LOW BACK PAIN EXAMINATION & THERAPEUTIC MANAGEMENT

Randall L. Braddock, M.D., M.S.
Back Pain is Common

- ½ of adults each year have back pain
- 2/3 of adults have it in their lifetime
- Common cause of physician visits
  - Behind routine exams, BP and diabetes
- Leading cause of work-related disability
More Art than Science

- RCT studies on low back pain have lumped all diagnoses and treated them all alike.
- Non-Specific Treatment for Non-Specific Diagnoses Gives Non-Specific Results.
THE FIRST THING YOU DO WITH LOW BACK PAIN

Determine if it is actually coming from the low back

If from low back, is it

- Musculoskeletal
- Neurological
Non-Back Causes of Low Back Pain

- Abdominal Problems
  - Cholecystitis
  - Penetrating Peptic Ulcer
- Pelvic Problems
  - Prostatitis
  - Endometriosis
- Retroperitoneal Problems
  - Aortic aneurysm
  - Neoplasm
  - Renal Disease
  - Pancreatitis
  - Bleeding
Rule Out the Red Flags

- Fracture
- Tumor
- Infection
- Neurological Deficit
Screening Tests

- Walk on heels (tests L-5 muscles)
- Walk on toes (tests S-1 muscles)
- Deep knee bend or get out of chair without using arms (tests L-4)
- One sit-up (tests L-3)
Muscle Stretch Reflexes

- **L-4** Quadriceps Muscle, Strike patellar tendon
- **S-1** Gastrocnemius Muscle, Strike Achilles tendon

Problem: There is no accepted L-5 reflex, and L-5 is the most common LS radiculopathy
  - Medial hamstring reflex sometimes helps
Sciatic Stretch Tests

- Straight Leg Raising (Lesegue)
- Braggard Sign
- Crossed Straight Leg Raising Sign (Fajersztajn)
- Sitting Straight Leg Raising Sign (Bechterew or Flip Test)
- For L-4 use Femoral Stretch Sign
Pitfalls with Straight Leg Raising Sign

- Don’t confuse hamstring tightness pain with a positive test
- Patient knows that it should hurt and gives false positive
SLR SIGN

- First Described by Lasegue’s student Forst
  - Forst L. Universite de Pare 1881
- Pain has to radiate below the knee
- 90% Sensitivity; 26% Specificity for lumbar disc herniation
  - Dyck P. Spine 1984; 9:3-5
- SLR vs. Seated SLR (Bechterew) for MRI proven LS HNP was 67% vs. 41%.
Specific DX of LBP often Problematic in the past

1982: Up to 85% cannot be given a definitive diagnosis

• White AA. Spine 1982. 7:141-49
In 1992: 85% Non-specific Diagnoses because

- Most have multifactorial causes of LBP
  - Abnormal posture
  - Functional instability
  - Poor muscle recruitment
  - Emotional distress

- Deyo RAR, Kent D. What can the history and physical examination tell us about back pain? JAMA 1992; 268(6):760-765.
Current Approach to Spinal Pain

- Spine is no longer a “black box”
- Now we try to find the pain generator
- Get a specific Diagnosis
- Use a specific Treatment
MRI has false positives

- Jensen MC et al, NEJM 1994
- 98 people without low back pain with MRI
  - Only 36% had normal discs at all levels
  - 52% had at least one disc bulge
  - 27% had a disc protrusion
  - 1% had outright disc extrusion
  - 19% had Schmorl’s node
  - 14% had annular defect
  - 8% had facet arthropathy
  - All got worse with age except for protrusions
Imaging False Positives

- **MRI**: Teresi LM et al. Radiology 164(1) 83-88, 1987
- **MRI**: Boden SD et al. JBJS (AM) 1990; 72:403-8
- **MRI**: Weinreb JC et al. Radiology 1989; 170:125-8
- **CT**: Wiesel SW et al. Spine 1984; 9:549-51
- **Myelogram**: Hitselberger WE J Neurosurg 1968; 28:204-06
Bulging Discs are Normal

“We should generally regard bulging disks as normal findings, since two studies now report that they are found in over half of asymptomatic adults.”

• Deyo Editorial: NEJM331:115-16; July 14, 1994 No. 2
• (Cites studies of Jensen and Boden)
Braddom’s Top Ten List of Most Common Causes of LBP

- Decompensation Syndrome
- Osteoarthritis
- Myofascial Pain Syndrome
- LS or Gluteal Strain
- LS Sprain
- Lumbar Disc Disease
- Facet Syndrome
- Spinal Stenosis Syndrome
- Osteoporosis
- LS Radiculopathy
Decompensation Syndrome

- Most common cause of LBP in developed nations
- Insidious onset
- Usually over 35 years old
- Obesity is common
- Weak back/abdominal muscles
- History of inactivity
- Primary or secondary
Kraus-Weber Tests
Developed with Sonja Weber, M.D.

- One sit-up
- One hook lying sit-up
- Leg lift for 10 seconds at 30 deg. hip flexion
- Prone torso lift for 10 seconds
- Prone leg lift for 10 seconds
- One slow toe touch in standing position
Hans Kraus MD

- Austrian Immigrant
- Practiced in NYC
- World’s best mountain climber
- 1953: Published data showing USA youth less fit than European youth
- 1956: Kraus was instrumental in Eisenhower’s President’s Council on Youth Fitness
- He probably started the fitness movement in USA
Secondary Decompensation Syndrome

- Common in patients with CHRONIC LBP

  - Patients with Chronic LBP have marked decrease in torque generation at all speeds tested
Decompensation Syndrome Rx

- Treatment is exercise
- Exercise in spite of the pain and pain will gradually resolve
- Must build the exercise into their lifestyle
  - Most patients will do back exercises only for a few weeks
Risk of Exercise for People with LBP?

- No RCT of exercise for acute, sub-acute, recurrent or chronic low back pain has demonstrated increased risk for back injury in the exercise group.


  Slide Courtesy of Joel Press, M.D.
Osteoarthritis

- Actually involves the facet joints
- Common on radiographs over 35 yoa
- History is usually:
  - Chronic with intermittent exacerbations
  - Morning stiffness
  - Loss of spinal ROM
  - Exacerbation with heavy activity
- Can lead to spinal stenosis syndrome
OA of facets (Z joints)

- No specific history or tests
- Imaging studies have many false positives
- Medial branch block is the only way to diagnose it and identify which one is involved
- Injection studies have shown it causes 15% of LBP in young persons, and 40% in older age groups.

Osteoarthritis Treatment

- Spine Stabilization Central Core Exercise
- NSAID’s? Acetaminophen?
- ROM and stretching exercise
- Modalities
- Avoid triggering activity
- Complementary medicine techniques
  - From copper bracelets to magnets to acupuncture
Myofascial Pain Syndrome

- Very common, frequently misdiagnosed
- No positive lab studies
- Typically post-traumatic
- Most common in the gluteus maximus
- Waxes and wanes in intensity
- Improved by graded exercise, modalities, massage, avoiding chemical- psychological-physical triggers
LS or Gluteal Strain

Strain is Muscle Injury

- Due to trauma...patient can cite what caused it
- Onset of pain often delayed
- Can refer sclerotomal sensations into the lower limbs
- Usually heals in six weeks or less
- Can be a lead-in for MPS in some individuals
Treatment of LS or Gluteal Strain

- Relative Rest
- May need temporary corset to get them functional
- NSAIDs? Acetaminophen?
- Cold Modalities
- Sedative Massage
- Steroid injection in resistant cases
Lumbosacral Sprain

- Injury to ligaments of the low back
- Patient can cite trauma that caused it
- Heals in six weeks
- **Superficial palpation is negative**
  - Injured ligaments too deep to palpate
- Current treatment is same as for LS Strain
3 Types of Disc Disease

- Disc Degeneration
- Internal Disc Disruption/Derangement
- Disc Herniation
Degenerative Spine Cascade of Kirkaldy-Willis

- Axial compression causes
  - Damage to vertebral end plates, causing
  - Disc deterioration, causing
  - Stress on posterior joints, causing
  - Z joint OA, which can result in
  - Multilevel spondylotic change and eventually spinal stenosis

Which comes first: Degenerated discs or facet joints?

- MRI study showed that disc degeneration comes first.
- Facet OA can be delayed for up to 20 years after the disc degeneration.

Disc Degeneration

- Bulge
- Thinner
- Lose water content
- Usually accompanied by and hard to separate from degenerative zygapophyseal joints
- Common in asymptomatic individuals
Lumbar Disc Disease

- Disc degeneration common over age 35 on imaging
- **Disc Degeneration is mainly genetic**
  - Battie et al, Spine 1995
    - Studied 115 sets of identical male twins
    - Heavy jobs explained only 7% of the variability
- Tends to cause generalized low back pain
- History often includes prolonged driving, lifting, coughing, sneezing, frequent spinal flexion
- Pain intensity sitting > standing > lying
- Arising from sitting position is often painful
Lumbar Disc Disease

- Hard to differentiate from osteoarthritis, which is almost always co-existent
- Treatment for acute exacerbation includes relative rest, NSAID’s?, acetaminophen, temporary corset for functional activity, modalities
- Long term treatment includes lifestyle changes, avoiding triggering activities, strengthening LS and abdominal muscles
Lumbar Disc Disease

- The problem of increased sitting in our society, especially with the invention of computers
- Prolonged sitting for 4 hours causes compression of L45 disc in particular in normal volunteers
- Standing up briefly every 15 minutes prevented this compression
  - Billy GG et al. PM&R 2014; 6:790-5
Disc Internal Derangement

- Internal architecture disrupted, but exterior surface normal without bulge or herniation
- Degradation of nucleus with radial fissures extending to outer third of the annulus
- Some believe that annular tears that extend to the outer layer are painful
- Controversial and commonly seen in asymptomatic individuals
LS Disc Herniations

- 95% at L4-5 or L5-S1
- Most common roots affected are L5 and S1
- Most herniations are posterolateral
LS discs can hit the exiting nerve root or the crossing nerve root

- LS region has cauda equina from L2 down
- Root exiting at L5S1 disc space is L5
- L5S1 disc can hit the exiting L5 root or the crossing S1 root
Procedures for Disc Disease

- Mainstay is conservative Rx
- Literature is poor in Rx
- Newer Procedures
  - Discectomy/fusion or prosthetic disc
  - Epidural steroids
  - Percutaneous endoscopic discectomy
Spinal Fusions on the Rise

- Spinal fusions per year in US is 250,000+, and this number is expected to increase steadily.
- Spinal fusion surgeries in US increased 77% between 1996 and 2001
- 75% are performed for spondylosis, disk disorders, and spinal stenosis
- Research is poor, either for regular or instrumented fusion
Cons on Discography

- Has a poor positive predictive value

- Accelerates disc degeneration
  - Disc needle puncture is used to cause disc degeneration in animal studies
    - The bigger the needle the faster it happens

- Clinical results are often inconclusive

- Long term outcome studies not available
Possible Biological RX of Degenerated Discs in Future

- **Protein injections**
  - Growth factors BMP-2 and BMP-7
  - Stimulate proteoglycan development

- **Gene therapy** using adenoviral vectors for intradiscal injection
  - To express BMP-2 and BMP-7
  - Lasts longer than protein injections

- **Cell therapy**
  - Autologous disc cells, articular chondrocytes, undifferentiated mesenchymal stem cells
Intradiskal Steroids Rx?

- Controversial
- First used by Feffer
  - Feffer HL: Clin Orth Relat Res 1969;67:100-04
- Criticized by Sowa et al
- Defended by Goodman et al
Intradiskal PRP Injections

- Tuakli-Wosornu et al. (Hospital for Special Surgery in NYC) PMR 8 2016 1-10
- Patients with chronic lumbar discogenic pain unresponsive to standard treatment
- Got either Intradiscal PRP or a contrast agent after discography.
- PRP patients had significantly lower pain, higher function, and higher satisfaction over 8 week period post-injection
SPINAL STENOSIS SYNDROME

- Hallmark is **PAIN ON STANDING**, that resolves on sitting or lying.
- Unlike intermittent claudication, the pain does not go away by just standing and resting.
Spinal Stenosis Syndrome

- 3% of chronic LBP cases, but rising
- Occurs mainly in those with osteoarthritis of the spine, plus congenitally narrow LS canal
- Pain improves with flexion...the Stoop Test
- Conservative RX is NSAID’s, epidural steroids, strengthening LS and abdominal muscles, use of a cane or cane chair, WC for long distances
- Surgical unroofing does not always produce relief
SPINAL STENOSIS SYNDROME

STOOP TEST

- Pain is better if the patient leans forward
- Patients usually notice that they can use a grocery cart for longer distance than ordinary walking
1942 and 2009: Spinal Stenosis Example
Spinal Stenosis Syndrome

Conservative Rx

- NSAIDs?
- Epidural steroids
  - Botwin AJPMR 2002
- Flexion-based lumbar stabilization exercise
  - Especially abdominals and pelvic girdle stabilizers
- Stretching hip muscles
  - Especially iliopsoas and rectus femoris
Spinal Stenosis Syndrome

- Natural history of SSS is favorable
  - Johnsson 4 year study (Clin Orthop, 1992)
    - 70% unchanged
    - 15% better
    - 15% worse
  - Amundson 10 year study (Spine, 2000)
    - Deterioration of symptoms is rare
    - Conservative Rx for a period of time before doing surgery does not worsen the ultimate results
Rest on our Sport Seat while you're waiting in line or listening to the tour guide.

It's so heavy-duty that it's guaranteed to hold a 250-pound person, yet weighs only 28 ounces! It also has the best construction, the most stability, and is the lightest of any we've tested. Made of extra-strength anodized aluminum with stainless steel fittings. May also be used as a cane when folded. (34" tall folded; seat is 21" tall)

Made in USA.

Sport Seat WA222D $29.85
Osteoporosis

- Produces 4% of low back pain in adults, affects 25 million people
- Much more common in fair skinned, thin, elderly women with history of low exercise activity
- More common with smoking, alcohol abuse, positive family history, early menopause, steroid use, hyperthyroidism, post-gastrectomy, etc.
Osteoporosis

- Typically accompanied by history of hip and wrist fractures
- Prevention involves children getting the densest skeleton possible
- Look for
  - “Dowager’s hump”
  - Arm span > height
  - History of loss of height
Osteoporosis Produces Two Types of Low Back Pain

- **Compression fracture pain**
  - Tend to occur at the thoracolumbar junction
  - Sudden, severe pain
  - Can make breathing difficult
  - Rarely refers pain into lower extremities
  - Takes six weeks to heal
  - Usually no neurological sequelae

- **“Crumble Syndrome” pain** (My term)
  - Fractures seen only on bone scan
Osteoporosis Treatment

- Graded weight bearing exercise
- Spine extensor muscle strengthening
- **Avoid spinal flexion exercise**
- Many other treatments are available
  - Estrogen
  - Calcium supplements
  - Bisphosphonates, calcitonin, Vitamin D, fluoride, anabolic steroids, and many others
SI JOINT DYSFUNCTION

- Now generally accepted as a cause of LBP
  - Incidence?
    - Some say rare
    - Some say most common cause of chronic LBP
  - Physical tests for it are not accurate
  - **Gold Standard is injection of SI joint with anesthetic with relief of pain on two occasions**
  - Pain pattern down the thigh and leg can mimic radiculopathy
Piriformis Syndrome

- Controversial
- Piriformis muscle pressure on the sciatic nerve
  - Pain: posterior thigh, can be below the knee
  - Diagnostic maneuvers
    - Pace: Resisted abduction and external rotation
    - Freiberg: Forced internal rotation of extended thigh
    - Beatty: Side-lying patient holds flexed knee several inches off the table
    - Fishman: FAIR maneuver of hip flexion, adduction, internal rotation

Piriformis Syndrome

- Originally described by Robinson 1947
- Low back pain, buttock pain, referred to the leg
- Argument: Is this due to sciatic entrapment or due to MPS of the piriformis muscle without entrapment of the sciatic?
- Piriformis functions:
  - In hip extension: hip external rotation
  - In hip flexion: hip abductor
- Said to cause 6-8% of back pain/sciatica
Most commonly used tests for Piriformis Syndrome from Kirschner et al 2009
Pace on left and FAIR on right
Fishman’s Clinical Criteria for Piriformis Syndrome

- Positive Lesegue sign at 45 degrees
- Tenderness at the sciatic notch
- Increased pain and sciatica in FAIR position
- EDX rules out myopathy and neuropathy
H reflex use in Piriformis Syndrome?

- Fishman and Zybert found prolongation of the H when done in the FAIR position.
  - Mean prolongation of 1.87 msec
- Fishman calls this “Dynamic EDX”
- Need further studies
Lumbosacral Radiculopathy

- Due to disc herniation in younger patients, lateral foraminal stenosis in older patients
- Should have low back pain, sciatica, neurological deficit of some type
- Conservative treatment effective in 80+% 
- Discal herniations resolve spontaneously in 75% of cases over time
3 MAIN INDICATIONS FOR SURGERY

- Cauda equina syndrome is a surgical emergency
- Neurologic progression
- Persistent radicular symptoms despite 6-8 weeks of conservative care
Physiatrists now use two types LS radiculopathy treatment

- **Conservative Treatment**
  - Relative rest
  - Oral steroids and/or NSAIDs
  - Ambulate with LS corset
  - Increase exercise and activities as symptoms permit
  - Use spinal stabilization exercise for “muscle fusion”

- **Aggressive Conservative Treatment**
  - Same as above
  - Epidural steroids
  - Transforaminal steroid injection at a specific nerve root
Efficacy of Transforaminal Epidural Steroid Injections

- TFESI

  - Used only RCTs, found 9 studies
  - Used only Level I and II studies
Recommendations TFESI vs Control

- Patients with *radicular pain* secondary to spinal stenosis or HNP who are *surgical candidates*:
  - **Grade A**: TFESI is a surgery sparing intervention compared to transforaminal injection (TFI) of bupivacaine
Recommendations TFESI vs Control

- Patients with **sub-acute and chronic** radicular symptoms
  - Grade A: A single TFI of bipivacaine or saline was as effective as a single TFESI
Rx: Finding the Right Position

- Many feel that back pain treatment should start with finding the position that minimizes the pain
  - Then build from that

- The Flexion School
- The Extension School
What are Williams Flexion Exercises?

- Dr. Paul Williams (1937) – felt LBP was due to increased lordosis causing unacceptable load on posterior aspects of the disk.
  - “Always sit, stand, walk and lie a way that reduces the lumbar lordosis to a minimum.”
- His exercises were designed to lessen lumbar lordosis:
  - Partial sit up, knee to chest, hamstring stretch, lunges (hip flexion stretch), seated flexion, squat
- Example: Bar rail
What are McKenzie Extension Exercises?

- Exercises based on mechanical assessment
  - Subgroups identified
  - Diagnostic categories dictate treatment approach
  - Directional preference oriented- NOT Extension exclusively
- Examples: Lying prone, prone on elbows, prone press ups, standing extension
Exercise and Chronic LBP

Strong evidence (level 1) that exercise and behavioral treatment have a moderate positive effect on pain intensity and small positive effect on functional status and behavioral outcomes.


Slide courtesy of Joel Press MD
What Factors in Exercise Therapy Improve Outcomes in Chronic Low Back Pain?

- Randomized controlled trials evaluating exercise therapy for chronic LBP- 43 studies, 72 independent exercise groups and 31 non-exercise comparisons.
- Most likely to be beneficial if
  - They are individually designed (vs. group)
  - Supervised (vs. unsupervised) home exercise of longer duration and/or intensity


Slide courtesy of Joel Press MD
Conflicting Trends in Treatment of Musculoskeletal Pain

- One school is that of **Evidence Based Medicine**
  - Based on mantra of treating every condition with the latest scientific data rather than purely relying experience
  - Result of the “Guideline” movement and computer revolution
  - Advocated by Sackett in England and by Richardson in USA

- The other school is **Integrative Medicine**
  - Very popular, but not scientific yet
  - Reminiscent of the early days of Physical Medicine
Manipulation in Spinal Pain Disorders

- Becoming more popular with the public and physiatrists
- Ancient techniques but popularized in USA by
  - Still (founder of osteopathic medicine) 1874
  - Palmer (founder of chiropractic medicine) 1895
- Has been shown to temporarily lessen acute back pain in RCT
- Treatment mechanism very controversial
  - Used for “somatic dysfunction”
    - Usually defined as a loss of the normal structural or functional aspects of tissues associated with joints
Manipulation in Spinal Pain Disorders

- Used for loss of functional ROM, change in tissue texture, or asymmetry of segmental motion testing

- Thrusting Techniques
  - Mobilization with impulse/high-velocity, low-amplitude

- Non-thrusting Techniques
  - Mobilization without impulse/articulatory technique
  - Muscle energy
  - Counterstrain
  - Functional technique
  - Myofascial release
  - Soft tissue techniques
  - Craniosacral techniques
When Standard Treatments Fail

- Surgical intervention
  - Poor evidence of efficacy
- Chronic oral opiates
  - Risk of addiction
- Spinal cord stimulators
  - Expensive
- Morphine pump
  - Need increasing dose over time
Medicines in Chronic LBP

 Antidepressants
  • nortriptyline
  • imipramine

 Anticonvulsants
  • gabapentin
  • carbamazepine
  • phenytoin
  • doxepin

 Benzodiazepines
  • clonazepam
Popular Alternative Physical Techniques in LBP Treatment

- **The Alexander Technique**
  - F. M. Alexander in early 1900’s

- **Feldenkrais**
  - Moshe Feldenkrais, Israeli physicist

- **Rolfing**
  - Ida Rolf, biochemist and physiologist

- **Trager Approach**
  - Milton Trager, physician

- **Aston Patterning**
  - Judith Aston, ergonomic designer

- **Hellerwork**
  - Joseph Heller…similar to Rolfing
AAPMR “Choosing Wisely” Campaign

- Don’t order an EMG for LBP unless there is leg pain
- Don’t order an imaging study for LBP without performing a thorough exam
- Don’t prescribe bed rest for acute low back pain without completing an evaluation
- Don’t prescribe opiates in acute disabling LBP before evaluation and trial of other treatments
- Don’t order repeat epidural steroid injections without evaluating response to previous injections

http://www.aapmr.org/research/evidence-based/Pages/Choosing-Wisely.aspx