Texas Society of Neuroradiology Annual Meeting
February 21-22, 2026

Imaging Mimics of Spinal Metastatic Disease: Diagnostic Pitfalls and Differentiation Strategies

Jawad Khan, Steve Fung

Department of Radiology, Houston Methodist Hospital

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Disclosures

- Financial Relationships:
  - None
- Off Label Use:
  - None
- Published Material
  - Book Chapter (in press): Yusufzai O, **Khan J**, Singh JK, **Fung SH**. Imaging metastatic spine disease. In *Metastatic Spine Disease: A Guide to Diagnosis and Management, 2nd ed.* Marco RAW, Schwab JH, Ed. Berlin: Springer; 2026.

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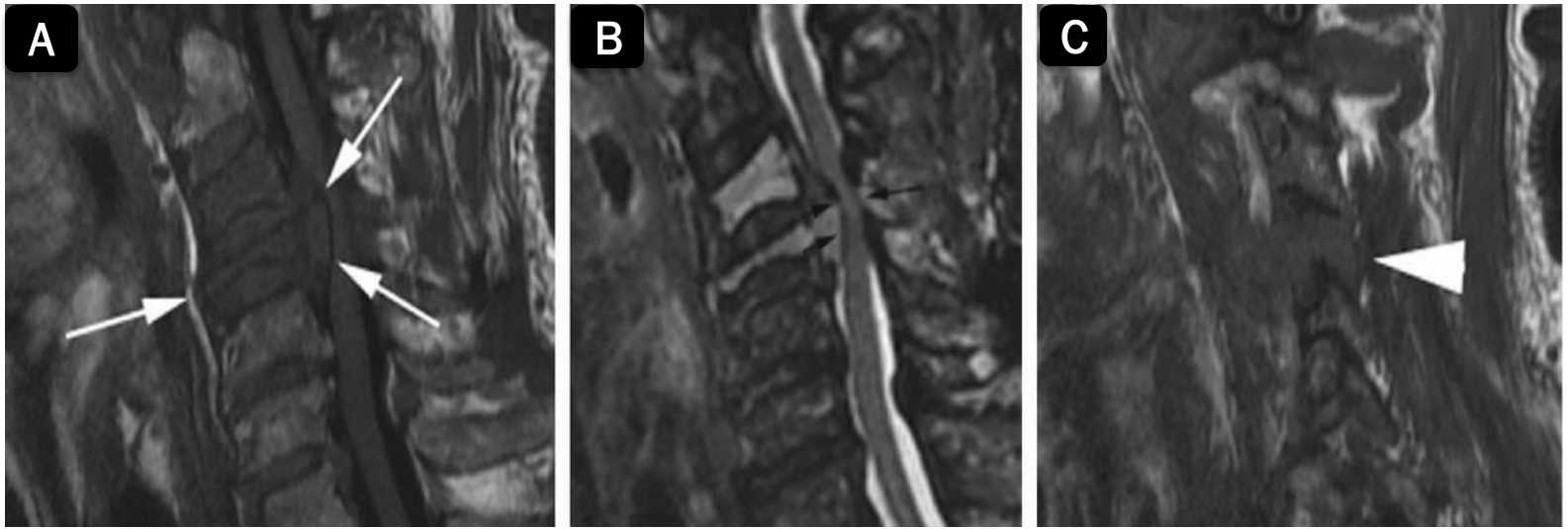
Objectives

1. Identify common benign entities that mimic spinal metastatic disease on imaging.
2. Differentiate metastatic lesions from mimics using multimodality imaging features and pattern recognition.
3. Avoid common diagnostic pitfalls that may lead to unnecessary biopsy, treatment delay, or overtreatment.

Background and Purpose

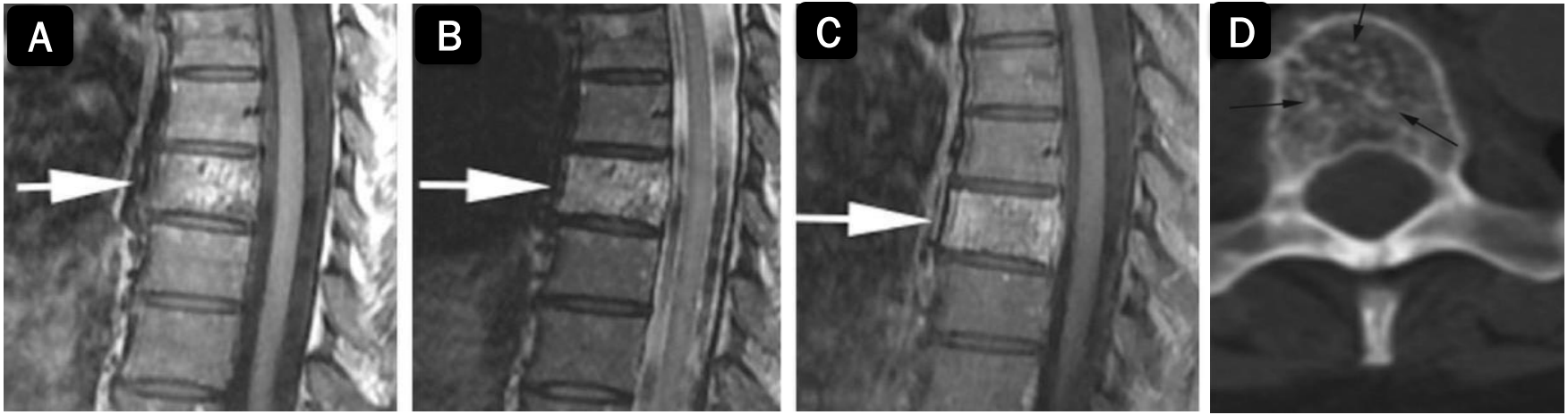
- Spinal abnormalities are common in oncologic and non-oncologic patients
- Many benign/inflammatory conditions mimic metastases ⟶ risk of misdiagnosis
- Goal: establish systematic imaging approach to distinguish true metastases from mimics using illustrative cases

Case 1



Example of ***metastatic disease*** in 79-year-old male with neck pain. (A) Sagittal T1W image shows pathologic fracture of C4 vertebral body and epidural tumor compromising the spinal canal (white arrows). Metastatic disease is also present in the C3 vertebral body. (B) Sagittal STIR image shows the deformity and compression of the spinal cord (short black arrows). (C) Sagittal T1W image to the right of midline shows tumor involvement of the C4 pars interarticularis (white arrowhead) and pedicle. Metastatic disease is also present in right C1 vertebral arch.

Case 2



Example of ***typical hemangioma*** in 73-year-old female. (A) Sagittal T1W image shows areas of bright signal in T8 vertebral body (white arrow). (B) Sagittal T2W image shows mostly areas of bright signal in T8 vertebral body (white arrow). (C) Sagittal T1W image with fat saturation and after intravenous contrast shows enhancement in the T8 vertebral body (white arrow). (D) Axial CT scan image from chest study shows typical thickened vertical trabeculae within the T8 hemangioma (black arrows)

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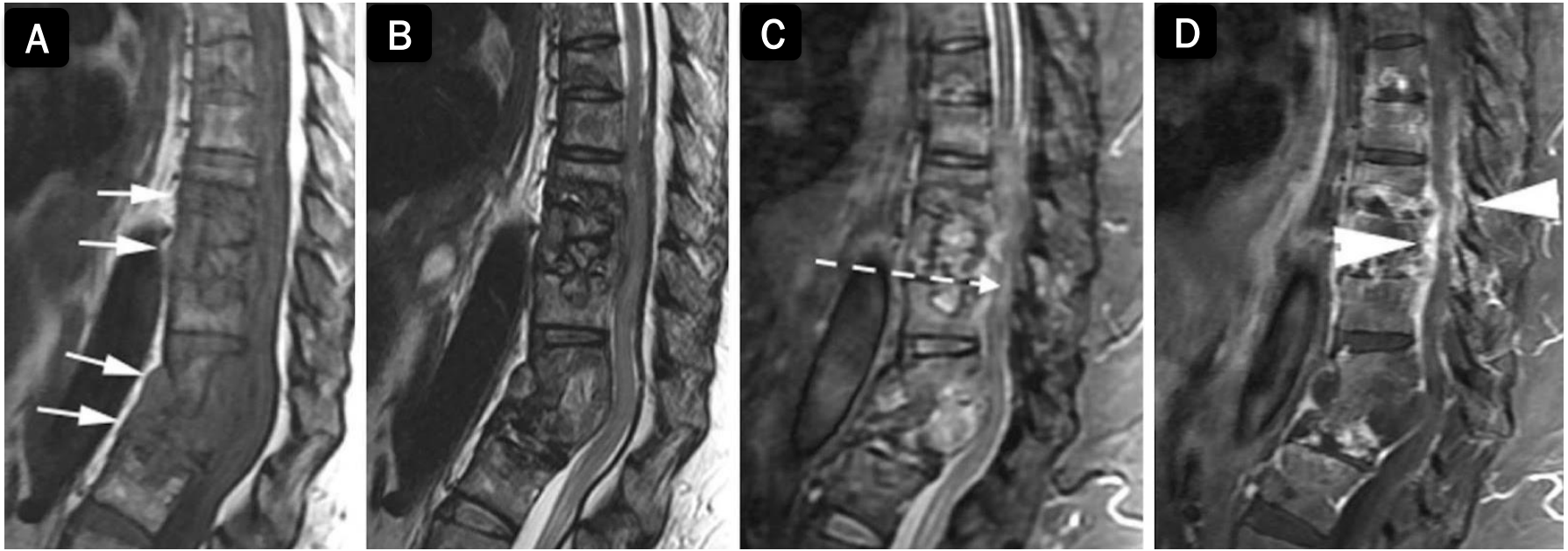
Case 3



Example of ***infection*** in 57-year-old female. (A) Sagittal T1W shows areas of low signal in multiple thoracic vertebral bodies (white arrows) and compression deformity (lowest arrow). (B) Sagittal T2W demonstrates involvement of multiple intervertebral discs. (c) Sagittal T2 STIR shows many of the lesions are high signal and epidural involvement results in high cord signal (dashed white arrow). (d) Sagittal T1W post-contrast shows epidural extension (arrowheads). Final diagnosis was ***tuberculosis.***

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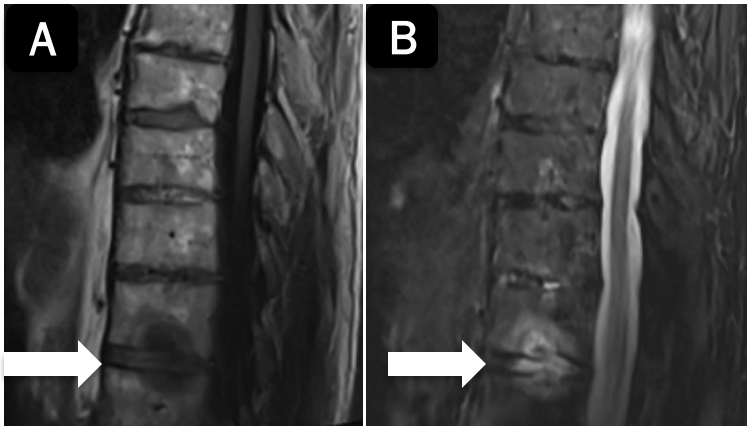
Case 4



Example of ***Modic type 1 endplate changes*** in a 54-year-old male. (A) Sagittal T1W image shows low signal involving the vertebral body marrow immediately adjacent to the affected endplate (arrow). Bottom: High STIR signal at the same endplate-adjacent region (arrow), reflecting marrow edema (Modic type 1 change).

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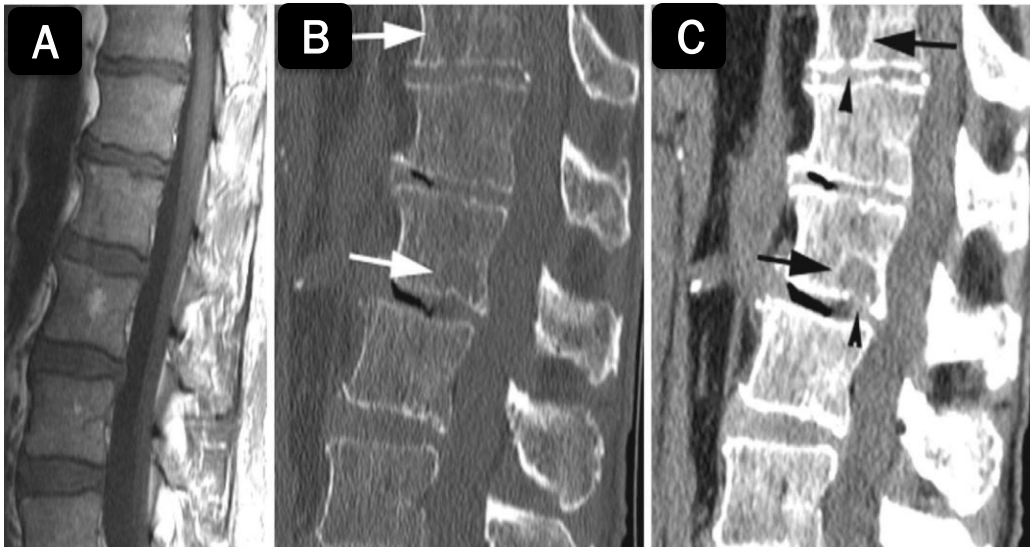
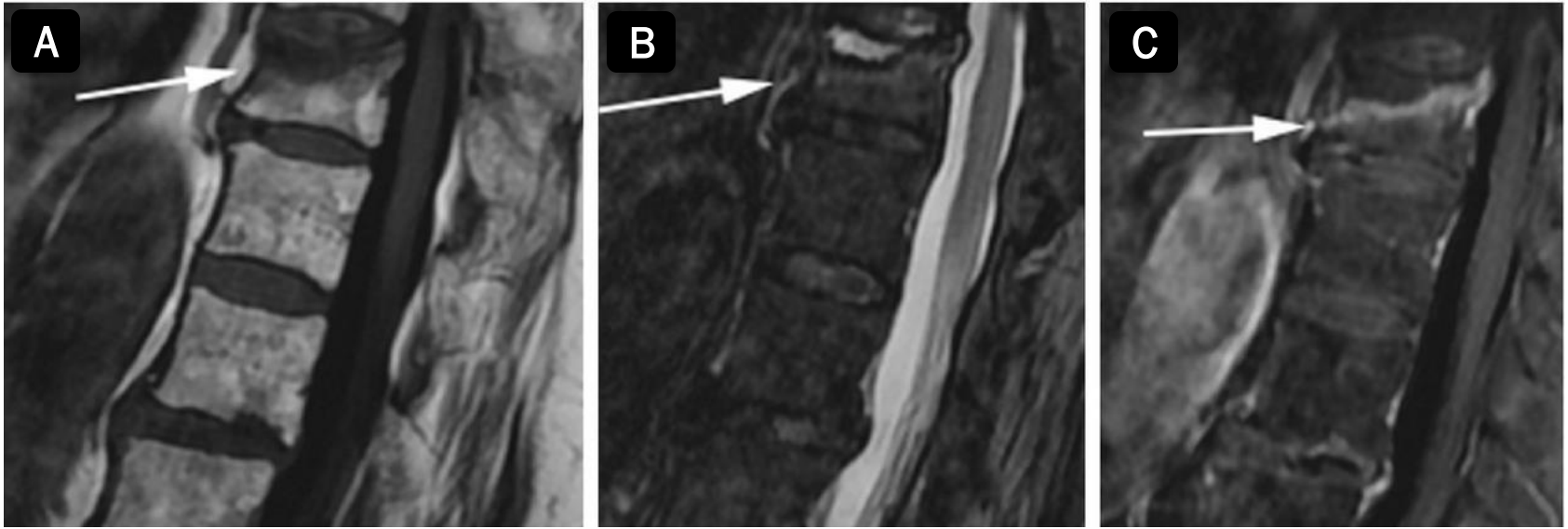
Case 5



Example of ***Schmorl's node***. 84-year-old male with cardiac pacemaker was imaged with CT scan to evaluate for metastatic disease. (A) Previous MRI and CT obtained 12 years ago showing normal bone marrow at L1 and T11. (C) Current sagittal CT showing new lucent areas in the L1 and T11 vertebral bodies (arrows). Subtle endplate defects (arrowheads) indicating that the disc has herniated through the endplate into the vertebral body (Schmorl's node).

Case 6



Example of benign fracture in 70-year-female with acute back pain (A) Sagittal midline T1W image shows low signal in deformed upper T11 vertebral body where there is usually high signal fat (arrow). (B) Sagittal midline STIR image shows high signal in deformed upper T11 vertebral body (arrow). (C) Sagittal T1W image with fat suppression after intravenous contrast shows enhancement in T11 vertebral body (arrow).

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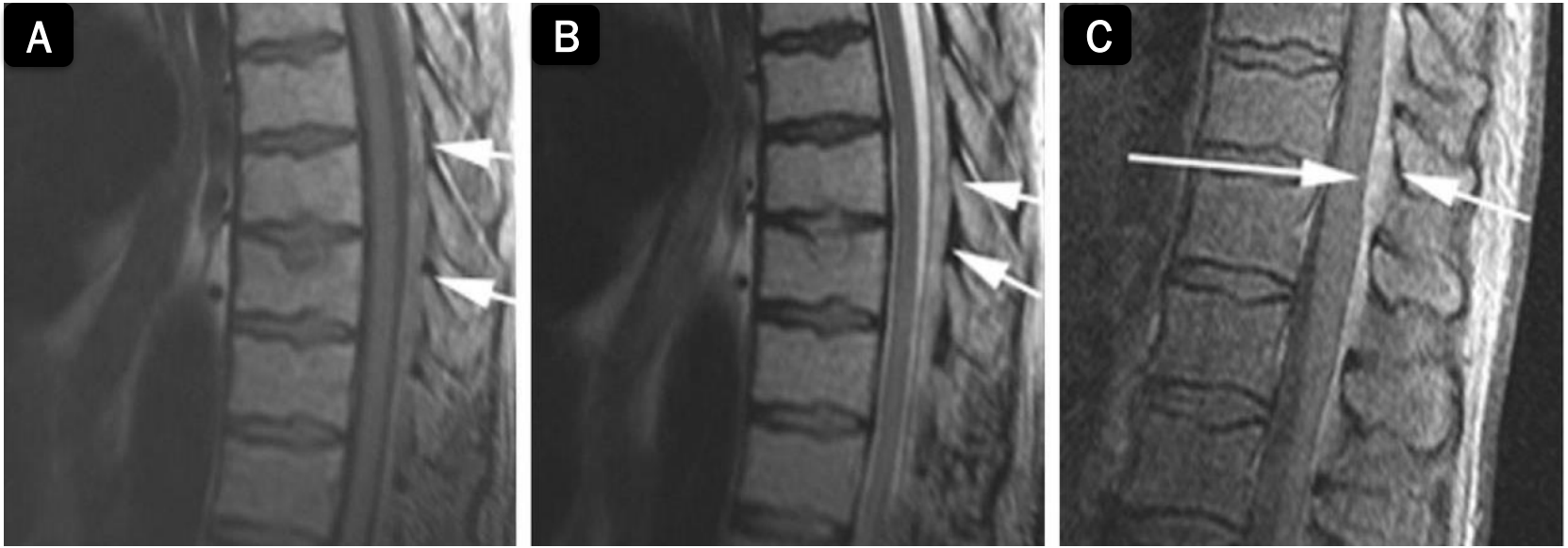
Case 7



Example of ***lymphoma*** in 41-year-old male. (S) Sagittal midline T1W image shows subtle low signal in posterior epidural space where there is usually high signal fat (arrows). (B) Sagittal midline T2W image without fat suppression shows subtle low signal in posterior epidural space where there is usually high signal fat (arrows). (C) Sagittal T1W image with fat suppression after intravenous contrast shows enhancement in posterior epidural space (arrows)

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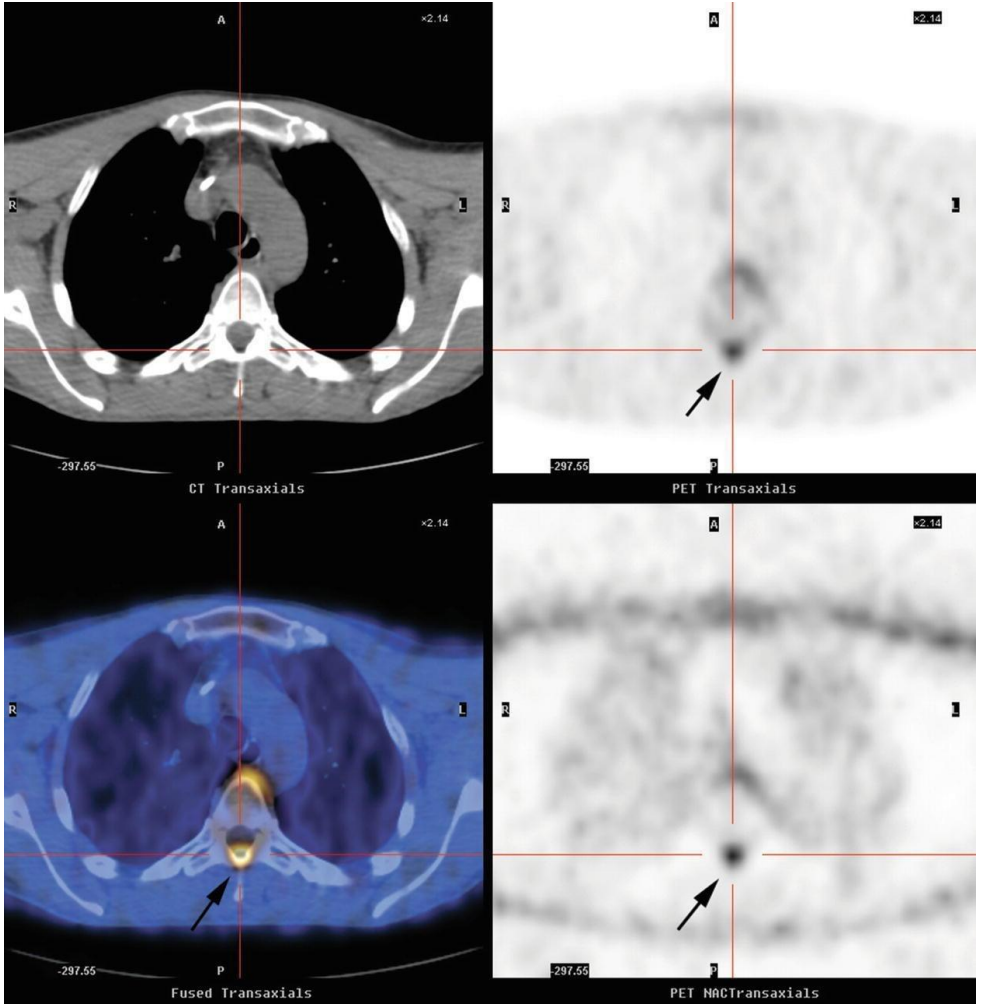
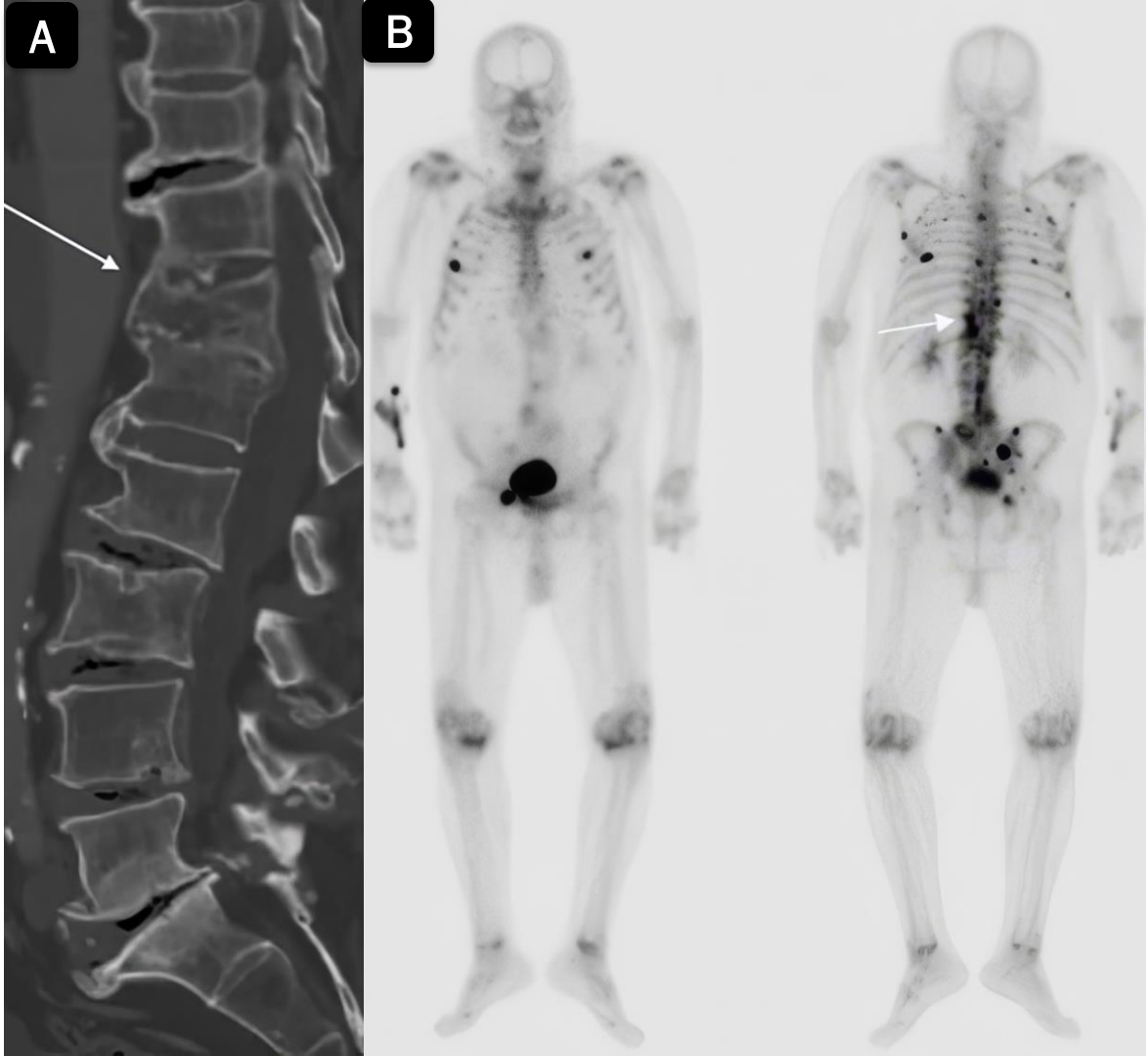
Case 7 (continued)

18F-FDG PET axial images show high metabolic activity in posterior thoracic epidural space (arrows). Patient was diagnosed with ***lymphoma.***



Case 8

Example of **metastatic disease** in a 79-year-male. (A) Sagittal midline CT image shows a compression deformity with somewhat sclerotic borders (arrow) and scattered sclerotic changes of the spine mostly involving the vertebral body endplates. (B) Skeletal scintigraphy with anterior (left) and posterior (right) projections shows numerous focal areas of increased radiotracer uptake involving the thoracolumbar spine (arrow), ribs and pelvis.



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Key Points

1. Benign lesions: preserved marrow fat, well-defined margins, non-aggressive features
2. Degenerative/traumatic: predictable distribution, mechanical findings
3. Infection: involves disc and shows inflammatory changes
4. Systematic, multimodality pattern recognition distinguishes metastases from mimics, preventing unnecessary intervention and guiding appropriate management.

References

1. Silva HSE et al. Multifocal and diffuse spinal lesions that may mimic metastases. *Neurographics*. 2019;9(3):163-181. doi:10.3174/ng.1800068
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3. Mhuircheartaigh JN, et al. Bone tumor mimickers: a pictorial essay. *Indian J Radiol Imaging.* 2014;24:225–36. 10.4103/0971-3026.137026

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