



Chadi Tannoury, MD.
Orthopaedic Spine Surgeon
Co-Director of Spine Fellowship
Boston Medical Center

COI

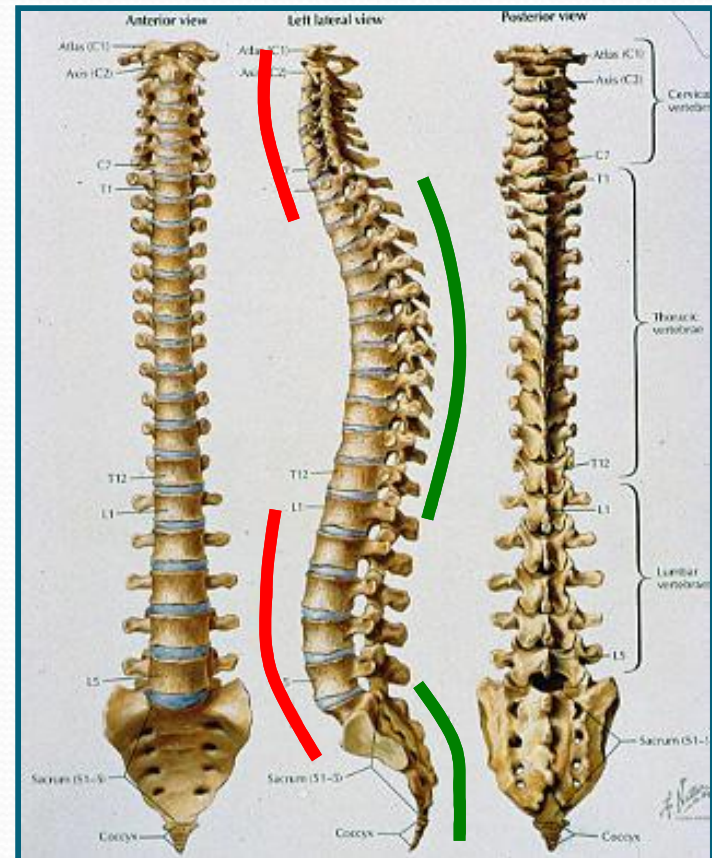
- Nothing to disclose.

Overview

- Spinal anatomy/terminology
- What Causes Back & Leg Pain:
 - Nerve pinch
 - Disk: Herniation – Degeneration
 - Facet problem?
 - Instability: Spondylolisthesis
 - Global: Stenosis

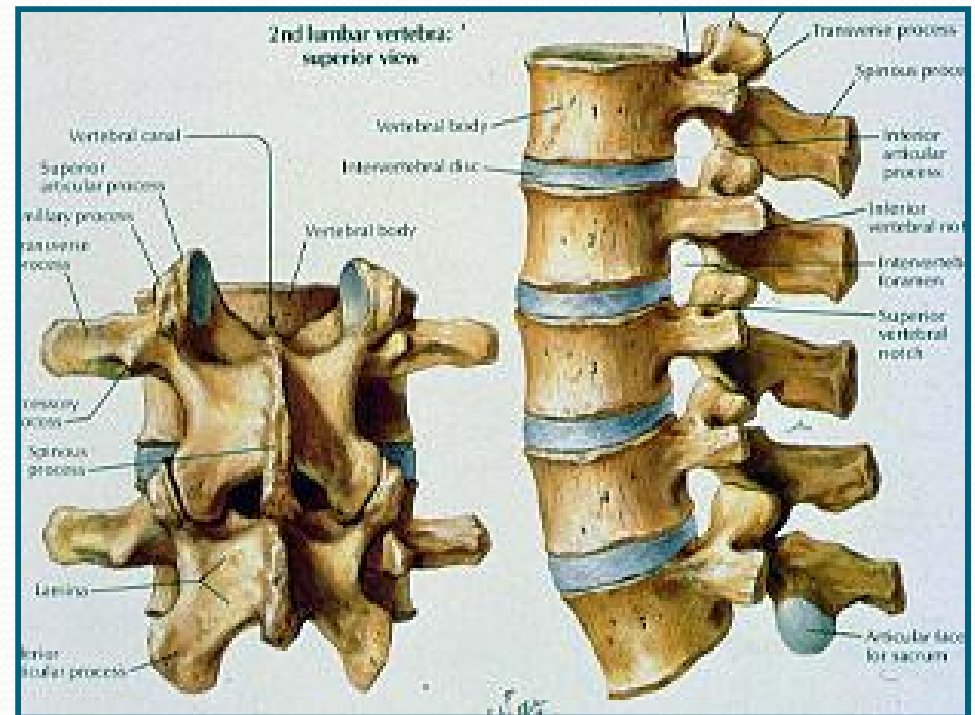
Spinal Bony Anatomy

- Sagittal Curves
 - Lordosis – C2 to T2
 - Kyphosis – T2 to T11
 - Lordosis – L1 to L5
 - Kyphosis – S1 to Coccyx



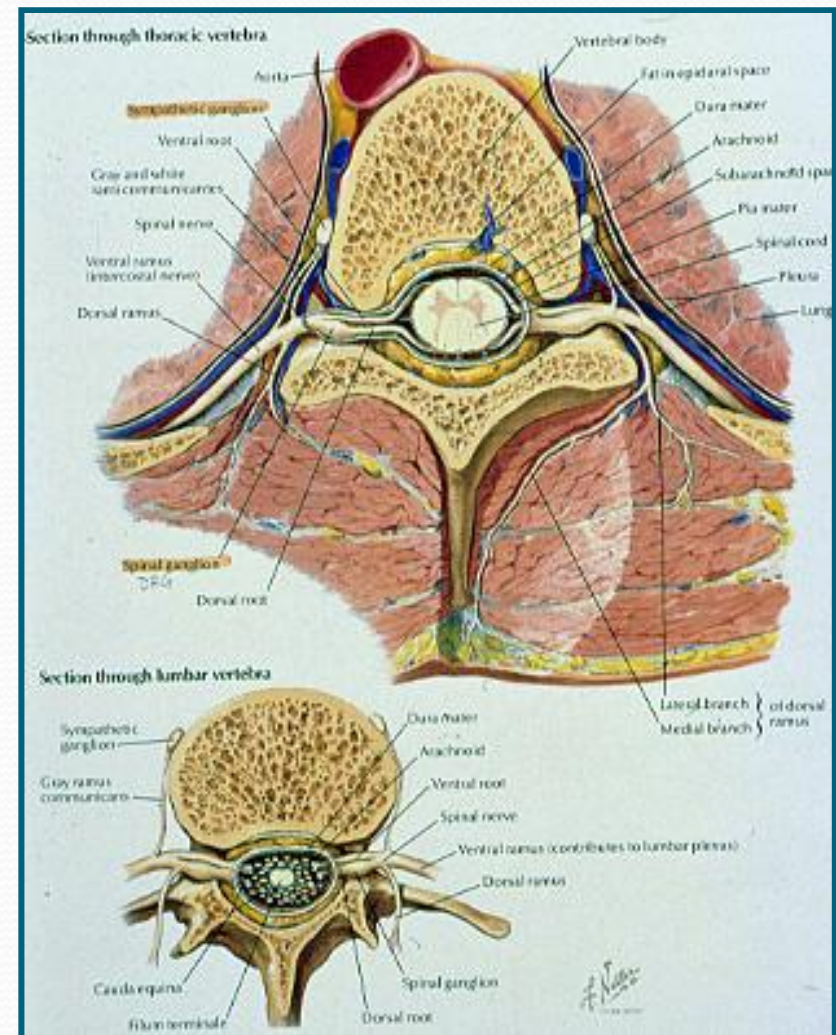
Lumbar Bony Anatomy

- Body
- Arch/lamina
- Spinous Process
- Facets
 - sagittal orientation
 - limit rotation
 - Inferior facet medial
 - Superior facet lateral
- Pars Interarticularis



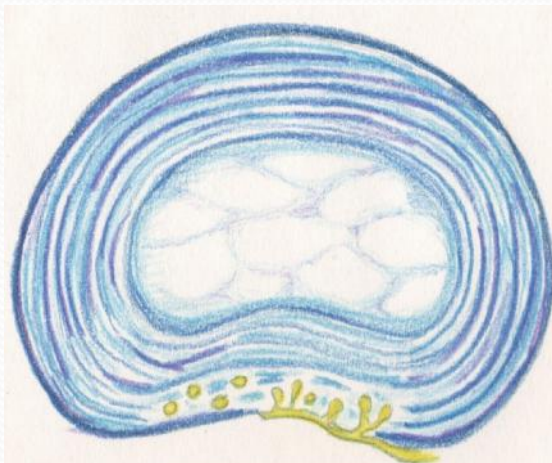
Spinal Nerves

- Ganglion
 - In foramen
 - Cell bodies of primary sensory neuron
- Nerve Root
 - Motor- ventral
 - Sensory- dorsal



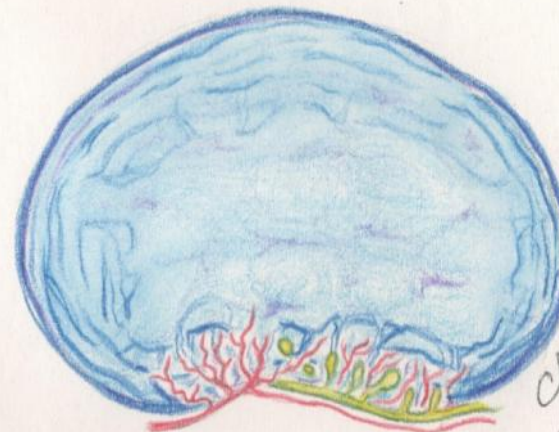
Pathophysiology

- HNP
- DDD



HEALTHY DISK

- CHANGES IN DDD:
- 1- Increased Collagen Type-I
 - 2- Decreased Collagen Type-II
 - 3- Decreased Aggrecan Content
 - 4- Decreased Water Content
 - 5- Increased MMPs
 - 6- Increased IL-1, IL-8, TNF- α



DEGENERATED DISK

C. Tannoury M.D.

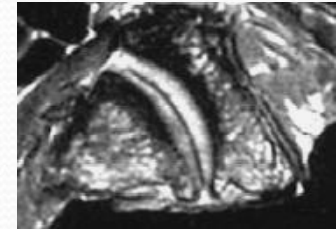
Biomechanical Considerations

Disc

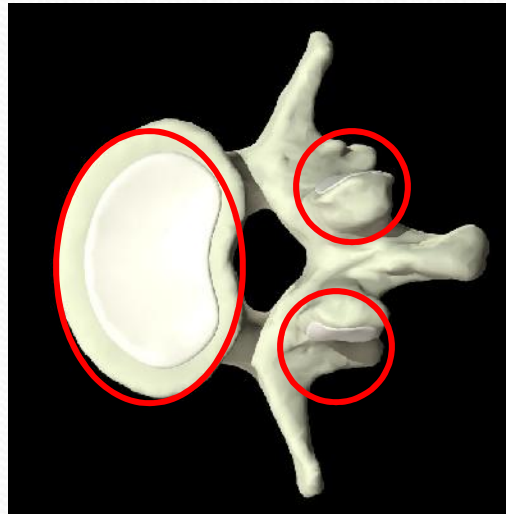


- ❖ Non-Synovial Joint
- ❖ Largest Avascular Structure in the Human Body
- ❖ 50% Torsional Load
- ❖ 80% Axial Load.
- ❖ Low Stiffness Nucleus (>0.01 MPa) Facilitate Minimal Resistance to Flex./Ext.

Facets



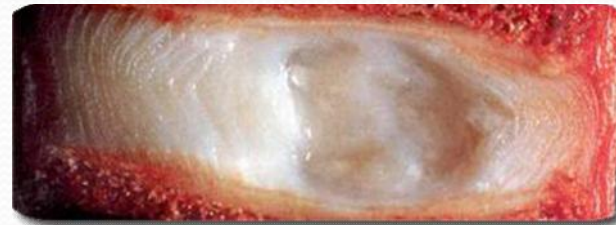
- ❖ Synovial Joint
- ❖ 50% Torsional Load
- ❖ 20% Axial Load.
- ❖ Shear resistance



Healthy



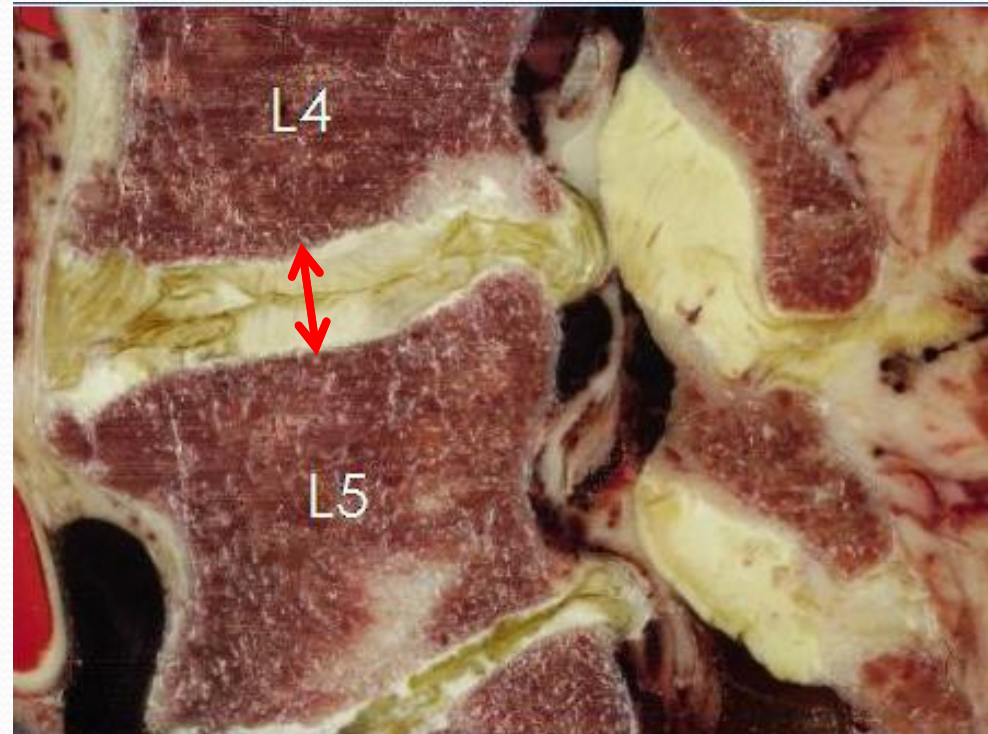
Slightly Degenerated



Strongly Degenerated



Healthy vs. Degenerated



Complete disc resorption causing kissing spines



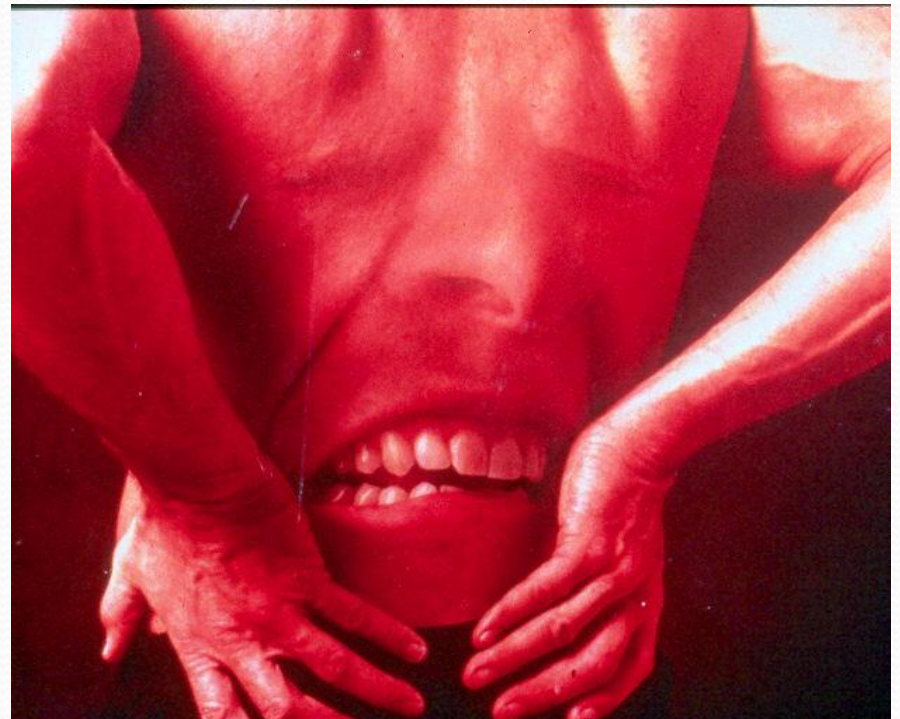
Sclerotic L4-5 spondylophyte, kissing laminae
neoarthritis and infolding ligamentum flavum



Low Back Pain

Incidence

- Lifetime 80%
- Chronic 10-20%



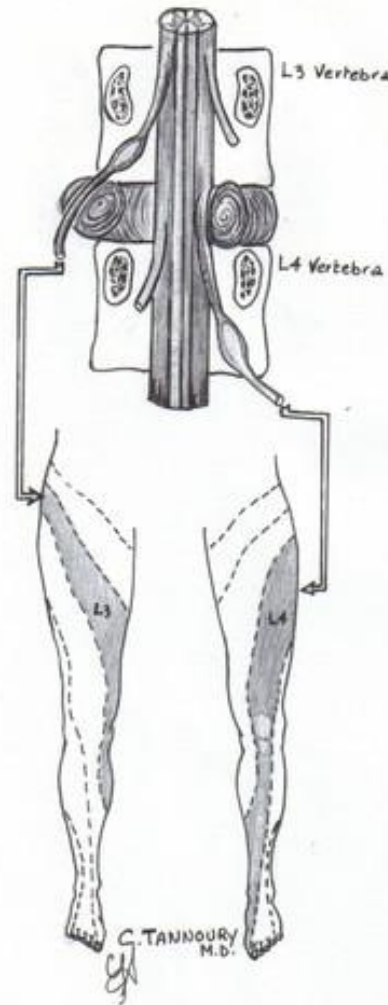
Herniated Lumbar Disc Disease

*Work Related Injuries Workshop
June 2015*

Lumbar HNP

(Bulge, protrusion, extrusion, slip, etc..)

- Unilateral Sciatica
- Leg pain >> Back Pain
- Dermatomal Distribution
- Neuro-tension signs

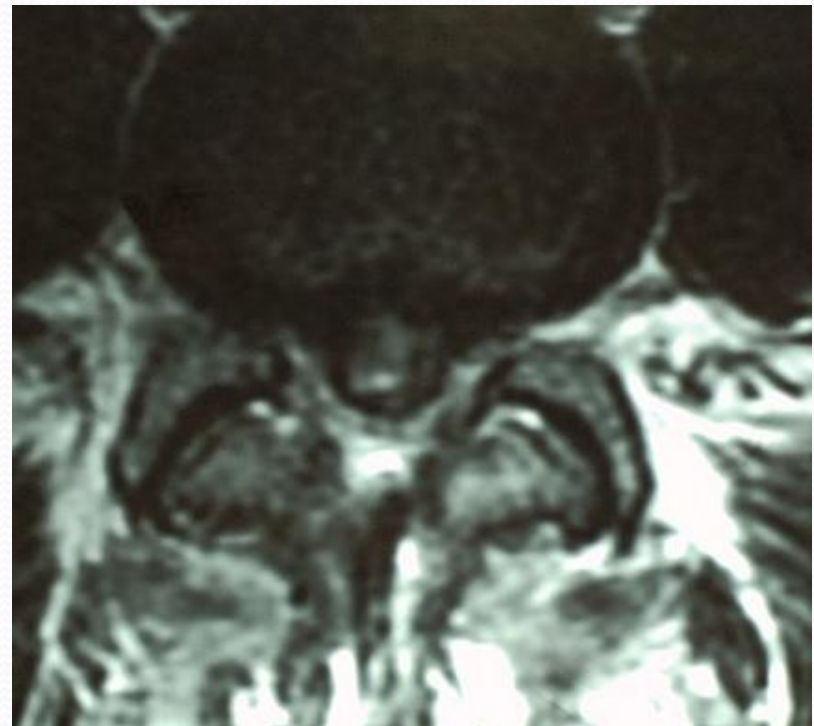


Posterolateral disc



Central Disc

- Often presents with back pain
- May have symptoms of neurogenic claudication





SCIATICA - 73% IMPROVE IN FIRST 3 MONTHS

- 38 % IN FIRST MONTH

HAKELIUS, 1970

LENGTH OF NONOPERATIVE TREATMENT

6 - 12 WEEKS

* Surgical results may deteriorate after
6 months

Laminotomy/partial laminectomy





Prognostic factors RTW @2yrs

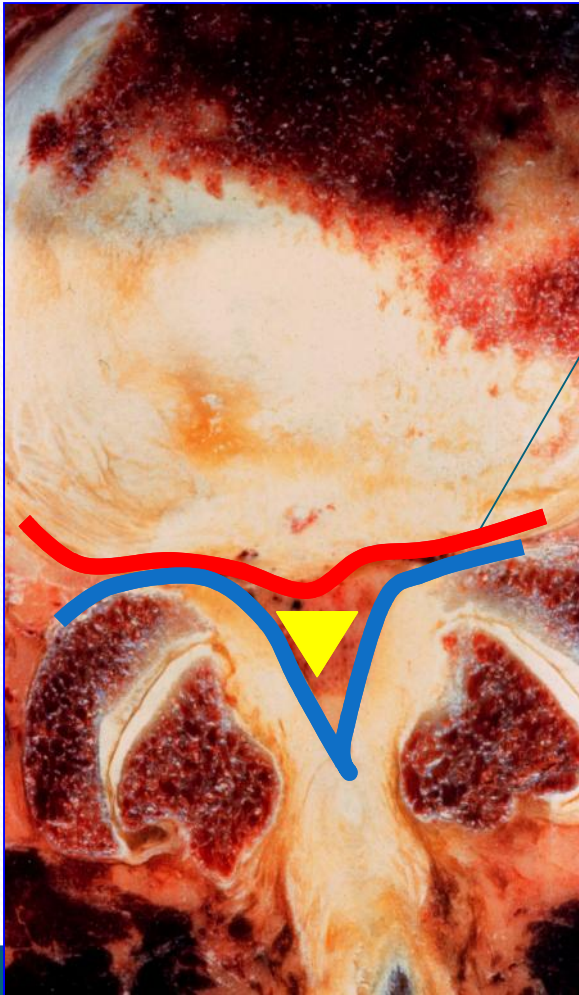
- POSITIVE factors:
 - Younger age
 - Better general health
 - Lower baseline sciatica bothersomeness
 - Less fear-avoidance-work
- NEGATIVE factors:
 - Sciatica duration > 3 months
 - Greater sciatica bothersomeness
 - Higher fear-avoidance-work

Groble et al, Spine J 2013

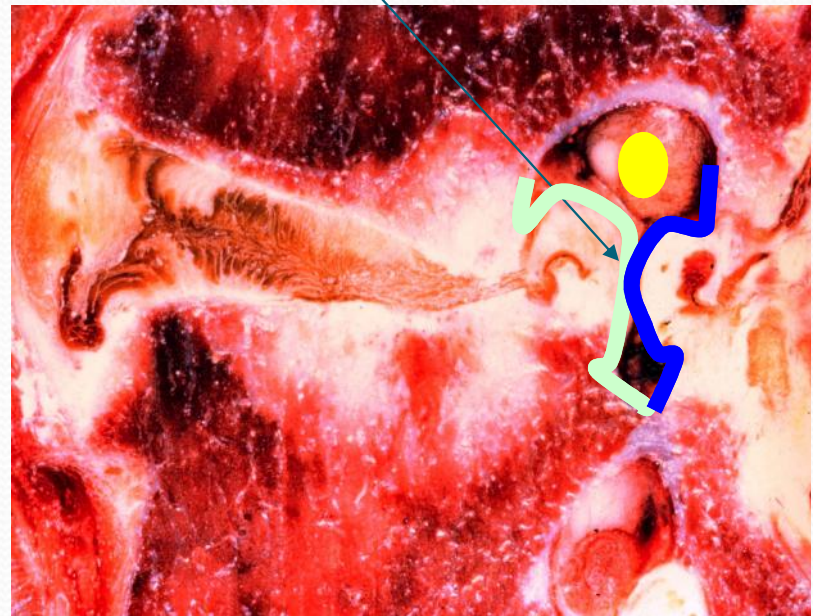
Spinal Stenosis = Arthritis

- Older patients
- Neurogenic Claudication 2/3
- Radicular pain 1/3
- Worse with extension
- High incidence of vascular comorbidities

Pathoanatomy



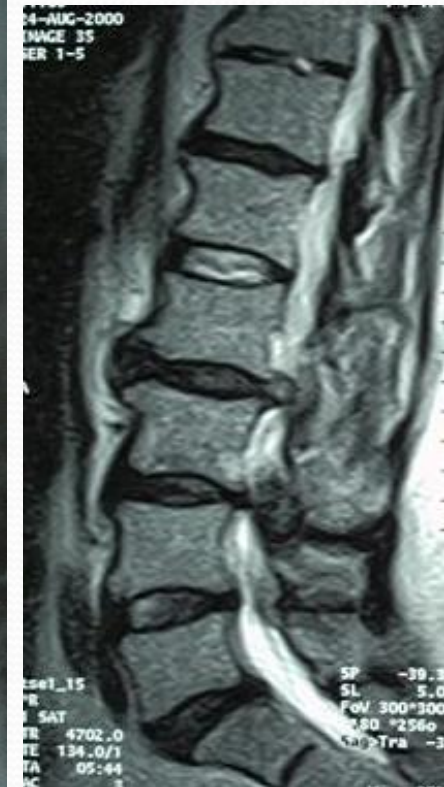
Lateral recess



Shopping Cart Sign



Radiographs/MRI



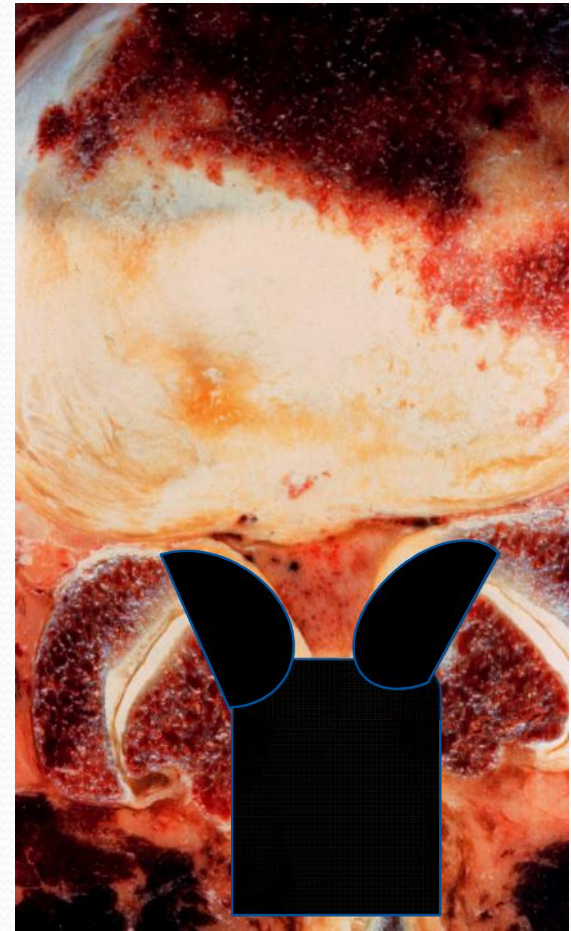


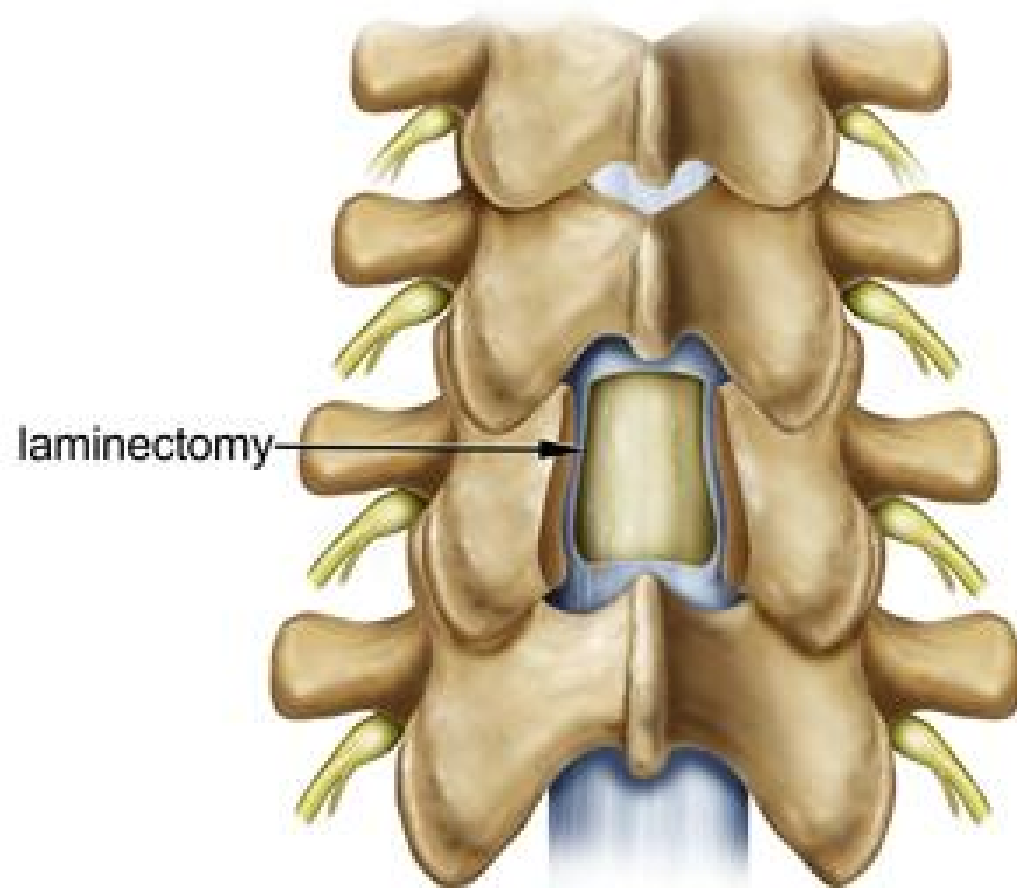
Conservative Therapy

- Flexion based exercises
- Epidural steroids
- Activity modification

Surgical Treatment

- Decompression
 - Central canal → laminectomy
 - Lateral recess → medial facetectomy
- Preserve Pars
- Fusion no necessary unless
 - Thin out pars
 - Remove >50% facet
 - Spondylolisthesis
 - Scoliosis





Psycho-social factors

- **Depression**

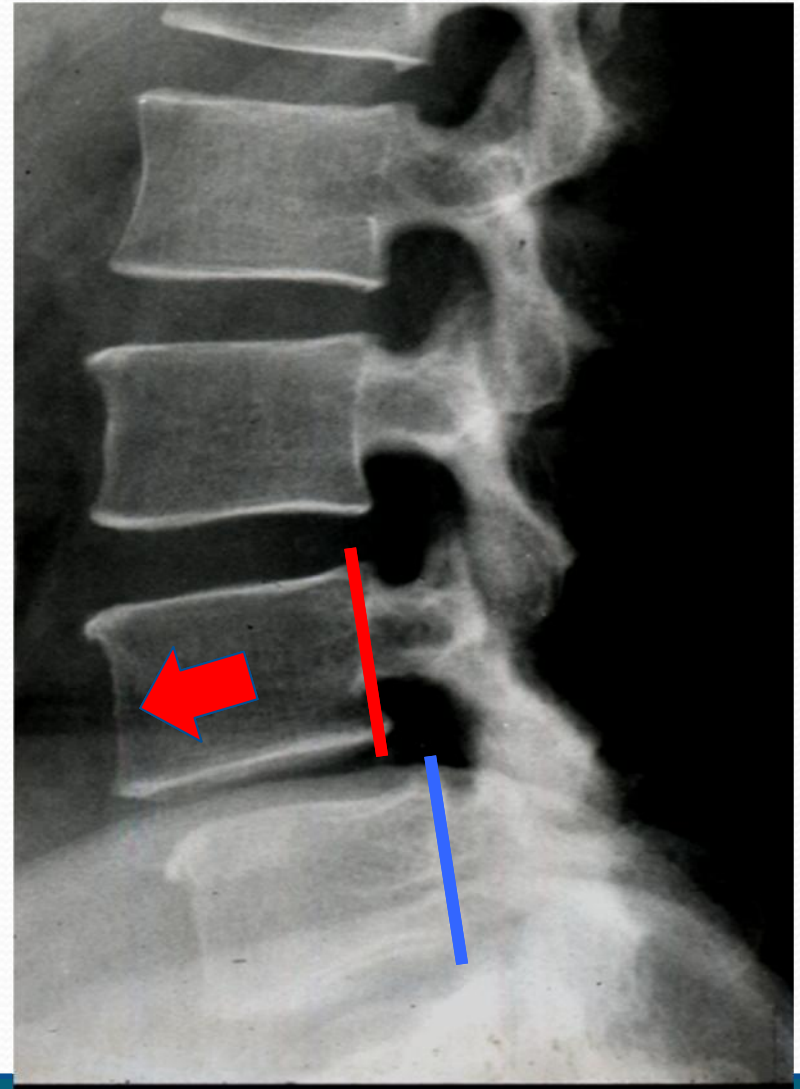
- a/w poorer outcome of LSS surgery
- Preop Depression // postop LSS sx severity & disability
- Identify patients w Depression and Rx them!

Sinikallio et al, Eur Spine J 2007

McKillop et al, Spine J 2013

Degen. Spondylolisthesis

Forward slippage of one vertebral body on another



Spondylolytic/isthmic Spondylolisthesis

- Discontinuity between posterior and anterior spinal elements
- Etiology:
 - Stress fracture
 - congenital
 - Traumatic
 - iatrogenic
 - unknown



CLINICAL FINDINGS

- Back pain
- Neurogenic Claudication
- Difficulty with ambulation
- Difficulty with extension
 - Walking down hill
 - Shopping cart sign
 - Lying prone

Treatment

- Conservative

- Exercises
- Epidural steroids
- Soft Bracing

- Surgical

- Adequate decompression
- Posterolateral fusion with instrumentation
- Posterior Interbody fusion (PLIF, TLIF)
- Anterior Posterior lumbar fusion (ALIF/PLFI)

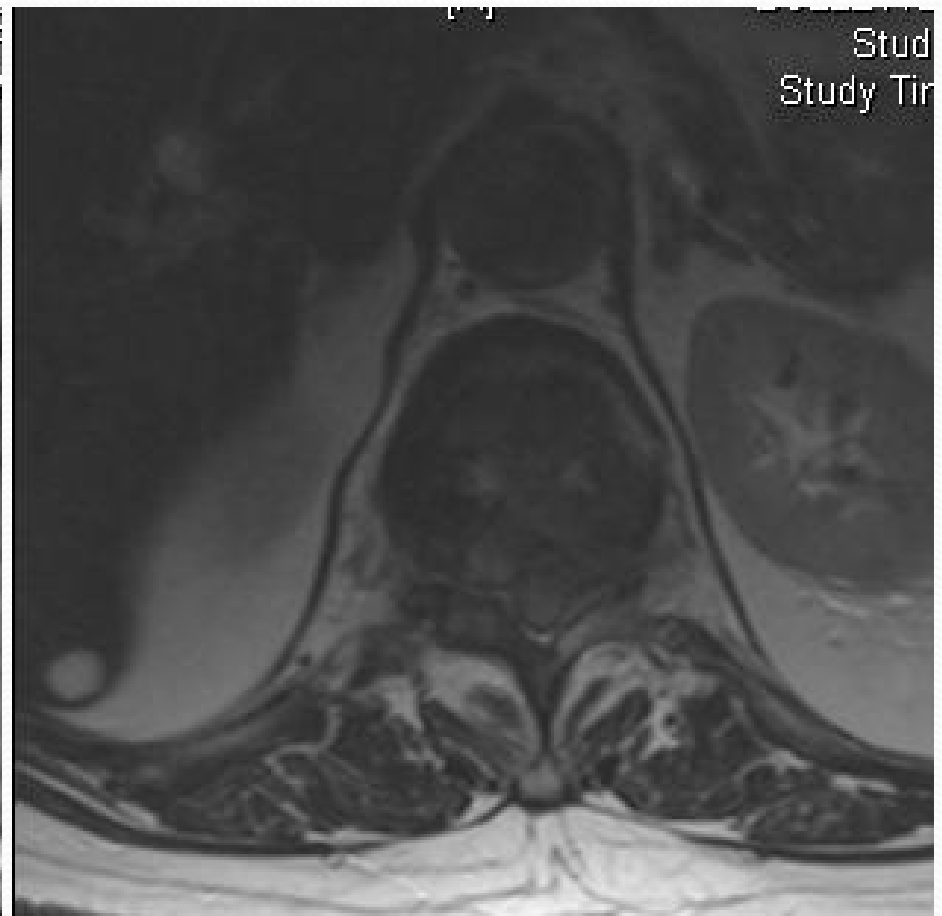


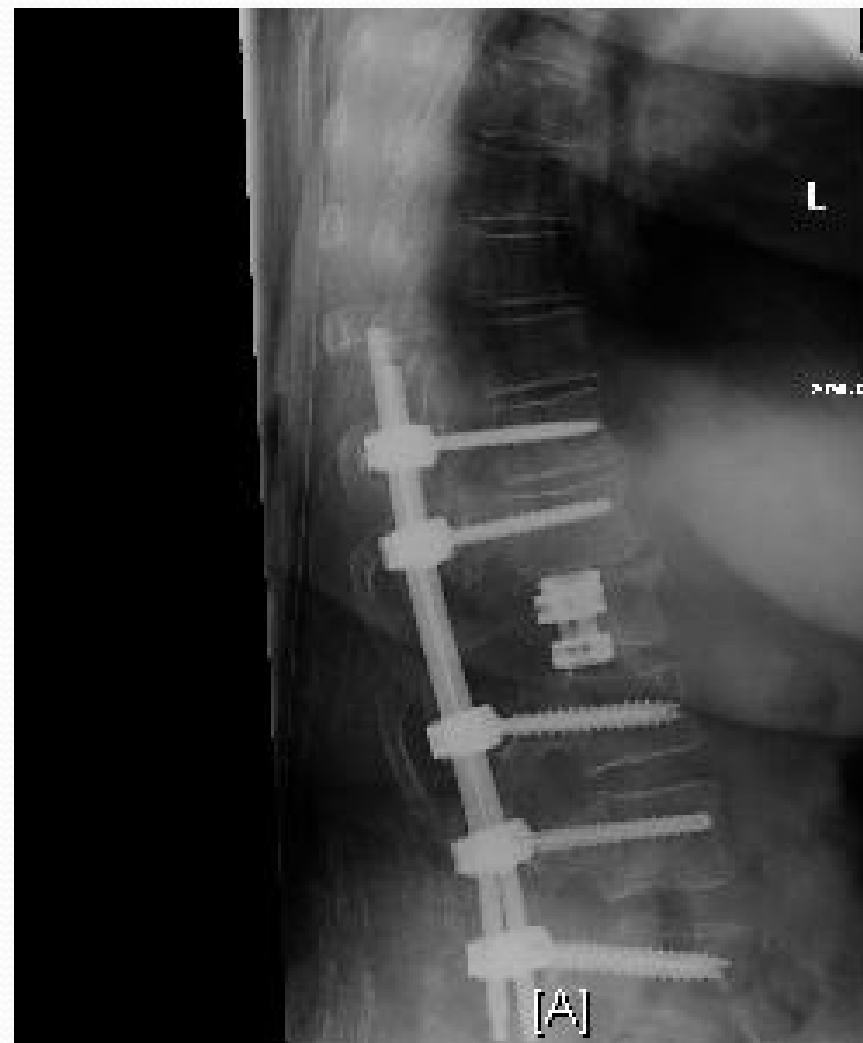
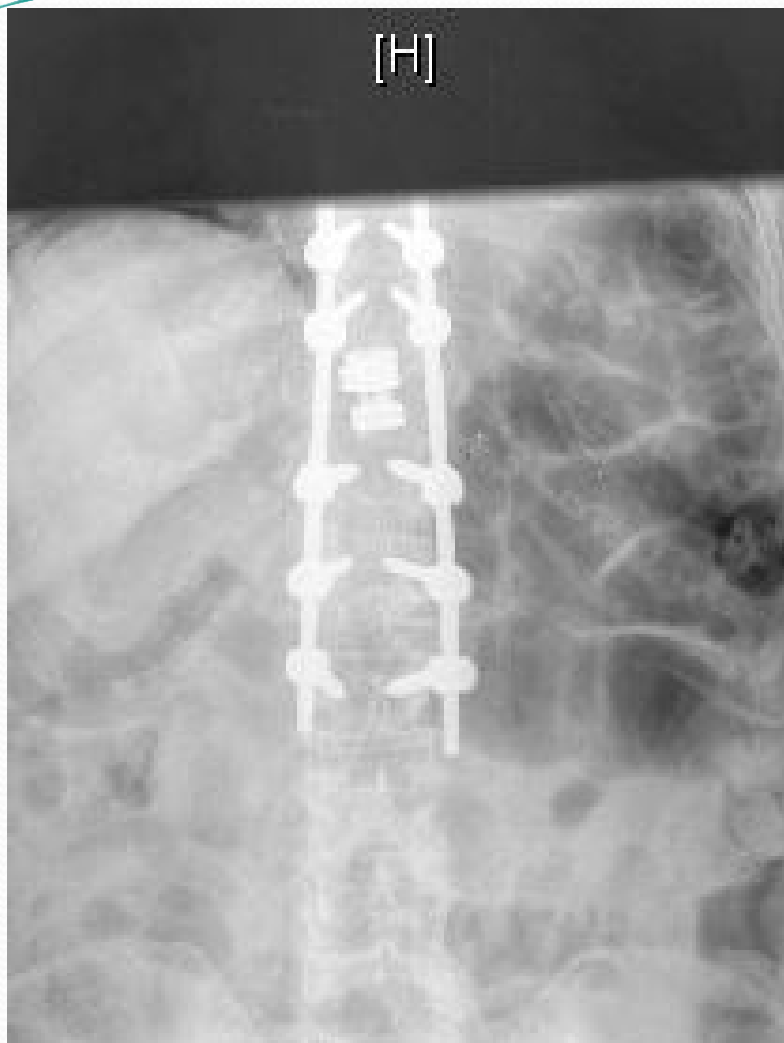


Red flags for possible serious spinal pathology

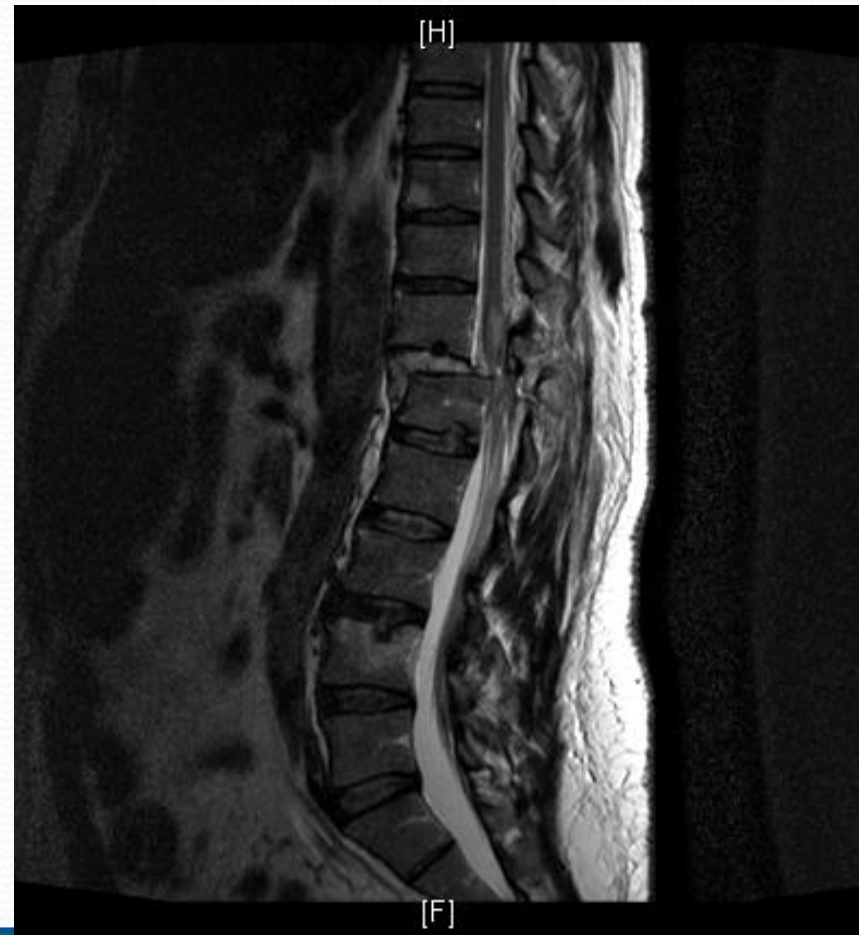
- Too Young – Too Old
- Past hx of carcinoma, steroids
- Unwell, weight loss
- Widespread neurology
- Structural deformity
- Abnormal blood parameters

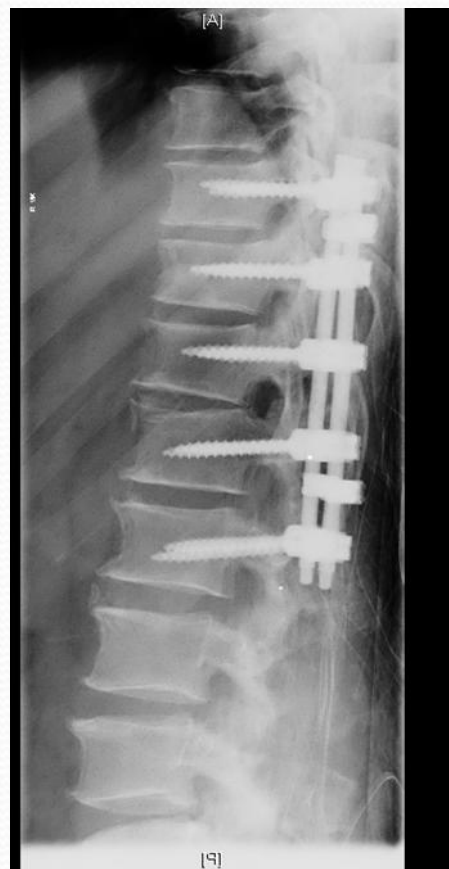
80 y F- Acute Back Pain w LE weak





45 y M – s/p MVA – No S/M LE





OCCUPATIONAL BACK PAIN

- ONE OF THE MOST COMMON LABOUR FORCE COMPLAINTS
- AFFECTS NEGATIVELY EMPLOYER AND EMPLOYEE



Length of disability and cost of workers' compensation low back pain

- Back pain claims= 10% of all claims
- 86% cost
- Of which 7% chronic: >1 year.....75% total cost

Hashemi et al, Occup Environ Med 1997




RISK FACTORS

- Repetitive physical strains: loading, lifting, twisting
- Job dissatisfaction:
 - No recreation
 - Low pay jobs
 - Employer's dismissal
- Depression
- Women > men

JOB NATURE

- MATERIAL HANDLING
- BENDING, TWISTING AND REACHING
- STANDING
- SITTING WITH NO BACK REST
- VIBRATION



- 
- Currently, it is not possible to predict accurately which workers with recent injuries will go on to develop chronic disability.

The probability of recovery and return to work from work disability as a function of time.

- If no return to work by 3 months: 50% risk of no return by 15 months

Crook J, *Qual Life Res* 1994, **3 Suppl 1**:S97-109



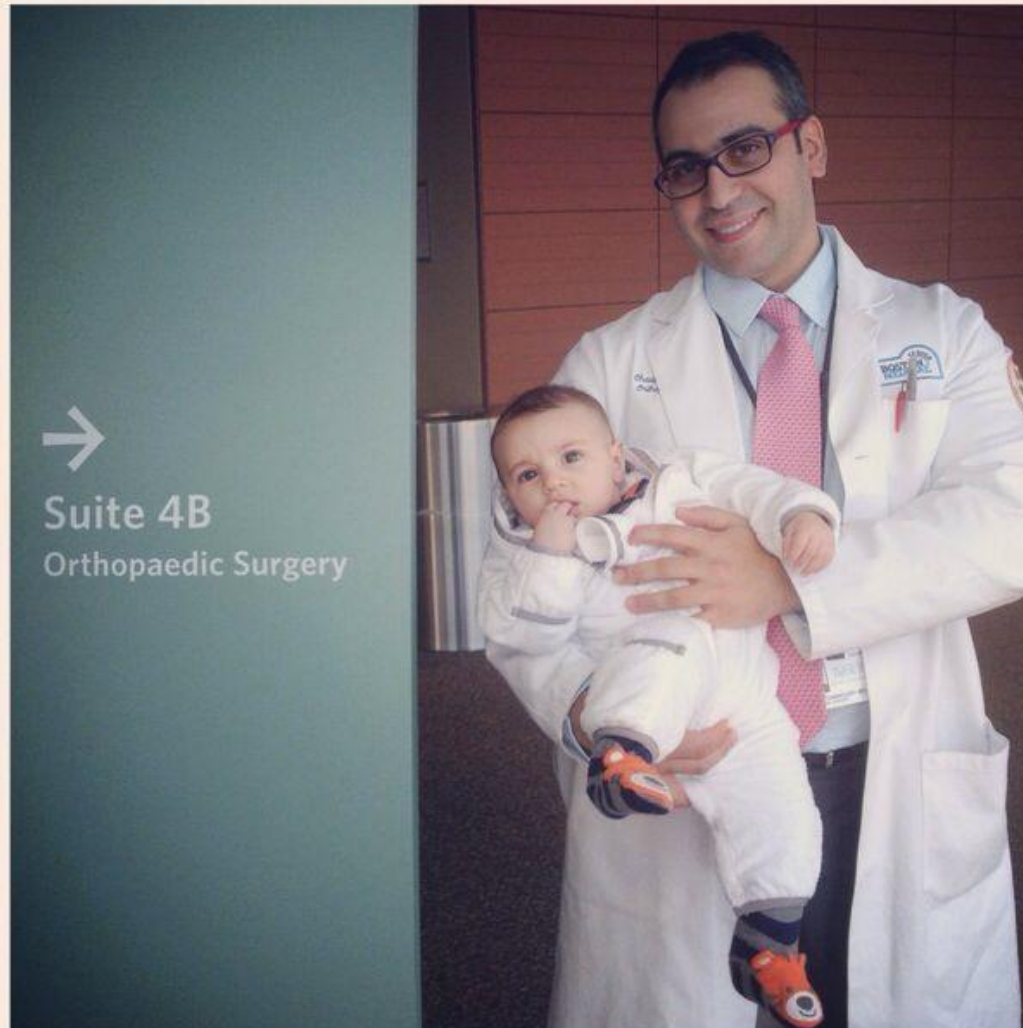
predictors of 6-month disability

- Age
- Education
- baseline pain
- Baseline disability
- low recovery expectations
- fears that work may increase pain

Turner et al, spine 2006

Ideally!

- Prevent injuries
- Immediate recognition and proper referral
- Aggressive management
- Offer light duty options
- Work hardening
- **Very active treating team communication**
- Surgery if needed
- **Minimally invasive surgery!!!!**



Thank You!!