Evaluation of Low Back Pain

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Epidemiology of Low Back Pain (LBP)

- Lifetime prevalence of 84%
- Chronic symptoms in 10-15%
- 80-90% of economic resources are for the 10% who develop chronic LBP
- 1% of US adults are permanently disabled from back pain
  - Largest Predictor of disabling pain
    - Maladaptive pain coping behavior
    - Presence of non-organic signs
    - Concomitant psychiatric disease
    - Low baseline physical function
    - Low general health
Biomechanics of the Lumbar Spine

- Intervertebral disc: annulus fibrosis, not the nucleus, that absorbs shock.
  - Flexion loads the anterior disc, particularly flexion with rotation.
  - Rotation increases disc pressure.
- Lifting load close to body safest.
- Z-joint allow for flex-ext.
  - 90% occur at L4-5 and L5-S1.
The Degenerative Cascade

- Tears of the annulus is the 1st sign of degenerative wear
- Loss of disc height, will put more stress on posterior elements (facet joint)
- Disc degeneration can precede facet joint disease by as much as 20 years
- Chain reaction, one level affective the levels above and below
Psychosocial Factors

- 30-40% of those with chronic low back pain have depression
- High correlation with anger and pain
  - Possibly related to deficient opioid modulation in those with high anxiety, anger, and fear reactivity

- As clinicians, try to reduce fear avoidance
  - Pain will be permanent; related to activity; exercise will damage their back

- Recognize pain catastrophizing
  - Excessively negative thoughts, high fear of movement
    - Reassure patient that they are not damaging their spine
    - Changes in beliefs account for 71% reduction in disability
HPI

- In addition to typical evaluation, r/o red flags
  - Cancer, infection, long tract signs, and fracture
- Yellow flags assoc with developing chronic disabling pain
  - Catastrophic thinking, negative expectations, avoidance of normal activity, poor sleep, compensation issues, stress/anxiety, work issues, extended time off work

- Enquire about functional decline- what can’t the patient do anymore?
- What position gives them the most comfort? What position does the patient sleep in?
- What hurts the most? Prolonged sitting, standing, or walking
Physical Examination

Reason for Abnormality

Bone structure

Muscle and fascial length

Clinical Example

Compression fractures (kyphosis)

Tight hamstrings that cause a posterior pelvic tilt

Weak and long abdominal muscles that allow an anterior pelvic tilt

Obesity or pregnancy causes changes in force and increased lumbar lordosis

Spasticity causes an extension pattern of the lower limb

Mood

Depression causes forward slumped shoulders

Neurologic disease

Long-distance cyclists have increased thoracic kyphosis and flat spine from prolonged positioning while riding

Body habitus

Habit
Physical exam (cont)

- Tenderness, ROM, what direction causes more discomfort
- Don’t miss UMN or asymmetric reflexes
- Check for subtle signs of motor weakness ie EHL weakness for L5 radic
- Check for core/abd strength- can the person do a plank or bridge? Watch patient try to do a sit up

Is the patient able to maintain Neutral spine position or does the patient have to extend the lower back?
Nonorganic Signs

- Inappropriate tenderness that is widespread or superficial
- Pain with only simulated loading or rotation of the spine
- Inconsistent performance when testing the same thing in different positions
  - I.e. FABER or SLR while sitting versus laying down
- Regional deficits in strength or sensation that do not have an anatomical basis
- Overreaction during physical exam
Diagnostic Evaluation

- **Plain Xrays:** Relative low sensitivity and specificity
  - I prefer to add flexion and extension views to r/o instability
    - Good for surgical screening perspective to evaluate spondylolisthesis
    - Good screening tool to r/o compression fractures

- **MRI:** Preferred imaging choice for disk disease
  - Can also evaluate soft tissue and musculature; Modic changes (acute=1)
    - Can determine the acuity of compression fractures
  - Adding gadolinium for post-surgical patients can help distinguish between epidural scar tissue or recurrent disc herniation
  - Overly sensitive? MRI study of patients without back pain that bulges and protrusions were common but extrusions were not.
  - Overall, must correlate between MRI and clinical findings
Further Imaging/Testing

- **Computed Tomography (CT):** Very useful for post-surgical patients to evaluate for osseous bridging to ensure true bony fusion.

- **Myelography:** Usually ordered by spine surgeon as pre-surgical screening tool. Provides very clear picture of intrathecal defects caused by the spine pathology.

- **Bone scanning (Scintigraphy):** Very sensitive to detect occult fractures, bony metastasis, and infection.

- **EMG/NCS:** Excellent test to look for physiological health of spinal nerves. Also important to help distinguish between entrapment neuropathies that may mask as radiculopathy.

- **Blood tests:** ESR, CRP, CBC to rule out infection.
Differential Diagnosis: Back>Leg pain

- Non-specific: 85% do not receive a specific diagnosis
  - Multi-factorial: deconditioning, poor muscle recruitment, emotional distress, arthritis, discogenic back pain
- Lumbar spondylosis: Often used for older patients with LBP
  - Facet joint point can refer to the knees or even below
  - Tight hip flexors → increased lumbar lordosis → posterior element stress
  - Biomechanically, lumbar extension and rotation increase facet joint forces
    - Facet loading maneuver is often documented, but diagnosis is through spinal injection
    - 15% in younger patients, 40% in older age groups
Low back pain > leg pain

Lumbar paraspinal muscle atrophy seen more likely in chronic low back, deconditioned patients and post-surgical patients.

Facet synovitis and arthropathy
- Check for instability
Lumbar Disc Disease

- Internal Disc Disruption: External surface remains normal, but internal architecture is disrupted
  - Degradation of the nucleus pulposus and radial tissues extending to the outer third of the annulus (HIZ or high intensity zones on MRI)
  - Pain is transmitted by the sinuvertebral nerve
  - Diagnosis is through discogram and post-discography CT

- Disc Herniation: Bulge (>50% circumference) vs Herniation (<50%)
  - 95% herniations at L4-5 and L5-S1, followed by L3-4 and L2-3
    - Annulus fibrosis is weakest posterolaterally
  - Inflammatory and mechanical compression of nerve root
Disc Herniations (HNP)

- Clinical picture is variable. Some patients only have axial low back pain
- Various movements are provocative
  - Posterolateral herniation: Pain with flexion
  - Central herniation: Pain with extension
  - Lateral herniation: Pain with ipsilateral side bending
- Most do well with conservative management
  - Directional preference therapy and core stabilization for physical therapy (PT)
- Lumbar epidural is used to provide pain relief to allow patient to maximize physical therapy
Classic paracentral HNP

Far lateral HNP
Mild foraminal stenosis: some effacement of fat

Moderate foraminal stenosis: touching of the nerve root and near effacement of perineural fat
Lumbar Spinal Stenosis (LSS)

- **ETIOLOGY**
  - *Degenerative*: most common. Typically >60 y.o. Obesity and family hx are risk factors
  - Spondylolisthesis (One vertebrae translating over the other, usually L4-5 or L5-S1)
  - Mass: lipoma, synovial cyst, cancer, **epidural lipomatosis**
  - Traumatic/post-operative fibrosis
  - Skeletal disease: DISH (diffuse idiopathic hyperostosis)
  - Congenital: dwarfism and spinal bifida
Degenerative LSS
Epidural Lipomatosis

- Another relatively common cause of LSS
  - R/o medical causes
    - Hyperlipidemia
    - Excessive steroid use?
  - Consider EMG
  - Refer to spine specialist
Clinical Presentation of LSS

- Neurogenic claudication is classic feature
  - Pain with walking/standing, relieved with rest
  - Pain 93%
  - Numbness/tingling 63%
  - Weakness 43%

- Examination
  - DTR absent in ankle 43% or knee 18%
  - Weakness in 37%
  - Cauda equina uncommon
    - Absent reflexes, motor weakness, and bladder/bowel dysfunction

DIAGNOSIS:
1. Confirm with advanced imaging i.e. MRI L spine
2. I often use EMG/NCS to determine the severity
   - Look for active axonal damage
Treatment options for LSS

- **Non-surgical**
  - Physical therapy: flexion based and reduce lumbar lordosis
  - Medication: NSAIDS, gabapentin
  - Epidural: effective for short term relief, but it is patient dependent

- **Surgical**
  - In general, very effective and medically indicated for failure of conservative management or progressive neurological deficit
Vertebral Compression Fractures (VCF)

- 1.4 million VCF’s worldwide
  - Osteoporotic (chronic steroid users)
  - Multiple myeloma and cancer
  - Traumatic
- Screen with Xray, but confirm with MRI (STIR sequence) to examine acuity
- Brace, limit bed rest, and start Physical therapy (consider aquatic therapy)
- Secondary prevention very important to prevent further fractures
  - Must treat osteoporosis
    - Biphosphonates, and strontium ranelate (non-US)
Non-surgical management options

- Reassurance, education, and resuming ordinary activity as soon as possible
- Exercise is debatable with evidence for pro and con
  - Chronic LBP: 30 min of aerobic exercise 5/week
- Physical therapy program typically start with training of the deep stabilizers such as the multifidi and transversus abdominis, then more complex dynamic and functional tasks.
  - Once patients have been signed off by the PT, they should do their home exercise program at least 3/week.
Non-surgical management of LBP

- **Aquatic therapy**: If patient can not tolerate land based, this is option
  - 90% reduction in gravitational stress if patient is immersed to the neck
  - Great for distinguishing mechanical versus chronic neuropathic pain (fibro)
  - Helps retrain the sensory system (gate-theory) via water temp, hydrostatic pressure, and turbulence
  - Good for patients with a lot of fear avoidance
  - Ok for pregnancy, but must be cool water pool
Medication Management

- **NSAIDS**: Longest trial was 6 weeks, but short term evidence for effectiveness is good

- **Muscle relaxants**: Controversial but often used clinically
  - **Benzodiazepines**: some studies show effectiveness for short term (5-14 days)
    - No evidence that is more effective than cyclobenzaprine
    - Multiple side effects and dangerous with opioids
  - **Cyclobenzaprine**: similar to TCA
  - **Carisoprodol**: high abuse potential, especially with opioids
  - **Baclofen**
  - **Tizandine**: central acting alpha 2 agonist

- **Antibiotics**: Augmentin study for 100 days for Modic 1 changes
Medication Management (cont)

- Antidepressants
  - TCA: Many studies support the use of TCA’s for chronic neuropathic pain conditions
    - Depression was excluded in many of these studies which suggests the mechanism of action is independent of the treatment of depression
  - Opioids: Commonly used for short term use, but use for chronic low back pain is controversial
    - Many side effects, high abuse potential
    - Should be considered last resort of LBP (tramadol is my 1st line)
- Anticonvulsants: Gabapentinoids, Topamax (not common)
- Systemic steroids: Multiple studies have shown them to be not effective
  - (anecdotal) I use commonly for those with radicular pain
Modalities/Other

- Manual Manipulation: More effective than placebo and effective for acute low back pain
  - Use with caution for patients who have cervical/lumbar fusion
- Traction: Mixed results from clinical trials
  - (Anecdotal) Give patients a trial of traction during PT
- Lumbar support braces: Conflicting evidence, poor compliance
  - Most important post-surgically, and when used for short term/task specific activities
    - For patients who have very mechanical symptoms, ie pain with extension, I find some patients respond well
- TENS unit: Meta-analysis shows a trend for pain reduction, but not statistically significant
Interventional Pain Management

- Lumbar medial branch injections
  - Followed by radiofrequency ablation/neurotomy (RFA)

- Lumbar epidural steroid injections
  - Interlaminar vs transforaminal epidural

- Spinal cord stimulation

- Vertebroplasty/Kyphoplasty
Facet mediated pain

- **Step 1: Lumbar medial branch injection (MBB)**
  - Pain diary to record the efficacy
  - Repeat injection to confirm diagnosis (minimize chance of false positive)

- **Step 2: RFA to denervate the lumbar facet joint**

- **EBM (Spine Journal 2017):**
  - Meta-analysis of 7 randomized controlled trials with 454 patients for 1 year follow up.
  - 95% in RFA group had improvements in back pain
Lumbar epidural injections

- Therapeutic and/or diagnostic
  - Transforaminal (TF-ESI) can help the surgeon isolate the pain generator
  - Used in *conjunction* with physical therapy to improve patient function
- Effective for short term management
- Clinical judgement for chronic low back pain
Spinal Cord Stimulation (SCS)

- Chronic neuropathic pain
  - Failed back syndrome
  - Complex regional pain syndrome
  - Phantom limb pain
  - Diabetic peripheral neuropathy
- 5-7 day trial followed by implantation if successful
- Paresthesia or Paresthesia free stimulation patterns
- May reduces the affective component of pain
SCS (cont)

- Constant improvements on technology
  - New waveforms
  - Dorsal root stimulation
  - Wireless systems
- Consistent evidence from prospective studies
  - After 24 months, 88% patients reported improvement in pain scores
  - Decrease opioid use and better functional goals
Vertebroplasty/Kyphoplasty

- Vertebroplasty
- Kyphoplasty
Vertebroplasty/Kyphoplasty Debate

- There is no consensus due to multiple conflicting studies
  - NEJM in Aug 2009 showed no pain relief, but there was no distinction between acute vs chronic VCF
  - Lancet in 2010 had their own randomized trial showing great pain relief at one month and one year later
- Practical management
  - Interventional procedures considered if patient is incapacitated (inpatient) or fails 2-4 weeks of conservative management
  - Vert/Kyphoplasty only done for acute/subacute fractures with some evidence of edema on MRI
Wrap Up and Questions

- Keep the patient moving!
- Maximize conservative measures
- Consider spinal injections to 'jump start' the patient
- If red flags- please refer to specialist

- Any questions?

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