

- 1 ☐ **Oh, My Aching Back**
A mechanical Problem
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- 2 ☐ **Oh, My Aching Back!**
 - Incidence
 - Basic Anatomy
 - Physical Stress Theory
 - Mechanical causes
 - Common diagnoses (What are they?)
 - Excessive stress
- 3 ☐ **Incidence: How Common?**
 - Leading cause of disability in people < 45 years old
 - \$50 Billion in U.S. LB care
 - Up to 80% of adults experience it
 - Despite more automated labor, better diagnostic imaging, etc., the incidence is rising
 - At any time, about 1% of the U.S. work force is chronically disabled from LBP
- 4 ☐ **Problems with LBP**
 - Commonly believed that "most people get better" - no matter what is done.
 - Croft et al studied 463 LBP patients with aggressive follow up
 - 59% did not return to MD
 - After 2 weeks, 2% had no pain
 - After 3 weeks, 21% no pain
 - After 1 year, 75% still had pain
- 5 ☐ **Diagnostic Difficulties**
 - MRIs with and without symptoms often the same
 - Treat the patient not the MRI
 - Start with conservative care
 - Physical therapy
 - Pain alone is not a good reason for surgery
 - Other medical problems mimic LBP (sex organs, abdominal aorta, pancreas, kidneys, etc.)
- 6 ☐ **Basic Anatomy**
 - Skeletal anatomy –rigid support & protection
 - Muscles – moves the skeletal structure
 - Ligaments – holds the bones together
 - Cartilage – between joints - "glide & slide" and shock absorption
 - Nerves- carry "messages" from brain ↔ body
- 7 ☐
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- 9 ☐ **Intervertebral Discs**
 - "Shock absorbers?"
 - McGill "they do not absorb, but transmit shock"
 - They function to:
 - Allow bending
 - "Spacers"
 - Transmit loads to the end-plates
 - Micro-fractures in vertebrae may account for some of the shock absorption
- 10 ☐ **The Nervous System**
 - The SPINAL cord carries signals from brain to spinal nerves
 - From base of brain to L1-L2
 - Then spinal nerves form Cauda Equina ("horse's tail")

- Spinal nerves emerge from between the vertebrae
 - Carry sensory messages from body to the brain
 - Carry movement messages to the body from the brain

11 ☐12 ☐13 ☐ **Muscles**

- Work in opposing fashion to move the spine
 - Flexors vs Extensors
- The lumbar spine is inherently unstable
 - Despite ligaments that hold bone to bone
- Muscle act as stabilizers
- Need proper balance

14 ☐15 ☐ **Lumbar movements**

- Flexion – places significant load on discs
- Extension – places load on facets
- Rotation– high torque to annulus of disc and facets on same side
- Side Bending – high load to facets and discs

16 ☐17 ☐18 ☐19 ☐ **All tissues respond to physical stress:**

- Excessive – Pain, inflammation, injury
- Adaptation – hypertrophy
- Normal – everyday activities
- Insufficient – atrophy, deterioration
- - Influencing factors: load, duration, frequency
 - True for: (bone, muscle, tendon, cartilage, ligaments, tendon)

20 ☐**Mechanical low back pain caused by too much stress**

- Atrophy – decreased stress tolerance (less stress injures more easily)
- External factors:
 - Vibration exposure
 - Chronic extreme positions (sitting?, dentists, etc)
- Intrinsic factors:
 - Smoking
 - Some medications
 - Genetics (spinal shape, weakened connective tissue)
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21 ☐**Excessive stress via:**

- Low load/long duration (sitting on an airplane)
 - Working in extreme positions
 - “Creep” = plastic bag overstretched
 - 20 minutes of overstretching may take 40 minutes to recover
 - Tall man on low chair
 - Short woman on chair too high
 - Sleeping positions
- High load/short duration stresses
 - Motor vehicle accidents
 - High velocity sports (e.g. skiing)

22 ☐ **Common Low Back Pathologies**

23 ☐ **Disc problems**

- Bulging/herniation (or "ruptured annulus")
 - Most common ages 25 to 55
 - If nerve root impinged (pain, tingling, loss of strength down one or both legs)
 - 90% at L5-S1 (which has most rotation and flexion)
- Risk factors
 - Heavy lifting
 - Smoking
 - Poor body mechanics (lift with flexed, twisted spine)
 - Vibration exposure
 - Exercises that overload disc tolerance levels
 - Chronic flexion and/or rotation (sitting?)
 - Tall man on low chair

24 ☐ **Discs: risks continued**

- Excessive stretching into end-range flexion and/or rotation
 - Sports or activities that overly flex low back (yoga and bicycling can do this)
- Weak or long oblique muscles in waist that restrict rotation
- McGill - many load cycles at end-range flexion were needed to rupture a disc in the lab

25 ☐ **Stenosis (Diminished space for the nerve)**

- The "aging spine" – decreased space as structures collapse, shrink, diminish
- Symptoms: pain with standing/walking; relieved with sitting
- Foraminal stenosis
 - on the side of the vertebral column where the spinal nerves emerge
 - Somewhat position dependent
 - Extension
- Central stenosis (less common)
 - In the Spinal Canal - encroachment against the spinal cord above L2 or nerve roots below it
- Can also cause lower extremity symptoms

26 ☐ **Stenosis**

- Foraminal stenosis is largely dependent on position of the spine
 - Patient prefers leaning on shopping carts to open the nerve spaces
 - Causes:
 - Weak or long abdominal muscles
 - Over developed spinal extensor muscles, or latissimus dorsi
 - Short hip flexors (e.g. psoas)
 - Weak gluteus maximus (buttocks)
 - Chronic postures of extension
 - » E.g. Short woman on chair too high
- A stress tolerant problem
 - Very low load, very long duration problem – not fragile

29 ☐ **Sacroiliac Pain**

- Excess motion or "stuck" joint between sacrum and Ilium
- Controversial
 - Many tissues connect into the region
 - Clinical tests have not been found to be reliable

- Movement is only a few millimeters
- Injection studies have found it to be real in some people

30 ☐ **Most Low Back damage occurs at:**

- Most flexible segment
- Law of Physics: "Movement takes place along path of least resistance"
- Greatest motion at most flexible segment
 - Disc?
 - Facet?
 - ETC?
- Increasing evidence shows increasing range of motion does not correlate to improved function.

31 ☐ **Improved function/comfort with:**

- Optimal balance of:
 - Muscular stability
 - Flexibility
- "Core" muscle endurance is more important than strength
- Choosing the right exercise for you
- Good ergonomics
 - Avoid sitting in any one position too long
 - Lift with care
 - Ask for help if too heavy

32 ☐ **Effective options in PT**

- Mobilization/Manipulation
- Directional preference exercise
- Stabilization exercise
- Lumbar traction