

A Physiatrist's view on Low Back Pain

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Objectives

- Discuss the **relevant anatomy, history and physical exam** in a patient with acute Low Back Pain
- Generate a **Differential Diagnosis**, based on history and physical examination
- Identify appropriate **diagnostic tests** to confirm diagnosis
- Discuss **Treatment Algorithms**

Epidemiology

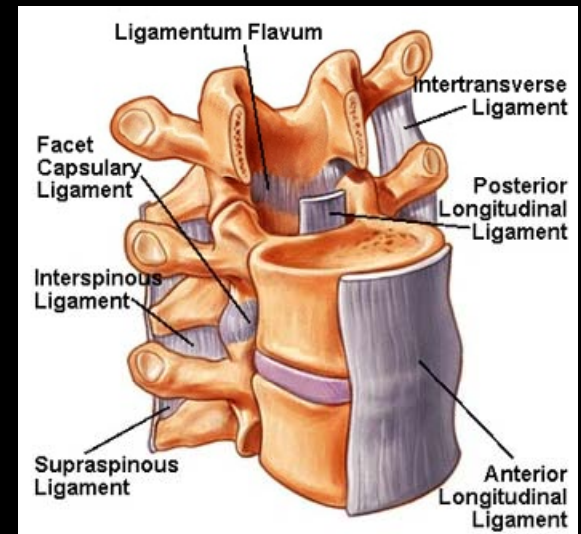
- 40% of people say they have had low back pain at some time in past 6 months
- Lifetime prevalence – 84 %
- 80 – 90% resolve in 3 – 6 months
- 80 – 90% of health care costs come from the 10% who develop chronic back pain (> 6 months)



ANATOMY OF LBP: PAIN GENERATORS

Innervated Structures

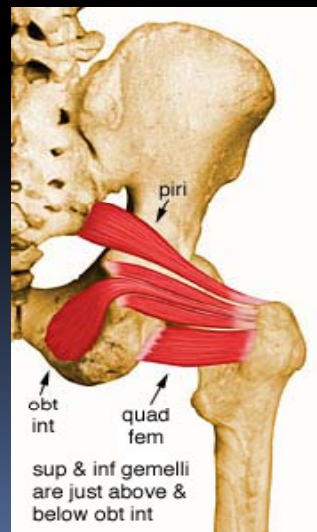
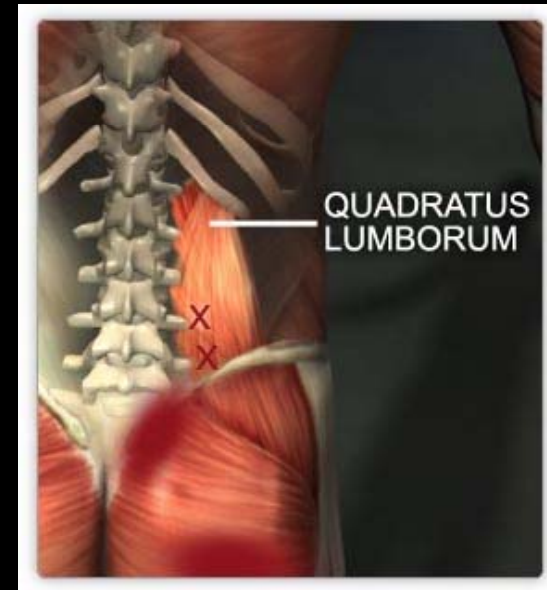
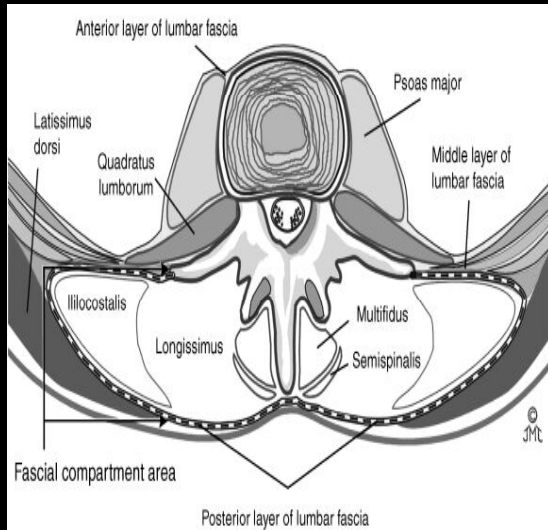
- Vertebral bodies
- Facet joints (Medial branch of DPR)
- Annulus fibrosus (outer 1/3): the “shock absorber”
- Ligaments: ALL, PLL, Interspinous
- Musculature
- Nerve Roots



Non-Innervated Structures

- Inner 2/3 Annulus fibrosus
- Ligamentum flavum
- Nucleus pulposus

Innervated Structures: Muscles



History

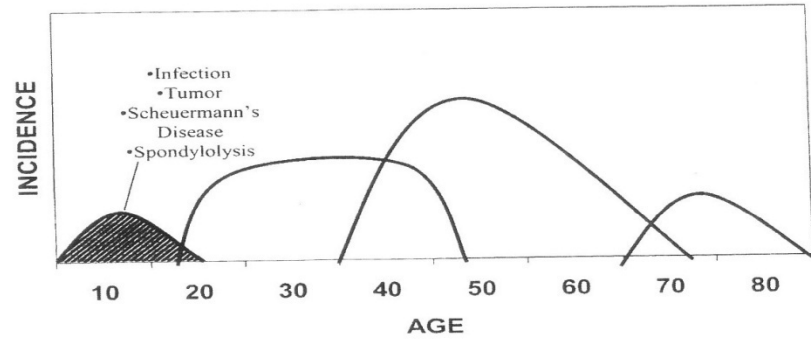
Low Back Pain is a symptom, not a disease

- Age
- Onset: Trauma ? / Duration
- **Location: Radiation ?**
- Characterization
- Aggravating / relieving factors
- Constant / intermittent
- Associated symptoms
- Progress / Treatment so far

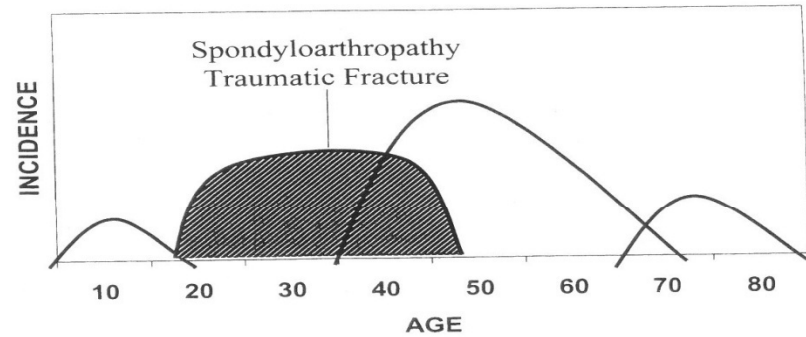


Age in LBP

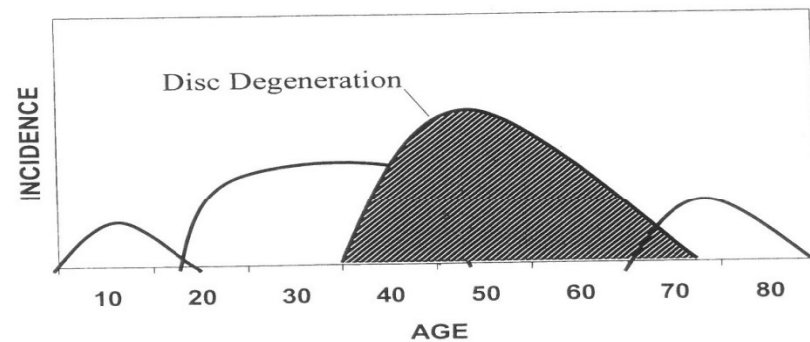
A: Alerts for Juveniles and Adolescents



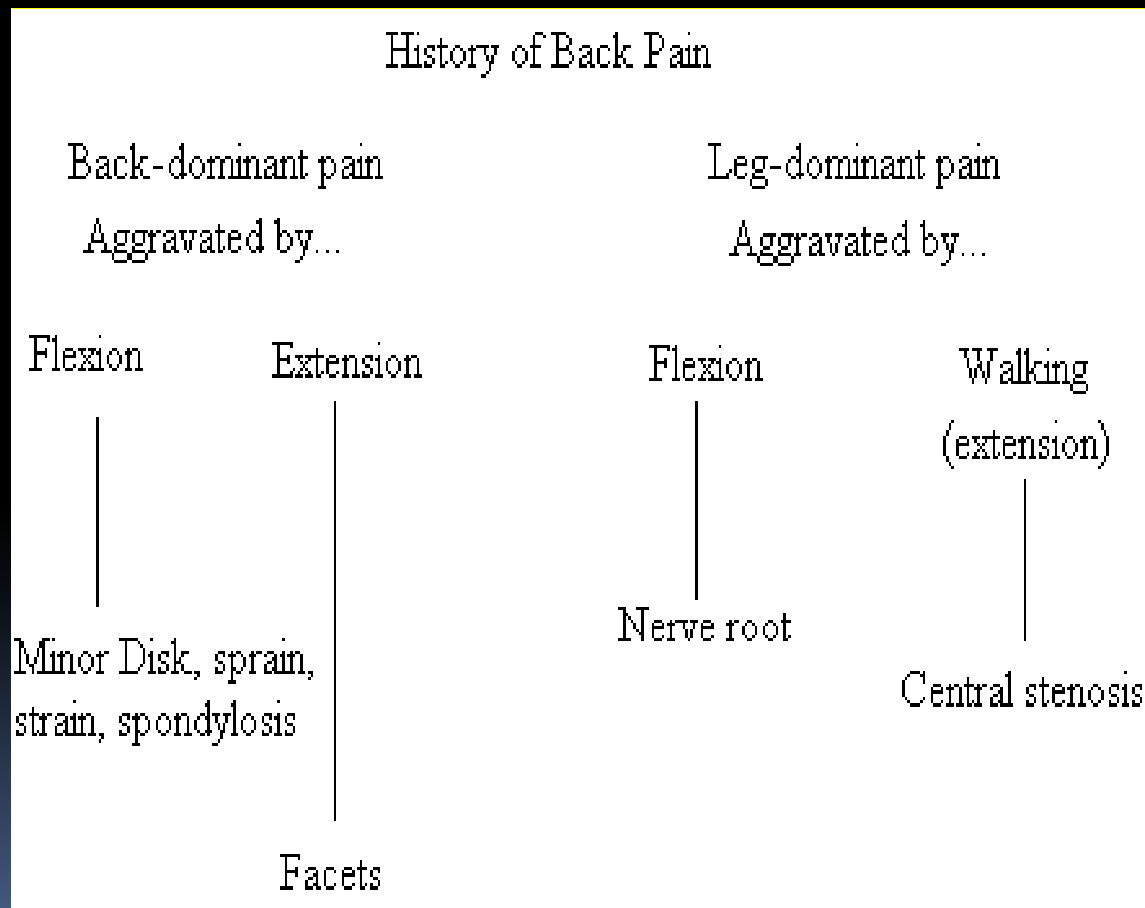
B: Alerts for Young Adults



C: Alerts for Middle Age




Co-relating history with the Pain Generator Source



RED FLAGS (Associated symptoms)

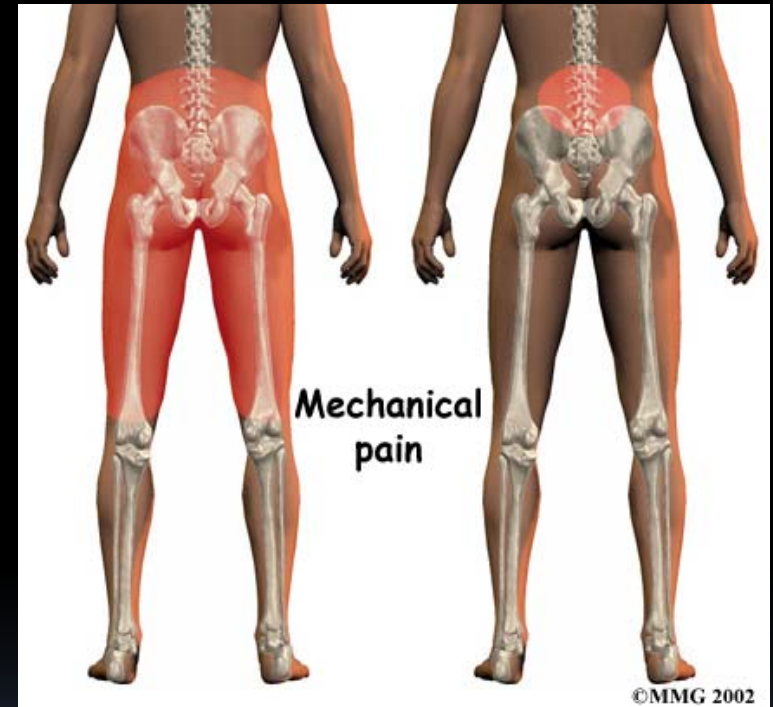
- Night / rest pain
- Fever with chills
- Bowel, Bladder or Erectile dysfunction
- Unexplained weight loss, h/o CA
- Duration greater than 6 weeks
- Age >70
- Immunosuppression, Intravenous (IV) drug use, prolonged use of corticosteroids
- h/o Osteoporosis



DEFINITIONS

Mechanical Low Back Pain(LBP)

- Generally triggered by an **acute** event
- **Aggravated by** activities e.g. **bending, lifting**, walking
- **Relieved by rest / recumbency**
- May radiate to buttock, hip, rarely thigh, rarely distal to knee
- **NO ASSOCIATED NEUROLOGIC SIGNS**
- **Sources:**
 - Disc, facet joint, nerve, ligament, muscle, instability



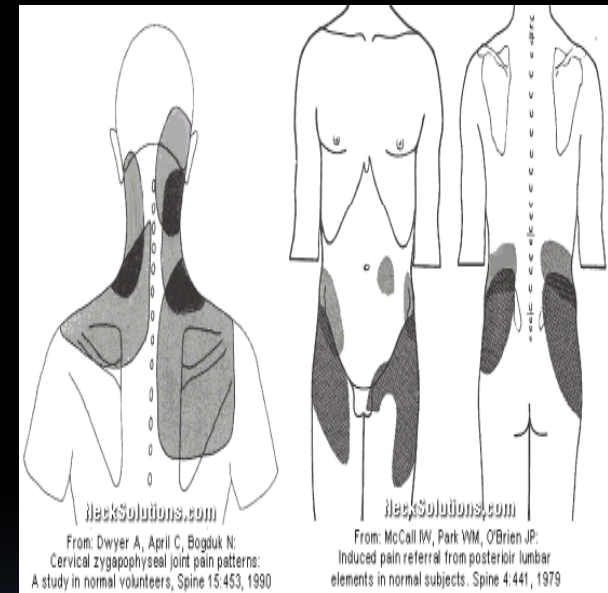
Non-mechanical Back Pain

- Generally **no preceding acute event**
- Constant pain +/- night pain, no relief with recumbency / rest / change in position
- **NO RADIATING LEG PAIN (unless co-existent nerve compression)**
- **Causes:**
 - Referred pain e.g. abdomen / retroperitoneum
 - Infection (bone, disc, epidural space)
 - Neoplasm (primary / secondary)
 - Inflammatory arthritides
 - Miscellaneous e.g. Paget's disease

Mechanical Low Back Pain

■ Facet joint Pain:

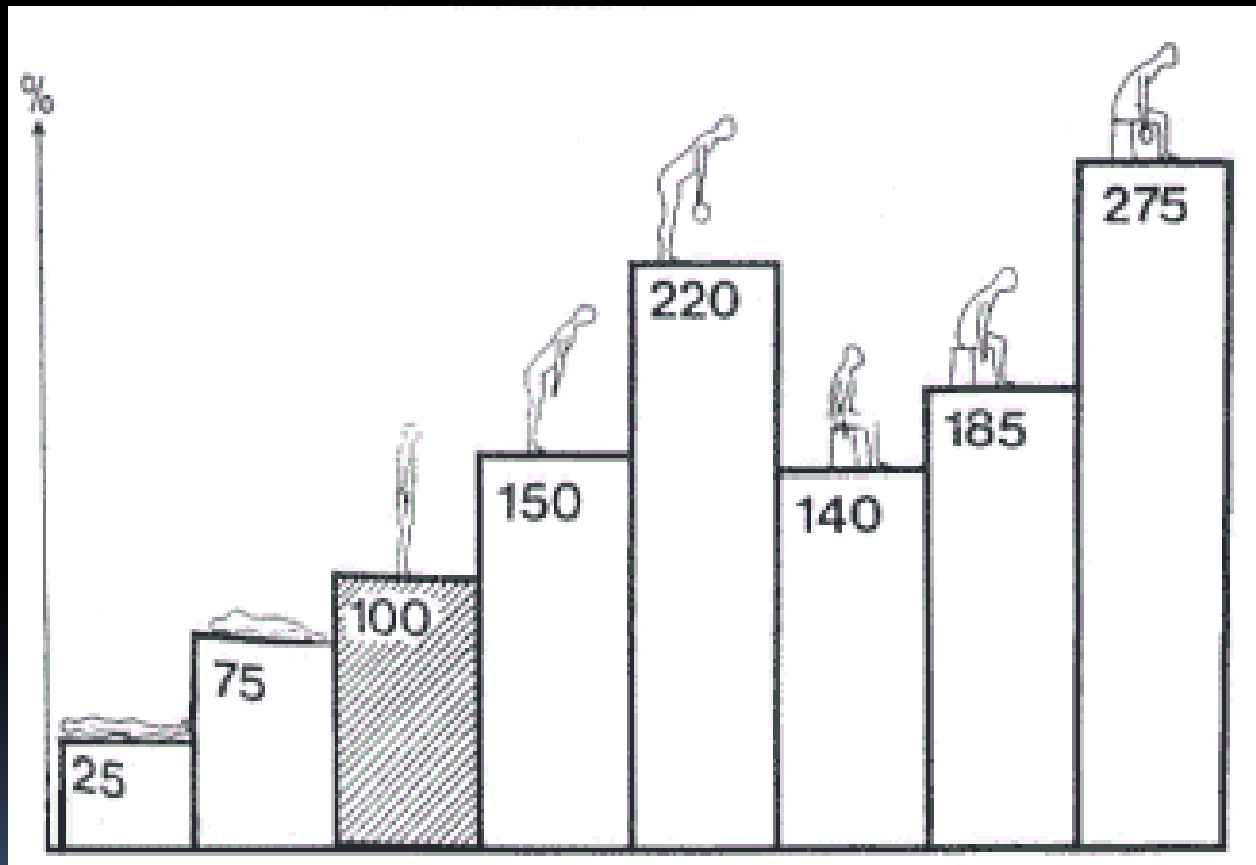
- Acute / subacute, trauma +/-
- Referral to buttock area is common
- Exacerbated with Lumbar extension / sitting
- Usually relieved by walking / lying down



Radicular Pain:

- Acute onset, s/p trauma (usually)
- Back Pain +/- for several years
- **LEG Pain distal to the knee** – usually sharp, shooting / stabbing
- **In a DERMATOMAL / RADICULAR fashion**
- Paresthesias
- **Exam:**
 - SLR: strong ++
 - Associated findings e.g. weakness, atrophy, loss of reflexes

Lumbar disc pressure Map



Radiculitis Vs Radiculopathy

- Radicular pain, exam s/o nerve root involvement
- No neural compression on MRI
- Annular tears usually + (HIZ on MRI T2 imaging)
- With a tear, the nucleus pulposus is exposed causing an auto-immune mediated inflammatory cascade
- Inflammatory mediators: PL A2, PGE2, COX 2, NO, IL
- The inflammatory mediators cause neural swelling, alter their EP function and cause pain without specific mechanical compression

Claudication Pain:

- Back pain for several years
- Leg pain is the most common “presenting incapacitating symptom”
- Usually Bilateral
- Vague: “heaviness, cramping, soreness”
- Paresthesias common
- Usually initiated by walking, prolonged standing, and walking downhill
- Relieved by sitting or bending forward

Sudden worsening = listhesis or HNP

Neurogenic & Vascular Claudication

	Neurogenic Claudication	Vascular Claudication
Location of Pain	Back, Thigh, Calf, rarely in buttock area	Usually calf +/- buttock
Quality	Vague: radicular, cramping, "heaviness"	Sharp, cramping
Aggravating factors	Spine extension, Standing, Walking, especially downhill	Not affected by spinal position or by standing, but by walking or any leg exercise
Relieving factors	Flexed spine posture, lying down, sitting, slow relief	Stopping muscular activity even standing, quick relief
Skin /Vascular exam	Pulses +, no skin changes	Weak / absent pulses, atrophic skin changes
SLR	Mild + or negative	Negative
Neurologic exam	+/- depending on severity	Negative

Instability

- Often-used term. 2 definitions
- **Mechanical (Gross) Instability**
 - Relative motion of one vertebrae on another, seen on flexion/extension films
 - Requires evaluation by spinal surgeon
- **Micro-instability**
 - Refers to very small movement, caused by tissue damage, poor muscular endurance, or poor muscular control
 - Contributes to Mechanical Low Back Pain

Myofascial Low Back Pain

- In the face of a **non-focal neurologic exam, normal plain film, a normal MRI**, and **continued low back pain**, a diagnosis of myofascial pain must be considered
- Treatment – antidepressants, trigger point injections, stretching, strengthening, ROM, aerobic exercise

Physical Exam

- Gait: while walking into the room
- Examine every patient with LBP in a gown !!!
- Posture with standing
 - Bending forward
 - Leaning to one side
 - Weight bearing on one leg more than the other
- Spine deformity e.g structural / reactive scoliosis, kyphosis, lordosis

Palpation

- **Muscles:**

- Paraspinals, gluteals, piriformis, quadratus lumborum, TFL

- **Bony prominences:**

- Spinous processes / Facets
- Iliac crest
- Ischial tuberosity
- Greater trochanter

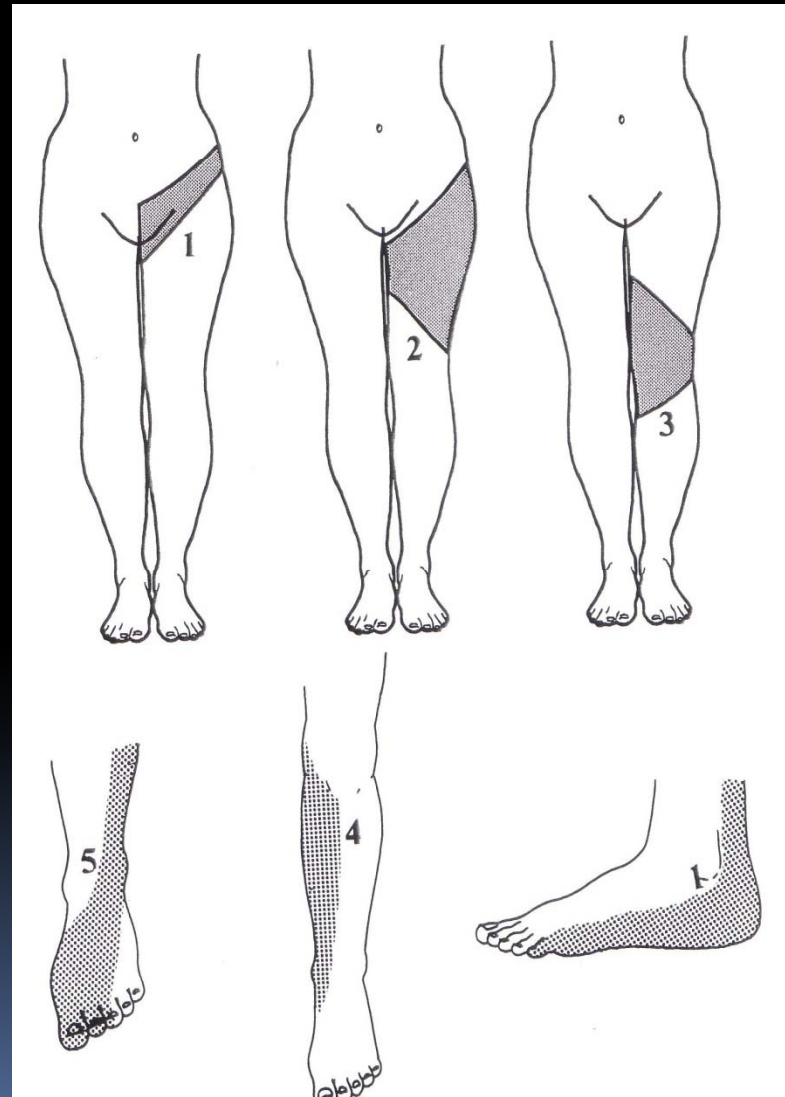
ROM and rhythm

- Flexion: 40 – 60 deg
- Extension: 20 – 35 deg
- Side bending: 15 – 20 deg
- Rotation: 15 – 20 deg
- **Which range specifically reproduces the pain?**

Neurological Exam

- **Strength testing (MMT): 0 – 5**
 - Hip flexors: L2/3
 - Quads: L3/4
 - Tibialis Anterior: L4
 - EHL: L5
 - Gastroc: S1
- **Toe/Heel walking**
- **Reflexes: 0 – 4+ (clonus): Compare side to side**
 - Knee (Patellar): L4
 - Tibialis Posterior: L5
 - Ankle (Achilles): S1
 - Medial Hamstring: L5/S1

Sensory Dermatomes



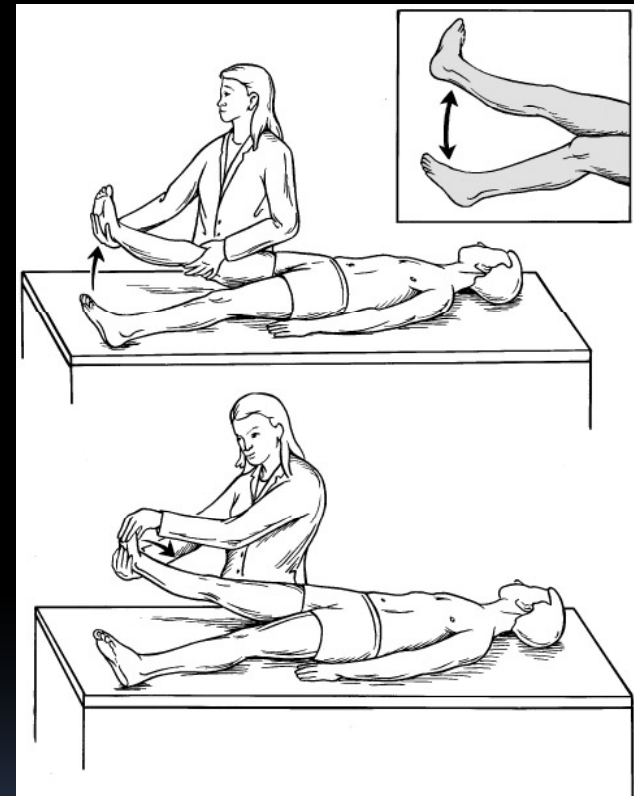
SPECIAL TESTS

To complete the physical exam in a patient with LBP, it is important to examine the following:

- Nerve Root tension signs
- Lumbar facets
- SI joints
- Hip joints

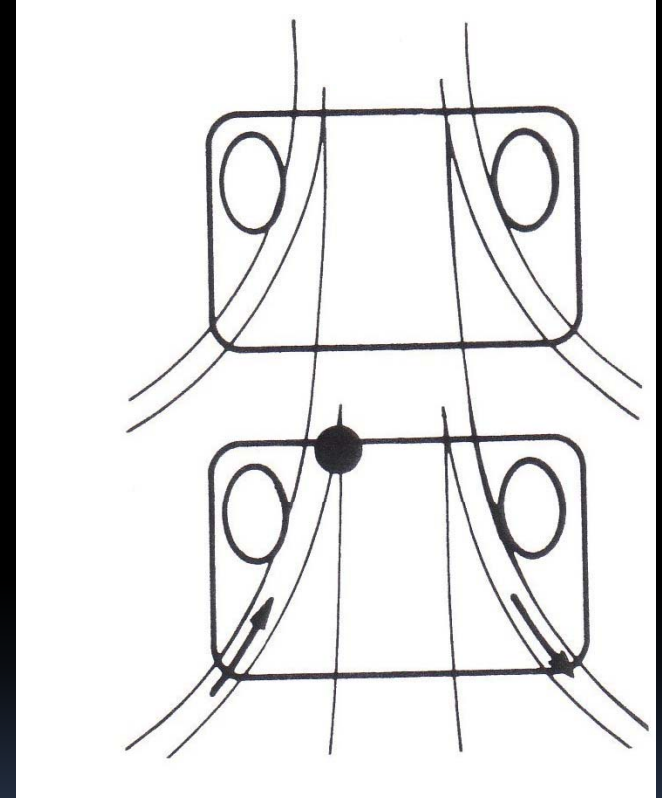
SLR (Straight Leg Raise):

- Patient lies supine with his pelvis flat on the bed and in a neutral position
- Elevate the leg by cupping your hand below the patient's heel, slowly, with the knee locked in extension => ask the patient whether elevating the leg causes any *pain in the leg/foot below the ipsilateral knee*



SLR (Straight Leg Raise):

- **(+) if REPRODUCES SAME PATTERN OF LEG PAIN BELOW THE I/L KNEE; occurs between 30 – 70 deg of hip flexion**
- **Pain felt below $< 30^\circ$ elevation:** Not sciatica, the sciatic nerve roots are not sufficiently stretched
- **Crossed SLR:**
 - Highly specific for sciatica of the opposite leg (**crossed straight leg raising test**) - although it is a very insensitive test
 - **C/L axillary disc herniation**

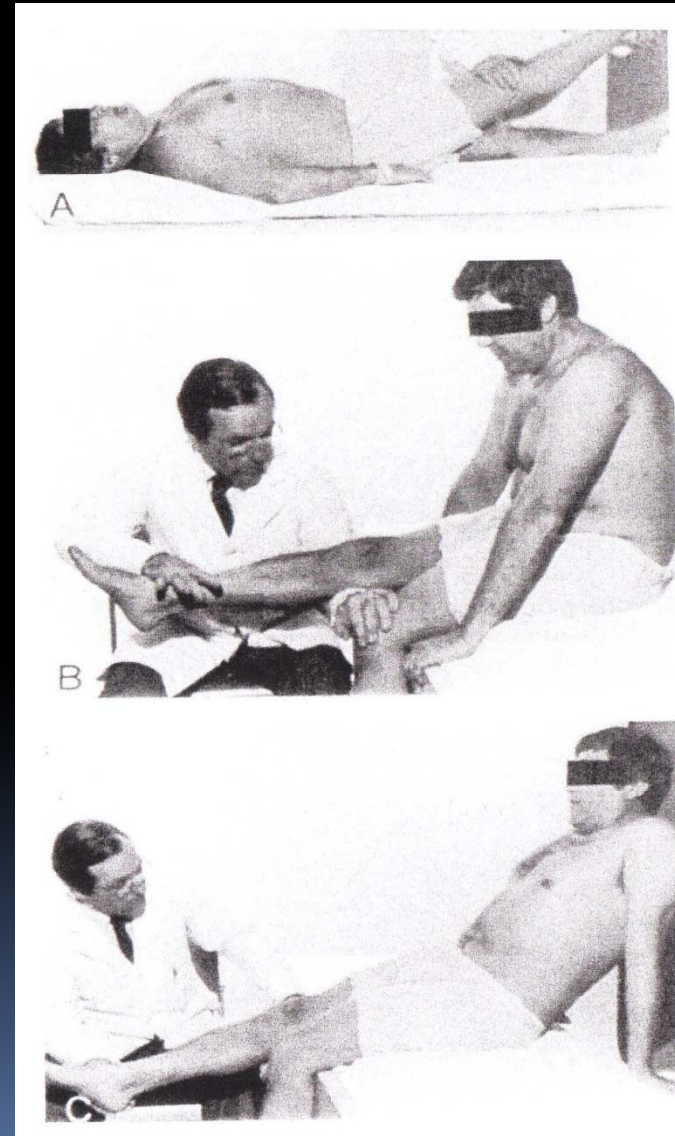


SLR: Lasegue's sign

- If the patient feels pain on leg raising => lower the leg a few degrees => the pain should disappear / lessen
 - then dorsiflex the foot in that position => re-appearance / aggravation of the pain suggests sciatica - **Lasegue's sign**
- **Flex the knee:** should relieve the pain
 - If patient still has pain with the knee flexed and if pain is increased on further hip flexion, ???
Hip pathology vs. non-organic pain

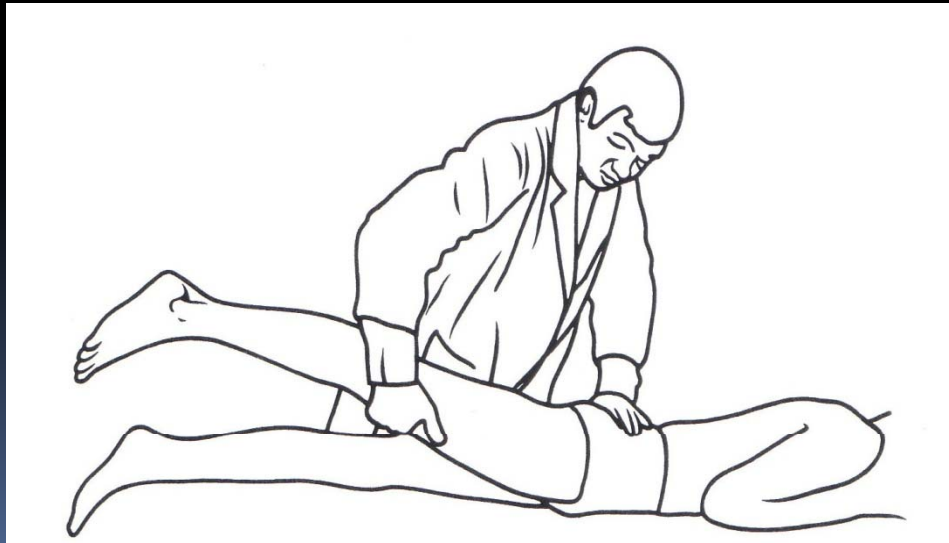
Sitting SLR (Straight Leg Raise):

- Often used when there is concern whether LBP is organic
- **Positive Tripod Sign**
- Very **strong ++** test for root tension when considering non-organic pain



False negative SLR:

- Large central disc herniation
- Proximal lumbar disc herniation
 - Reverse SLR (Femoral Nerve Stretch Test)

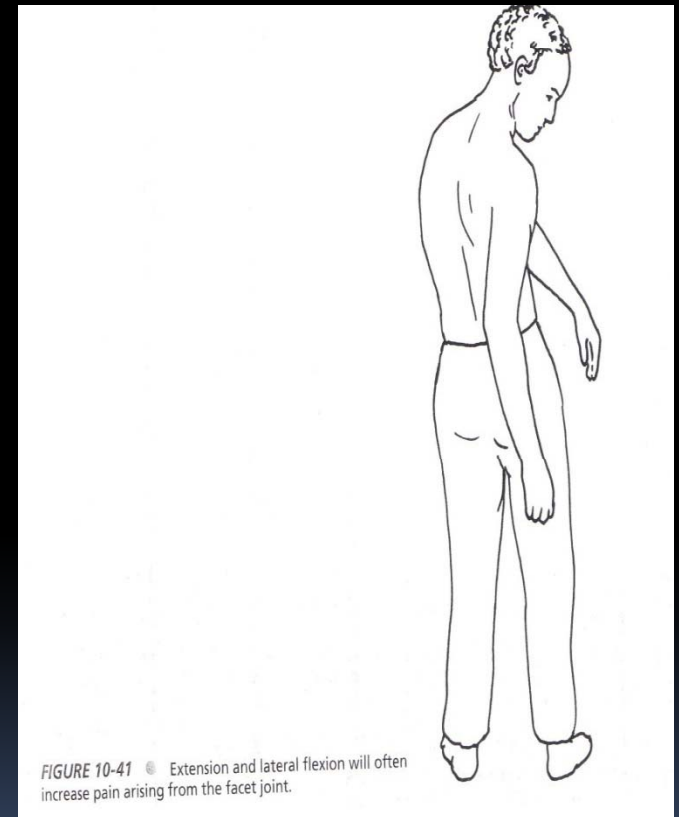


SLR Sensitivity & Specificity

	Sensitivity (%)	Specificity (%)
SLR	73-98	11-61
Crossed SLR	23-43	88-98

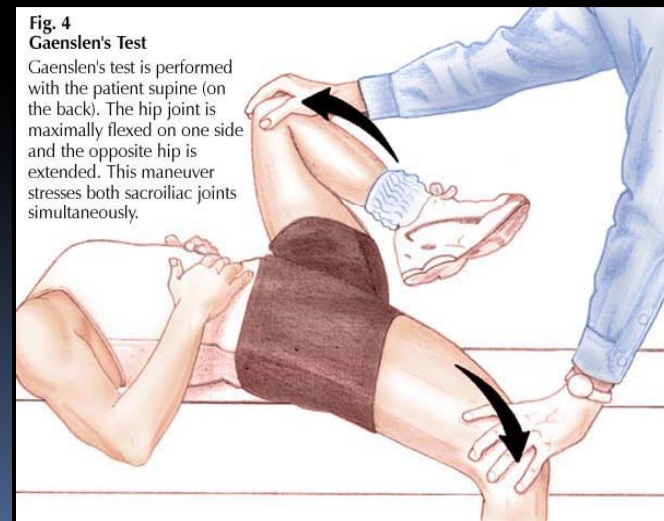
Lumbar facet exam

- TTP laterally over the facet area
- Loading lumbar facets causes pain
 - Standing position
 - Extension
 - Lateral flexion
 - Causes pain +/- TTP



Special Tests (contd)

- **SI joint Stress Tests:**
 - “Fig 4” test (FABER test)
 - Gaenslen’s test
 - Multiple other tests



Special Tests (contd)

- Ober's test
- Assess tightness of TFL & IT band



Waddell's signs

- Indicates **symptom magnification** and nonorganic etiology of LBP
- **DOES NOT MEAN PATIENT IS MALINGERING**
- **3/5 of the following needed:**
 - Inappropriate tenderness (skin rolling)
 - Reproduction of pain with axial loading
 - Inconsistency with exam (SLR supine vs sitting)
 - Regional sensory deficits
 - Overreaction to exam

Diagnostic tests

- **Labs:**

- Usually not necessary unless suspect Rheumatologic process, Infection or Malignancy
- CBC with differential
- ESR/CRP
- Urine for Bence Jones Protein
- Serum Protein Electrophoresis / Urine Protein Electrophoresis

Imaging studies

- Xrays
- MRI Scan LS spine, +/- Contrast ??
- CT Scan, +/- Myelogram
- Bone Scan
- EMG/NCV

Xrays: Indications

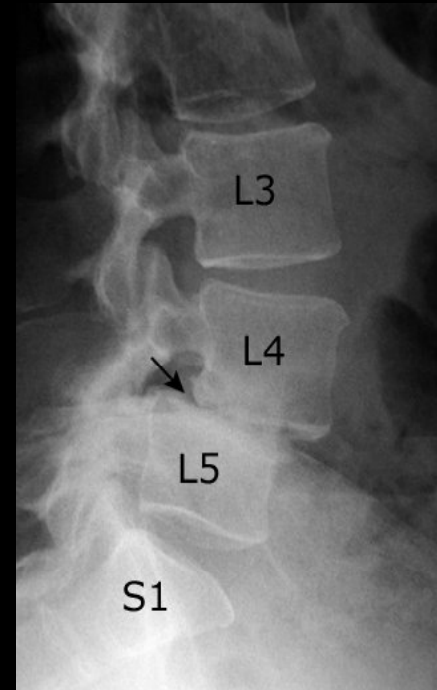
Red flags:

- Back pain in patients > 55 years old
- h/o violent trauma
- Persistent night / rest pain
- h/o CA
- Systemic illness / weight loss
- Associated morning stiffness, iritis, colitis, skin rash, urethral discharge

Xrays:

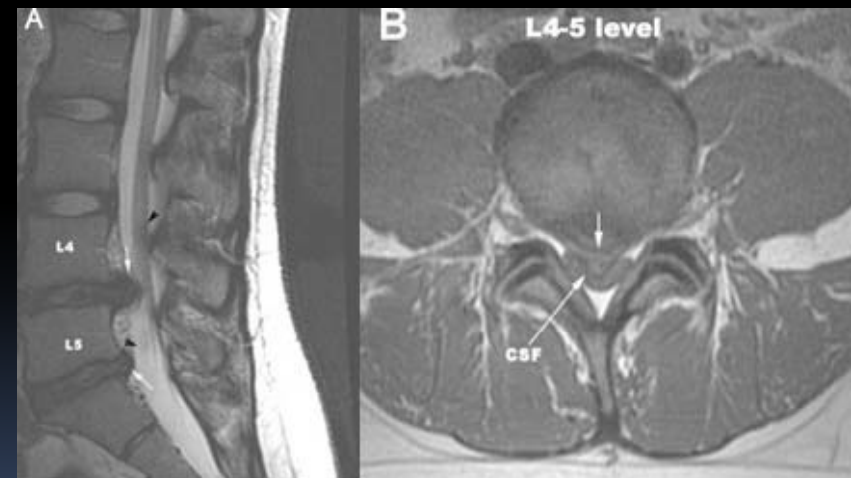
- **Views:**
 - AP/Lateral/Obliques
 - Flexion / Extension views
- **Demonstrate:**
 - Bony anatomy & Alignment
 - Fractures
 - DDD / DJD
 - Rarely, CA
 - Instability
 - Spondylolysis
 - Spondylolisthesis





MRI Scan

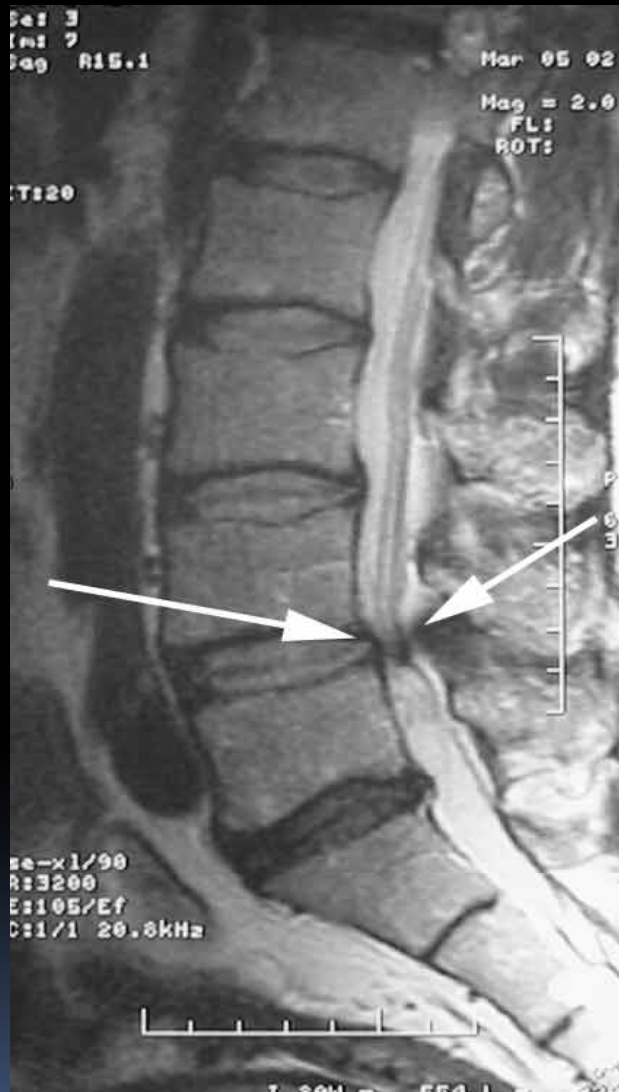
- Mainly soft tissue pathology
- Also shows bony architecture
 - Disc: degeneration, herniation
 - Nerve roots: compression
 - Spinal stenosis: canal dimension
 - HIZ on T2: Annular tear
 - Intradural lesions



MRI: Very sensitive, not specific in determining source of pain

Definite indications of MRI

- **Neurologic deficit**
- **Clinical suspicion of HNP**: Radicular symptoms + Signs of nerve root tension +/- neurologic deficit
 - Initially / after failed conservative care ??
- **Recurrent radicular symptoms** suggestive of recurrent / residual HNP (failed back)
- **“Red flags”**: clinical suspicion of CA / mets / infection
 - 8-12 weeks of persistent LBP, **despite treatment**
- Spinal stenosis ?? (relative indication)



When to add contrast ?

- Suspect CA / mets
 - If mets: consider Bone Scan
- Infection ??
 - Role of Bone Scan
- Failed back syndrome
 - To differentiate a recurrent disc vs scar infiltration

MRI: Sensitive but not specific

- MRI findings must be carefully correlated with the patient's clinical findings, as disc abnormalities are common in asymptomatic patients

Role of CT Scan

- Superior detection of **bony detail**
- **Indications for plain CT:**
 - **Contra-indication to MRI** (pacemakers, orbital FB, mechanical valves ??, shrapnel ??)
 - Better visualize bony **tumors** (???)
 - **Fractures**
 - Rarely, to assess **fusion mass**

CT Myelogram

- Usually a test ordered by the neurosurgeons
- Indications:
 - Multiple herniations, polyradiculopathies
 - Failed Back syndrome
 - Decision making in spinal stenosis
 - C/I to MRI
 - Obese patients

Indications of Bone Scan

- Suspicion of multiple **bony mets**
- Early detection of **bone infection**
(Indium Scan more specific for infection than Gallium / Technetium)
- **Unexplained bone pain** (especially in high-powered athletes: stress fractures)

Role of EMG/NCS

- Extension of physical exam:
 - Localizes level of nerve root involvement
- Co-relates exam findings and imaging studies with physiology

Indications for EMG/NCS

- **Multiple pathologies** suspected
- Suspected radiculopathy / plexopathy, **poor correlation** between their radicular symptoms and neuroimaging
- **Multilevel disease** on neuroimaging
- **Recurrent LBP** after successful Tx (acute on chronic process)



**PUTTING IT ALL
TOGETHER**

Differential Diagnosis

- Lumbar strain /MPS
- DDD, DJD
- Facet arthropathy
- SI joint dysfunction
- Piriformis Syndrome
- Radiculopathy
- Neurogenic Claudication
(Central canal stenosis)
- Spondylosis
- Spondylolysis
- Spondylolisthesis
- Ankylosing
spondylitis
- Seronegative
arthritis

Absolute Indications for Urgent Referral to a Neurosurgeon

- ***Bowel / bladder incontinence (Cauda Equina Syndrome)***
 - A true surgical emergency
- ***Worsening neurologic deficit***
- ***Suspected spinal cord compression***

Other Indications for Urgent Referral to a Neurosurgeon

- **Persistent Neurologic Deficit** after 4-6 weeks of conservative therapy
- **Persistent symptoms** after 4-6 weeks in a patient with positive straight leg raising sign, consistent clinical findings and favorable psychosocial circumstances
- Known Canal Stenosis with new radicular symptomatology and nerve root tension signs
- Failed Back Syndrome with recurrent symptoms suggestive of acute HNP

Treatment

- Initial step: **patient education** and **outlining treatment plan**
 - Weight loss, in obese patients
 - Abdominal brace
 - Vocational issues – change jobs ??
- **Start conservative,**
 - Except if any of the “**red flags**” are present
- Proceed with more invasive / **aggressive techniques** **if conservative measures fail**

Treatment Options

- Complete Bed Rest (CBR)
- Physical Therapy
- Medications
- Interventional pain procedures
- Surgery

Indications of Complete Bed Rest

- Lumbar sprain / strain
- Acute radicular syndrome secondary to HNP
 - Maximum period of Complete Bed Rest is 48-72 hours

Physical Therapy:

- Know which muscles to stretch and/or strengthen
- **Physical Therapy can:**
 - Improve ROM
 - Reduce Pain & Spasm
 - Strengthen weak muscles
- **Start with passive techniques**
 - Active exercises not easily tolerated initially
 - Stretching, modalities including ice, heat, U/S, massage, TENS

Physical Therapy:

- **Lumbar stabilization**
 - Strengthens abdominal muscles and lumbar paraspinals
 - Flexion based (Williams) vs Extension based (McEnzie)
 - If HNP: McEnzie extension exercises, to centralize pain
 - If LCS: Williams flexion exercises
- **Back School:** prevent recurrent episodes

Therapy Prescription

- Name
- Diagnosis
- Therapy type (PT, OT e.g.)
- Instructions
- Frequency
- Duration
- Precautions
 - Avoid extension exercises with facet arthropathy
 - Weight bearing restrictions, if applicable

Medications

- NSAIDs
- Muscle relaxants
- Opioids
- Topical options
- Antidepressants (Myofacial Pain)
- Anticonvulsants (Neuropathic Pain)

Invasive techniques

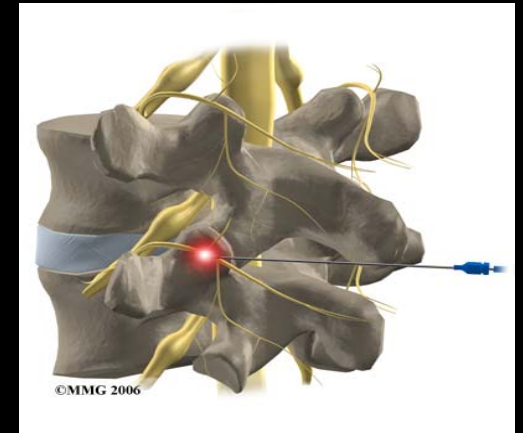
- **Trigger point injections**
- Indicated for **myofascial pain**
 - Lidocaine / Bupivacaine – 1cc per Trigger Point
 - Dry needling
 - Botulinum toxin – controversy over efficacy
 - Knowledge of anatomy is important to identify trigger points and avoid complications with injection



INTERVENTIONAL PAIN PROCEDURES

Role of Spinal Injections:

- Facet blocks (Medial Branch Blocks) & Radio Frequency Ablation
 - Facet arthritis
- Epidural steroids
 - Lumbar stenosis / Acute HNP
- Selective Nerve Root Blocks
 - Acute disc herniation
- SI joint, piriformis injections



New Techniques:

- IDET
- Chemonucleolysis
- Intra-discal Steroid injection
- Nucleoplasty
- Intra-thecal therapy (Morphine, Ziconotide, clonidine, Baclofen)
- Spinal Cord Stimulator
- Prolotherapy

Indications for Pain management referral

- **Acute HNP**, radicular pain not controlled with adequate trial of meds, no significant neurologic deficit (SNRB v LES)
- Radicular pain from **canal stenosis**
- Chronic **DDD** +/- acute exacerbation
- **Recurrent HNP**
- Failed Back Syndrome

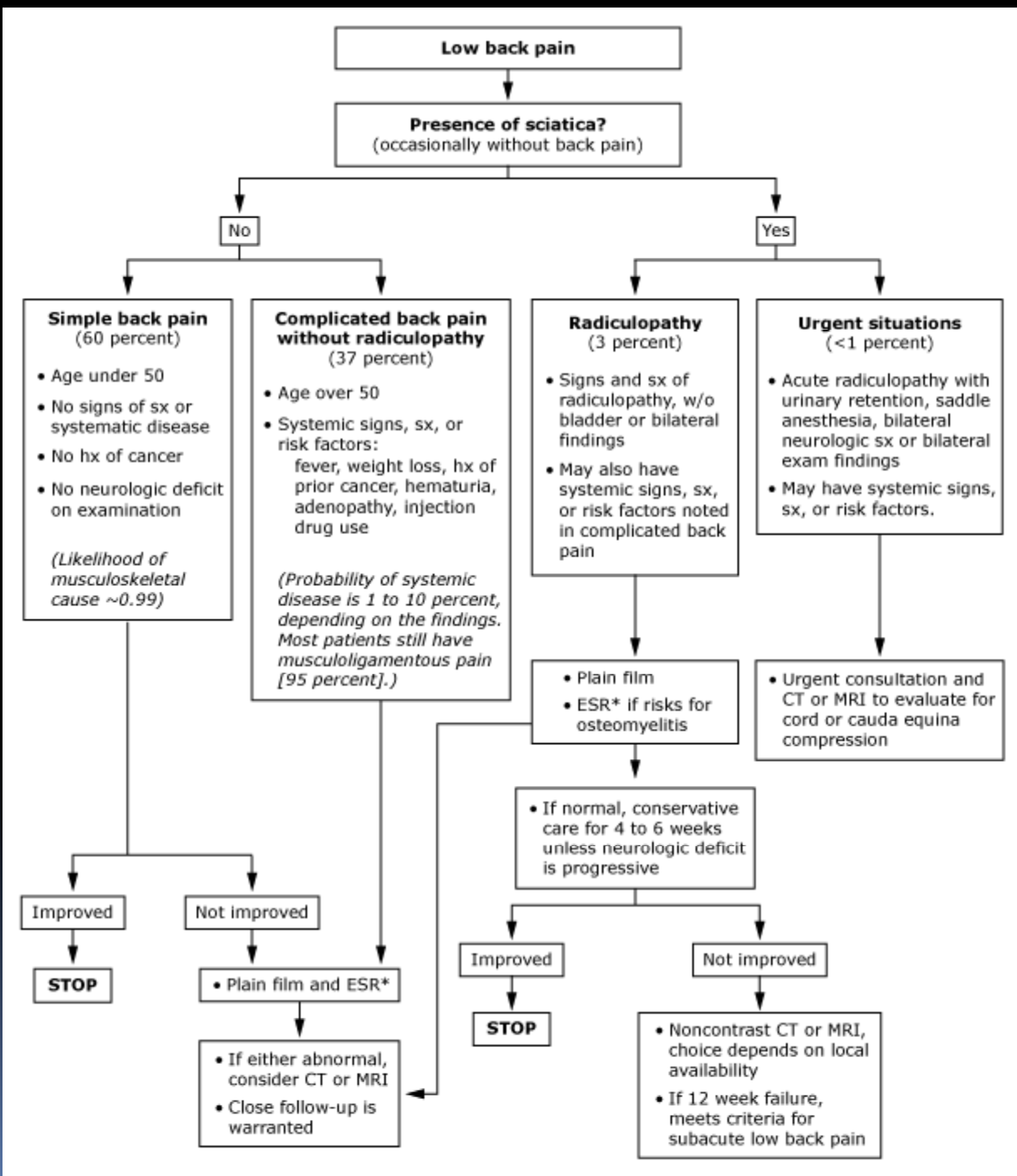
Evidence based Clinical Practice Guidelines from the American Pain Society (2009: SPINE, Vol. 34, Number 10, Pg 1066-1109)

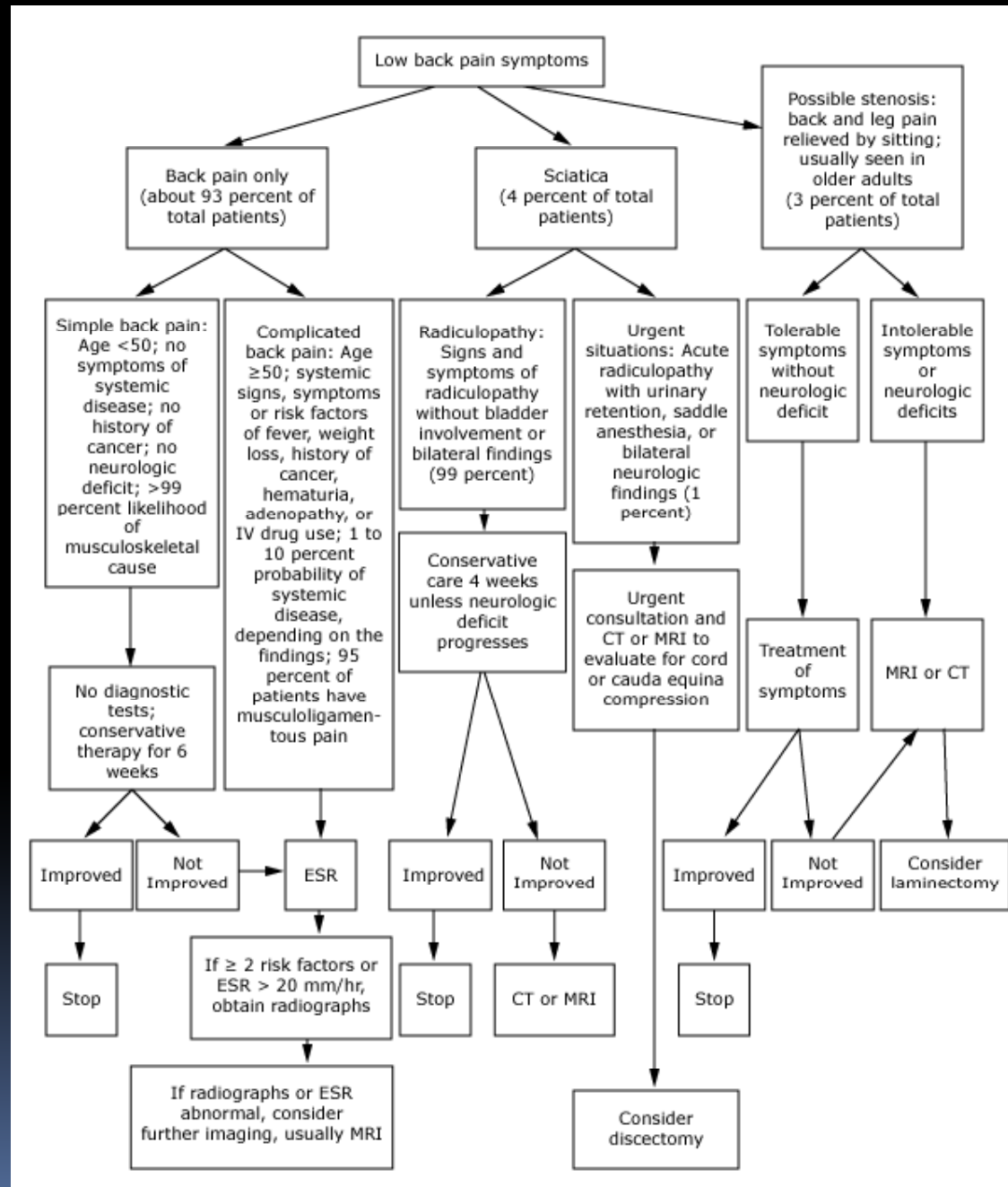
Algorithm

- **Establish Diagnosis**
 - 90% can be diagnosed with H&P alone
- **Start conservative**
 - Lifestyle modification (weight loss, smoking / EtOH cessation)
 - PT, NSAIDs, Muscle relaxants (if indicated)
 - Allow 6 – 8 weeks for treatment

Algorithm

- **Add Medications as indicated**, judicious use of opioids
 - Post-surgical, severe DDD, DJD
- **Pain Management / Surgical referral, if indicated**
- 10% become chronic pain syndromes
 - Long acting opioids usually required
- **Alternative treatment options**
 - Osteopathic / Chiropractic referral
 - Accupuncture / Tai Chi / Pilates







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