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# Back and Neck Pain: Precision Spine Diagnosis Guides Therapy

## Surgeon's Perspective

*October 19, 2017*

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# Disclosure

- I am a consultant for Nuvasive



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# Current state of diagnosis and treatment of back and neck pain



# Goals of surgery for back and neck pain

- Durable pain relief
- Focused/targeted
- As minimally invasive as possible



# Neck and back pain – common causes

- Degenerative disc disease
- Arthritis
- Instability
- Spinal deformity/scoliosis

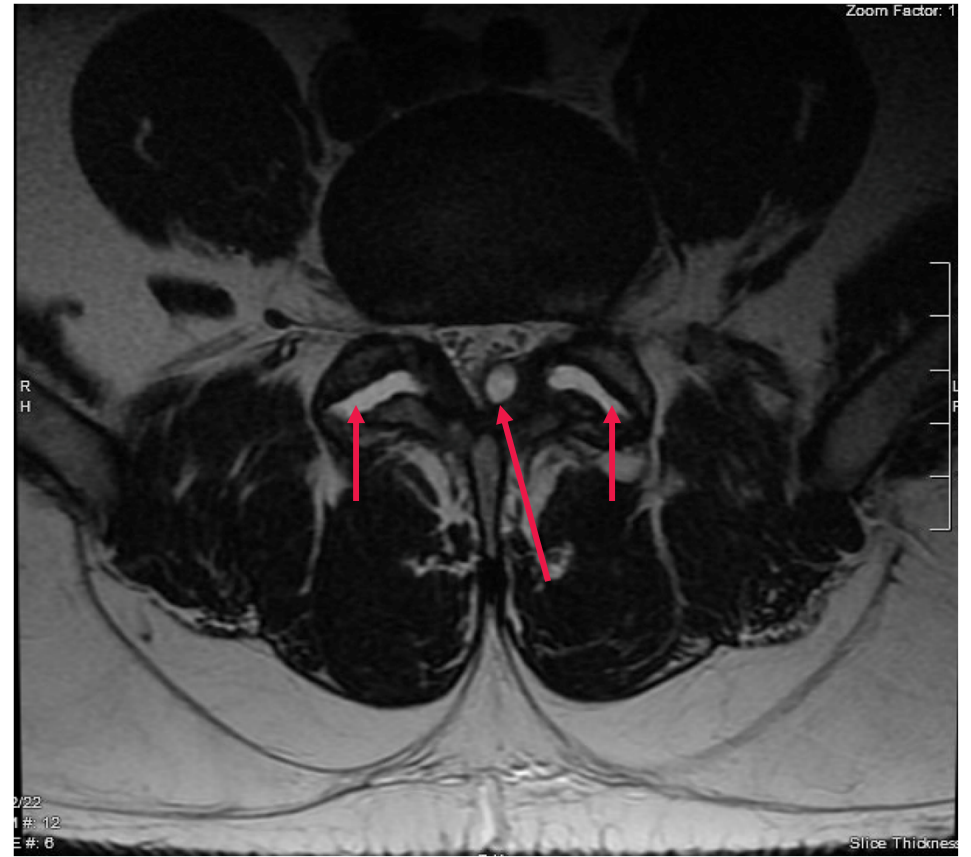
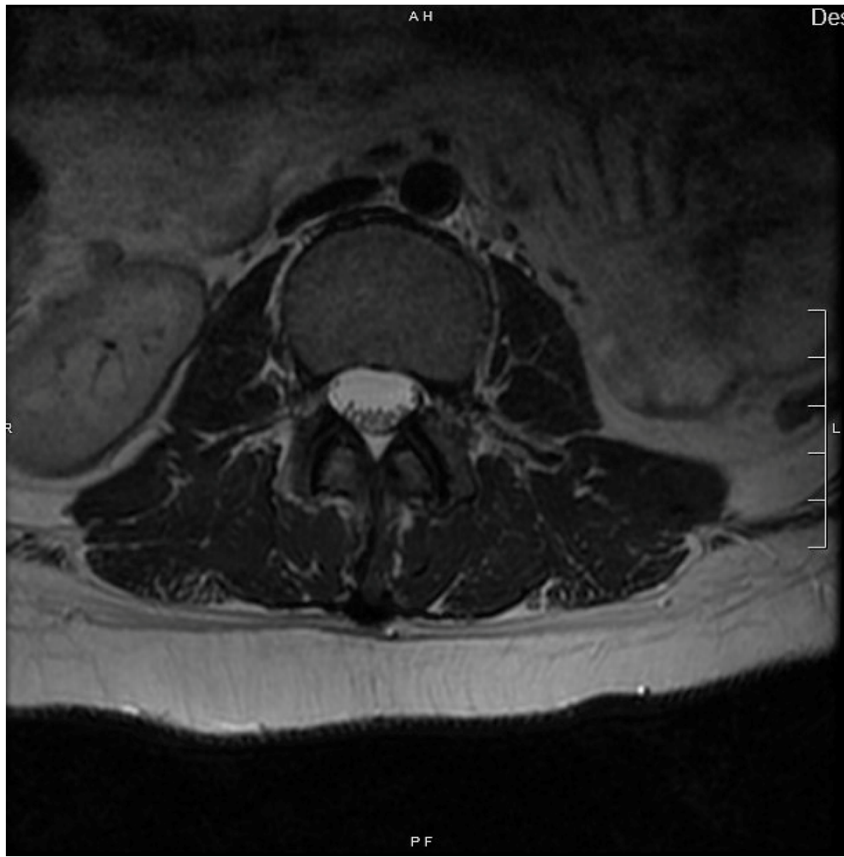
# Degenerative disc disease - lumbar



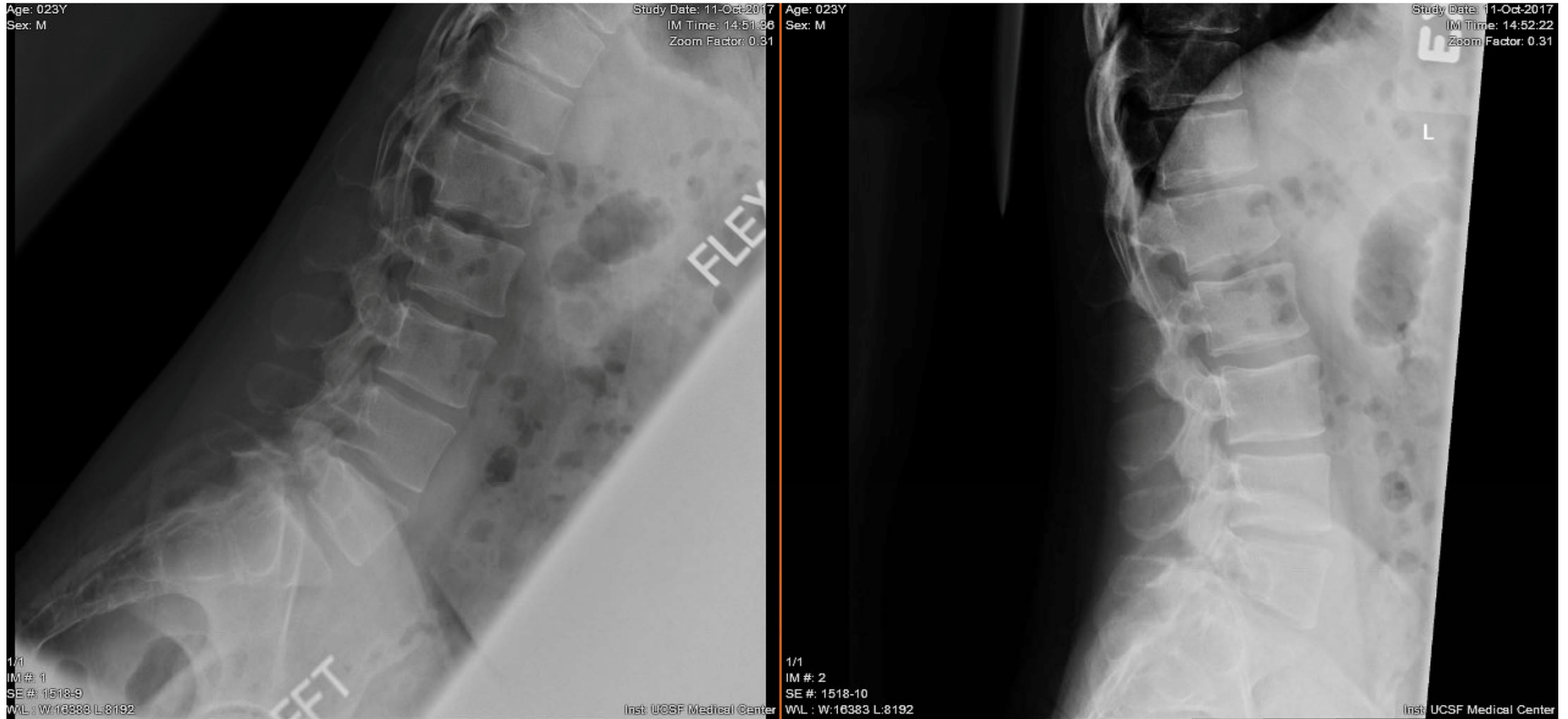
# Degenerative disc disease - cervical



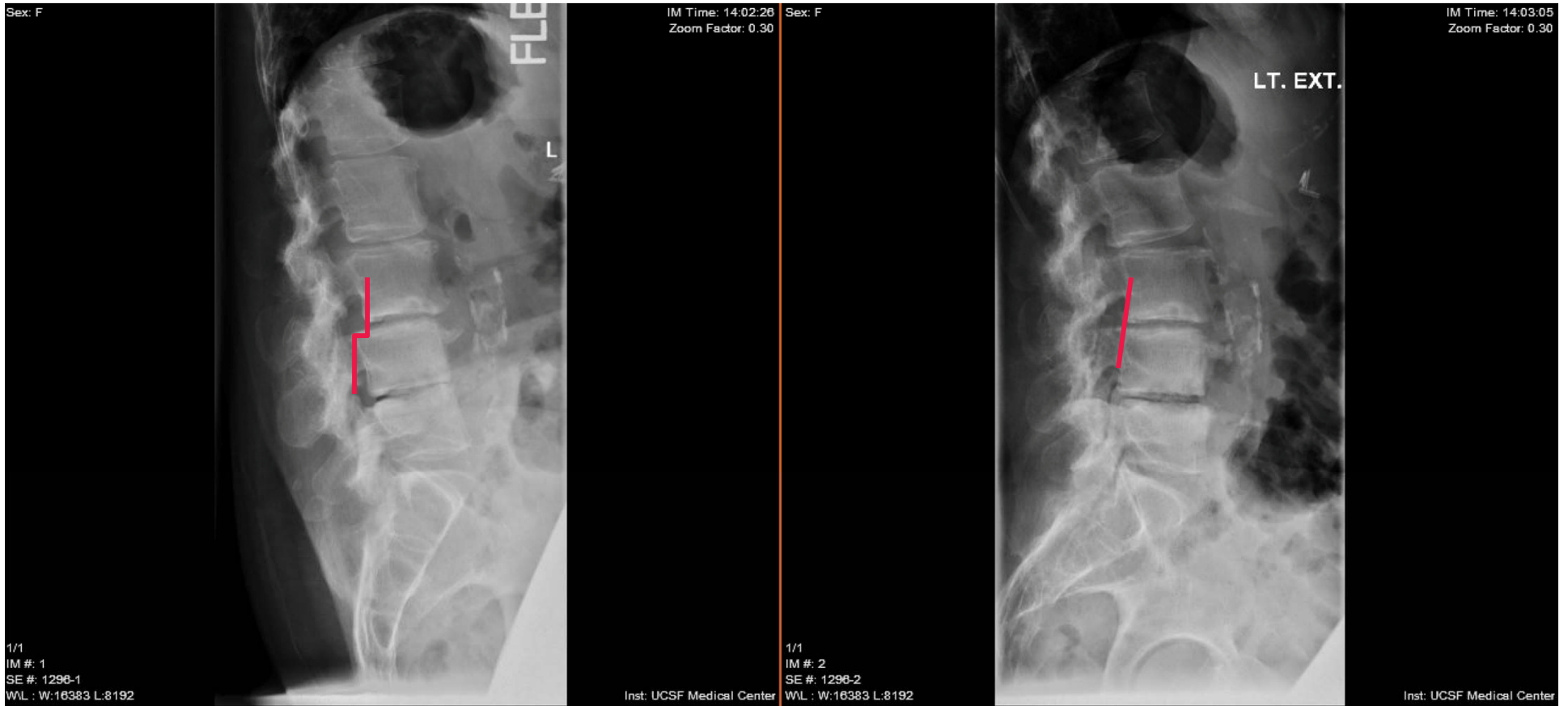
# Arthritis



# Instability

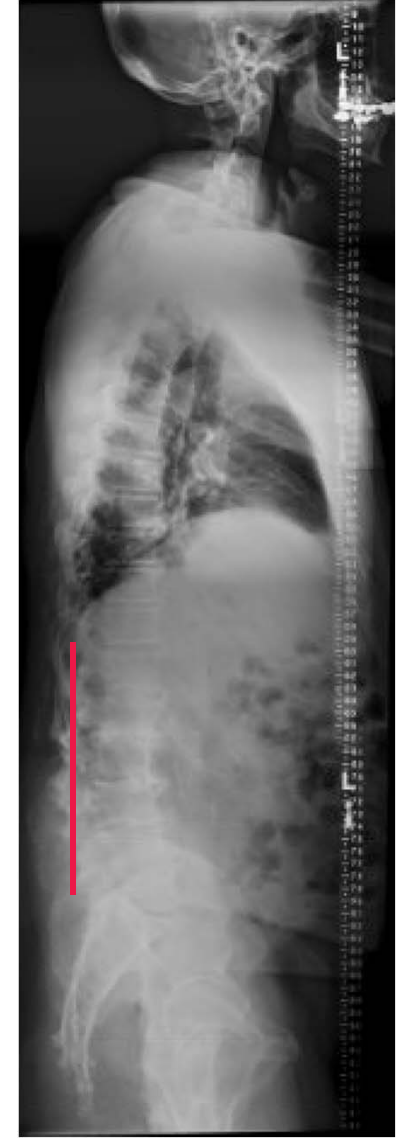


# Instability





# Spinal deformity/scoliosis



# Non-operative management

- Primary care
  - NSAIDs
  - Core and back strengthening with physical therapy
  - Spinal injections
  
- Refer to spinal specialist
  - Failure of non-operative management
  - Neurologic deficit
  - “Red flags”





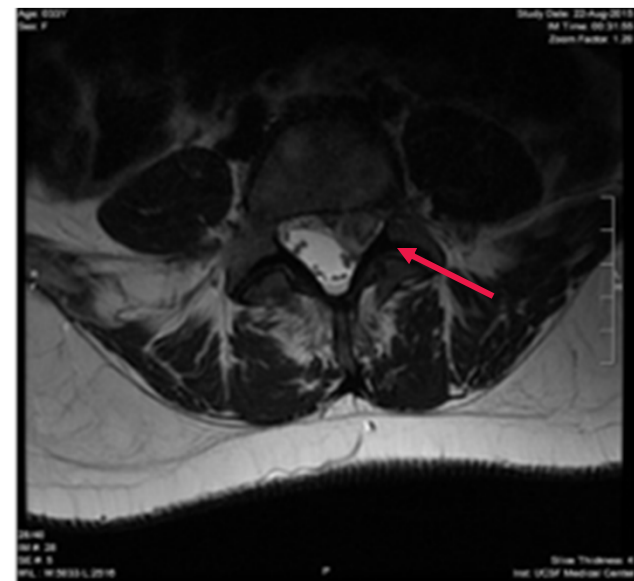
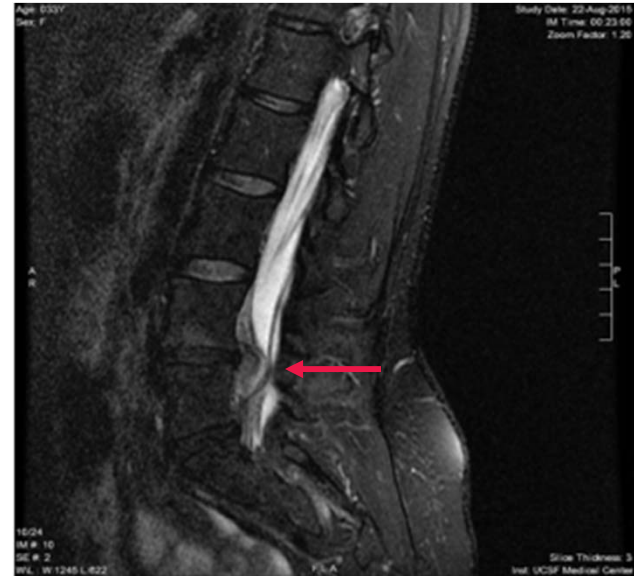
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# “Simple” diagnosis and treatment



# Diagnosis and treatment - simple

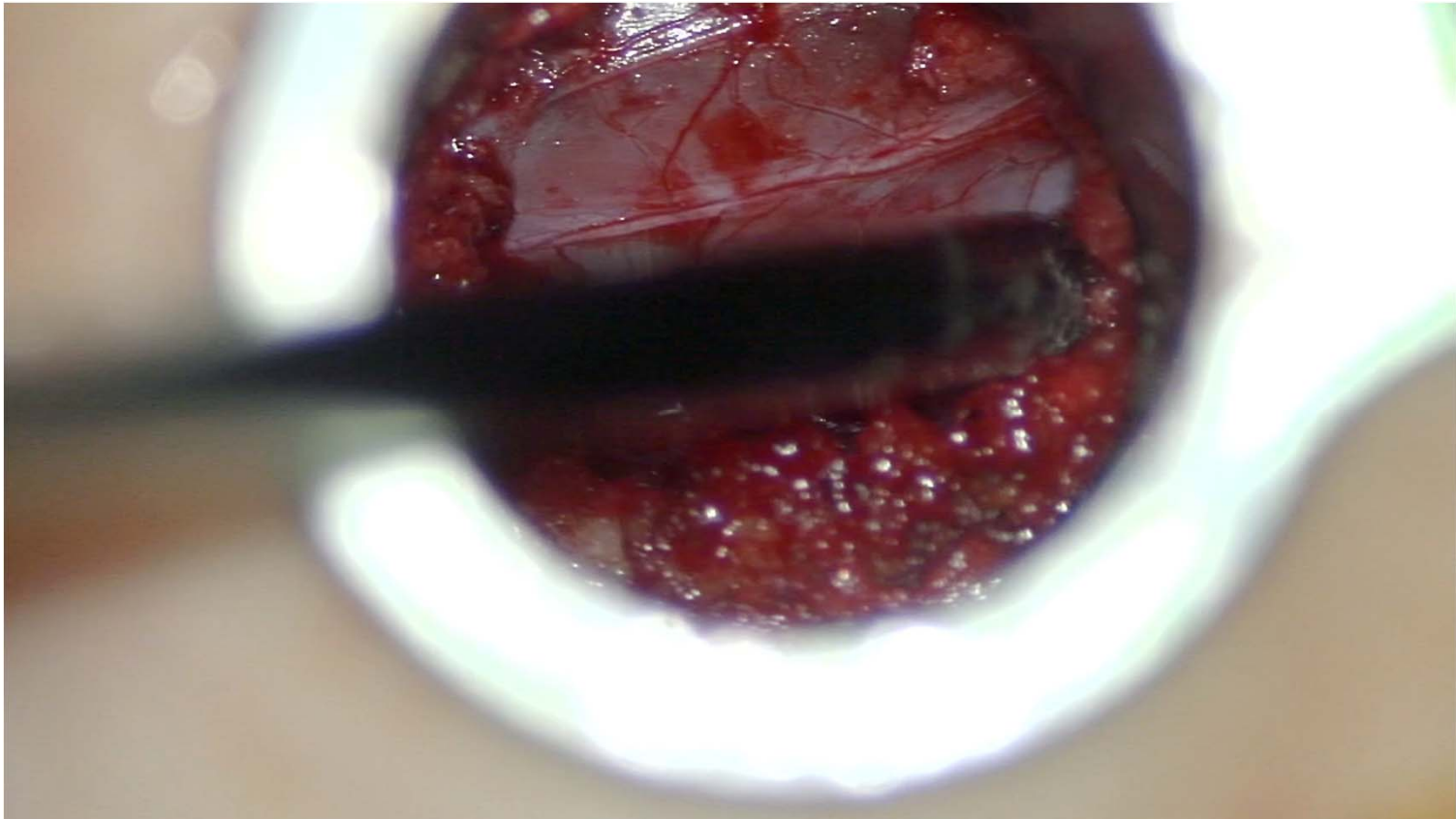
- 33 year old female environmental scientist
- Left foot weakness
  - She notices that her foot is dragging and catches on curbs and steps
- Herniated lumbar disc on the left at level L4/5



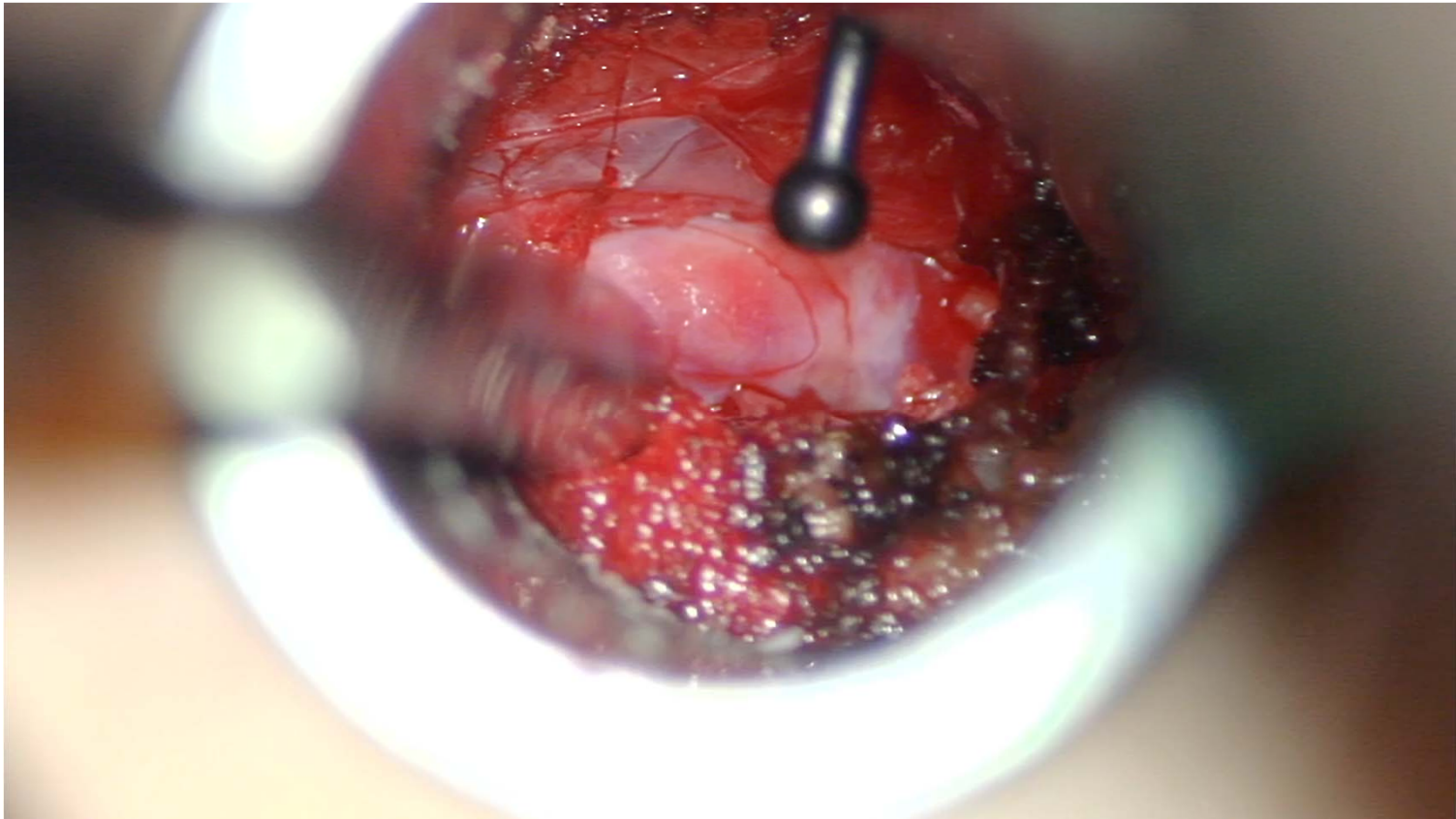
Simple:  
Neurologic deficit correlates with the single  
level pathology demonstrated on imaging

The patient needs surgery

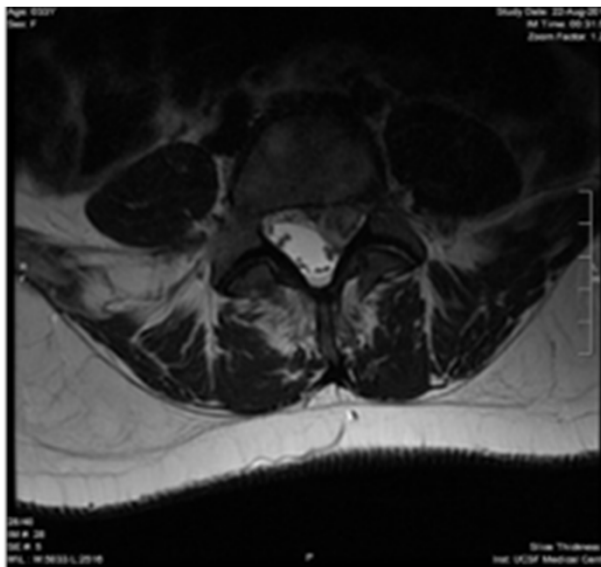
# Focused minimally invasive treatment



# Minimally invasive surgical result



# Minimally invasive radiographic result

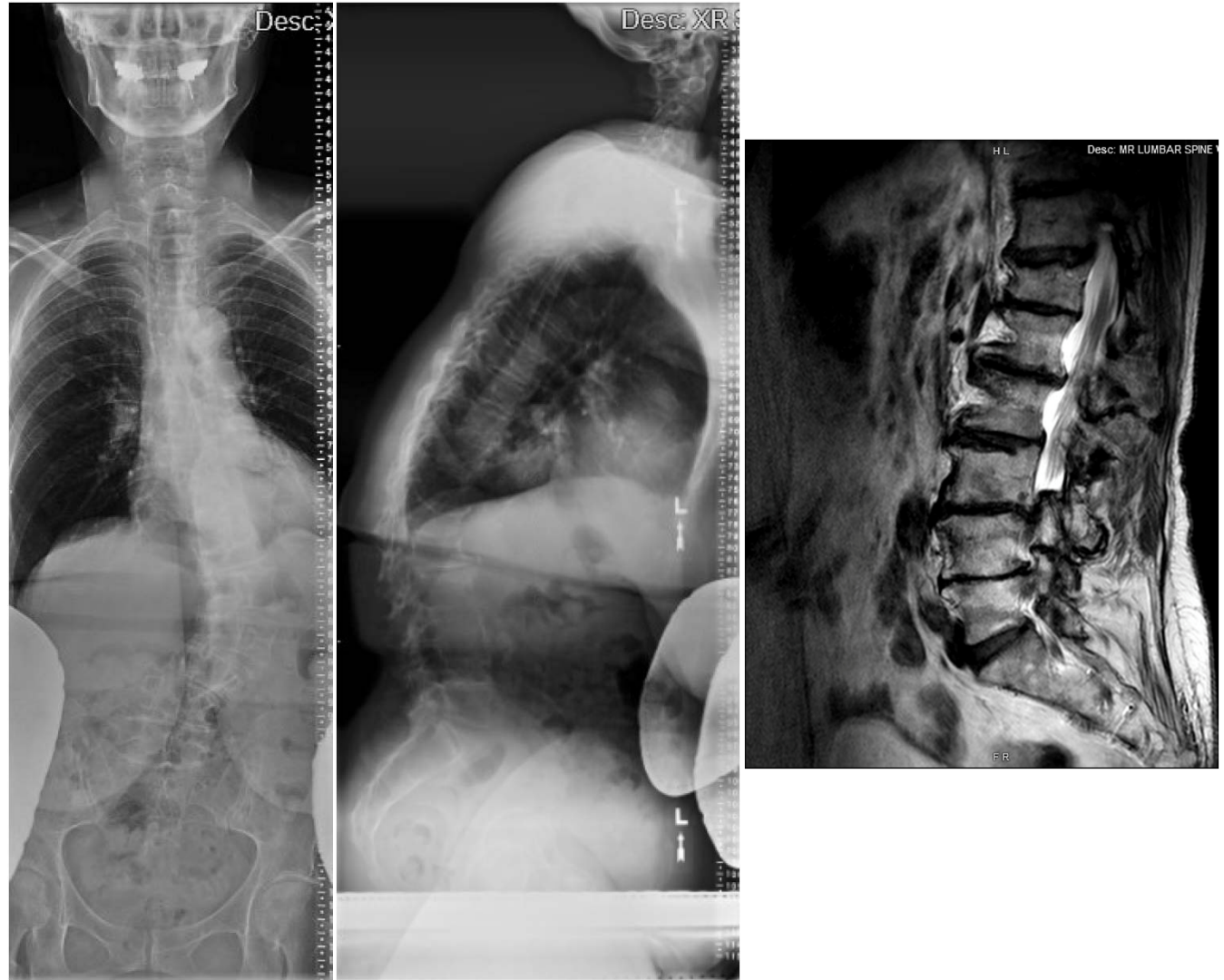


- The patient went home 1 hour after surgery
- Her foot strength returned
- In one month, she took a planned vacation to England walking 15+ miles



# Diagnosis and treatment – “simple”

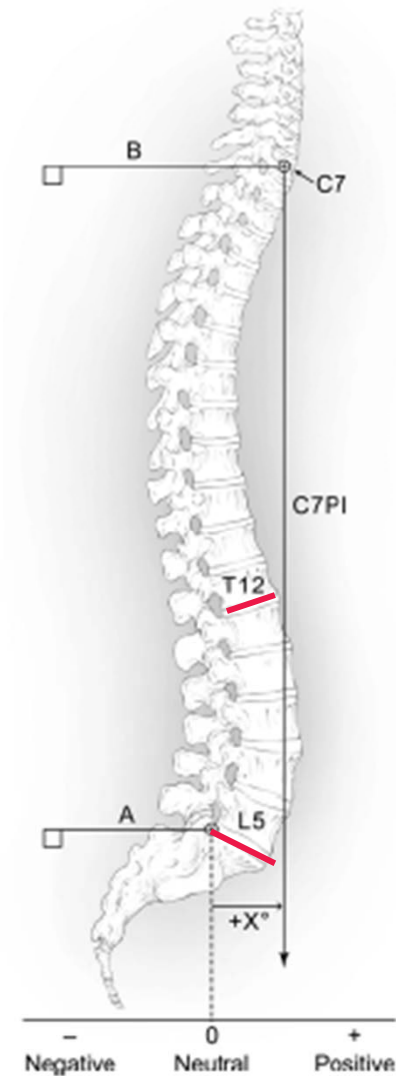
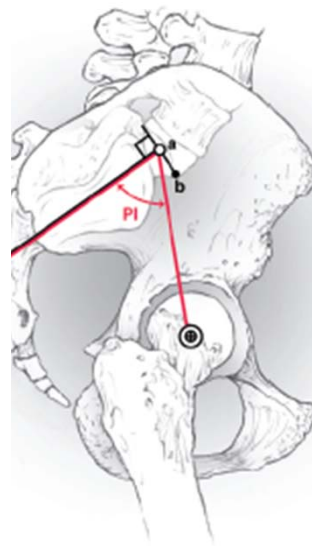
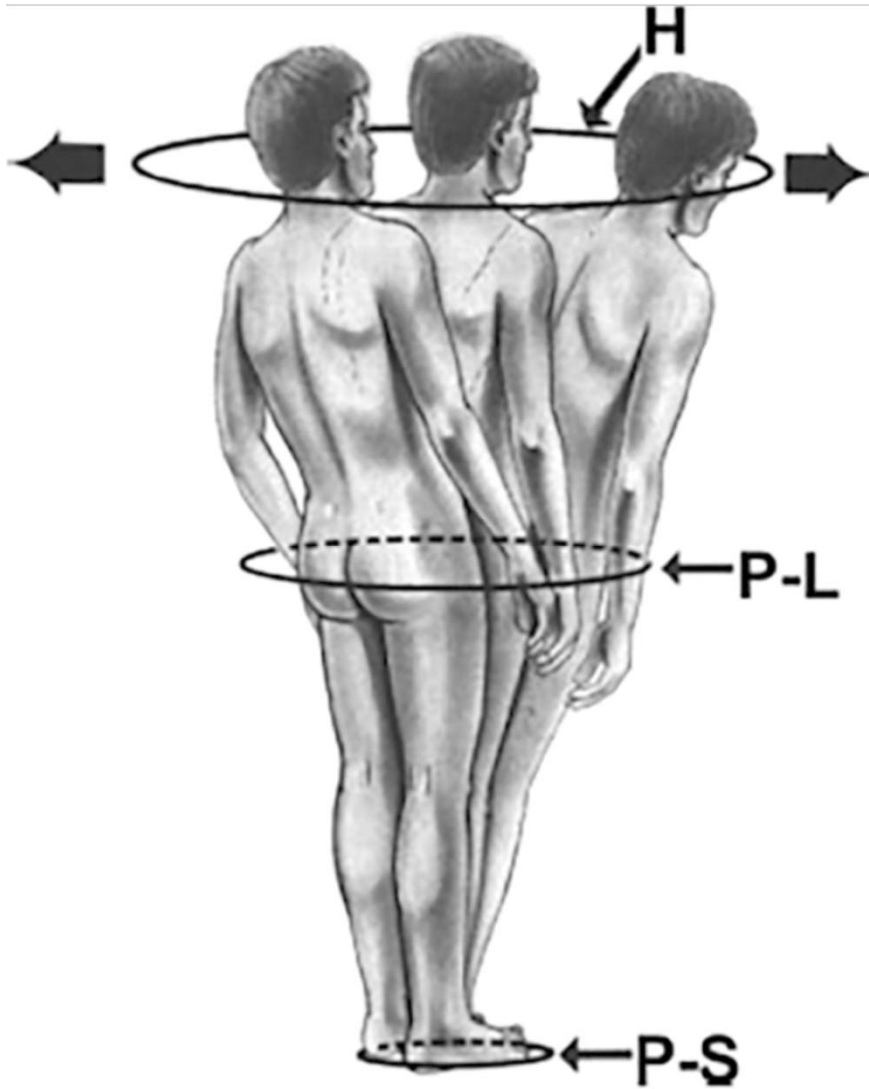
- 67 year old female nurse
- Debilitating back and bilateral leg pain
- She has had prior spine surgery



Simple?



# Spinal balance: Pelvic orientation and the lumbar spine

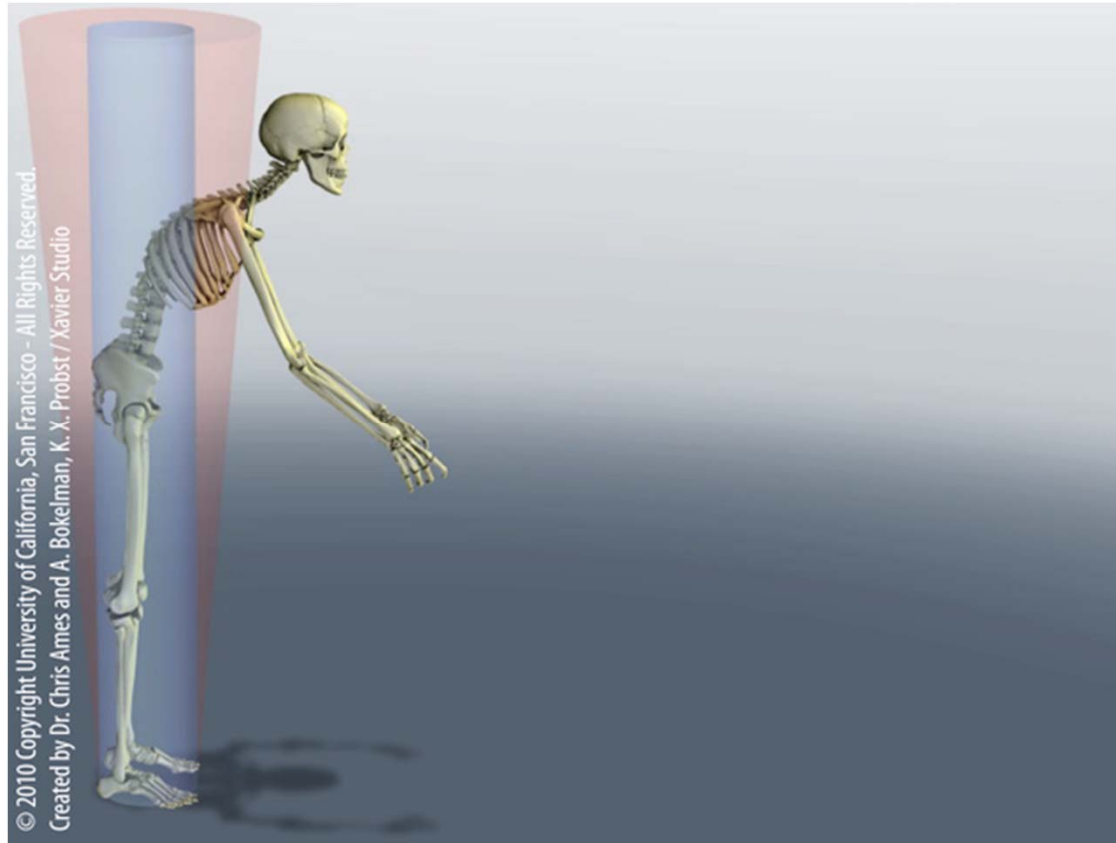


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# Matching the pelvis and lumbar lordosis



# Decompensation when mismatched



# Diagnosis and treatment – “simple”



# Diagnosis and treatment – “simple”





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# Diagnostic Challenges



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# Diagnosis and treatment – “challenging”

- Multiple levels of degeneration
  - Multiple levels of stenosis
  - Neurologically intact
  - Mild spinal deformity
- 
- How can I design a **focused** treatment with a **high likelihood** of improving the patient’s pain?



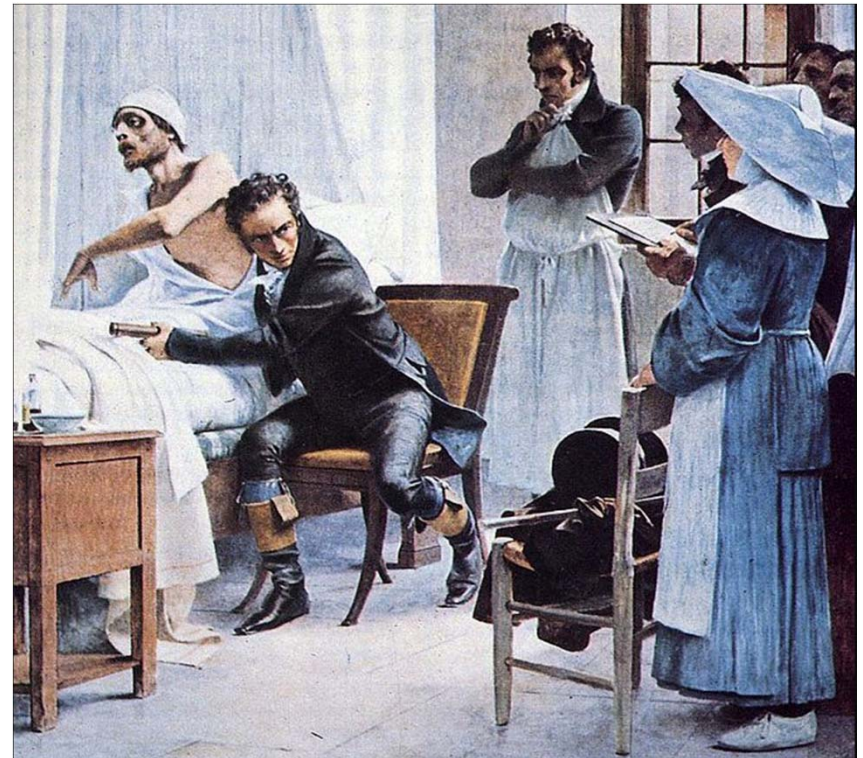
# Diagnosing the pain generator – Basic

## ■ History

- Back pain vs leg pain
- Pain with axial loading vs constant pain

## ■ Physical examination

- Subtle weakness
- Pattern of numbness, if present
- Dropped reflexes



[www.thehealthculture.com](http://www.thehealthculture.com)



# Diagnosing the pain generator – Advanced



- Imaging
  - X-rays
    - Static and dynamic
    - Full length
  - CT scan
  - MRI



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# Diagnosing the pain generator: Precision



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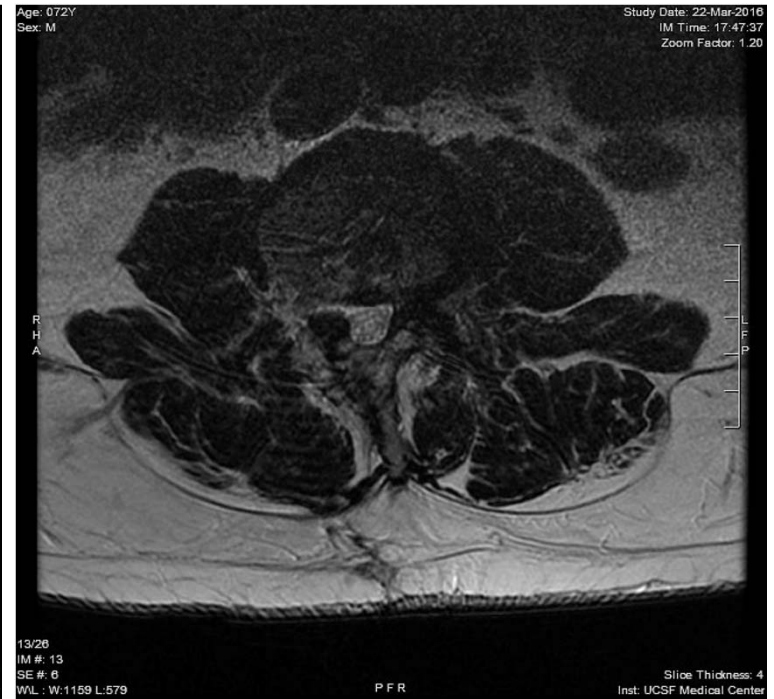
# Case 1 - History

- 73 year old male
  - Parkinson's disease
  - Laminectomy without fusion 4 years prior
- 80% leg pain
  - Down the front of his legs – L3 and L4
- 20% back pain
  - Worse with standing and walking
  - Improves with lying down

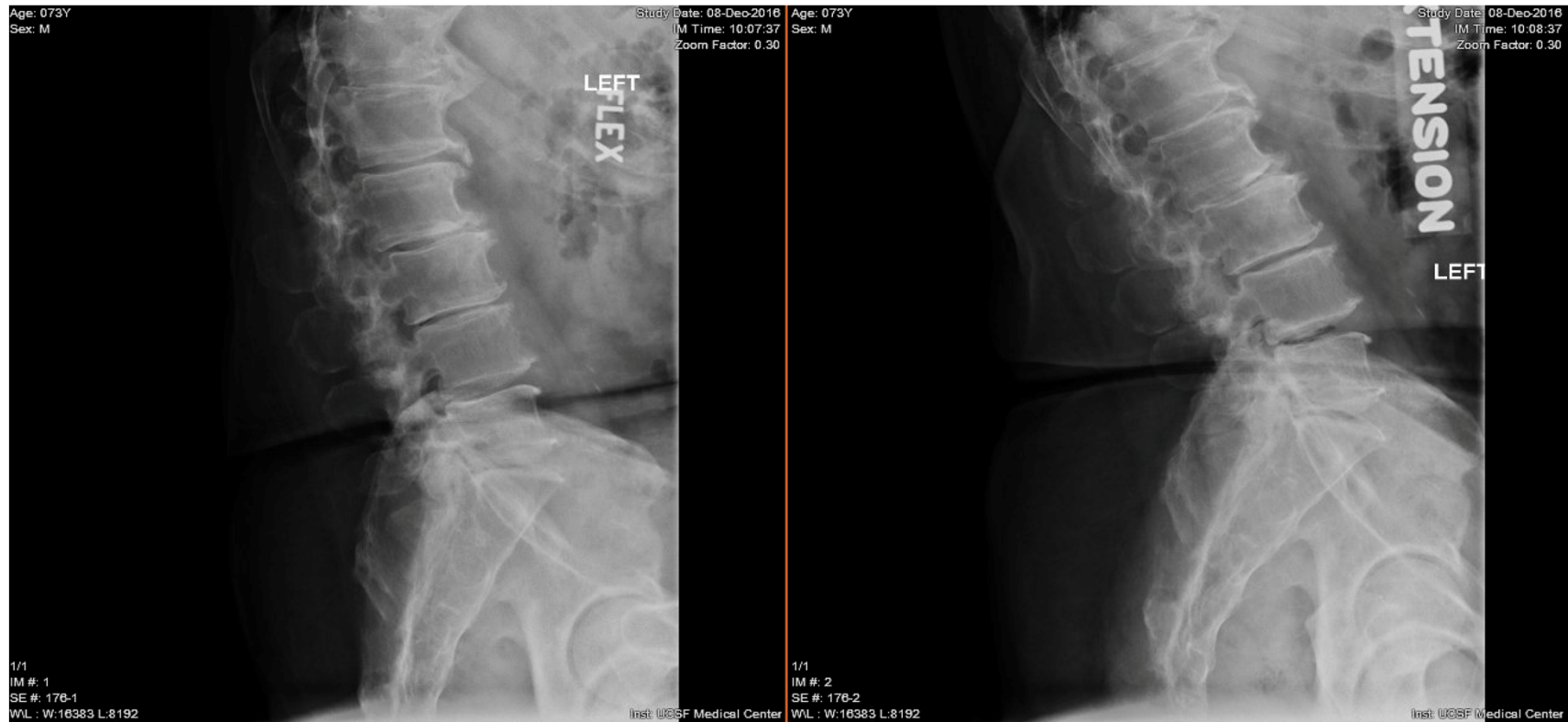
# Case 1 – Physical and prior treatment

- Neurologically intact
  
- Has tried;
  - Pain medications including NSAIDs and narcotics
  - Physical therapy
  - Accupuncture

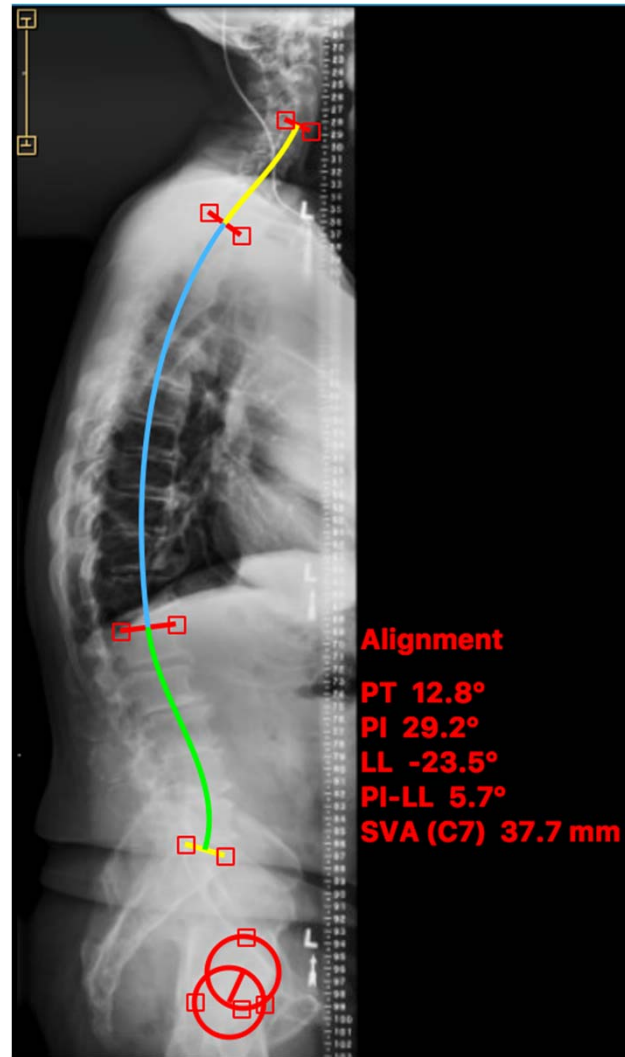
# Case 1 – MRI



# Case 1 – Dynamic x-rays



# Case 1 – Full length x-rays



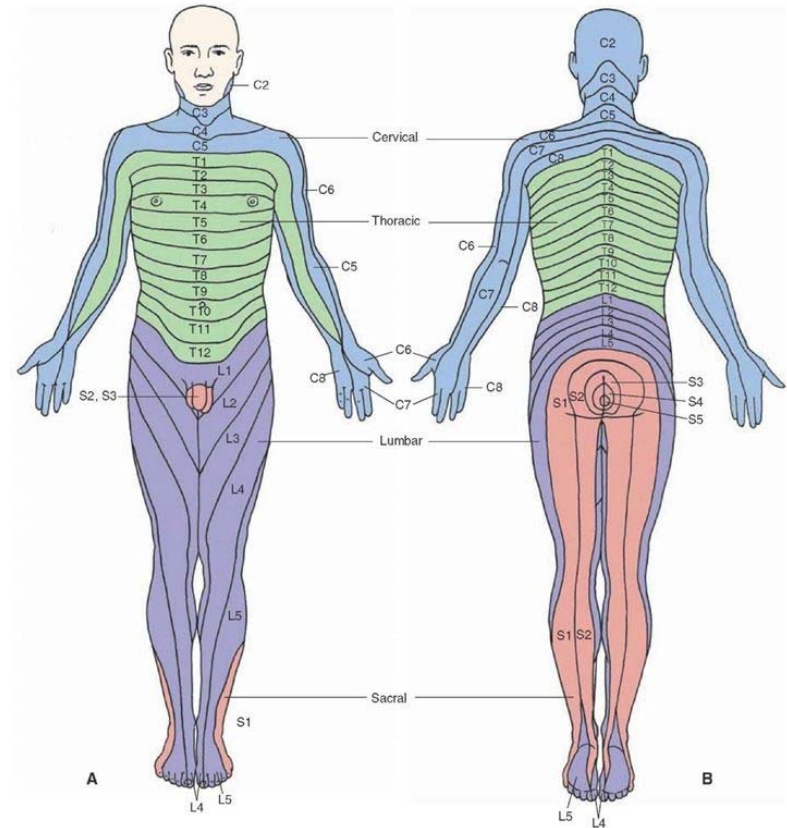


How do I get more data to help focus a minimally invasive operation?



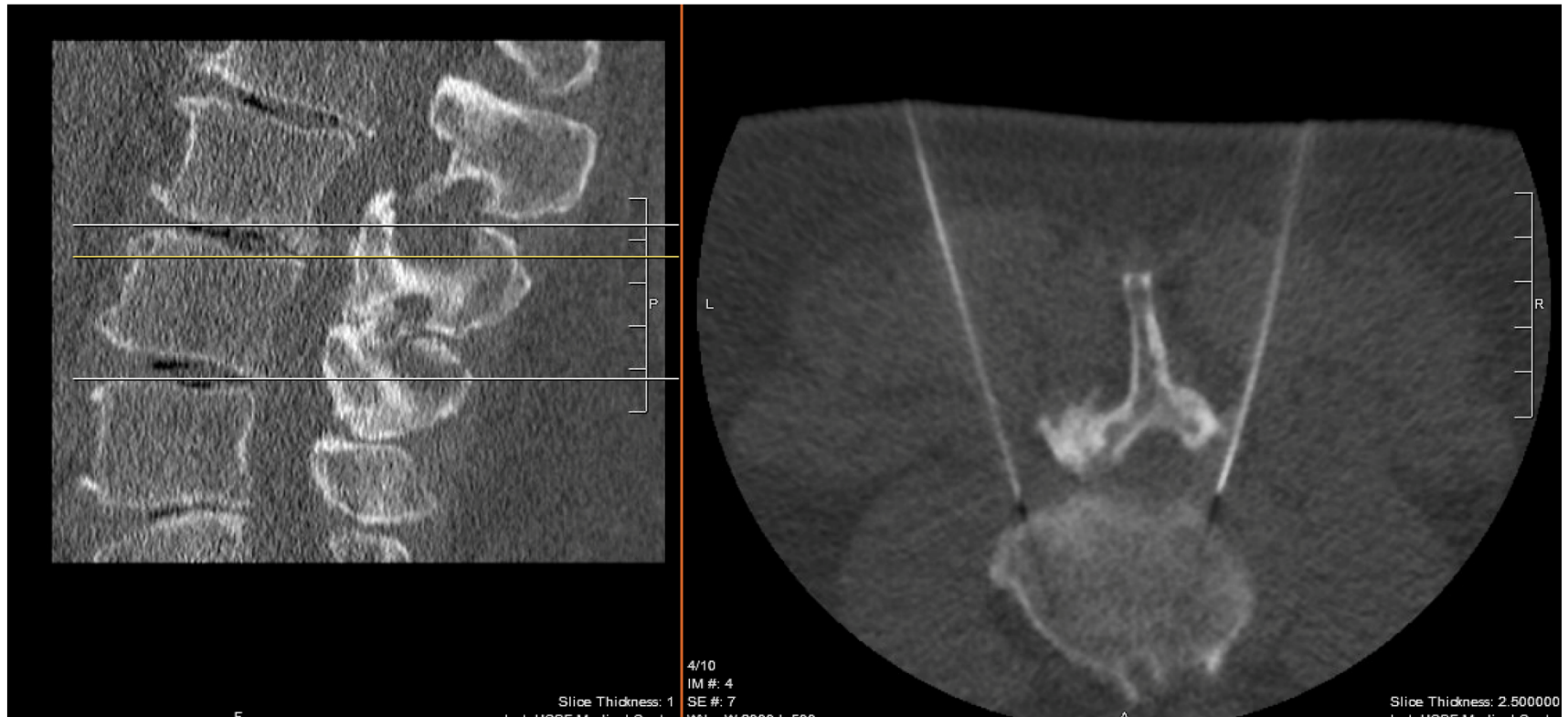
# Case 1 – Precision diagnostics

- The patient's leg pain follows L3 and L4 distributions
- There is degenerative disc disease and stenosis at those levels
- **Transforaminal epidural steroid injections can be used diagnostically to identify the pain generators**



[www.what-when-how.com](http://www.what-when-how.com)

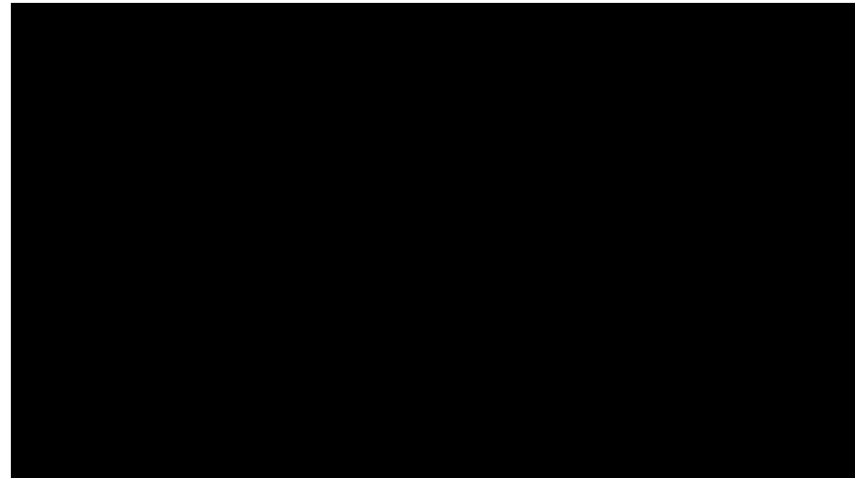
# Case 1 – CT guided injections



# Case 1 – CT guided injections

- L3 and L4 – bilateral transforaminal epidural steroid injections
  - Steroid mixed with local anesthetic
- Immediate resolution of leg pain and significant improvement in back pain
  - Only lasted for 2 weeks
- **Diagnostic success – L3 and L4 are the major pain generators**

# Case 1 – Minimally invasive lumbar fusion



# Case 1 – Outcome



- Hospitalized less than 48 hours
- Went home instead of rehab
- Within 6 weeks, only taking occasional acetaminophen
- In 3 months, re-started Tai Chi

# Case 1 - Outcome



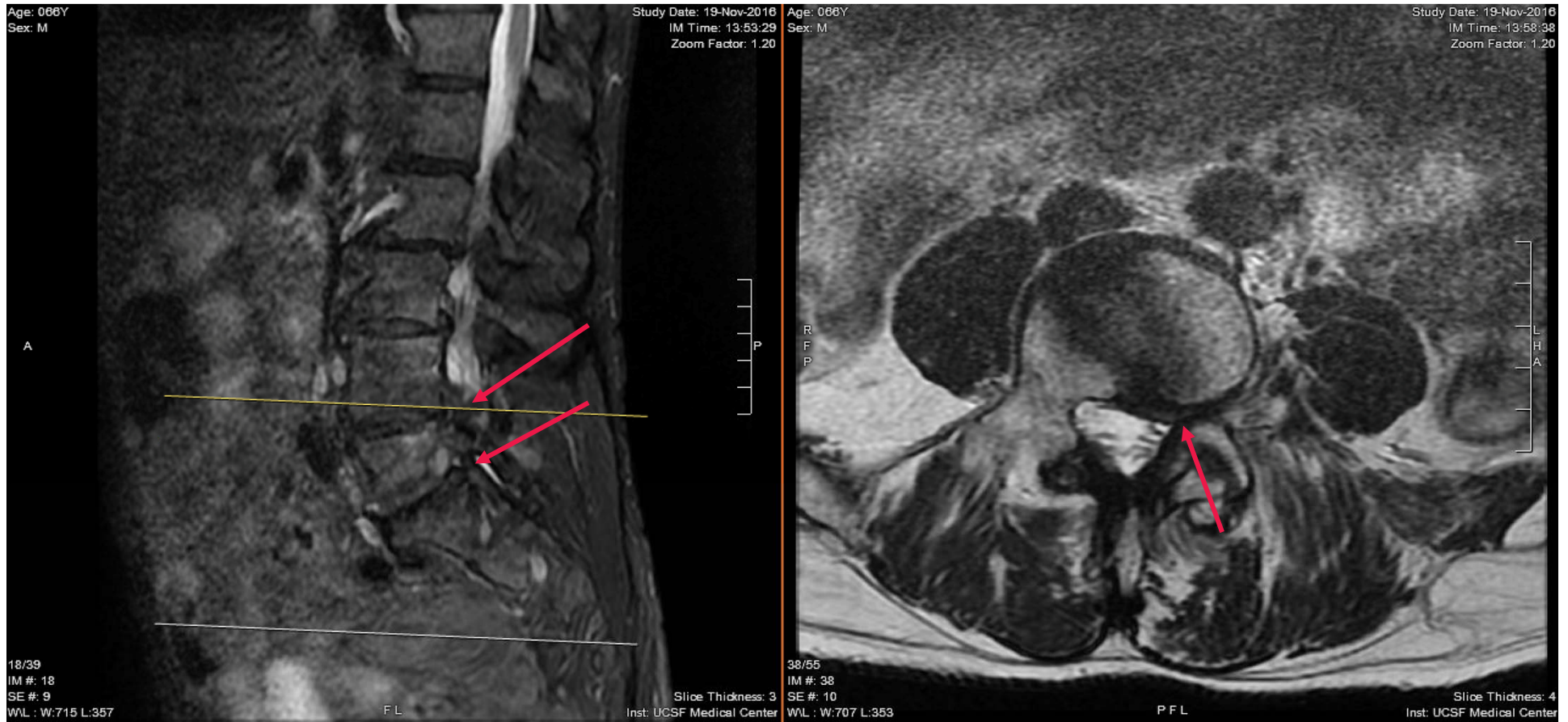


## Case 2 – History and physical

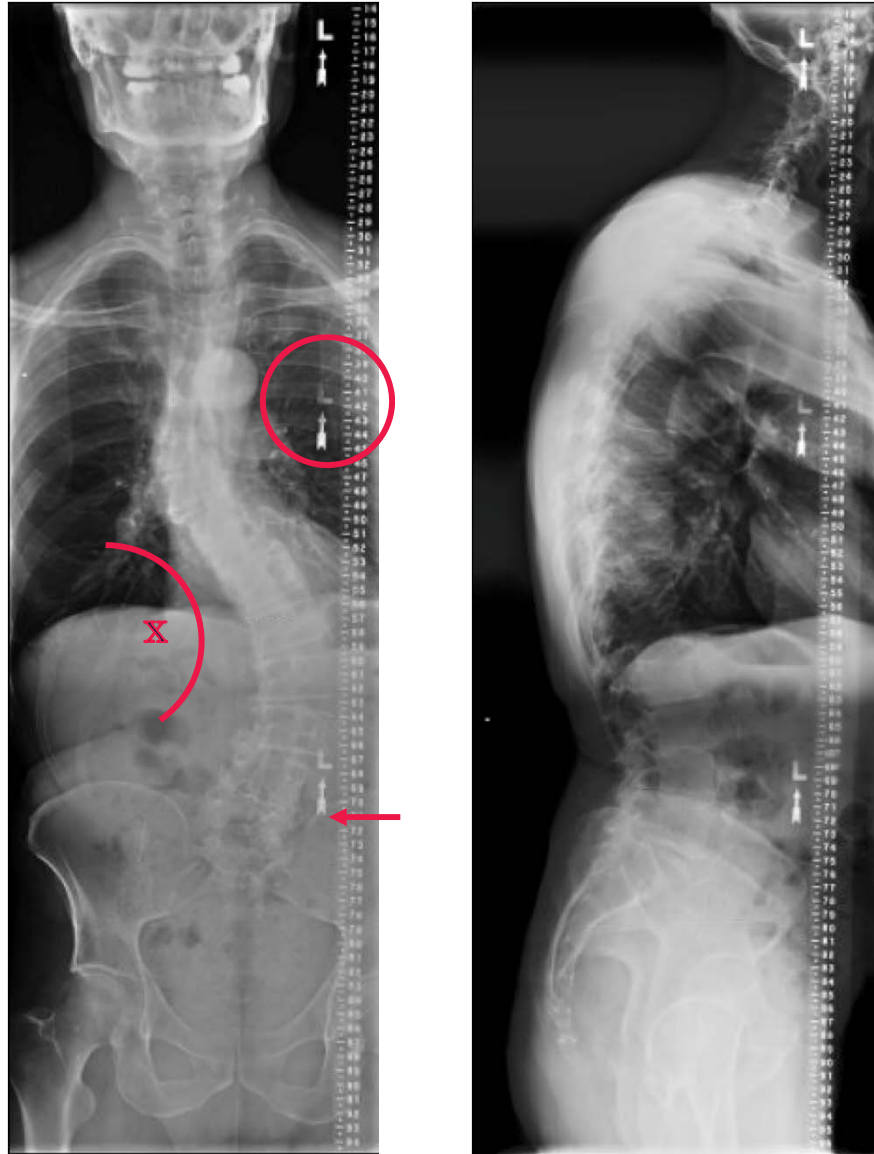
- 66 year old male
  - Otherwise healthy
- 50% left leg pain
- 50% back pain
  - Located in the lower back on the **left** side
- **Left foot weakness**



# Case 1 – MRI



## Case 2 – Full length x-rays



## Case 2 – Decision making

- Based on his main complaint of left low back pain and left foot weakness, I believed that the scoliosis was not symptomatic
- I could potentially avoid a very large operation
- How can I know for sure?

# Case 2 – Precision– CT guided injections



Left sided L4/5 and L5/S1 CT guided transforaminal epidural steroid injections

Therapeutics – 100% pain relief and improvement in foot strength

Lasted one month

**Diagnostic success!**

## Case 2 – Minimally invasive fusion at only 2 levels



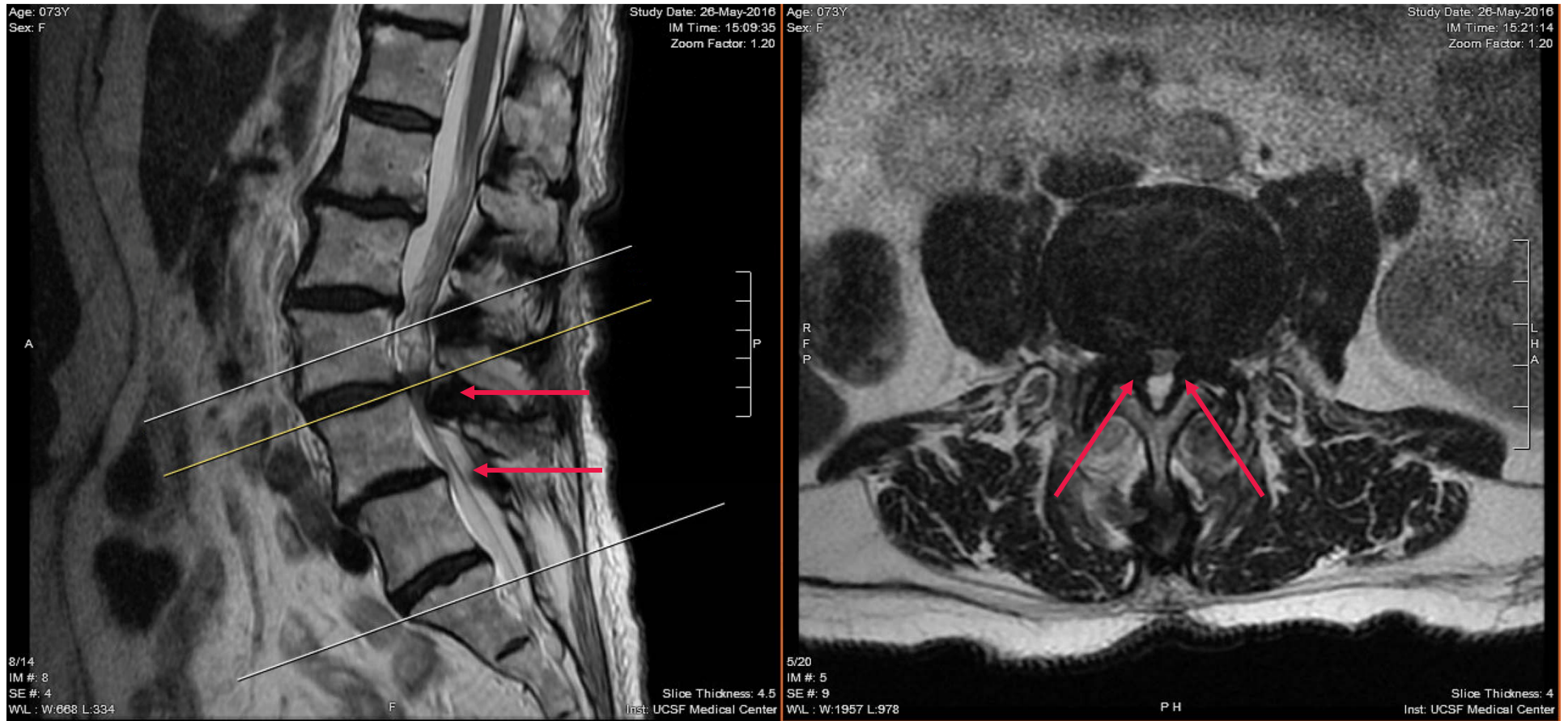
- After surgery, he noticed his foot was stronger and his pain was relieved
- He went home 4 days after surgery

# Case 3 – History and physical

- 74 year old female
  - Otherwise healthy
  
- 50% right leg pain
- 50% low back pain
  - Worse with standing
  - Improves with lying flat

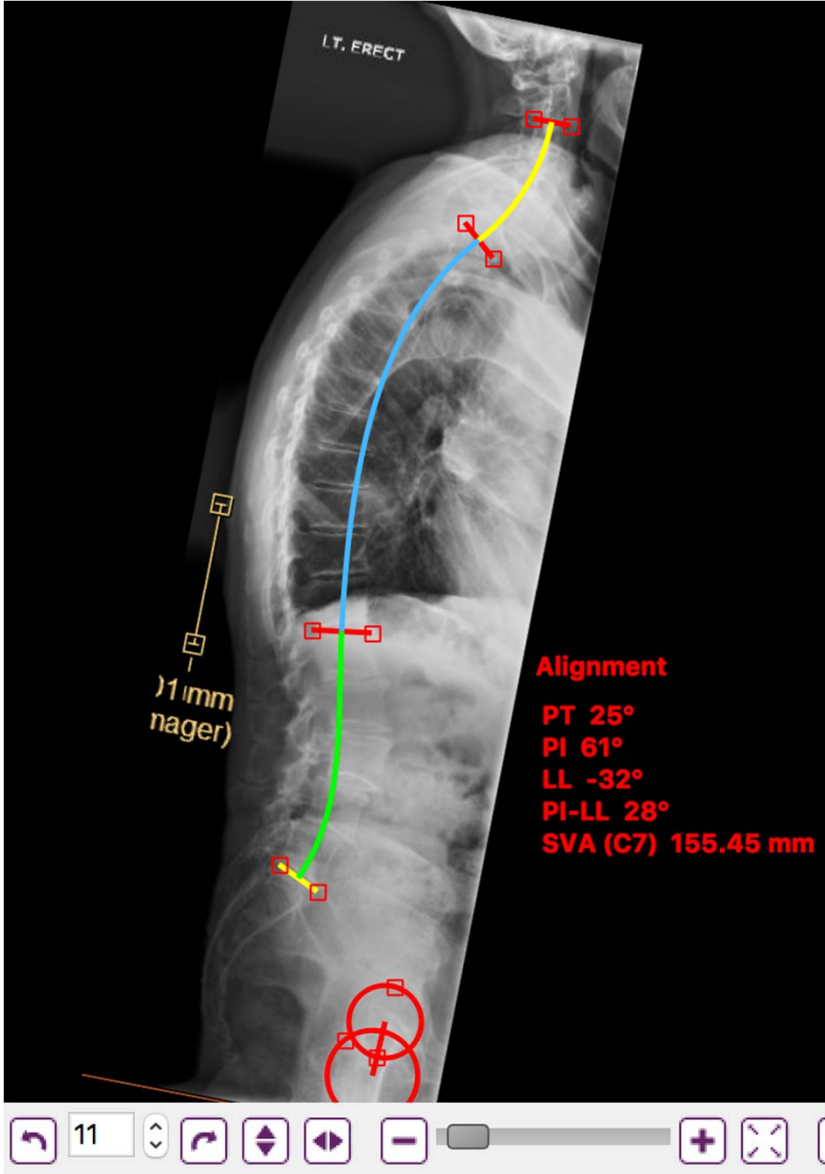


# Case 3 – MRI





# Case 3 – X-rays



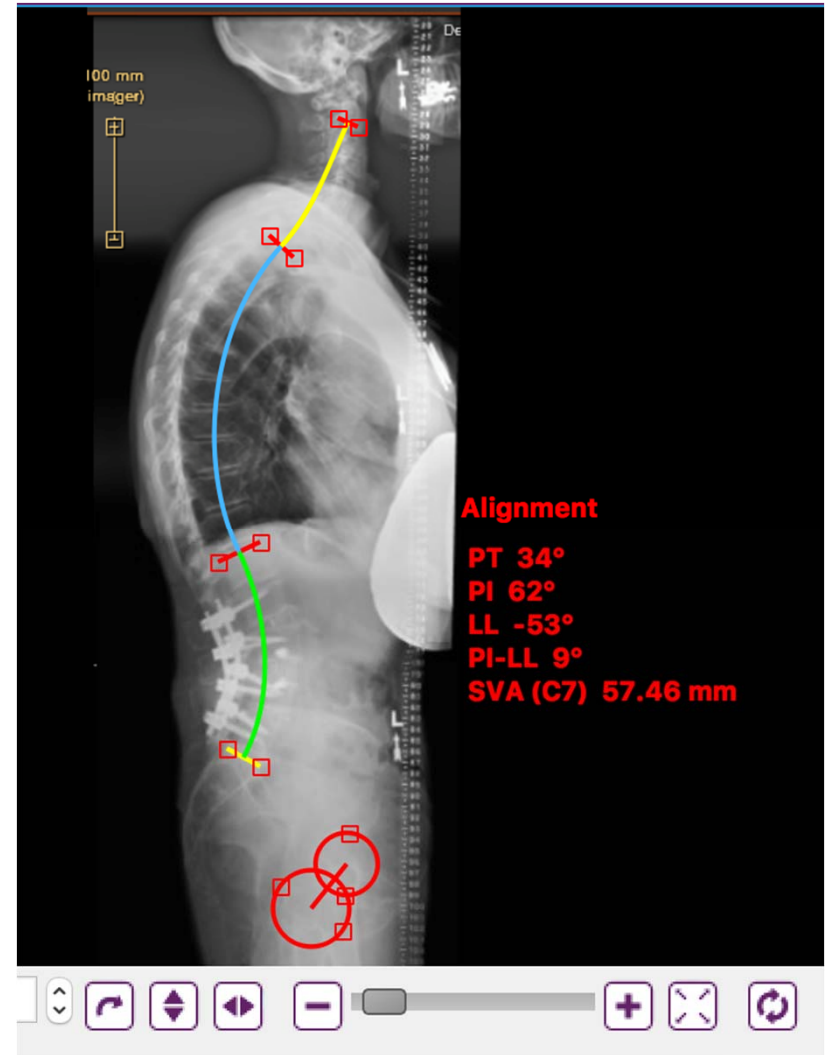
# Case 3 – Decision making

- The patient's leg pain localizes to the lower levels of the spine
- She has instability at those levels as well as neural compression
- However, she also has a problem with global spinal balance
  - This can possibly be fixed with realigning the bottom levels
- **How can I be certain that this will be enough?**

## Case 3 – Precision diagnostics

- L2/3, 3/4, 4/5 CT guided transforaminal epidural and facet injections
- Very transient resolution of symptoms
- **Diagnostic success!**

# Case 3 – Minimally invasive 3 level fusion to treat instability and spinal deformity





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# Final Thoughts



# Modern diagnosis and treatment of spinal disorders

- The goal of spine surgery is to **individualize** treatment
- Evaluation begins with a thorough history and physical examination
- Complete imaging includes;
  - MRI
  - CT
  - X-rays
- CT guided transforaminal epidural steroid injections remain critical in non-operative management **AND** in precisely diagnosing complex spinal problems

# Acknowledgements

- UCSF Department of Neurological Surgery
- UCSF Department of Radiology and Biomedical Imaging
  - Neuroradiology Group
- UCSF Department of Orthopedic Surgery
- My team
  - Tiffany Pong, PA-C
  - Diego Esquivel
  - Omar Flamenco