

But My Back Hurts Only When I'm Standing !

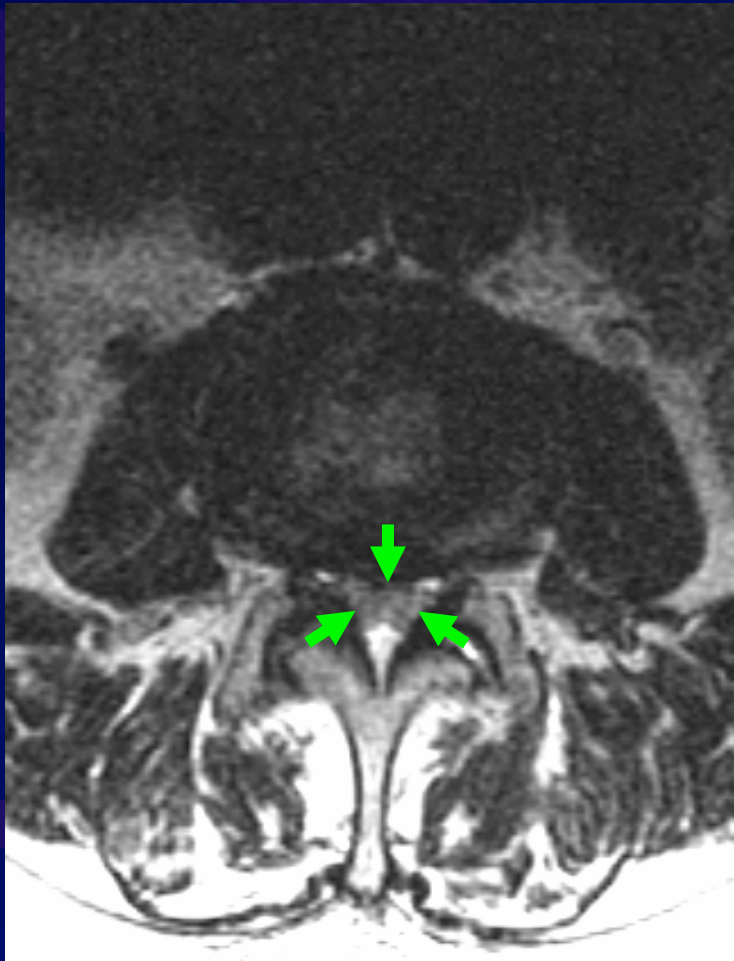


Axial Loading for Spinal Canal Stenosis



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Spinal Canal Stenosis



- Progressive narrowing of the central canal, lateral recesses, and neural foramina most commonly due to degenerative disease
- In the United States, majority of individuals over 60 years old are affected

Symptoms of Lumbar Stenosis

- Most commonly presents as midline back pain aggravated by standing or walking
- Improved by leaning forward

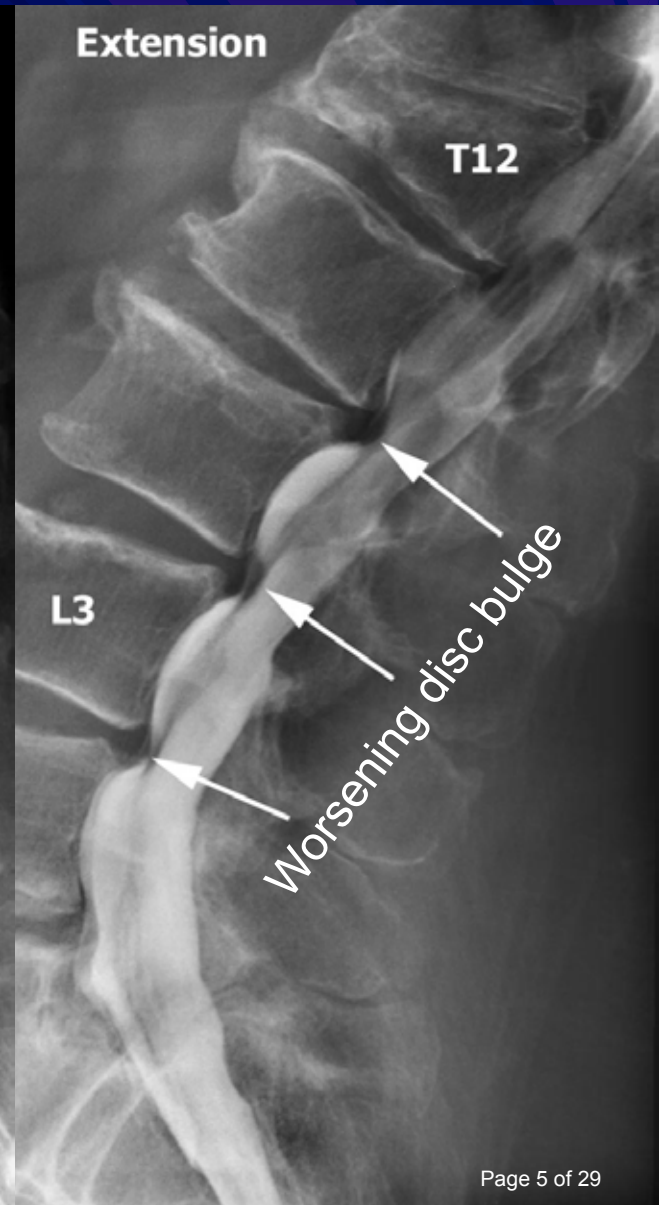
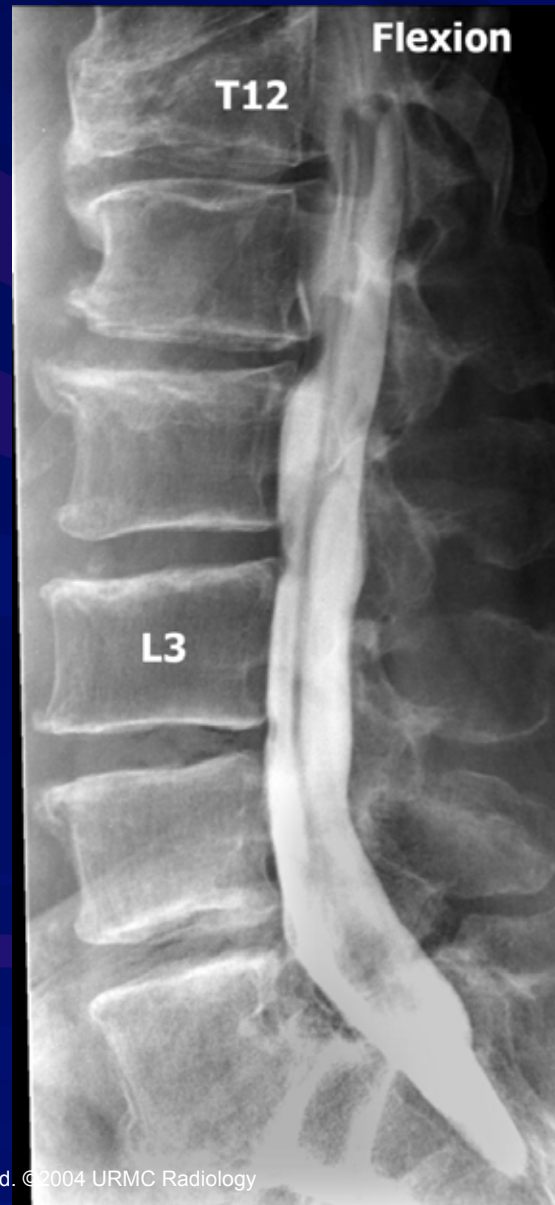


Purpose

- To review the role of axial-loading in MRI for the diagnosis of spinal canal stenosis
- To learn how axial-loading in MRI can be performed during conventional supine MRI

Effect of Positioning

- Myelography may demonstrate worsening of spinal stenosis during extension



Axial Load



Axial Loading

- Some individuals are symptomatic only in the upright position
- May be secondary to axial load exerted by bodyweight on the spine, making spinal stenosis worse in the standing position

Effects of Axial Loading



- MRI is typically performed in the supine position with no axial load
- Surgically treatable spinal stenosis may become hidden during supine MRI

Axial Loading Device

- Device used to generate axial loading
- Simulates the upright standing position during conventional supine MRI
- Consists of a harness and a platform



Harness



- Harness comes in several sizes to fit various body types
- Two nylon straps fasten the harness to the foot platform

Foot Platform

- Foot platform applies an adjustable tension to the harness



Patient Interview



- Identify patients who might benefit from axial-loading during MRI

Evaluation of Symptoms

- Patient may complain of pain that occurs only when standing
- Pain may be relieved by lying down



Evaluation of Prior MRI

- Prior MRI might show no significant spinal stenosis due to lack of axial load

My back doesn't hurt lying down. I have no pain at all !

- Patient may have been asymptomatic during prior MRI due to supine positioning



Using the Axial Loading Device



- Harness is worn like a vest

- Vest is buckled in place



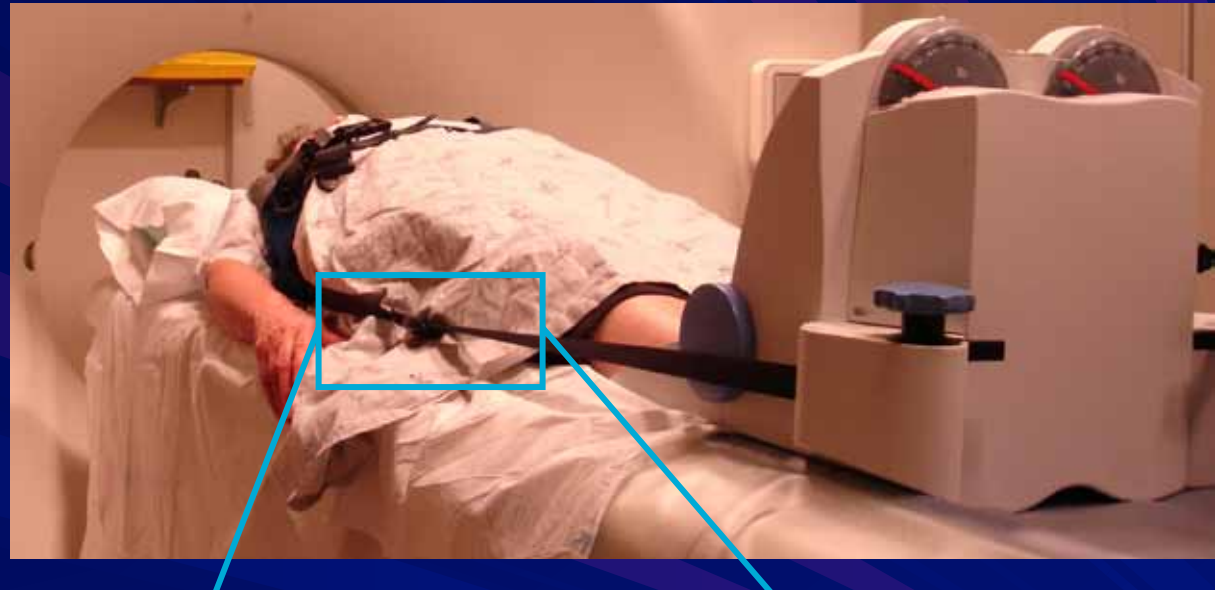
Using the Axial Loading Device

- The foot platform is placed at patient's feet
- One size fits all



Using the Axial Loading Device

- Harness is fastened to the foot platform with two nylon straps



Using the Axial Loading Device



- Tension is applied to the harness by adjusting two large blue knobs

- As the two knobs are turned, the axial load increases



Using the Axial Loading Device



- Axial load (in pounds) is indicated by two display gauges.
- Recommended total axial load is 50% of patient's bodyweight



MRI with Axial Loading

- Patients usually become symptomatic due to the axial load

My back hurts!
It feels as if I
am standing!

- Patient should be given reassurance



MRI with Axial Loading



No Pain!

No Axial Load

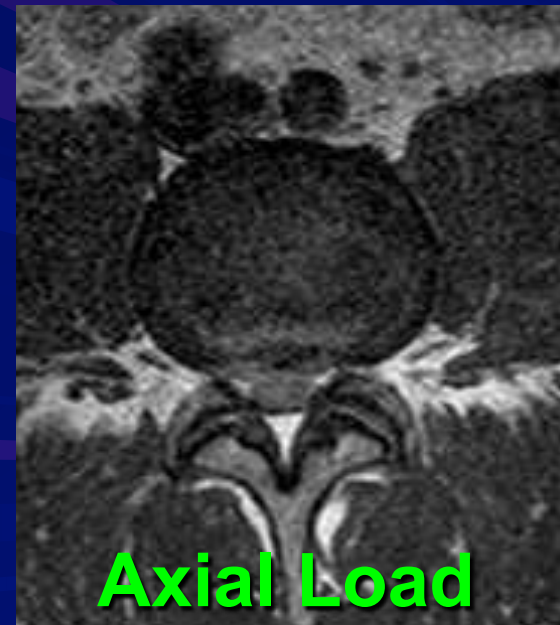
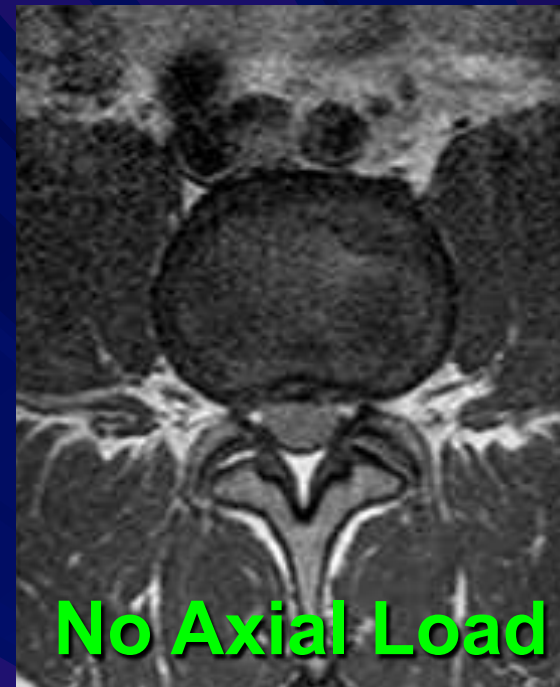


Ouch!

With Axial Load

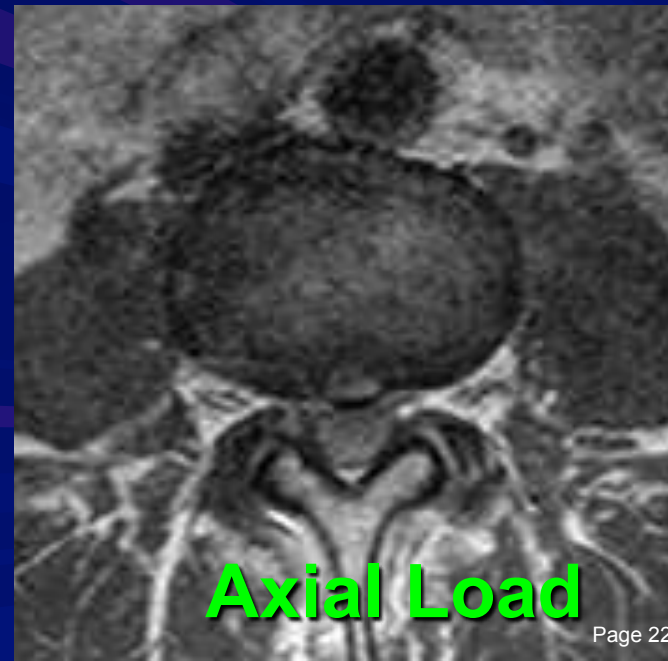
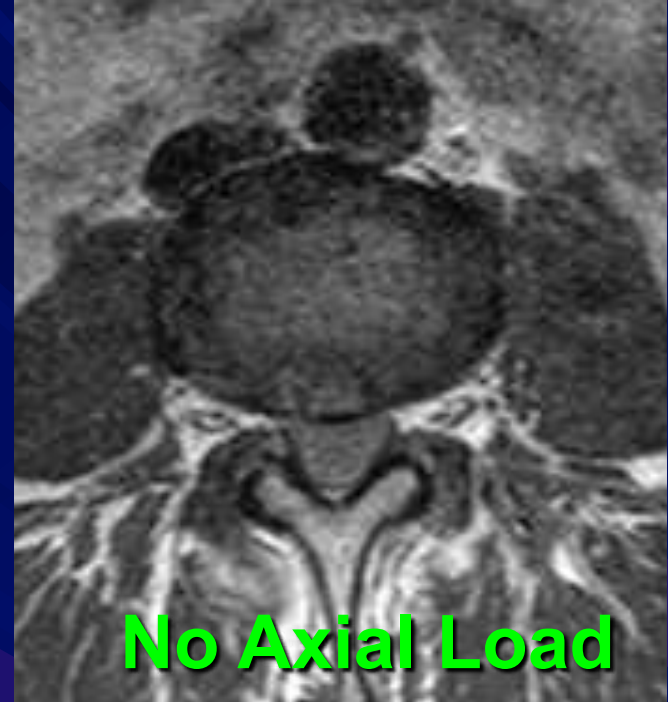
Female 41y

- Neurogenic claudication at L4-L5
- Increasing central stenosis with axial load



Male 63y

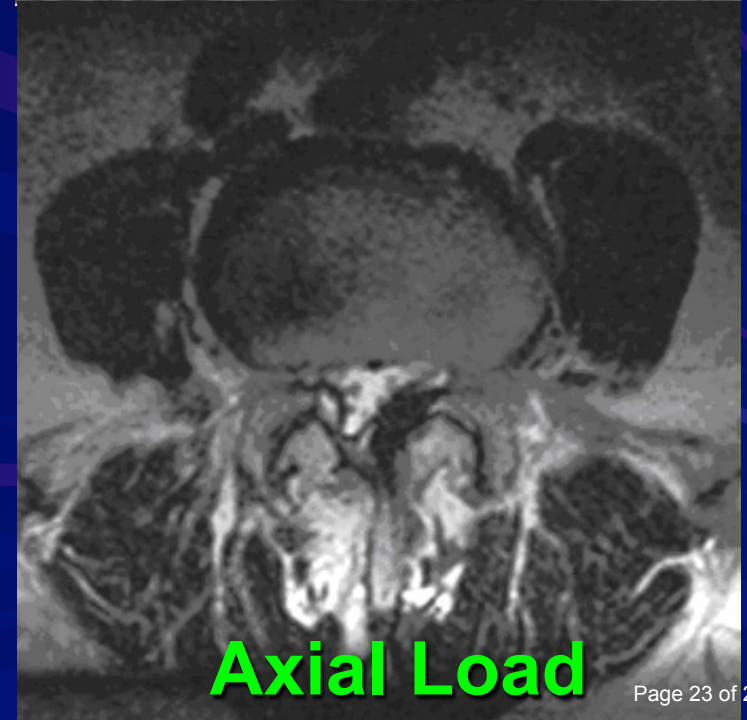
- Neurogenic claudication at L4-L5
- Increasing disc herniation and central stenosis with axial load



Female 58y

- **Neurogenic Claudication at L4-L5**

- **Increasing synovial cyst bulge with axial load**



Female 52y

■ Neurogenic Claudication
at L4-L5

■ Increasing central
stenosis with axial load



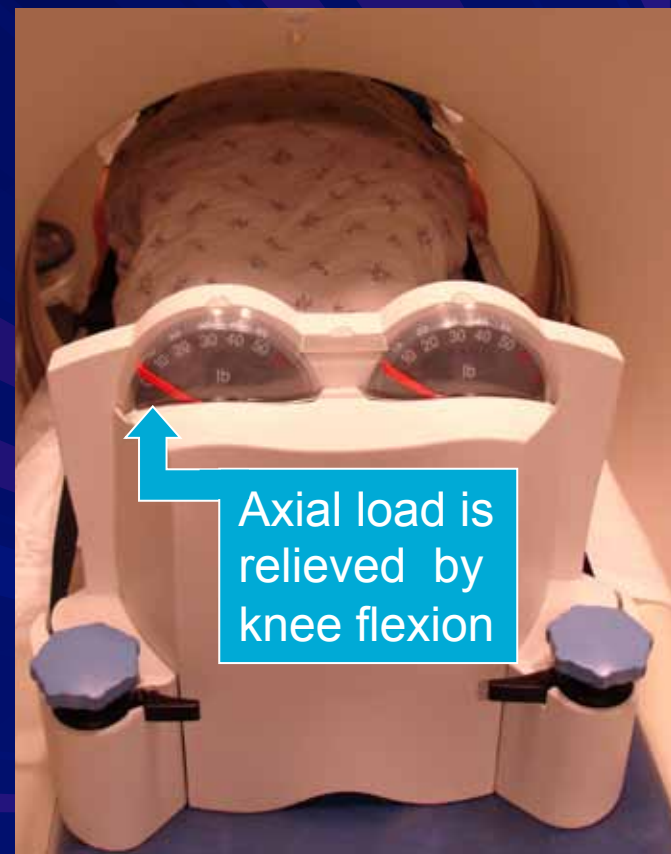
Will it affect Management?

- The incremental increase in diagnosis of operative spinal canal stenosis with the use of an axial-loading device is currently under investigation.
- There is some evidence that management could change for some patients. (Hiwatashi, et al. AJNR 2004; 25:170-174)

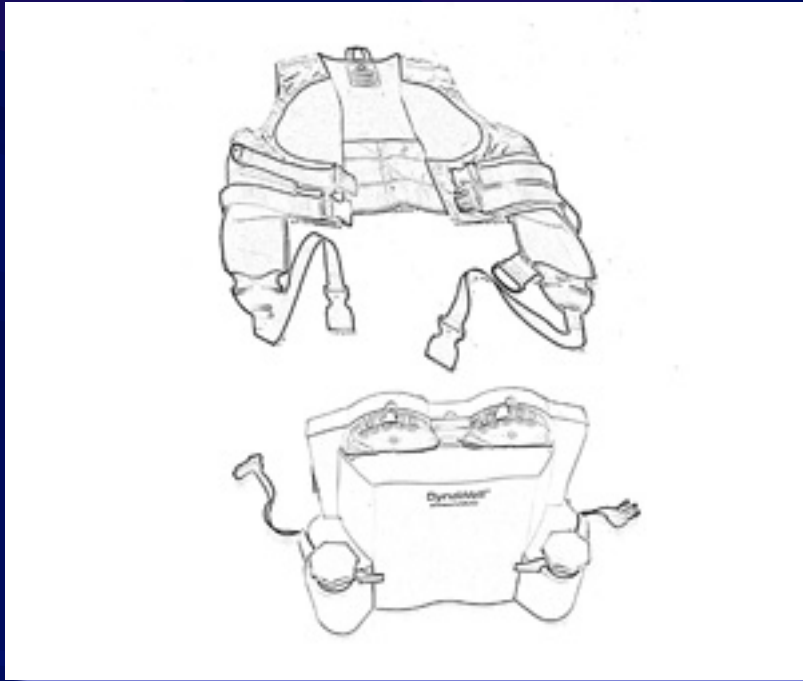


Is it safe?

- FDA-approved for both CT and MRI
- If patient cannot tolerate their back pain, hip or knee flexion instantly relieves the axial load
- Large display gauge allows MRI technologist to see absence of axial load in those situations



What are other options?



■ Axial Loading Device



■ Upright MRI

Conclusion

- Axial-loading during MRI can unmask operative cases of spinal canal stenosis that may otherwise appear inconsequential
- Axial-loading can be performed during conventional supine MRI
- The incremental diagnostic yield of axial loading for spinal canal stenosis is currently under investigation

References

- Danielson BI, Willen J, Gaultz A, et al. Axial loading of the spine during CT and MR in patients with suspected lumbar spinal stenosis. *Acta Radiol.* 1998; 39(6):604-11.
- Hiwatashi A, Danielson B, Moritani T. Axial loading during MRI imaging can influence treatment decision for symptomatic spinal stenosis. *AJNR* 2004; 25:170-174.
- Jinkins JR, Dworkin J. Upright, weight-bearing, dynamic-kinetic MRI of the spine. *Acta Clin Croat* 2002; 41(Suppl):31-35.
- Kimura S, Steinbach GC, Watenpaugh DE. Lumbar spine disc height and curvature responses to an axial load. *Spine* 2001; 26:2596-2600.
- Willen J, Danielson B. The diagnostic effect from axial loading of the lumbar spine during computed tomography and magnetic resonance imaging in patients with degenerative disorders. *Spine* 2001; 26(23):2607-14.