

American College Of Radiology ACR Appropriateness Criteria™

ACUTE LOW BACK PAIN—RADICULOPATHY

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Summary of Literature Review

Introduction

Acute low back pain (LBP) with or without radiculopathy (pain radiating down the leg(s)) is one of the most common health problems in the United States and is the leading cause of disability for persons younger than age 45. The cost of evaluation and treatment of acute LBP (duration of less than three months) runs into billions of dollars annually, not including time lost from work.

Because of the high prevalence and high cost of dealing with this problem, government agencies have sponsored extensive studies that are now part of the growing body of literature on this subject. One of the earlier comprehensive studies was carried out in Quebec and was reported in the journal *Spine*, in 1987 (1). The U. S. Department of Health and Human Services recently convened a 23-member multidisciplinary panel of experts to review all of the literature on this subject, grade it, and develop a “Clinical Practice Guideline,” which was published in December 1994 (2). States have convened similar panels in recent years, largely because of the rapidly rising workers’ compensation claim burden being imposed on state budgets by LBP management. One of the more inclusive efforts was recently endorsed by the State of Florida, and is available by mail or on the Internet (3).

It is now clear from the above studies and others that *uncomplicated* acute low back pain is a benign, self-limited condition that does not warrant any imaging studies. The vast majority of these patients are back to their usual activities in 30 days (1-3). The challenge for the clinician, therefore, is to distinguish that small segment within this large patient population that should be evaluated further because of suspicion of a more serious problem.

Indications of a more complicated status, often termed “red flags,” include the following (2):

- (1) recent significant trauma, or milder trauma age >50
- (2) unexplained weight loss
- (3) unexplained fever
- (4) immunosuppression
- (5) history of cancer
- (6) IV drug use
- (7) prolonged use of corticosteroids, osteoporosis
- (8) age >70

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Plain X-rays:

Plain x-rays are recommended when any of the above red flags are present (2,3).

Normal plain lumbar x-rays may be sufficient for the initial evaluation of these red flags (2,3):

- (1) recent significant trauma (at any age)
- (2) prolonged steroid use
- (3) osteoporosis
- (4) age >70

The initial evaluation of the LBP patient may require further imaging if red flags such as suspicion of cancer or infection are present (2,3).

Isotope Bone Scans

The role of the isotope bone scan in patients with acute low back pain has changed in recent years with the wide availability of magnetic resonance imaging (MRI) and especially contrast-enhanced MRI. The bone scan is a moderately sensitive test for detecting the presence of tumor, infection, or occult fractures of the vertebrae but not for specifying the diagnosis (2,3). The yield is *very* low in the presence of normal plain x-rays and laboratory studies, and highest in known malignancy (4). The test is contraindicated in pregnancy.

High-resolution isotope imaging including single photon emission computed tomography (SPECT) may localize the source of pain in patients with articular facet osteoarthritis prior to therapeutic facet injection (5). Similar scans may be helpful in detecting and localizing the site of painful pseudoarthrosis in patients following lumbar spinal fusion (6).

Plain and contrast-enhanced MRI has the ability to demonstrate inflammatory, neoplastic, and most traumatic lesions as well as show anatomic detail not available on isotope studies. Gadolinium-enhanced MRI reliably shows the presence and extent of spinal infection, and is useful in assessing therapy (7). MRI has therefore taken over the role of the isotope scan in many cases where the location of the lesion is known. The isotope scan remains invaluable when a survey of the entire skeleton is indicated.

MRI, CT, Myelography, Myelography/CT

Uncomplicated acute low back pain (no red flags) warrants the use of none of these imaging studies (1-3). The early indiscriminate use of expensive imaging procedures in this common clinical setting has caused large increases in worker's compensation costs and in some cases has led to the perception that CT and MRI of the lumbar spine is not worth the cost. Adding to this controversy is the fact that nonspecific lumbar disc abnormalities are common, and can be demonstrated readily on myelography, CT, and MRI even in asymptomatic patients (8-11).

The appropriate use of these imaging procedures is an important challenge that has been extensively addressed in the major reviews referenced herein (1-3). For example, low back pain complicated by "red flags" suggesting infection or tumor may justify early use of CT or MRI even if plain x-rays are negative (2). The most common indication for the use of these imaging procedures, however, is the clinical setting of LBP complicated by radiating pain (radiculopathy, sciatica) or cauda equina syndrome (bilateral leg weakness, urinary retention, saddle anesthesia), usually due to herniated disc and/or canal stenosis.

MRI

MRI of the lumbar spine has become the initial imaging modality of choice in complicated low back pain, displacing myelography and CT in recent years. Sagittal images provide most of the information seen on myelography. Axial views match or exceed the value of CT scans in most instances.

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CT

CT scans provide superior bone detail but are not quite as useful in depicting disc protrusions when compared with multiplanar MRI.

Myelography/CT

“Plain” myelography was the mainstay of lumbar herniated disc diagnosis for decades. It is now usually combined with postmyelography CT. The *combined* study is as accurate in diagnosing disc herniation as plain CT or MRI, but suffers the disadvantage of requiring lumbar puncture and contrast injection (12-14).

Thermography, Discography, CT Discography

Expert panels agreed that these imaging modalities were either too nonspecific (thermography) or carried additional risk (discography) not warranted in view of the efficacy of other less invasive imaging procedures (2,3). When other studies fail to localize the cause of pain, discography may occasionally be helpful. Although the images often depict nonspecific aging or degenerative changes, the injection itself may reproduce the patient’s pain, which may have diagnostic value (15).

Definitions

Acute low back pain:	Lumbosacral pain of less than 3 months duration.
Radiculopathy:	Dysfunction of a nerve root usually caused by compression of the root.
Spinal stenosis:	Narrow bony canal that may cause radiculopathy, or cauda equina syndrome.
Herniated disc:	Herniation of the nucleus pulposus through the annulus fibrosis.
Sciatica:	Pain radiating down the leg(s) below the knee along the distribution of the sciatic nerve, usually due to mechanical pressure and/or inflammation of lumbosacral nerve roots.
Cauda equina syndrome:	Compression of multiple nerve roots often resulting in bilateral motor weakness (legs), urine retention, saddle anesthesia.

Anticipated Exceptions

None.

Review Information

This guideline was originally developed in 1996. A complete review and revision of this document was approved in 1999. The next review will be completed in 2002.

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Clinical Condition: Uncomplicated Low Back Pain

Variant 1: No red flags.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Plain Lumbar X-Rays	2	
Isotope Bone Scan	2	
CT	2	
Myelogram	2	
Myelogram/CT	2	
Plain MRI	2	
MRI + Gadolinium	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 2: Trauma, steroids, osteoporosis, over 70.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Plain Lumbar X-Rays	8	
Plain MRI	5	
MRI + Gadolinium	4	
Isotope Bone Scan	4	
CT	4	
Myelogram	2	
Myelogram/CT	2	
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Clinical Condition:

Acute Low Back Pain

Variant 3:

Suspicion CA, infection.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Plain MRI	8	
MRI + Gadolinium	7	
Plain Lumbar X-Rays	7	
Isotope Bone Scan	5	
CT	4	
Myelogram	2	
Myelogram/CT	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 4:

Radiculopathy.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Plain MRI	8	
Myelogram/CT	5	
CT	5	
MRI + Gadolinium	4	
Plain Lumbar X-Rays	4	
Isotope Bone Scan	2	
Myelogram	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

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Clinical Condition: Acute Low Back Pain

Variant 5: Prior lumbar surgery.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Plain MRI	7	
MRI + Gadolinium	7	Differentiate disc versus scar.
CT	5	To study fusion bone.
Isotope Bone Scan	5	Helps detect and localize painful pseudoarthrosis.
Plain Lumbar X-Rays	5	Flex/extension may be useful.
Myelogram/CT	5	
Myelogram	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Variant 6: Cauda equina syndrome.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Plain MRI	8	
MRI + Gadolinium	6	
Plain Lumbar X-Rays	5	
CT	4	
Myelogram/CT	4	May be requested preoperatively.
Myelogram	2	
Isotope Bone Scan	2	
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References

1. Scientific approach to the assessment and management of activity-related spinal disorders. A monograph for clinicians. Report of the Quebec Task Force on Spinal Disorders. *Spine* 1987; 12(7):S1-S59.
2. Acute low back problems in adults: assessment and treatment. Agency for Health Care Policy and Research. *Clin Pract Guidel Quick Ref Guide Clin* 1994; (14)iii-iv:1-25.
3. Florida medical practice guidelines for low back pain or injury. State of Florida Agency for Health Care Administration; 1996; Tallahassee, Florida.
4. Schutte HE, Park WM. The diagnostic value of bone scintigraphy in patients with low back pain. *Skeletal Radiol* 1983; 10(1):1-4.
5. Even-Sapir E, Martin RH, Mitchell MJ, Iles SE, Barnes DC, Clark AJ. Assessment of painful late effects of lumbar spinal fusion with SPECT. *J Nucl Med* 1994; 35(3):416-422.
6. Holder LE, Machin JL, Asdourian PL, Links JM, Sexton CC. Planar and high-resolution SPECT bone imaging in the diagnosis of facet syndrome. *J Nucl Med* 1995; 36(1):37-44.
7. Post MJ, Sze G, Quencer RM, Eismont FJ, Green BA, Gahbauer H. Gadolinium-enhanced MR in spinal infection. *J Comput Assist Tomogr* 1990; 14(5):721-729.
8. Hitselberger WE, Witten RM. Abnormal myelograms in asymptomatic patients. *J Neurosurg* 1968; 28(3):204-206.
9. Wiesel SW, Tsourmas N, Feffer HL, Citrin CM, Patronas N. A study of computer-assisted tomography. I. The incidence of positive CAT scans in an asymptomatic group of patients. *Spine* 1984; 9(6):549-551.
10. Boden SD, Davis DO, Dina TS, Patronas NJ, Wiesel SW. Abnormal magnetic-resonance scans of the lumbar spine in asymptomatic subjects. A prospective investigation. *J Bone Joint Surg Am* 1990; 723:403-408.
11. Jensen MC, Brant-Zawadzki MN, Obuchowski N, Modic MT, Malkasian D, Ross JS. Magnetic resonance imaging of the lumbar spine in people without back pain. *N Engl J Med* 1994; 331(2):69-73.
12. Modic MT, Masaryk T, Boumphrey F, Goormastic M, Bell G. Lumbar herniated disk disease and canal stenosis: prospective evaluation by surface coil MR, CT, and myelography. *AJR* 1986; 147(4):757-765.
13. Jackson RP, Lain JE, Jacobs RR, Cooper BR, McManus GE. The neuroradiographic diagnosis of lumbar herniated nucleus pulposis: II. A comparison of computed tomography (CT), myelography, CT-myelography, and magnetic resonance imaging. *Spine* 1989; 14(12):1362-1367.
14. Kent DL, Haynor DR, Larson EB, Deyo RA. Diagnosis of lumbar spinal stenosis in adults: a metaanalysis of the accuracy of CT, MR, and myelography. *AJR* 1992; 158(5):1135-1144.
15. Colhoun E, McCall IW, Williams L, Cassar VN. Provocation discography as a guide to planning operations on the spine. *J Bone Joint Surg Br* 1988; 70(2):267-271.

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