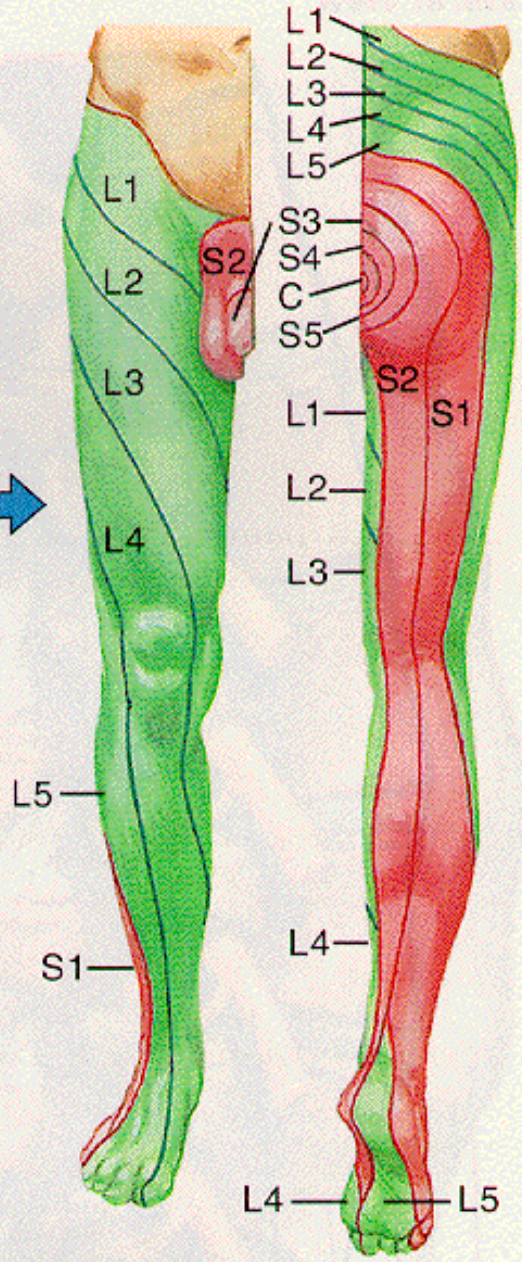
Pain Patterns in Lumbar Disease

Radicular pain due to nerve root compression



Compression of specific nerve root results in pain sensation in radicular pattern specific to distribution of that particular nerve root

Radicular pain patterns (single segment distribution)



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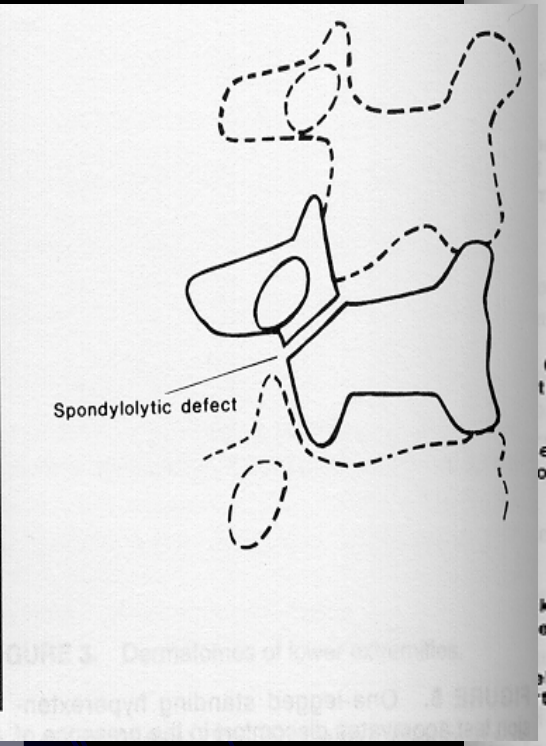
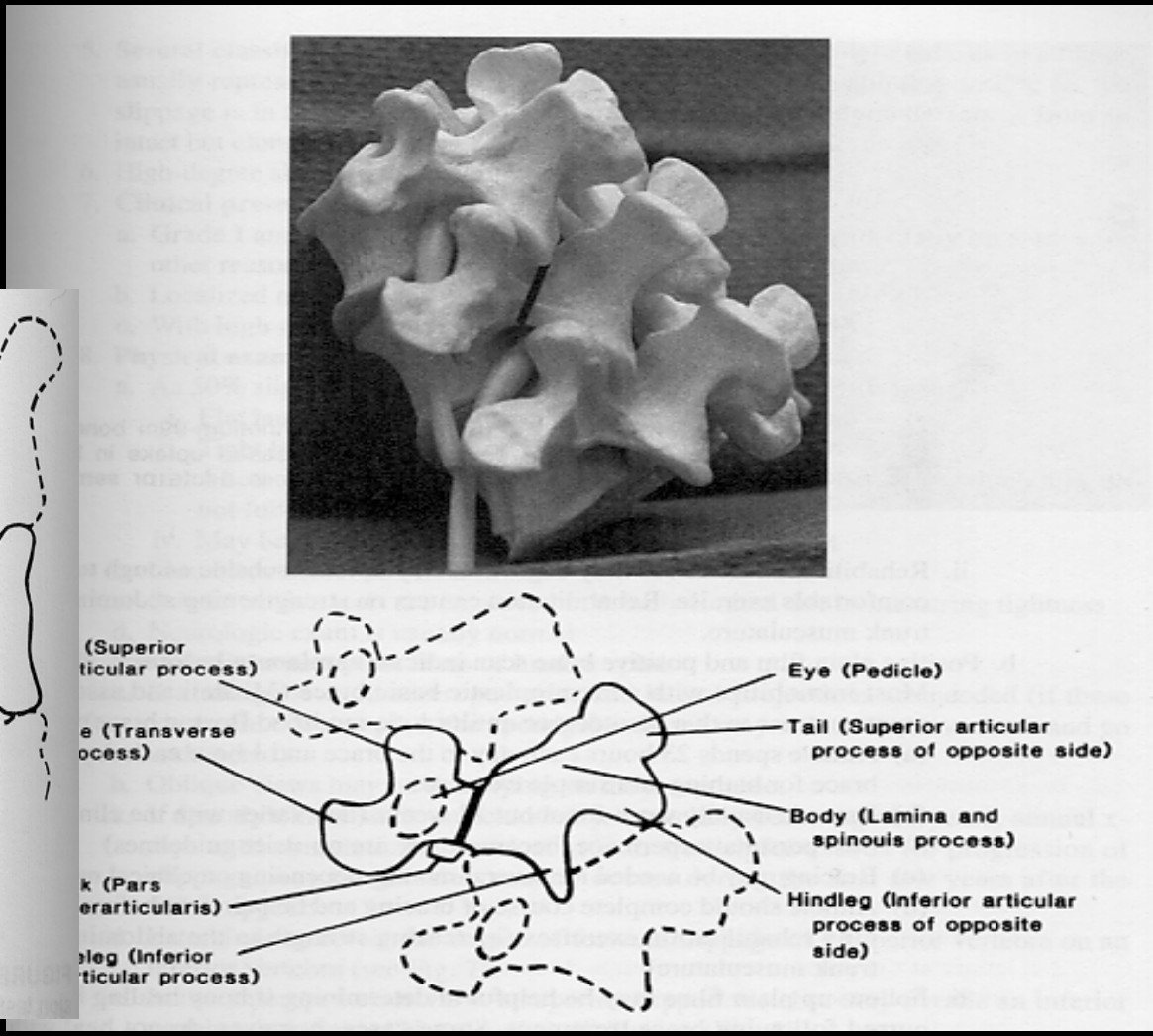
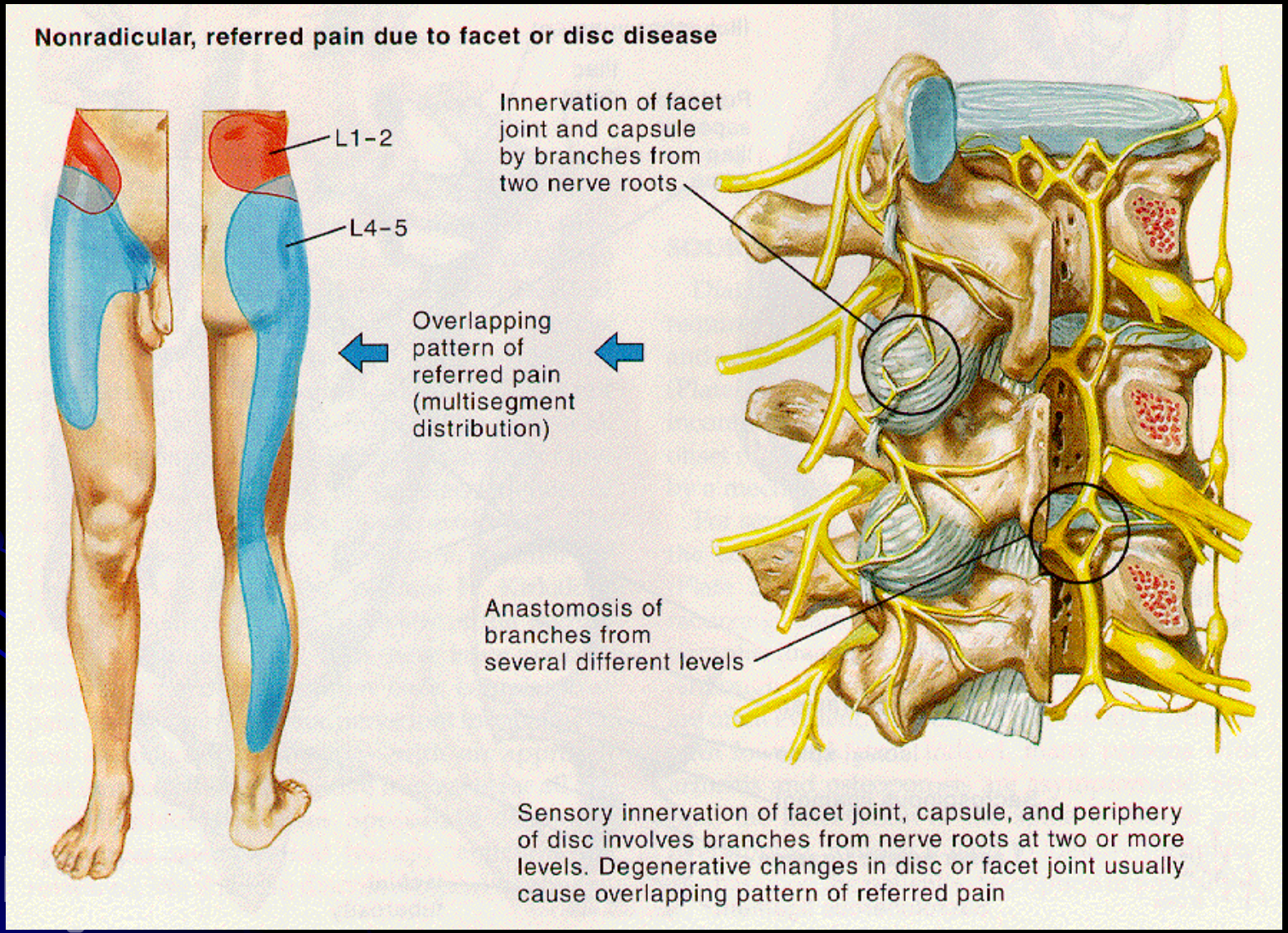
Spondylo-lysis and -listhesis





Spondilo-lysthesis

Facet joint pain



Ankylosing spondylitis

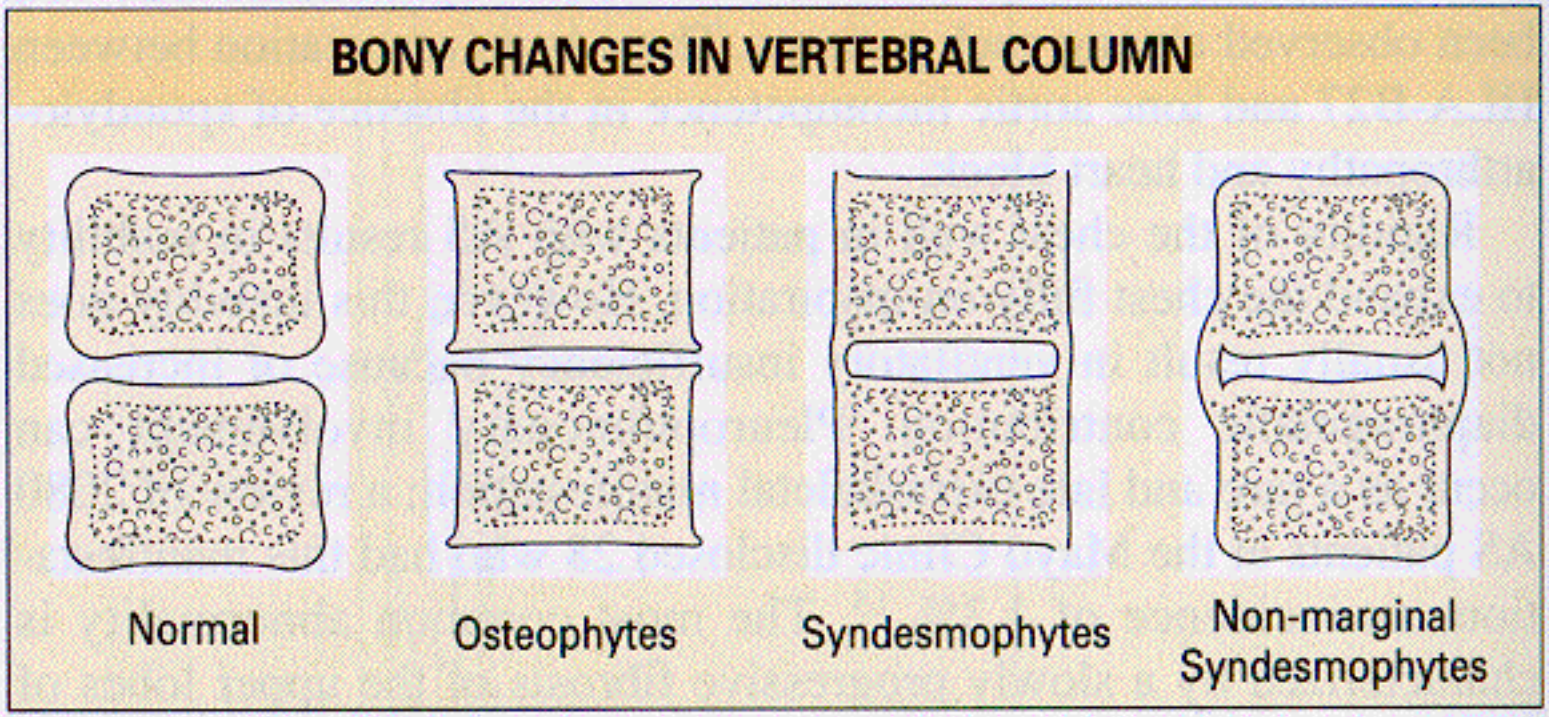


Fig. 19.14 Bony changes observed in degenerative disc disease (osteophytes), AS (syndesmophytes), and psoriatic spondylitis (non-marginal syndesmophytes and paraspinal ossification).

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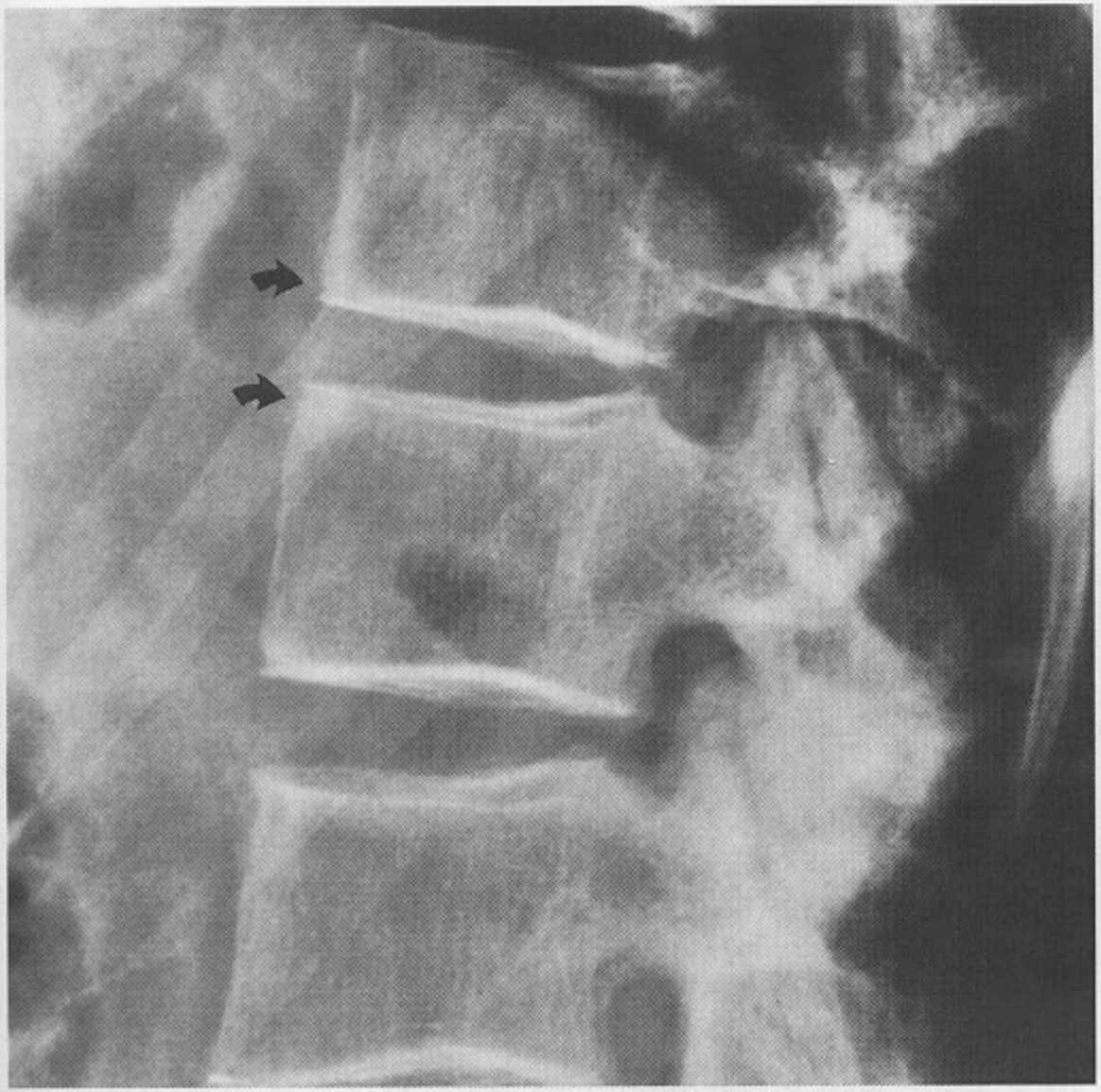

Figure 12-14. Ankylosing spondylitis with squaring of the vertebral bodies *(arrows)*. The posterior elements are ankylosed

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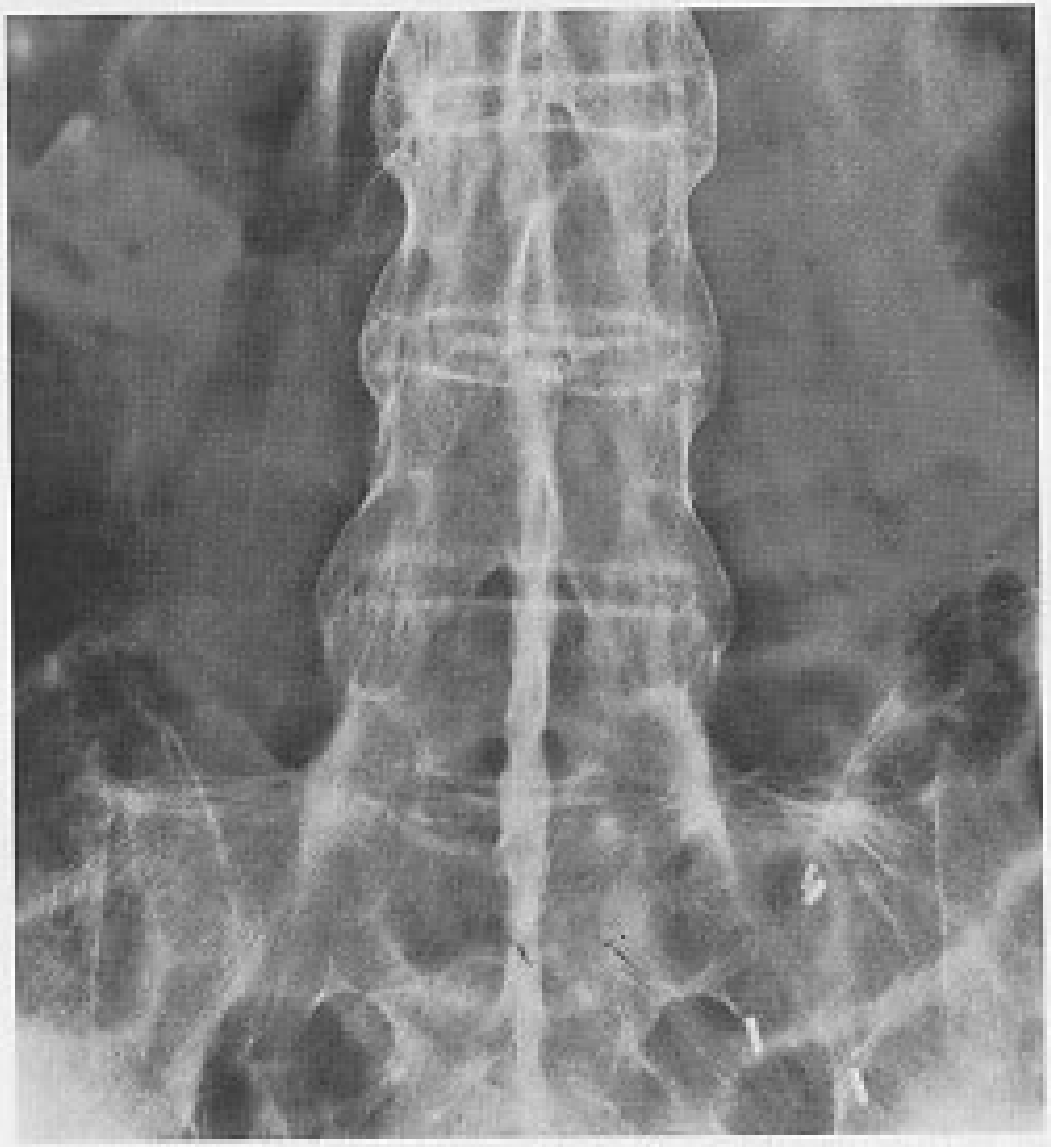
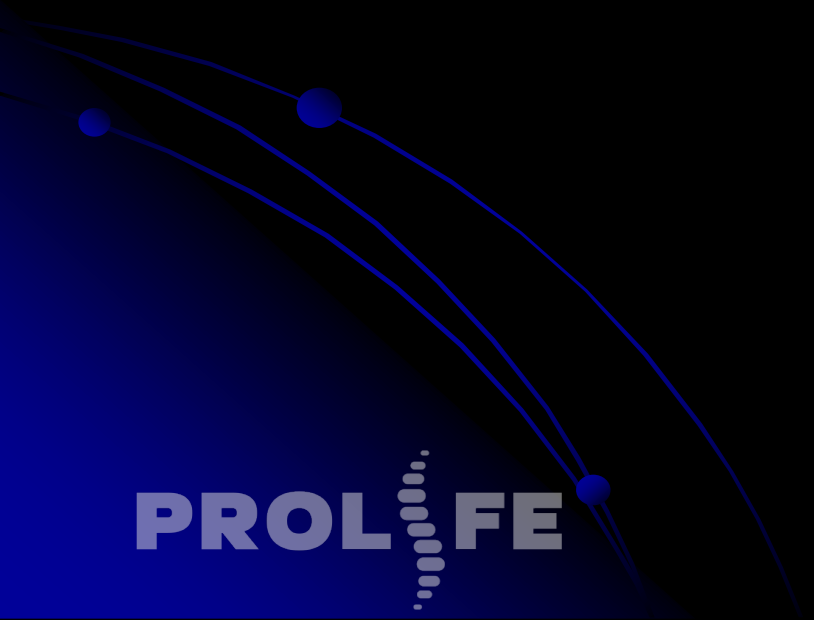


Figure 12-16. Ankylosing spondylitis with syndesmophytes and ossification of the posterior ligamentous structures. The SI joints have fused.

History



History

- Three major concerns:
  - Is there evidence of systemic disease
  - Is there evidence of neurological disease
  - Is there social or psychological stress which is contributing?
- Exclude serious underlying pathology, such as infection, malignancy or cauda equina syndrome

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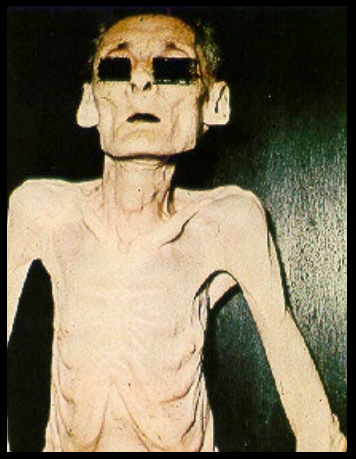
Red Flags



- General
  - **> 1 month**
  - Rest +/-
- Cancer
  - **> 50**
  - **History of Cancer**
  - **Weight loss**
  - **Unrelenting night pain**
- Infection
  - IVDU
  - Steroid use
  - Fever
  - UTI
- Fracture
  - Age > 70
  - Steroid use
  - Trauma hx
  - Bladder dysfunction
  - Osteoporosis
- Cauda Equina Syndrome
  - **Saddle anesthesia**
  - **Bowel/bladder dysfunction**
  - Loss of sphincter tone
  - Rapid progression
  - Unilat or bilat major motor weakness

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Yellow Flags

- Belief that back pain is harmful or severely disabling
- Fear-avoidance behavior and reduced activity level
- Social withdrawal and low mood
- Expectation that passive treatments will help

Back Pain Risk Factors

- Caucasian
- Western states
- Smoker
- Increasing age up to 55
- Prolonged driving of vehicle
- Hard physical labor
  - vibration or repetitive lift > 40 lbs

Back Pain Risk Factors

- Psychological stress
- Job dissatisfaction
- Prior episode of back pain
- Osteoporosis

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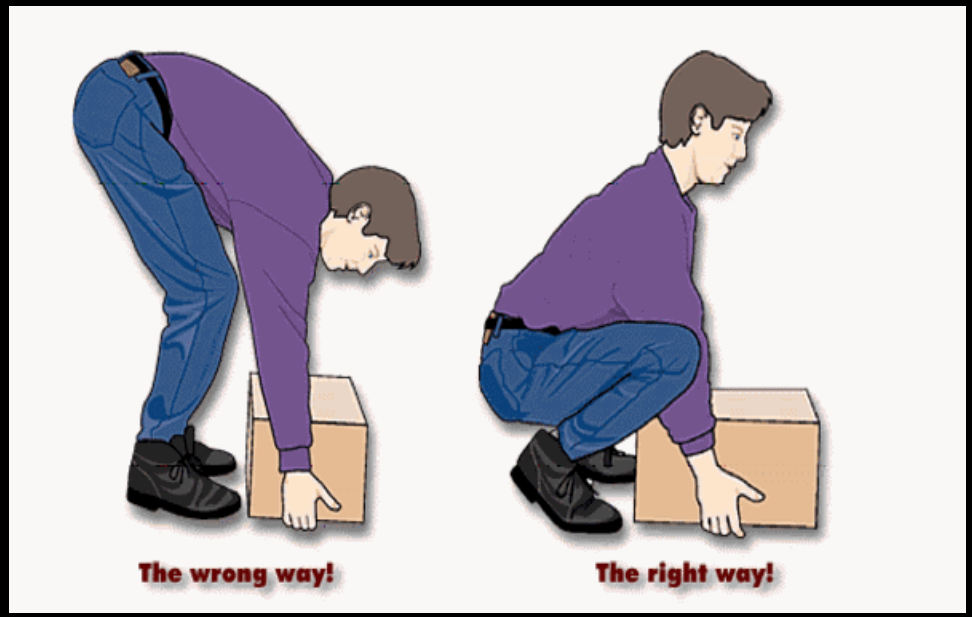
Onset

- Acute - Lift/twist, fall, MVA
- Subacute - inactivity, occupational (sitting, driving, flying)
- ?Pending litigation
- Pain effect on:
  - work/occupation
  - sport/activity (during or after)
  - ADL's



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Pain Character

- Sharp
- Burning
- Dull ache

Pain with…

- Prone positionn
  - Facet, Lat HNP, systemic
- Sitting
  - Paramedian HNP, annular tear
- Standing
  - Lateral HNP, central stenosis, facet syndrome
- Walking
  - central stenosis

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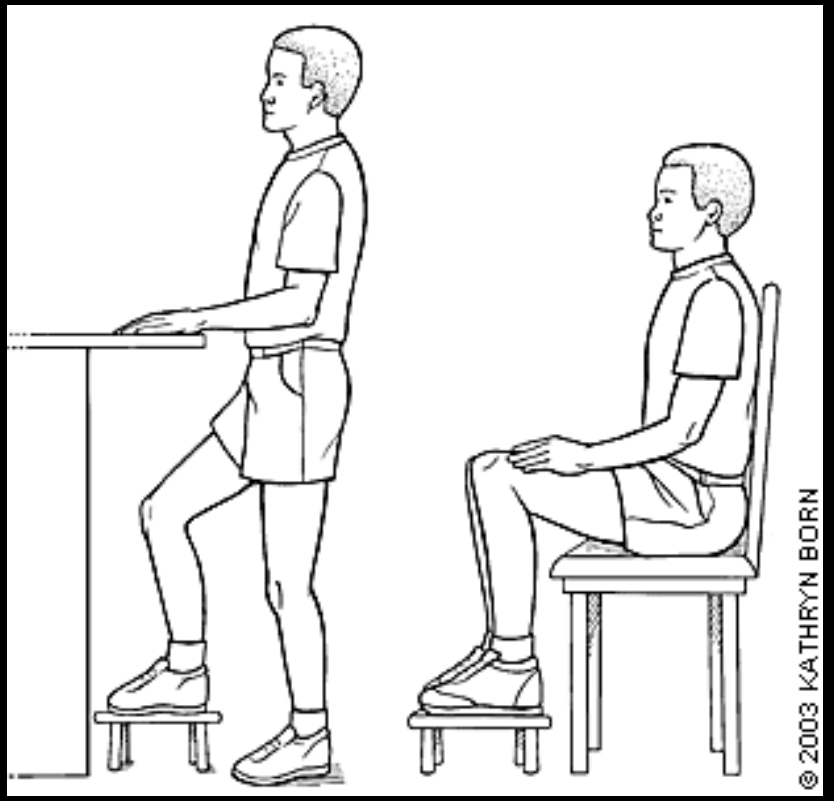
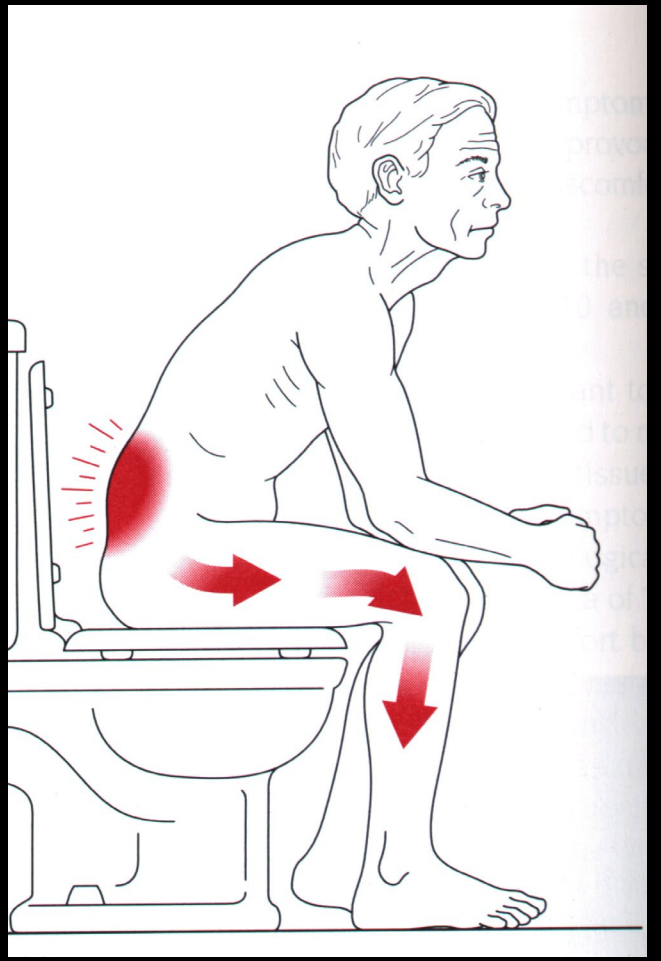
Radiation

- Up back
- To sacrum
- To buttocks
- Down leg



Other Symptoms

- Cough/valsalva exacerbation
- Distal neuro sx - weakness/paresthesia
- Perianal paresthesia
- Bowel/bladder sx



Other History

- Prior treatments and response
- Prior h/o back pain
- Exercise habits
- Occupation/recreational activities

Examination

- Walk
- Standing
- Sitting
- Supine

Walking

- Gait
  - length of stride
  - arm swing
  - trunk motion
  - ?pelvic tilt

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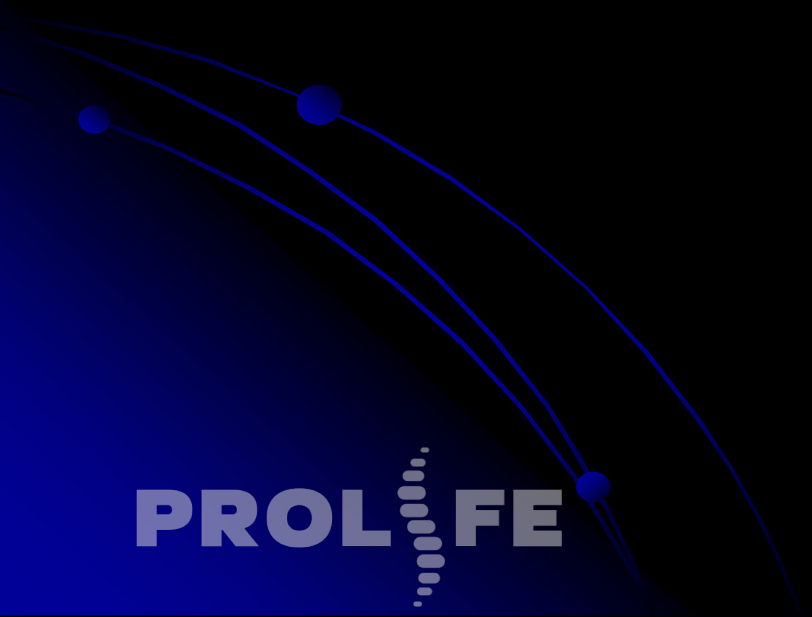
Standing



Posture

- Kyphosis
- Hyperlordosis
- Scoliosis

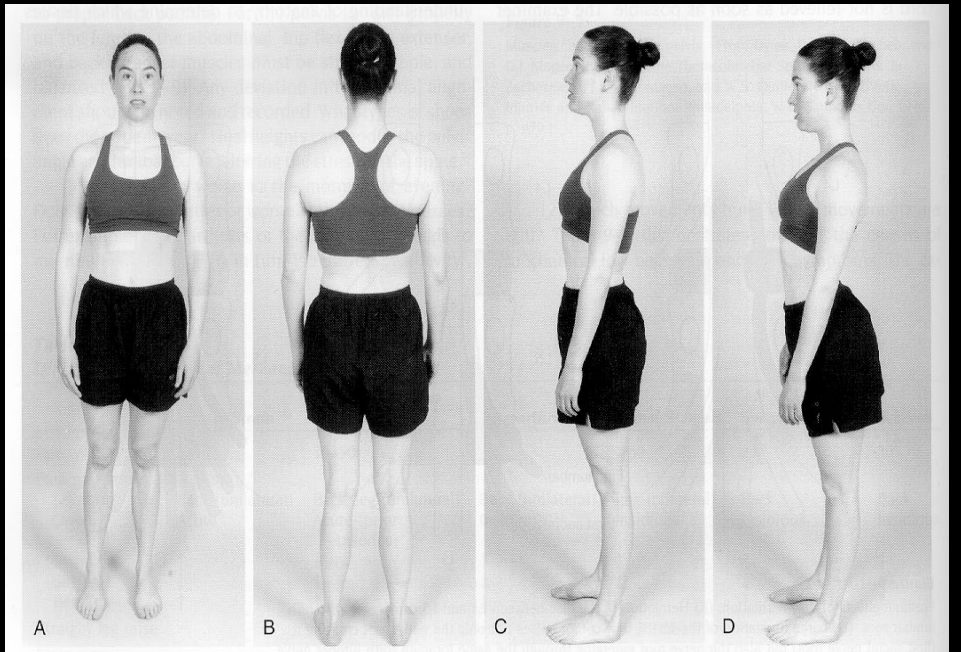


Figure 9–11
Views of the patient in the standing position. (A) Anterior view. (B) Posterior view. (C) Lateral view. (D) Lateral view with excessive lordosis.

Range of Motion

- FF ~90° (reversal of lumbar lordosis with FF)
- Ext ~15-20°
- Side bend ~ 30°
- Trunk rotation

Palpation

- Spinous processes
- Dorsal lumbar fascia/soft tissues

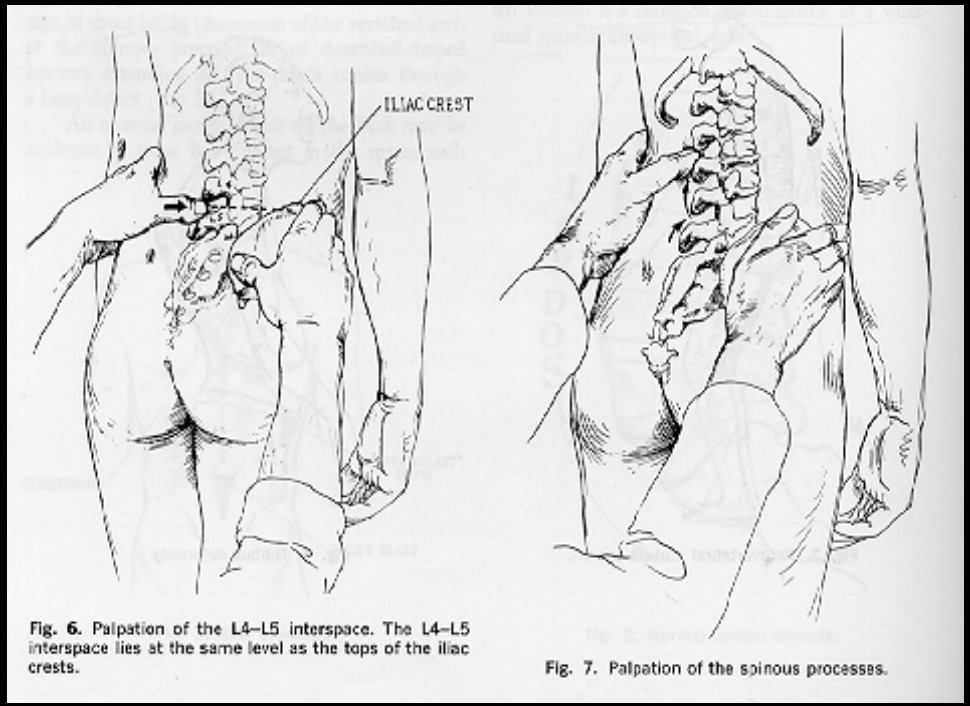


Fig. 6. Palpation of the L4–L5 interspace. The L4–L5 interspace lies at the same level as the tops of the iliac crests.

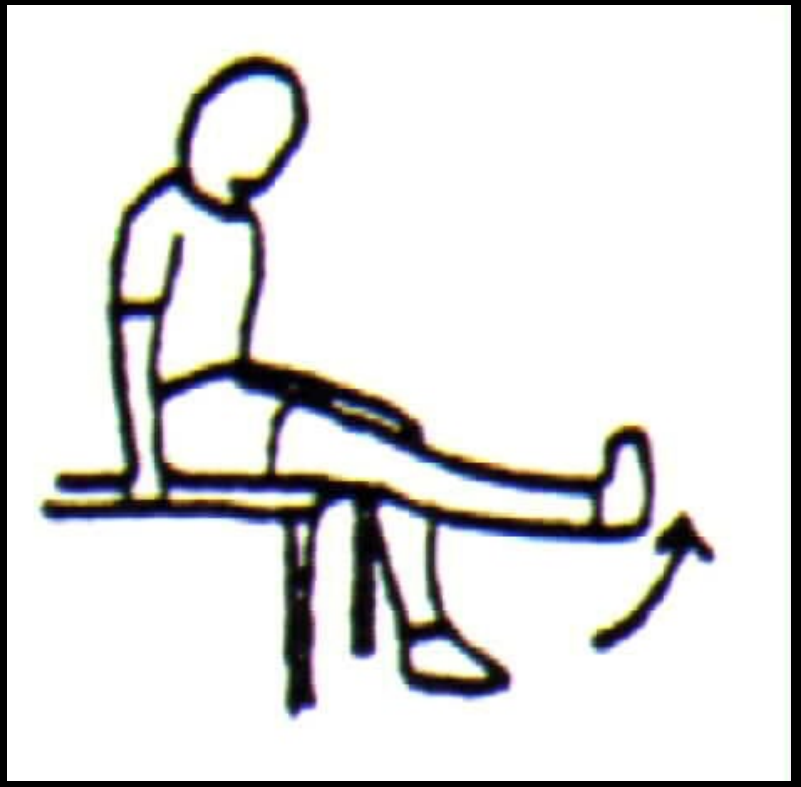
Fig. 7. Palpation of the spinous processes.

Other

- Single leg extension
  - Stork Test
- Gastroc strength
  - Toe raises
- Squat
- Standing single-leg balance (nl 15-30 sec)

Sitting

- Distracted SLR
- DTR - patellar & Achilles
- Strength - EHL, TA, Peroneals, quads, hip flexors
- Sensation



Supine Tests to Stretch the Spinal Cord or Sciatic Nerve

- Straight Leg Raise
- Cross Leg SLR
- Kernig Test

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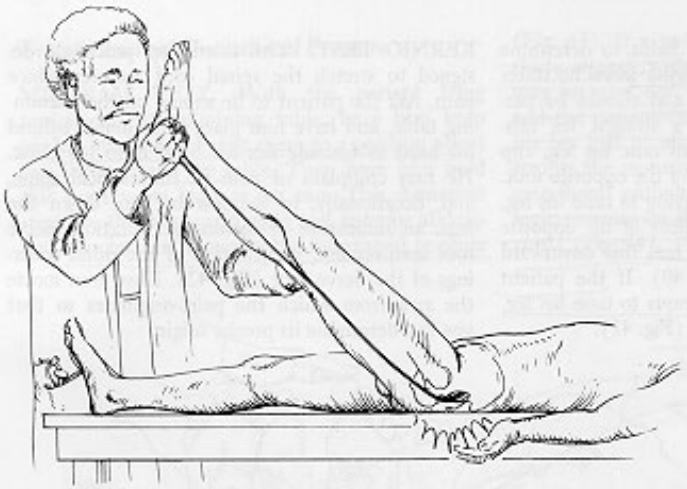

Fig. 37. Straight leg raising.

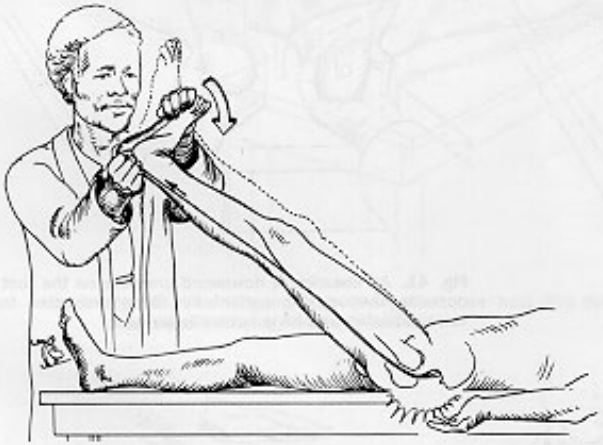

Fig. 38. In this position, dorsiflexion of the foot reproduces sciatic pain.

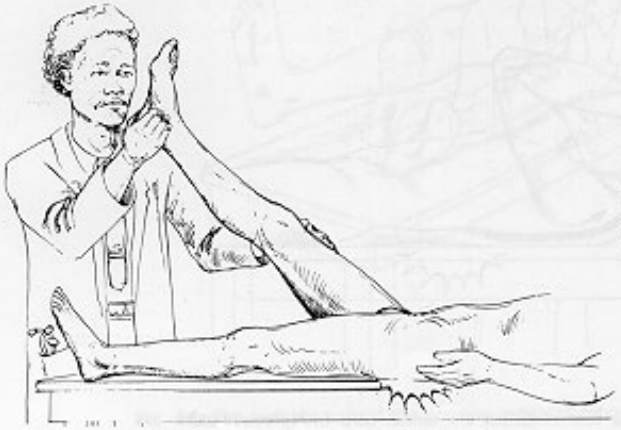

Fig. 39. A positive straight-leg raising test: Back pain on the involved side induced by straight-leg raising the non-involved leg.

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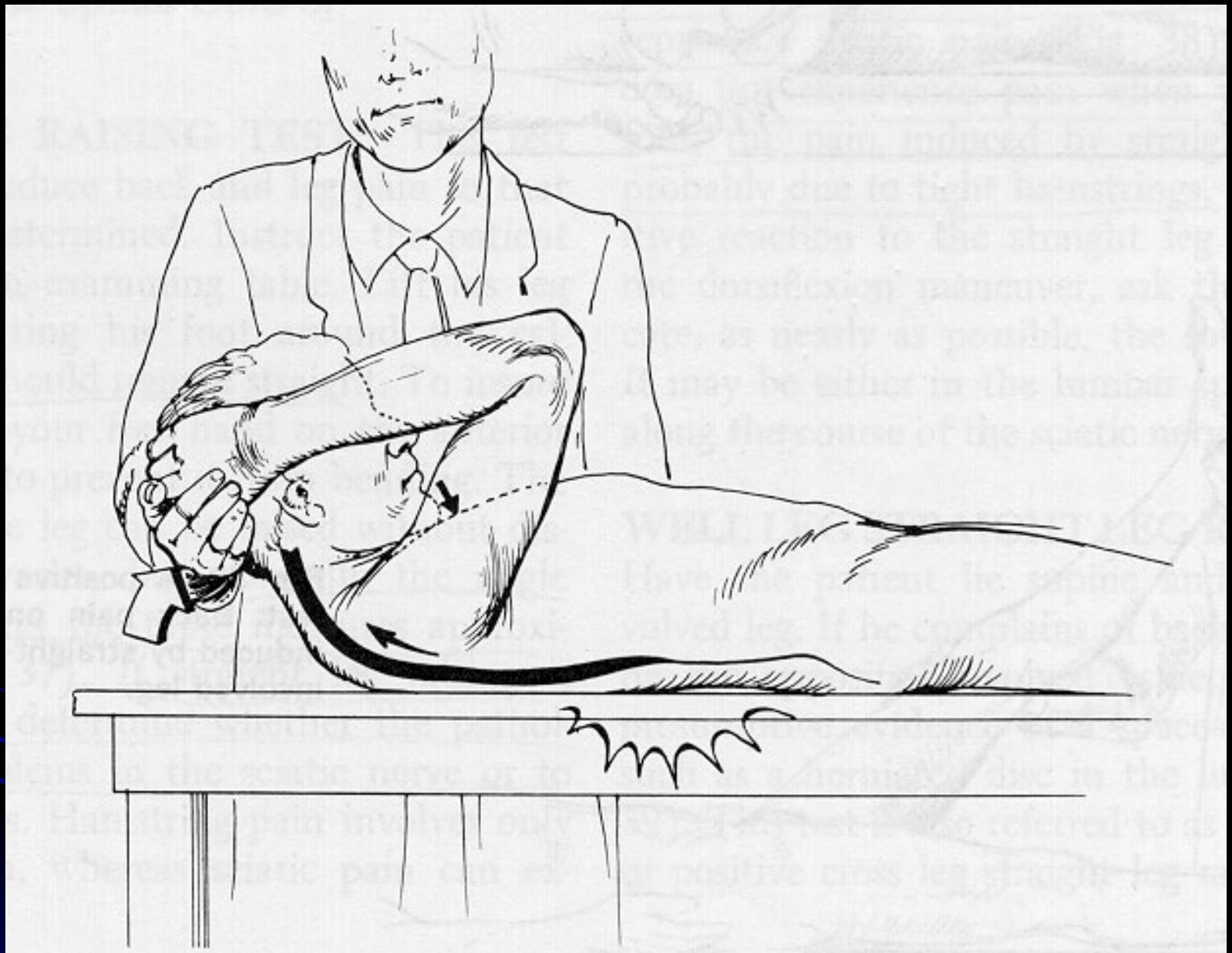
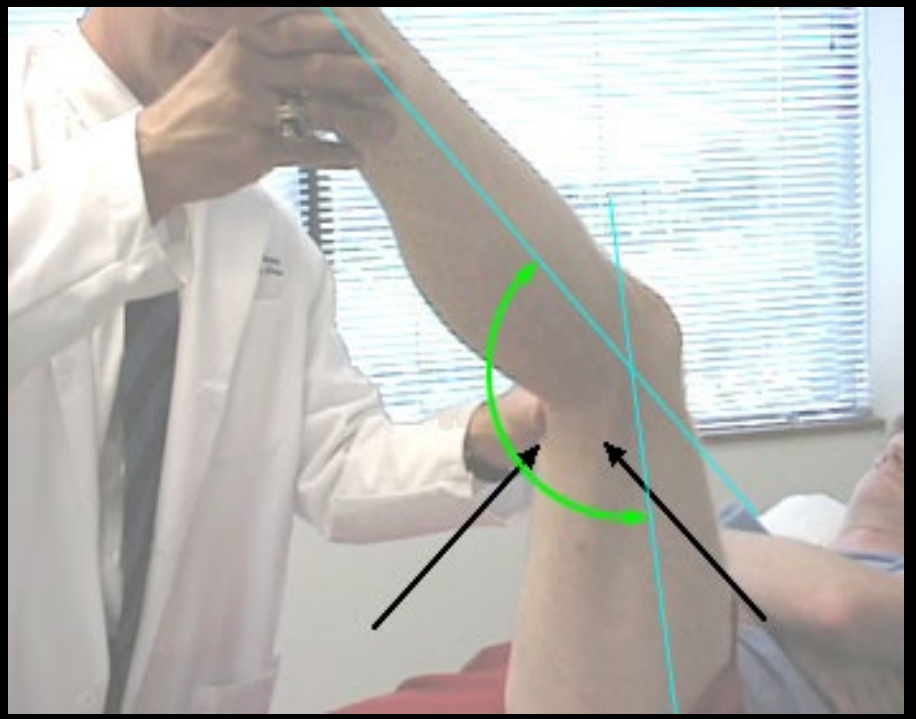


Fig. 42. The Kernig test stretches the spinal cord to reproduce pain.

Supine

- Hamstring flexibility (Popliteal angle)
- Leg lengths
  - measured ASIS to Med Mal
  - estimated



Non-organic Physical Signs ("Waddell's signs")

- Non-anatomic superficial tenderness
- Non-anatomic weakness or sensory loss
- Simulation tests with axial loading and *en bloc* rotation producing pain
- Distraction test or flip test in which pt has no pain with full extension of knee while seated, but the supine SLR is markedly positive
- Over-reaction verbally or exaggerated body language

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Neurologic Testing

- Primary focus on the L5 and S1 never roots, since 98 percent of clinically important disc herniations occur at L4-L5 and L5-S1

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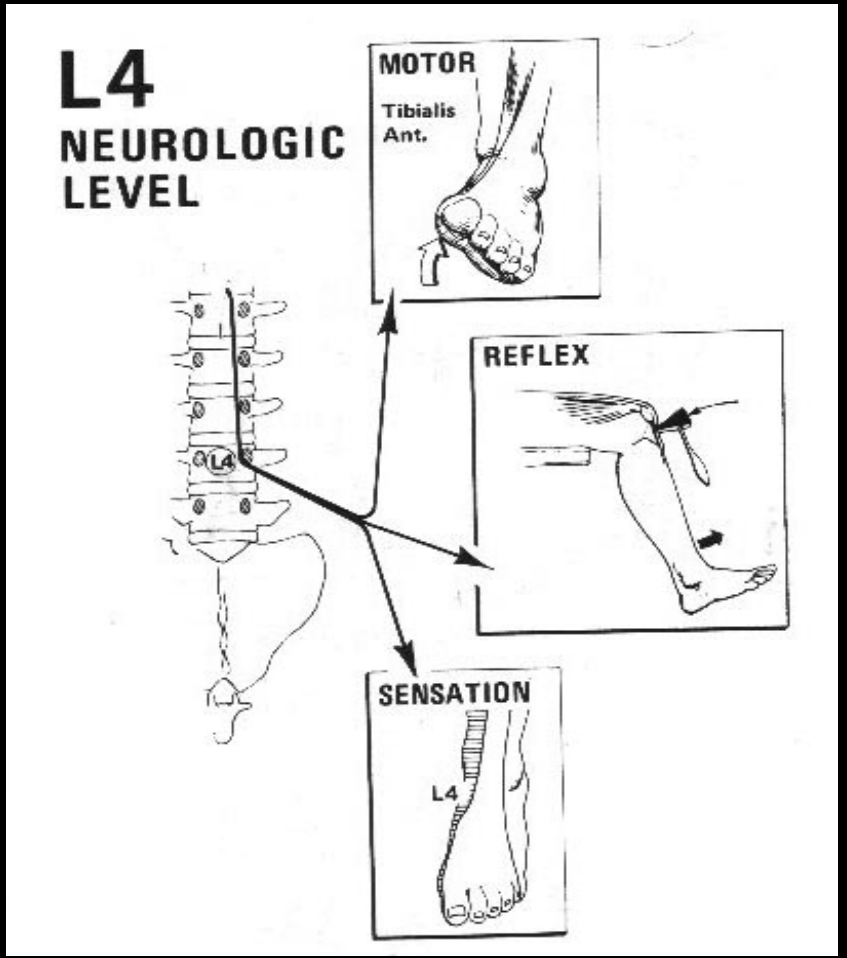
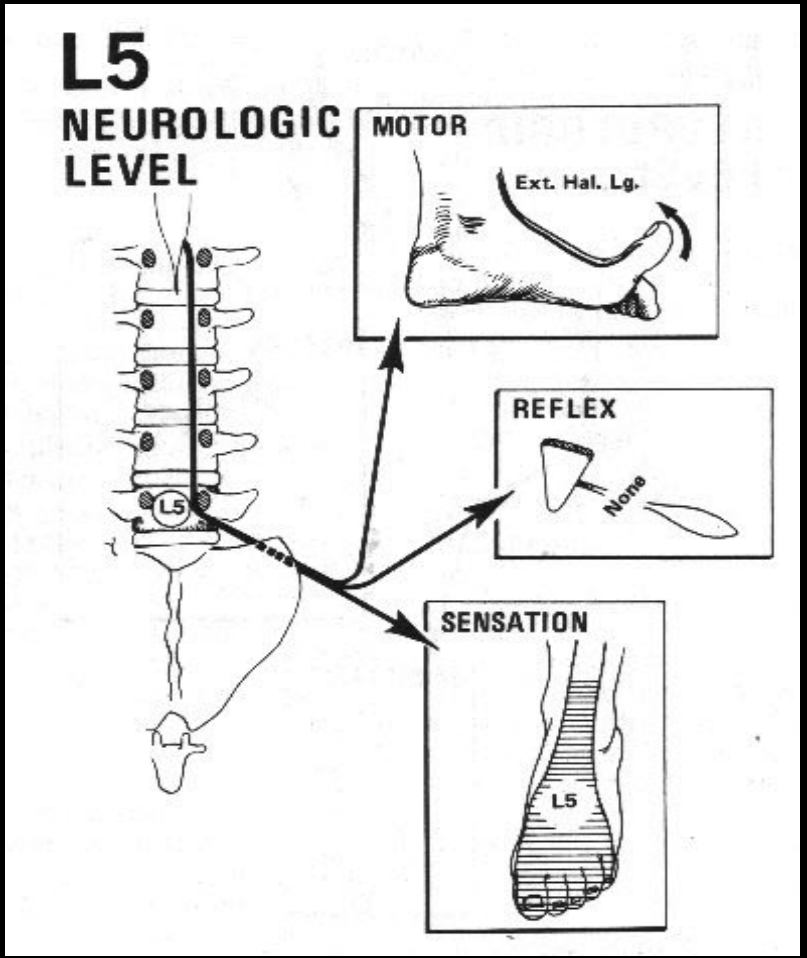
Sacral Plexus

- L4
  - Quads/Tibialis Anterior
  - Patellar reflex
  - Sensory Great toe and medial leg



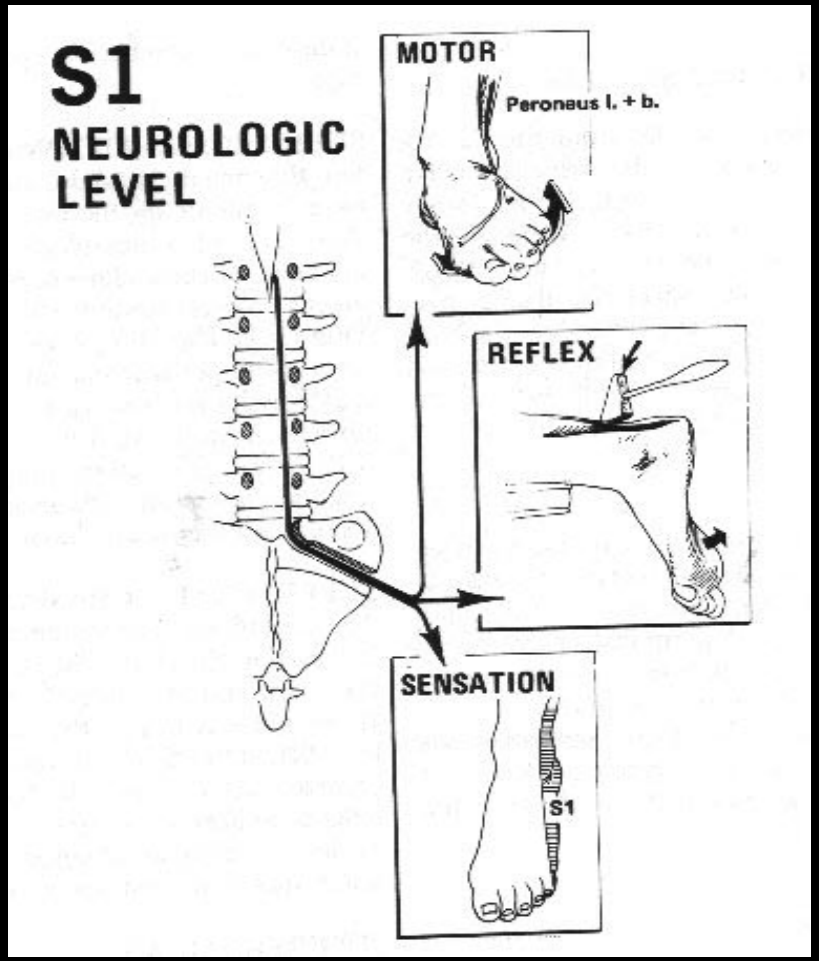
Sacral Plexus

- L5
  - Strength of Ankle and great toe dorsiflexion
  - Extensor Hallucis Longus
  - Sensory to dorsum of foot



Sacral Plexus

- S1
  - Ankle reflexes and sensation of posterior calf and lateral foot
  - Peroneals/Gastroc
  - Achilles reflex
  - Sensory to lateral and plantar foot



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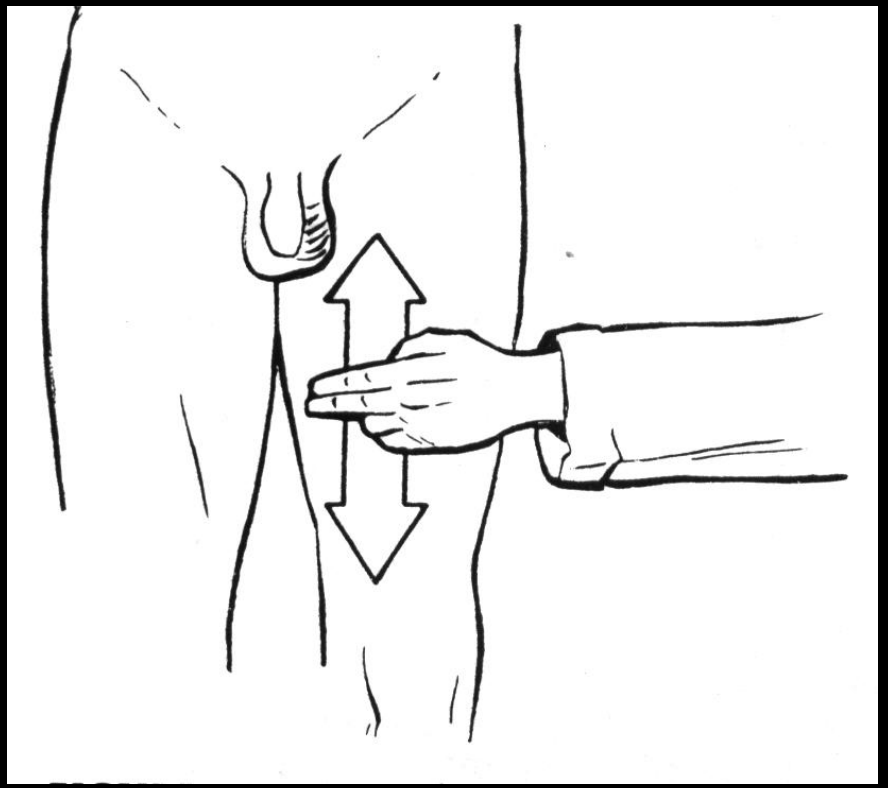
Other

- Rectal tone
- Anal wink
- Cremasteric reflex



Diagnostic Studies

- Radiographs
  - Early if ominous signs
    - Fever
    - night pain
    - age extremes
    - h/o Ca
    - wt loss
    - Trauma osteoporosis
  - Symptoms present > 1 month

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Diagnostic Studies

- MRI
  - More sensitive for infection and cancer
  - > 12 weeks of pain
  - Herniated discs
  - Spinal Stenois
  - order if hx/exam confusing
  - roadmap for surgeon
  - more costly, increased time to scan, problem with claustrophobic patients

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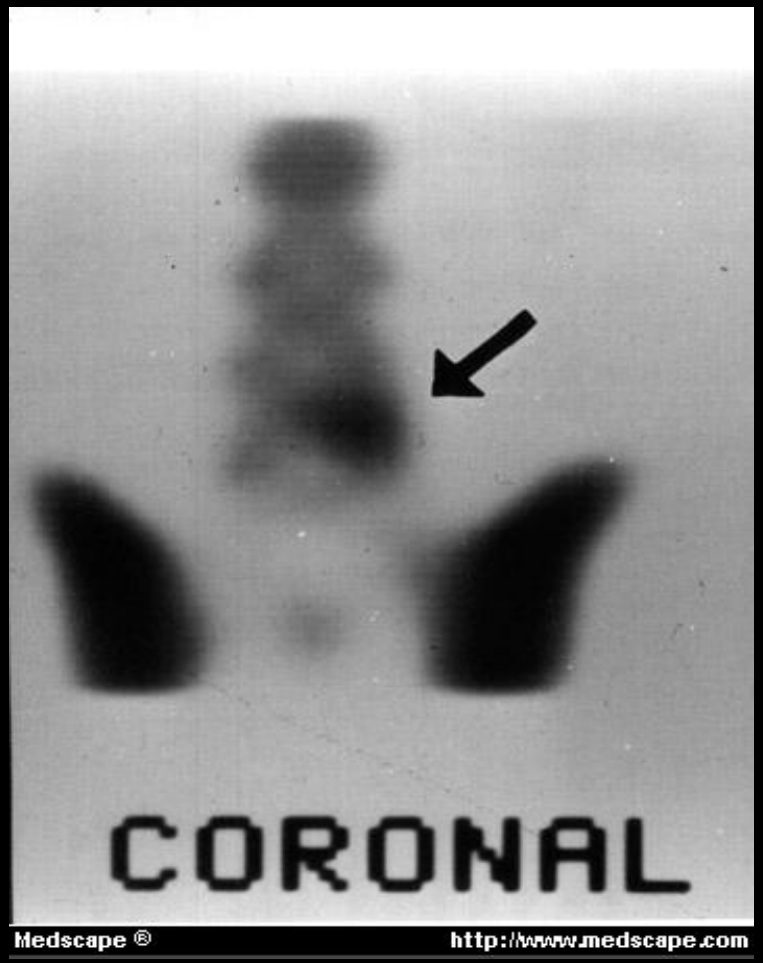
Diagnostic Studies

- Bone Scan (SPECT)
  - suspect for stress fx, Ca, inflammation



Diagnostic Studies

- EMG/NCV
  - r/o peripheral neuropathy
  - localize nerve injury
  - correlate with radiographic changes
  - order after 4 weeks of symptoms

TABLE 5–1. ELECTROPHYSIOLOGICAL FINDINGS COMMONLY PRESENT IN NEUROLOGIC DISEASE*

Type of Disease	Spontaneous Activity	Motor Unit Potential Configuration	Motor Unit Potential Recruitment	Nerve Conduction Studies	Repetitive Stimulation
Muscle disease	NL or fibs†	Myopathic	NL or myopathic	Essentially normal‡	NL
Myasthenia gravis§	NL	May be variable	NL	NL	Decrement
Peripheral nerve disease	Fibs	Neuropathic	NL or neuropathic	Decreased amplitude and/or slow conduction	NL
Anterior horn cell disease	Fibs	Neuropathic, may be "giant"	NL or neuropathic	NL¶	NL or decrement
Upper motor neuron disease	NL	NL	NL or decreased number firing slowly#	NL	NL

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Lab Studies

- CBC, ESR, UA
- Avoid RF, ANA or others unless indicated

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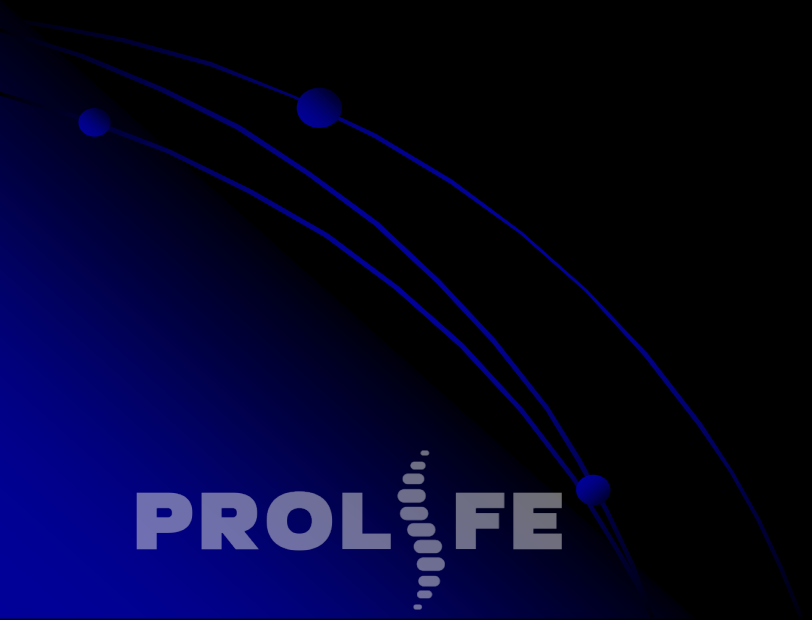
Treatment



Treatment Recommendations

- Based on the Joint Clinical Practice Guidelines from the American College of Physicians and the American Pain Society
- Level of evidenced reviewed and graded
- Guidelines published in Annals of Internal Medicine in 2007

Recommendations

- A Panel Strongly recommends
- B Panel recommends consideration for eligible patients
- C Panel makes no recommendation
- D Panel recommends against
- I Panel found insufficient evidence

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Acute Mnagement

- Medications
  - Pain control
    - Acetaminophen/NSAID's
    - Minimize use of opioids
    - 2007 joint guidelines from ACP and APS recommend against steroids
  - Muscle relaxers
    - Short term use of benzo or non benzodiazepine muscle relaxers in combination with NSAIDs/acetaminophen

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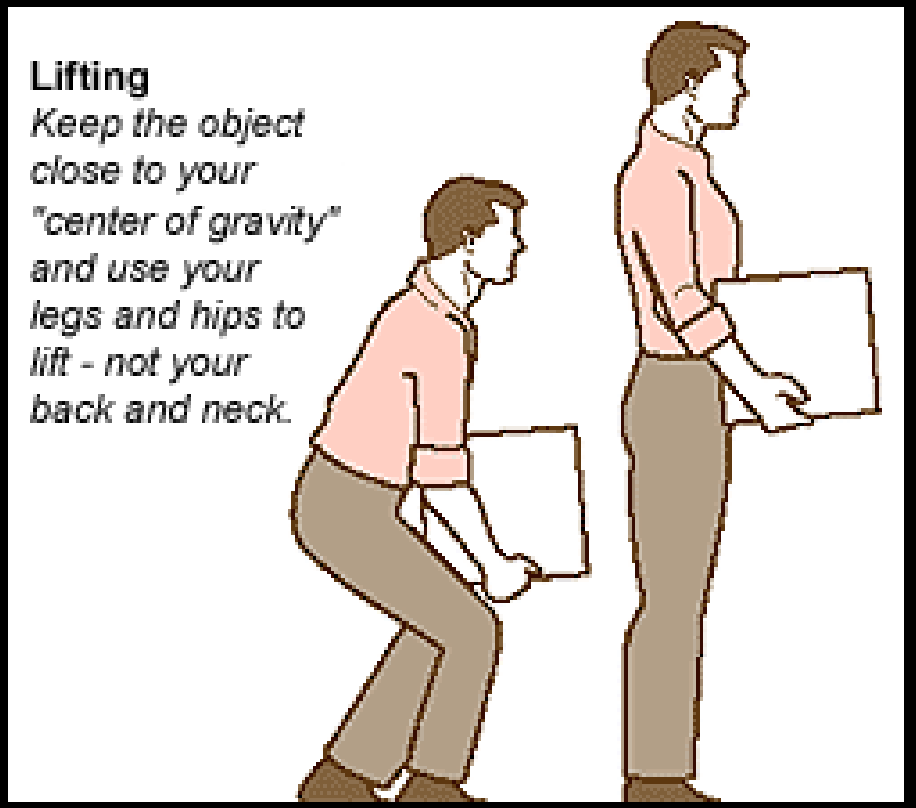
Acute Management

- Back Exercises
  - There is no evidence that suggests that back exercises are helpful during acute pain and may actually be counterproductive
  - Upon recovery, back exercises may be useful in preventing recurrence
  - Resume normal activity as quickly as possible

Subacute Management

- Continue patient education
- Mechanics - lifting technique, sport, ...
- Avoid
  - **prolonged sitting/standing**
  - recurrent bending
  - twisting



Conditioning

- ACTIVITY & CONDITIONING
  - walking
- Stretching - HS, hip extensors, erector spinae
- Strengthening - abs, erector spinae

Chronic Low Back Pain

- > 3 months
- Treatment goals:
  - Control pain
  - Maintain function
  - Prevent disability

PROLIFE

Evidenced-Based Reasonable Therapies for Chronic Low Back Pain

- Acetaminophen
- NSAIDS
- TCAs
- +- Opioids
- +- Benzodiazepines

- Physical therapy
- Exercise therapy
- Interdisciplinary rehab
- Spinal Manipulation
- Yoga
- Massage

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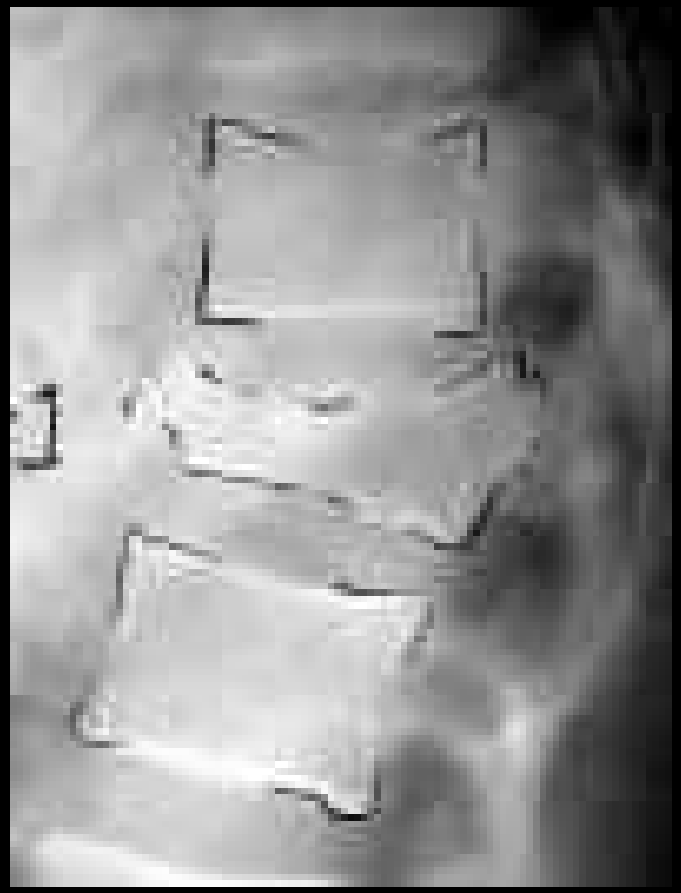
Referral

- Fractures
- HNP (> 8 weeks)
- Ominous signs/sx - fever, weakness, bowel/bladder dysfunction
- Refractory sx > 12 weeks



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Referral to…

- PM&R
- Pain Clinic
- Neurosurgery
- Orthopedics

Caveats of Management

- Adequate/complete initial evaluation
- Follow-up evaluations
  - 1-3 days for acute pain
  - 4-6 weeks for chronic pain
- Activity Activity Activity
- Survey for Red Flags

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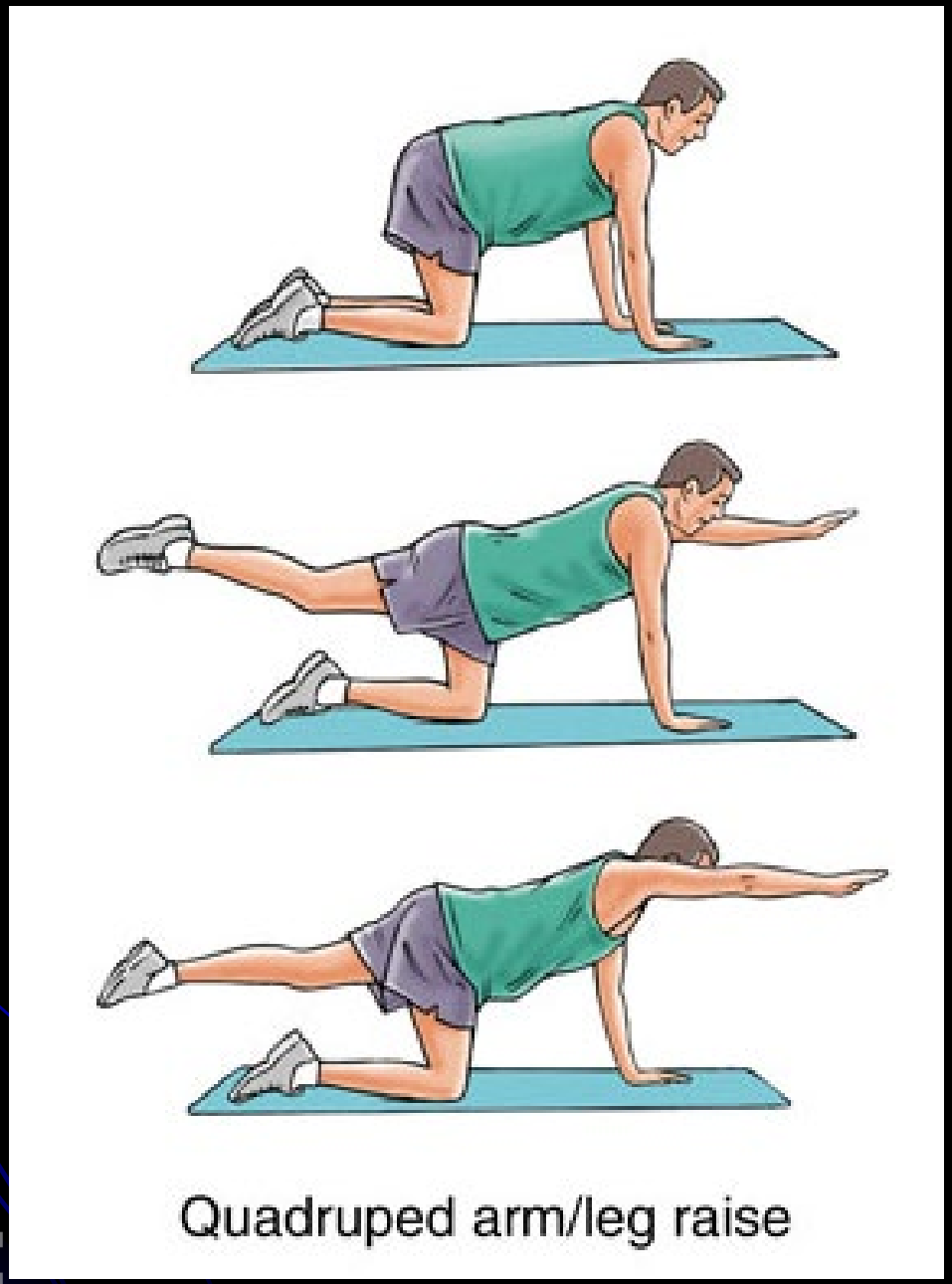
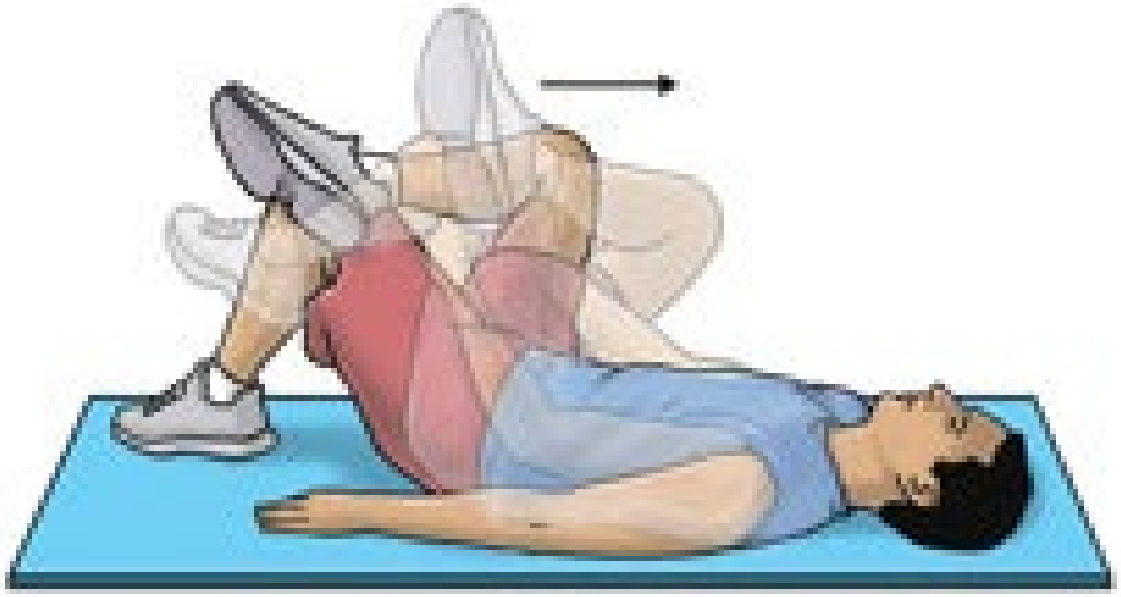
Rehabilitation Exercises for Chronic Back Pain

Standing hamstring stretch

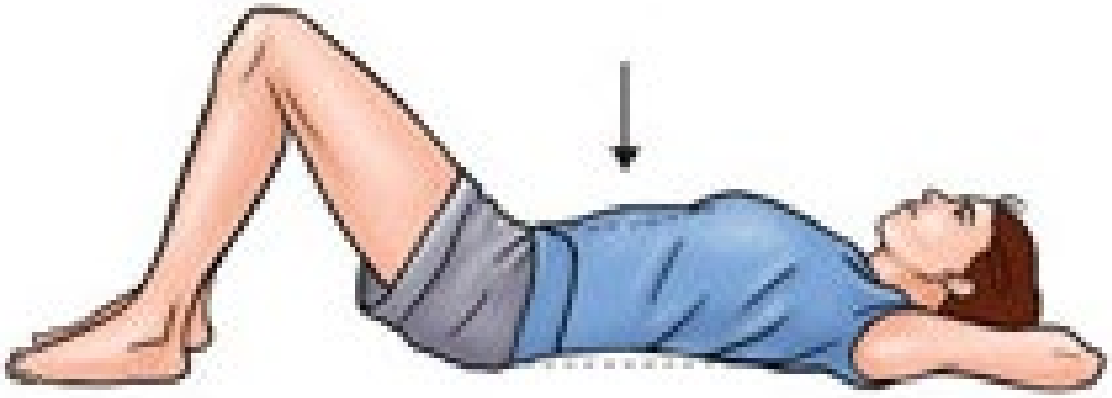


Quadruped arm/leg raise

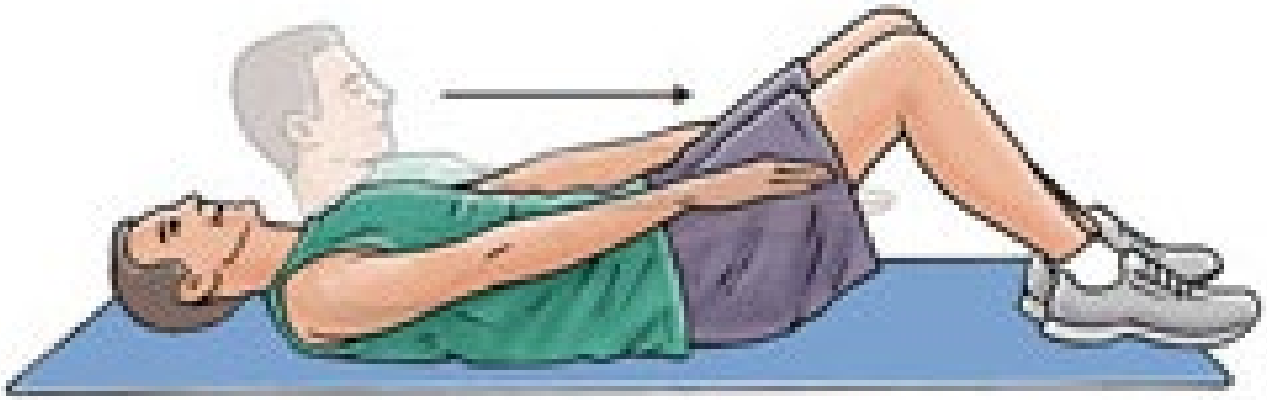


Gluteal stretch

Cat and camel

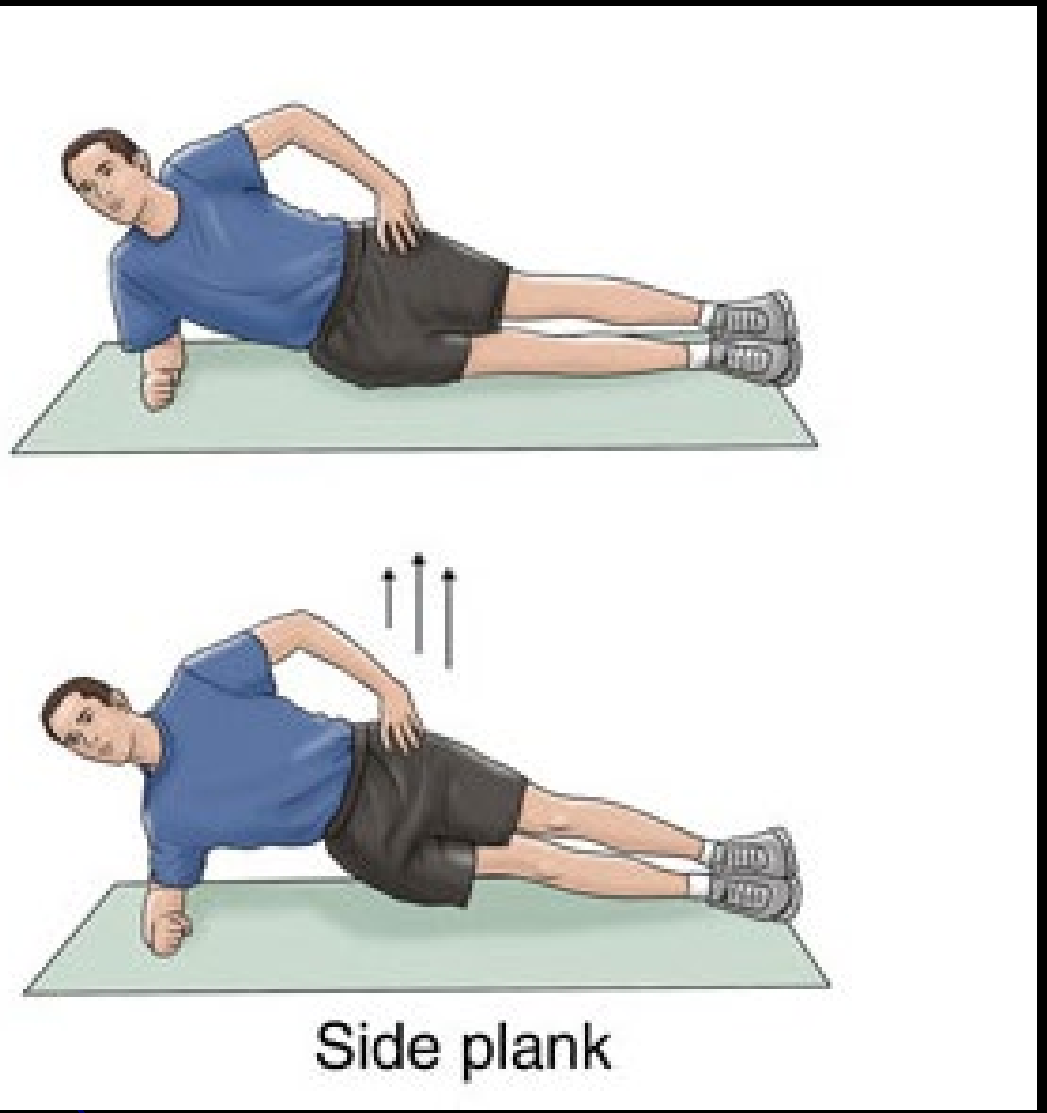


Pelvic tilt



Partial curl

Extension exercise


Side plank

All of the following are Red Flags EXEPT?

1. > 50 years of age
2. History of Cancer
3. Weight loss
4. Radicular symptoms

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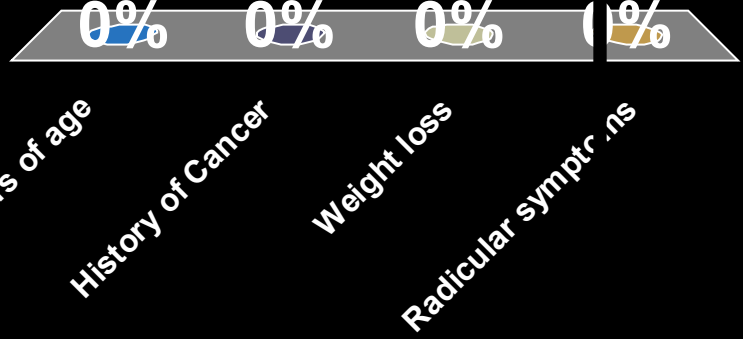

Indications for an MRI include:

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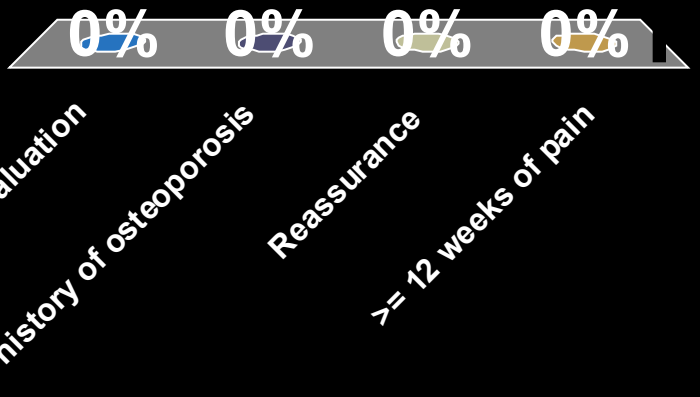
1. Initial trauma evaluation
2. A history of osteoporosis
3. Reassurance
4. >= 12 weeks of pain



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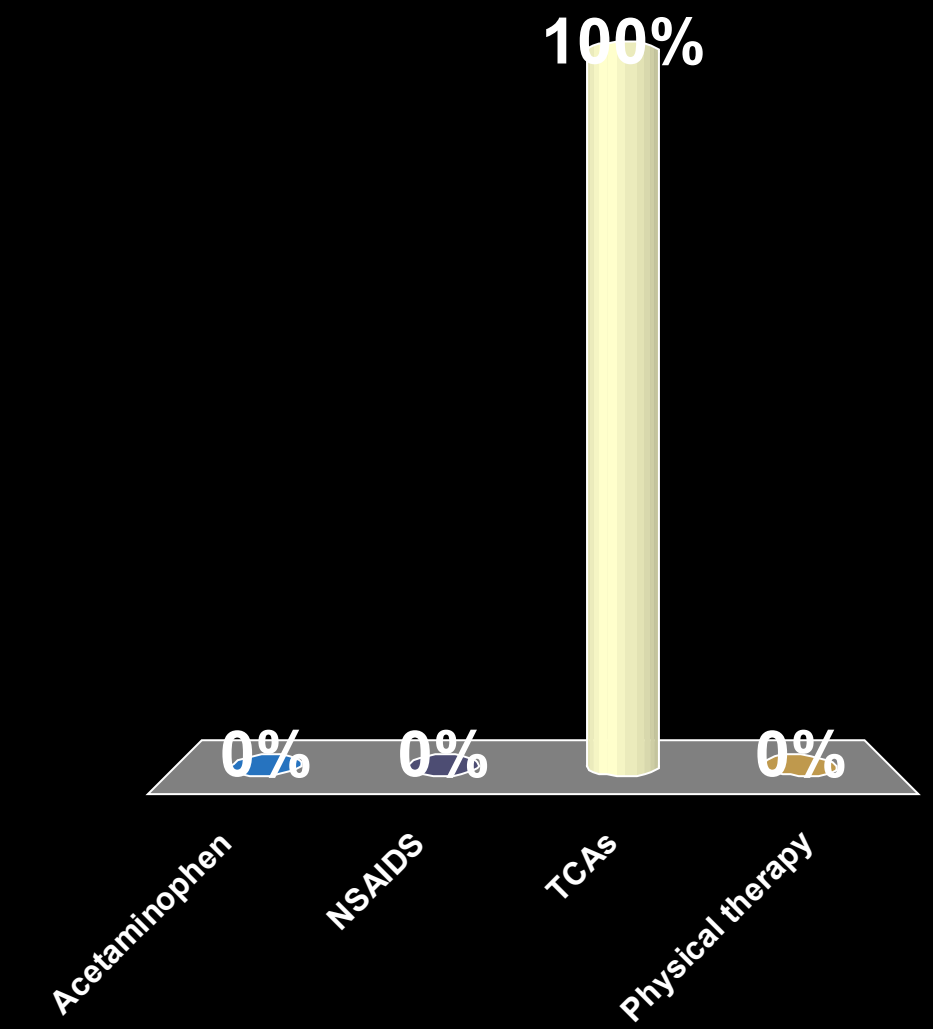
Effective treatment for acute low back pain includes all except:

1. Acetaminophen
2. NSAIDS
3. TCAs
4. Physical therapy



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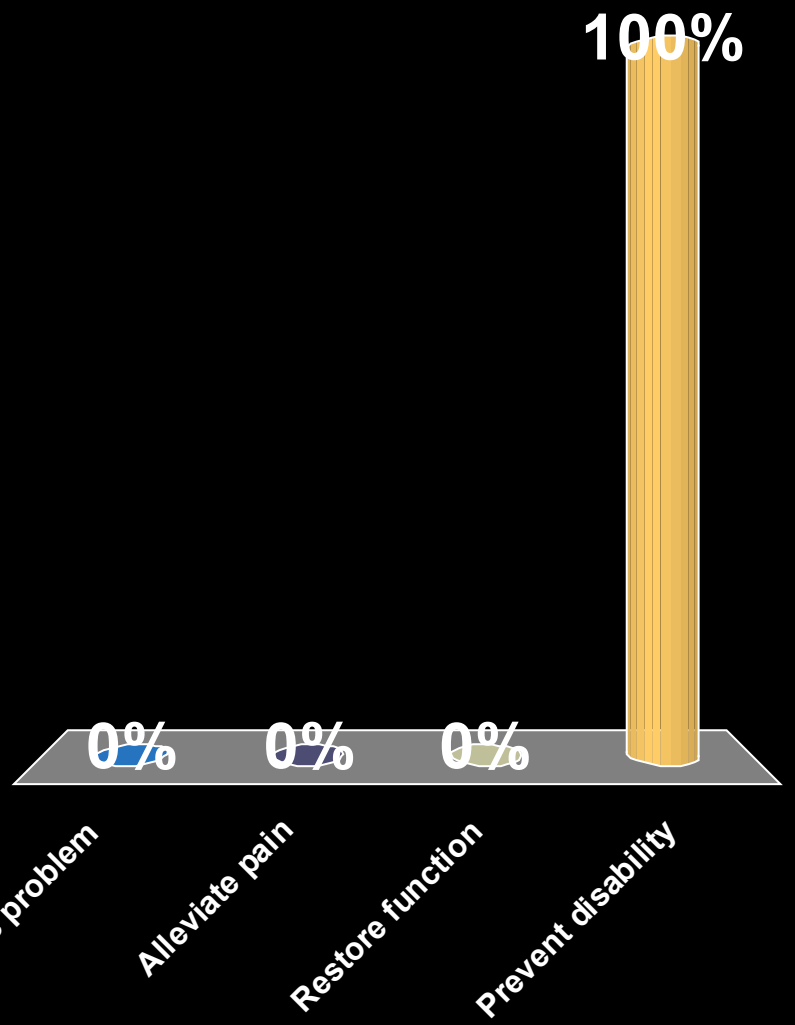
Treatment goals of Chronic Low Back Pain include:

1. Cure problem
2. Alleviate pain
3. Restore function
4. Prevent disability



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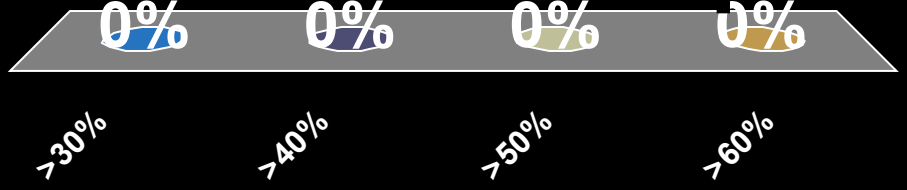
What is the lifetime incidence of low back pain

1. >30%
2. >40%
3. >50%
4. >60%

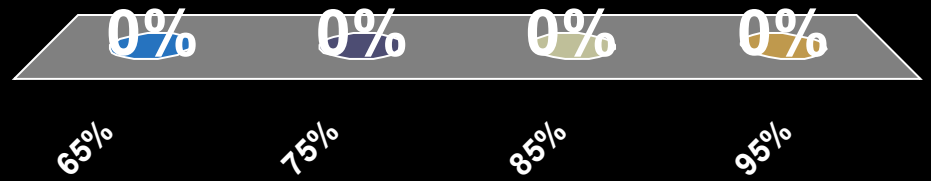
10



In what percentage of patients can the cause of low back pain not be determined?

1. 65%
2. 75%
3. 85%
4. 95%

10



Conclusions

Describe the clinically relevant anatomy of the lumbar spine

Discuss the “red flags” of lower back pain their associated clinical significance

Discuss the common causes of low back pain

Review and practice physical examination of the lower back and common rehabilitation exercises