Epidemiology:

- Incidence of LBP:
  - 60-90% lifetime incidence
  - 5% annual incidence
- 90% of cases of LBP resolve without treatment within 6-12 weeks
- 40-50% LBP cases resolve without treatment in 1 week
- 75% of cases with nerve root involvement can resolve in 6 months

LBP and lumbar surgery are:
- 2nd and 3rd highest reasons for physician visits
- 5th leading cause for hospitalization
- 3rd leading cause for surgery
Vertebra

- Body, anteriorly
  - Functions to support weight

- Vertebral arch, posteriorly
  - Formed by two pedicles and two laminae
  - Functions to protect neural structures
The Motion Segment: this is the functional unit of the spine and is composed of 2 vertebrae and its associated soft tissues.
The Motion Segment: Function

**Annulus Fibrosus** functions as a coiled spring, holding the vertebrae together.

**Nucleus Pulposus** functions as a ball bearing the vertebrae roll over during flexion, extension, and lateral bending.
INTRA-VERTEBRAL DISC PRESSURES
A diagrammatic comparison of loads (disc pressures) in the third lumbar disc during various activities. Note that sitting pressures are greater than standing.
Approach to LBP

- History & physical exam
- Classify into 1 of 4:
  - LBP from radiculopathy or spinal stenosis
  - BAD: LBP from other serious causes
    - Cancer, infection, cauda equina, fracture
  - Non-specific LBP
  - Non-back LBP
- Workup or treatment
PATIENT HISTORY
“OPQRSTU”

- Onset
- Palliative/Provocative factors
- Quality
- Radiation
- Severity/Setting in which it occurs
- Timing of pain during day
- Understanding - how it affects the patient
LBP: Risk Factors

- Heavy lifting and twisting
- Obesity
- Poor physical fitness/conditioning
- History of low back trauma
- Psychiatric history (chronic LBP)
Differential Diagnosis for all back pain

- **Etiologic**
  1. Mechanical Spinal Condition (97%)
  2. Non-mechanical Spinal Condition (1%)
  3. Non-spinal/Visceral Disease (2%)

- **Temporal**
  - Acute
  - Chronic
% of Back Pain due to Herniated Disk?

1. 4%
2. 14%
3. 40%
4. None of the above
Differential: Mechanical LBP

- Lumbar “strain” or “sprain” – 70%
- Degenerative changes – 10%
- Herniated disk – 4%
- Osteoporosis 
  compression fractures – 4%
- Spinal stenosis – 3%
- Spondylolisthesis – 2%
Sciatica is defined as...

1. Pain radiating up the back
2. Pain radiating to the thigh
3. Pain radiating below the knee
4. Pain in the butt
Figs. 24, 25. The sciatic nerve may be barely palpable at the midpoint between the ischial tuberosity and the greater trochanter. The hip must be flexed to palpate the nerve.
Nonmechanical spinal conditions
(1% OF ALL LOW BACK PAIN)

- **Neoplasia**: multiple myeloma, metastatic CA, lymphoma, leukemia, spinal cord tumors, retroperitoneal tumors, primary vertebral tumors (0.7%)

- **Infection**: osteomyelitis, septic diskitis, paraspinous abscess, epidural abscess, shingles (0.01%)

- **Inflammatory arthritis**: Ankylosing spondylitis, psoriatic spondylitis, Reiter’s syndrome, IBD (0.3%)

- Scheuermann Disease (osteochoondrosis)

- Paget Disease
Visceral Disease
(2% OF ALL BACK PAIN)

1. Disease of pelvic organs: prostatitis, endometriosis, chronic PID
2. Renal Disease: nephrolithiasis, pyelonephritis, perinephric abscess
3. Aortic aneurysm
4. GI disease: pancreatitis, cholecystitis, penetrating ulcer
BACK PAIN
BACK PAIN
BACK PAIN
RADICULAR (LEG) PAIN
Nerve Root Syndromes

<table>
<thead>
<tr>
<th>Nerve root</th>
<th>L4</th>
<th>L5</th>
<th>S1</th>
</tr>
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<tbody>
<tr>
<td>Pain</td>
<td></td>
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<tr>
<td>Numbness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor weakness</td>
<td>Extension of quadriceps</td>
<td>Dorsiflexion of great toe and foot</td>
<td>Plantar flexion of great toe and foot</td>
</tr>
<tr>
<td>Screening examination</td>
<td>Squat and rise</td>
<td>Heel walking</td>
<td>Walking on toes</td>
</tr>
<tr>
<td>Reflexes</td>
<td>Knee jerk diminished</td>
<td>None reliable</td>
<td>Ankle jerk diminished</td>
</tr>
</tbody>
</table>
Fig. 47.2  Seated flexion test (Piedallu or lock sign). As one bends forward, the sacrum is locked versus the ilium and is thus brought upward, whereas the free or unlocked side stays down.

Fig. 20. Palpation of the paraspinal muscles.
SIJ Dysfunction - Patrick’s Test

FABER test:
Flexion
A-
Bduction
External
Rotation
SIJ Dysfunction - Gaenslen’s sign

**TESTS FOR SACROILIAC PAIN**

1. [Illustration of a person lying on their back with an arrow indicating pain over the sacroiliac joints.]

2. [Illustration of a person lying on their side with an arrow indicating pain over the sacroiliac joints.]

**FIGURE 2.** Gaenslen’s sign. With the patient supine, the examiner abducts one hip and knee while extending the other to elicit counter-rotation and to stress both sacroiliac joints simultaneously. Back or buttock pain is a positive sign. Care should be taken to avoid aggravating the femoral nerve.
Radiculopathy - Straight Leg Raising
Radiculopathy - Laseque Sign

Demonstration of Laségue Sign
Radiculopathy - Kernig Sign

Pain present

Pain relieved
Diagnostic Tools:

1. Laboratory:
   - Performed primarily to screen for other disease etiologies
     - Infection
     - Cancer
     - Spondyloarthropathies
   - No evidence to support value in first 7 weeks unless with red flags
   - Specifics:
     - WBC
     - ESR or CRP
     - HLA-B27
     - Tumor markers: Kidney, Breast, Lung, Thyroid, Prostate
2. X-Ray:
- Pre-existing DJD is most common diagnosis
- Usually 3 views adequate with obliques only if equivocal findings
- Indications:
  - History of trauma with continued pain
  - Less than 20 years or greater than 55 years with severe or persistent pain
  - Noted spinal deformity on exam
  - Signs / symptoms suggestive of spondyloarthropathy
  - Suspicion for infection or tumor
Diagnostic Tools:

3. EMG / NCV (Electrodiagnostics):
   - Can demonstrate radiculopathy or peripheral nerve entrapment, but may not be positive in the extremities for the first 3-6 weeks and paraspinals for the first 2 weeks
   - Would not be appropriate in clinically obvious radiculopathy

4. Bone scan:
   - Very sensitive but nonspecific
   - Useful for:
     - Malignancy screening
     - Detection for early infection
     - Detection for early or occult fracture
5. Myelogram:

- Procedure of injecting contrast material into the spinal canal with imaging via plain radiographs versus CT
- In past, considered the gold standard for evaluation of the spinal canal and neurological compression
- With potential complications, as well as advent of MRI and CT, is less utilized:
  - More common: Headache, nausea / vomiting
  - Less common: Seizure, pain, neurological change, anaphylaxis
- Myelogram alone is rarely indicated
- Hitselberger study 1968 *Journal of Neurosurgery*:
  - 24% of asymptomatic subjects with defects
6. CT with myelogram:

- Can demonstrate much better anatomical detail than myelogram alone
- Utilized for:
  - Demonstrating anatomical detail in multi-level disease in pre-operative state
  - Determining nerve root compression etiology of disc versus osteophyte
  - Surgical screening tool if equivocal MRI or CT
Diagnostic Tools:

7. CT:

- Best for bony changes of spinal or foraminal stenosis
- Also best for bony detail to determine:
  - Fracture
  - DJD
  - Malignancy
- SW Wiesel study 1984 Spine:
  - 36% of asymptomatic subjects had “HNP” at L4-L5 and L5-S1 levels
8. Discography (Diagnostic disc injection):

- Less utilized as initial diagnostic tool due to high incidence of false positives as well as advent of MRI
- Utilizations:
  - Diagnose internal disc derangement with normal MRI / myelo
  - Determine symptomatic level in multi-level disease
- Criteria for response:
  - Volume of contrast material accepted by the disc, with normals of 0.5 to 1.5 cc
  - Resistance of disc to injection
  - Production of pain—*MOST SIGNIFICANT*
- Usually followed by CT to evaluate internal architecture, but also may utilize MRI
- As outcome predictor (*Coulhoun study 1988 JBJS*):
  - 89% of those with pain response received benefit from surgery
  - 52% of those with structural change received surgical benefit
Diagnostic Tools:

9. MRI:

- **Best diagnostic tool for:**
  - Soft tissue abnormalities:
    - Infection
    - Bone marrow changes
    - Spinal canal and neural foraminal contents
  - Emergent screening:
    - Cauda equina syndrome
    - Spinal cored injury
    - Vascular occlusion
    - Radiculopathy
  - Benign vs. malignant compression fractures
  - Osteomyelitis evaluation
  - Evaluation with prior spinal surgery
• MRI with Gadolinium contrast:
  • Gadolinium is contrast material allowing enhancement of intrathecal nerve roots
  • Utilization:
    • Assessment of post-operative spine---most frequent use
    • Identifying tumors / infection within / surrounding spinal cord
    • Diagnosis of radiculitis
  • Post-operatively can take 2-6 months for reduction of mass effect on posterior disc and anterior epidural soft tissues which can resemble pre-operative studies
  • Only indications in immediate post-operative period:
    • Hemorrhage
    • Disc infection
Diagnostic Tools:

10. Psychological tools:

- Utilized in case scenarios where psychological or emotional overlay of pain is suspected
  - Symptom magnification
  - Grossly abnormal pain drawing
  - Non-responsive to conservative interventions but with essentially normal diagnostic studies

- Includes:
  - Pain Assessment Report, which combines:
    - McGill Pain Questionnaire
    - Mooney Pain Drawing Test
    - MMPI
    - Middlesex Hospital Questionnaire
    - Cornell Medical Index
    - Eysenck Personality Inventory
## Specificity / Sensitivity

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disc “Herniation”</td>
<td>CT</td>
<td>0.90</td>
<td>0.70</td>
</tr>
<tr>
<td></td>
<td>MRI</td>
<td>0.90</td>
<td>0.70</td>
</tr>
<tr>
<td></td>
<td>CT Myelo</td>
<td>0.90</td>
<td>0.70</td>
</tr>
<tr>
<td>Spinal Stenosis</td>
<td>CT</td>
<td>0.90</td>
<td>0.80-0.95</td>
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<tr>
<td></td>
<td>MRI</td>
<td>0.90</td>
<td>0.75-0.95</td>
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<tr>
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<td>Myelogram</td>
<td>0.77</td>
<td>0.70</td>
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<tr>
<td>Study</td>
<td>Subjects</td>
<td>Anatomical Findings</td>
<td>Prevalence (%)</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------</td>
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<tr>
<td></td>
<td></td>
<td>Herniated Disk</td>
<td>Bulging Disk</td>
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<tr>
<td>Boden et al.</td>
<td>Volunteers &lt; 60 yr old</td>
<td>22</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>Volunteers ≥ 60 yr old</td>
<td>36</td>
<td>79</td>
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<tr>
<td>Jensen et al.</td>
<td>Volunteers (mean age, 42 yr)</td>
<td>28</td>
<td>52</td>
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<tr>
<td>Weishaupt et al.</td>
<td>Volunteers (mean age, 35 yr)</td>
<td>40</td>
<td>24</td>
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<tr>
<td>Stadnik et al.</td>
<td>Patients referred for head or neck imaging (median age, 42 yr)</td>
<td>33</td>
<td>81</td>
</tr>
</tbody>
</table>
Medications

- **Anti-inflammatory medications (NSAID’s):**
  - Beneficial; no differences; watch side-effects

- **Paracetamol:**

- **Narcotic Pain Relievers:**
  - No more effective than NSAID’s
  - Many side effects

- **Muscle Relaxants (i.e., Flexin®):**
  - Can decrease pain and improve mobility
  - 70% with drowsiness/dizziness
Chiropractic/Osteopathic

- Davenport, Iowa in 1895 by David Palmer; ‘done by hand’ (Greek)
- Spinal manipulation
- Conflicting evidence on the effects of spinal manipulation
  - ~75-90% improvement anyway within 4 weeks
- Greater patient satisfaction
Exercise & Bed Rest

- Advice to stay active:
  - ‘There is no evidence that advice to stay active is harmful for either acute low back pain or sciatica.’
  - Hurt does not equal harm

- One or two days of bed rest if necessary

- Light activity, avoiding heavy lifting, bending or twisting

- No data on any particular exercises
Massage & Physical Therapy

- Might be beneficial
- More quality research is needed
- Different types of massage
Acupuncture

- Very little quality research and data
- Seems to indicate that acupuncture is not effective for the treatment of back pain
Injections

- Epidural injections:
  - Insufficient and conflicting evidence

- Facet joint injections:
  - No improvement

- SI joint injections:
  - Some benefit

- Local/Trigger point injections:
  - Possibly some benefit
Surgery

- Discectomy improves pain in short term but not long term (i.e. 10 years)
- Microdiscectomy similar to standard diskectomy
- Automated percutaneous diskectomy and laser discectomy both less effective
- ? Endoscopic discectomy
Other Modalities

- Back Brace/Corset/Lumbar Support:
- Spinal manipulation: - conflicting data
- Massage: - probably yes
- IDET (Intradiscal Electrothermal Annuloplasty) - No convincing evidence that shows the short or long-term clinical efficacy of this procedure.
- TENS:
- Hot/Cold:
- Ultrasound:
- Traction:
Intradiscal Electrothermal Therapy
Prevention

➢ **Exercise:**
  - Aerobic, back/leg strengthening

➢ Back braces and education about proper lifting techniques are ineffective

➢ **Weight loss and smoking cessation**
Key Points about low back pain

- It is the *patient*, not the diagnostic test, that is treated

- **80%** of patients will recover from acute low back pain within 3 days to 3 weeks, *with or without treatment*, with up to **90%** resolved in 6-12 weeks

- Pursue diagnostic workup if any red flags found during initial evaluation

- If ESR elevated, evaluate for malignancy or infection

- In older patients initial X-ray useful to diagnose compression fracture or tumor
Final Thoughts:

- It is the *patient*, not the diagnostic test, that is treated.

- 80% of patients will recover from acute low back pain within 3 days to 3 weeks, *with or without treatment*, with up to 90% resolved in 6-12 weeks.
Red Flags

- Age > 70
- Fevers, chills, recent UTI/skin infection, penetrating wound near spine
- Recent significant trauma or milder trauma age > 50
- Unrelenting night pain or pain at rest
- Progressive motor or sensory deficit
- Saddle anesthesia, bilateral sciatica or leg weakness, difficulty urinating, fecal incontinence
- Unexplained weight loss
- History of cancer or strong suspicion of cancer
- History of osteoporosis
- Immunosuppression
- Chronic oral steroid use
- IV drug use, substance abuse
- Failure to improve after 6 weeks of conservative therapy
- Point tenderness