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Educational Abstract
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From Detection to Decision: Multimodality Imaging and Prognostic Scoring in Spinal Metastatic Disease

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Summary

To review a structured, multimodality imaging approach to metastatic spinal disease with emphasis on modality selection, imaging interpretation, and standardized prognostic scoring. Using illustrative cases, we highlight the complementary roles of MRI and CT, CT myelography, bone scintigraphy, and FDG PET/CT in lesion detection, characterization, assessment of spinal stability, and cord compression. Particular focus is placed on the Spinal Instability Neoplastic Score (SINS) and the Epidural Spinal Cord Compression (ESCC) scale, underscoring the neuroradiologist's role in guiding multidisciplinary oncologic management.

Educational Objectives

A) Describe the strengths and limitations of MRI, CT, myelography, bone scintigraphy and PET/CT in evaluating spinal metastatic disease. B) Apply imaging findings to assess spinal stability and neurologic risk using SINS and ESCC scoring systems. C) Recognize imaging features that directly impact surgical, radiation, and medical oncology decision-making.

Background and Purpose

Spinal metastases are a frequent source of pain, neurologic compromise, and mechanical instability in cancer patients. Accurate imaging interpretation is critical for early diagnosis and appropriate triage. This educational activity aims to provide neuroradiologists with a practical framework for multimodality imaging evaluation and standardized prognostic reporting to optimize patient outcomes.

Materials and Methods

This exhibit is based on a comprehensive review of imaging modalities used in metastatic spinal disease, supported by representative clinical cases. MRI sequences are correlated with CT, CT myelography, bone scintigraphy, and FDG PET/CT findings. Imaging features relevant to lesion localization, osseous destruction, epidural extension, spinal canal compromise, and instability are systematically reviewed. Prognostic scoring using SINS and ESCC is illustrated with imaging examples.

Results

MRI demonstrates the highest sensitivity for marrow-replacing lesions, and is helpful for identifying epidural and paraspinal extension of tumors. CT provides superior evaluation of osteolytic vs osteoblastic process, cortical destruction, and pathologic fractures. Nuclear medicine and PET/CT improve whole-body staging and lesion specificity. Standardized application of SINS and ESCC allow consistent communication of mechanical stability and neurologic risk, directly influencing recommendations for surgical consultation and radiotherapy.

Conclusion

A multimodality imaging strategy is essential for comprehensive evaluation of metastatic spinal disease. Familiarity with the strengths of each modality, combined with structured prognostic scoring using SINS and ESCC, enables neuroradiologists to provide actionable, clinically relevant interpretations that guide multidisciplinary oncologic care.

References

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Figures

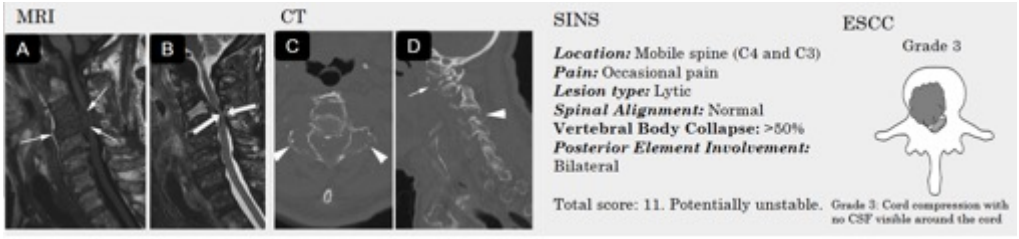

Figure 1. Multimodality imaging and prognostic assessment of metastatic spinal disease through an example case of a 79 year-old male with neck pain eventually diagnosed with multiple myeloma. Sagittal T1W (A), and STIR (B) images showing pathologic fracture of C4 with > 50% height loss and epidural tumor compromising cord (white arrows). Metastatic disease is also present in the C3 vertebral body. Axial (C) and sagittal (D) CT just to the right of midline shows lytic disease in C4 pars interarticularis bilaterally and tumor involvement of right C1 vertebral arch (white arrowheads and arrows).

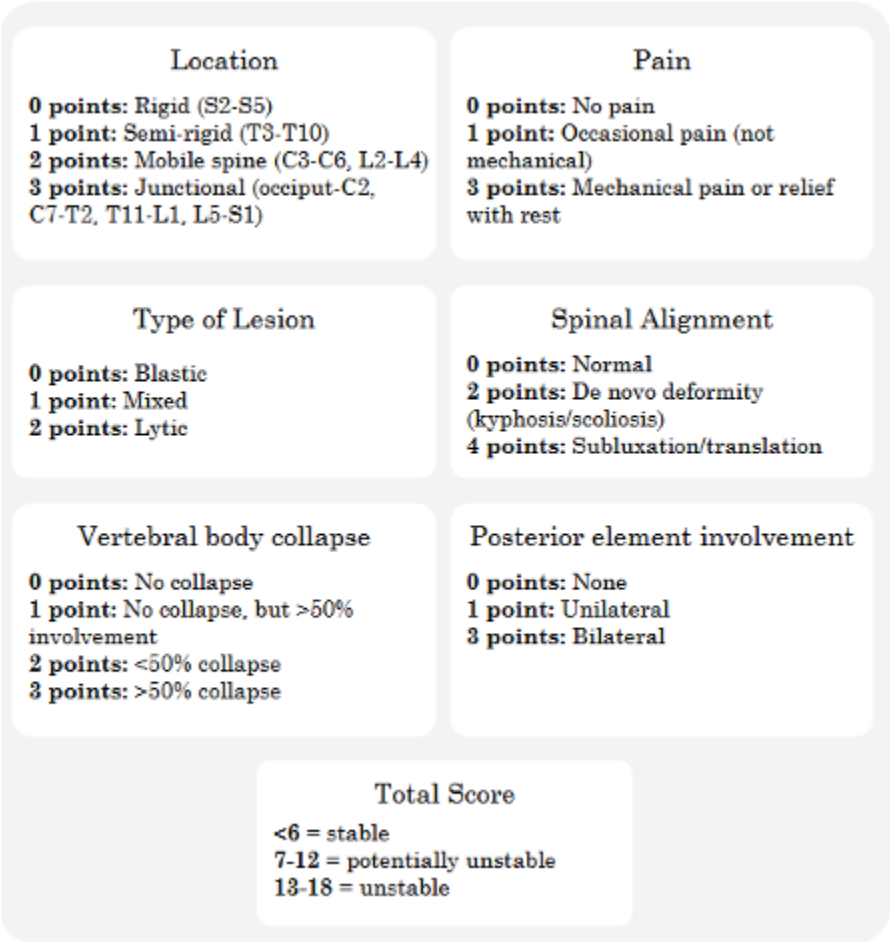

Figure 2. Spinal Instability Neoplastic Scoring system.

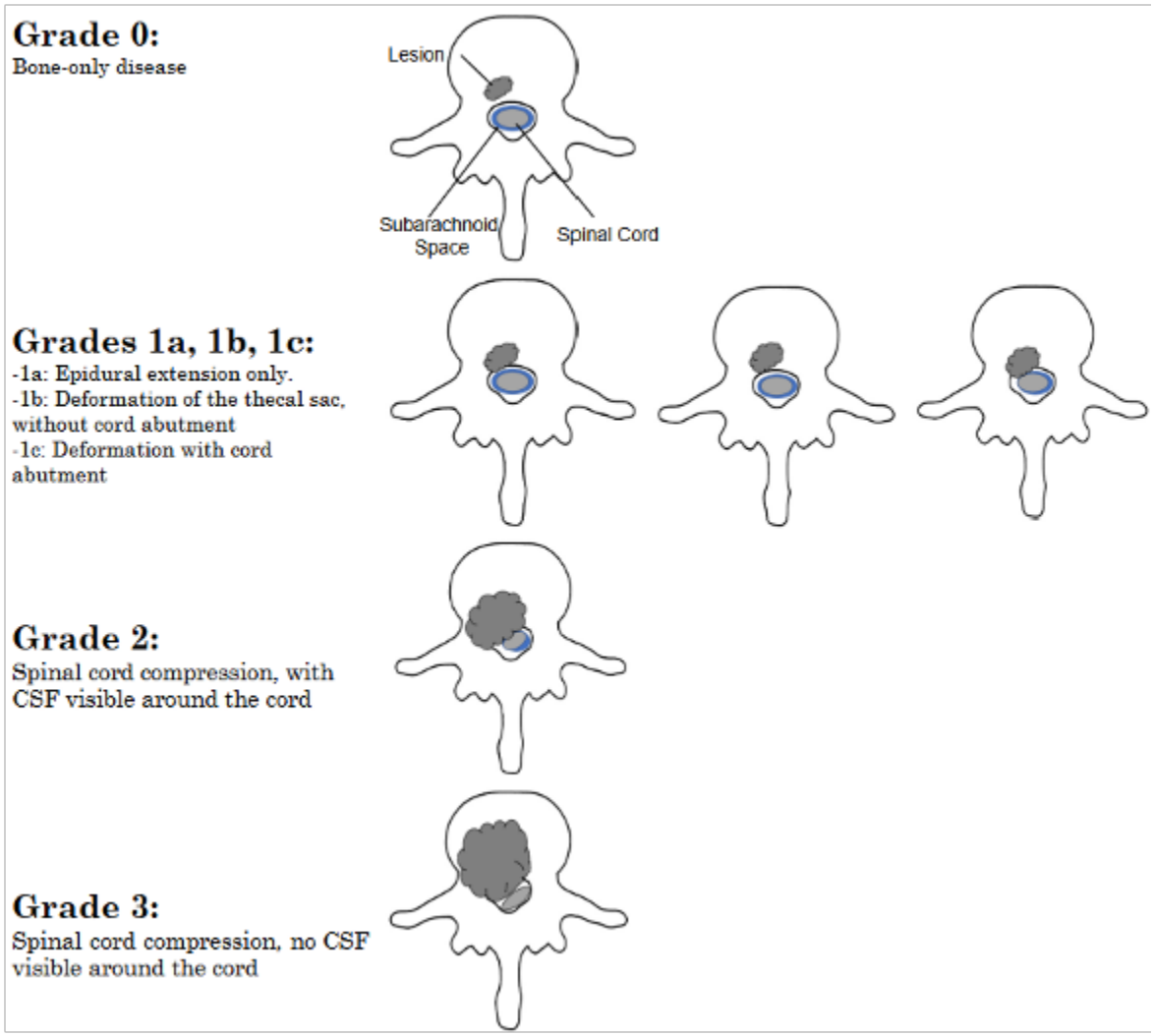

Figure 3. Epidural Spinal Cord Compression (ESCC) scale.