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 fibrosis (outer 1/3): the “shock absorber”
- Ligaments: ALL, PLL, Interspinous
- Musculature
- Nerve Roots

Non-Innervated Structures

- Inner 2/3 Annulus fibrosis
- 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

History of Back Pain

- Back-dominant pain
  - Aggravated by...
    - Flexion
    - Extension
      - Minor Disk, sprain, strain, spondylosis
      - Facets

- Leg-dominant pain
  - Aggravated by...
    - Flexion
      - Nerve root
    - Walking (extension)
      - Central stenosis
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

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<thead>
<tr>
<th>Location of Pain</th>
<th>Neurogenic Claudication</th>
<th>Vascular Claudication</th>
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<td>Back, Thigh, Calf, rarely in buttock area</td>
<td>Usually calf +/- buttock</td>
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| 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
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° 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 => reappearance / 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

<table>
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<tr>
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<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
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<tr>
<td>SLR</td>
<td>73-98</td>
<td>11-61</td>
</tr>
<tr>
<td>Crossed SLR</td>
<td>23-43</td>
<td>88-98</td>
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Lumbar facet exam

- TTP laterally over the facetal 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, hernation
  - 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 **myofacial pain**
    - Lidocaine / Bupivacaine – 1cc per Trigger Point
    - Dry needling
    - Botulinum toxin – controversy over efficacy
    - Knowledge of anatoamy 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
Low back pain

Presence of sciatica?
(occasionally without back pain)

No

Simple back pain
(60 percent)
- Age under 50
- No signs of sx or systematic disease
- No hx of cancer
- No neurologic deficit on examination
(Likelihood of musculoskeletal cause ~0.99)

Complicated back pain without radiculopathy
(37 percent)
- Age over 50
- Systemic signs, sx, or risk factors:
  fever, weight loss, hx of prior cancer, hematuria, adenopathy, injection drug use
(Probability of systemic disease is 1 to 10 percent, depending on the findings. Most patients still have musculoskeletal pain [95 percent].)

Radiculopathy
(3 percent)
- Signs and sx of radiculopathy, w/o bladder or bilateral findings
- May also have systemic signs, sx, or risk factors noted in complicated back pain

Urgent situations
(<1 percent)
- Acute radiculopathy with urinary retention, saddle anesthesia, bilateral neurologic sx or bilateral exam findings
- May have systemic signs, sx, or risk factors.

- Pain im
- ESR* if risks for osteomyelitis

If normal, conservative care for 4 to 6 weeks unless neurologic deficit is progressive

- Improved
- Not improved

STOP

Plain film and ESR*
- If either abnormal, consider CT or MRI
- Close follow-up is warranted

- Improved
- Not improved

STOP

Noncontrast CT or MRI, choice depends on local availability
- If 12 week failure, meets criteria for subacute low back pain
Bibliography

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- Uptodate