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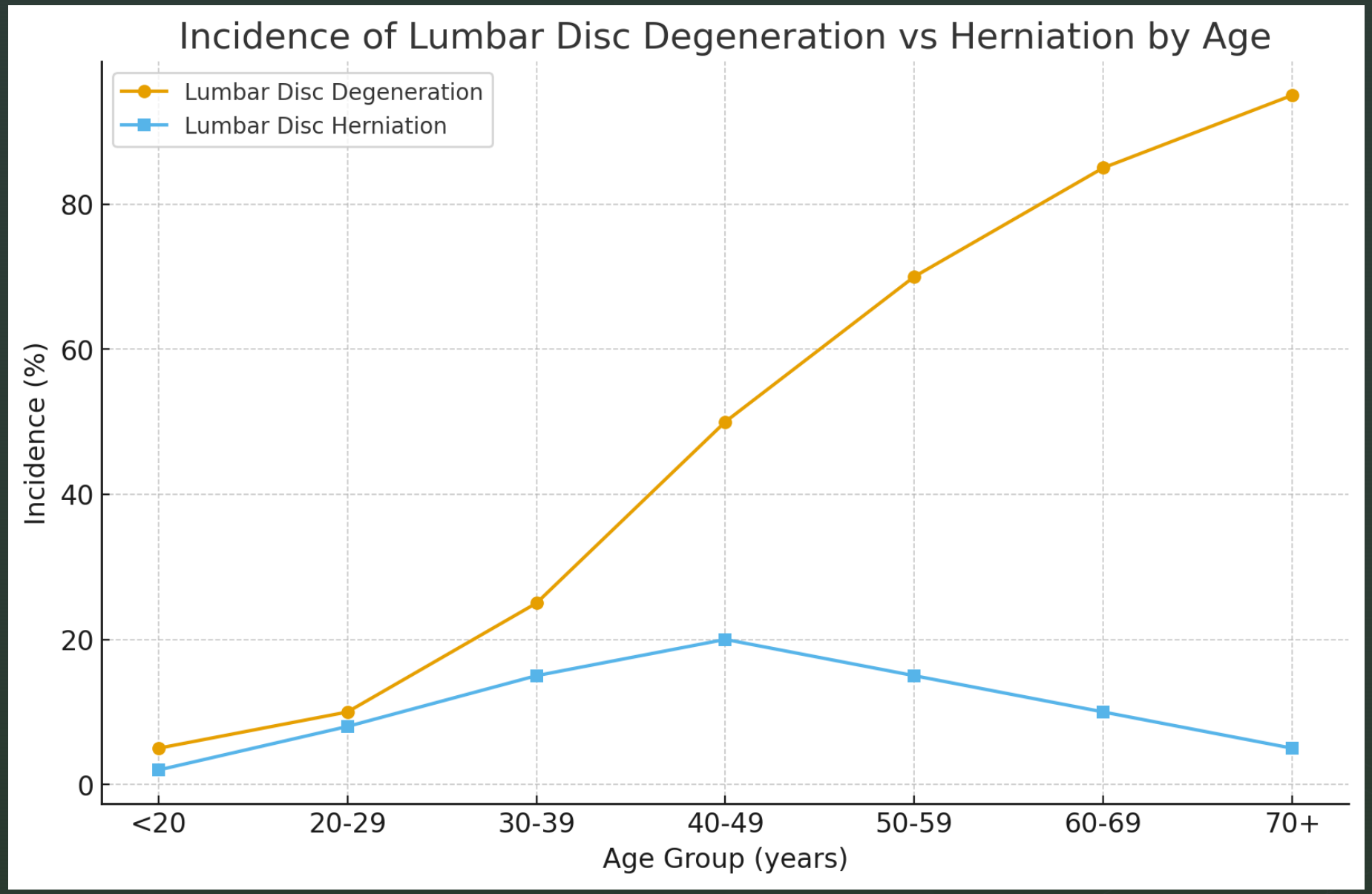
Lumbar Herniated Disc

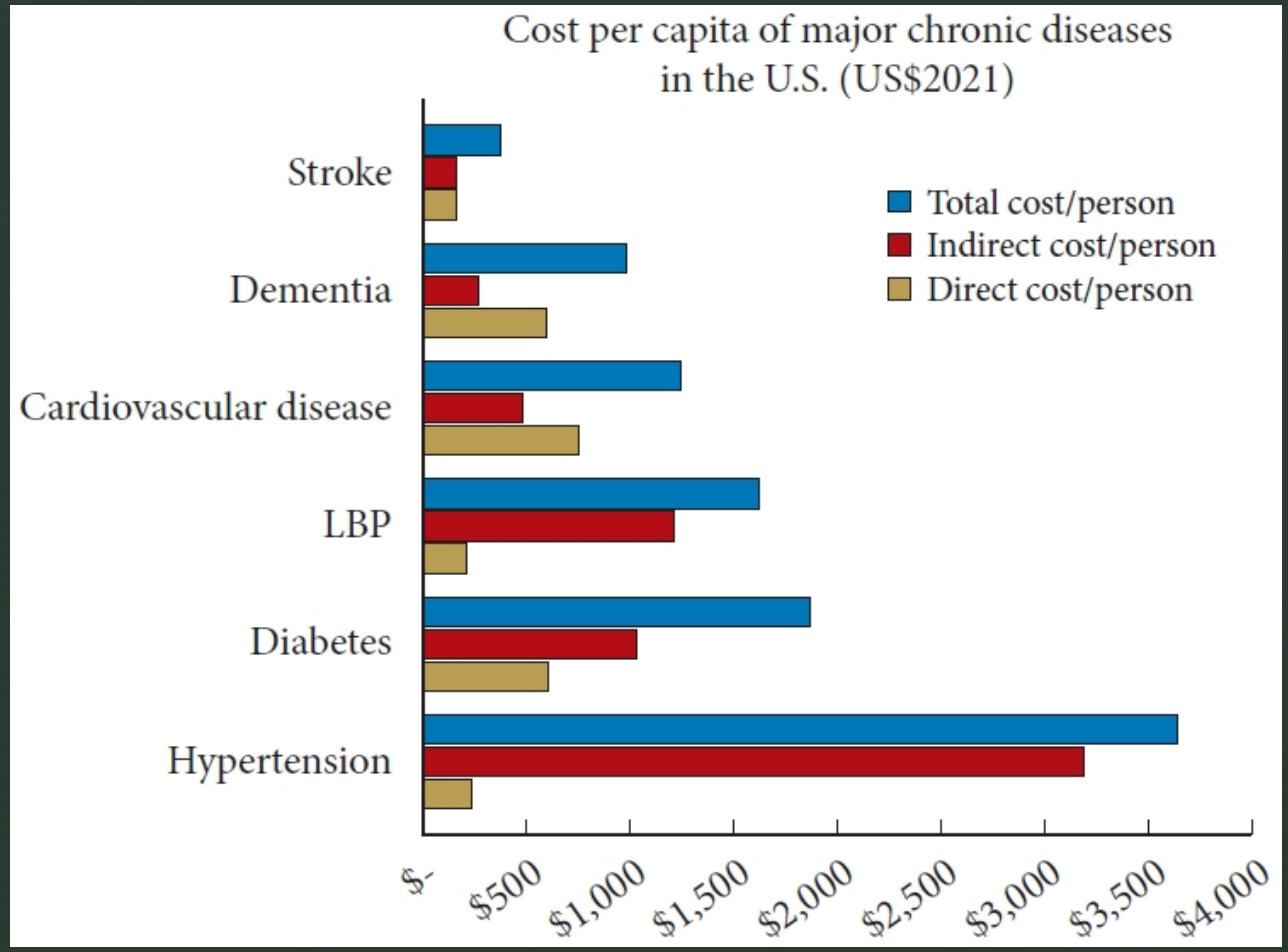
Scope of the problem

- In 2020, LBP affected 619 million people globally.
- Expected to increase to 843 million people by 2050.
- LBP is the single leading cause of disability worldwide.
- Can be experienced at any age.
- Lifetime risk of a symptomatic herniated disc is 1-3%.

- *WHO data*


Incidence of Lumbar Disc Degeneration vs Herniation by Age
Lumbar Disc Degeneration
Lumbar Disc Herniation
Incidence (%)
0
20
40
60
80
<20
20-29
30-39
40-49
50-59
60-69
70+
Age Group (years)

Economic burden of low back pain



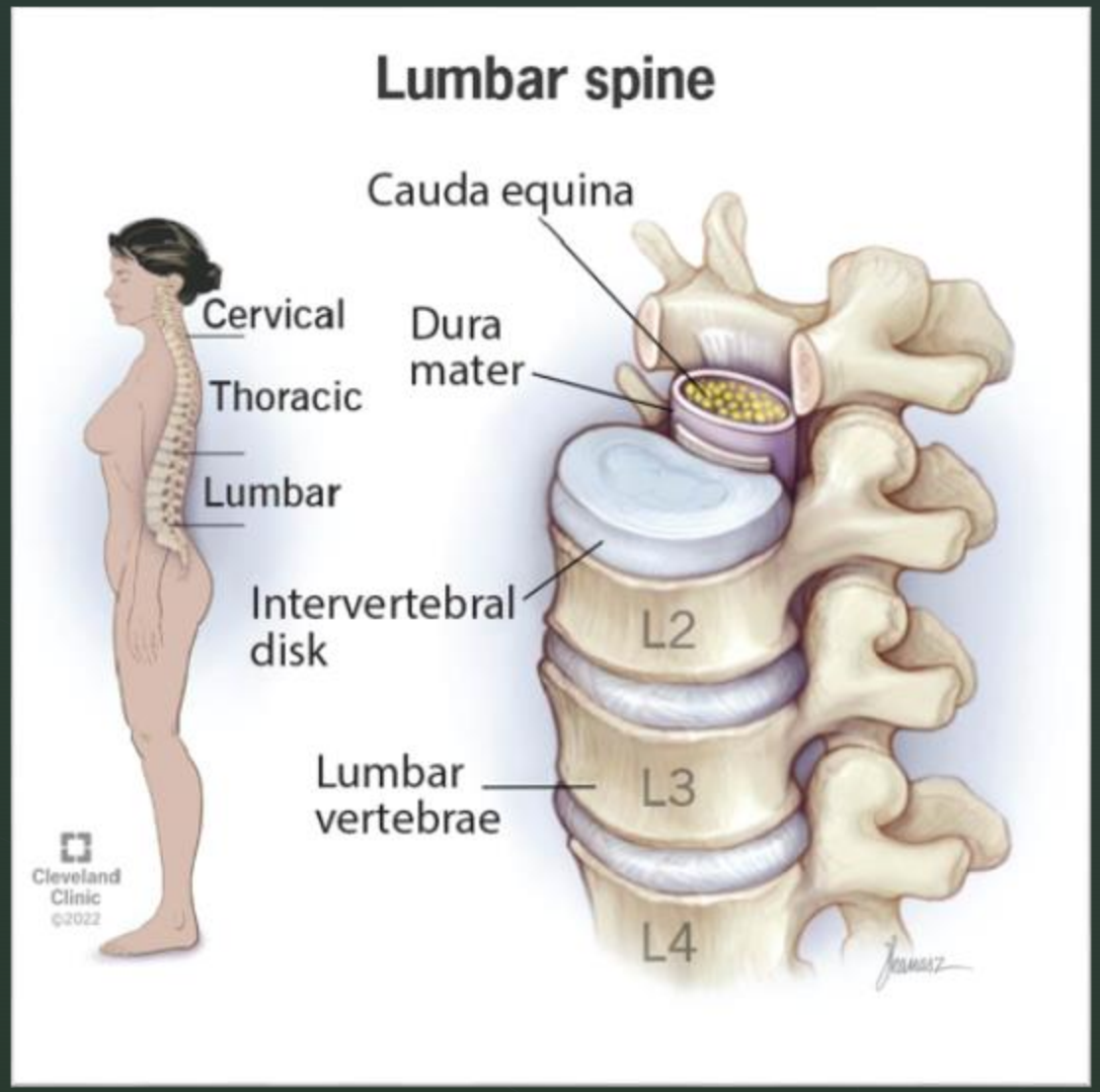
Waters H, Graf M. The costs of chronic disease in the U.S Santa Monica (CA), Milken Inst. 2018.

Workers compensation claims

- Low back pain is the most frequent reason for WC claims, accounting for 1/3 of claims
- Lumbar herniated discs are more common in WC claims than in other insurances
- Most at risk occupations include:
  - Construction workers
  - Manual laborers
  - Warehouse and delivery drivers
  - Nurses and healthcare workers
  - Agriculture workers

Spine Anatomy

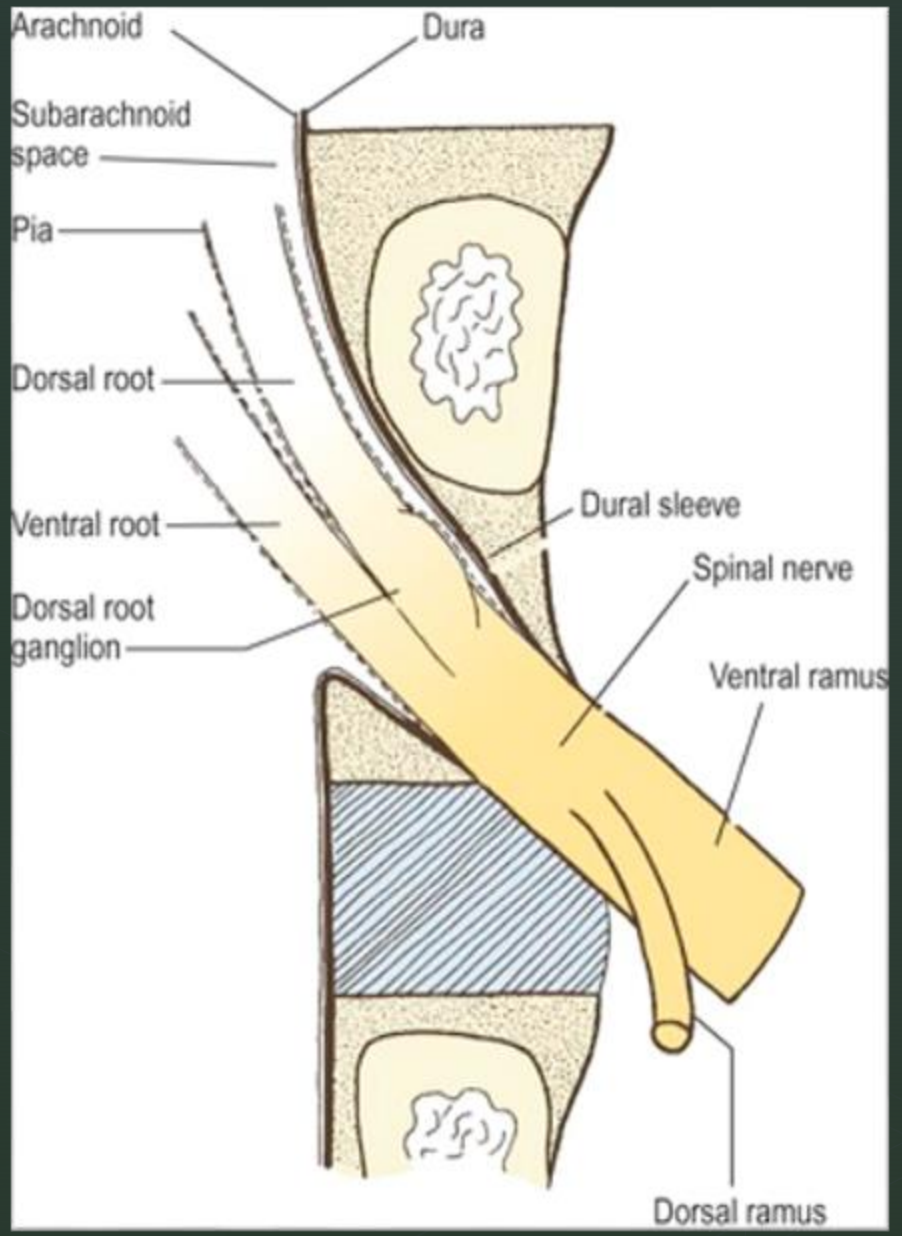
- 33 vertebra
- Intervertebral discs
- Spinal cord terminates L1- L2
- Cauda equina



https://radiologykey.com/nerves-of-the-lumbar-spine/

Lumbar spinal nerves

- Dorsal root = afferent sensory fibers
- Ventral root = efferent motor fibers primarily but may contain some sensory fibers
- Ventral root at L1 and L2 = preganglionic sympathetic efferent fibers
- Spinal cord terminates at L1-2 in majority of people
- Cauda equina



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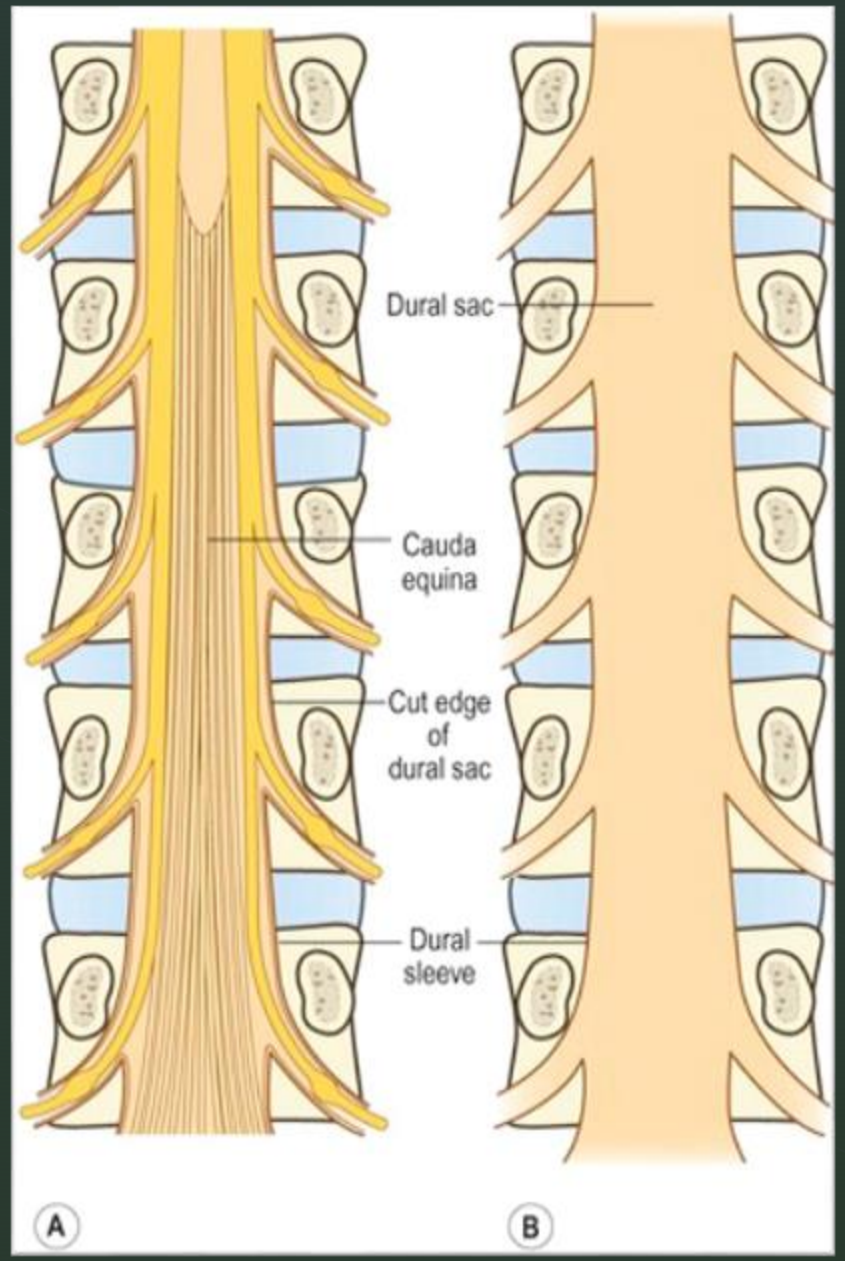

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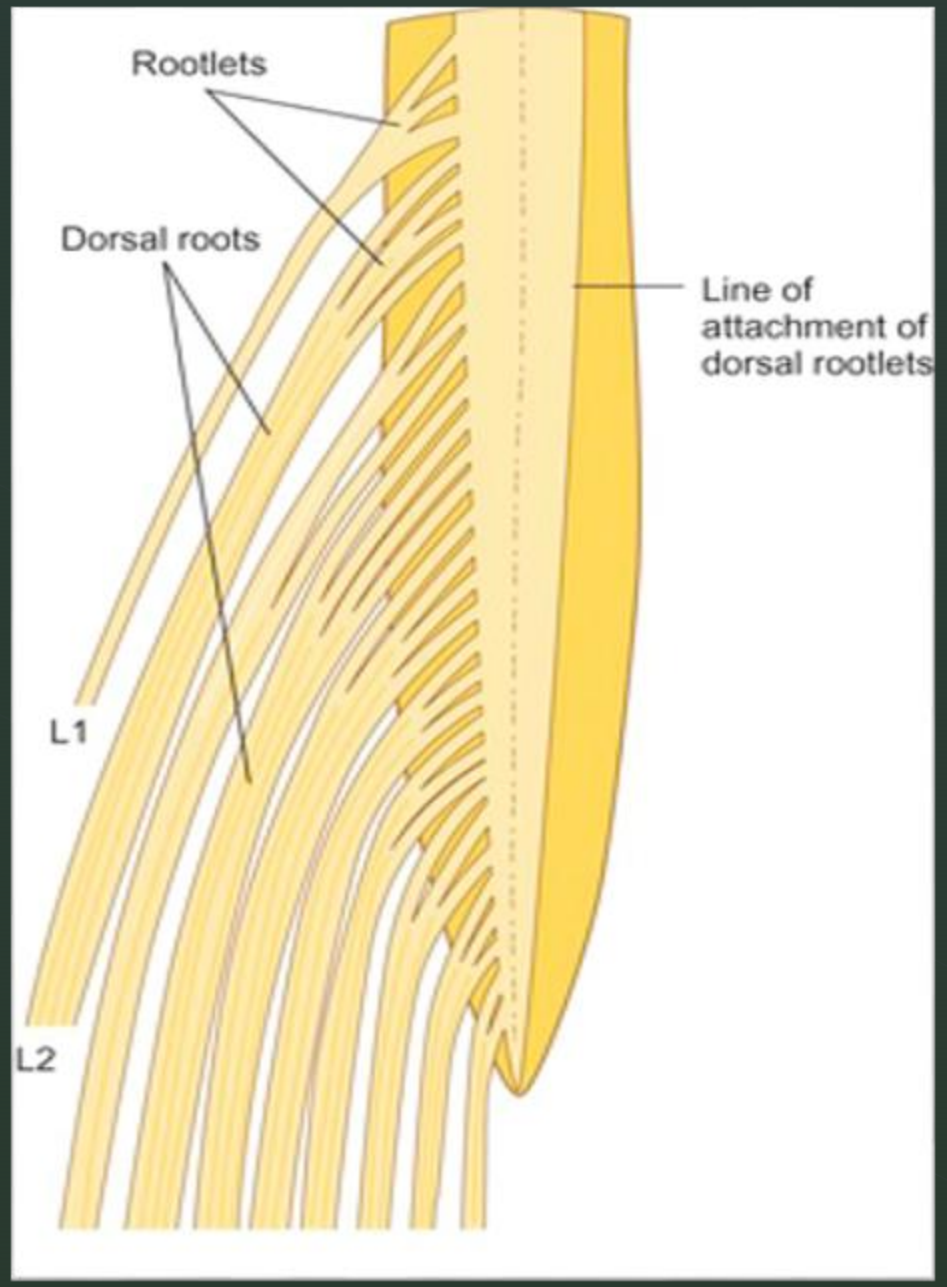

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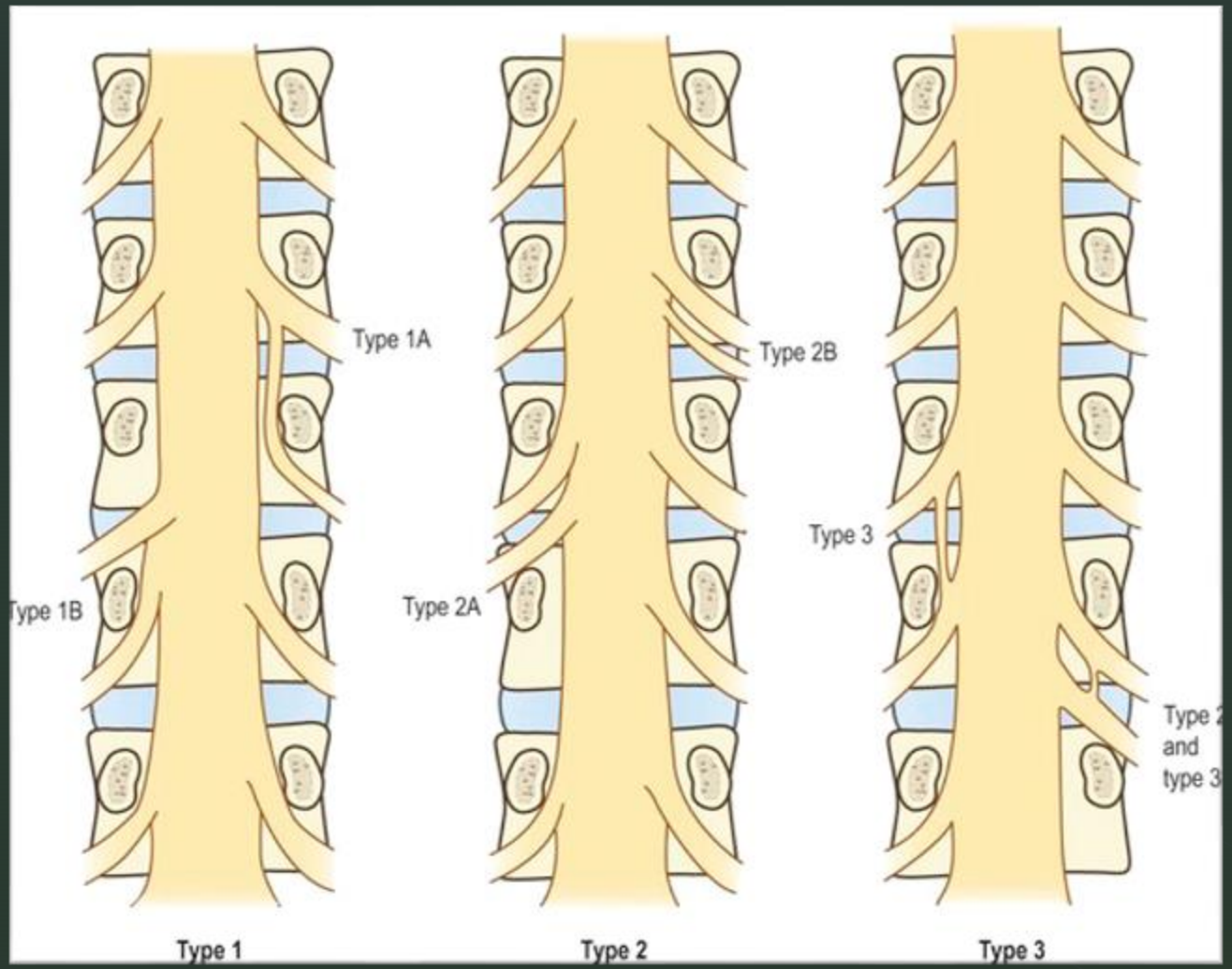

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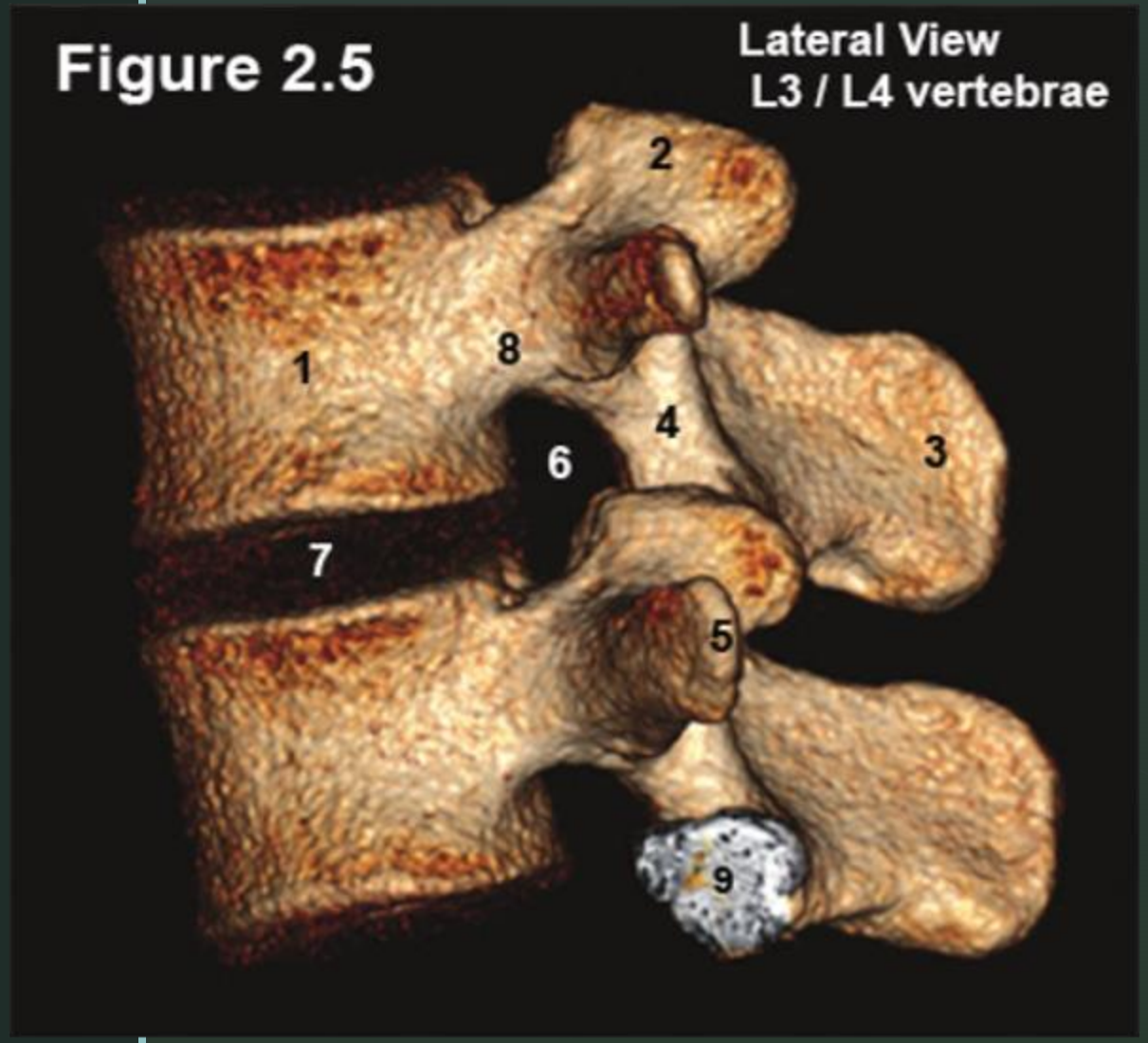

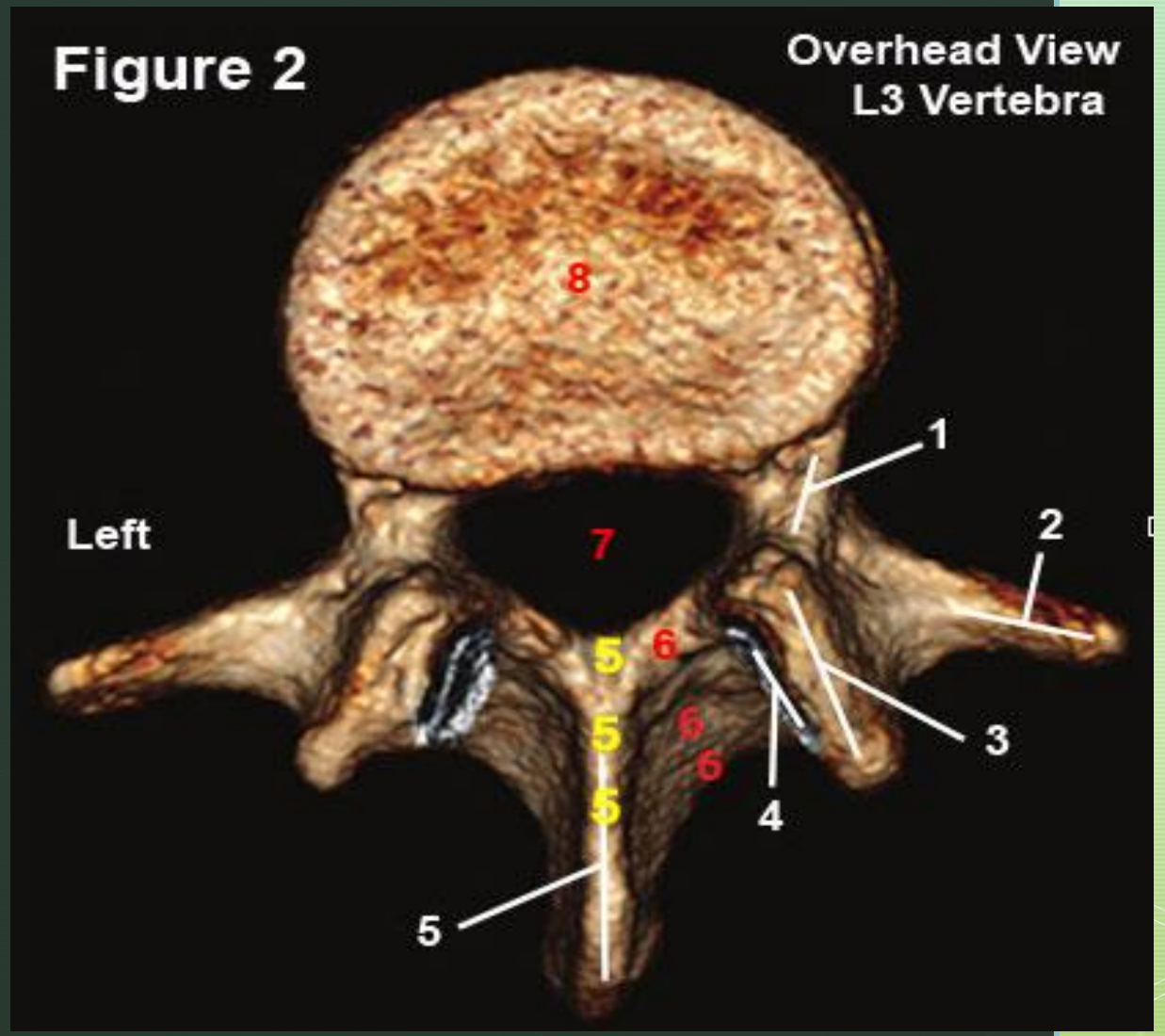

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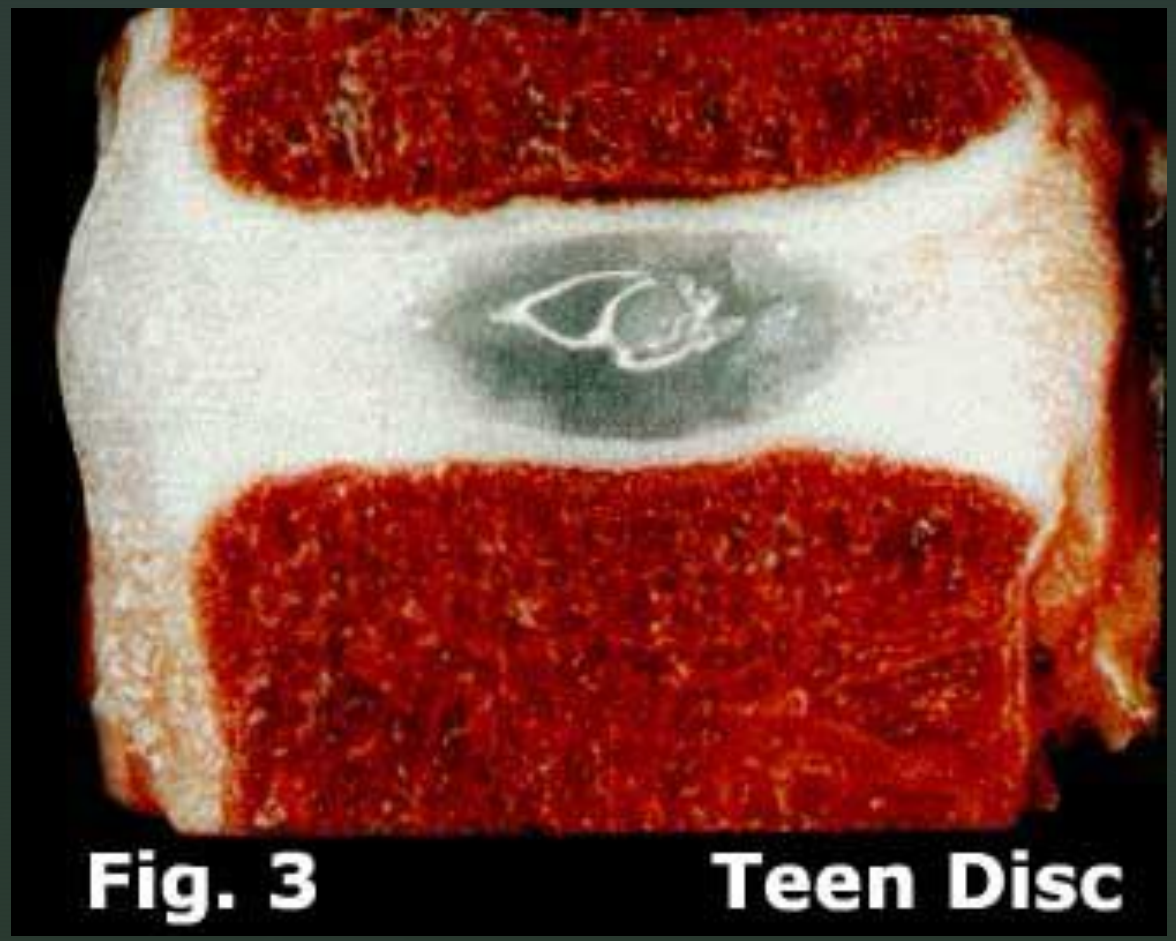
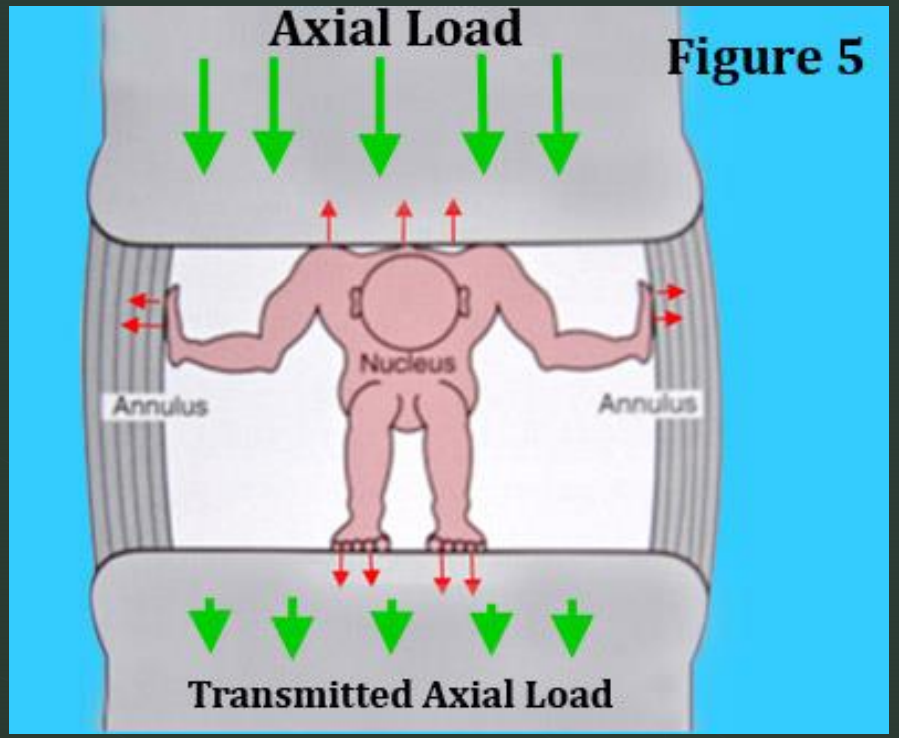
The Nucleus Pulposus





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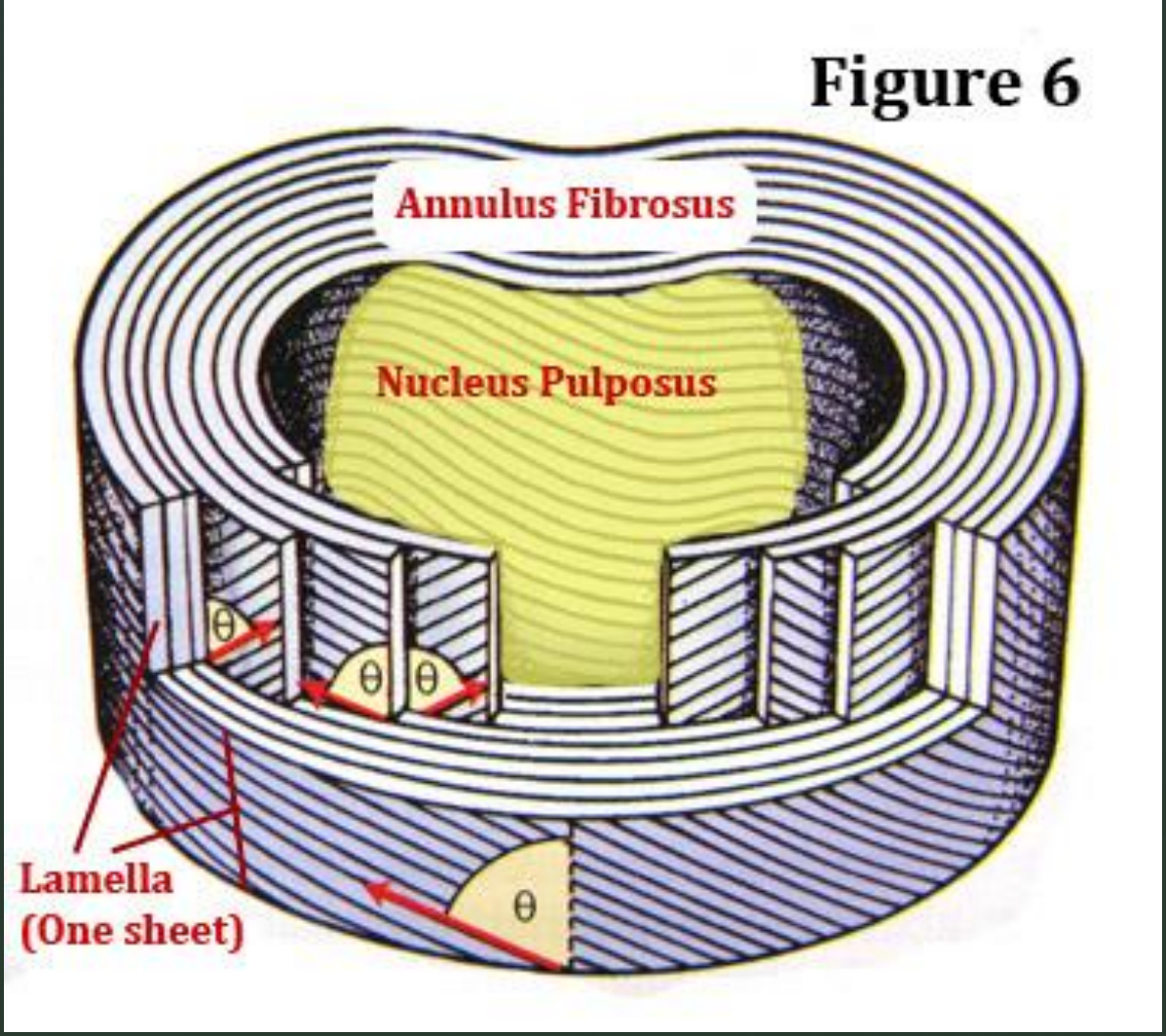
The Annulus Fibrosus



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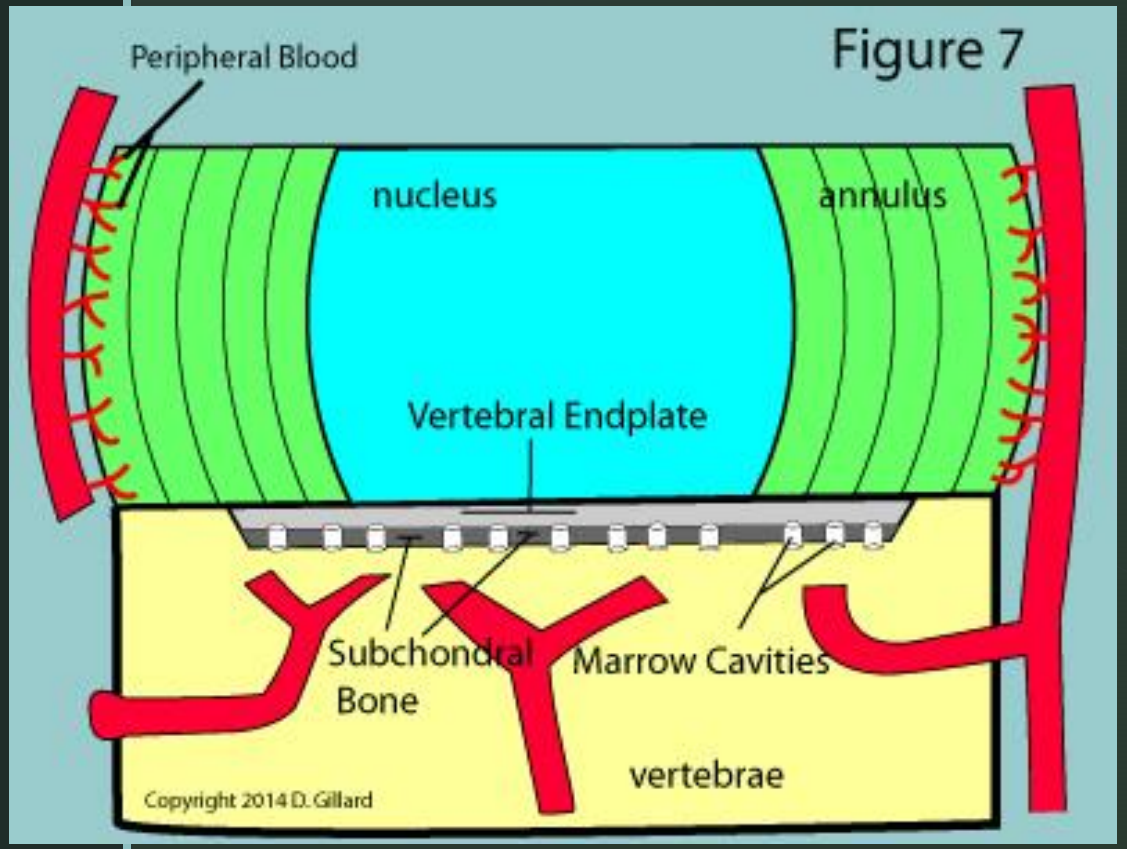
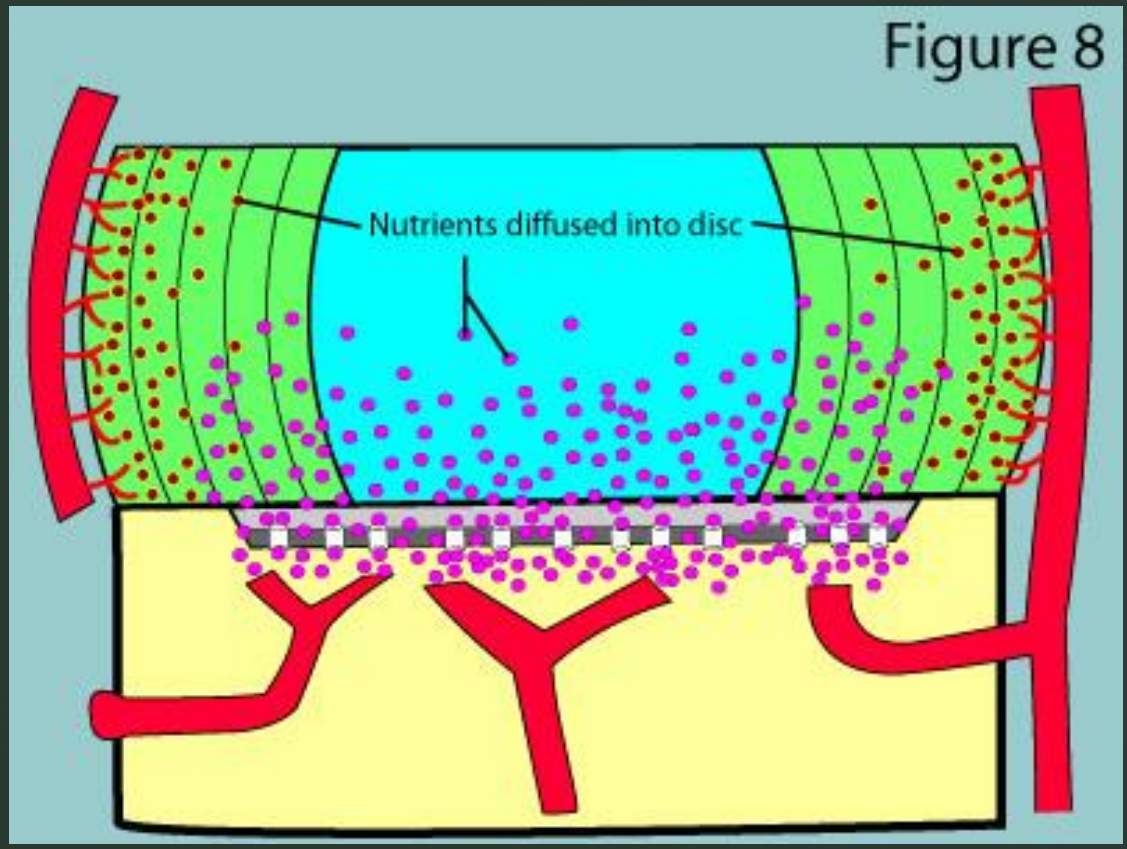
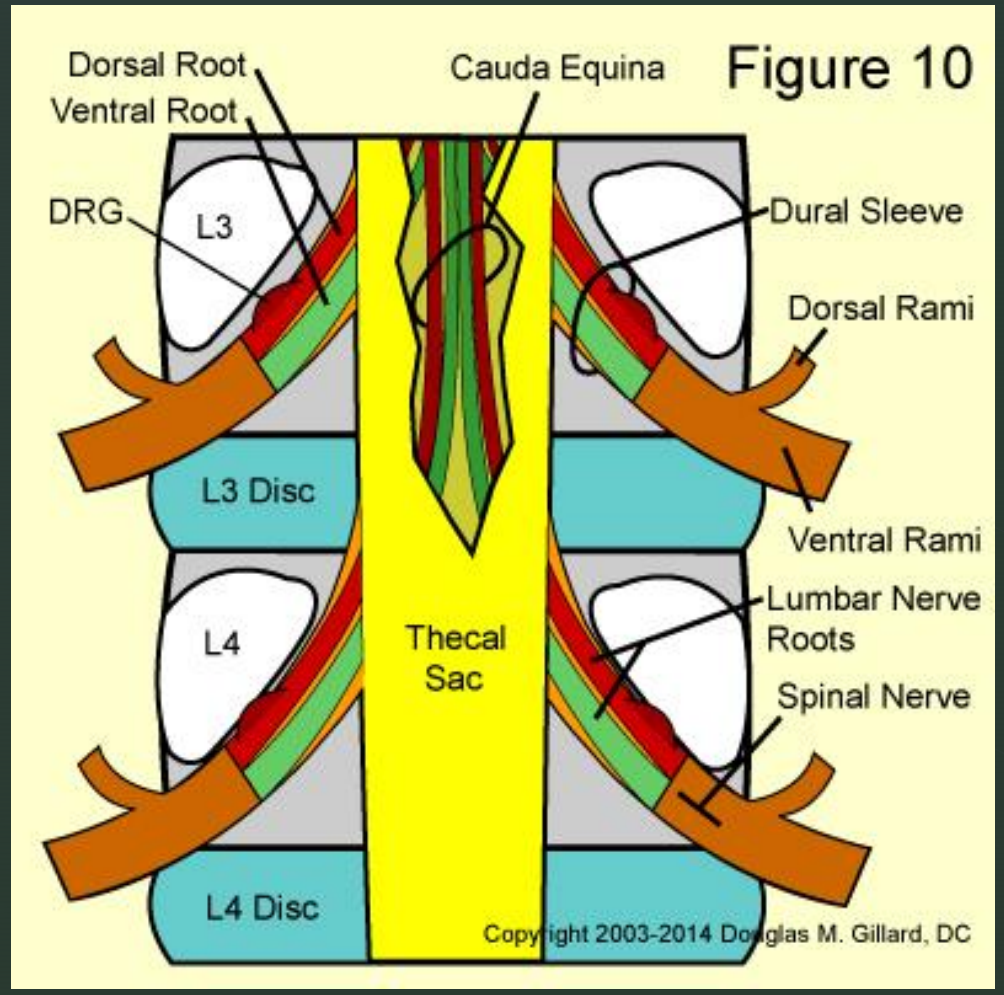
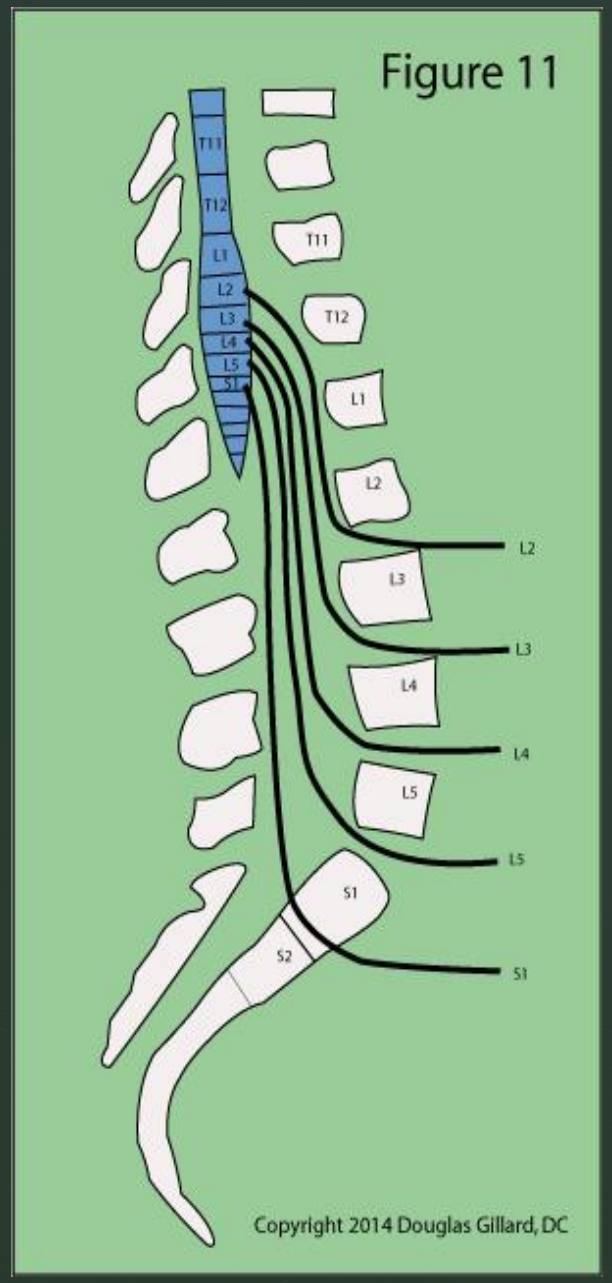
The Vertebral Endplate





Spinal nerves





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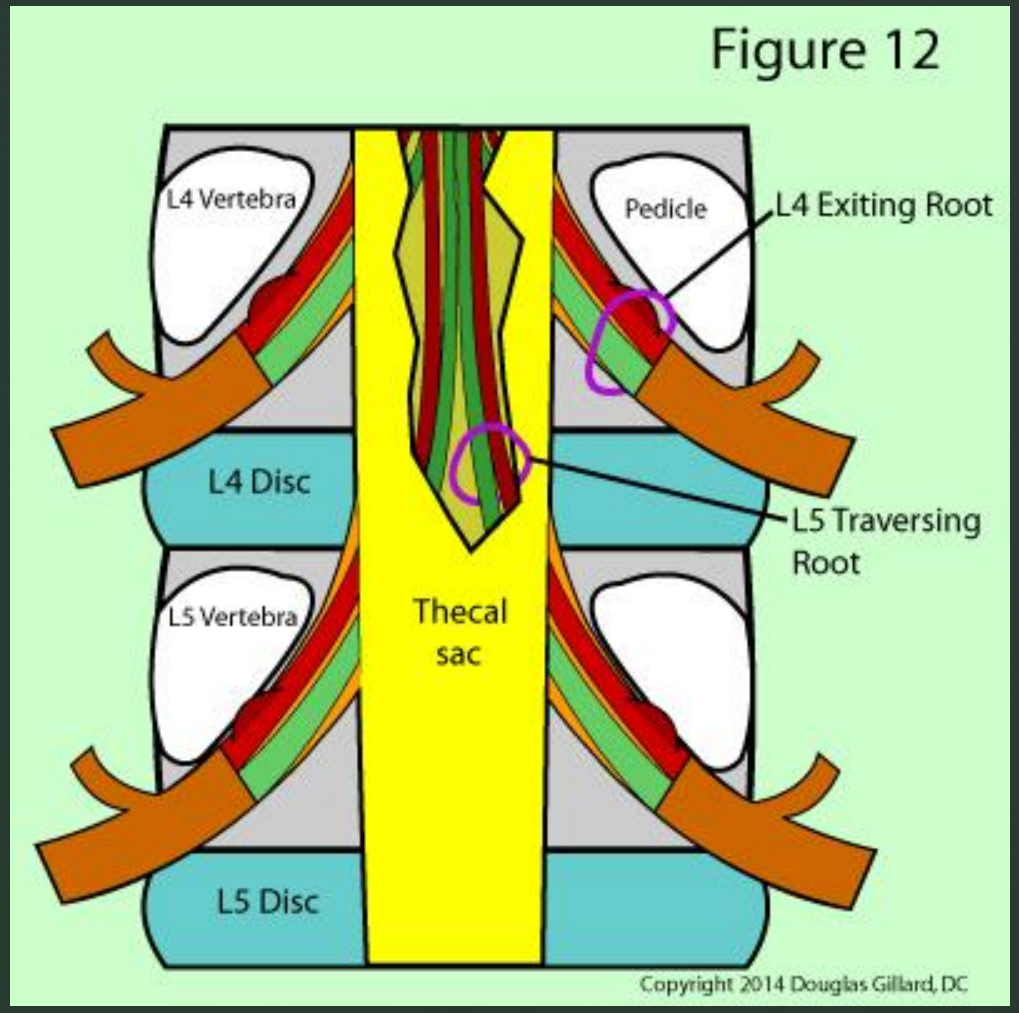
Exiting and Traversing Nerve Roots



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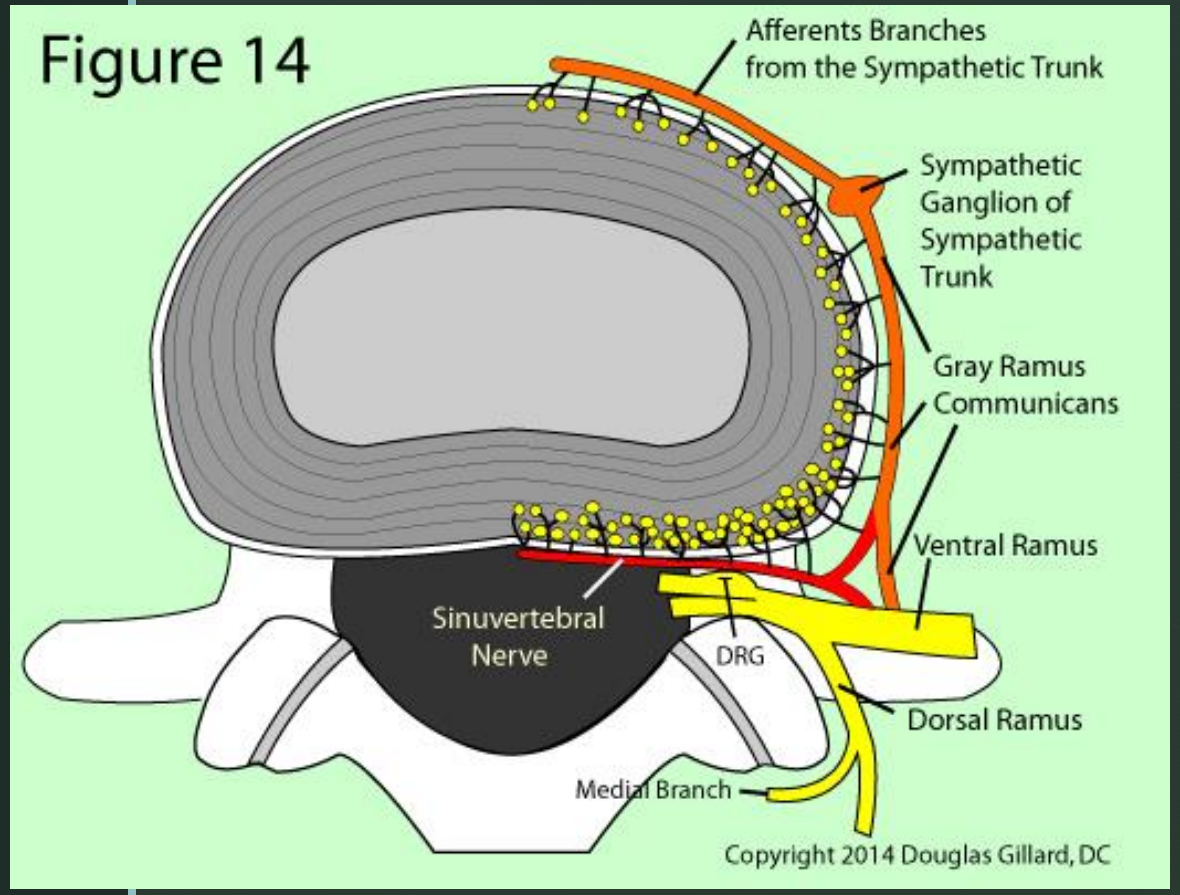
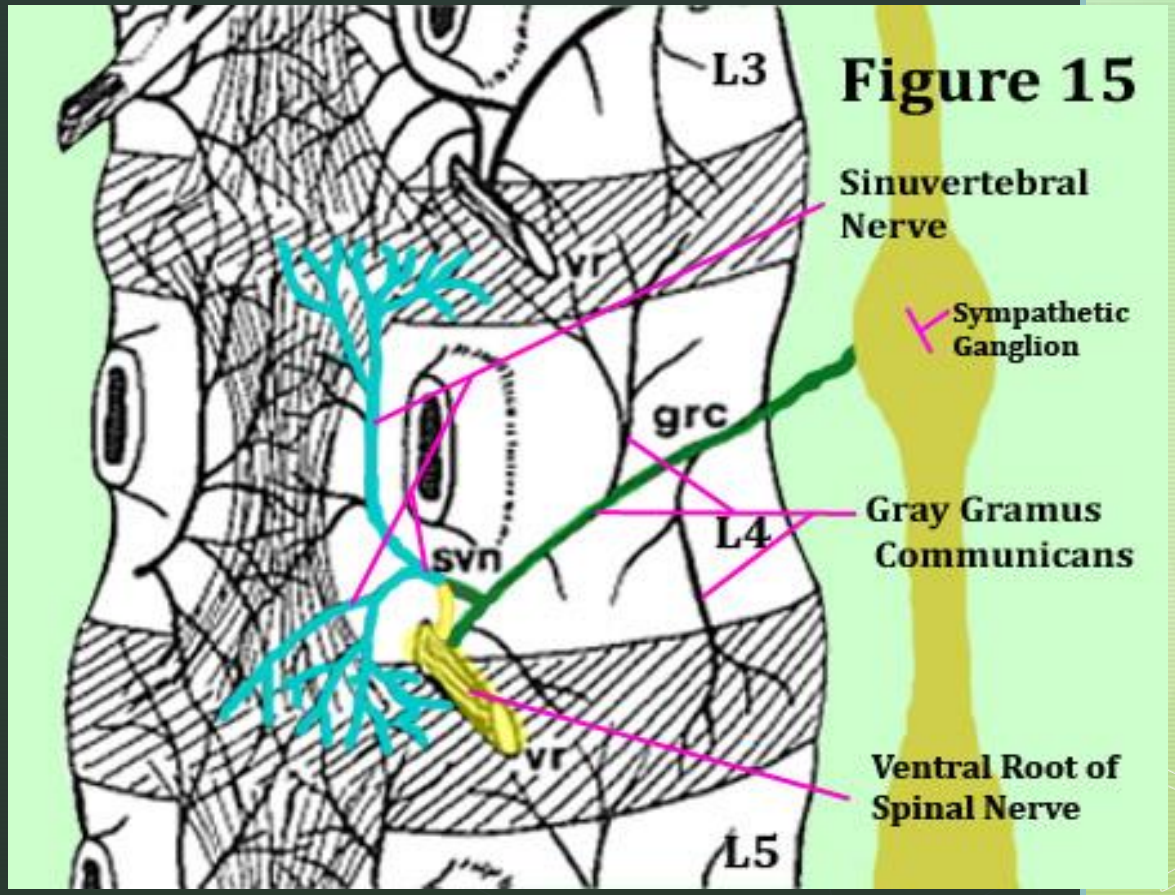
Innervation of the Disc





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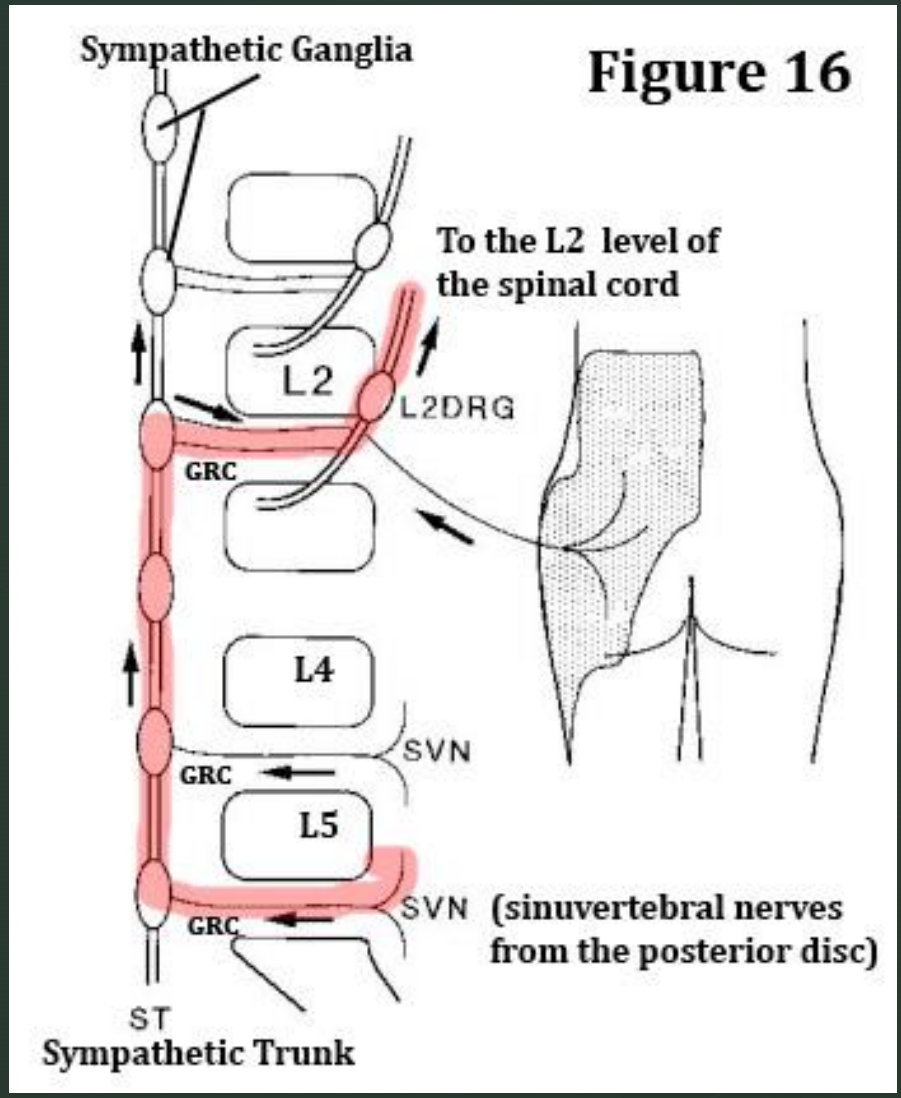
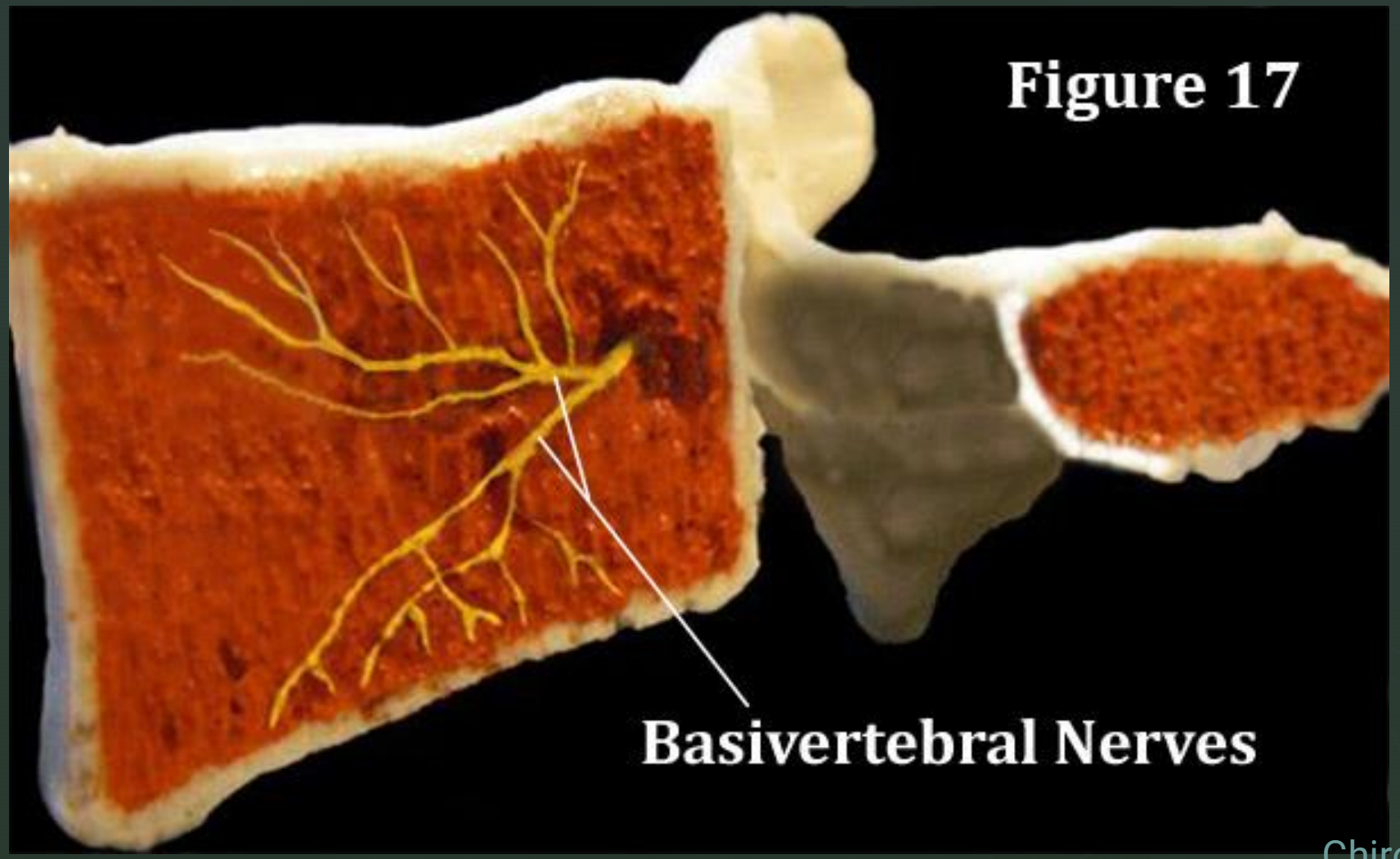
Routing of disc pain



Basivertebral Nerve

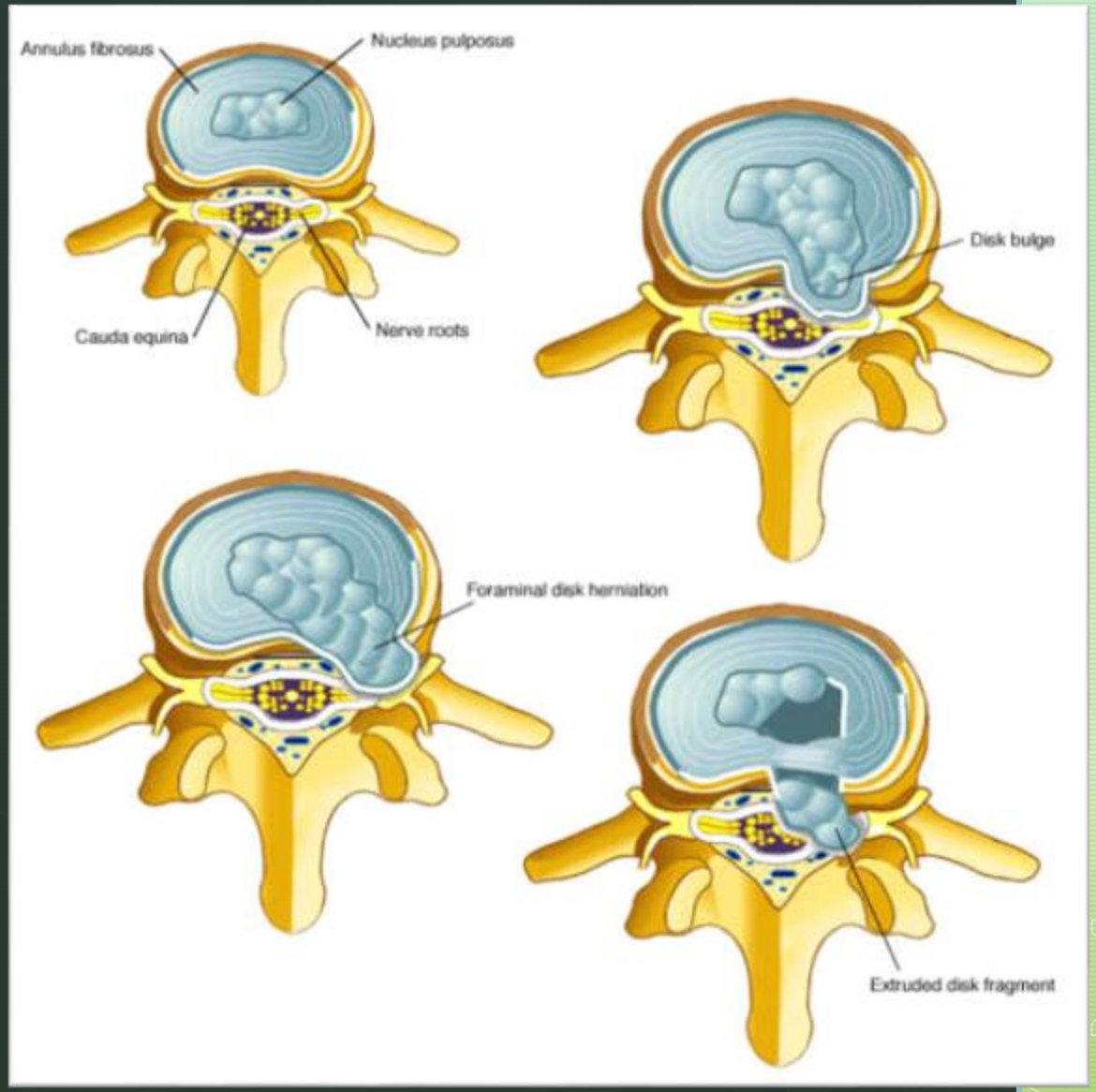


Lumbar Disc Herniation (LDH)

Disc bulge – outer layer of the disc protrudes without a tear

Disc herniation – disc material pushes through a tear in the annulus

Disc extrusion – a disc herniation where the herniation is longer than it is wide



Risk Factors

- Age
- Gender
- Genetics
- Occupational & physical factors
- Physically demanding jobs
- Improper lifting
- Repetitive strains
- Frequent driving
- Overweight or obesity
- Sedentary lifestyle
- Smoking
- Traumatic injury
- Medical comorbidities

Symptoms of LDH

- Primary Symptoms
  - Radiating leg pain (sciatica)
  - Low back pain
  - Numbness or tingling
  - Muscle weakness
  - Pain with movement
- Red flag symptoms
  - Loss of bladder or bowel control
  - Loss of sensation in perineum
  - Severe or progressive weakness in both legs

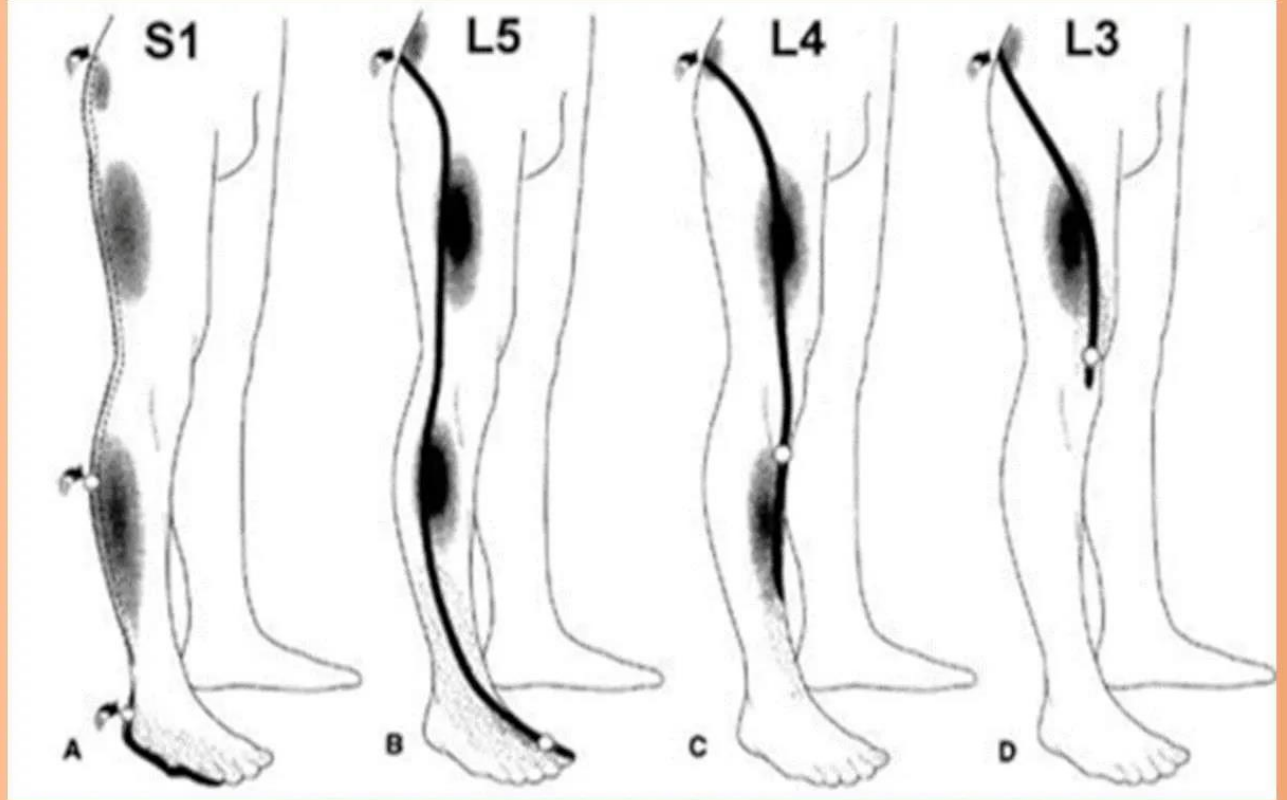
History & Examination

- Onset of pain
- Character
- Distribution
- Aggravating factors
- Alleviating factors
- Associated symptoms
- Posture
- Gait
- Strength
- Sensation
- Reflexes
- SLR

Table 1. Lumbosacral Nerve Roots With Associated Myotomes and Dermatomes

Nerve Root	Motor	Sensory
L1		Upper anterior thigh
L2	Hip flexors (T12-L3)	Anteromedial thigh
L3	Quadriceps / Hip Adductor (L2-L4)	Anteromedial thigh
L4	Tibialis anterior	Medial leg, medial foot
L5	Extensor hallucis longus	Lateral leg, dorsum of foot
S1	Peroneus longus and brevis, plantar flexors	Posterolateral leg, lateral border / plantar surface of foot

Lumbar Radiculopathy



umpcphysiciansresources.com

Imaging

- Imaging for suspected lumbar disc herniation is indicated when symptoms are severe, progressive, or fail to improve after six weeks of conservative treatment, and when "red flag" symptoms like severe or progressive neurological deficits are present.
- MRI is the gold standard
- CT myelogram can be used when MRI is not possible
- CT
- X-rays

- It is important to remember that not all findings on imaging are clinically significant. As a clinician you need to consider history, examination findings and imaging to arrive at a most likely diagnosis.
- “I don’t treat MRIs, I treat patients.”

Disability & QOL in LDH

- ADLs
- Mental health
- Sleep hygiene
- Personal relationships
- Work productivity

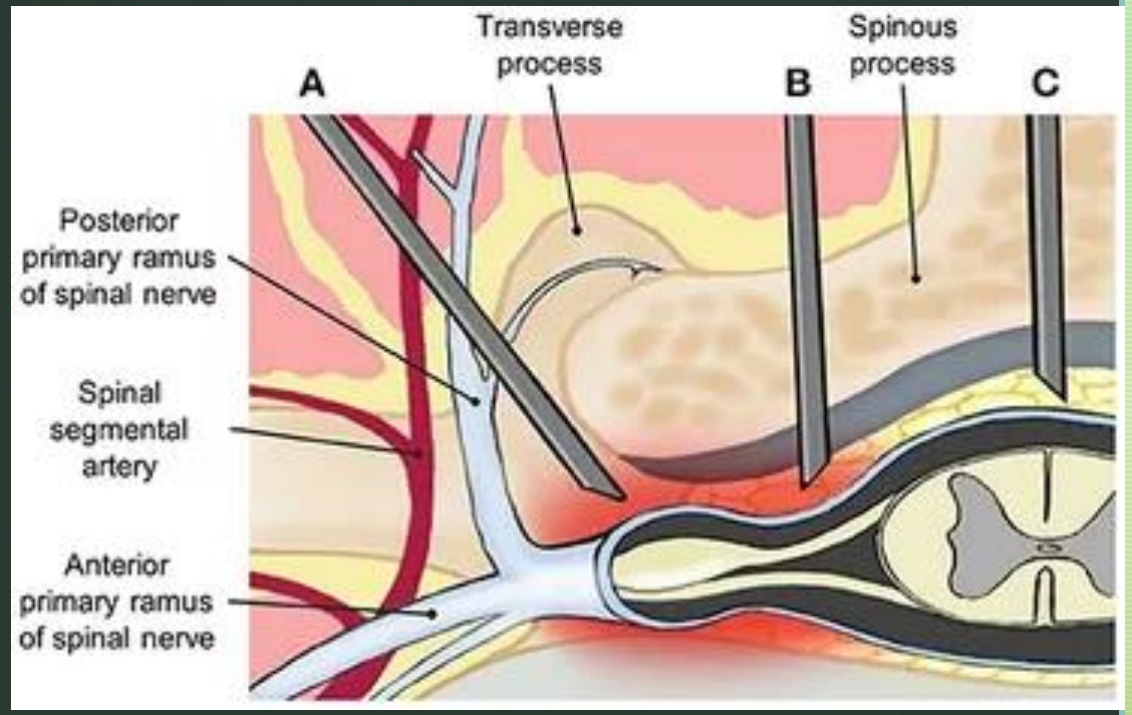
First line treatment

- Short-term rest
- PT
- Massage
- Acupuncture
- Chiropractic
- TENS
- Pharmacologic interventions
  - NSAIDs, anticonvulsants, corticosteroids, opioids

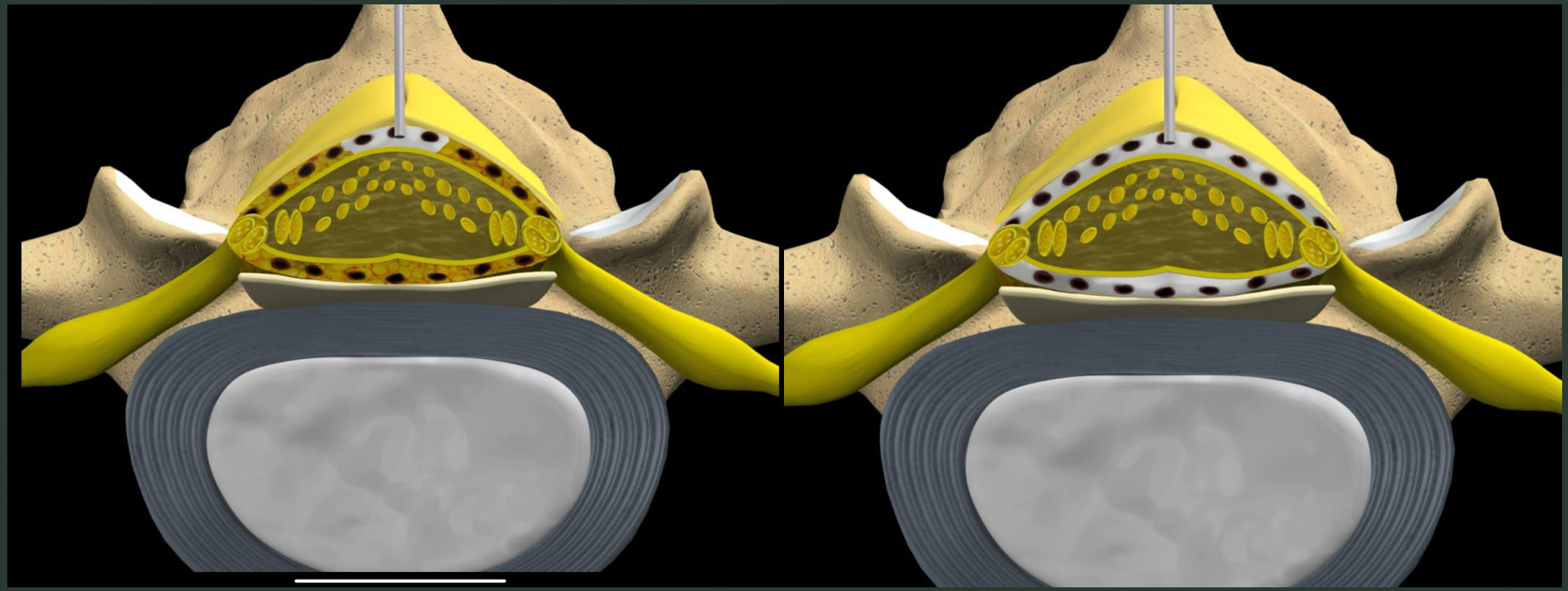
- Conservative treatment is usually tried for 6-12 weeks if tolerated. However, symptoms > 6 weeks are less likely to improve without interventions
- These interventions have limited high-quality evidence for LR pain
- 60-80% of patients can improve in 6-12 weeks
- At 1-2 years, improvement can be as high as 90%
- Chronic back pain and chronic radiculopathy are complications

Second-line Treatment

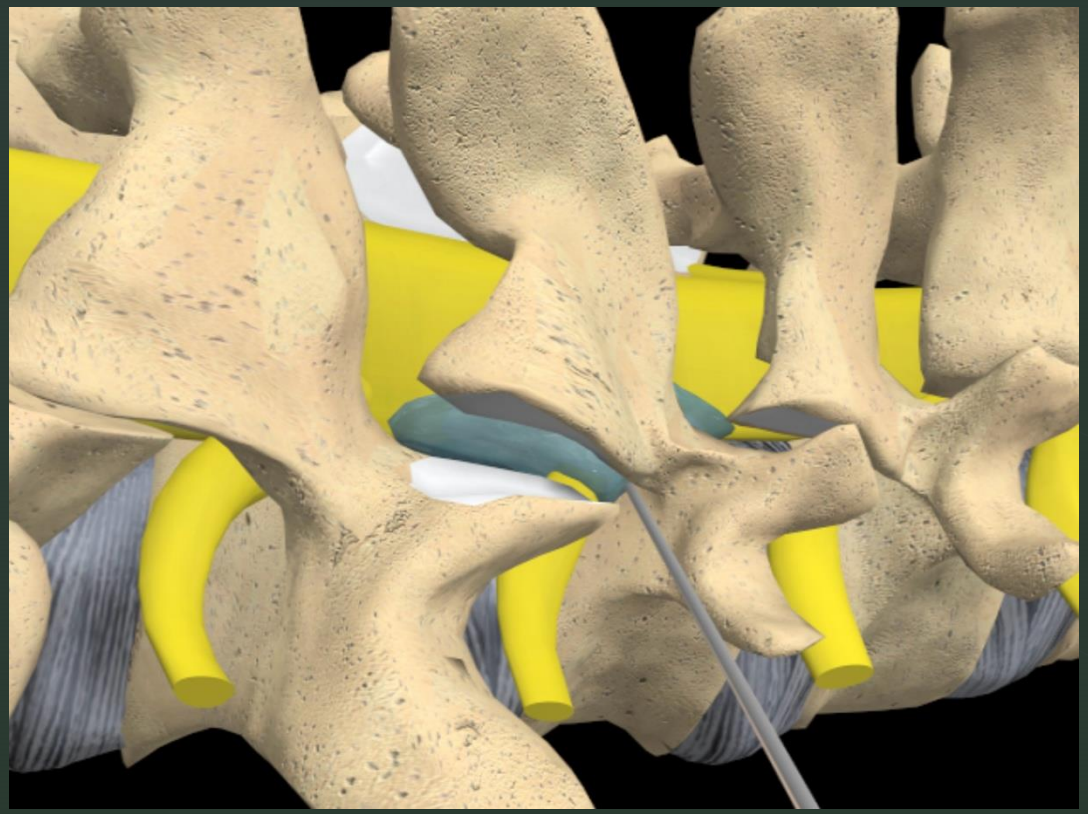
- ESIs
  - Interlaminar vs transforaminal approach
  - Meta-analysis shows good short to medium term improvement (3-6 months)
  - Some evidence indicates better response to transforaminal approach (12 months)
  - Studies show decreased opioid use
  - Low risk in most patients

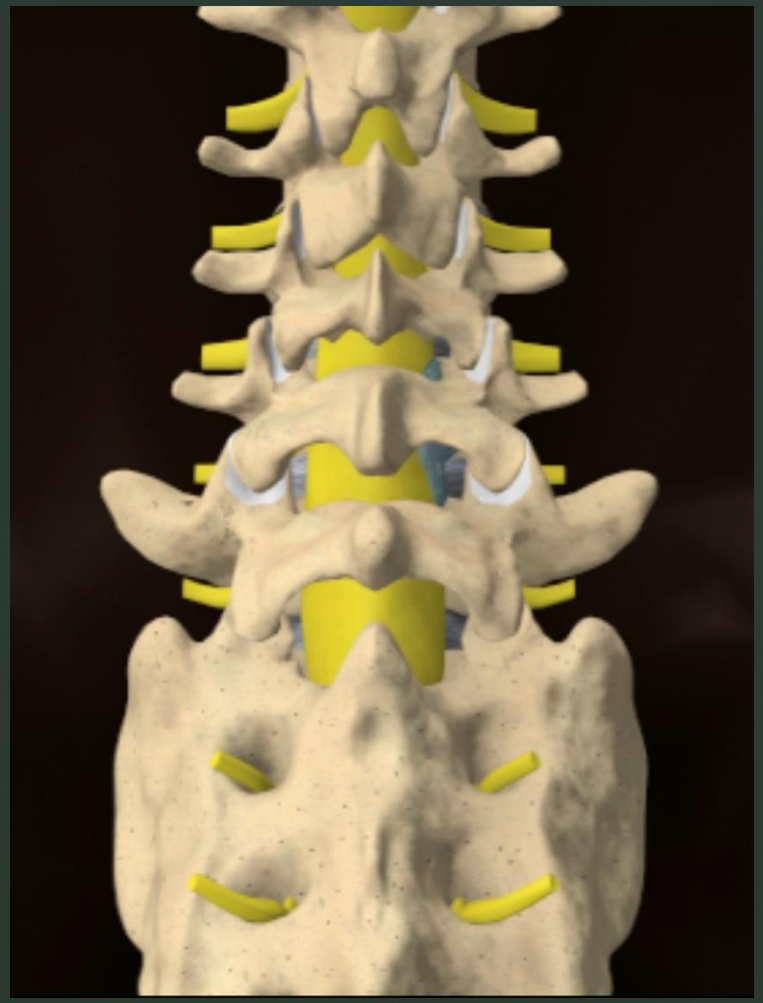


Interlaminar approach to ESI



Transforaminal approach to ESI



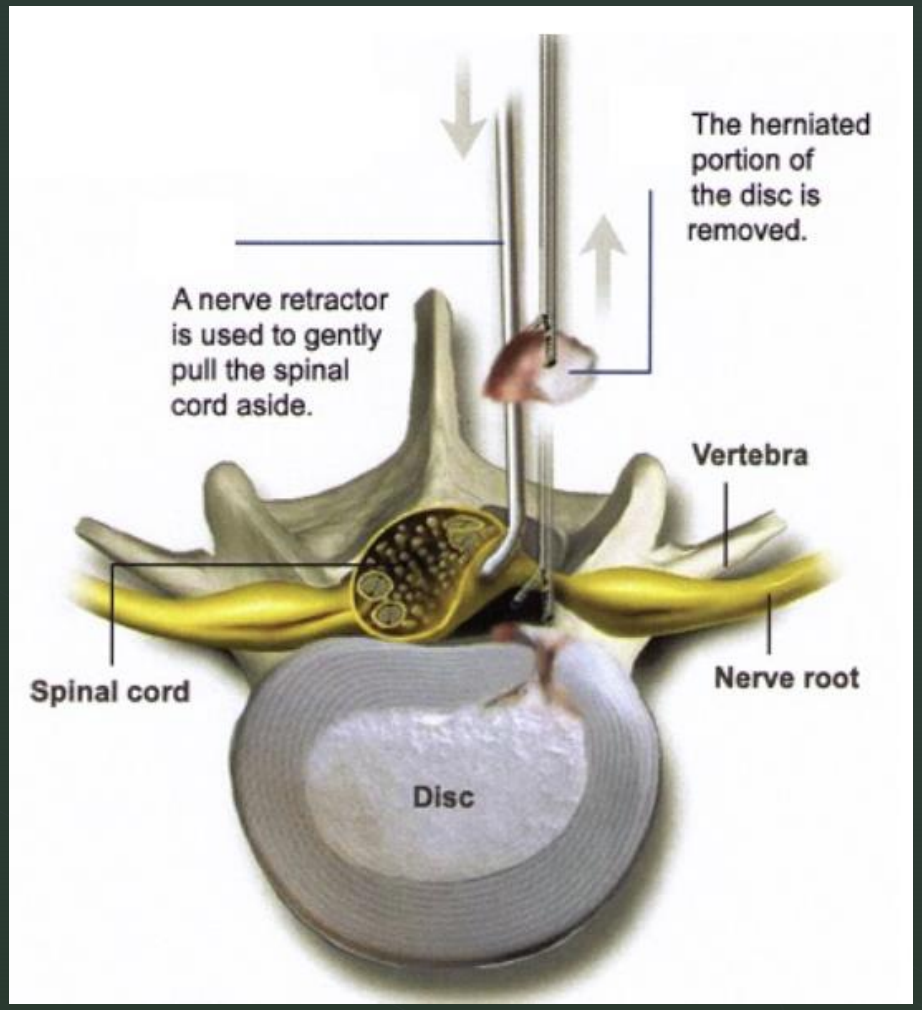


Radiofrequency ablation

- Intradiscal electrothermocoagulation (IDET)
  - There is insufficient evidence to make a recommendation regarding this in the treatment of LDH
- Lumbar MBN RFA
  - Indicated for facet mediated pain and not disc related pain.
- In patients with predominantly low back pain with a herniated disc but also evidence of facet arthropathy, it would be reasonable to perform diagnostic MBNBs to rule out the facets as the primary pain generator

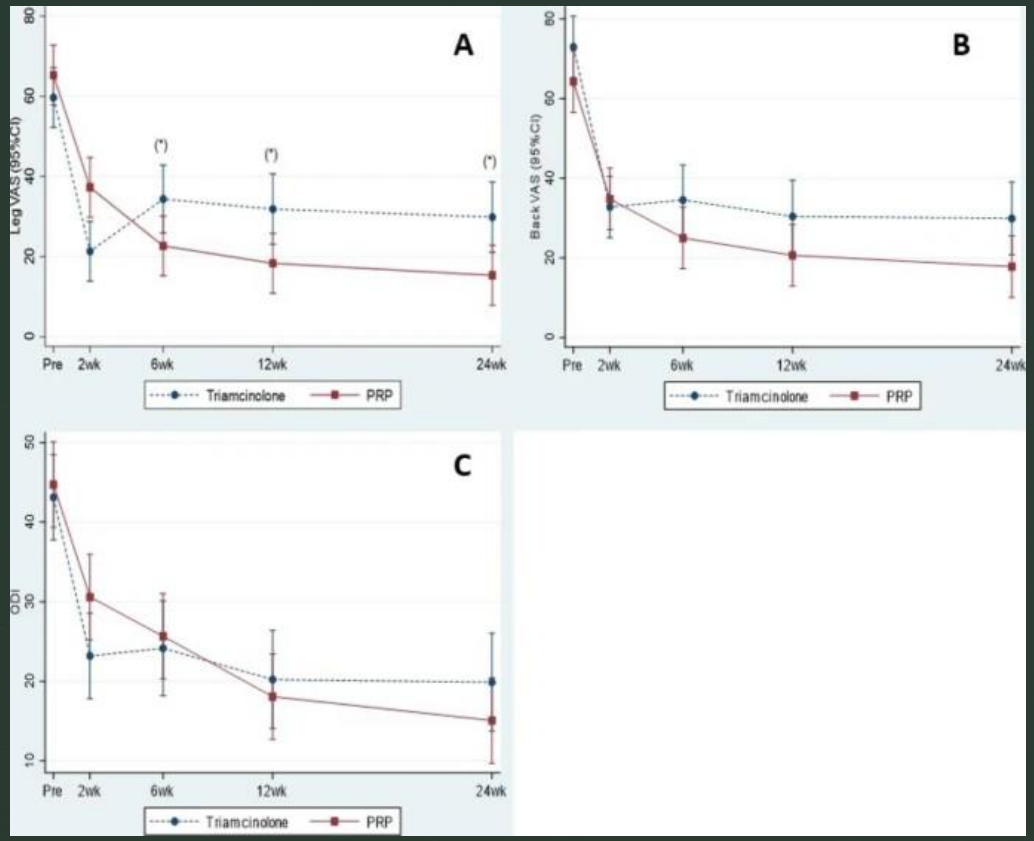
Discectomy

- Surgical removal of herniated disc and/or disc fragments
- Some studies show that discectomy after 14-22 weeks after incident LDH may lead to better outcomes
- Open discectomy, Microdiscectomy and microendoscopic discectomy are all approaches that are recommended



Biologics and Regenerative Therapy

- Limited data on use of PRP or stem cells for LDH
- One randomized, blinded study demonstrated decreased leg VAS, back VAS and improved ODI in both groups for up to 24 weeks. The leg VAS difference was superior in the PRP group



Wongjarupong et al, BMC Musculoskeletal Disorders 24, 335 (2023)

Intradiscal ozone

- One study looked at intraforaminal and intradiscal injections of LA/steroid (control gp) and LA/steroid/oxygen-ozone(O2-O3)(treatment gp)
- RCT
- 159 patients total
- Successful outcome in both groups at 2 weeks, 3 months and 6 months with trend favoring the treatment group

- Kelekis et al compared intradiscal O2-O3 injections to microdiscectomy in a non-inferiority RCT
- 49 patients (25 in O2-O3 group)
- Single level herniations
- Follow up out to 6 months
- Intradiscal O2-O3 was non-inferior to microdiscectomy
- 29% of intradiscal O2-O3 patients went on to microdiscectomy

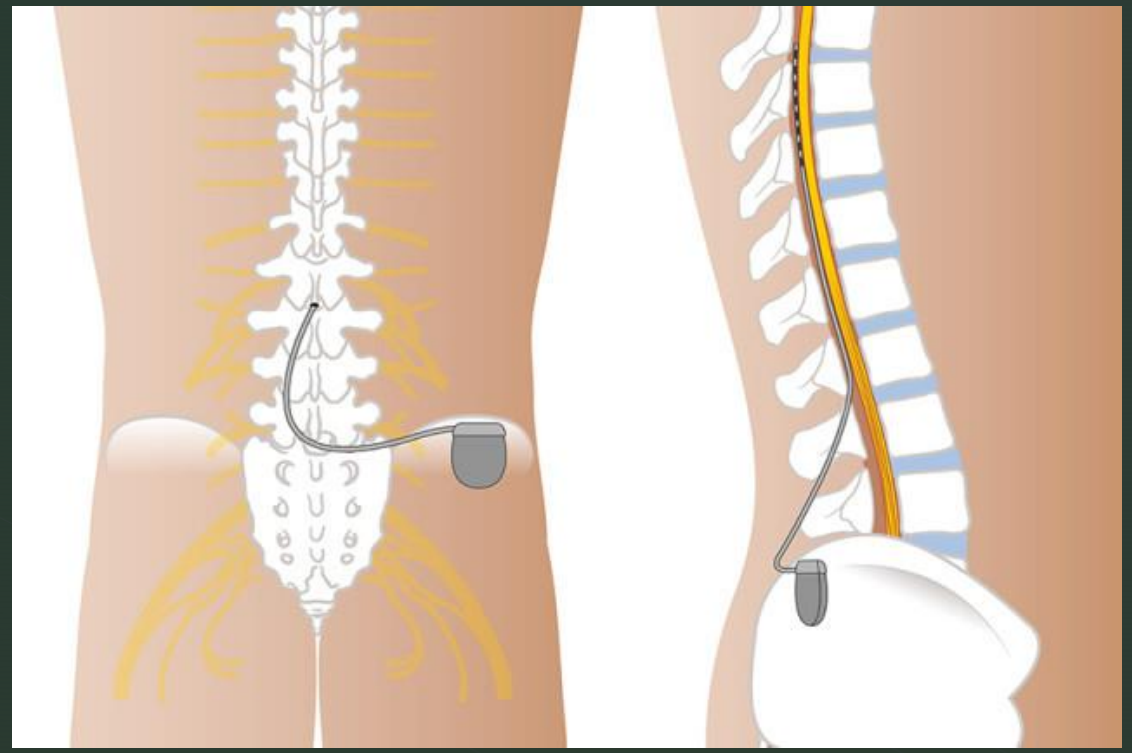
Intradiscal high pressure saline injections

- Minimally invasive technique
- Involves percutaneous intradiscal high-pressure injection of saline designed to tear the thinned PLL leading to a reduction in mechanical compression of nerves by the herniation.

- Kanai, 2009
  - 25 consecutive patients
  - High pressure injection of saline until sudden LOR to injection and leakage of contrast medium out of disc into the epidural space
  - 20/25 (80%) responders through 6 month observation period
  - More efficacious in patients with extruded/sequestered discs

Implantable Pain Therapies

- SCS and ITDD typically have limited application in patients with LDH unless the pain is chronic and they have failed conservative treatment and surgery is not an option.



Conclusion

- LDH is a common cause of lumbar radiculopathy
- LDH is most often managed by conservative treatment
- In refractory cases, epidural steroid injections can provide good relief and may allow some patients to avoid surgery
- Microdiscectomy is indicated in patients failing conservative treatment and ESIs and is generally highly successful in reducing pain and restoring function, though there is a risk of re-operation for recurrent disc herniation
- Other minimally invasive treatments have demonstrated positive results but are still considered experimental and hard to get coverage for outside of a clinical trial

Questions?