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The "Monster Back": Non-Opioid Pain Management

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Paul F. Pasquina, M.D.
Professor and Chair, Physical Medicine & Rehabilitation
Director, Center for Rehabilitation Sciences Research
Uniformed Services University of the Health Sciences
Chief, Department of Rehabilitation
Walter Reed National Military Medical Center

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Disclaimer

- No conflicts of interest to report.
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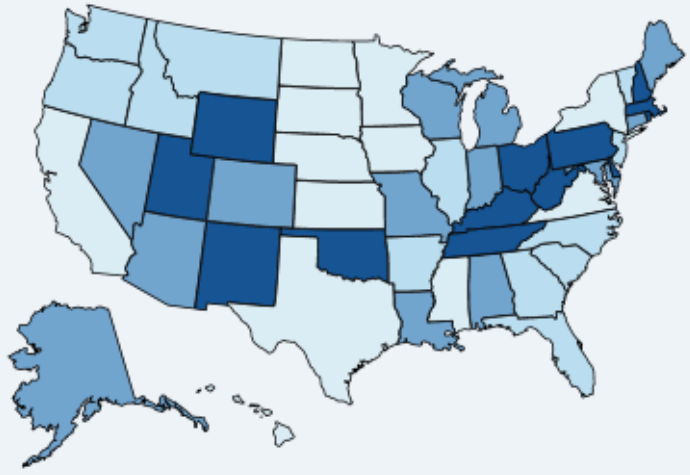
- The views expressed in this presentation are those of the author and do not reflect the official policy of the Department of Army, Department of Defense, or U.S. Government

Drug overdose death rates, United States, 2014*



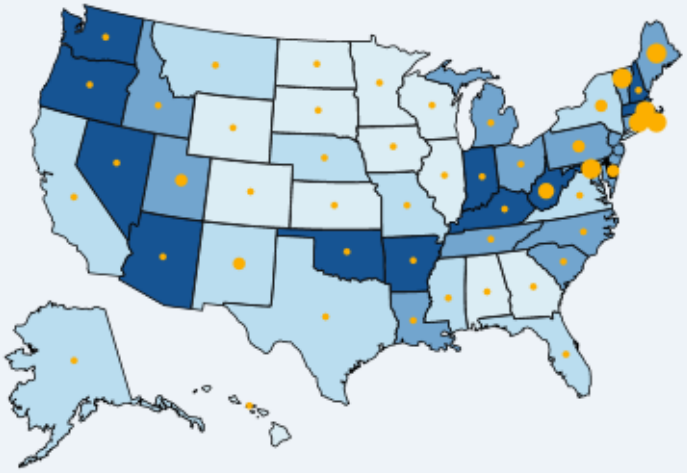
Drug overdose deaths per 100,000 population

6.3 - 11.7	11.9 - 14.4
15.1 - 18.4	19 - 35.5

*Age-adjusted death rate per 100,000 population

Source: CDC National Vital Statistics System

Rate of Past Year Opioid Abuse or Dependence* and Rate of Medication-Assisted Treatment Capacity with Methadone or Buprenorphine



Rate per 1,000 persons aged 12 years and older

Rate of dependence		Treatment capacity	
3.4 - 6.4	6.5 - 9.2	0.7 - 3.0	3.2 - 4.3
9.4 - 10.3	10.8 - 12.9	4.4 - 7.2	7.3 - 16.5

*Opioid abuse or dependence includes prescription opioids and/or heroin

Source: AJPH 2015;105(8):e55-63.

Economic Impact of the Opioid Epidemic:

- **55 billion** in health and social costs related to prescription opioid abuse each year[1]
- **20 billion** in emergency department and inpatient care for opioid poisonings[2]

Source: Pain Med. 2011;12(4):657-67.[1]
2013;14(10):1534-47.[2]

On an average day in the U.S.:

- More than **650,000 opioid prescriptions** dispensed[1]
- **3,900 people** initiate nonmedical use of prescription opioids[2]
- **580 people** initiate heroin use[2]
- **78 people** die from an opioid-related overdose*[3]

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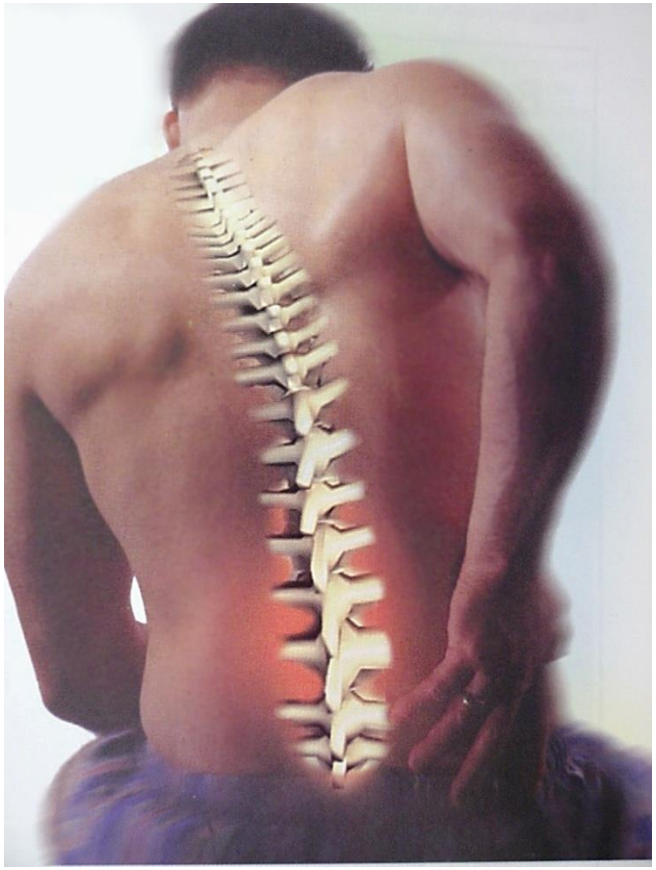
Epidemiology

- Lifetime incidence ~ 85%
- Chronic (>3mo) 15-45% of population
- 90% improve within 3 months, 50% recur
- Second only to common cold as cause of lost work time
- Most common disability in those under 45
- Most expensive health care issue for patients between 20 and 50
- 10% of patients responsible for 80-90% of costs



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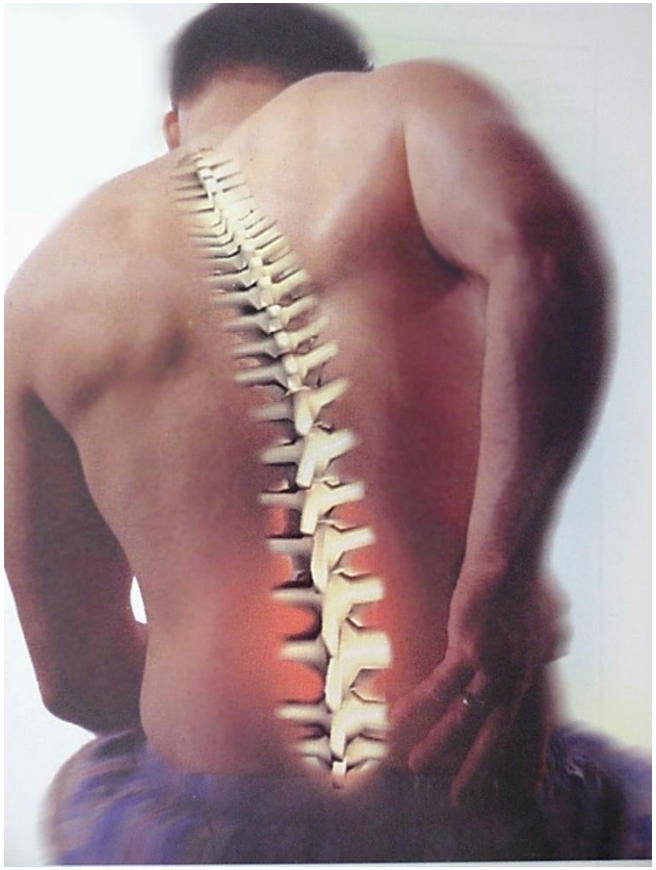
Epidemiology

- Neuropathic (stenosis, HNP): 37-54%
- Discogenic : 35%-50%
- SI joint pain: 15%-35%
- Facetogenic: 10%-25%
- Myofascial: 20%



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Differential Diagnosis *(Determine the pain generator)*

- Pain Generators:
  - Bone
  - Soft Tissue
  - Nerve
  - Referred
- Lumbosacral Strain/Sprain
- Radiculopathy (sciatica)
- Spondylosis, Spondylolysis, Spondylolisthesis
- Visceral referred pain
- Cauda Equina Syndrome
- Cancer
- Infection
- Seronegative spondyloarthropathies
- Compression fractures

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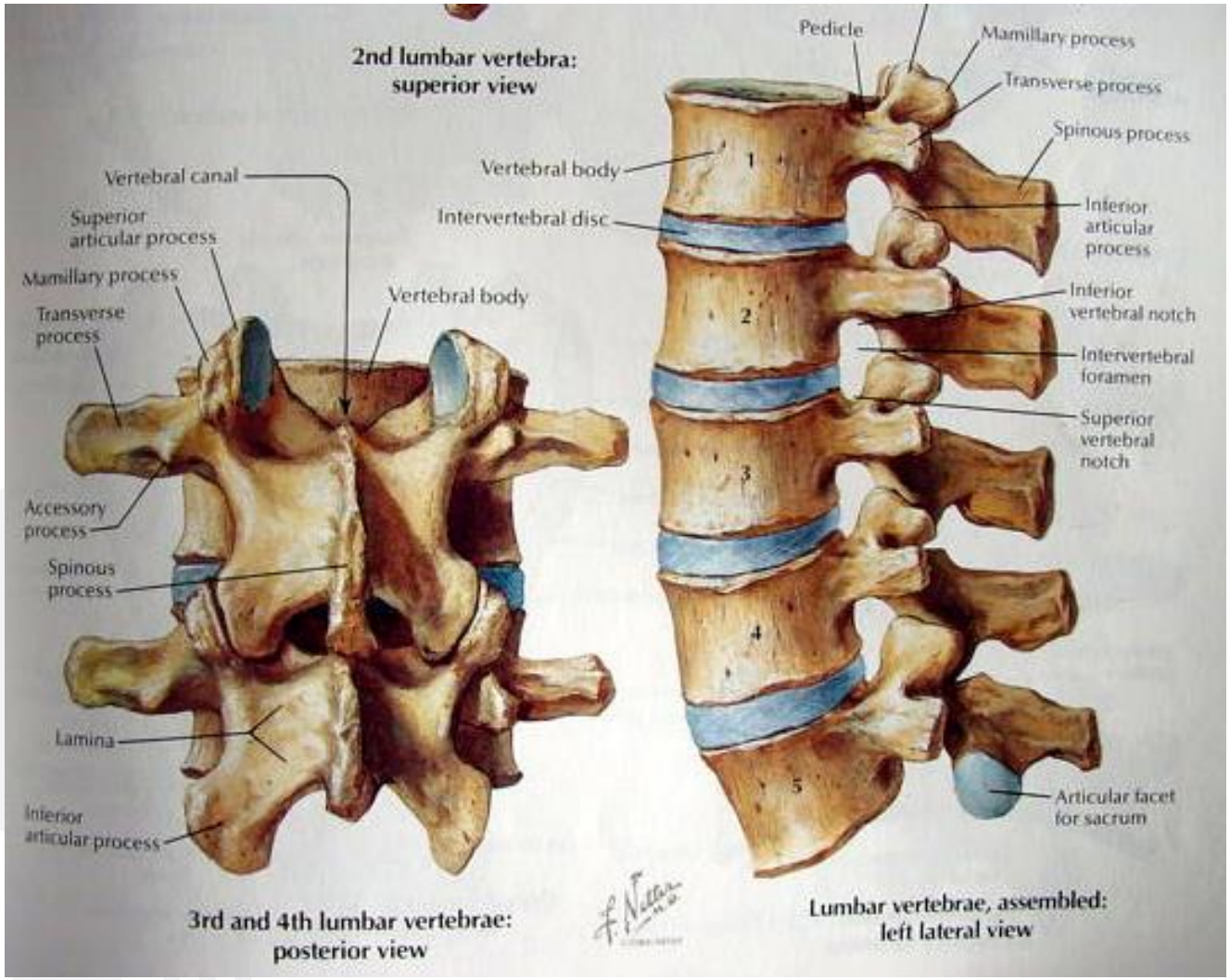
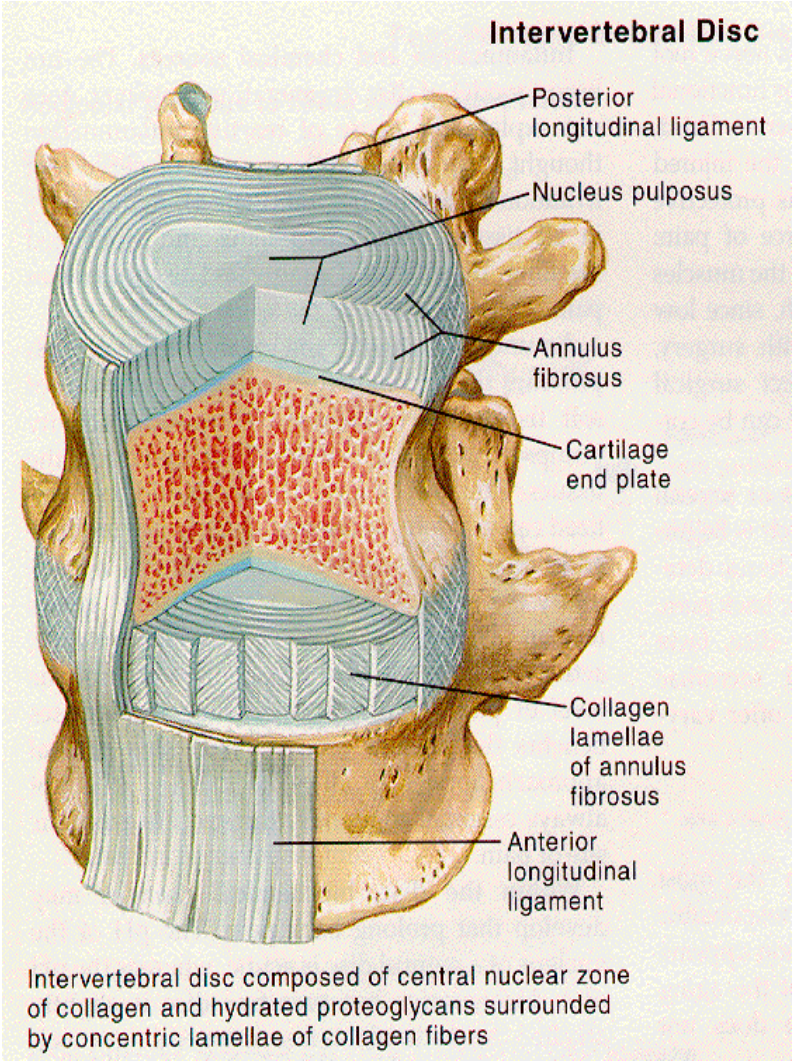
Normal Vertebral Anatomy

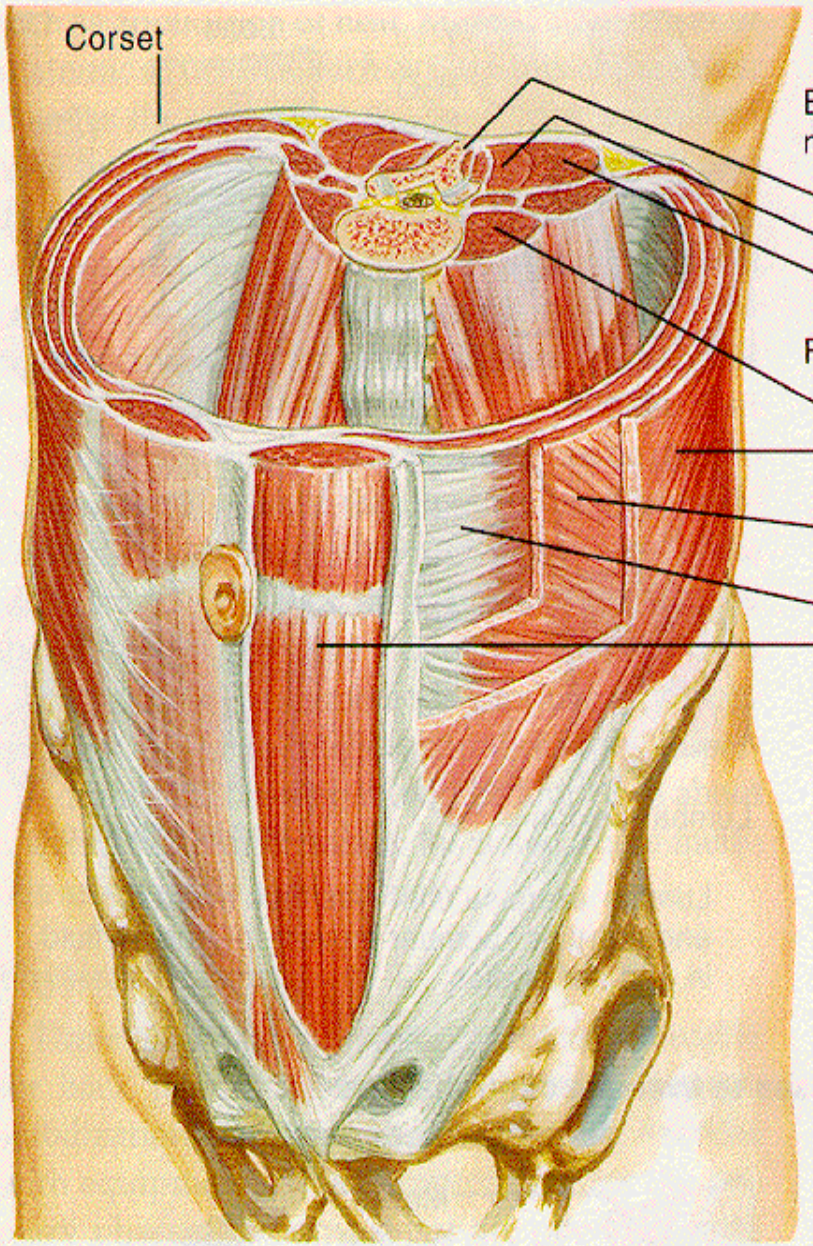


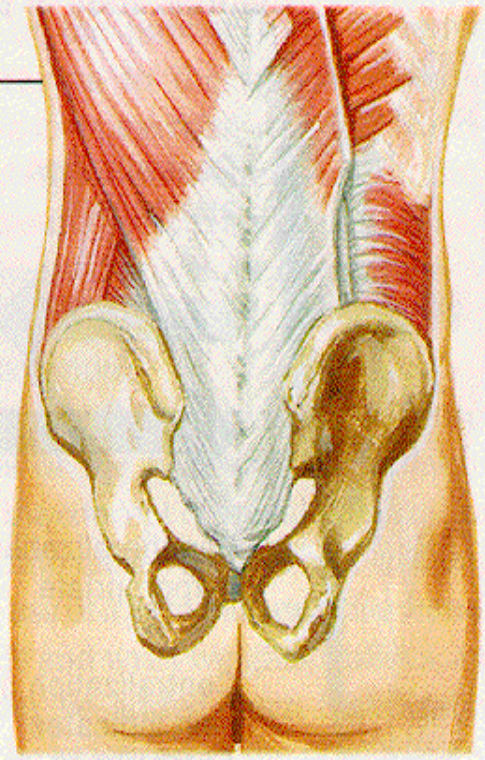
Intervertebral Disc

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

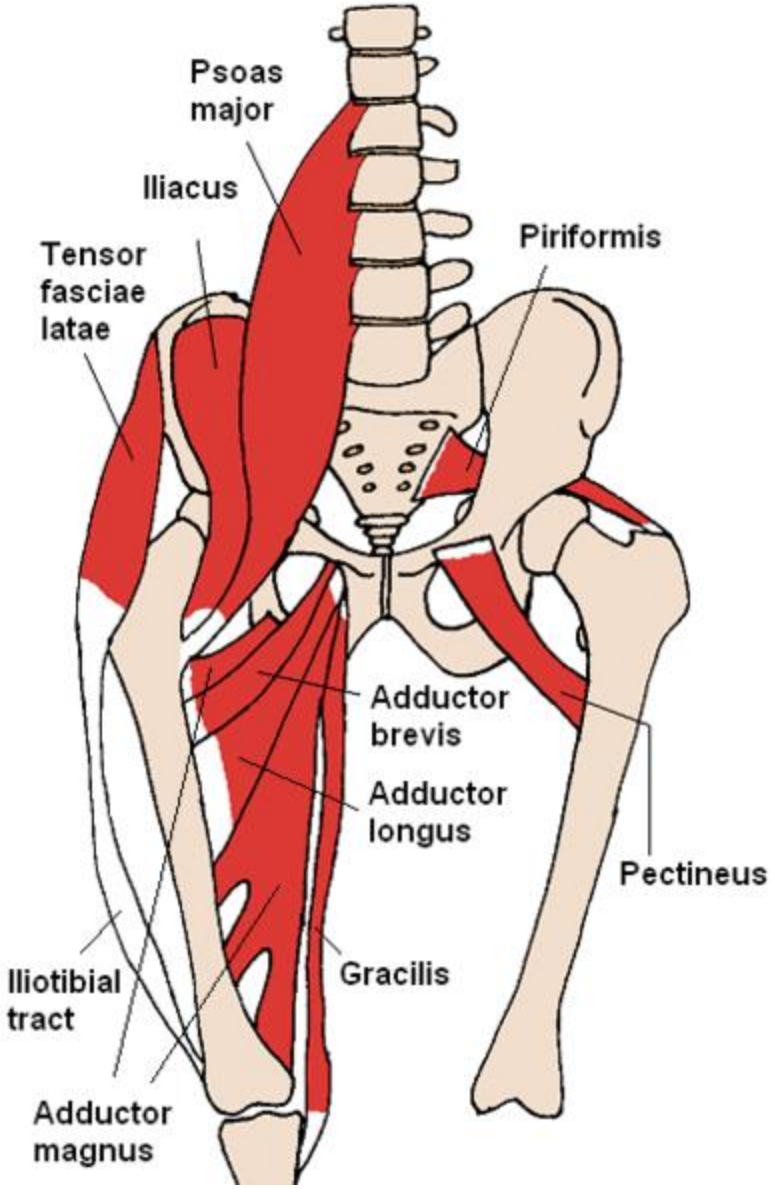


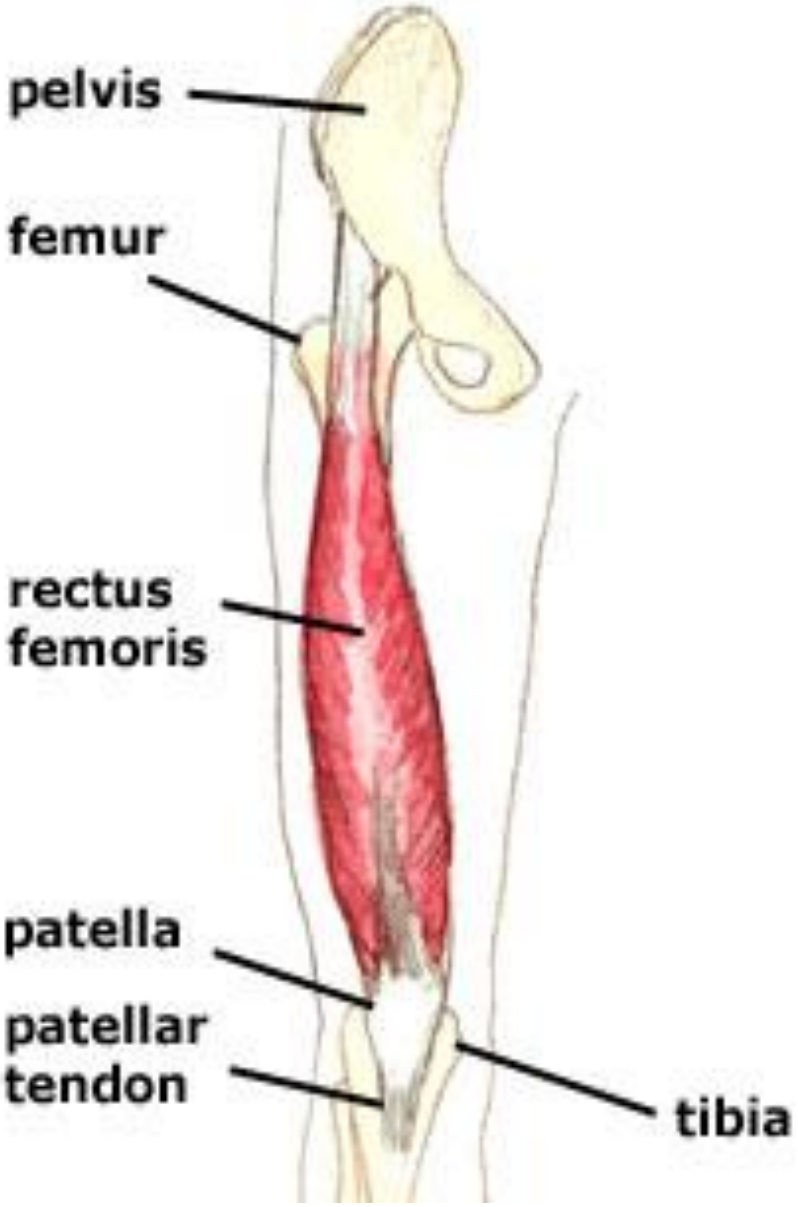
Dynamic "corset" concept of lumbar stability





Stability of lumbar spine maintained by corset of abdominal and paraspinal musculature, ligaments, and fascia. Co-contraction of abdominal muscles (particularly oblique) helps maintain spinal position through various movements. Retraining and strengthening musculature help hold spine in neutral (pain-free) position


Psoas major
Iliacus
Tensor fasciae latae
Piriformis
Adductor brevis
Adductor longus
Pectineus
Gracilis
Iliotibial tract
Adductor magnus


pelvis
femur
rectus femoris
patella
patellar tendon
tibia

Kinetic Chain

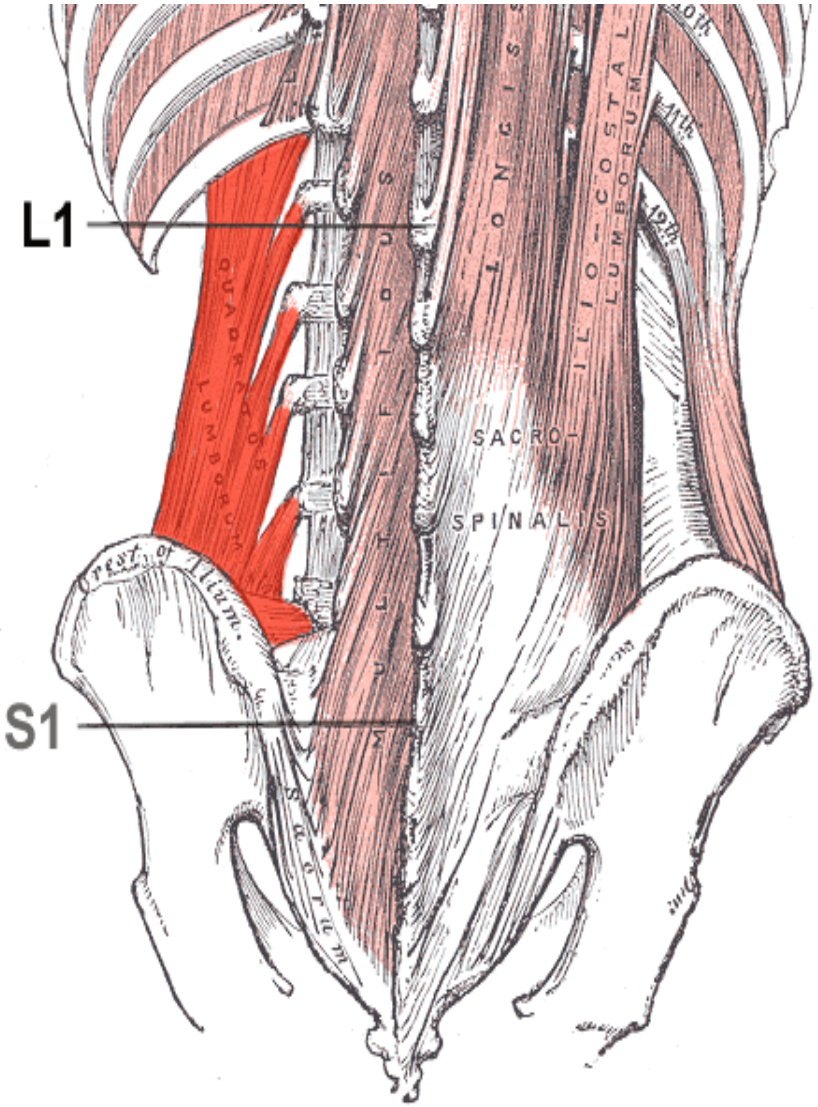
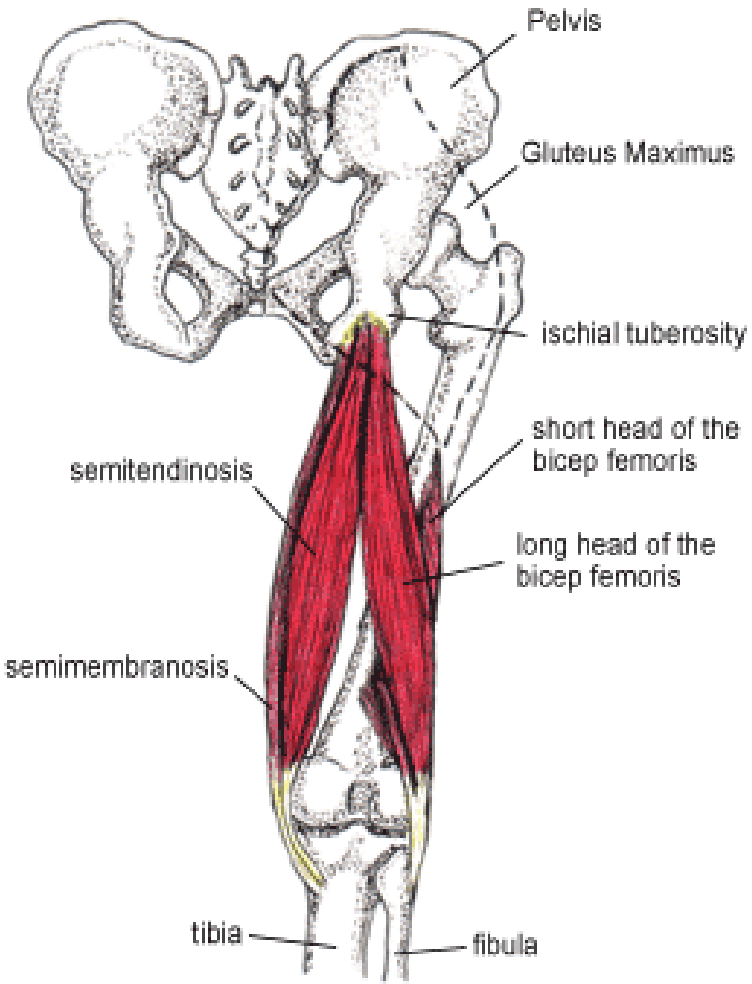


Fig. 1
Hamstring Muscles



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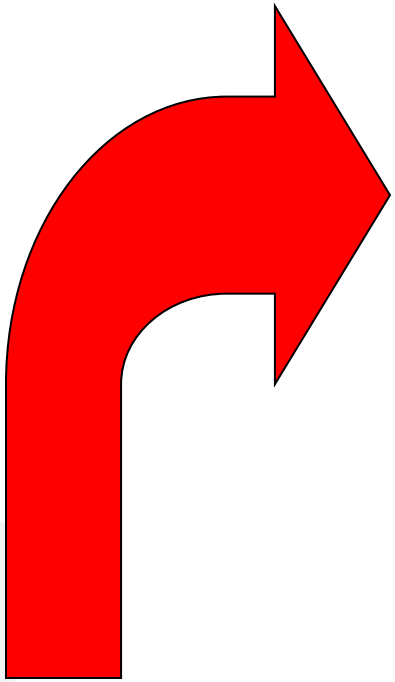
History

- Intensity
- Location
- Radiation
- Duration
- Trauma
- Modifiers
- Sleep
- Anxiety
- **Red Flags**



- Age <20 or >50
- Systemic Illness
  - Fevers
  - Chills
  - Night sweats
  - Weight Loss
- Bowel or Bladder Changes
- Numbness/Weakness
- History of Cancer
- Rest pain
- Drug use

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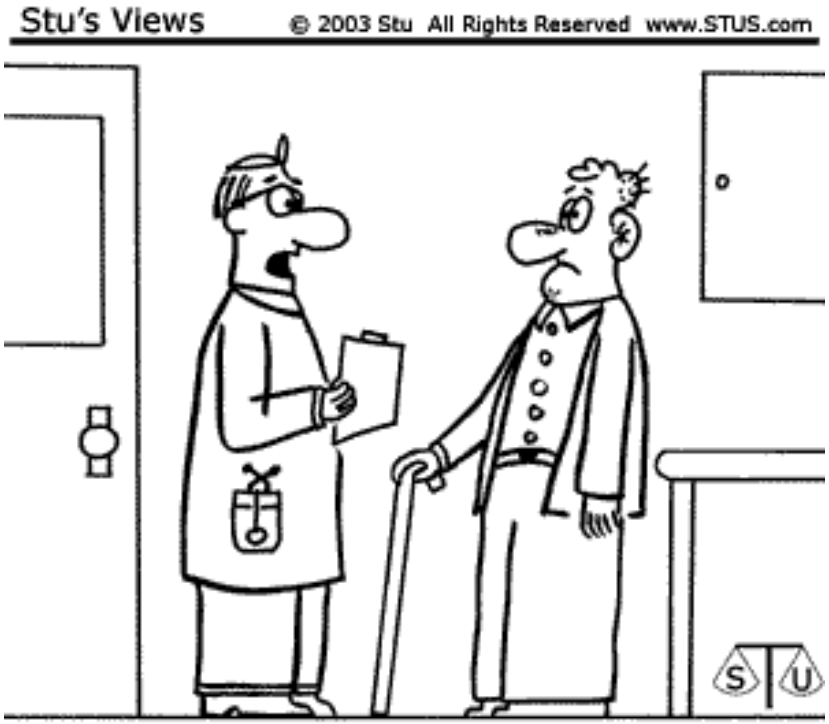
Physical Exam

- Vitals
- Inspection
- Palpation
- Range of motion
- Special Tests
- Motor
- Sensory
- Reflexes



"I'm stumped.
We'll have to wait for
the autopsy."

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Inspection

- General appearance
- Cutaneous inspection
  - Infection
  - Trauma
  - Developmental Abnormalities
- Other deformities

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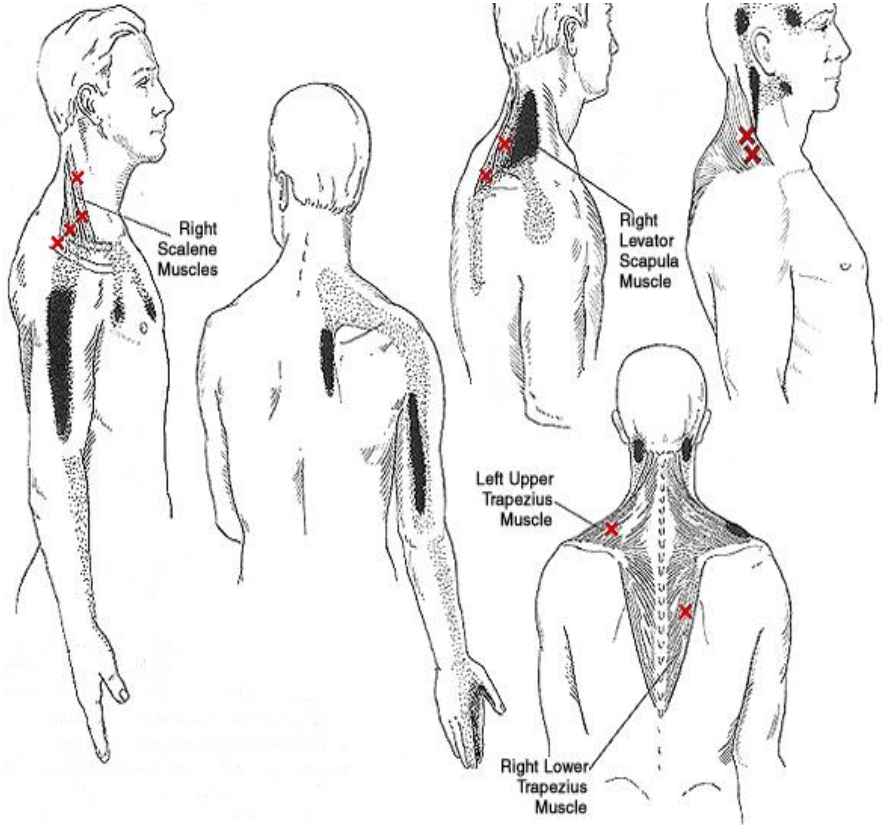
Palpation

- Percussion of vertebral bodies
  - Fracture
  - Infection
- Spasms
- Trigger points



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Range of Motion

- Flexion
- Extension
- Lateral bending
- Facet loading

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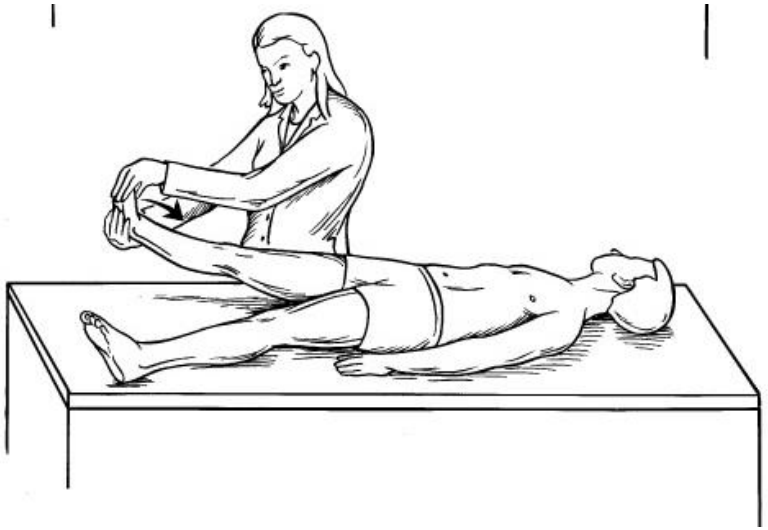
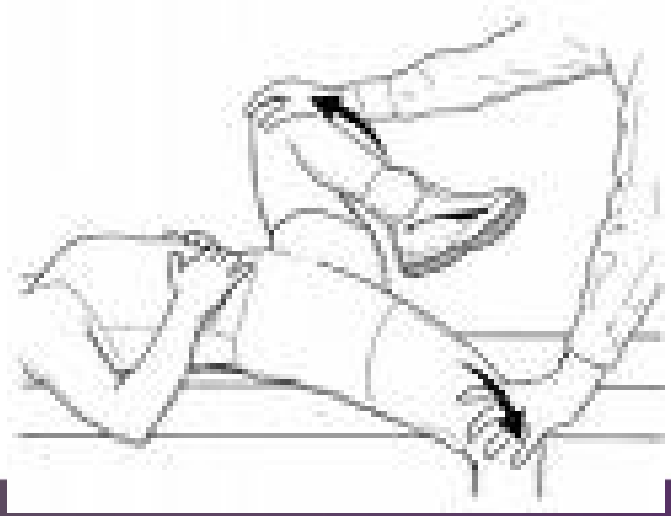
Special Tests

- Tests to stretch spinal cord, cauda equina, or sciatic nerve
- Tests to assess the sacroiliac joir
- Spondylolysis - Stork Test
- Limb Length Tests
- Core stability testing
- Flexibility Tests
- Tests to assess for non-organic signs





Tests to Stretch the Spinal Cord or Sciatic Nerve

- Straight Leg Raise
- Lasegue's Sign
- Cross Leg SLR
- Hoover Test
- Kernig Test
- Valsalva Maneuver

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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Hoover Test

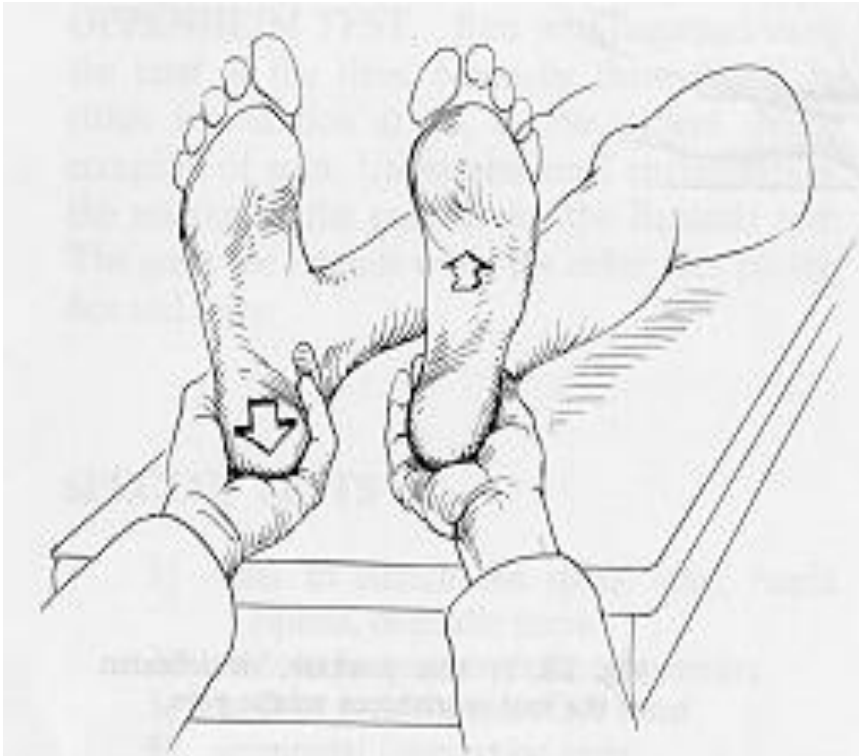

Fig. 40. The Hoover test.

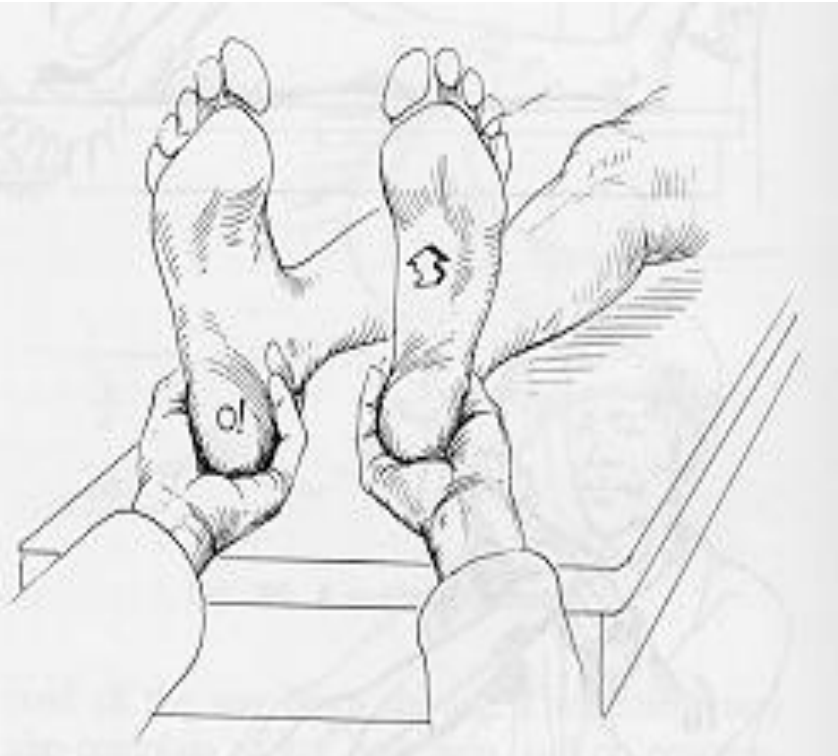

Fig. 41. An absence of downward pressure on the foot opposite the one the patient has been instructed to raise indicates that he is not really trying.

Tests to Stretch the Spinal Cord or Sciatic Nerve

- Straight Leg Raise
- Lasegue's Sign
- Well Leg SLR
- Hoover Test
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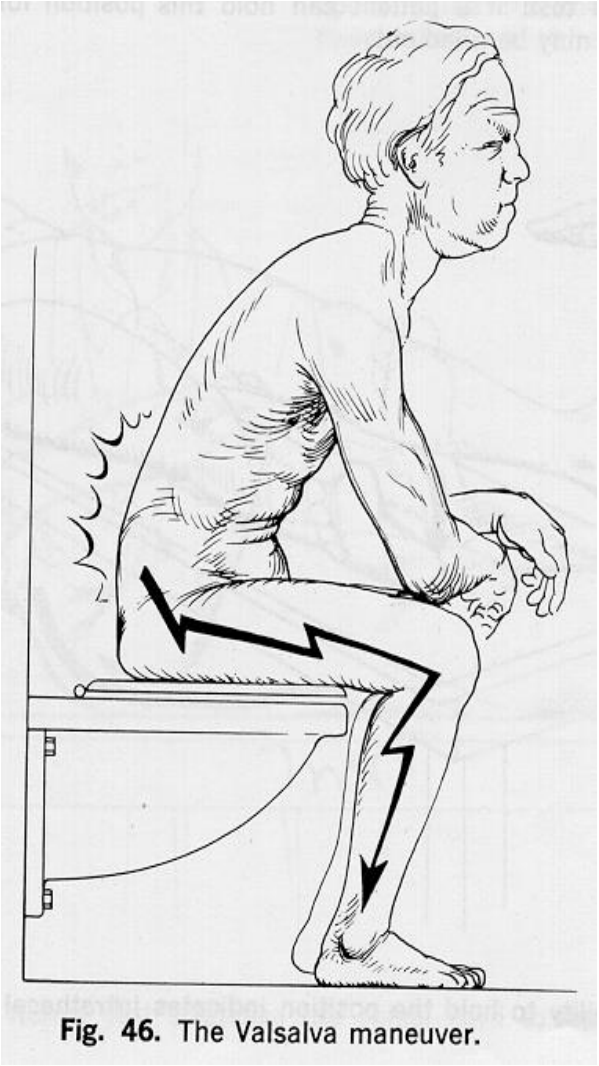

Fig. 46. The Valsalva maneuver.

Test to Assess the Sacroiliac Joint

- Pelvic Rock Test
- Gaenslen's Sign
- Patrick or FABER Test

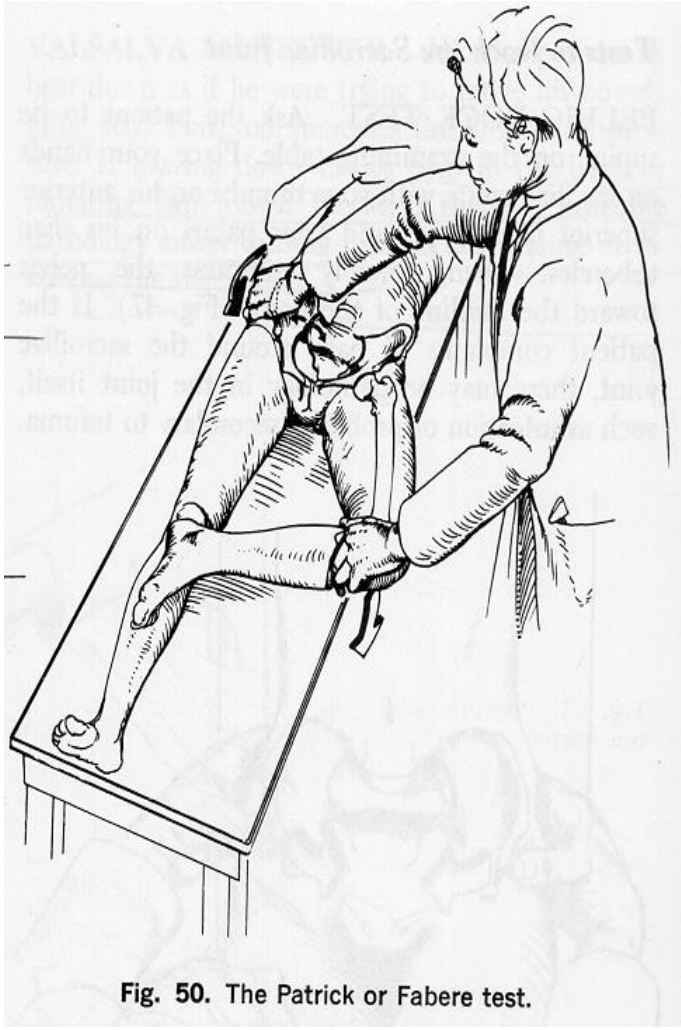

Fig. 50. The Patrick or Fabere test.

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Posterior Element

Facet Pain vs. Spondylolysis

- Stork Test

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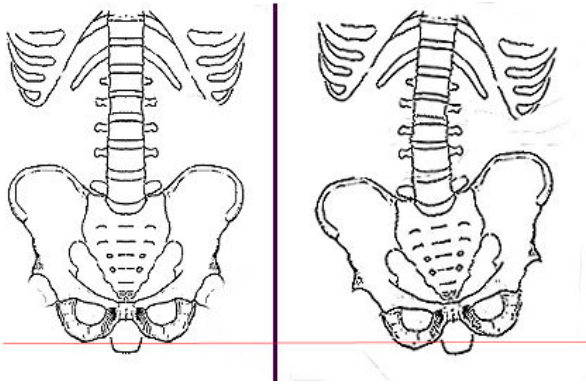
True vs. Functional Leg Length Discrepancy



- Leg length assessment
  - Pelvic obliquity
  - Supine leg lengths

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Flexibility Tests

- Thomas test
- Popliteal angle
- Ober test
- Piriformis test

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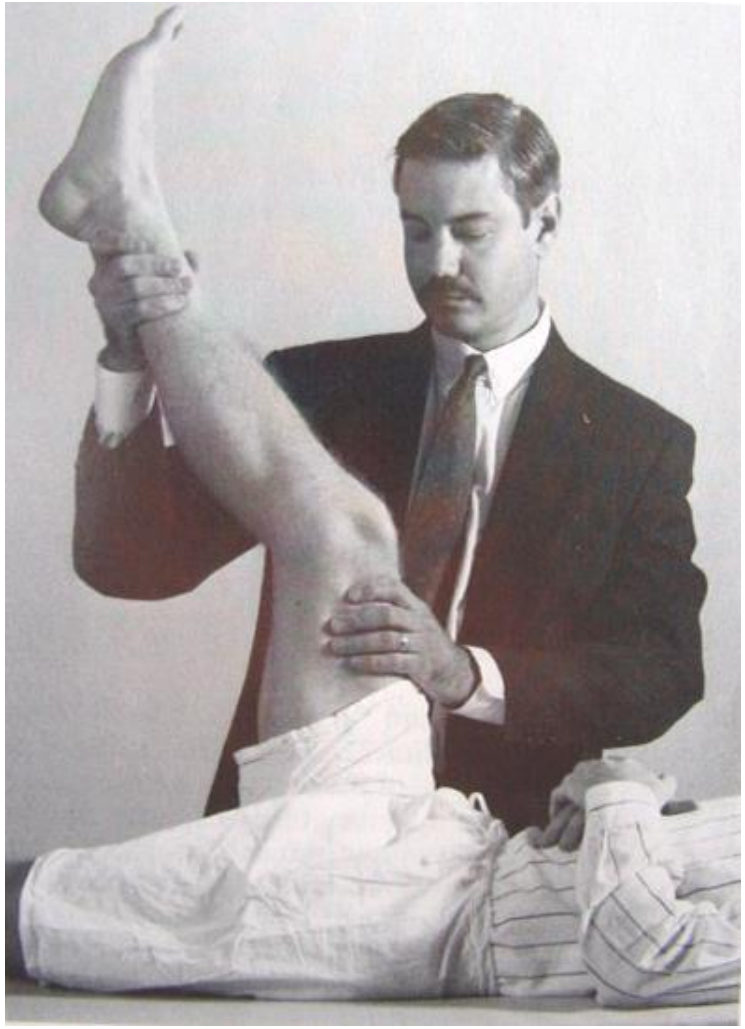
Flexibility Tests

- Thomas test
- Popliteal angle
- Knee Flexion (measure heel from buttocks)
- Ober test
- Piriformis test



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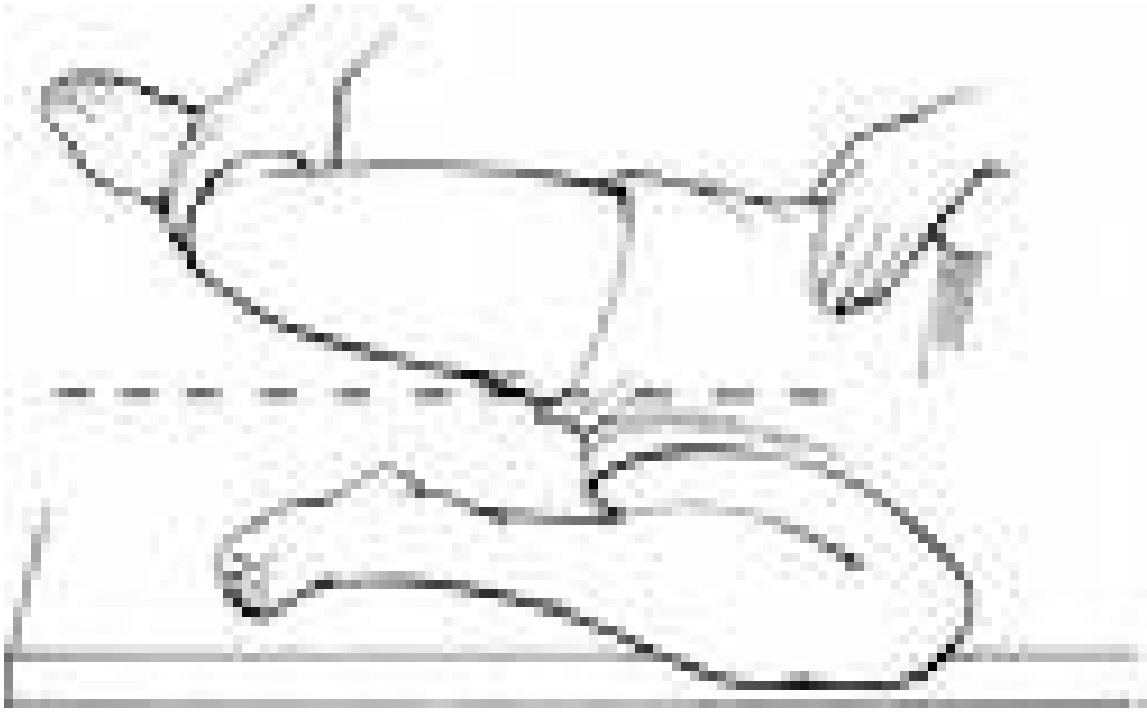
Flexibility Tests

- Thomas test
- Popliteal angle
- Ober Test
- Piriformis test



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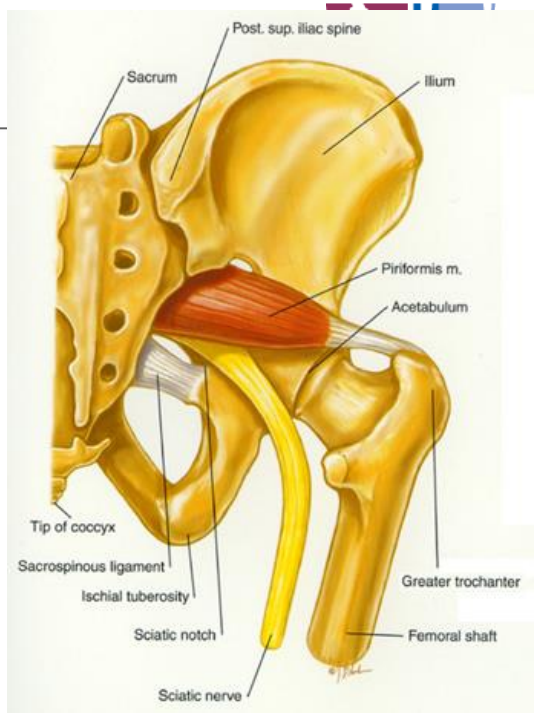
Flexibility Tests

- Thomas test
- Popliteal angle
- Shober test
- Piriformis test



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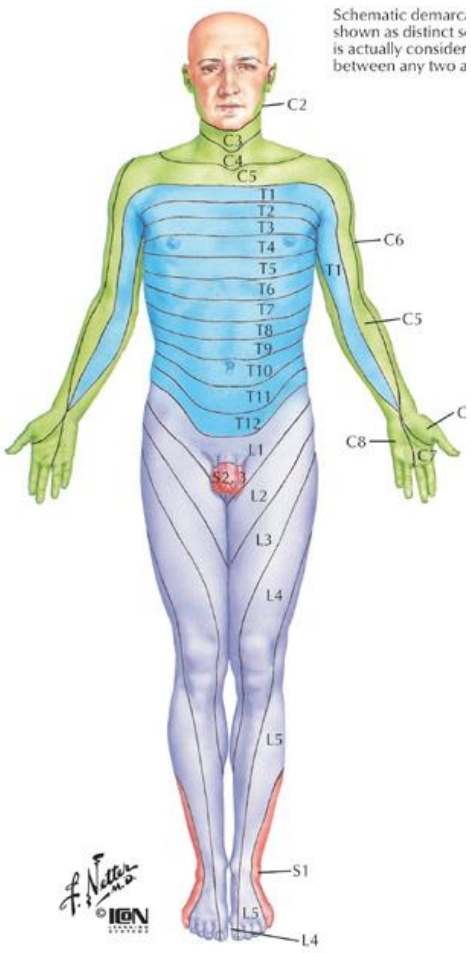
Neuromuscular Screening

- Heel Walk - anterior tibialis (L4, 5)
- Toe Walk - tibial nerve (S1, 2)
- Strength testing
  - Quadriceps extension (L2,3,4)
  - Foot inversion - ant. tib (L4)
  - Great Toe / toe extension (L5)
  - Foot eversion - peroneus (S1)
- DTRS
  - Knee jerk reflex (L4)
  - Ankle jerk reflex (S1)
- Sensation:
  - L4: medial side of foot, medial leg
  - L5: dorsum of foot, lateral leg
  - S1: lateral side of foot



Levels of principal dermatomes

C5	Clavicles
C5, 6, 7	Lateral parts of upper limbs
C8, T1	Medial sides of upper limbs
C6	Thumb
C6, 7, 8	Hand
C8	Ring and little fingers
T4	Level of nipples

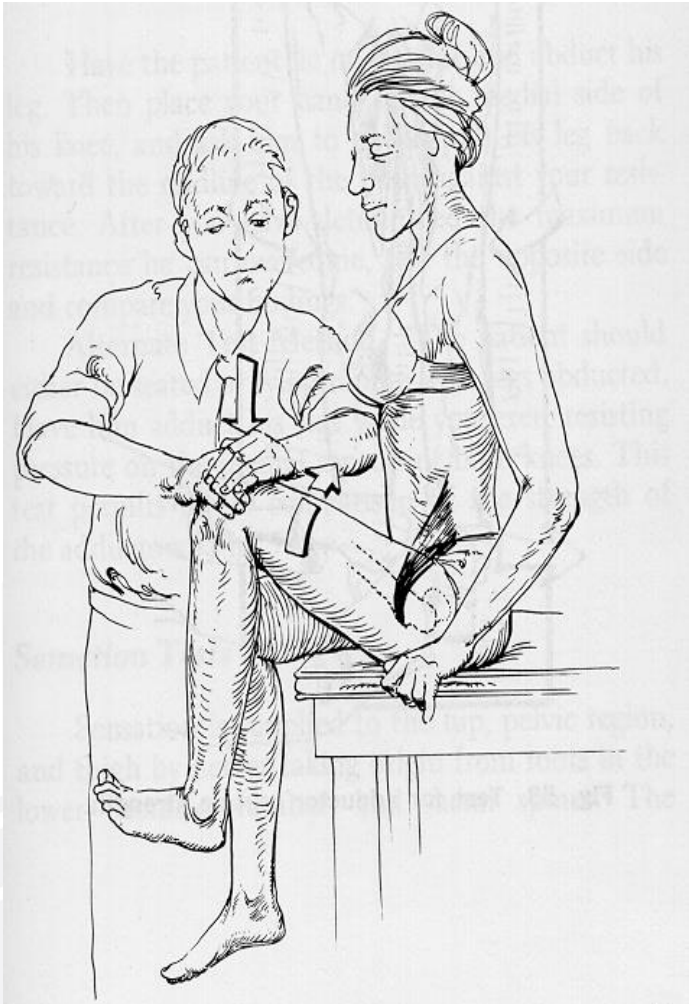
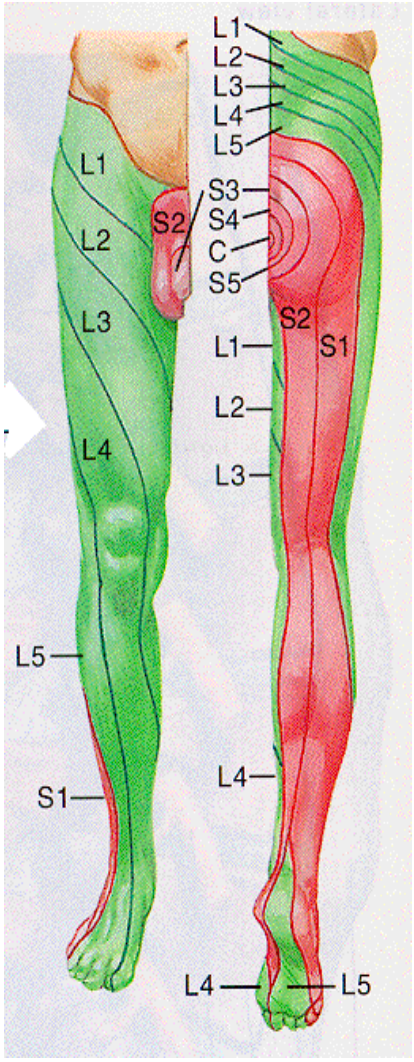


Fig. 49. Flexion muscle test for the iliopsoas muscle.



PHYSICAL EXAMINATION OF THE LUMBAR SPINE

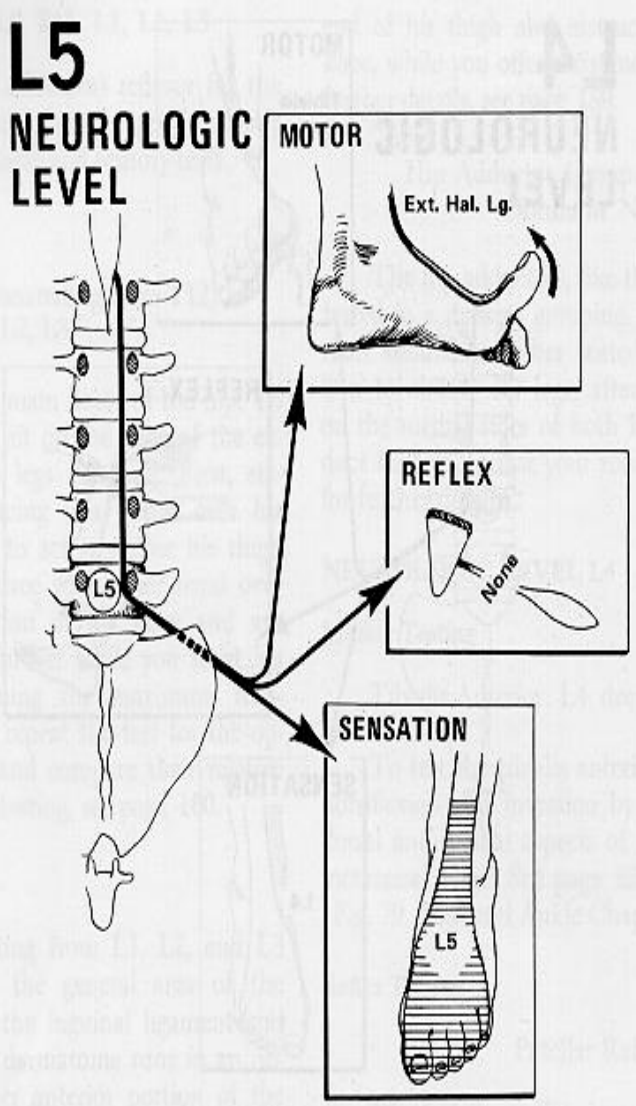


Fig. 31. Neurologic level L5.

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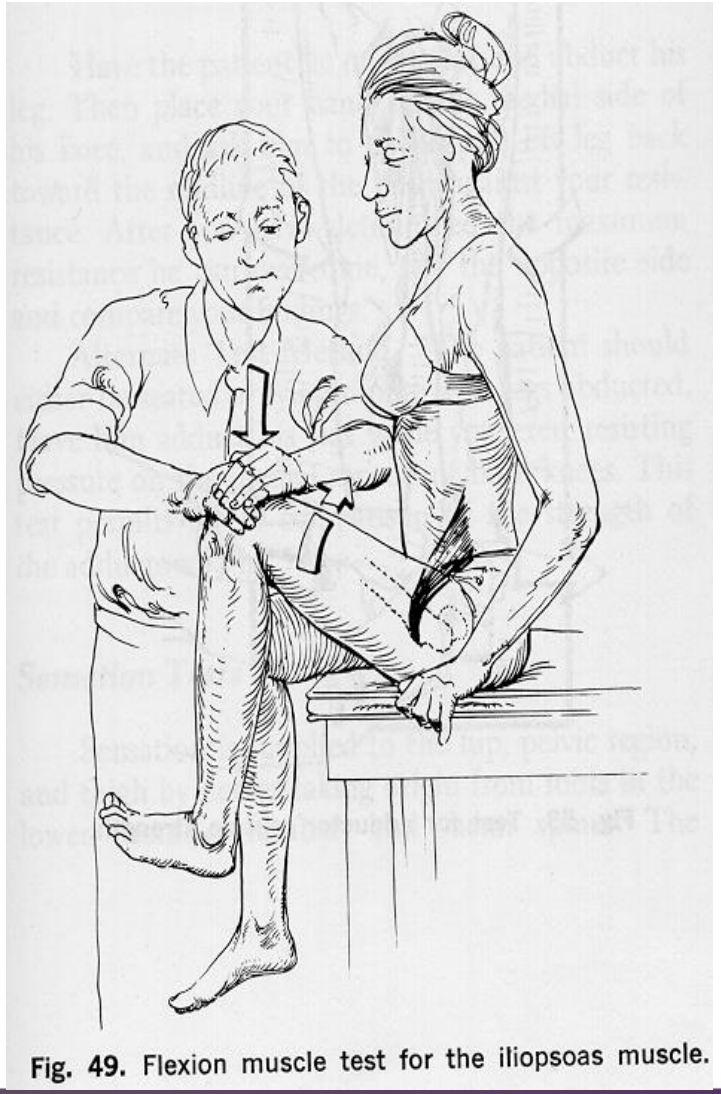
Motor/Strength Exam



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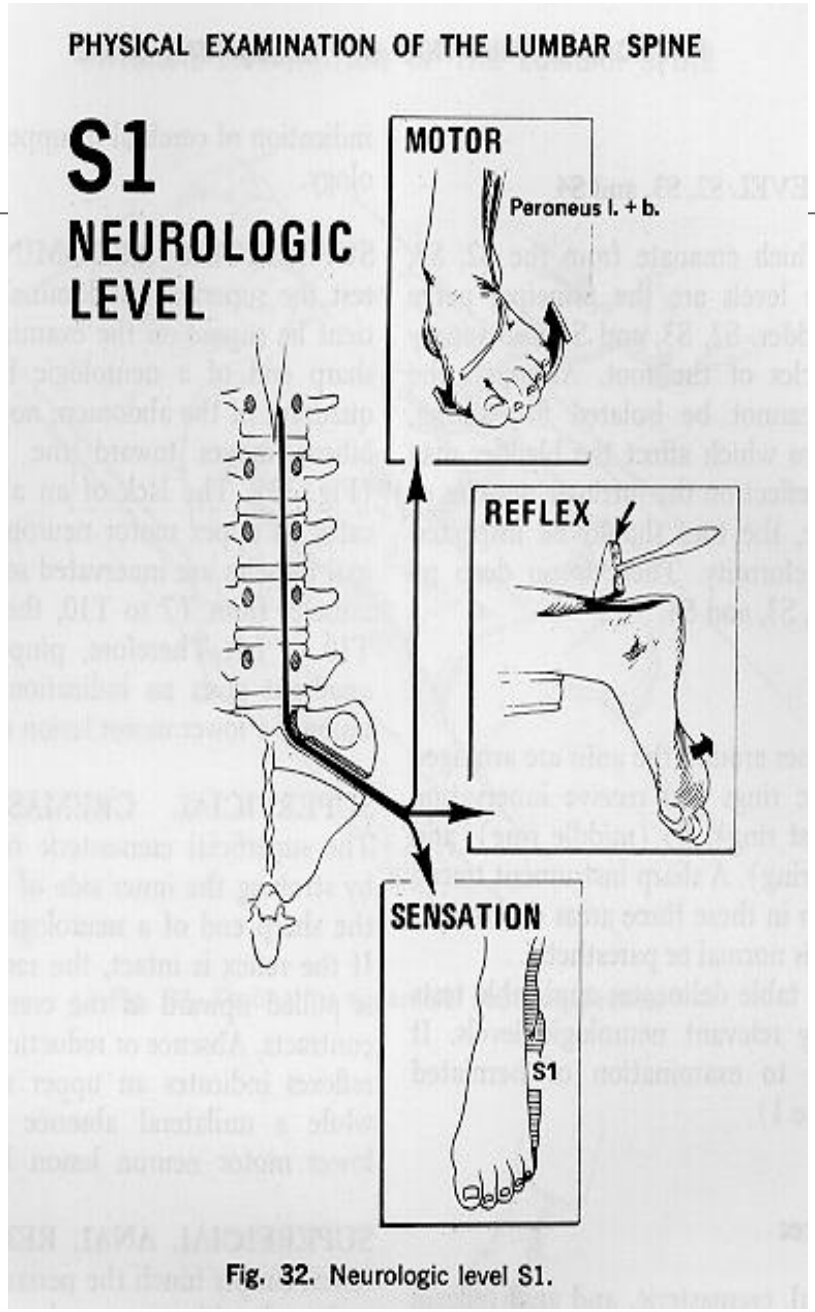

Fig. 32. Neurologic level S1.

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Accuracy of History & Exam Tests for Lumbosacral Radiculopathy

Herniated Disc (sens, spec)

- Sciatica (95%, 88%)
- Ipsilateral SLR (83%, 40%)
- Crossed SLR (25%, 90%)
- Ankle dorsilflexion weakness (35%, 70%)
- Great toe extensor weakness (50%, 70%)
- Impaired Achille's reflex (50%, 60%)
- Ankle plantar flexion weakness (6%, 95%)

Spinal Stenosis (sens, spec)

- Age > 65 (77%, 69%)
- Severe LE pain (65%, 67%)
- No pain when seated (46%, 93%)
- Symptoms worse with walking (71%, 30%)
- Numbness (63%, 59%)
- Wide-based gait (43%, 97%)
- Pinprick deficit (47%, 81%)
- Weakness (47%, 78%)
- Vibration deficit (53%, 81%)
- Absent Achille's reflex (46%, 78%)

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Motor/Strength Exam

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Tests for Core Stability

- Trendelenberg Test
- Pelvic Bridging

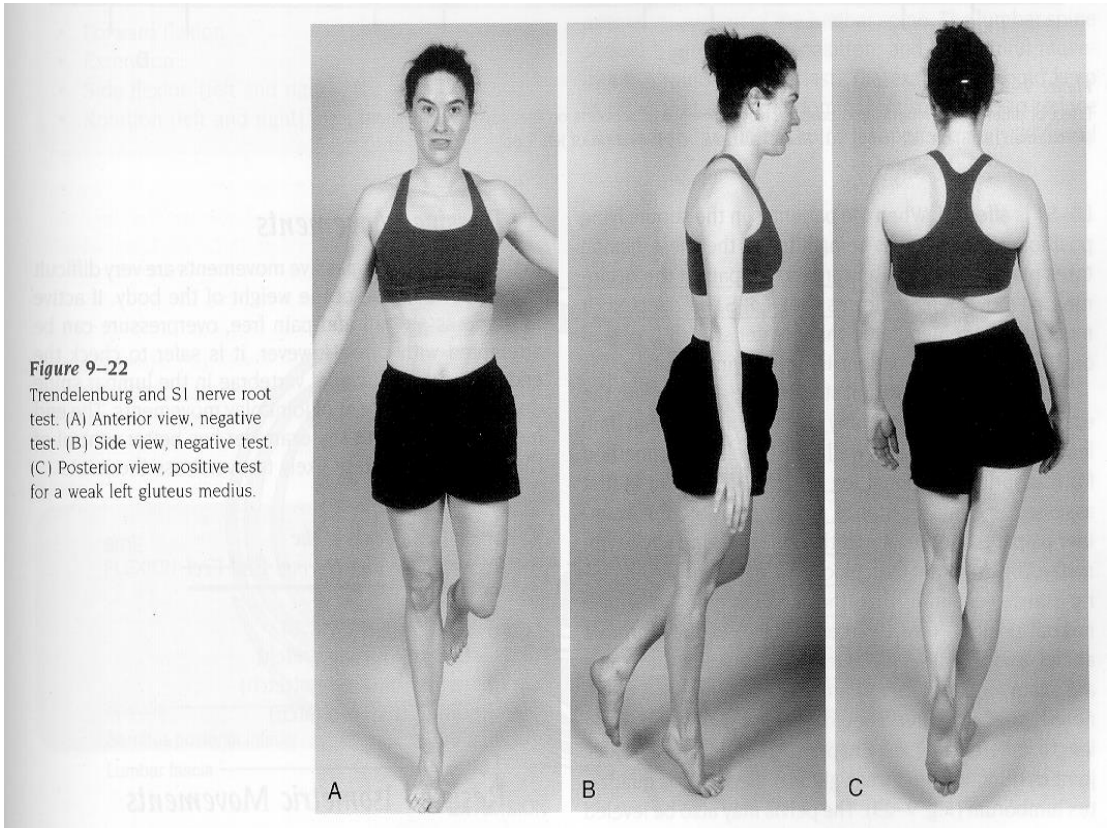

Figure 9–22
Trendelenburg and S1 nerve root test. (A) Anterior view, negative test. (B) Side view, negative test. (C) Posterior view, positive test for a weak left gluteus medius.

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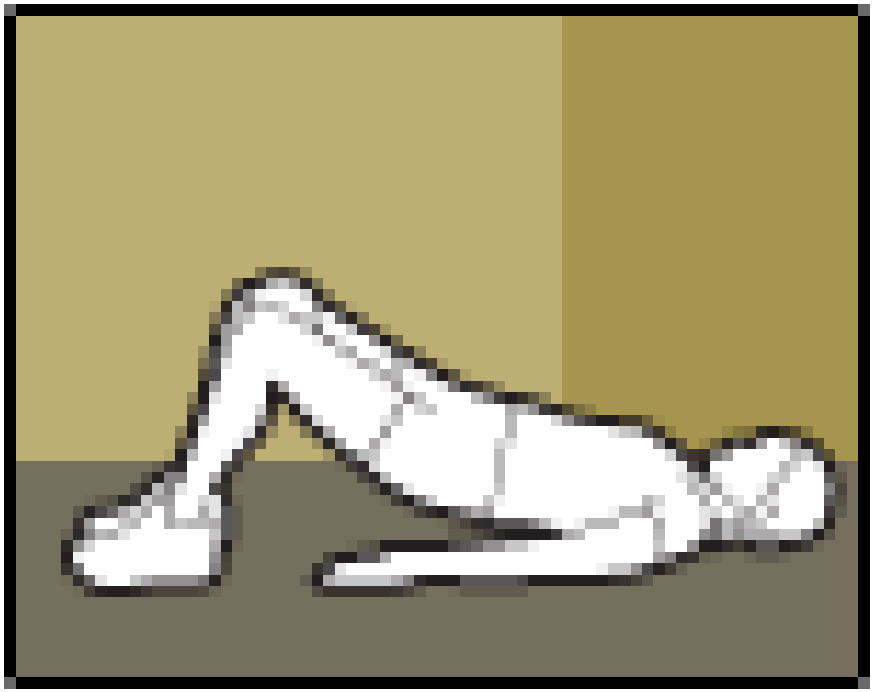
Tests for Core Stability

- Trendelenberg Test
- Pelvic Bridging



WADDELL'S SIGNS

- Simulation (Axial Loading, Rotation)
- Tenderness (Superficial)
- Distraction
- Overreaction - Exaggerated painful response to a stimulus
- Regional weakness / sensory changes

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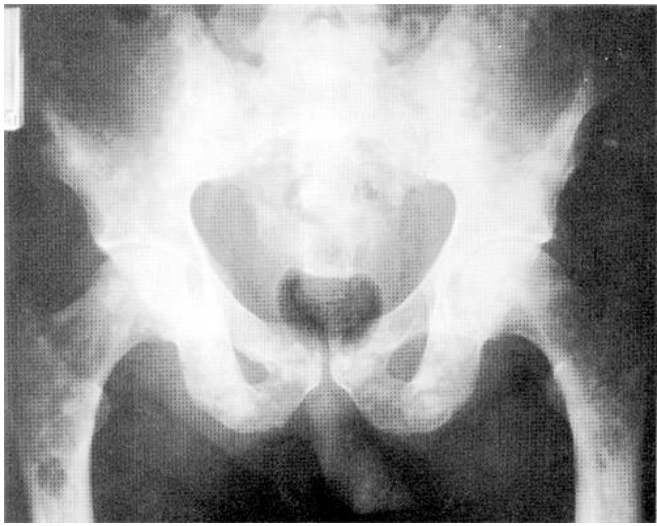
Metastatic Disease

- BLT KP
- Myeloma, Lymphoma, Sarcoma
- 96% of spinal metastases, back pain is the initial symptom



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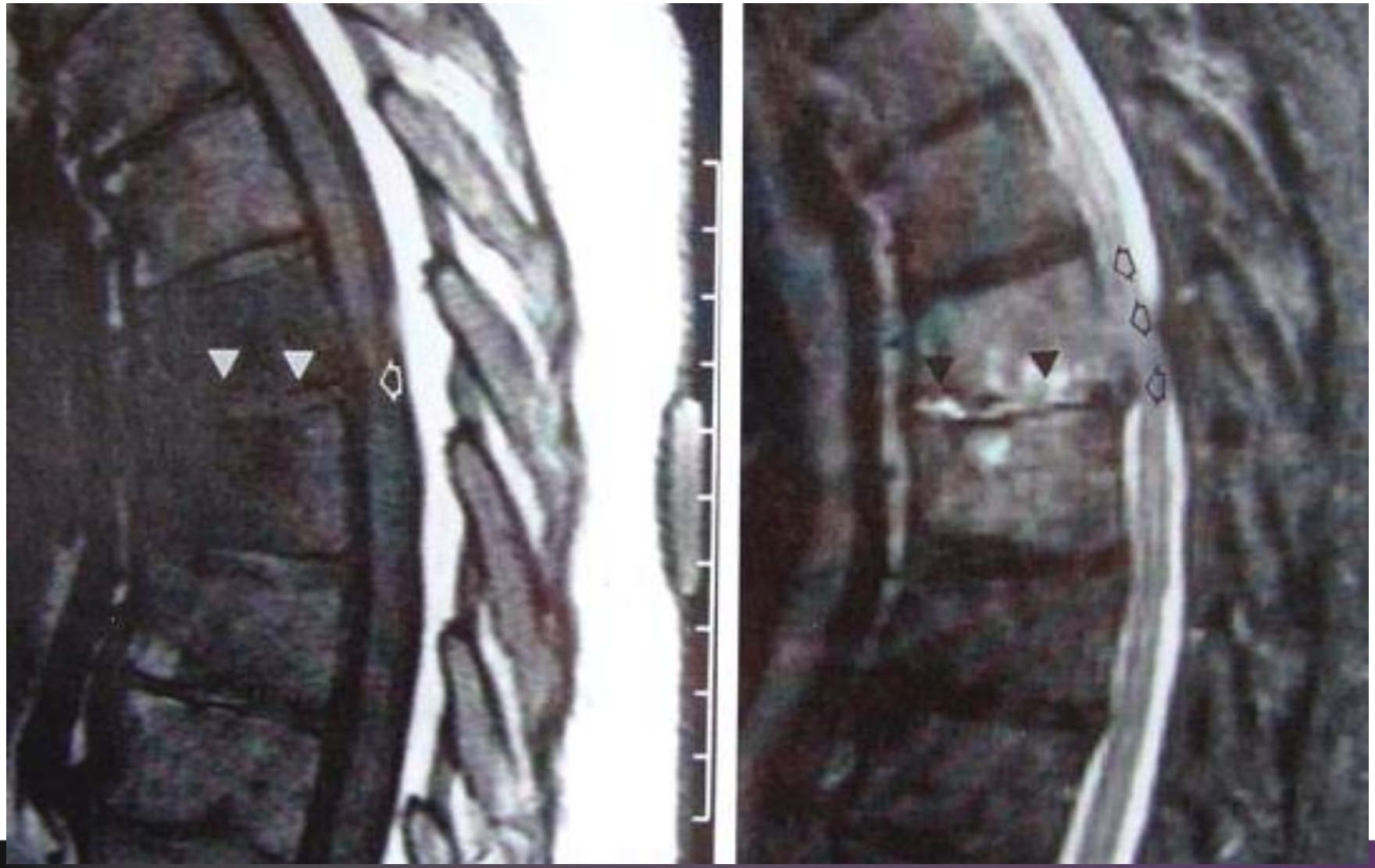
Discitis



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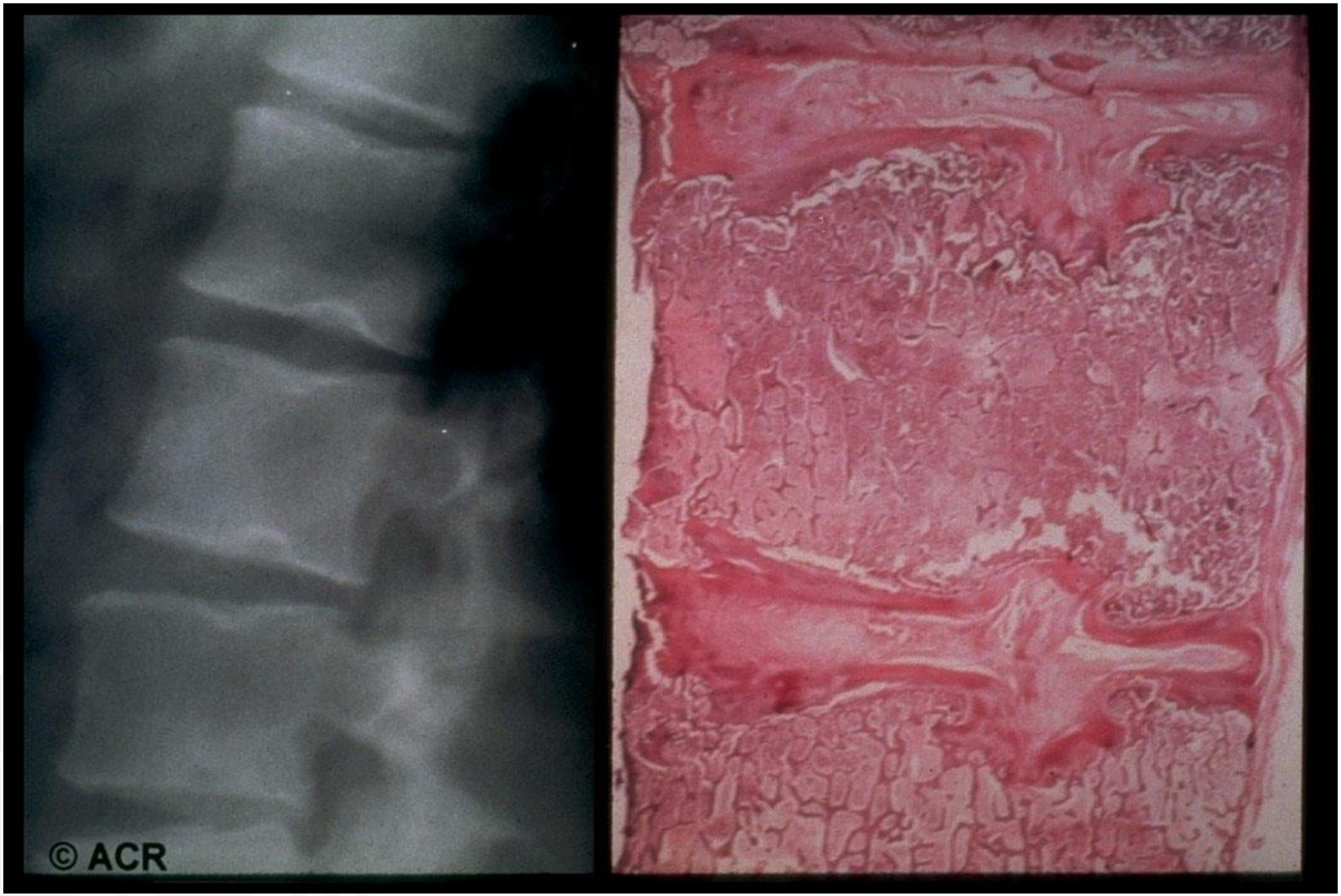
Spondylosis



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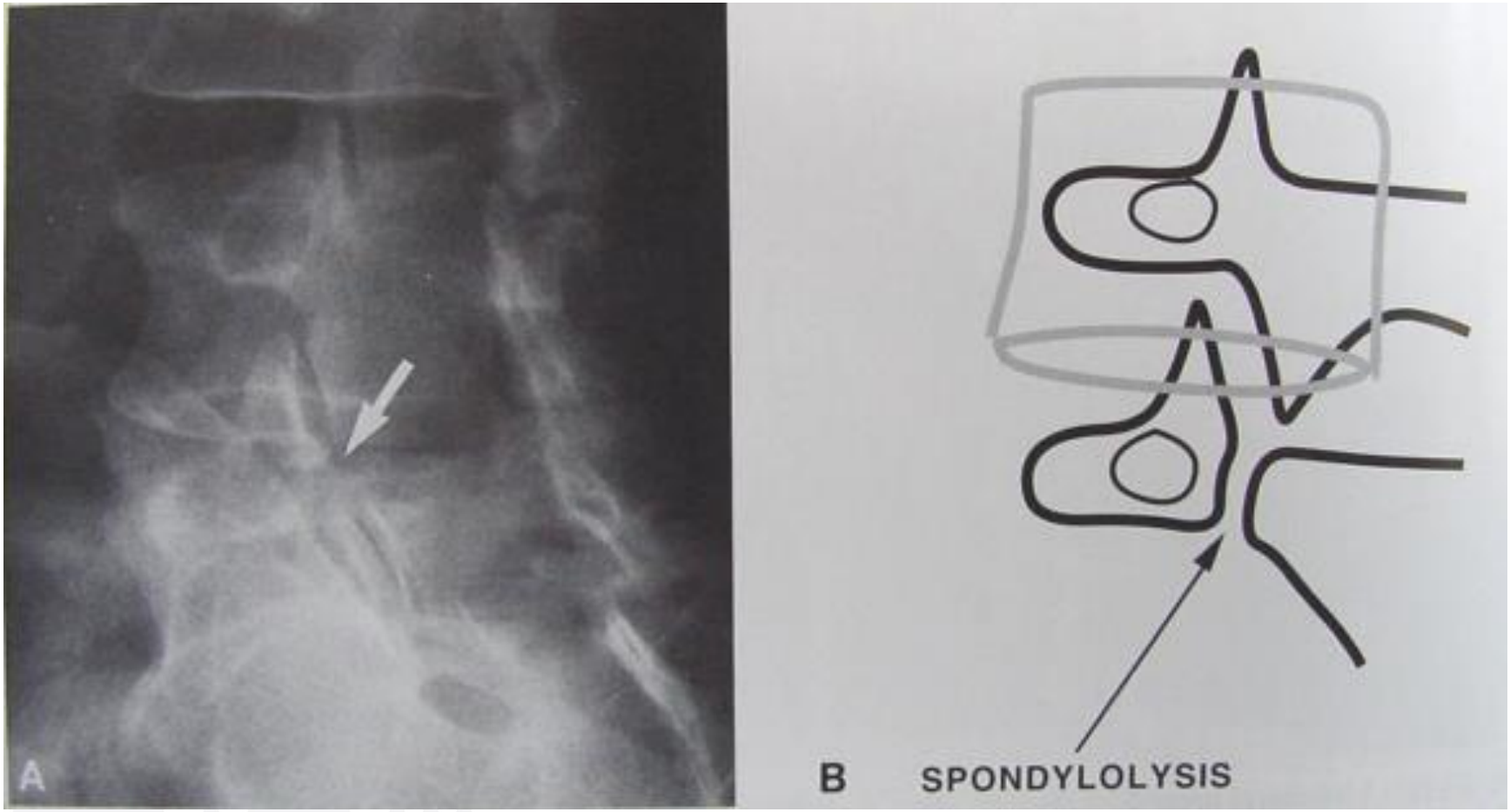
Spondylolysis



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Spondylolysis

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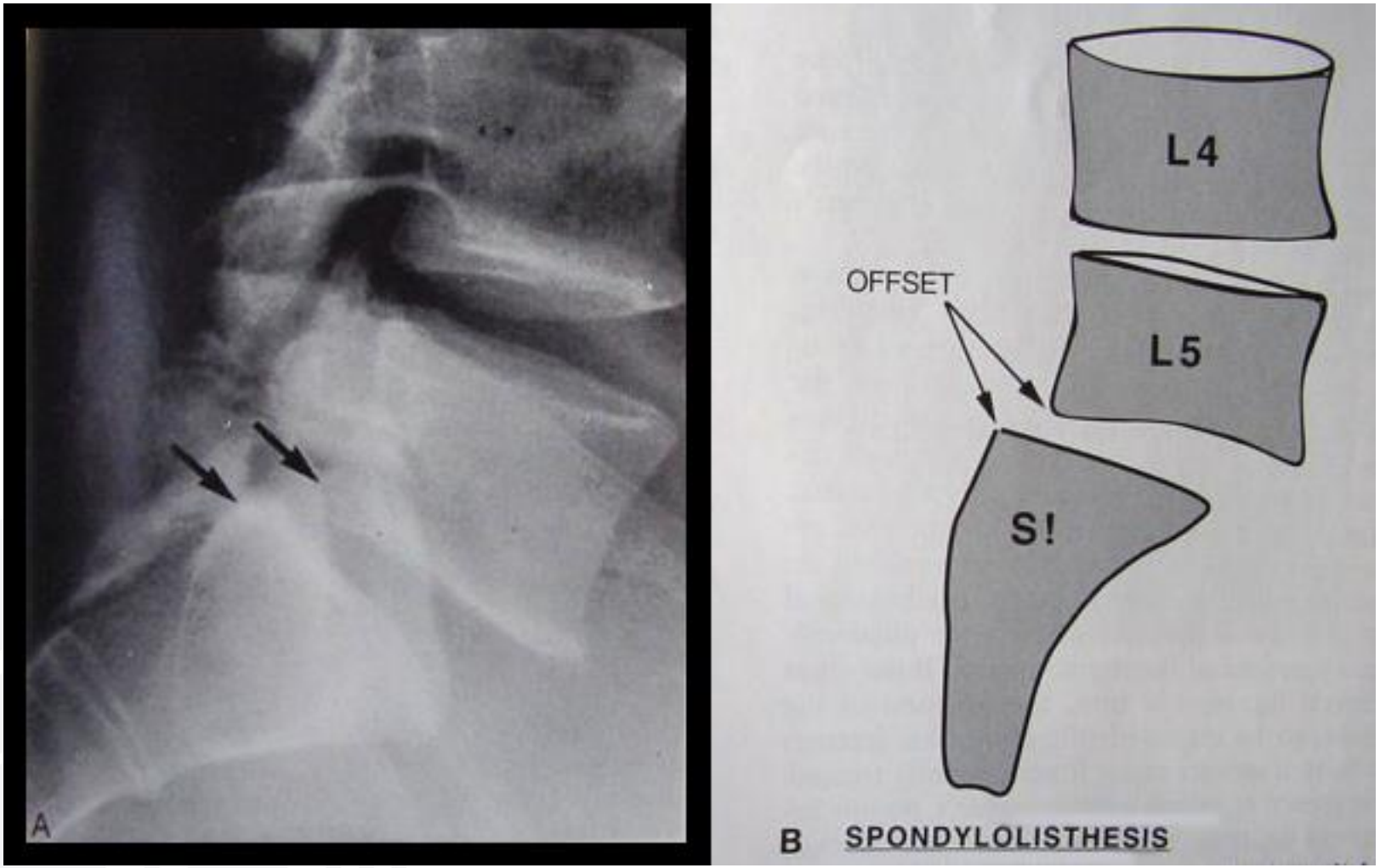
Spondylolisthesis



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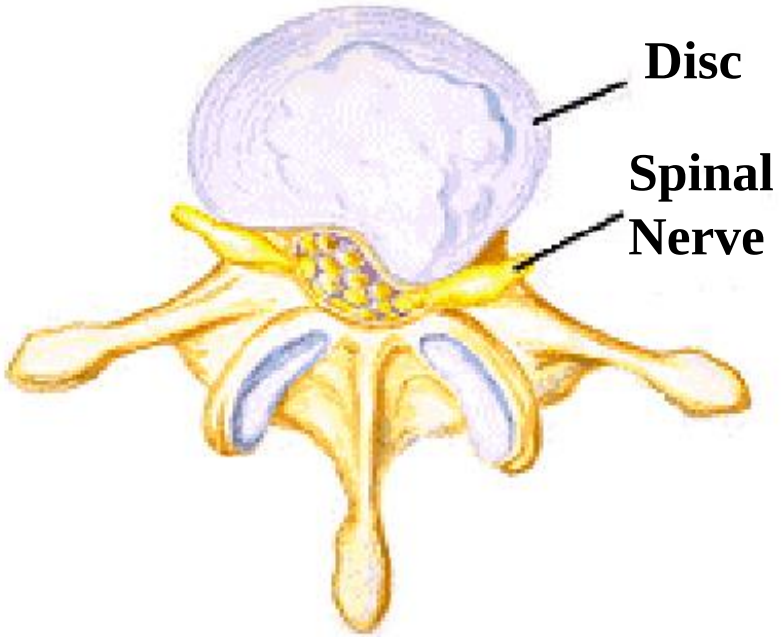
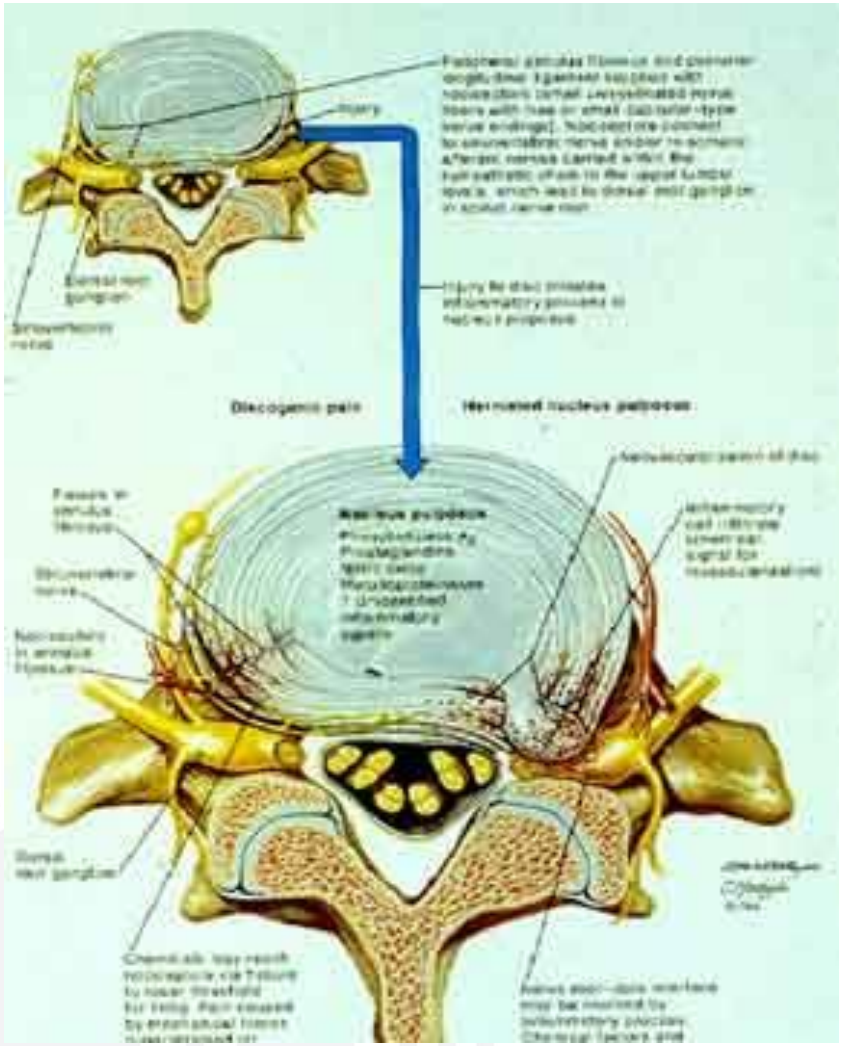
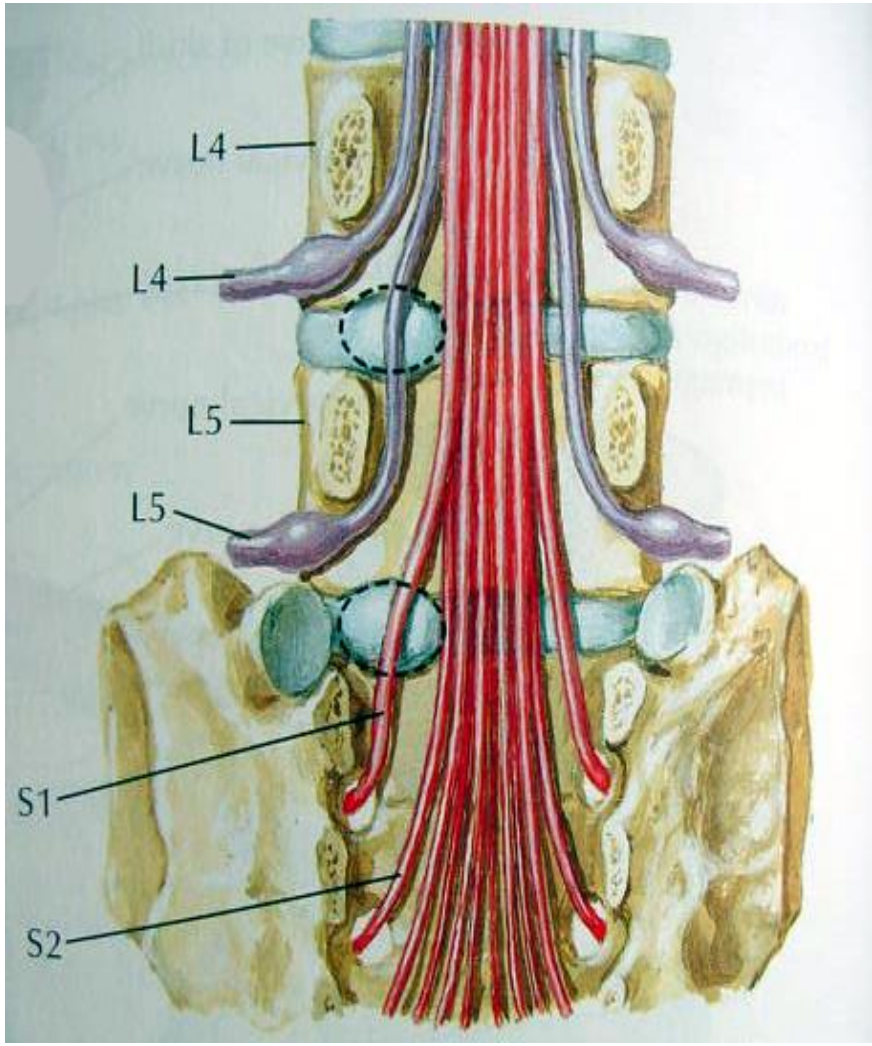
Nerve Root Impingement *(Radiculopathy)*

- Only represent 1% of all patients with LBP
- Causes:
  - Herniated nucleus pulposus
  - Foraminal stenosis
  - Mass occupying lesion




Discogenic pain
Herniated nucleus pulposus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L4
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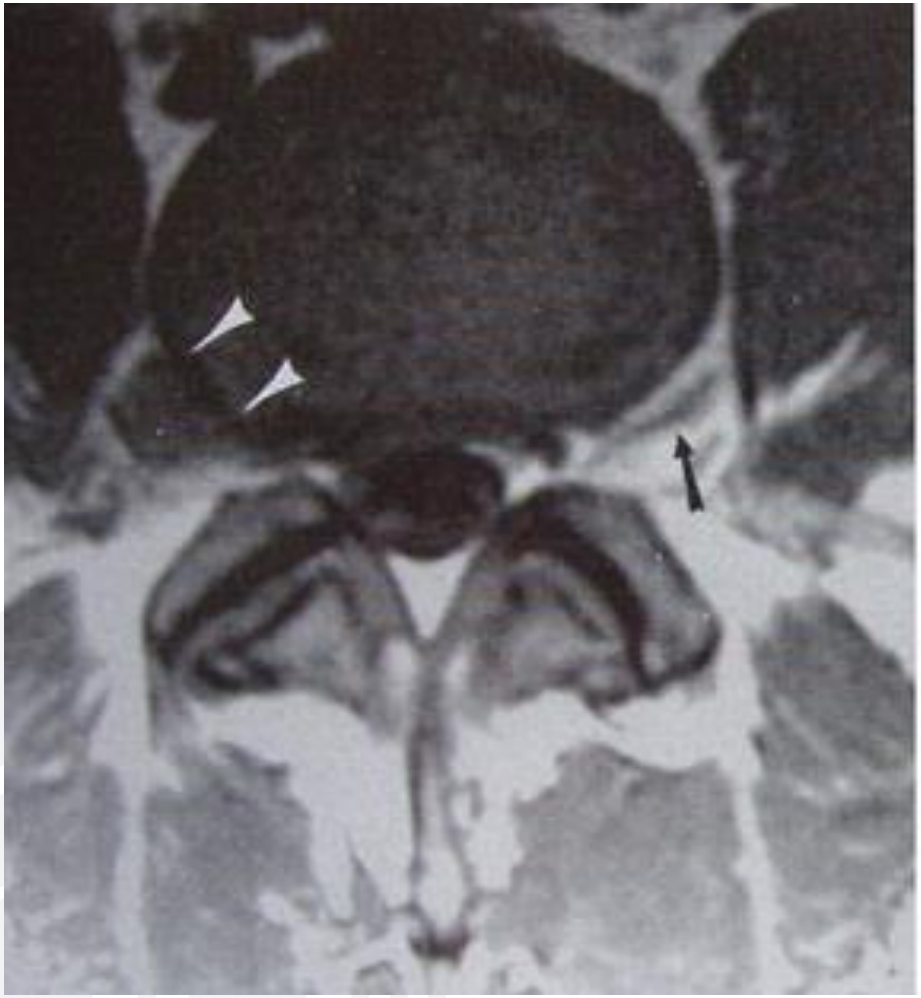

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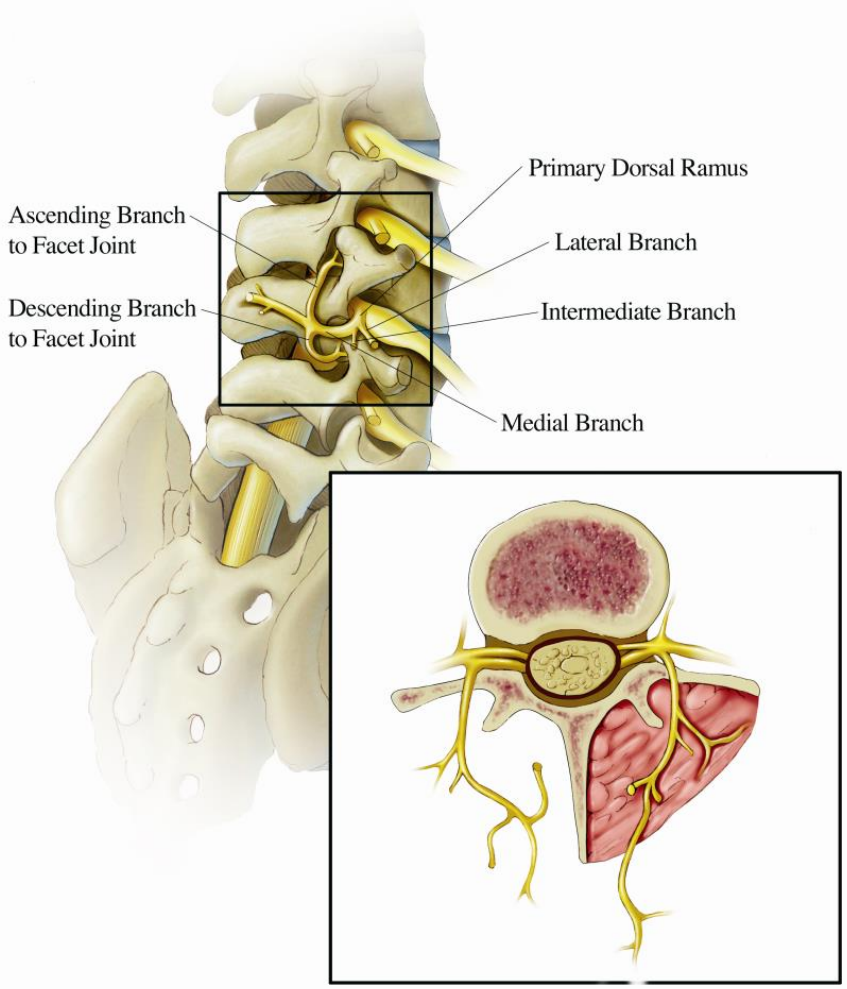
Facet Joint Pathology

- True synovial joints
- Innervation by 2 medial branches
- Protect against axial rotation, shearing forces, and assist disc in resisting compressive forces in lordotic postures
- Prevalence varies between 5-15% in L-spine, 35-50% in C-spine, and 35-45% in T-spine
- Load borne by l-z-joints varies between 3-25% of axial load



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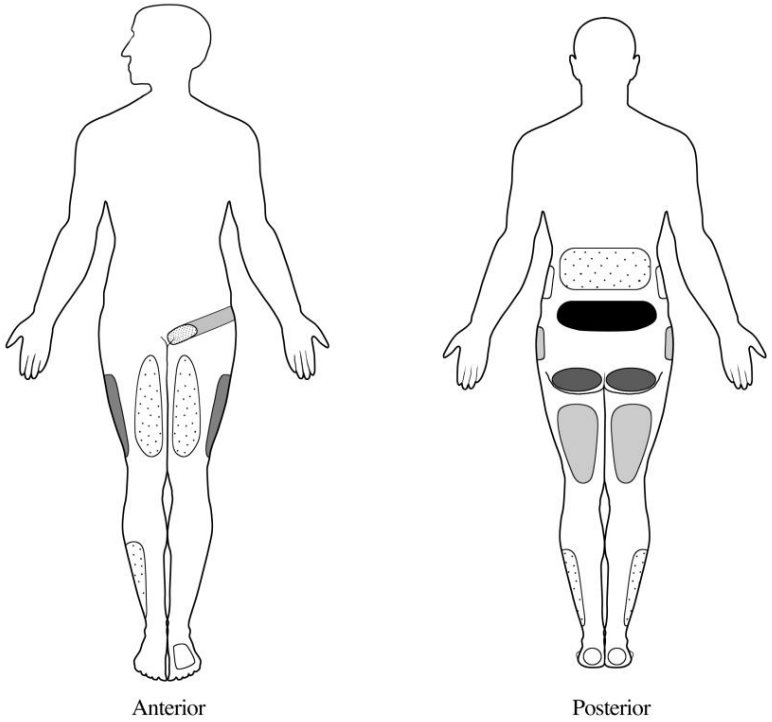
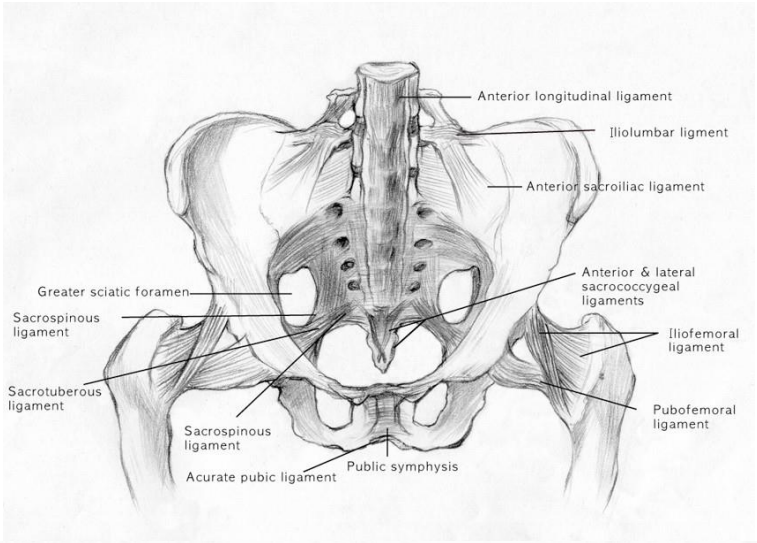
Diagnosis

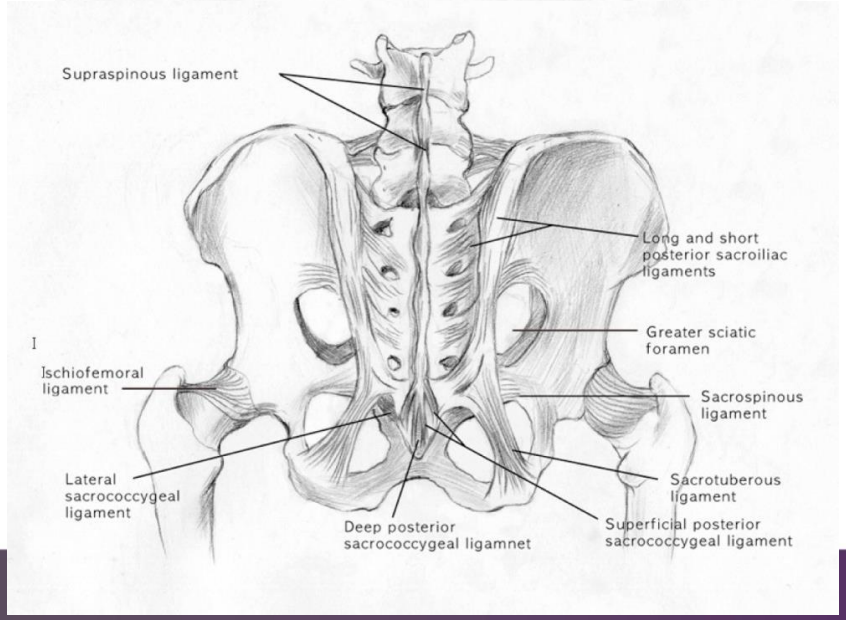
- No single historical or PE exam sign can reliably identify facet block responders
  - Paraspinal tenderness weakly associated with facet block and RF treatment outcomes
- Imaging has low specificity for identifying a painful z-joint
- Medial branch blocks and IA injections often touted as “equivalent”, but this is unproven.
- MBB may be more predictive of RF treatment outcome, and IA may be more specific for identifying a painful joint
  - Face Validity
  - Comparison of clinical trials evaluating RF denervation



Sacroiliac Joint Pain Prevalence Rates

- Underestimated by surgeons & PCPs
- Heterogeneous condition
- Represents 15%-30% of cases of axial LBP below L5
- Bi-modal peaks in prevalence rates
- Intra- and extra-articular etiologies
- 40%-50% 2º to trauma





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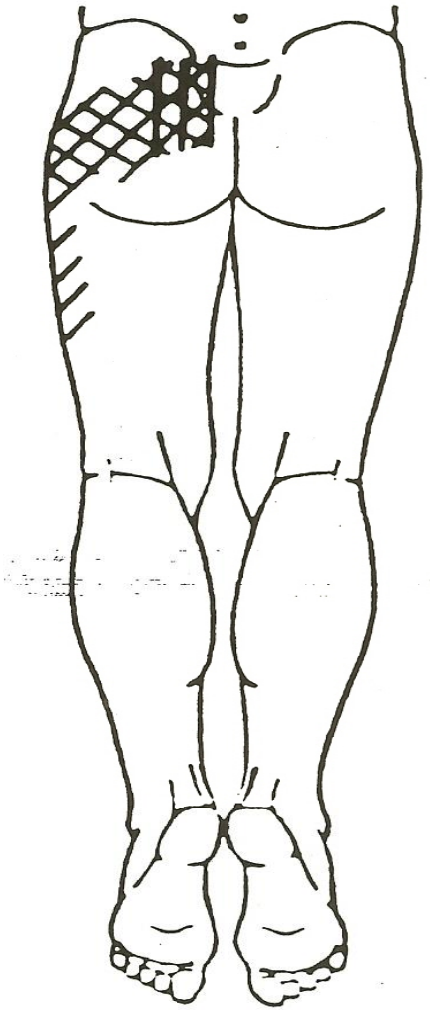
Predisposing Factors

- Rotation and axial loading
- Leg length discrepancy
- Pelvic & scapular obliquity
- Scoliosis
- Previous back surgery
- Lumbar pathology/ Transitional anatomy
- Pregnancy

SI Joint Pain Referral Zones

- Retrospective analysis in 50 pts diagnosed with SIJ pain based on diagnostic blocks (Slipman et al. 2000)
  - 47 described buttock pain (94%)
  - 36 described lower lumbar pain (72%)
  - 25 had lower extremity pain (50%)
  - 14 had leg pain distal to the knee (28%)
  - 7 described groin pain (14%)
  - 6 reported foot pain (12%)



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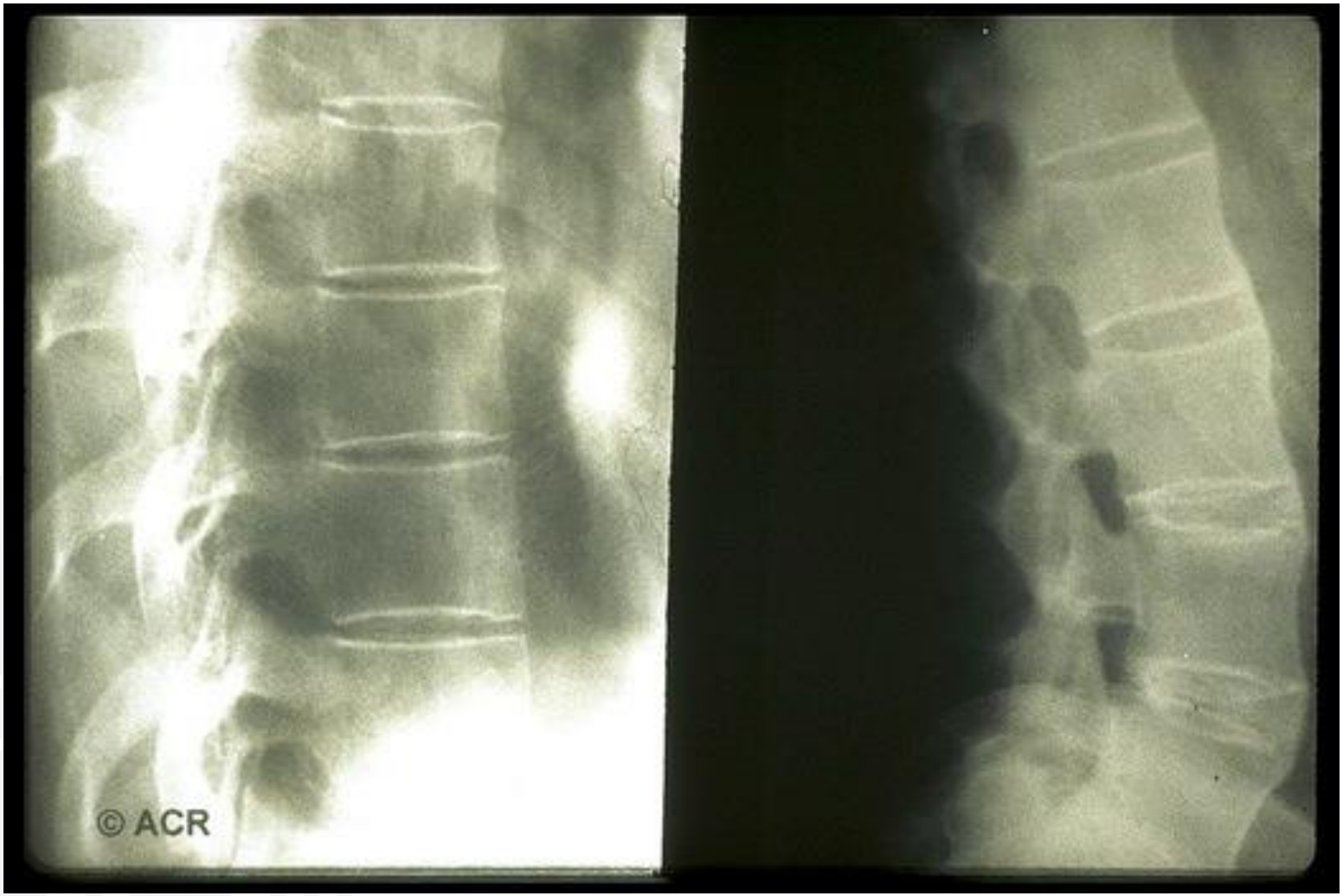
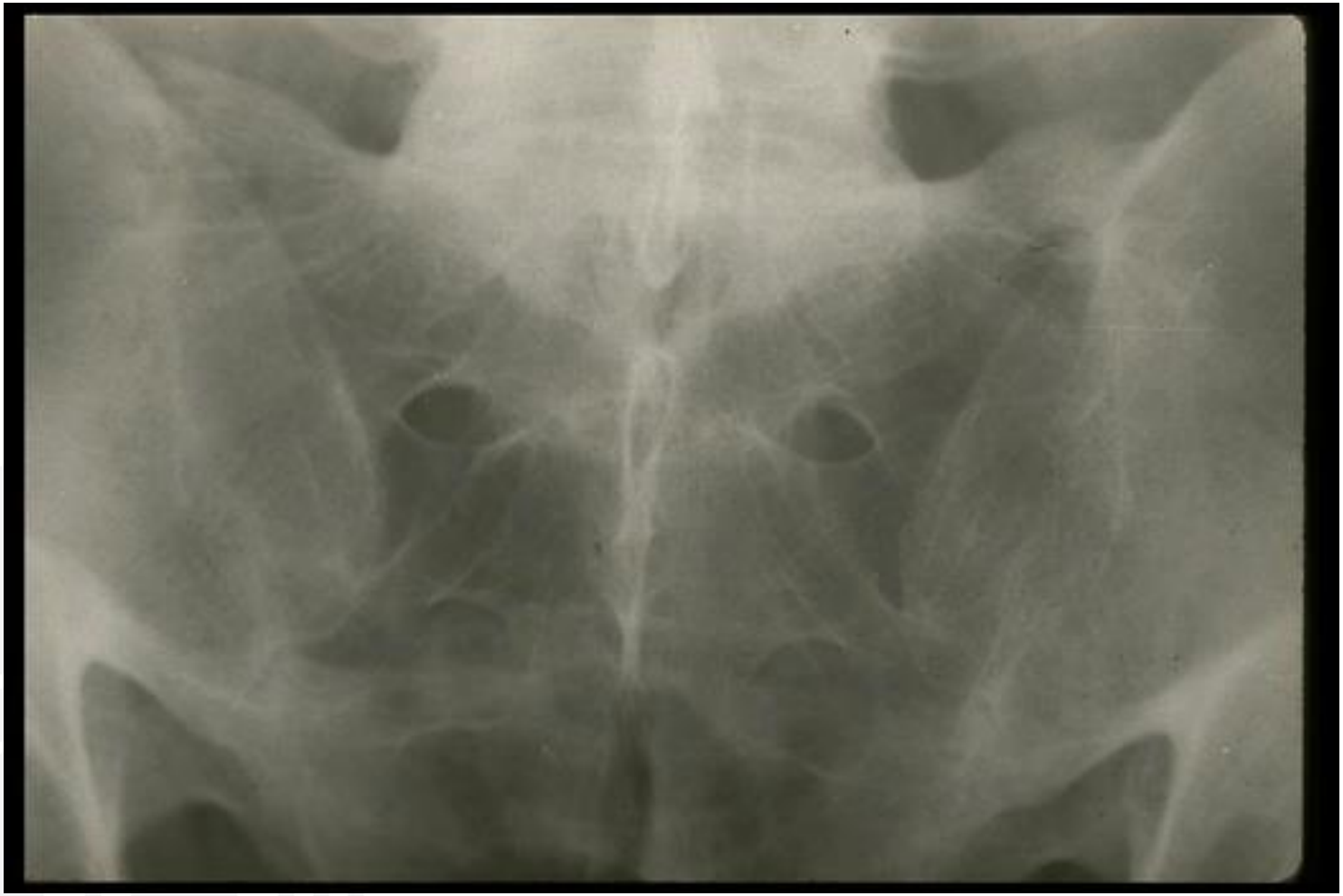
Ankylosing Spondylitis






© ACR

HLA-B27: Disease Associations

Disease	Association
Ankylosing Spondylitis	> 90%
Reiter's Syndrome	80%
Reactive Arthritis	85%
Inflammatory Bowel Disease	50%
Psoriatic Arthritis	
With Spondylitis	50%
With Peripheral Arthritis	15%
Whipple's Disease	30%

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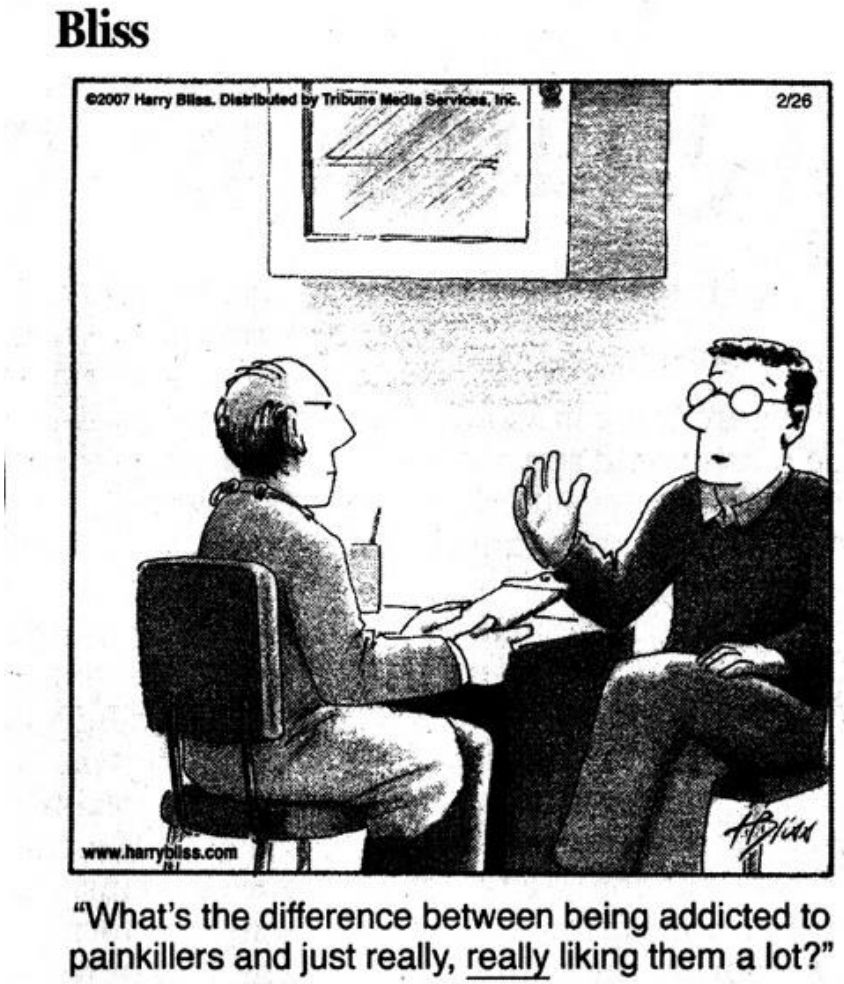
Evidence Based Treatments

- Acute Low Back Pain
- Chronic Low Back Pain



Negative Outcome Predictors for Back Pain

- Previous LBP episode
- Low education
- High physical job stress
- Physically demanding job
- Poor job satisfaction
- Obesity
- Somatization
- Low levels of physical activity
- Older age
- Poor coping skills
- High anxiety levels
- Depression
- "Negative" attitude
- Smoking
- Fear-avoidance
- Catastrophization
- Ongoing litigation
- Higher baseline pain & disability
- Not having opportunity for reduced work load after RTD

Adapted from Cohen et al. BMJ 2009

Appendix Table 5. Level of Evidence and Summary Grades for Noninvasive Interventions in Patients with Acute Low Back Pain*

Intervention	Level of Evidence	Net Benefit	Grade
Acetaminophen	Fair	Moderate	B
Nonsteroidal anti-inflammatory drugs	Good	Moderate	B
Skeletal muscle relaxants	Good	Moderate	B
Superficial heat	Good	Moderate	B
Advice to remain active	Good	Small (no significant harms)	B
Benzodiazepines	Fair	Moderate	B
Opioids and tramadol	Fair	Moderate	B
Self-care education books	Fair	Small (no significant harms)	B
Herbal therapies	Fair (devil's claw and white willow bark) to poor (cayenne)	Moderate (devil's claw and white willow bark), unable to estimate (cayenne)	B (devil's claw and white willow bark)
Spinal manipulation	Fair	Small to moderate	B/C
Advice to rest in bed	Good	No benefit	D
Exercise therapy	Good	No benefit	D
Systemic corticosteroids	Fair	No benefit	D
Aspirin	Poor	Unable to estimate	I
Acupuncture	Poor	Unable to estimate	I
Back schools	Poor	Unable to estimate	I
Interferential therapy	Poor	Unable to estimate	I
Low-level laser	Poor	Unable to estimate	I
Lumbar supports	Poor	Unable to estimate	I
Massage	Poor	Unable to estimate	I
Modified work	Poor	Unable to estimate	I
Shortwave diathermy	Poor	Unable to estimate	I
Transcutaneous electrical nerve stimulation	Poor	Unable to estimate	I
Superficial cold	Poor	Unable to estimate	I

* See Appendix Tables 1, 2, and 3 for explanation of grades. Low back pain is considered acute if its duration is <4 weeks.

Appendix Table 6. **Level of Evidence and Summary Grades for Noninvasive Interventions in Patients with Chronic or Subacute Low Back Pain***

Intervention	Level of Evidence	Net Benefit	Grade
Acetaminophen	Fair	Small (no significant harms)	B
Acupuncture	Fair (some inconsistency vs. sham acupuncture)	Moderate	B
Psychological therapy (cognitive-behavioral therapy or progressive relaxation)	Good for cognitive-behavioral, fair for progressive relaxation	Moderate (cognitive-behavioral) to substantial (progressive relaxation)	B
Exercise therapy	Good	Moderate	B
Interdisciplinary rehabilitation	Good	Moderate	B
Nonsteroidal anti-inflammatory drugs	Good	Moderate	B
Spinal manipulation	Good	Moderate	B
Opioids and tramadol	Fair (primarily indirect evidence from trials of patients with other pain conditions)	Moderate	B
Brief individualized educational interventions	Fair	Moderate	B
Benzodiazepines	Fair	Moderate	B
Massage	Fair	Moderate	B
Yoga	Fair (for Viniyoga) to poor (for Hatha yoga)	Moderate (Viniyoga), unable to estimate (Hatha yoga)	B (Viniyoga)
Tricyclic antidepressants	Good	Small to moderate	B/C
Antiepileptic drugs	Fair (for gabapentin) to poor (for topiramate)	Small (gabapentin in patients with radiculopathy), unable to estimate (topiramate)	C (gabapentin), I (topiramate)
Back schools	Fair (some inconsistency)	Small	C
Firm mattresses	Fair	No benefit or harm	D
Traction	Fair	No benefit (continuous or intermittent traction), small to moderate (autotraction for sciatica)	D (continuous or intermittent traction), C (autotraction for sciatica)
Aspirin	Poor	Unable to estimate	I
Biofeedback†	Poor	Unable to estimate	I
Interferential therapy	Poor	Unable to estimate	I
Low-level laser	Poor	Unable to estimate	I
Lumbar supports	Poor	Unable to estimate	I
Shortwave diathermy	Poor	Unable to estimate	I
Skeletal muscle relaxants	Poor	Unable to estimate	I
Transcutaneous electrical nerve stimulation	Poor	Unable to estimate	I
Ultrasonography	Poor	Unable to estimate	I

* See **Appendix Tables 1, 2, and 3** for explanation of grades. Low back pain is considered subacute at 1–3 months' duration and chronic at >3 months' duration.
† The use of auditory or visual signals reflecting muscle tension or activity to learn how to inhibit or reduce the muscle activity.

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Manipulation


YOU WON'T FEEL A THING
MITCHELL REPORT
ROCKET
22

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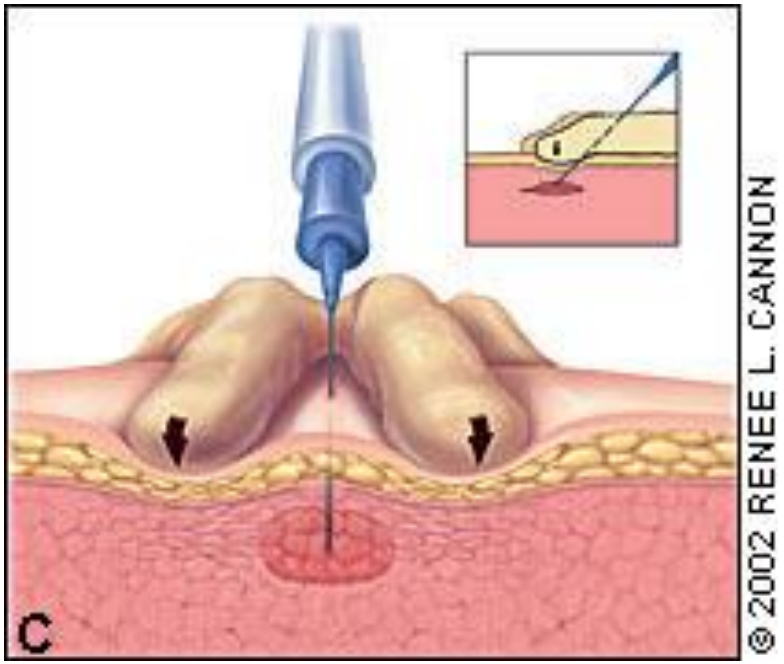
Myofascial Pain Syndrome

Trigger Points:

- Treatments
  - Spray and stretch
  - Ultrasound
  - Massage
  - Manipulation
  - Trigger point injection
- Injection material
  - 1cc lidocaine
  - +/- Corticosteroid
  - Dry needle (more post injection soreness)
- Disrupts the pain cycle
  - Stops hyper-responsive signals



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Epidural Steroid Injections

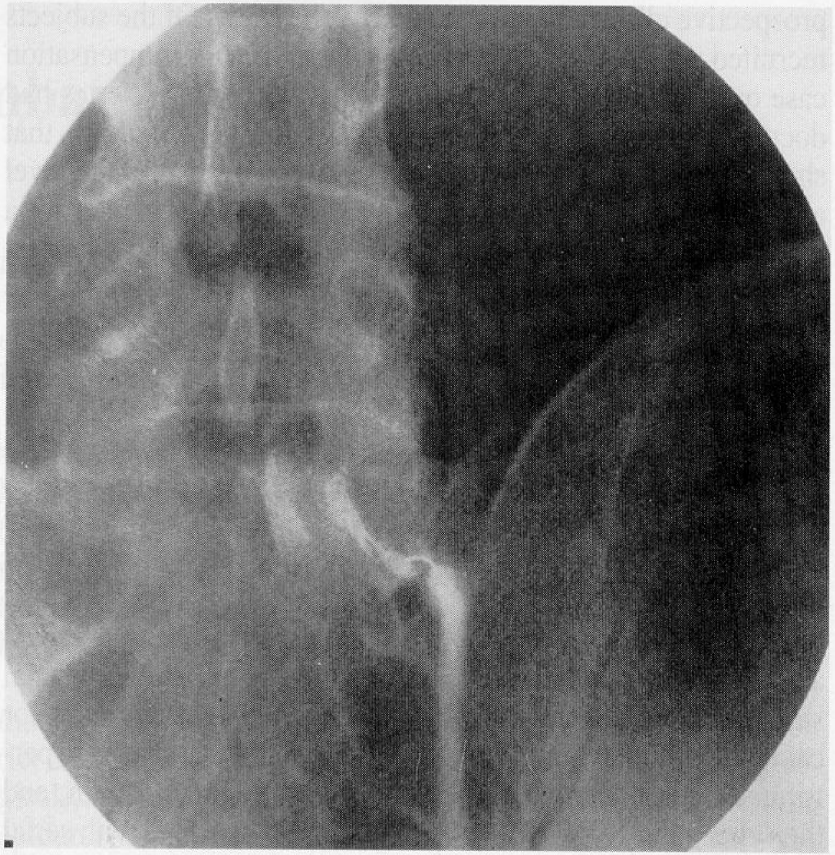

Fig 3. Example of an S1 transforaminal epidural injection on the anterior-posterior fluoroscopic projection demonstrating contrast outlining the right S1 nerve roots.

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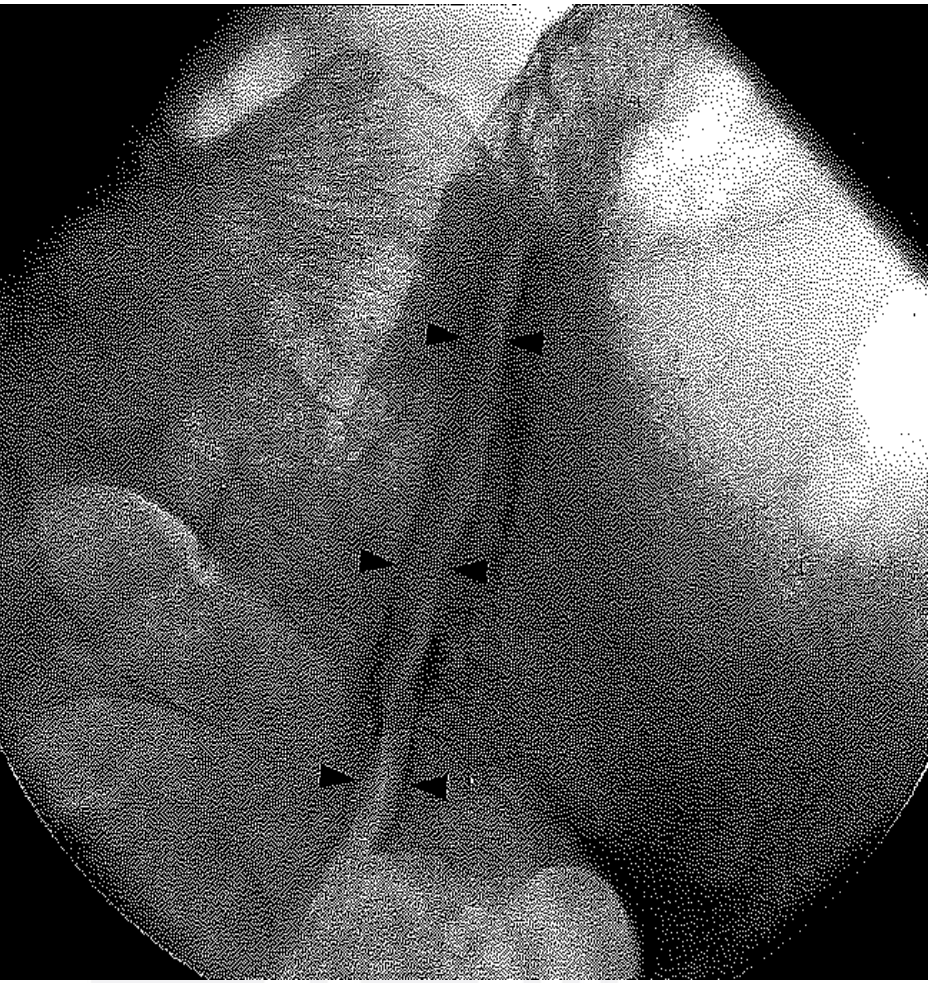
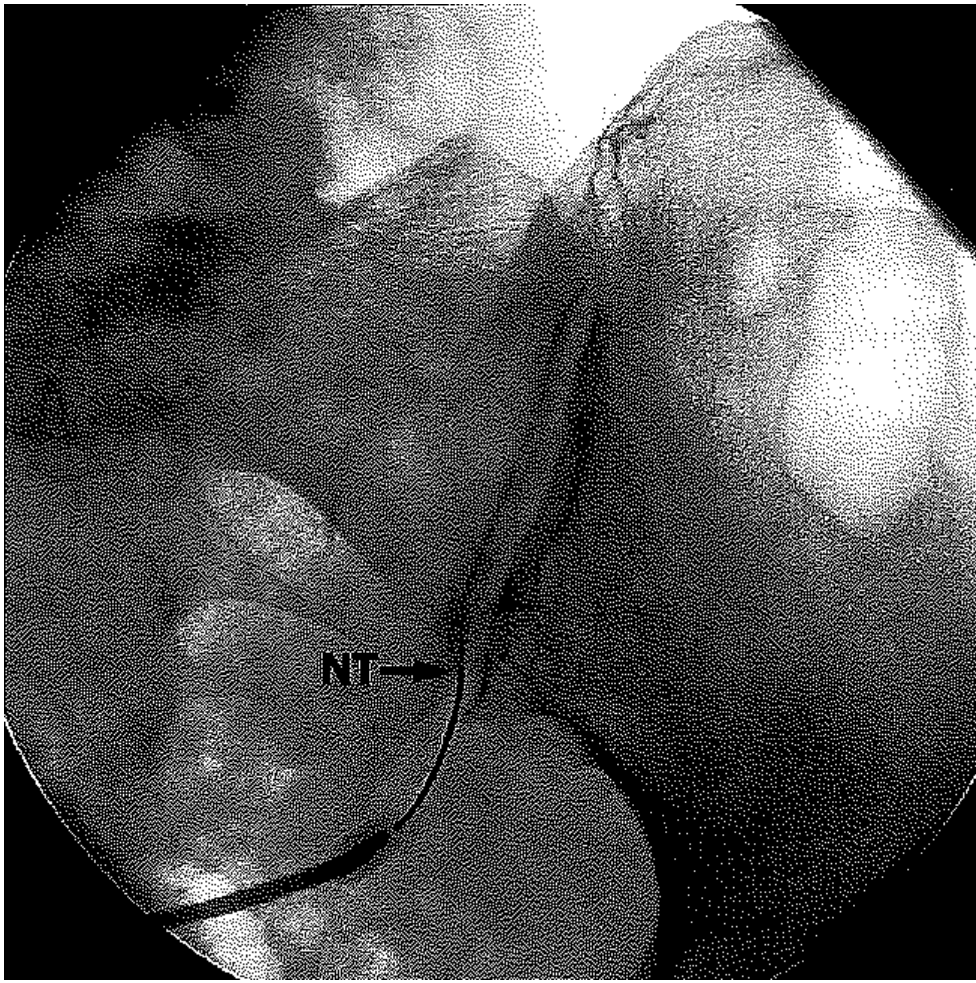
Sacroiliac Joint Injections





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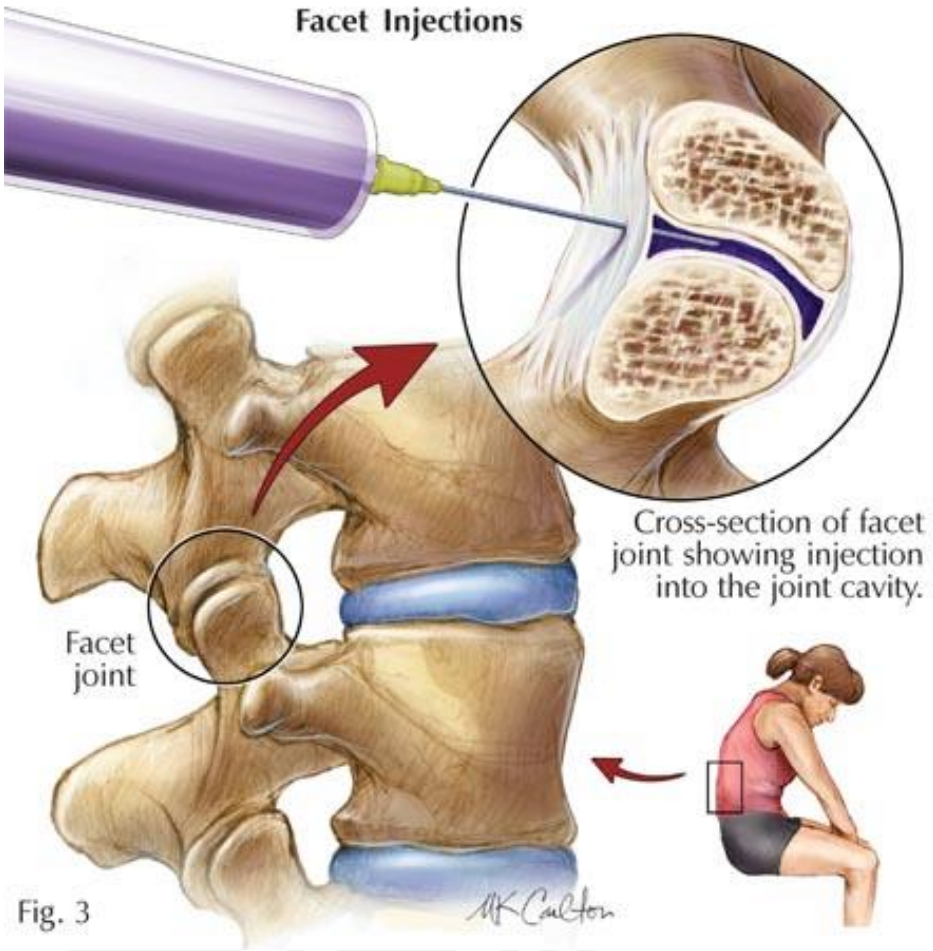
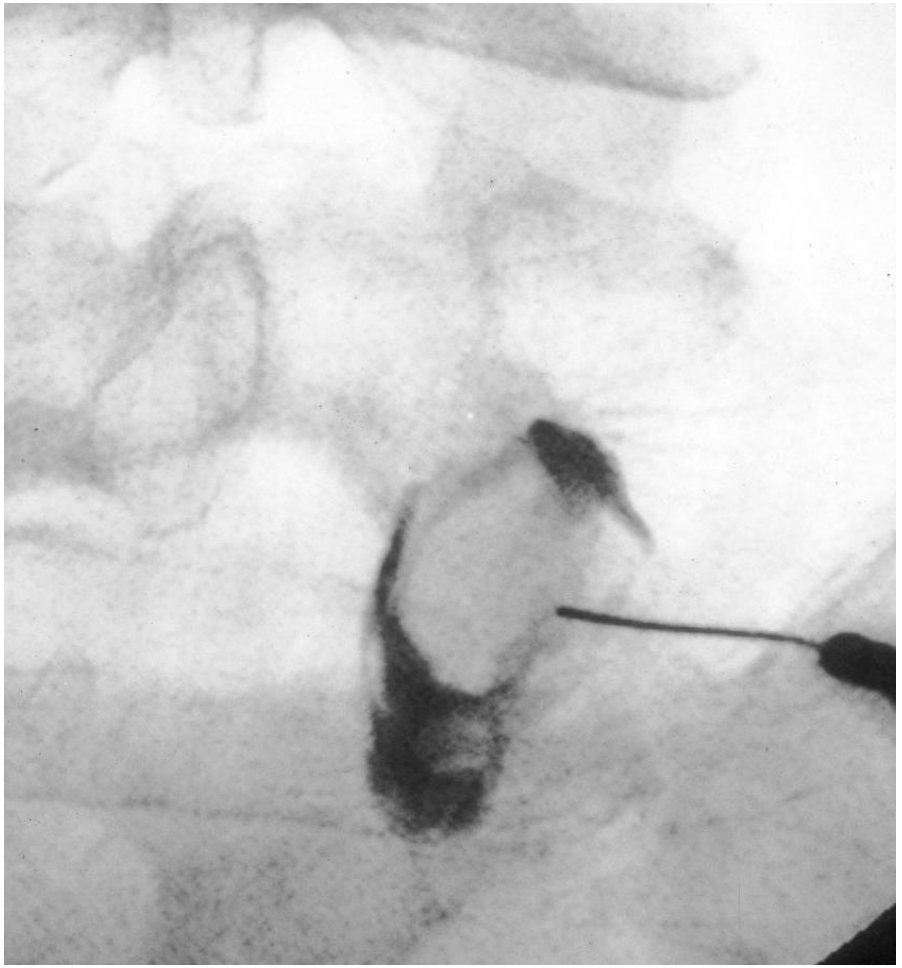
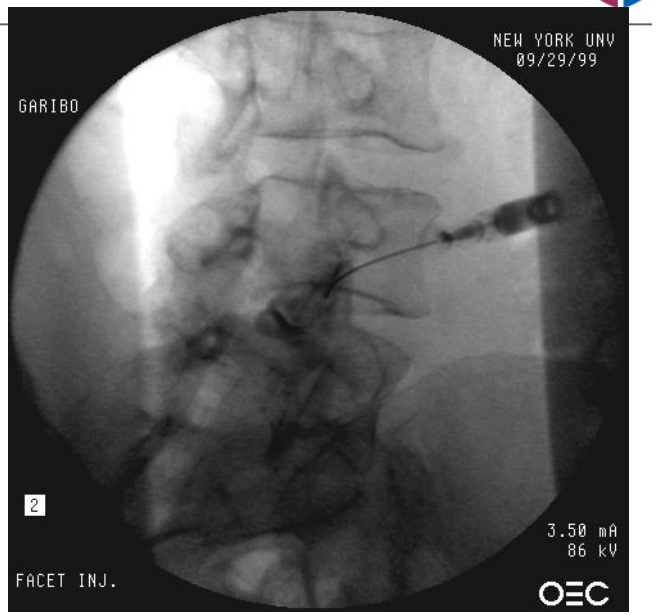
Intra-articular Facet Injection

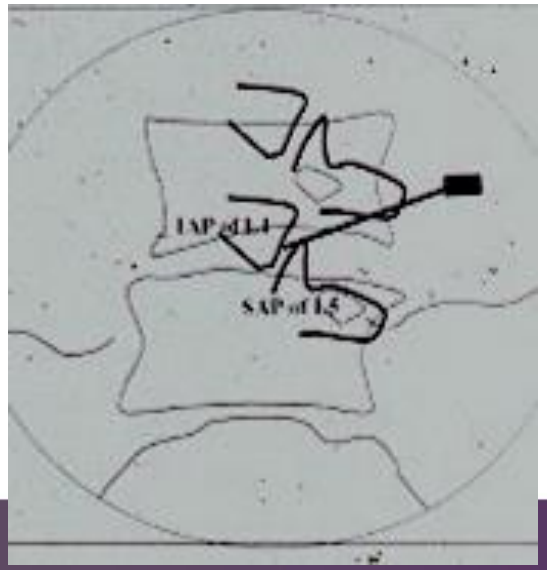




Intra-Articular & MBB as Treatments

- IA injections shown to be ineffective in 3 RCTs
  - Anecdotal evidence & results of a small (n=46) RCT comparing it to MBB in those with (+) SPECT scans suggests they may provide intermediate-term relief in a subset of patients with acute inflammation
- MBB blocks: Very weak evidence in the form of clinical trials by one group showing > 1-year benefit, and a very small uncontrolled study showing MBB in SPECT (+) pts (n=28) fared better than in SPECT (-) pts (n=5) @ 1-month





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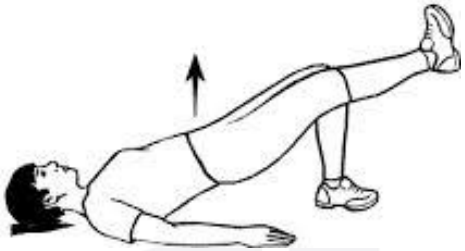
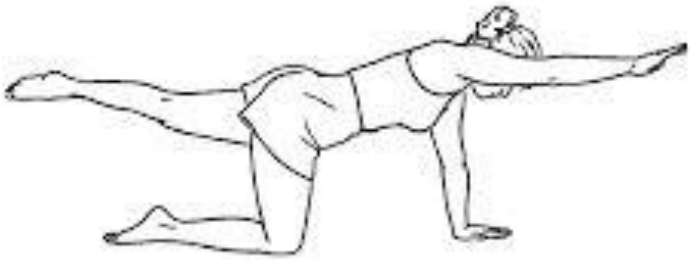
Exercises Should Target Physical Exam Findings





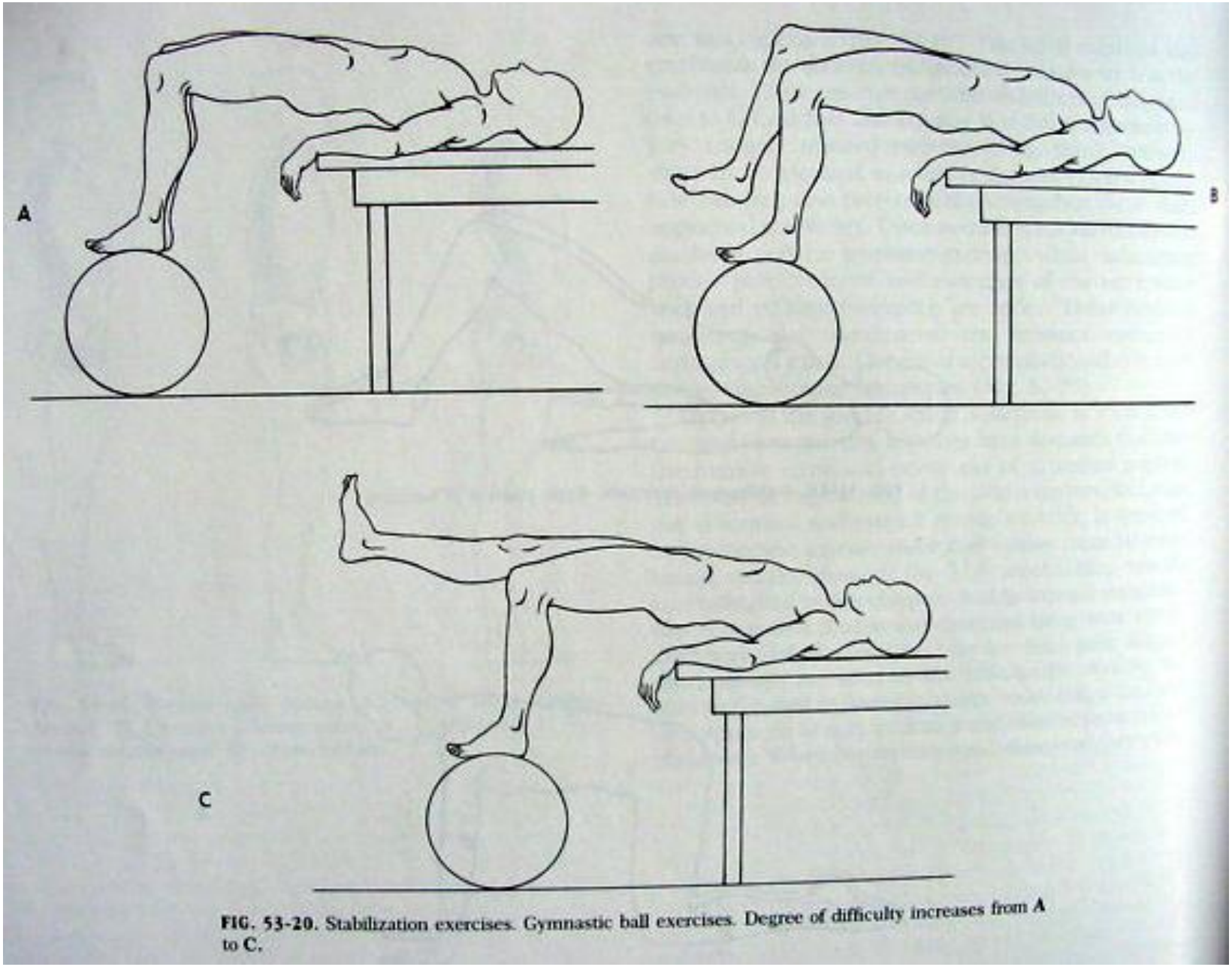


FIG. 53-20. Stabilization exercises. Gymnastic ball exercises. Degree of difficulty increases from **A** to **C**.

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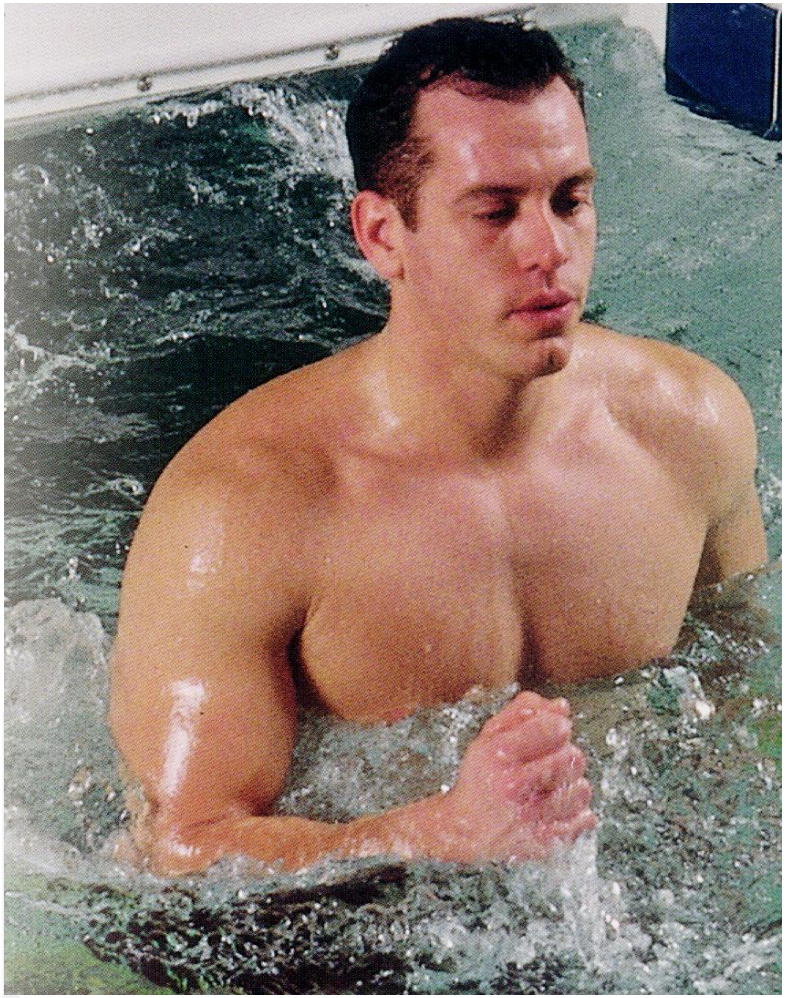
Aerobic Conditioning/ Activity Specific Exercise



Questions?

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Take-Home Points

- Almost all procedural interventions have conflicting evidence behind them, but are likely provide short to intermediate-term benefit to a well-selected population
- More effective for subacute pain in an anatomical distribution
- Factors predicting success for interventional procedures mirror predictive factors for back pain in general
  - Moderate-strong evidence for intermediate-term relief with facet & SI joint radiofrequency denervation
  - Moderate evidence for very short-term benefit with SI joint injections
  - Moderate evidence for short benefit for ESI in a carefully selected population with clear-cut radicular pain
  - Conflicting evidence for TPI's
  - Moderate evidence for very short-term benefit with SI joint injections
- Procedures as adjunct for physical therapy interventions

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RCT's Involving Muscle Injections for LBP

Trigger Point Injections

- Garvey et al. 1989: DB study comparing lidocaine, lidocaine/steroid, acupuncture and vapocoolant spray with acupressure: No difference between groups
  - No difference between injectates c/w other studies
- Di Cesare et al. 2011: DB clinical trial that found acupuncture mesotherapy injections > TPI mesotherapy

Botulinum Toxin

- Botox vs. Saline for nonspecific LBP: 1 of 2 positive
- Botox vs. steroid/LA for piriformis syndrome: 1 of 1 positive
- Botox vs. acupuncture for LBP: 1 of 1 positive