

## CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 43 year old woman initially presented to an emergency room following back pain which commenced with lifting a 40 pound box. She was treated for acute mechanical back strain with pain medication and muscle relaxants. Three days later she was seen in clinic with persistent back pain. She was again treated with pain medication and muscle relaxants. On an additional one-week follow-up visit, her pain was 50% better. She then came in earlier than a scheduled follow-up appointment (scheduled two weeks following her last visit) with increased pain, three weeks after the original injury. The patient decided to pursue chiropractic manipulations. At a follow-up visit a month after the original injury and following five sessions of chiropractic manipulation the patient was somewhat improved. She returned to the clinic approximately two weeks later, at between six and seven weeks after her initial injury, with ongoing pain which the patient stated was now worse. Plain films were ordered and were normal. The patient returned to clinic four days later with persistent and more severe pain.

At no time did the patient have any localizing neurologic symptoms or abnormal findings on neurologic examination. At no time did the patient have any systemic features such as fever, night sweats, or weight loss. She had no personal history of malignancy.

What is the most appropriate imaging technique for patients with persistent low back pain, assuming that plain films have already been obtained and provided no useful information?

- (a) lumbar myelography
- (b) lumbar myelography followed by CT examination
- (c) nuclear medicine bone scan
- (d) magnetic resonance imaging of the lumbar spine

<b>RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION</b>
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(See full history on the prior page.)

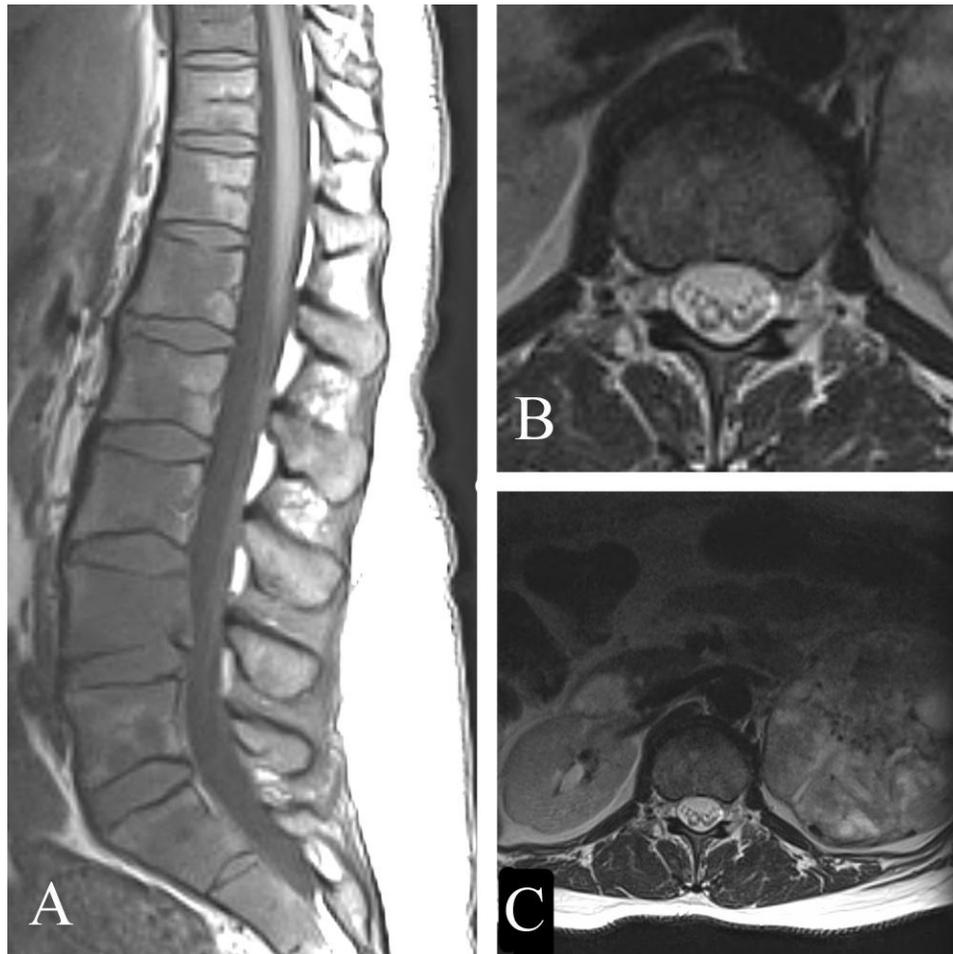
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Answer: (d), magnetic resonance imaging of the lumbar spine is the most appropriate imaging method for evaluation of severe back ache. Magnetic resonance imaging is outstanding for evaluation of both bones and soft tissues and can readily diagnose most important causes of severe ongoing back pain. Recommendations about when to image varies. Generally, “red flags” prompt earlier evaluation. These include: young (pediatric) or old (arbitrarily somewhere around 50) age; a personal history of malignancy; significant trauma, or such systemic features as weight loss, fever, or night sweats.

Lumbar myelography, once a mainstay of evaluation of low back pain, has largely been supplanted by magnetic resonance imaging and is rarely if ever performed without an accompanying CT study, and (a) is incorrect. Lumbar myelography with CT has also largely been supplanted by magnetic resonance imaging, but has a role in the post-operative evaluation of patients who have undergone prior lumbar surgery, particularly when patients have undergone fusion with placement of hardware. CT can better evaluate hardware complications (loosening and fractures) and can provide better detail of adjacent soft tissues (when combined with CT) because of significant image degradation caused by the hardware on magnetic resonance images. However, the patient does not have any history of prior lumbar surgery, and (b) is incorrect. Nuclear medicine bone scans are usually used when evaluating bone turnover. This may be helpful for evaluation of fractures of indeterminate age, or when evaluating pars interarticularis defects (spondylolysis) for activity, but a nuclear medicine bone scan would not be the first choice for imaging evaluation in this case, and (c) is incorrect.

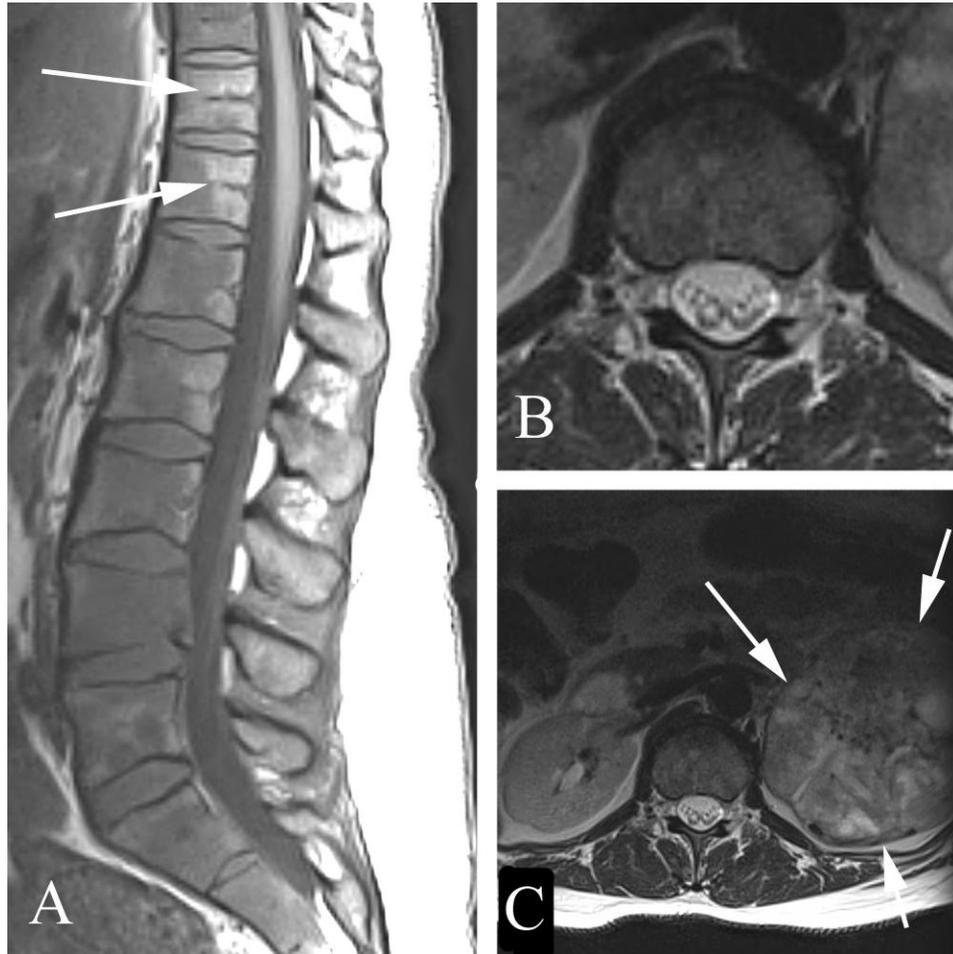
IMAGING STUDY AND QUESTIONS



Imaging questions:

- 1) What type of study is shown in the figure?
- 2) Are there any abnormalities?
- 3) What is the most likely diagnosis?
- 4) What is the next step in management?

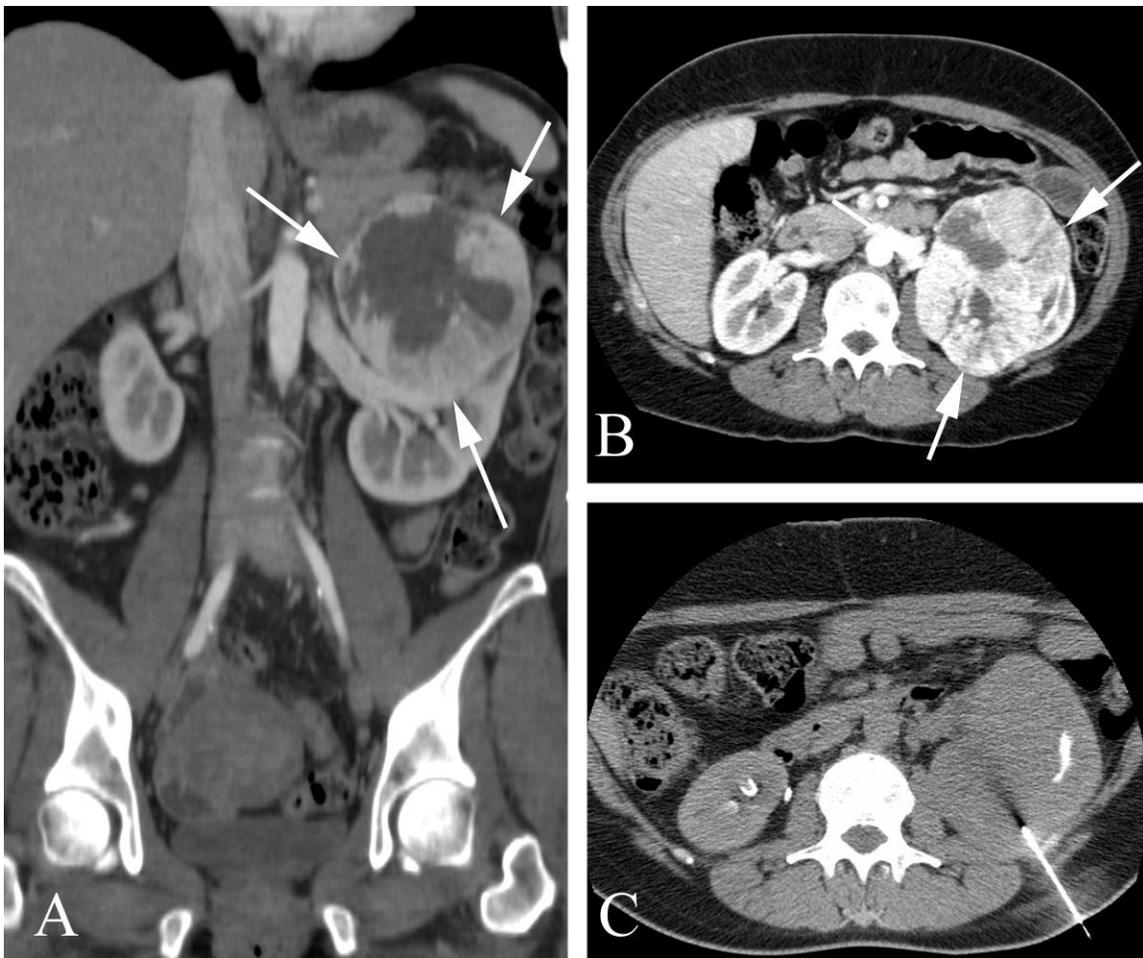
IMAGING STUDY QUESTIONS AND ANSWERS
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- 1) What type of study is shown in the figure? This is a spine magnetic resonance imaging (MRI) examination. A is a sagittal T1 weighted image, B is an axial T2 weighted image cropped to emphasize the vertebral column and spinal canal, and C is an axial T2 weighted image without cropping or magnification.
- 2) Are there any abnormalities? The T1 weighted image shows diffuse, multilevel abnormal bone marrow signal intensity; note that the arrows in A point to normal marrow at the T11 and T12 levels (all the gray marrow is abnormal). The cropped axial T2 image nearly excludes the important feature, which is a large renal tumor (arrows in C).
- 3) What is the most likely diagnosis? Renal cell cancer with bone metastases.
- 4) What is the next step in management? Biopsy to confirm histology of the lesion and referral to oncology.

**PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP**

The patient was still in the department when the lumbar MR was read. Given the abnormalities on the MR study, an immediate chest, abdomen, and pelvic CT was performed to evaluate the extent of the disease process. It showed bone metastases and a large renal tumor, but no other metastatic deposit. The patient's renal tumor was biopsied the same day, yielding a diagnosis of renal cell carcinoma. The patient was referred to oncology and treated with nephrectomy and Temsirolimus. She died within four months.



43 year old woman with persistent severe back pain following a lifting injury with renal cancer. A. Contrast enhanced coronal CT image shows a large mass arising from the superior pole of the kidney (arrows). B. Contrast enhanced axial CT image shows a large, heterogeneous left renal mass (arrows). C. CT directed biopsy (the patient was actually prone during the biopsy and the image has been reoriented to match the other axial image) shows a biopsy needle in the renal mass.

## SUMMARY

**Presenting symptom:** Back pain is a ubiquitous disorder, and is a common cause of physician visits in the United States. 90% of people experience back pain at some point in their life, and half of working people have pain every year.

**Imaging work-up:** Given the nearly universal occurrence of back pain, imaging all patients with back pain is unlikely to be cost effective and therefore multiple attempts have been made to devise lists to limit imaging to situations where it is likely to have the greatest benefit in patient care. Immediate imaging is typically done for severe trauma (such as a motor vehicle accident), but generally not done for “lifting injuries.” Recommendations generally call for expedited imaging of patients with a personal history of malignancy, those with unremitting pain, pediatric patients, elderly patients, and patients with such constitutional symptoms as weight loss or fever. Patients with neurological signs such as foot drop or loss of bowel or bladder control should probably undergo urgent imaging. Finally, patients with persistent pain (the usual cutoff is 6 weeks) should undergo imaging, as occurred in this patient. Most algorithms call for performing plain films first, but in fact whether the plain films are normal or show an abnormality, MR is usually obtained as well.

**Establishing the diagnosis:** In this case, metastatic disease arising from the kidney was virtually certain on the basis of the imaging findings. A CT directed biopsy proved the diagnosis.

**Take-home message:** Not all patients with spine pain require imaging, but if imaging is required, MR is the study of choice. Plain films are often acquired prior to MR imaging, but infrequently are definitive enough to direct treatment.

### FURTHER READING

Renfrew, DL. Spine pain. Chapter 6 of *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at [www.symptombasedradiology.com](http://www.symptombasedradiology.com).

Staiger TO, Gatewood M, Wipf JE, Deyo RA. Diagnostic testing for low back pain. UpToDate, accessed 3/14/2011.

Wheeler SG, Wipf JE, Staiger TO, Deyo DA. Approach to the diagnosis and evaluation of low back pain in adults. UpToDate, accessed 3/14/2011.