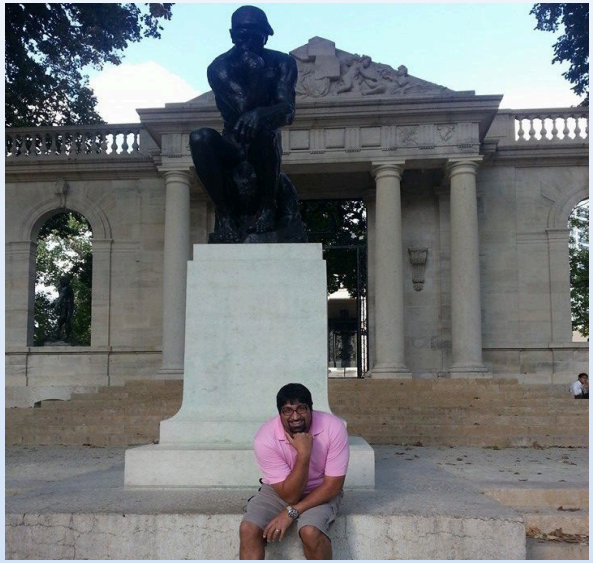
Understanding Current Practices to Diagnose and Treat Low Back Pain



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No Financial Disclosures
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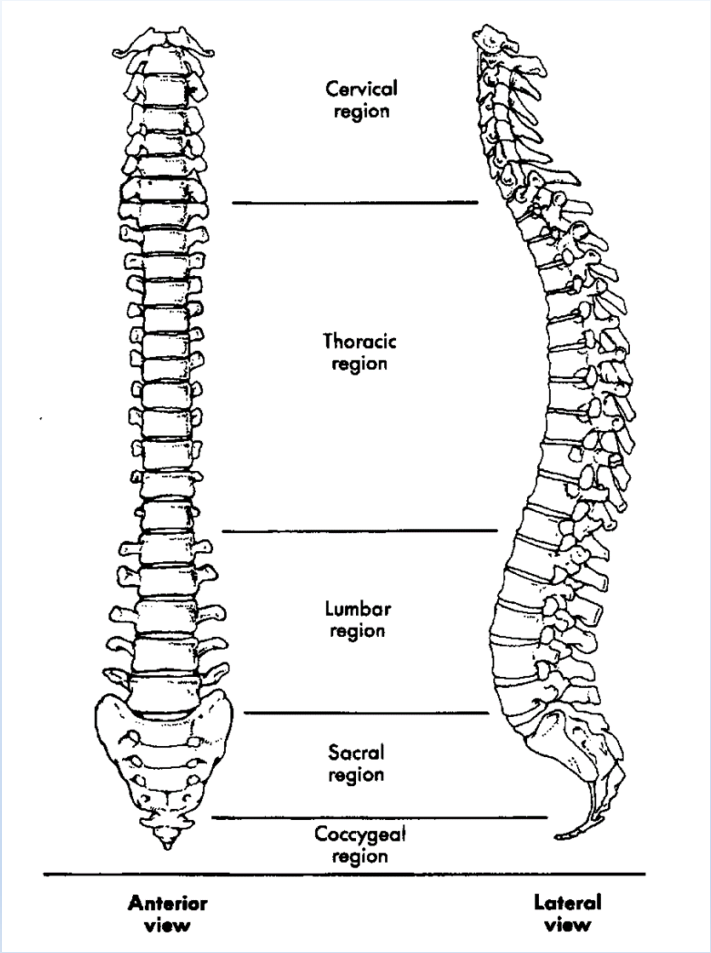
Objectives

- Improve Clinical Skills
- Improve Diagnostic Imaging Skills
- Improve Understanding and Utilization of the VA guidelines for Low Back Pain

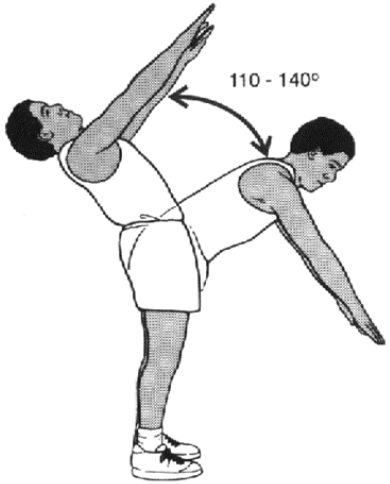
The Spine

- largest segment of body
- most significant functional unit for general movement
- integral role in upper and lower extremity function
- relatively little movement between 2 vertebrae

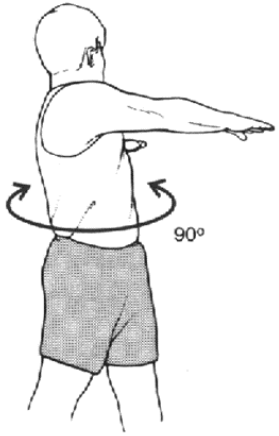


Spine Movement

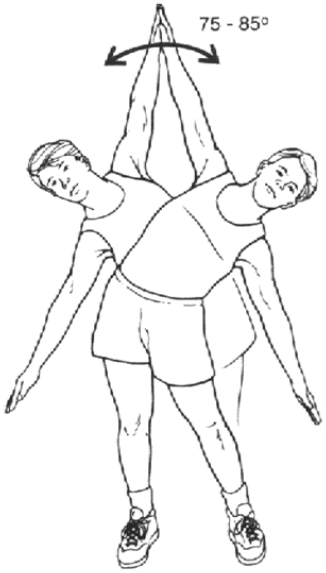
- collectively -- LARGE ROM
- flex/ext
- L-R rotation
- L-R lateral flexion



Flexion and Extension

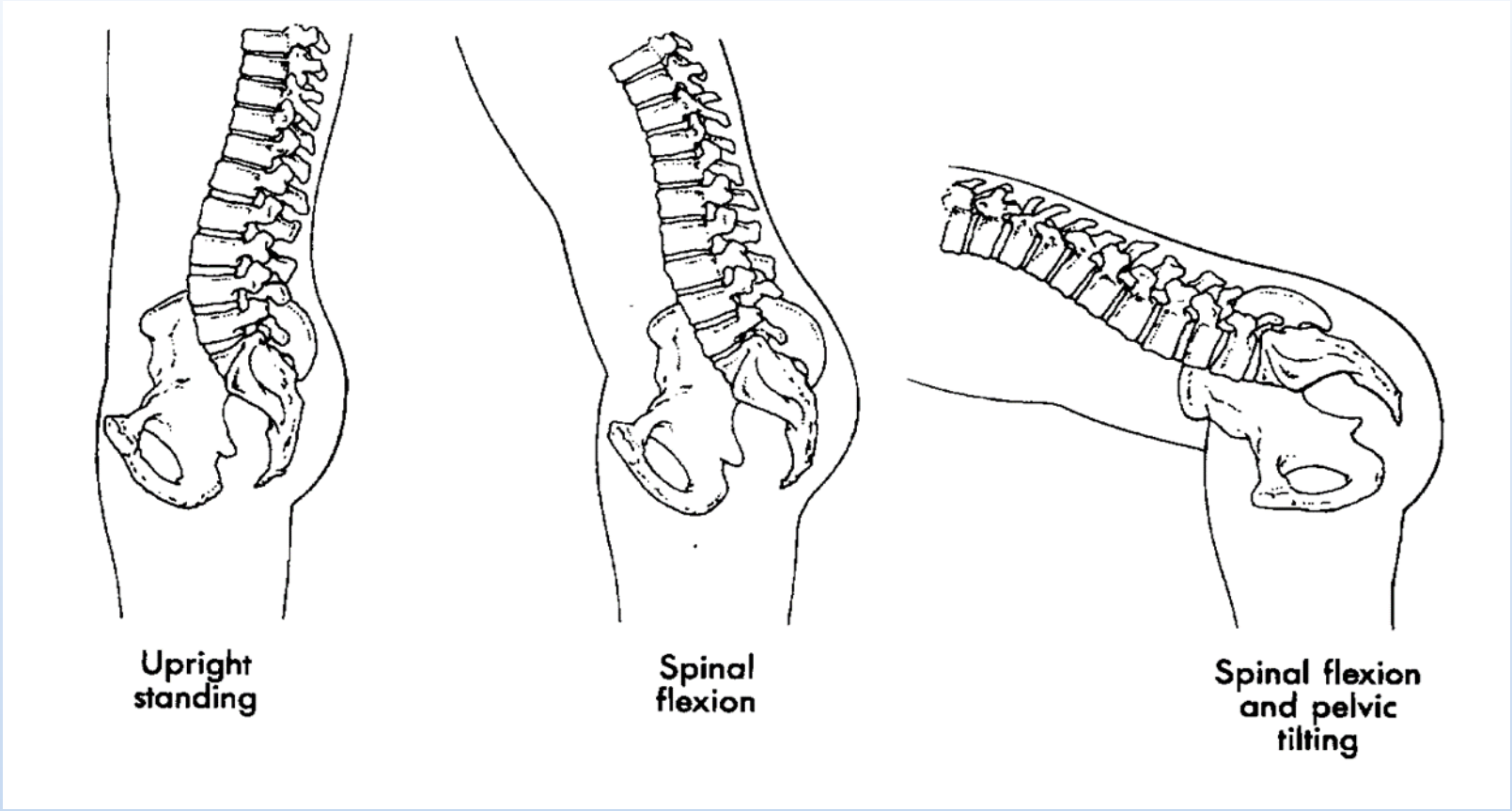


Rotation



Lateral Flexion

Spine Movements

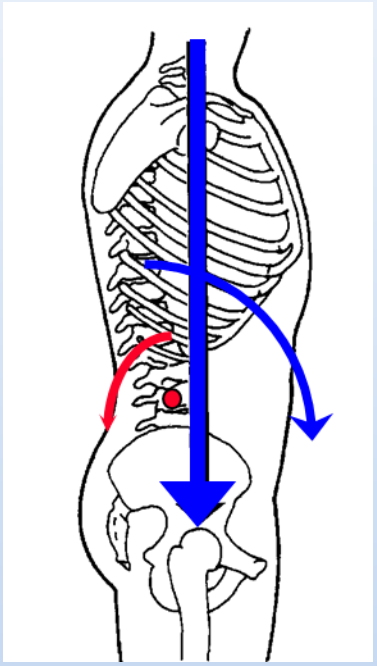


1st 50-60º in lumbar vertebrae

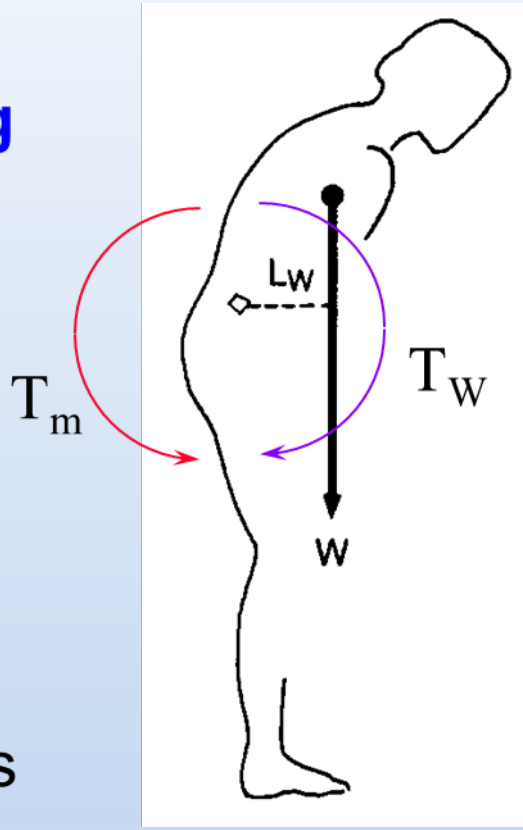
Flexion beyond 50º due to anterior pelvic tilting

Consequences of Pelvic Tilt

in normal standing the line of gravity passes ventral (anterior) to the center of the 4th lumbar vertebral body

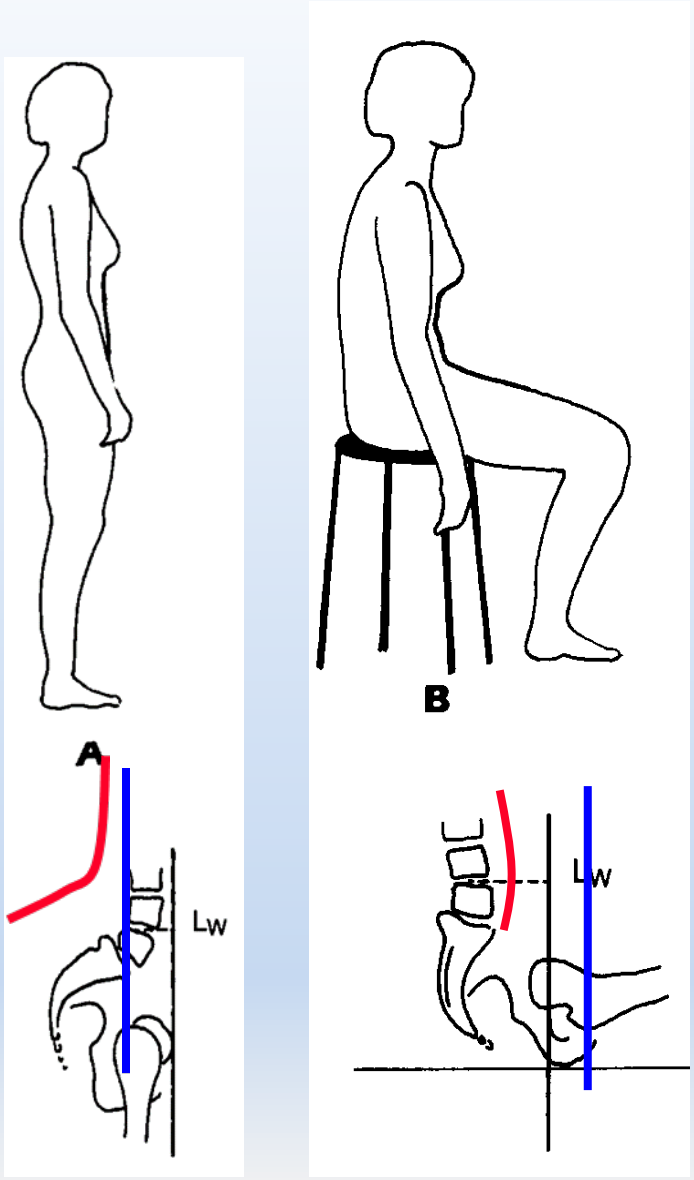


- This creates a **forward bending torque** which must be counter-balanced by **ligaments and muscles in the back**
- any movement or displacement of this line of gravity affects the magnitude of the bending moment (or torque)
- slouched posture support comes from ligaments – this is bad for extended periods of time



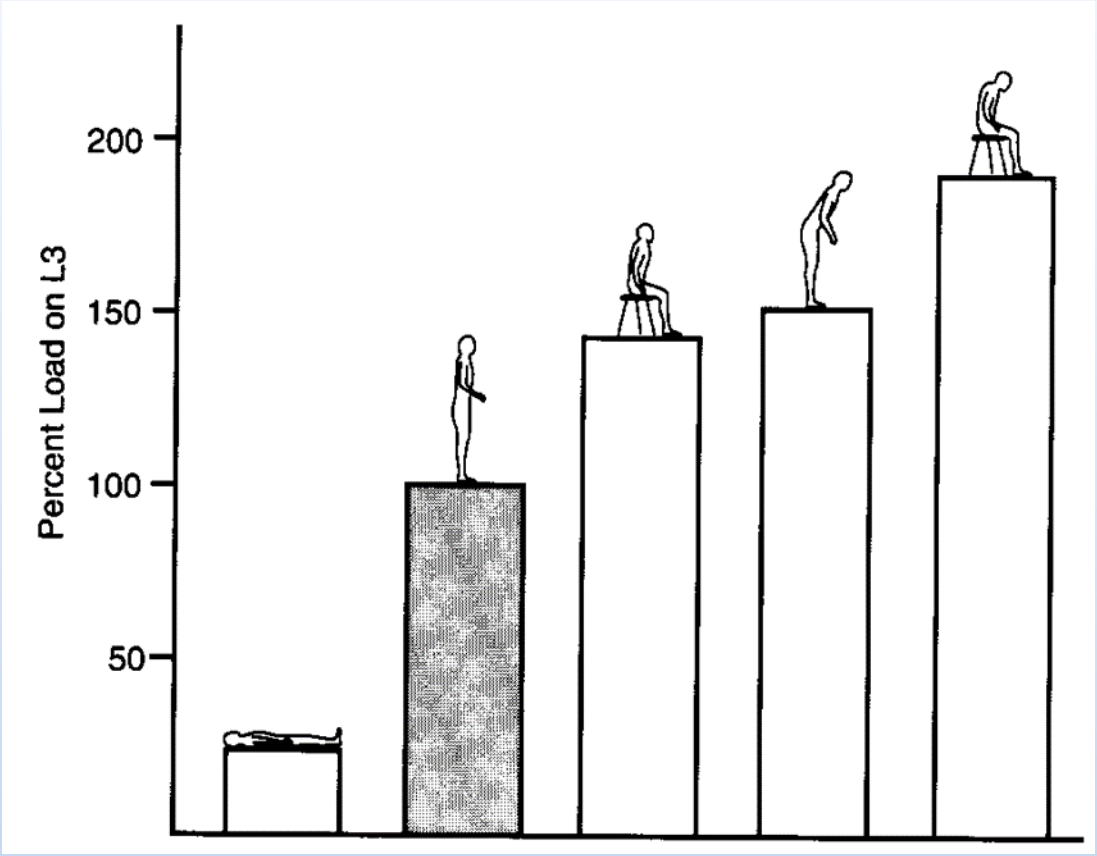
Consequences of Pelvic Tilt and Sitting

- Sitting (relative to standing)
- pelvis posteriorly tilted
- lumbar curvature is flattened
- line of gravity (already ventral to lumbar spine) shifts further ventrally
- increases the moment created by body weight about the lumbar spine
- increased muscular support increases the load on the spine



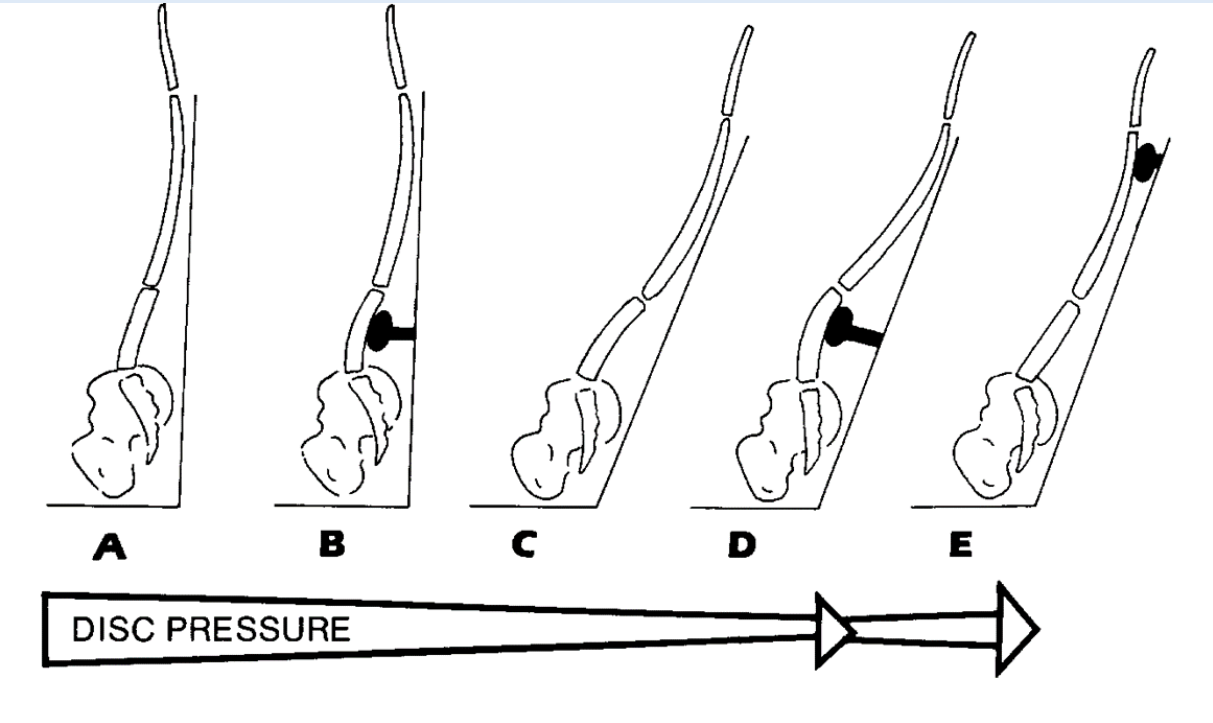
Loading of the Spine

- lowest when lying supine
- normal when standing upright
- 140% when sitting with no back support
- 150% when hunched over



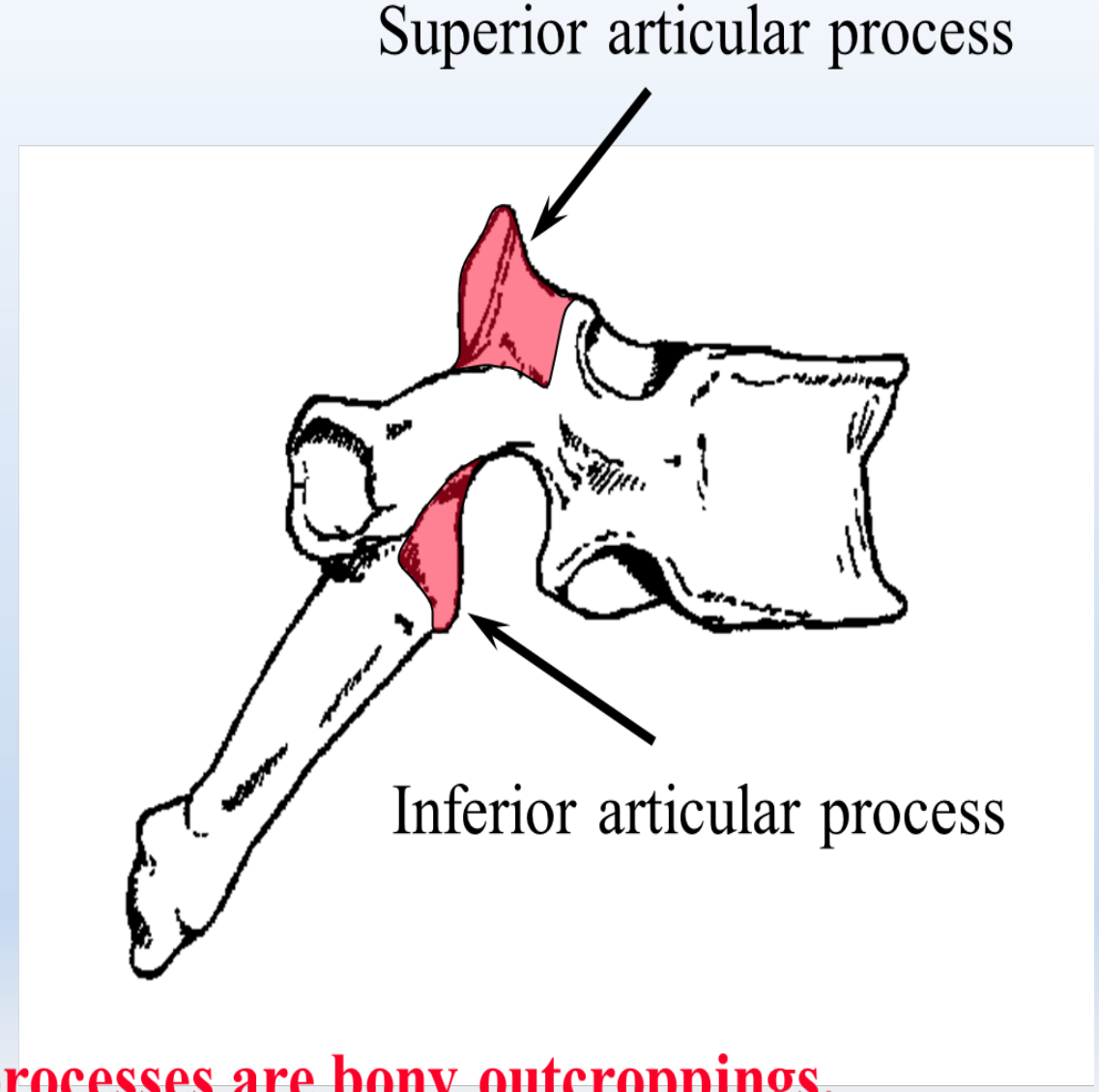
Loads

- Lumbar load is strongly related to support needed to maintain lumbar lordosis
- in erect, supported sitting the addition of a back rest reduces lumbar load
- reclining seated position reduces disc pressure even further



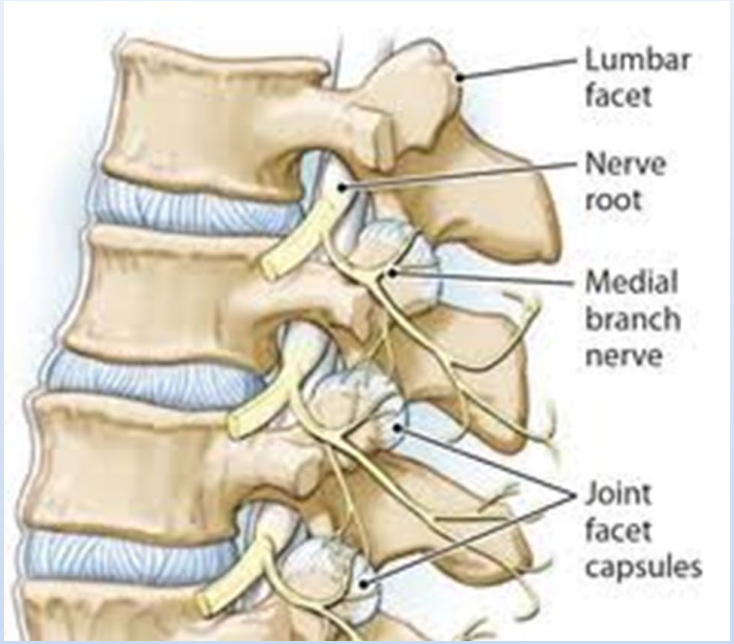
The Spine Vertebral Articulation

- each articulation is a fully encapsulated synovial joint
- these are often called apophyseal joints



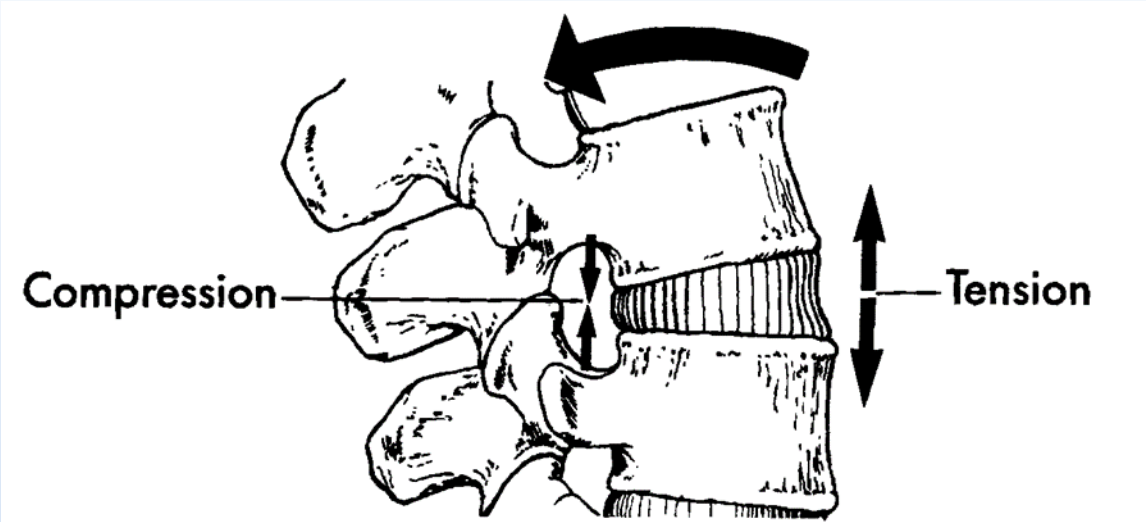
Note: the processes are bony outcroppings.

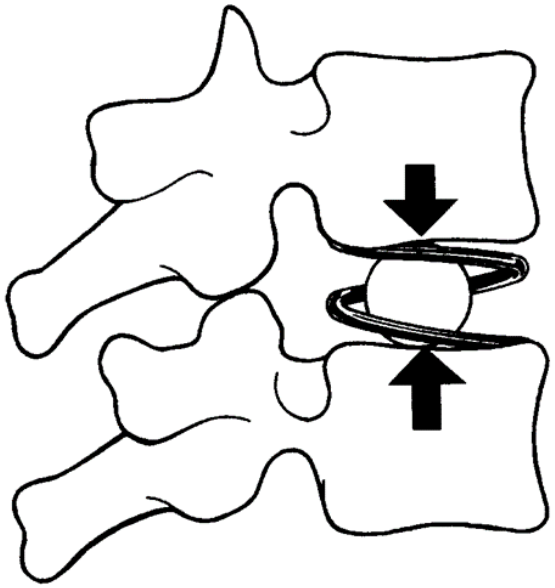
Facet Joint/Capsule Innervated

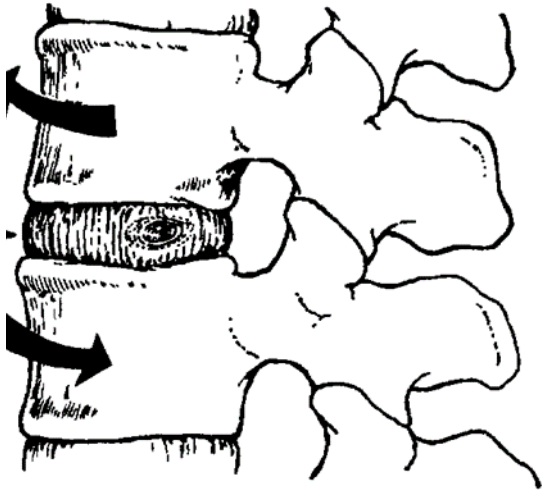


The Spine – Intervertebral Discs

- ‘shock absorbers’ of the spine
- capable of withstanding compressive
- torsional and bending loads
- role is to bear and distribute loads in
- vertebral column and restrain
- excessive motion in vertebral segment







Lateral view

2 regions of vertebral disk

NP -- nucleus pulposus

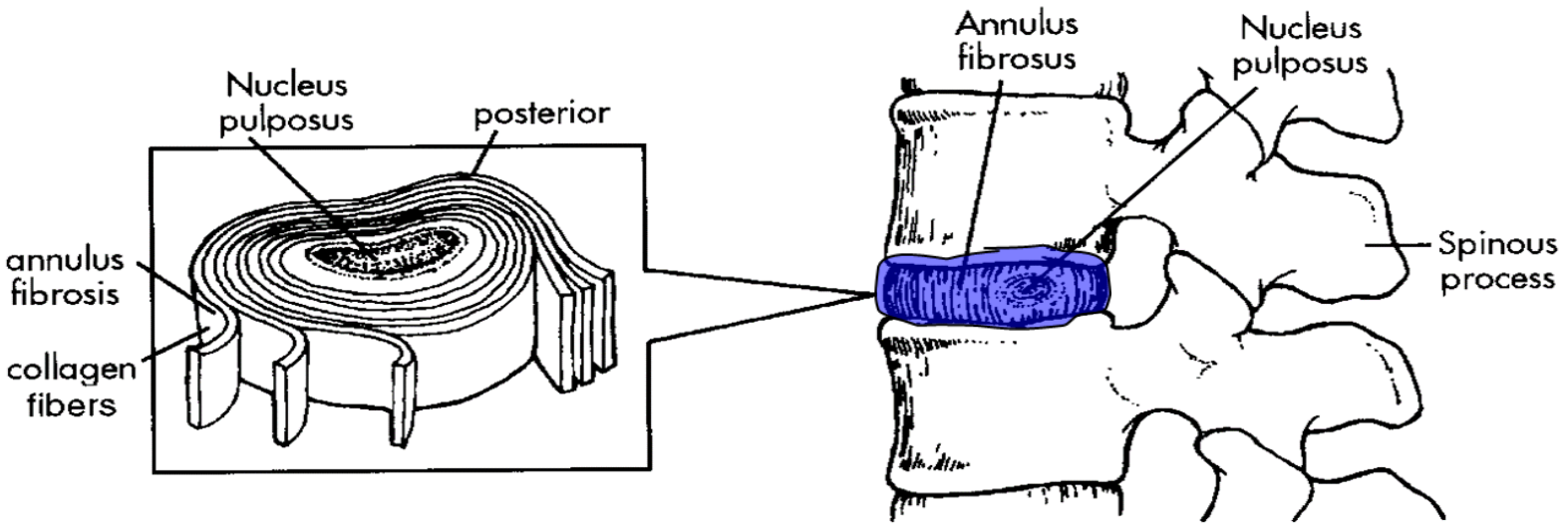
- gel-like mass in center of disk under pressure such that it preloads disk
- 80-90% water, 15-20% collagen

AF -- annulus fibrosus

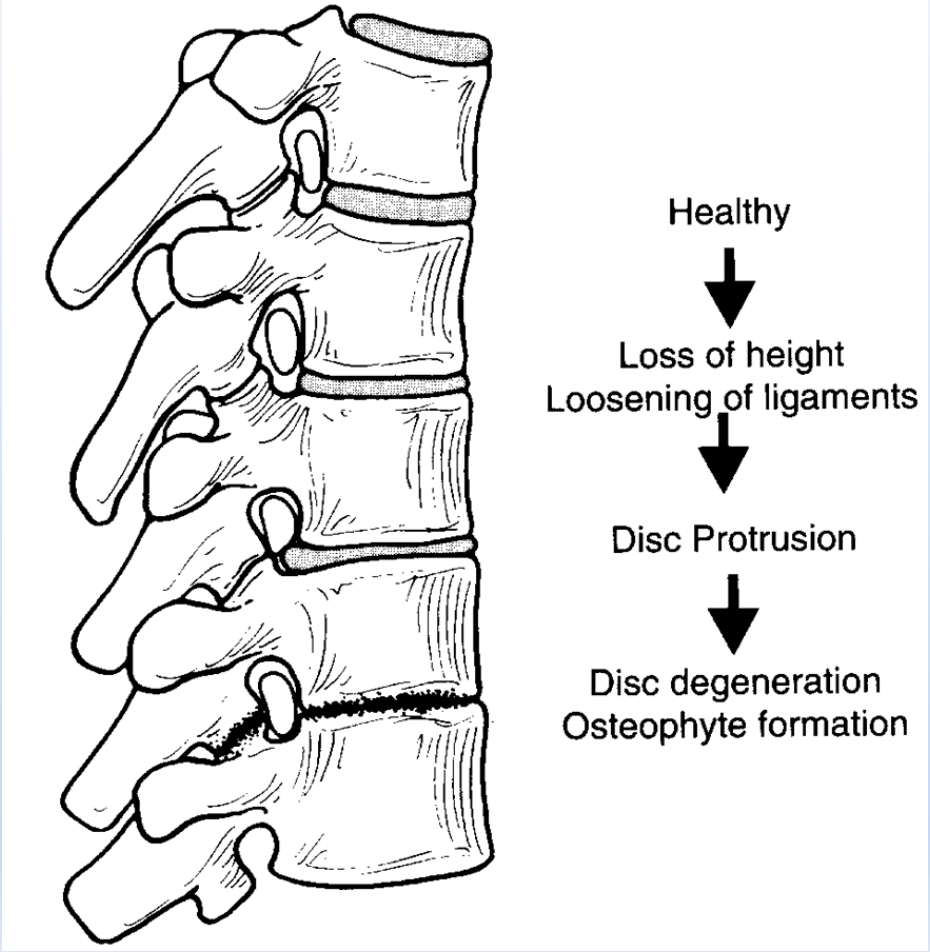
- fibrocartilaginous material
- 50-60% collagen

Disc is avascular & aneural so healing of a damaged disc is unpredictable & not promising

Disc rarely fails under compression vertebral body will usually fracture before damage to disc occurs

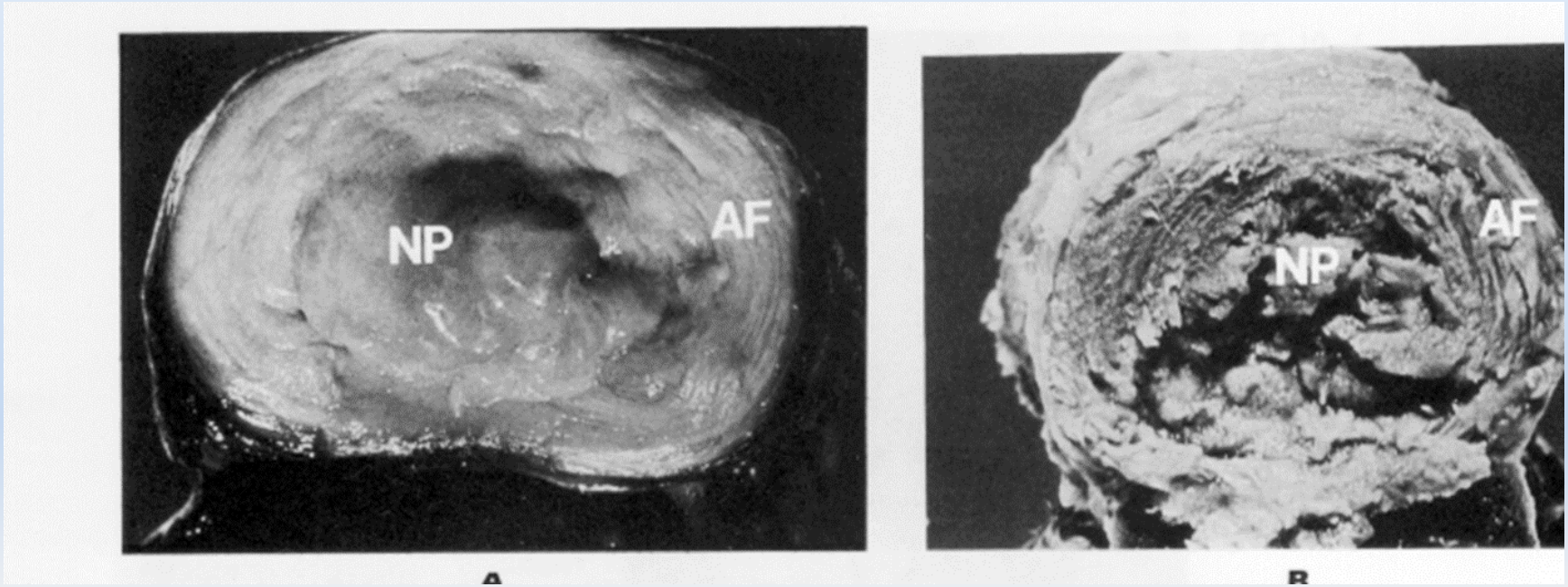


Progression of Disc Degeneration

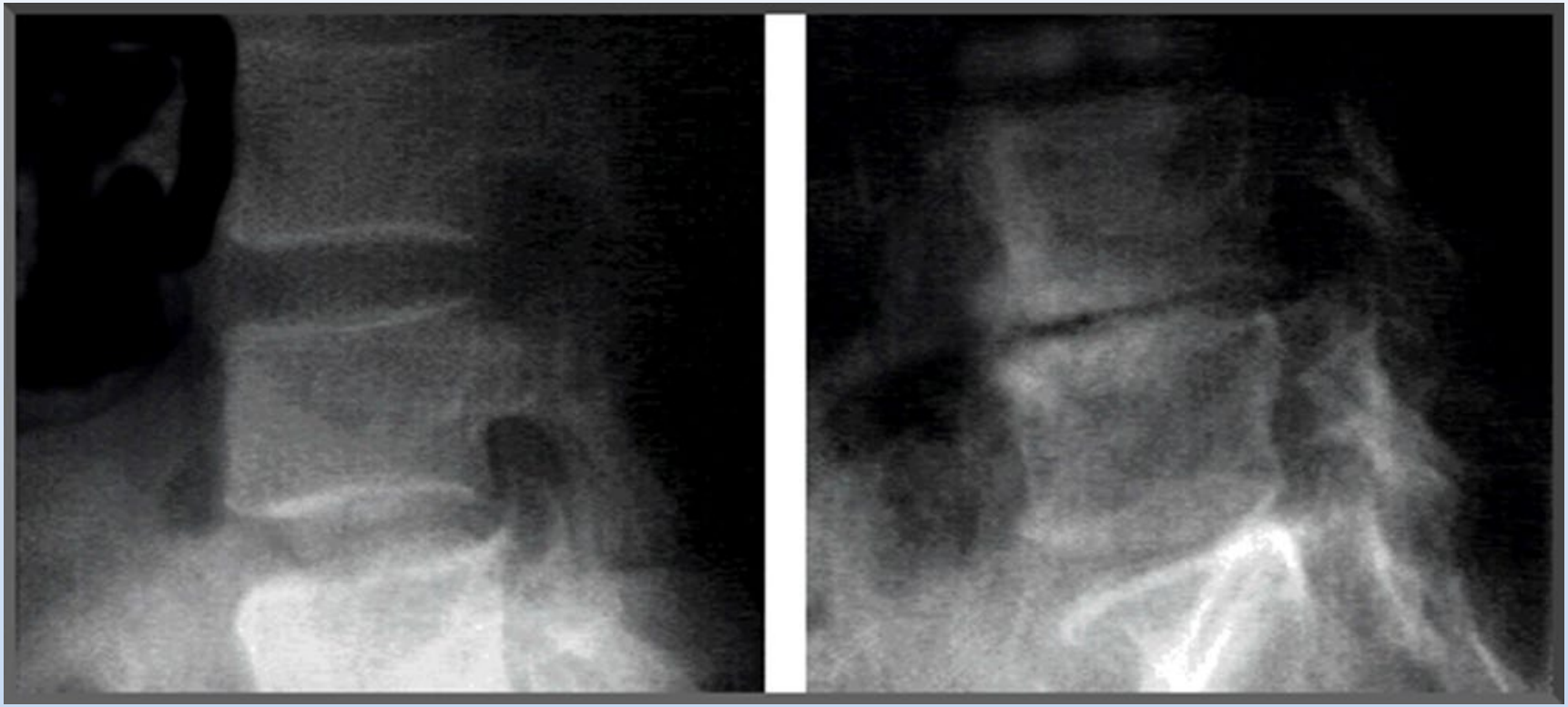


Disc Degeneration

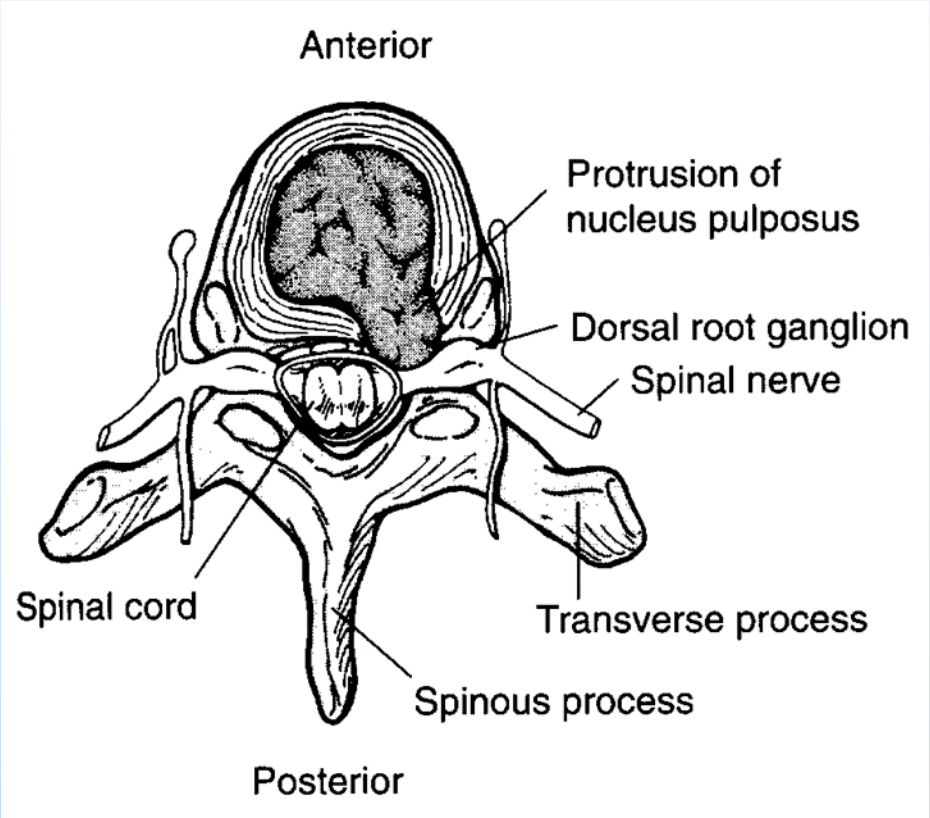
- disk integrity decreases with age
- lose ability to retain water in disc so disc “dry out”
- Ability to distribute load across the disc changes



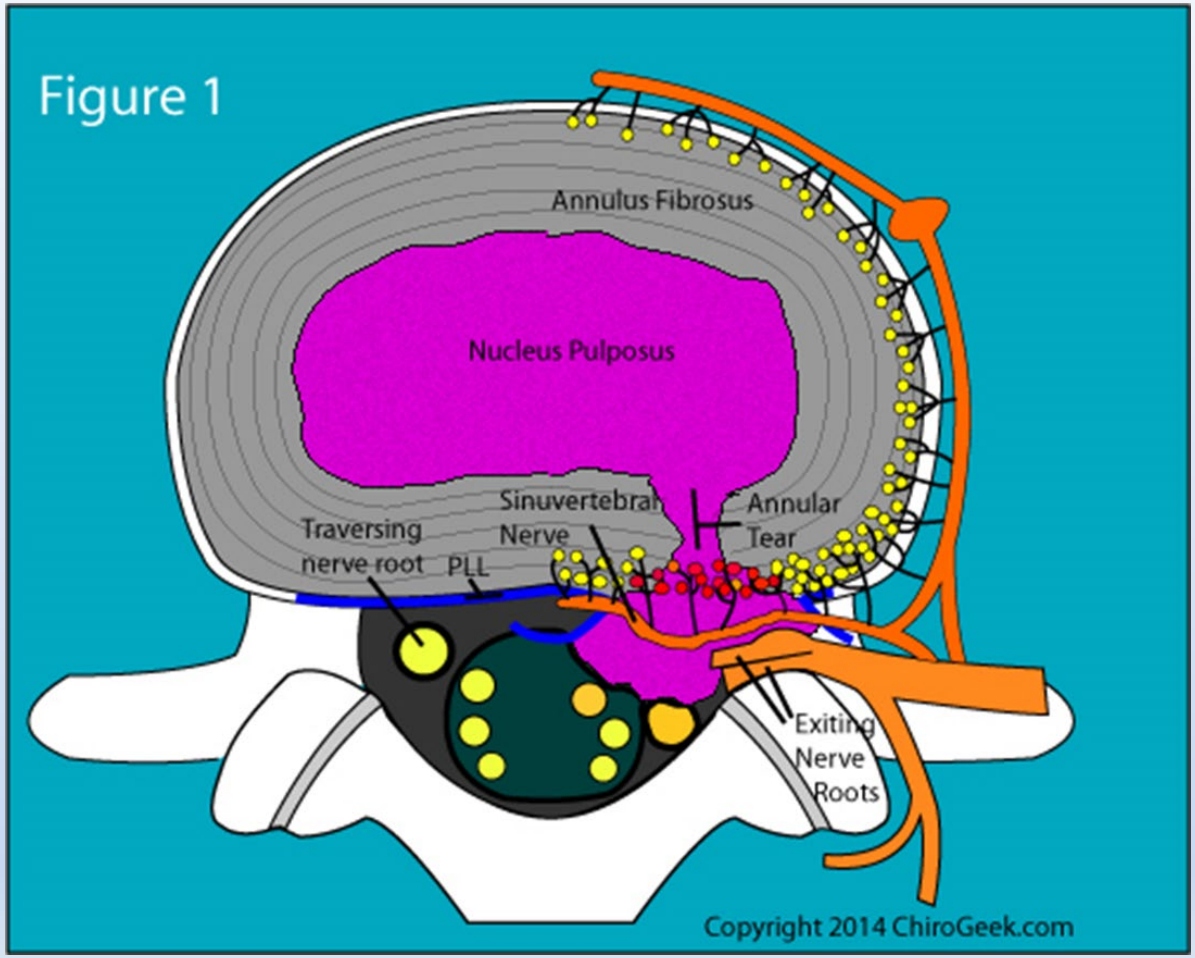
Disc Degeneration



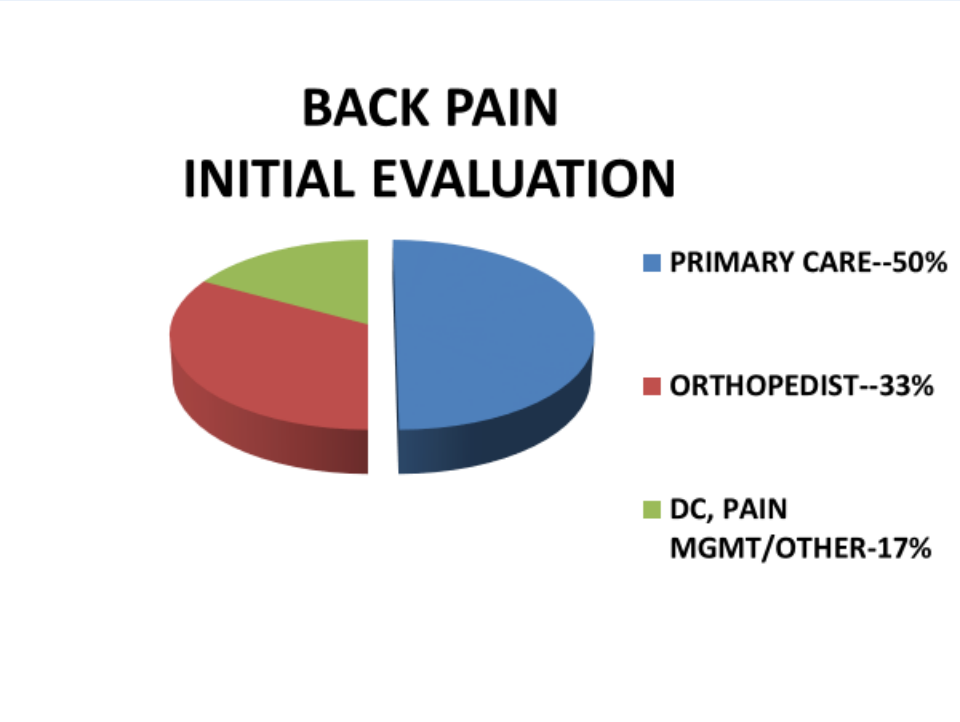
Disc Herniation



Disc Annulus Innervated



Back Pain in the Community



Back Pain

- Lifetime incidence of Acute Low Back Pain is 60-90% of the population annual incidence 5% of population.
- 2nd to 5th chief complaint seeing primary care specialists.
- Natural history of acute low back pain favorable-90% resolve within in 6-12 weeks.
- Vs. Chronic low back pain-13 million physician visits annually for-prevalence, disability & expense remain high.
- Back pain is the number one cause of disability in U.S. for people under 45 years.

Back Pain in Veterans

- Veterans Affairs Population
- Severe pain was 40% greater in veterans than nonveterans.
- 2014 National Health Interview Survey showed that 33% of Veterans reported LBP past 3 mths.
- 65.5% of US military veterans reported pain in the previous 3 mths.
- LBP was axial in 20% of Veterans and had features of sciatica in 12%.
- After controlling for age, sex, race, ethnicity, education, and survey year in the logistic regression analysis, veterans had 1.5 times the odds (99% CI, 1.1–2.0) of having severe pain than nonveterans.

Definitions of Chronicity

- LBP is a symptom of AXIAL, NON-RADIATING PAIN, rather than a disease or a syndrome. It is a complex human experience that is influenced not only by physical factors but also what you think, feel, and do when you are hurting.

- ACUTE – an immediate warning from your nervous system telling you that you may be injured (< 1 MONTH). It signals that you should stop doing what you are doing and that you may need to seek medical attention.

- SUBACUTE - when your body is still healing, but may not be in immediate danger (1-3 MONTHS).

- CHRONIC – persists after your body has healed most tissue damage (> 3 MONTHS), can be caused by conditions that have no cures, like arthritis. may be worsened with lifestyle factors (inactivity, stress, and smoking), can affect all aspects of your life (physical activities, more stressed, disrupt sleep, etc).

VA Guidelines for LBP

We recommend:

- Clinicians conduct a history and physical examination, that should include identifying and evaluating neurologic deficits (e.g., radiculopathy, neurogenic claudication), red flag symptoms associated with serious underlying pathology (e.g., malignancy, fracture, infection), and psychosocial factors
- Diagnostic imaging and appropriate laboratory testing when neurologic deficits are serious or progressive or when red flag symptoms are present

We suggest:

- Performing a mental health screening as part of the low back pain evaluation and taking results into consideration during selection of treatment

We recommend against:

- Routinely obtaining imaging studies or invasive diagnostic tests for patients with acute axial low back pain (i.e., localized, non-radiating)

There is inconclusive evidence to recommend for or against:

- Any diagnostic imaging for patients with low back pain greater than one month who have not improved or responded to initial treatments

Conservative Approaches

We recommend:

•For chronic low back pain:

Cognitive behavioral therapy

We suggest:

•For acute low back pain:

Offering spinal mobilization/manipulation as part of a multimodal program

•For chronic low back pain:

Mindfulness-based stress reduction

Offering clinician-directed exercises

Offering spinal mobilization/manipulation as part of a multimodal program

Offering acupuncture

Offering an exercise program, which may include Pilates, yoga, and tai chi

Pharmacologic Approaches

We recommend:

•For acute or chronic low back pain:

Treating with nonsteroidal anti-inflammatory drugs (NSAIDs), with consideration of patient- specific risks

We suggest:

•For acute low back pain or acute exacerbations of chronic low back pain:

Offering a non-benzodiazepine muscle relaxant for short-term use

•For chronic low back pain:

Offering treatment with duloxetine, with consideration of patient-specific risks

We recommend against:

•For acute or chronic low back pain:

Treatment with benzodiazepines

The use of systemic corticosteroids (oral or intramuscular injection) for LBP with or without radiculopathy

Initiating long-term opioid therapy (for patients who are already prescribed long-term opioid therapy, refer to VA/DoD CPG for the Management of Opioid Therapy for Chronic Pain

•For chronic low back pain:

The chronic use of oral acetaminophen

Pharmacologic Approaches

Table 1: Dosing for Select Pharmacologic Agents[1]

Generic	Starting Dose	Max/Day	Half-life (t½) (hrs)
Muscle Relaxants			
TIZANIDINE	2-4 mg TID	36 mg	2.5
BACLOFEN	5 mg TID	80 mg	~ 3.75
CYCLOBENZAPRINE[2]	5 mg TID	30 mg	18
METAXALONE[2]	800 mg TID	3,200 mg	~ 9
METHOCARBAMOL[2]	1.5 gm QID	4.5 gm	1-2
ORPHENADRINE[2]	100 mg BID	200 mg	14-16
Antidepressants			
AMITRIPTYLINE[2]	10-25 mg QHS	150 mg	~ 13-36
DESPIRAMINE[2]	10-25 mg QHS	150 mg	15-24
NORTRIPTYLINE[2]	10-25 mg QHS	150 mg	14-51
DULOXETINE[2]	30 mg QD	60 mg	~ 12
VENLAFAXINE ER	37.5 mg QD	225 mg	~ 11

Interventional Treatments

We suggest:

- Offering epidural steroid injections for the very short-term effect (less than or equal to two weeks)reduction of radicular low back pain

We recommend against:

- Offering spinal epidural steroid injections for the long-term reduction of radicular low back pain, non-radicular low back pain, or spinal stenosis

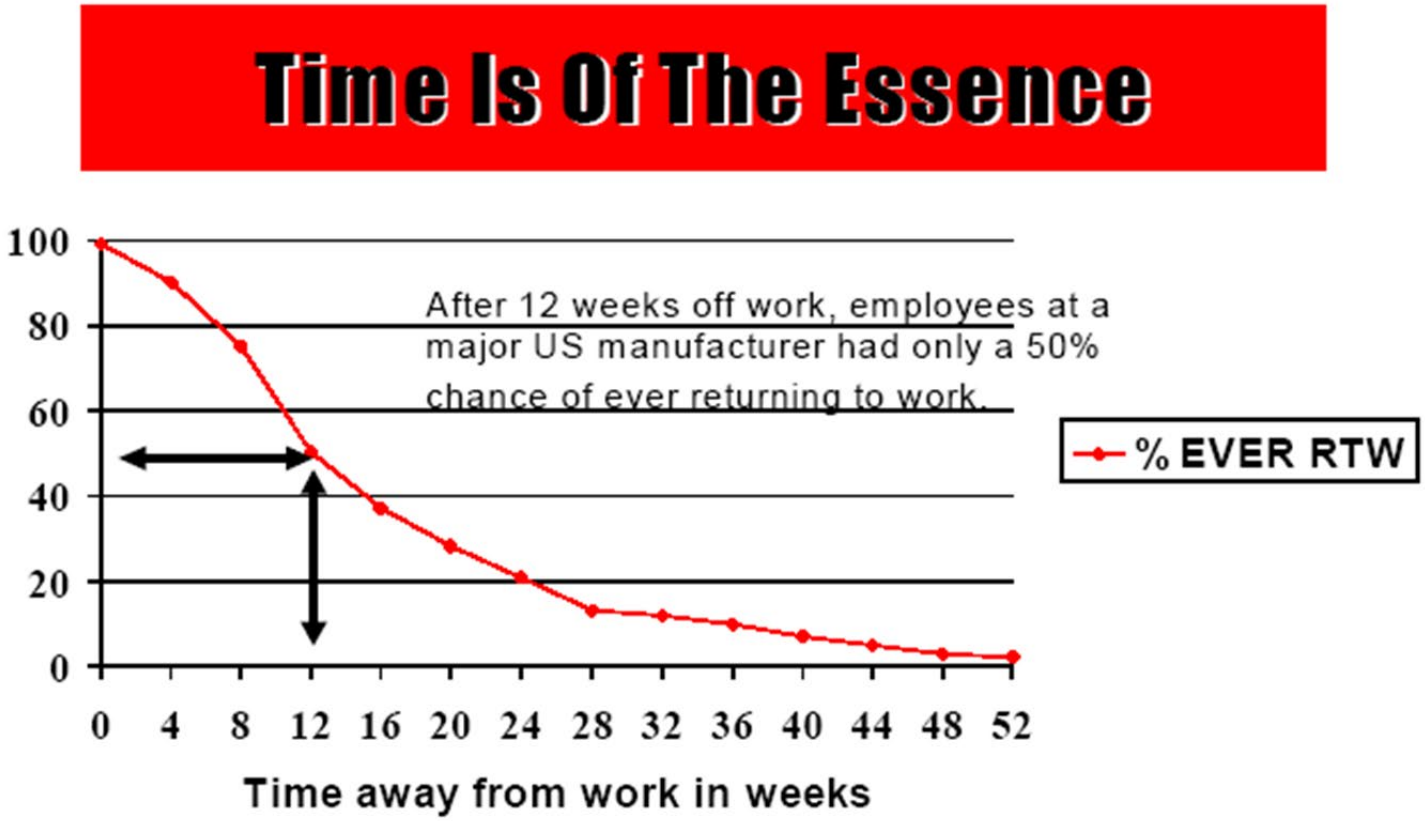
We suggest against:

- Offering intra-articular facet joint steroid injections for the treatment of low back pain

There is inconclusive evidence to recommend for or against:

- Medial branch blocks and radiofrequency ablative denervation

Return to Function

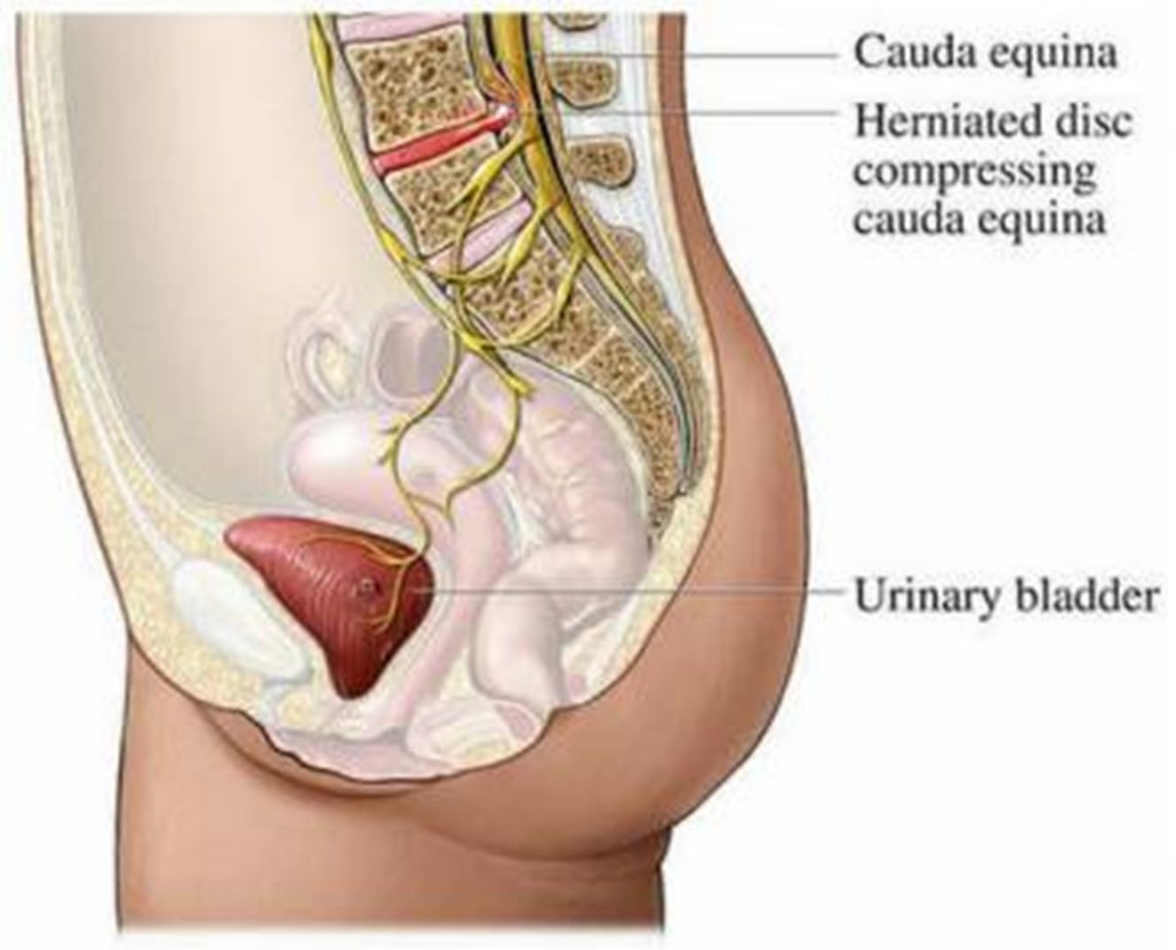


H&P

Detailed history & physical examination to determine:

1. The presence of **red flags** for urgent conditions-musculoskeletal vs. other etiologies.
2. Non-specific regional back pain-pain is typically axial in location that predicts favorable course.
3. Radiculopathy/other neuro related spine condition.

Red Flags


Cauda equina
Herniated disc compressing cauda equina
Urinary bladder

Red Flags

- Cauda equina syndrome?
- Cancer?
- Infection?
- Fracture?
- Confirmation of red flag conditions may require
- Lab testing [complete blood count (CBC)/erythrocyte sedimentation rate (ESR)/C-reactive protein (CRP)/ urinalysis (UA) and PSA when appropriate]
- Medical imaging [lumbosacral (LS) radiographs/computed tomography (CT)/magnetic resonance imaging (MRI)]
- Test results may indicate need for emergent surgical referral

Cauda Equina Syndrome

For a diagnosis of CES, one or more of the following must be present:

(1) bladder and/or bowel dysfunction.

(2) reduced sensation in the saddle area.

(3) sexual dysfunction, with possible neurologic deficit in the lower limb (motor/sensory loss, reflex change).

Cauda equina syndrome: a literature review of its definition and clinical presentation

Fraser, S, et. al. Arch Phys Med Rehabilitation. 2009 Nov;90(11):1964-8.

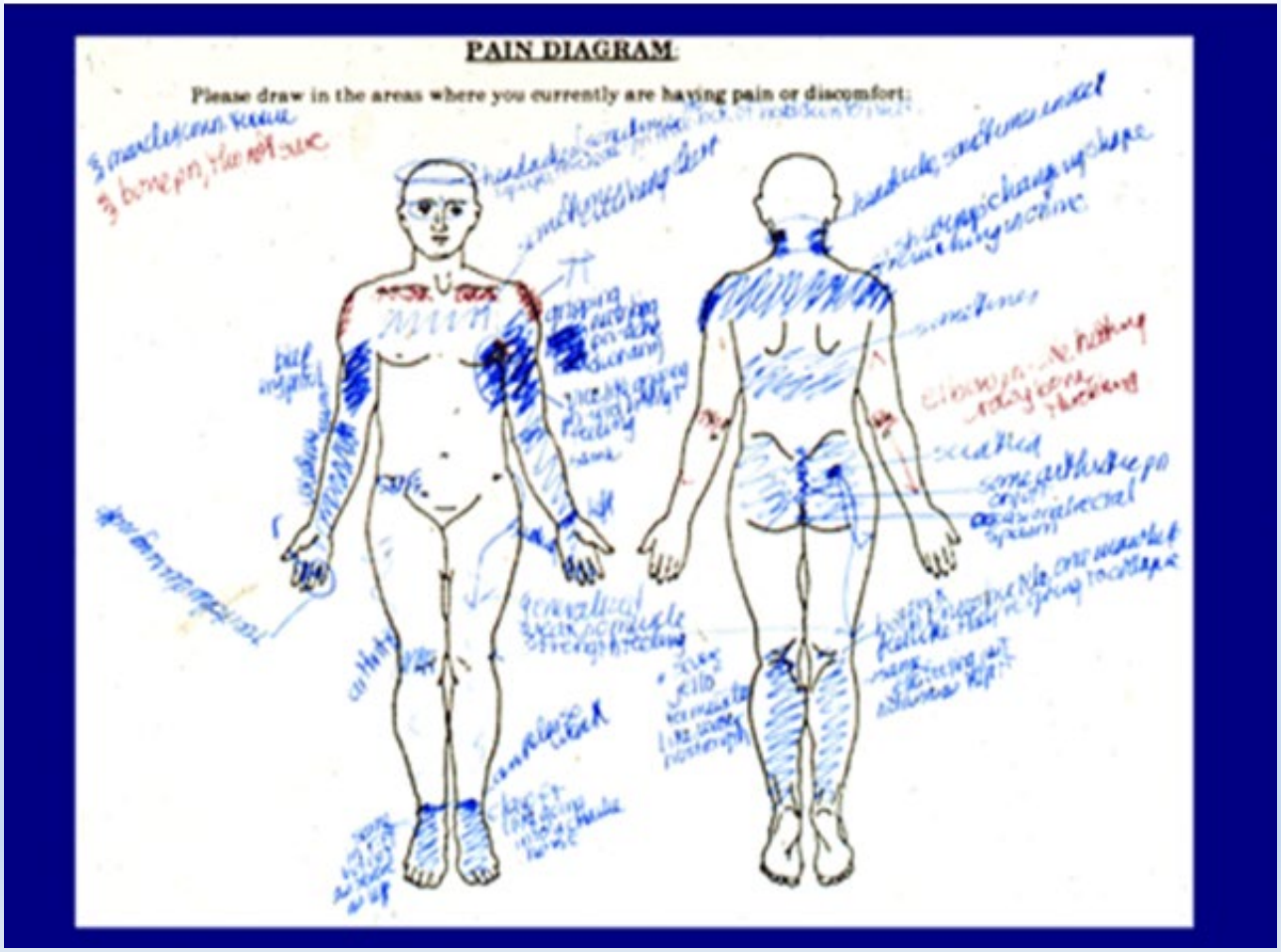
Review

Table 2. History and Physical Examination Features

Disease	History	Physical Examination	Notes
Degenerative joint disease	Nonspecific	Nonspecific	Common radiologic abnormalities
Degenerative disk disease	Sciatic pain	Impaired ankle or patella reflex; great toe, ankle, or quadriceps weakness; lower extremity sensory loss	Common cause of root nerve impingement
Spinal stenosis	Severe leg pain, pseudoclaudication	Wide-based gait, abnormal Romberg's test, thigh pain after 30 sec of lumbar extension	More common with advancing age, uncommon before age 50 y
Ankylosing spondylitis	Gradual onset, morning stiffness, improves with exercise, pain not relieved when supine	Decreased spinal range of motion	Usual onset before age 40 y
Osteomyelitis or spinal abscess	Source of infection, history of IV drug use	Fever, localized tenderness	Can cause cord compression
Malignancy in the spine	Current or past cancer diagnosis, weight loss, failure to improve after 4 wk, no relief with bed rest	Localized tenderness	Metastatic disease, commonly from prostate, breast, and lung cancer; can cause cord compression; more common in patients >50 y
Intra-abdominal visceral disease	Depends on affected viscera	Depends on affected viscera	Peptic ulcer disease, pancreatitis, nephrolithiasis, pyelonephritis, prostatitis, pelvic infection or tumor, aortic dissection
Metabolic bone disease with or without compression fracture	Nonspecific pain, osteoporosis or osteoporosis risk factors, trauma, corticosteroid use	Localized tenderness if vertebral fracture	Osteoporosis with vertebral fracture
Herpes zoster	Unilateral pain in distribution of dermatome	Unilateral dermatomal rash	Most common in elderly or immune-compromised patients

Source: References 7, 8.

Pain


PAIN DIAGRAM
Please draw in the areas where you currently are having pain or discomfort:

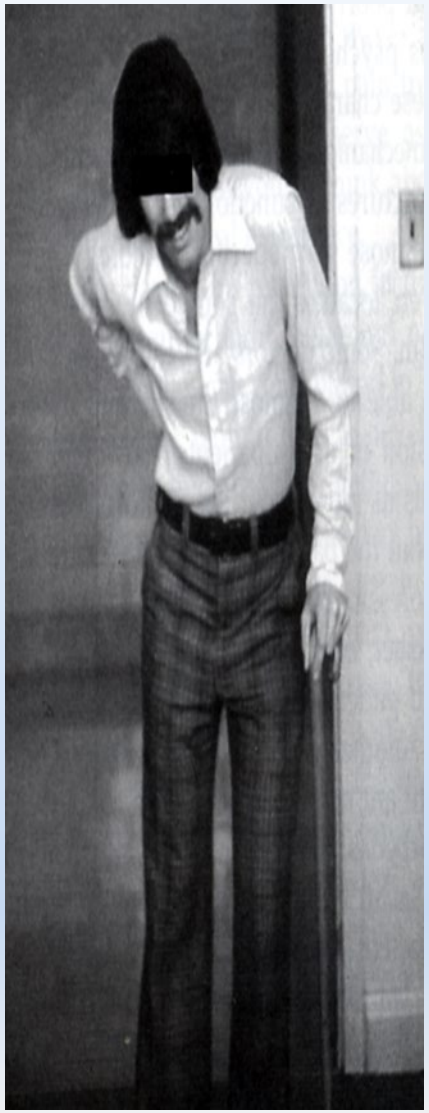
Pain

- IASP “Unpleasant sensory and emotional experience associated with actual or potential tissue damage”.
- Need to address emotional component of pain fist…then understand the actual or potential tissue damage.
- Pain is subjective…interacting with the limbic system with modulation of pain…many potential sources of potential pain in the low back…muscles, facets, discs, nerve impingement.

Pain Behaviors

- Grimace
- Groan
- Guarding
- Overreaction
- Inconsistencies
- Give-way weakness
- Shaking

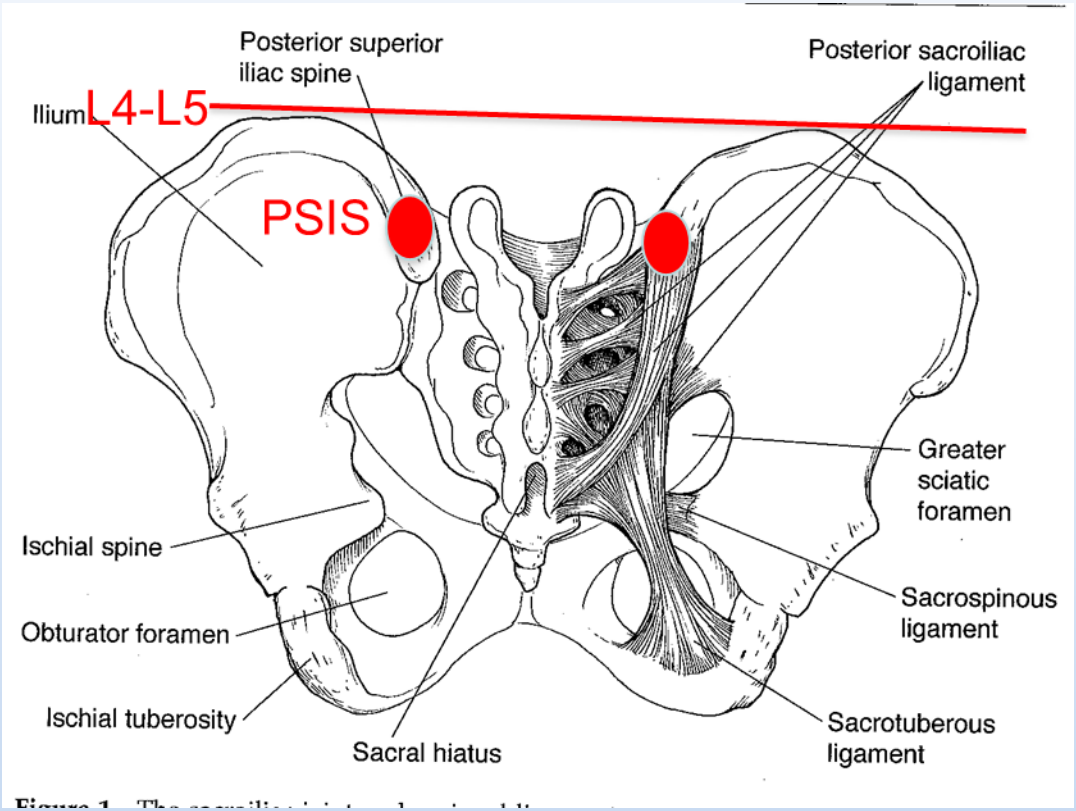
- Equipment
- Cane
- Ice-packs,
- Heating pads
- Braces: collars



Gait

- Balance
- Base of support
- Arm swing/ trunk and shoulder rotation
- Cadence
- Leg: cicumduction, stance time, position
- Pain behavior

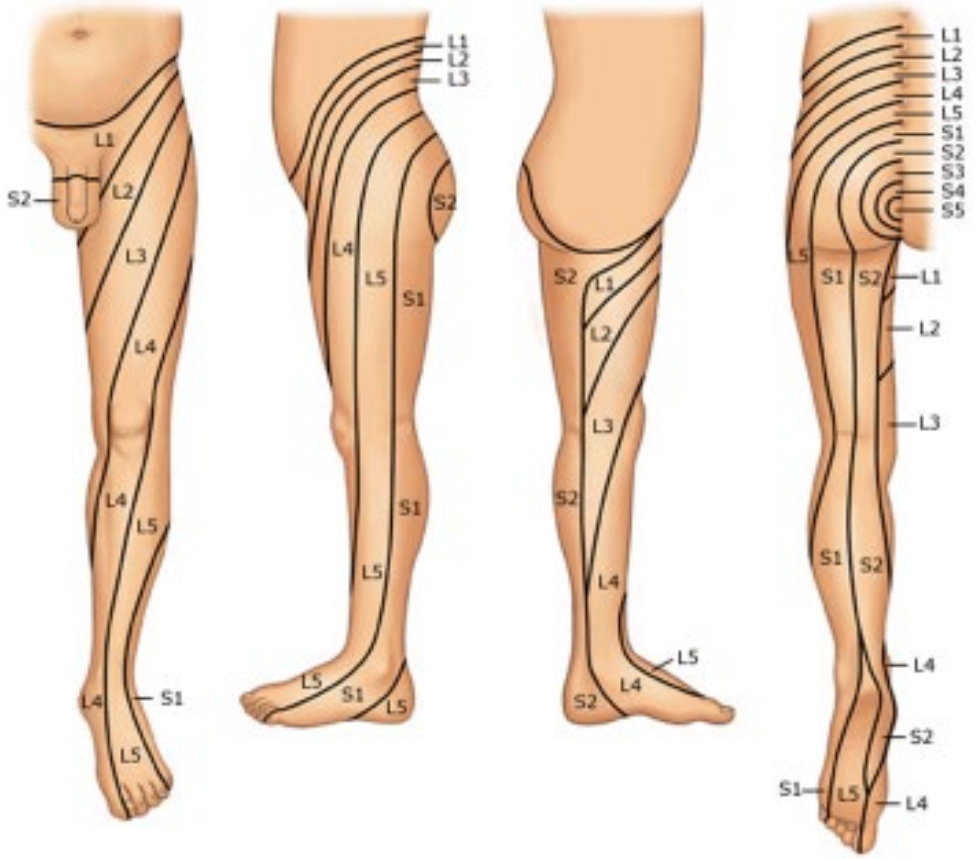
Static Stance



Motor Strength Testing

- 5 = Normal, full ROM vs. gravity, max resistance
- 4 = Good, full ROM vs. gravity, moderate resistance
- 3 = Fair, full ROM vs. gravity,
  no resistance
- 2 = Poor, full ROM,
  gravity eliminated
- 1 = Trace
- 0 = No activity

Lumbosacral dermatomes



Schematic representation of the lumbosacral dermatomes. Patients with sciatica may have pain, paresthesias, and diminished sensation in the dermatome of the nerve root that is involved.

UpToDate®

Core Stability Testing

Muscle Stretch Reflexes

- Lower Limb
- Patella (L2, L3,L4)

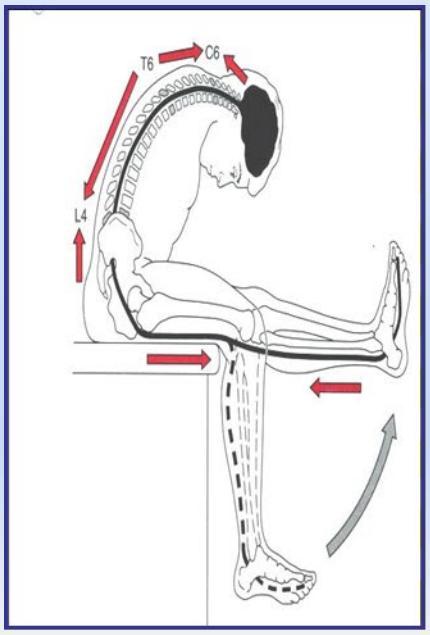
- Achilles (S1, S2)

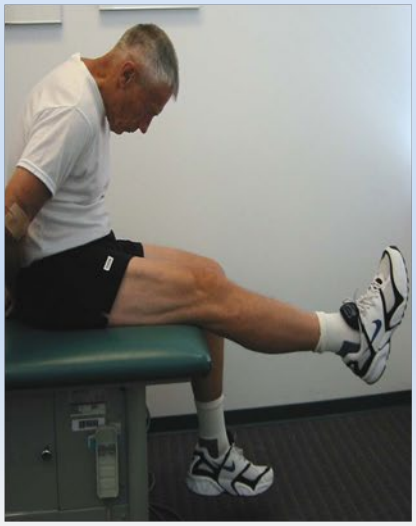
Muscle Stretch Reflexes

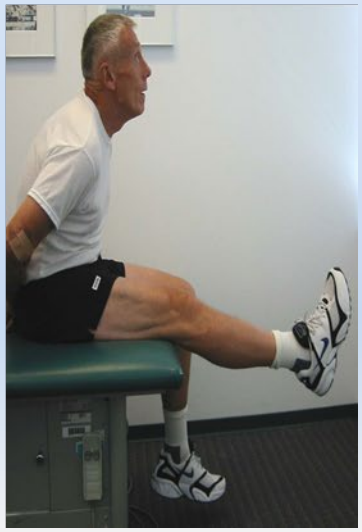
- 4 + = hyperactive with clonus
- 3 + = more brisk
- 2 + = normal response
- 1 + = decreased with facilitation
- 0 = no response

Dural Tension Signs

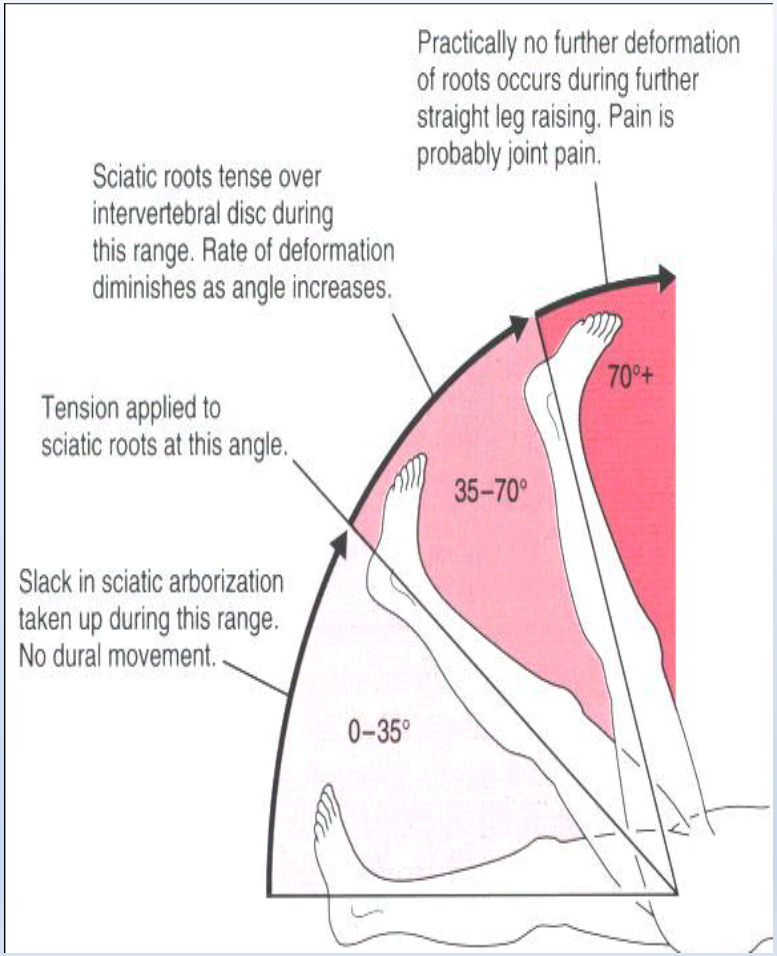
- Straight Leg Raise (SLR)
- Slump Seated
- Femoral Nerve Stretch





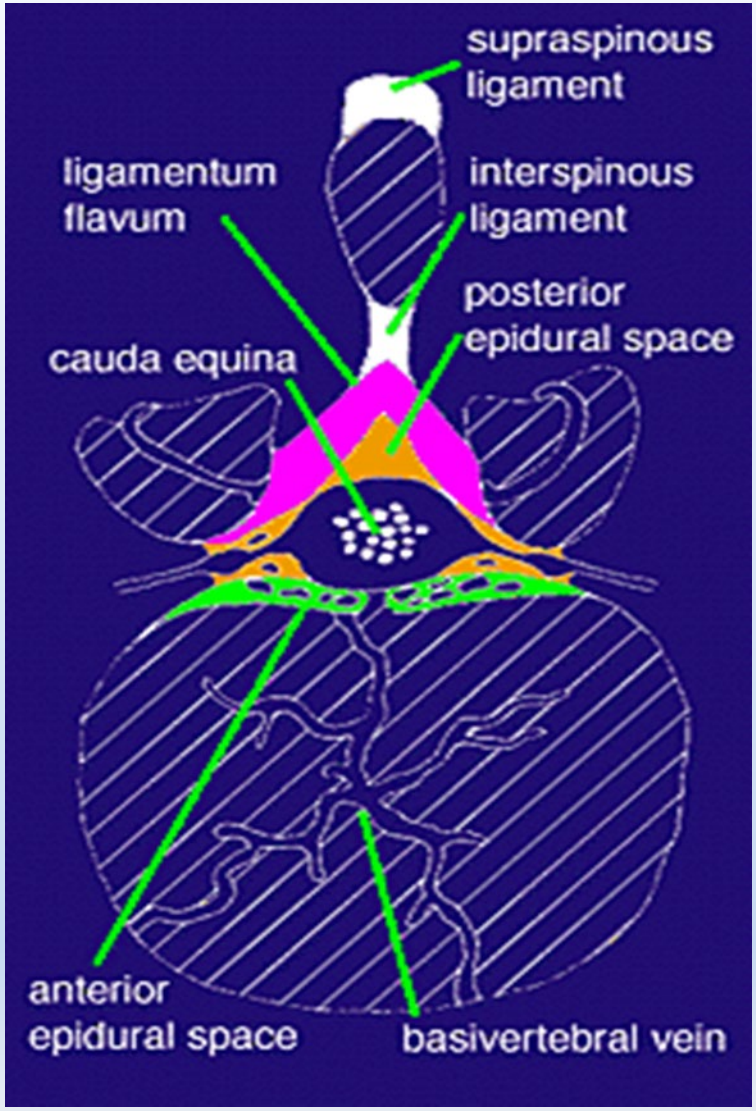


Straight Leg Raise

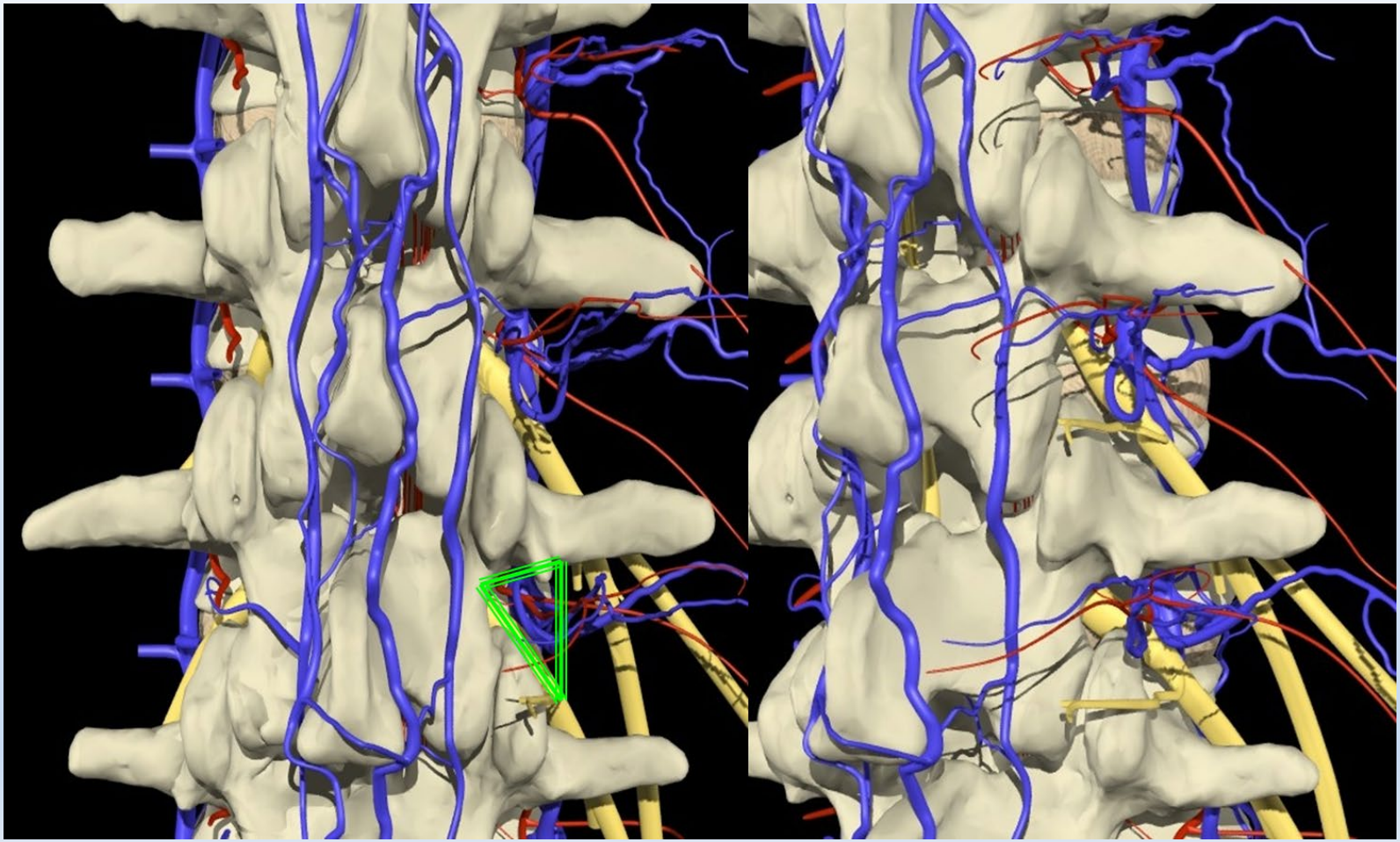


Epidural Space

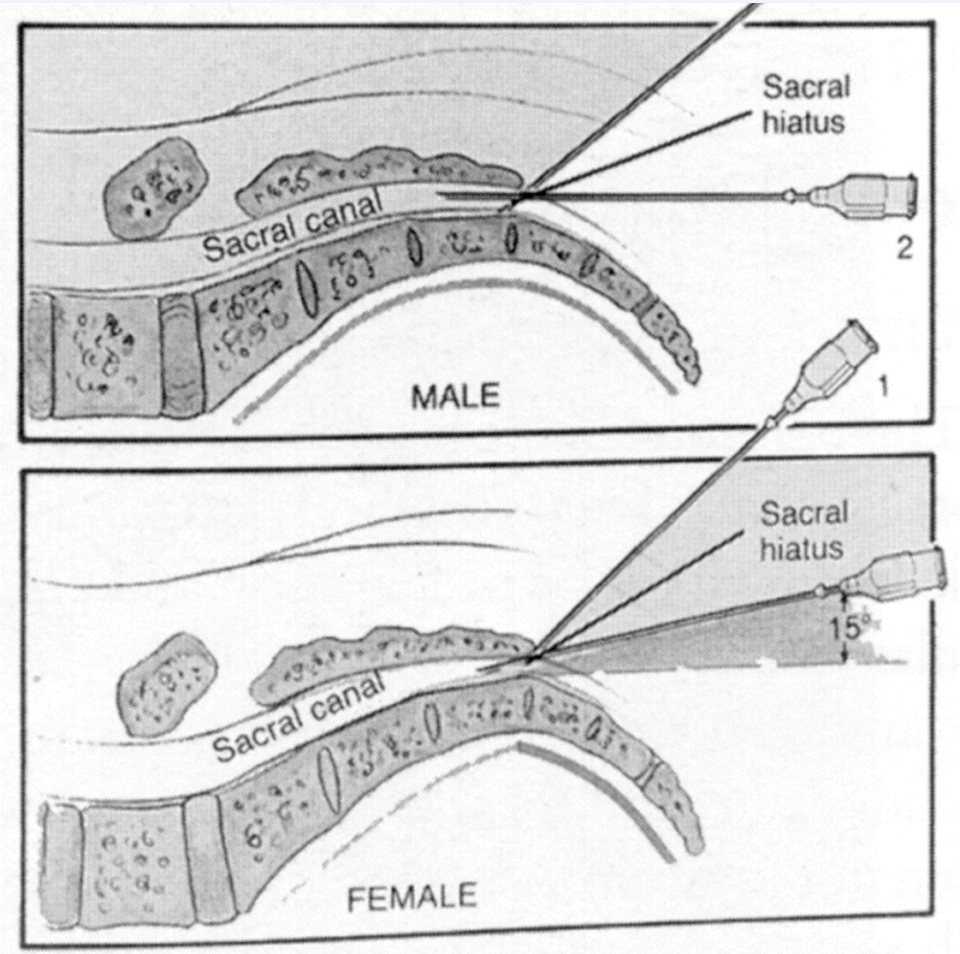
- **Contents:**
  - **Loose areolar connective tissue**
  - **Semiliquid fat**
  - **Lymphatics**
  - **Arteries**
  - **Extensive plexus of veins**
  - **Spinal nerve roots**
- **Segmented and discontinuous**



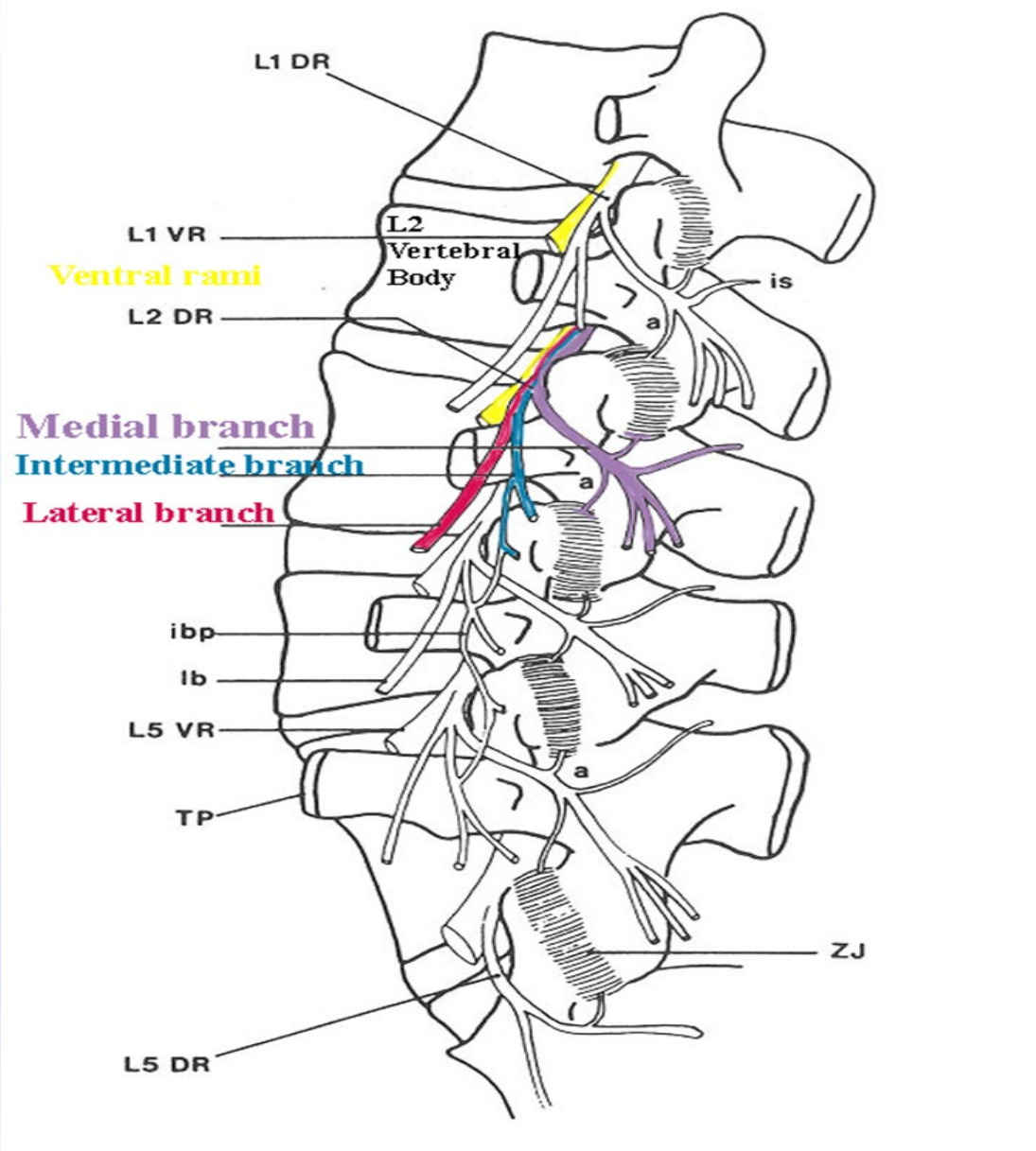
Transforaminal Approach

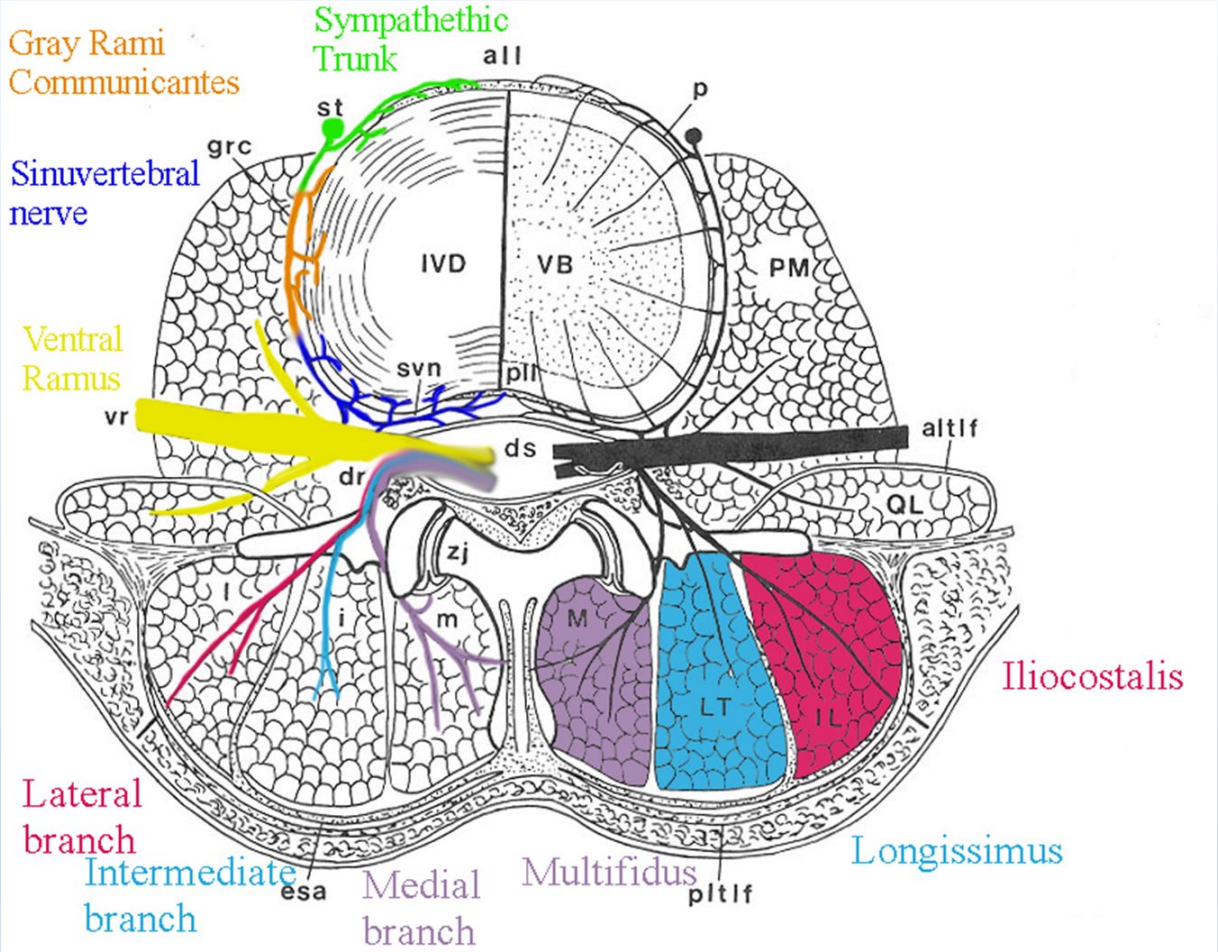


Caudal Approach



Dorsal Rami Anatomy




Gray Rami Communicantes
Sympathethic Trunk
all
st
p
grc
Sinuvertebral nerve
IVD
VB
PM
Ventral Ramus
svn
pll
vr
altlf
ds
dr
QL
zj
l
i
m
M
LT
IL
Iliocostalis
Lateral branch
Intermediate branch
esa
Medial branch
Multifidus
pltlf
Longissimus

Medial Branch Blocks

Lumbar intra-articular blocks and medial branch blocks (50% relief)

False positive rate 38%

Schwarzer AC, Aprill CN, Derby R, Fortin J, Kine G, Bogduk N. The false-positive rate of uncontrolled diagnostic blocks of the lumbar zygapophysial joints. *Pain* 1994;58:195-200.

Comparative medial branch blocks (>80% relief)

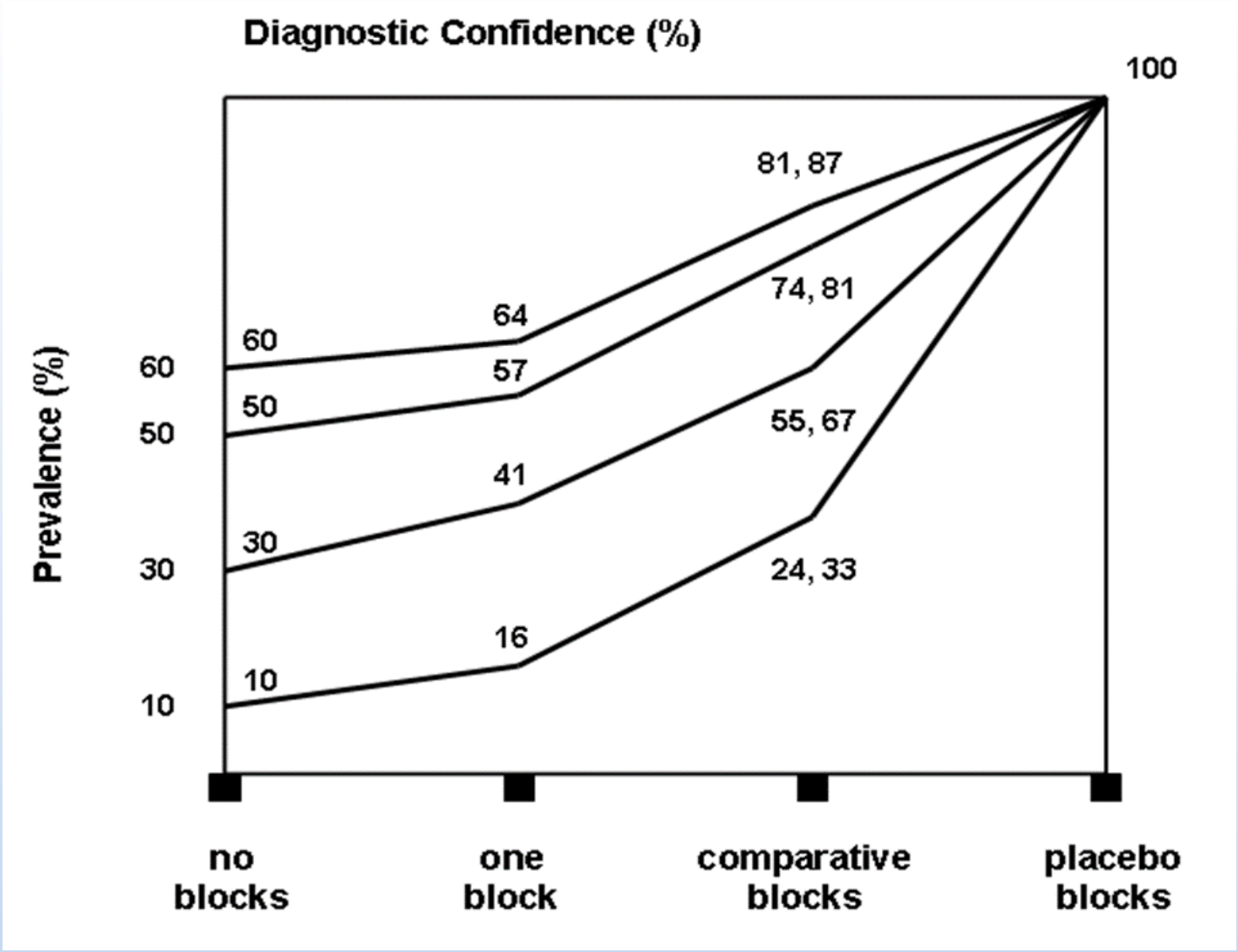
False positive rate 27-29%

Dreyfuss. Spine; 2000: 25:1270

Manchikanti, BMC Musculoskeletal Disorders 5:15,2004

Lumbar zygapophysial joint pain - prevalence

	Patients	Blocks	Relief	Prevalence
Schwarzer	Elderly, not injured	Placebo/intra-articular	50%	40%
Schwarzer	Injured young workers	Concordant comparative MBB	50%	15%
Carette	Rheumatology clinic	Single intra-articular block	50%	58%
Manchikanti	Various	Concordant comparative MBB	75%	45%
Manchikanti	Various	Concordant comparative MBB	75%	38%
Manchikanti	Various	Concordant comparative MBB	75%	31%
Laslett	Various	Single IA block or MBB	75%	23%
Laslett	Various	Concordant comparative IA/MBB	75%	24%
Manchukonda	Various	Concordant comparative MBB	80%	27%


Diagnostic Confidence (%)
100
Prevalence (%)
60
50
30
10
81, 87
74, 81
55, 67
24, 33
64
57
41
16
60
50
30
10
no blocks
one block
comparative blocks
placebo blocks

	Patients	Blocks	Relief	Prevalence
Schwarzer	Elderly, not injured	Placebo/intra-articular	100%	12%
Laslett	Various	Concordant comparative IA/MBB	95%	11%

1. Schwarzer AC, Wang S, Bogduk N, Mc- Naught PJ, Laurent R. Prevalence and clinical features of lumbar zygapophysial joint pain: a study in an Australian population with chronic low back pain. Ann Rheum Dis 1995;54:100-106.
2. Schwarzer AC, Aprill CN, Derby R, Fortin J, Kine G, Bogduk N. Clinical features of patients with pain stemming from the lumbar zygapophysial joints. Is the lumbar facet syndrome a clinical entity? Spine 1994;19:1132-1137.
Carette S, Marcoux S, Truchon R, Grondin, Gagnon J, Allard Y, Latulippe M. A controlled trial of corticosteroid injections into facet joints for chronic low back pain. New Engl J Med 1991; 325:1002-1007.
3. Manchikanti L, Pampati V, Fellows B, Bakhit CE. Prevalence of lumbar facet joint pain in chronic low back pain. Pain Physician 1999;2:59-64.
4. Manchikanti L, Pampati V, Fellows B, Bakhit CE. The diagnostic validity and therapeutic value of lumbar facet joint nerve blocks with or without adjuvant agents. Current Review of Pain 2000; 4:337-344.
5. Manchikanti L, Boswell MV, Singh V, Pampati V, Damron KS, Beyer CD. Prevalence of facet joint pain in chronic spinal pain of cervical, thoracic, and lumbar regions. BMC Musculoskeletal Disorders 2004; 5:15.
6. Laslett M, Oberg B, Aprill CN, McDonald B. Zygapophysial joint blocks in chronic low back pain: a test of Revel's model as a screening test. BMC Musculoskel Disord 2004;5:43.
7. Laslett M, McDonald B, Aprill CN, Tropp H, Oberg B. Clinical predictors of screening lumbar zygapophysial joint blocks: development of clinical prediction rules. The Spine J 2006; 6:370-379.
8. Manchukonda R, Manchikanti KN, Cash KA, Pampati V, Manchikanti L. Facet joint pain in chronic spinal pain: an evaluation of prevalence and false-positive rate of diagnostic blocks. J Spinal Disord Tech 2007; 20:539-545.

Radiofrequency Neurotomy

OUTCOMES

60% of patients obtained at least 90% relief lasting at least 12 months

87% of patients obtained at least 60% relief lasting at least 12 months

Pain relief accompanied by clinically and statistically significant improvements in disability

SELECTION

At least 80% relief of pain following controlled medial branch blocks. n = 15

TECHNIQUE

16G electrodes. 2 lesions parallel to the nerve

Dreyfuss P, Halbrook B, Pauza K, Joshi A, McLarty J, Bogduk N. Efficacy and validity of radiofrequency neurotomy for chronic lumbar zygapophysial joint pain. Spine 2000;25:1270–7.

OUTCOMES

56% of patients obtained 100% relief for at least six months

Pain relief corroborated by complete restoration of ADLs, cessation of medication and return to work.

Median duration of relief 15 months

SELECTION

100% relief of pain following controlled medial branch blocks. n = 106

TECHNIQUE

16G electrodes. 2 lesions parallel to the nerve, or 10 mm exposed tip

MacVicar J., Borowczyk J, MacVicar A, Loughnan B, Bogduk N. Lumbar medial branch radiofrequency neurotomy in New Zealand. Pain Med 2013; 14:639-645.

OUTCOMES

60% of patients obtained at least 90% relief lasting at least 12 months

87% of patients obtained at least 60% relief lasting at least 12 months

Pain relief accompanied by clinically and statistically significant improvements in disability

SELECTION

At least 80% relief of pain following controlled medial branch blocks. n = 15

TECHNIQUE

16G electrodes. 2 lesions parallel to the nerve, 5 mm exposed tip

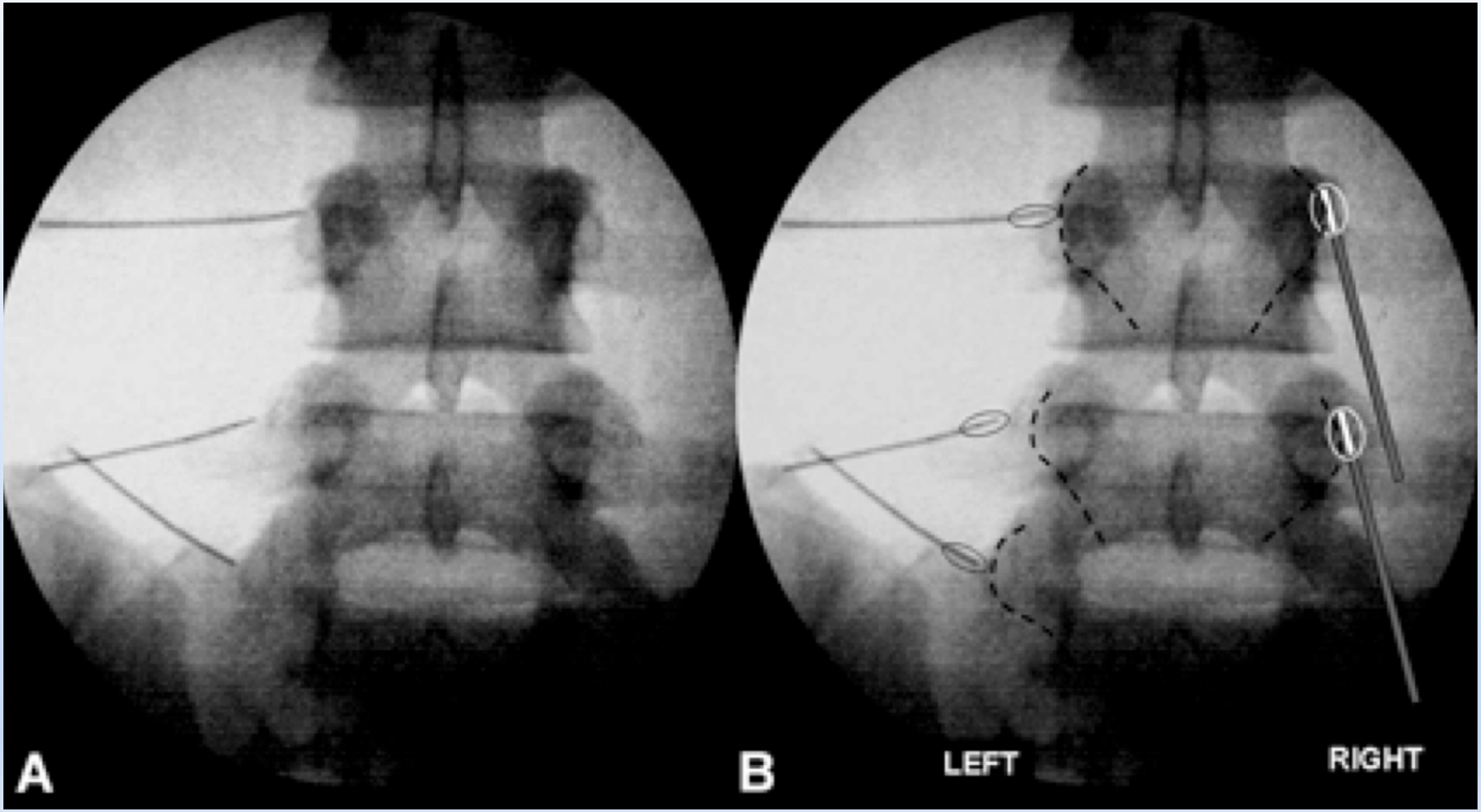
Dreyfuss P, Halbrook B, Pauza K, Joshi A, McLarty J, Bogduk N. Efficacy and validity of radiofrequency neurotomy for chronic lumbar zygapophysial joint pain. Spine 2000;25:1270–7.

RCT's

No benefit/minimal benefit

- Poor selection
  - intra-articular blocks
  - single blocks
  - 50% relief
- Poor technique
  - anatomically inaccurate
  - electrode perpendicular to the nerve
- Small gauge electrodes

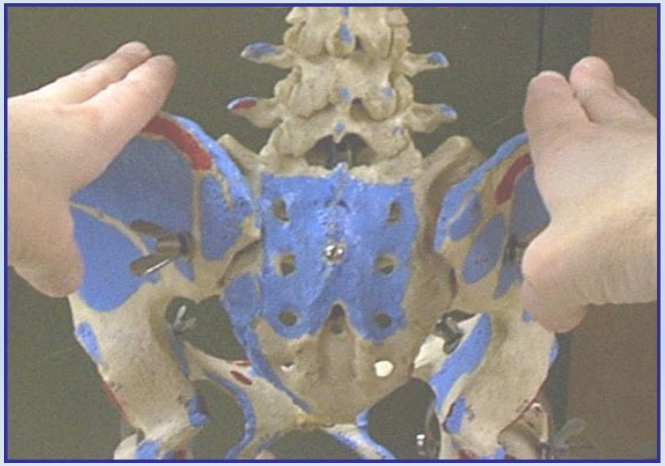
van Wijk RMA, Geurts JWM, Wynne HJ, et al. Radiofrequency denervation of lumbar facet joints in the treatment of chronic low back pain. A randomized, double-blind sham lesion-controlled trial. Clin J Pain 2005;21(4):335-44

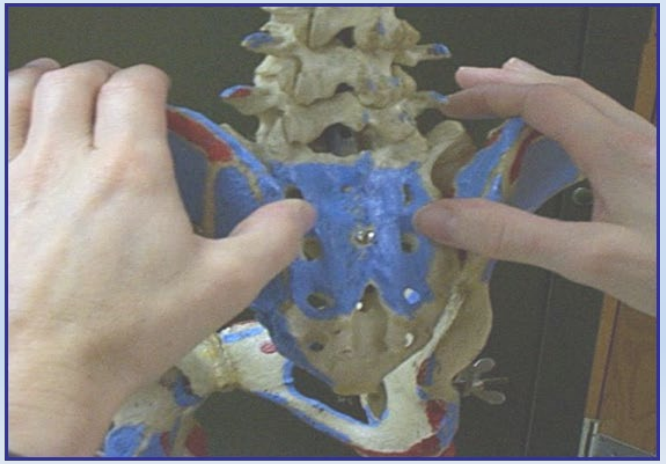

A
B
LEFT
RIGHT

Sacrolliac Joint

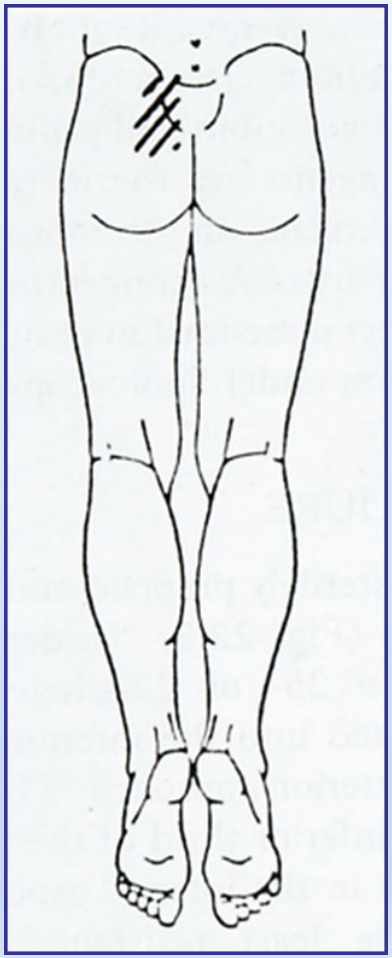
- Form closure: joint surfaces congruently fit together
- Force closure: muscles & ligaments provide force to withstand load
- Motor control: timing & sequencing of muscle activation & release

SIJ Assessment



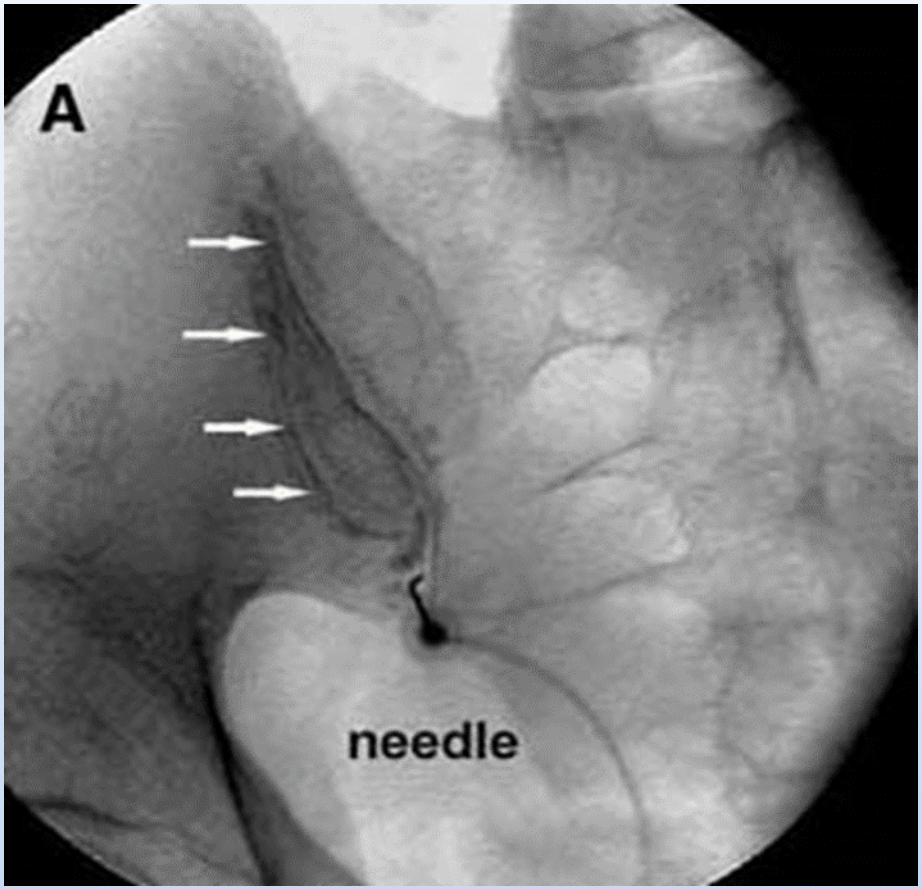


SIJ provocation testing



- SIJ border tenderness
- Patrick's test
- Gaenslen's test
- Prone hip extension
- Compression testing

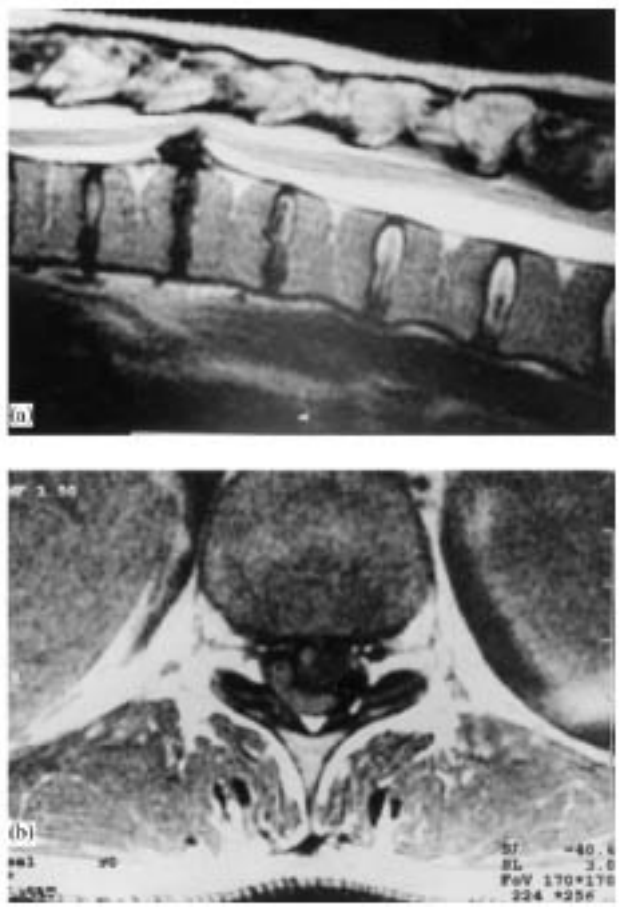
SIJ Injections



Common Back Pain Misconceptions

- I should rest until my back pain goes away.
- My back pain means I have really significant biological damage or disease.
- X-rays, CT, and MRI can always identify the cause of pain.
- Back pain will usually be cured by medical treatment.

Back Pain & MRI



Several studies have shown that there is a poor correlation between MRI findings and patients' low back symptoms.

1. Wittenberg et al., 1998

2. Savage et al., 1997

Active Resumption of ADLs

- Patients understandably have concerns and fears about re-injury and will underestimate their abilities.
- Based on history and findings, prescribe a graded exercise program-with P.T. input.
- When ongoing subjective complaints exceed objective findings, a focus should move away from a focus on pain and instead focus on function.

Thank You