Compression Fractures

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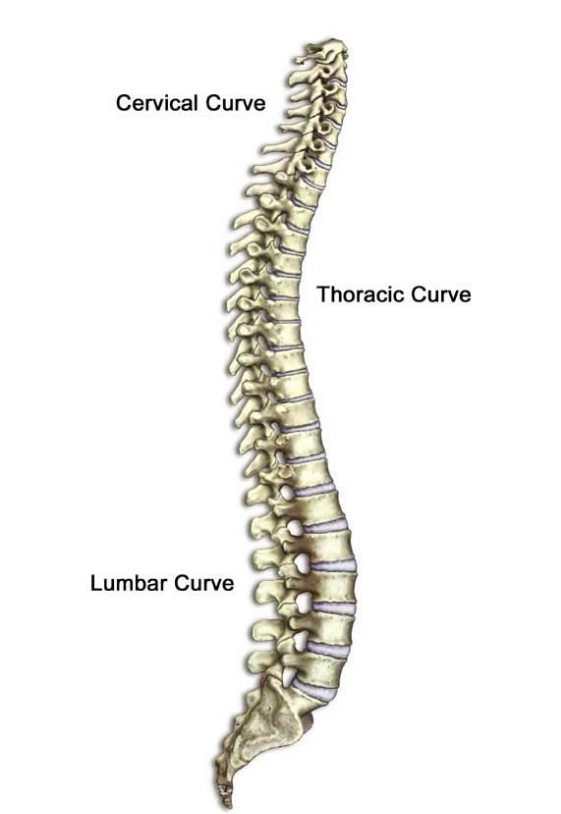
Overview

- Spine Anatomy
- Thoracolumbar Fractures
- Cases
- Compression Fractures, Ddx
- Radiologic Tests of Choice
- Treatment Options



Cedars-Sinai Medical Center, www.csmc.edu/7133.html

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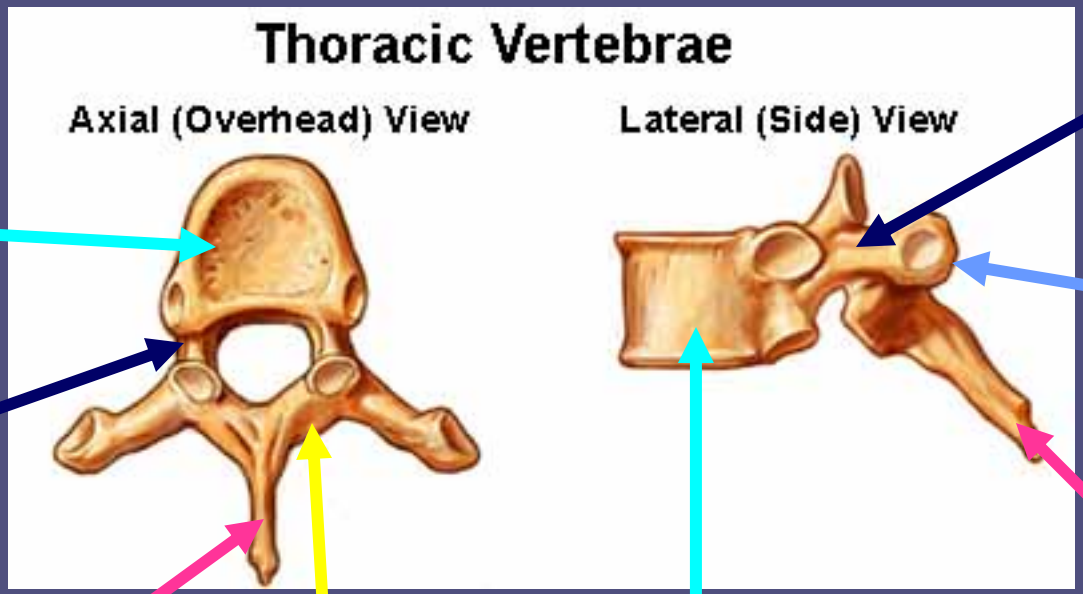
Vertebral Anatomy: Overview of Thoracic Vertebrae



http://www.spineuniverse.com/displayarticle.php/article1286.html

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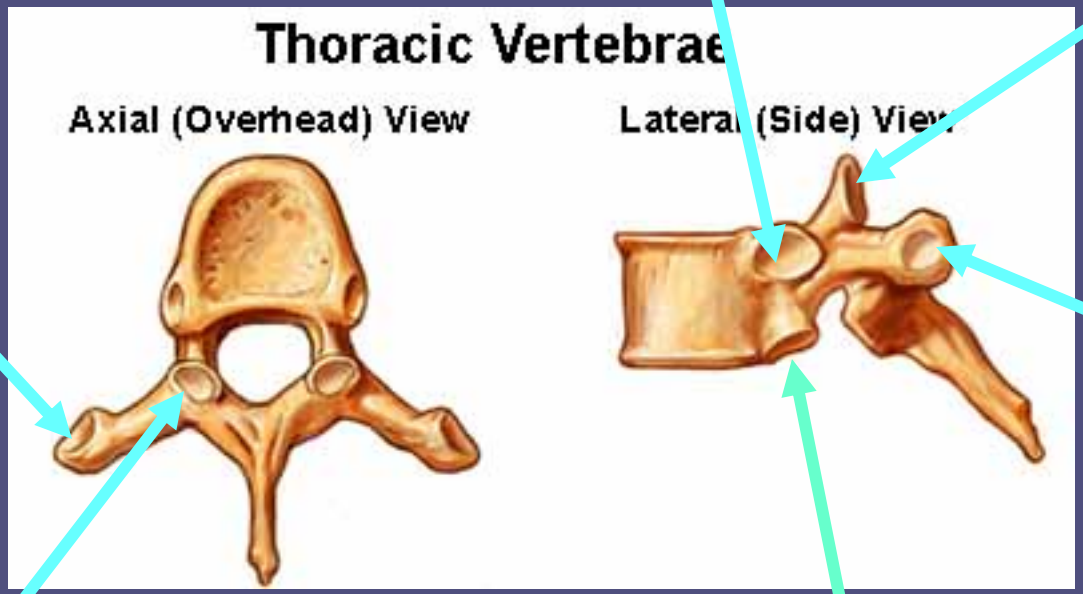
Vertebral Anatomy: Overview of Facets



Superior Costal Facet

Superior Articular Facet

Transverse Costal Facet

Transverse Costal Facet

Superior Articular Facet

Inferior Costal Facet

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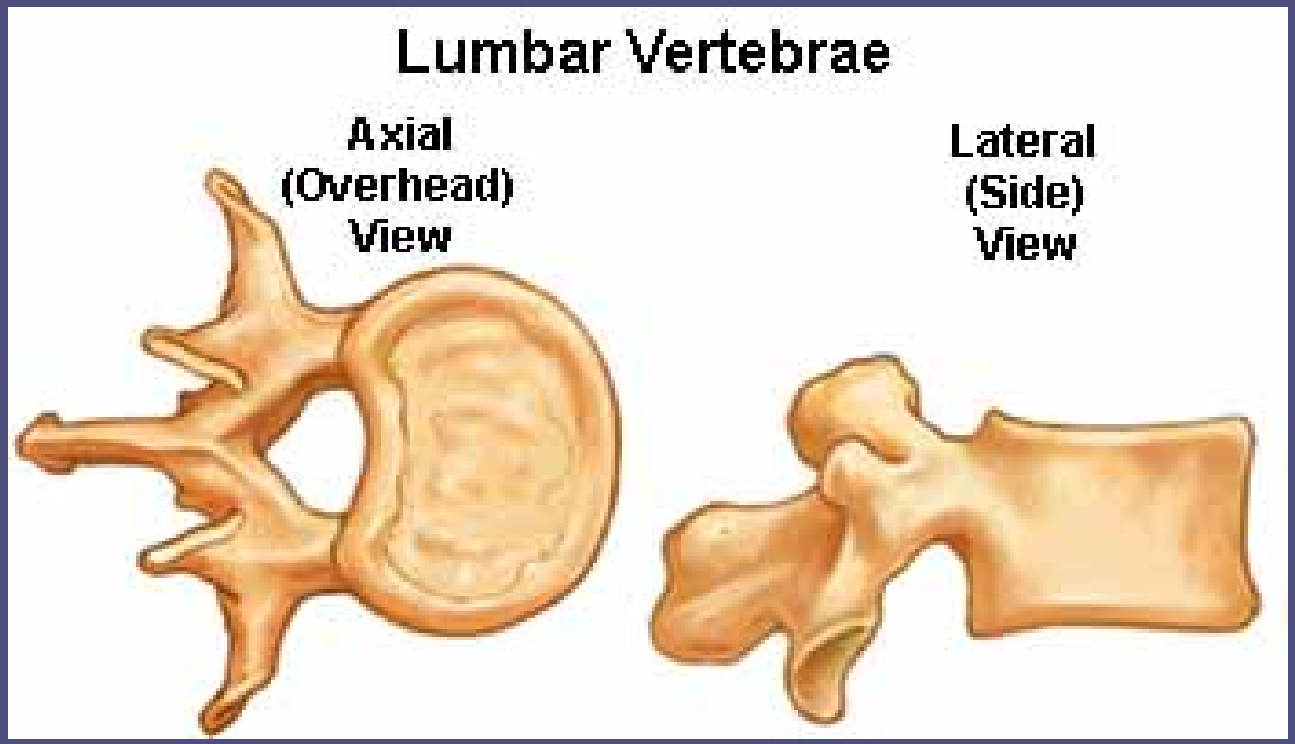
For Comparison…



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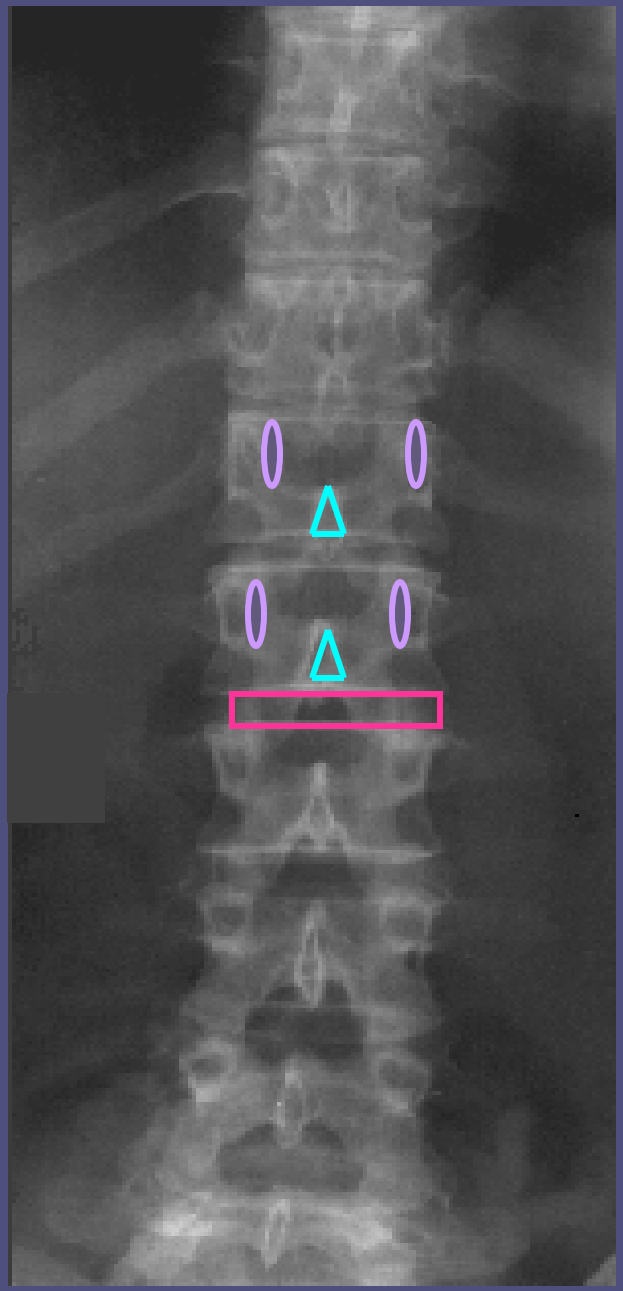
Normal Frontal Radiograph

- Need to Assess:
  - Quality Control
  - Soft Tissues
  - Alignment
  - Bones
  - Cartilage



Spinous Processes

Pedicles

Intervertebral Disc Space

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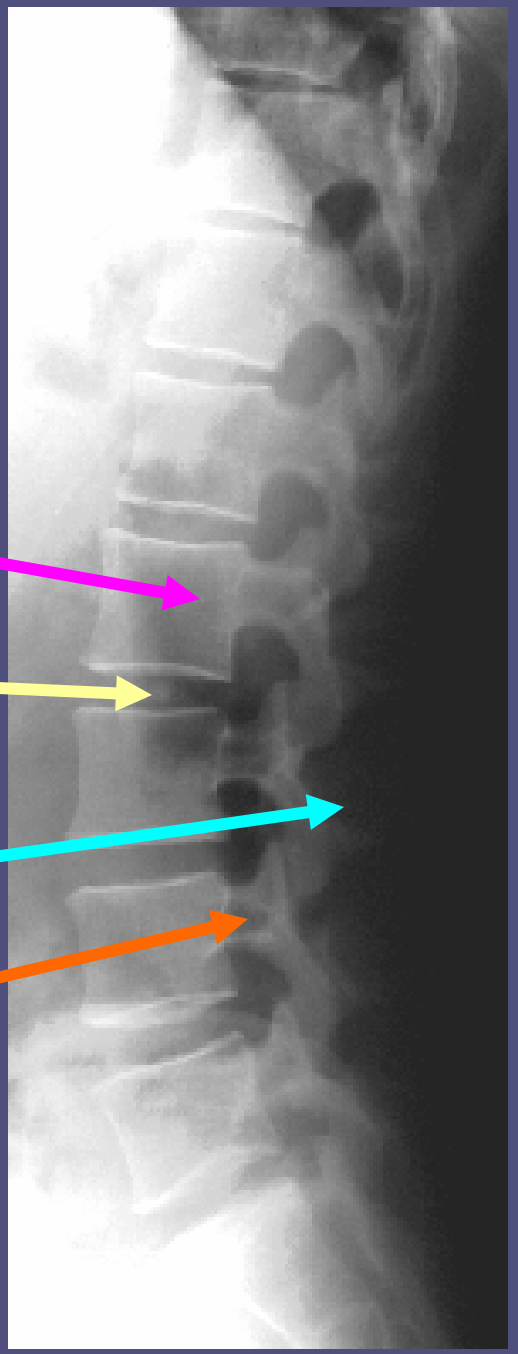
Normal Lateral Radiograph



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Spinal Columns

1.) **Anterior column**
- Anterior longitudinal ligament, anterior half of the vertebral body, disc, and annulus

2.) **Middle column**
- Posterior half of the vertebral body, disc, and annulus, and the posterior longitudinal ligament

3.) **Posterior column**
- Facet joints, ligamentum flavum, the posterior elements and the interconnecting ligaments.

Panjabi et al. 1995

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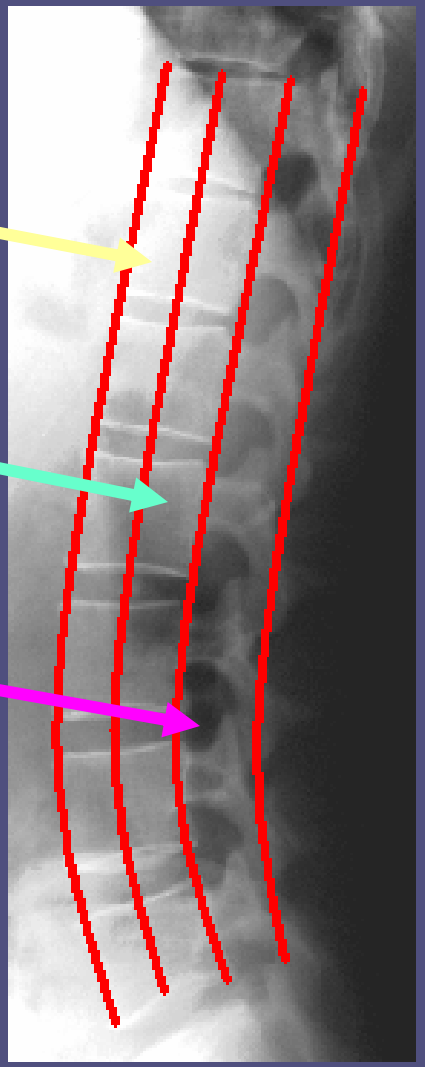
Spinal Columns

Anterior Column

Middle Column

Posterior Column



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Spinal Columns

- The spinal canal and cord are located in the Posterior Column, adjacent to the Middle Column
- Therefore, fractures in elements in the Middle or Posterior Columns have the potential to impinge on the spinal canal and cord
- For this reason, Middle and Posterior Column fractures are considered unstable.

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Types of Fractures

Type of Fracture	Column Affected	Stable vs. Unstable
Compression/Wedge Fracture	Anterior Only	Stable
Burst fractures	Anterior and Middle	Unstable
Fracture/Dislocation Injury	Anterior, Middle, Posterior	Unstable
Seat belt fractures	Anterior, Middle, Posterior	Unstable

http://www.spineuniverse.com/displayarticle.php/article1441.html

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Patient LI

- Patient LI, an 82 year old female with osteoporosis and mild dementia, presented to her physician with lower back pain and posterior leg pain
- Back pain present for 1-2 months
- Difficulty getting out of bed in morning due to pain
- Loss of appetite because of intensity of pain

Patient LI

- Given that Patient LI had osteoporosis, her physician suspected she had a compression fracture.

Compression Fractures

- Osteoporosis is the leading cause of vertebral compression fractures in the U.S.
- 700,000 per year in U.S.
- Affect 25% postmenopausal women
- Incidence expected to increase fourfold in next 50 years
- Why Important?
  - Pain can lead to immobility and further disability
  - 15% increased mortality rate
  - Preventable in most cases

Old et al., 2004

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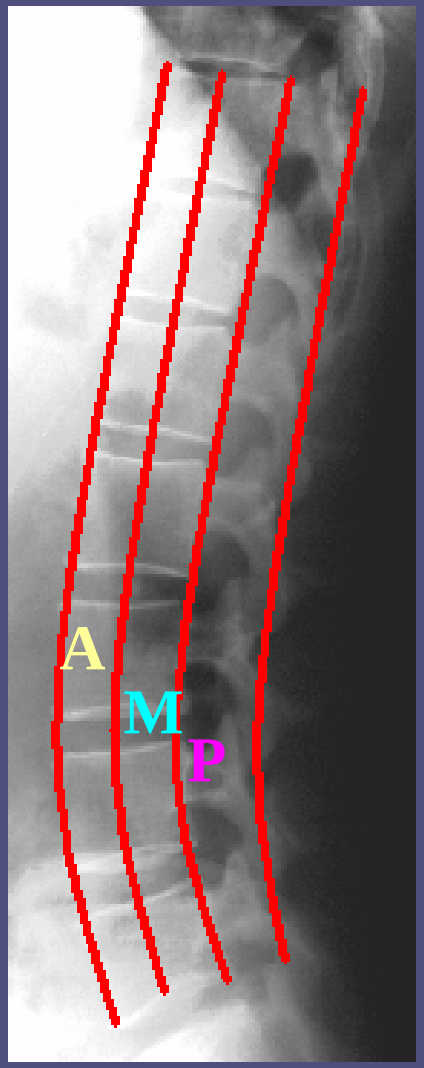
Compression Fractures

- Most commonly occur T8-L4
- Anterior or lateral flexion causes failure of Anterior column only
- Middle column and Posterior column are undisrupted
- Middle column may act as hinge
- Can be further classified by the Denis Classification according to endplate involvement



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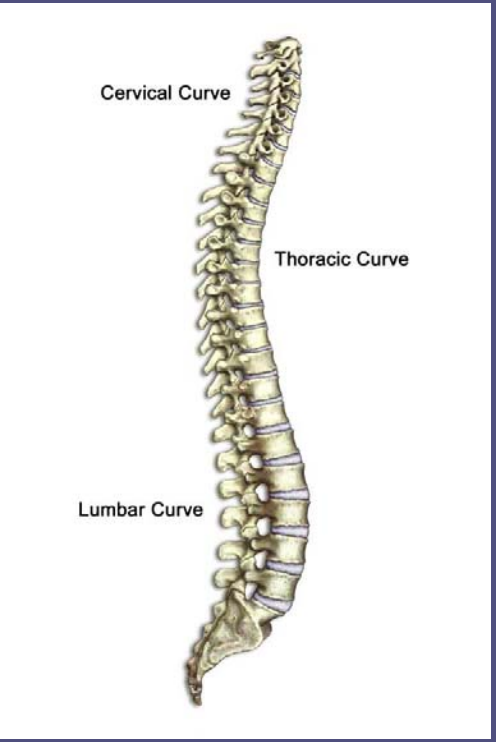
Differential Diagnosis

- Atraumatic Compression Fracture:
  - Osteoporosis
    - Senile/Post-Menopausal
    - Steroids
  - Osteomalacia
  - Pagets Disease
  - Multiple Myeloma
  - Hyperparathyroidism



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What is your initial imaging test of choice?

- Plain frontal and lateral radiographs are the initial studies of choice
- In 20-30% cases multiple fractures are present
- Important to image entire spine

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Radiograph Findings of Compression Fractures

- Anterior height of vertebral body is diminished
- Posterior height of vertebral body is normal
- No anterior or posterior translation of vertebral bodies
- If anterior compression is >40% when compared to posterior vertebral body height, suspect burst fracture

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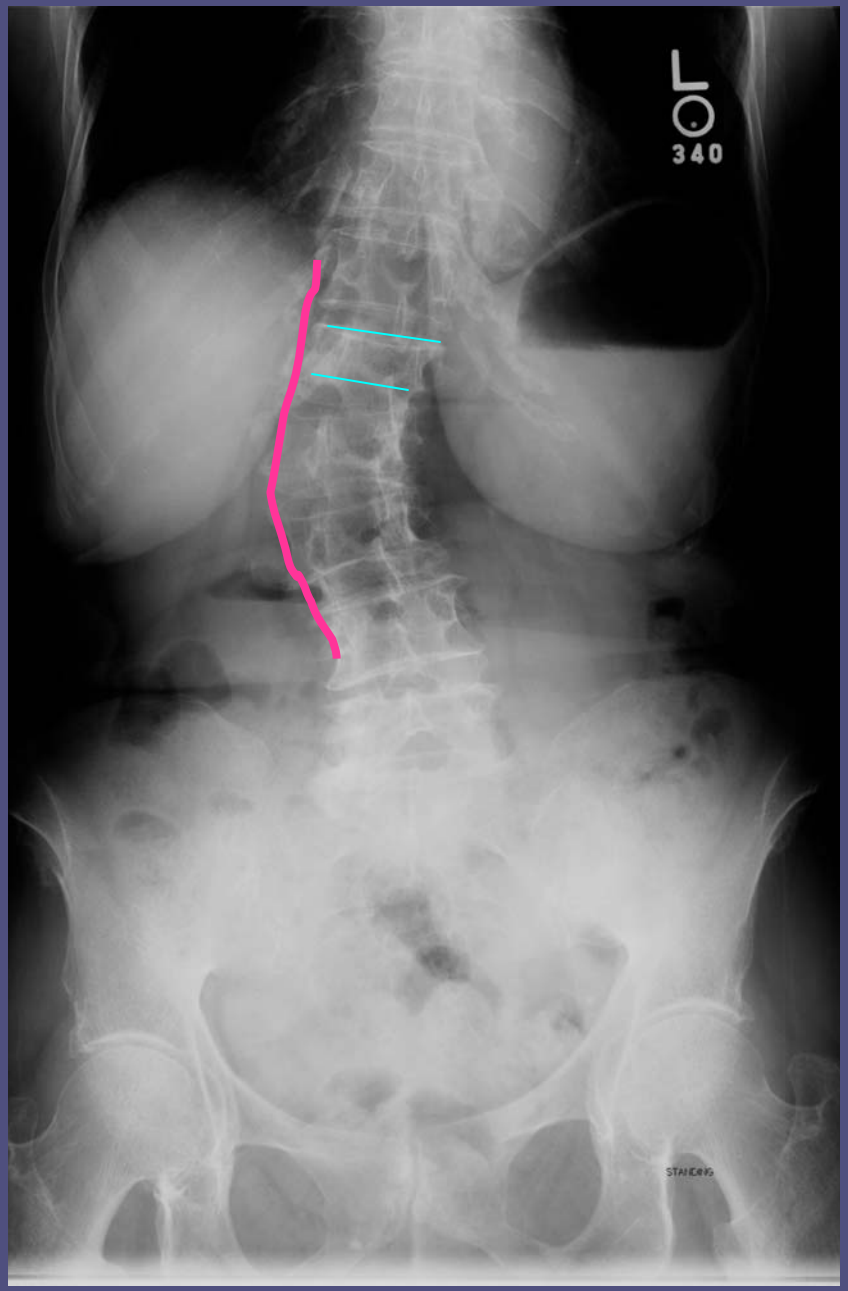
Patient LI: Frontal Plain Radiograph

- Dextroscoliosis centered around L2-3
- Multilevel degenerative changes
- Endplate sclerosis
- Multilevel facet hypertrophy
- Increased lucency in vertebral bodies
- Compression fracture of L1



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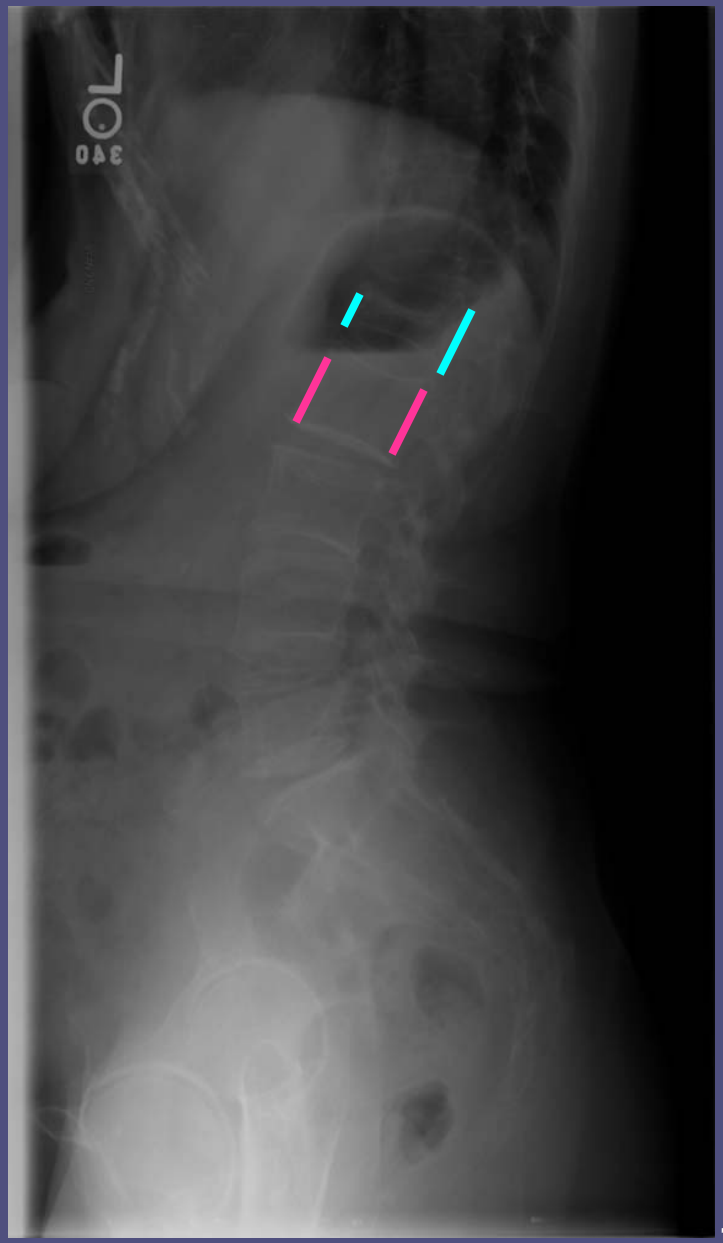
Patient LI: Lateral Radiograph

- Compression fracture of the L1 vertebrae causing focal kyphosis
- There is a 5 mm anterolisthesis of L5 on S1



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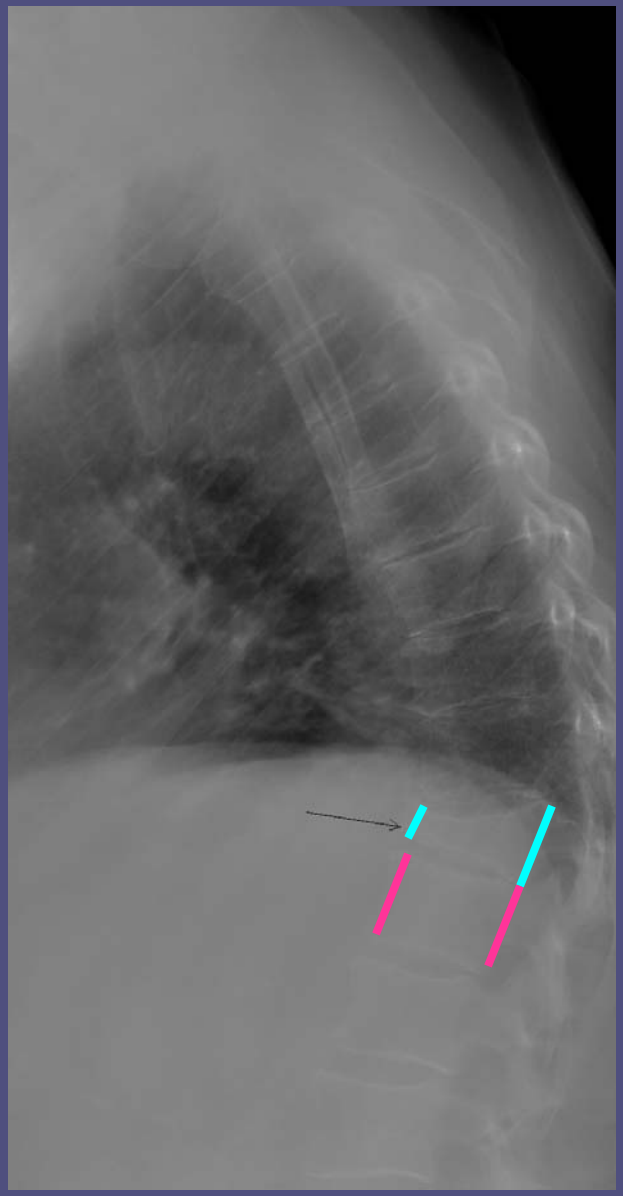
Comparison A: Lateral Radiograph

- 71 year old with a history of osteopenia who presented with mid-lower back pain
  - Compression fracture of anterior of the T11 vertebral body
  - Demineralization present



Courtesy Dr. Yamada, BIDMC

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Comparison B: Lateral Radiograph

- 82 year old who suffered a mechanical fall at her assisted living home
- There is approximately a 15% loss of anterior vertebral body height of T12

Courtesy Dr. Yamada, BIDMC

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Role of Additional Imaging

- Role of CT:
  - Use to identify fractures not well visualized on plain film
  - Allows for visualization of middle and posterior elements
    - Can distinguish between compression fracture and burst fracture
  - Can also reveal spinal canal narrowing
  - Disadvantage:
    - Can't detect horizontal fractures of vertebral bodies or pedicles well

- Role of MRI:
  - Recommended when patient has suspected spinal cord compression or other neurologic symptoms

Old et al., 2004

Patient LI

- Given that Patient LI reported posterior leg pain, her physician decided to order an MRI to assess the spinal cord and spinal canal

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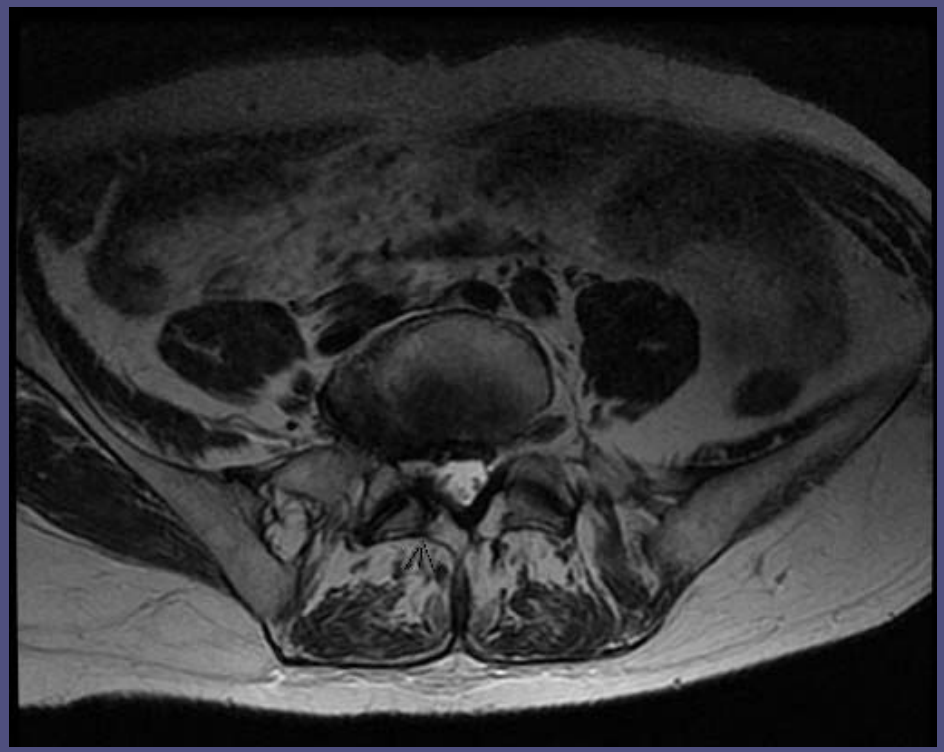
Patient LI: T2 MRI

Sagittal

Axial



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Patient LI: MRI Findings

- The conus terminates at L1
- No evidence for internal expansile mass
- Dextroscoliosis of the lumbosacral spine with apex at L2/3
- L1 compression fracture
- Spinal stenosis

Treatment Options

- Non-operative treatment is the standard
  - Pain medication (observe bowel motility)
  - Brief rest (2-3 days), encourage early ambulation
  - Avoid compression overloads for 2 months
  - Muscle relaxants, external back braces, and physical therapy may also help
- If patients do not respond to conservative tx:
  - Percutaneous Vertebroplasty
  - Kyphoplasty

Singh et al., 2006

Summary

- Compression fractures common in elderly population
- Compression fractures are caused by failure of the anterior column only
- Initial imaging modality of choice is plain film
- Can use CT or MRI if have concern that the middle or posterior columns are involved, and to evaluate spinal cord
- Treatment is usually conservative

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