2011 Imaging Criteria

Magnetic Resonance Imaging (MRI), Lumbar Spine[1*MDR, 2*RIN, 3]

ICD-9-CM: 88.93
CPT: 72148, 72149, 72158
I/O Setting: Outpatient

INDICATION(S)

100 Suspected nerve root compression by lumbar disc herniation/foraminal stenosis
200 Suspected lumbar spinal stenosis
300 Suspected cauda equina syndrome ♦
400 Degenerative disc disease by x-ray
500 Suspected lumbar spine injury with neurologic deficit at/distal to injury ♦
600 Suspected nerve root compression by tumor/metastasis (gadolinium contrast recommended) ♦
700 Suspected bone metastasis (gadolinium contrast recommended)
800 Follow-up bone metastasis after Rx
900 Preoperative evaluation of osteomyelitis (gadolinium contrast recommended)
1000 Suspected osteomyelitis/disc space infection (gadolinium contrast recommended)
1100 Follow-up epidural abscess (gadolinium contrast recommended)
1200 Suspected meningocele post lumbar spine surgery (gadolinium contrast recommended)

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100 Suspected nerve root compression by lumbar disc herniation/foraminal stenosis **[One]**[4, 5]
- 110 Unilateral radiculopathy with motor deficit **[One]**[6, 7]
  - 111 Severe weakness/mild atrophy in nerve root distribution by PE[8]
  - 112 Mild to moderate weakness in nerve root distribution by PE **[One]**
    - -1 Continued Sx/findings **after** Rx **[Both]**
      - A) NSAID **[One]**[9]
        - 1) Rx ≥ 3 wks
        - 2) Contraindicated/not tolerated[10]
      - B) Activity modification ≥ 6 wks[11]
    - -2 Worsening weakness/motor deficit ♦[12]
- 120 Unilateral radiculopathy with sensory deficit **[One]**[13]
  - 121 Refractory severe pain in nerve root distribution **[All]**[14]
    - -1 Pain unrelieved by change in body position
    - -2 Interferes with ADLs[15]
    - -3 Continued severe pain **after** Rx **[Both]**[16]
      - A) NSAID **[One]**[9]
        - 1) Rx ≥ 3 days
        - 2) Contraindicated/not tolerated[10]
      - B) Opiate **[One]**[17]

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1) Rx ≥ 3 days
2) Contraindicated/not tolerated

122 Mild to moderate pain/paresthesias/numbness in nerve root distribution **[One]**
- -1 Continued Sx/finding **after** Rx **[Both]**[18]
  - A) NSAID **[One]**[9]
    - 1) Rx ≥ 3 wks
    - 2) Contraindicated/not tolerated[10]
  - B) Activity modification ≥ 6 wks[11]
- -2 Worsening Sx/findings ♦[19]

200 Suspected lumbar spinal stenosis **[All]**[20*RIN, 21, 22]
- 210 Low back/bilateral lower extremity Sx/findings **[All]**[23, 24]
  - 211 Pain/paresthesias/numbness worse with walking
  - 212 Pain/paresthesias/numbness worse with spinal extension
  - 213 Pain/paresthesias/numbness improved with forward flexion
- 220 Symptoms interfere with ADLs[15]
- 230 Continued Sx/findings **after** Rx **[Both]**[25]
  - 231 NSAID **[One]**[9]
    - -1 Rx ≥ 3 wks
    - -2 Contraindicated/not tolerated[10]
  - 232 Activity modification ≥ 6 wks[26]

300 Suspected cauda equina syndrome **[One]** ♦[27, 28]
- 310 Bilateral lower extremity weakness/numbness/pain[8, 29]
- 320 Bowel incontinence and other etiologies excluded
- 330 Bladder dysfunction and other urologic etiologies excluded[30]
- 340 Diminished rectal sphincter tone by PE
- 350 Perianal/perineal "saddle" anesthesia by PE

400 Degenerative disc disease by x-ray **[All]**[31, 32]
- 410 Back pain interferes with ADLs[15]
- 420 No neurologic Sx/findings[33]
- 430 X-ray findings **[All]**[34]
  - 431 Disc space narrowing
  - 432 Osteophyte formation
  - 433 End-plate sclerosis
- 440 Continued symptoms **after** Rx **[All]**
  - 441 NSAID **[One]**[9]
    - -1 Rx ≥ 3 wks
    - -2 Contraindicated/not tolerated[10]
  - 442 Activity modification ≥ 6 wks[35]

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443 PT ≥ 6 wks[36]
450 Preoperative evaluation[37]

500 Suspected lumbar spine injury with neurologic deficit at/distal to injury ♦[38]

600 Suspected nerve root compression by tumor/metastasis (gadolinium contrast recommended) **[Both]**[39, 40] ♦
610 Lumbar spine Sx/findings **[One]**
611 Cancer by Hx
612 Pain by Hx
613 Bone lesion by bone scan/x-ray
620 Unilateral pain/weakness in nerve root distribution[41]

700 Suspected bone metastasis (gadolinium contrast recommended) **[All]**[40, 42]
710 Cancer by Hx
720 No neurologic Sx/findings[43*RIN]
730 Lumbar spine Sx/findings **[One]**
731 Pain by Hx
732 Bone lesion by bone scan/x-ray
740 Bone scan **[One]**[44]
741 Negative/nondiagnostic for bone metastasis[45]
742 Positive site in lumbar spine[46]

800 Follow-up bone metastasis after Rx **[All]**[47]
810 No neurologic Sx/findings[43*RIN]
820 Initial lumbar spine MRI positive
830 Chemotherapy/radiation Rx completed[48]

900 Preoperative evaluation of osteomyelitis (gadolinium contrast recommended)[49, 50]

1000 Suspected osteomyelitis/disc space infection (gadolinium contrast recommended) **[Both]**[49, 51]
1010 Localized lumbar spine pain by Hx
1020 Findings **[One]**[52, 53]
1021 ESR > 30 mm/hr
1022 Temperature > 100.4 F(38.0 C)
1023 WBC > 10,000/cu.mm($10x10^9$/L)
1024 Blood culture positive
1025 C-reactive protein > 10 mg/L

1100 Follow-up epidural abscess (gadolinium contrast recommended) **[One]**[40, 54, 55]

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- 1110 New/worsening neurologic Sx/findings **[One]** ♦
  - 1111 Muscle weakness by Hx/PE
  - 1112 Sensory deficit by Hx/PE
  - 1113 Loss of bowel/bladder control by Hx
- 1120 New/worsening pain at site ♦
- 1130 Periodic evaluation of response to Rx w/o new/worsening Sx/findings[56]

1200 Suspected meningocele post lumbar spine surgery (gadolinium contrast recommended)[57, 58]

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Notes

(1)-MDR:

While MRI is becoming a routine part of the preoperative evaluation for chronic low back pain, its use in this context is considered controversial because the efficacy of surgery itself remains unproven. Requests for MRI for chronic low back pain without underlying pathology require secondary medical review.

(2)-RIN:

These criteria do not cover positional MRI, a newer technique that uses an open-configuration system in which patients are scanned in a weight-bearing, upright position and in the flexed and extended positions (Jinkins et al., Eur Radiol 2005; 15(9): 1815-1825). A recent cohort study reported improved detection of missed disc herniations using a dynamic MRI system in patients with clinical symptoms but without abnormal conventional MRI findings (Zou et al., Spine (Phila Pa 1976) 2008; 33(5): E140-144). While there is currently no consensus for best practice, this technique shows promise for demonstrating clinically significant neural compression when conventional recumbent MRI is nondiagnostic.

(3)

The following are examples of relative and absolute contraindications to the use of magnetic resonance imaging:
• Implanted devices that are electrically or magnetically activated (e.g., cardiac pacemakers, automatic cardioverter defibrillators, drug infusion pumps, cochlear implants)
• Ferromagnetic metal objects (e.g., cerebral aneurysm clips, intraocular metallic foreign body, prostheses, screws)
• Pregnancy, first trimester
• Renal insufficiency in cases when magnetic resonance imaging is performed with gadolinium-based contrast

(4)

MRI is the initial study of choice for suspected nerve root compression, whether caused by disc disease, tumor, or metastatic disease. CT or MYL-CT may be needed if MRI is not feasible.

(5)

Compression usually affects the sensory neurons of the nerve root first, causing pain and paresthesias. Motor neurons are somewhat less vulnerable, and are usually affected later or in more severe compression. Neurologic findings of sensory loss and reflex loss are corroborative findings for compressive radiculopathy but are not substitutes for radicular pain or muscle weakness.

(6)-DEF:

Lumbar radiculopathy refers to a sensory or motor dysfunction in the discrete distribution of an affected lumbar nerve root. Most cases result from compression of the nerve root as it exits the spinal canal, usually by a disc herniation. Radiculopathy is also frequently caused by stenosis of the lateral recess, a space bounded by the vertebral processes through which the nerve root must pass.

(7)

Weakness in radiculopathy affects muscles innervated in a specific nerve root distribution:
• Quadriceps weakness (L3)
• Quadriceps or anterior tibialis weakness (L4)
• Foot or toe dorsiflexor weakness (L5)
• Foot, toe plantar flexor, or hamstring weakness (S1)

Anatomic variation can exist in these nerve root distributions. Early on in the disease process the entire nerve root distribution may not be affected.

(8)

Muscle strength can be graded on a 0 to 5 scale (0 is no visible or palpable muscle contraction and 5 is normal strength) (Braddom and Buschbacher, Physical medicine and rehabilitation, 2nd ed. 2000). For the purposes of these criteria, severe muscle weakness is defined as "less than 2 out of 5" muscle strength by PE (less than full ROM with gravity eliminated) or the inability to ambulate.

(9)-POL:

NSAIDs are preferred for the treatment of this condition because of their anti-inflammatory effect. It is a matter of local medical policy whether to accept acetaminophen or other analgesics as alternatives for NSAIDs.

(10)

Contraindications to NSAIDs may be absolute (e.g., pregnancy, history of allergic reaction) or relative (e.g., anticoagulant use, history of PUD).

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(11)
Activity modification for lumbar radiculopathy involves limiting activities that provoke or aggravate symptoms, such as heavy lifting, repetitive bending, or prolonged standing. PT with exercises to improve posture and strengthen the lumbar muscles may be beneficial in some patients.

(12)
Urgent imaging should be considered for patients with progressive motor weakness.

(13)
Pain in radiculopathy is present in a specific nerve root distribution:
• Hip, thigh, and knee pain (L3)
• Hip, thigh, knee, and medial leg pain (L4)
• Hip, lateral thigh, and leg pain (L5)
• Buttock, posterior thigh, and calf pain (S1)
Anatomic variation can exist in these nerve root distributions. Early on in the disease process the entire nerve root distribution may not be affected.

(14)
Early evaluation for patients with refractory pain is reasonable, including those patients with excruciating symptoms that are unremitting, totally unresponsive to treatment, and interfere significantly with ADLs. This is an unusual circumstance, as most patients are able to achieve some relief with rest and analgesics. Early evaluation is to verify the diagnosis, to exclude other causes of severe pain, and for consideration of interventions such as epidural steroid injection and surgery. Assessment should also include psychosocial issues, since nonphysical factors can complicate treatment.

(15)
Activities of daily living (ADLs) are frequently divided into those simple activities relating to basic self-care and those that involve more complex interactions with others and the environment (called instrumental activities of daily living or IADLs). This criterion includes both types of activity. Whether a condition is of sufficient severity to interfere with ADLs or IADLs is somewhat subjective. There should be an indication that symptoms impede the patient's ability to effectively work, shop, manage at home, care for family members, or tend to personal hygiene.

(16)
Muscle relaxants (e.g., cyclobenzaprine) may be effective within the first 4 days of treatment when muscle spasm is present; their benefits, however, must be weighed against their sedative properties (Chou and Huffman, Ann Intern Med 2007; 147(7): 505-514).

(17)
The short-term effectiveness of opioids has been documented for a variety of pain syndromes; prolonged use is generally not recommended because of the potential for sedation and physical dependence (Douglass and Bope, J Am Board Fam Pract 2004; 17 Suppl: S13-22).

(18)
Treatment of radiculopathy primarily involves NSAIDs and activity modification. Opiates are sometimes useful for short-term pain control, and some patients find relief using muscle relaxants as well.

(19)
Worsening symptoms includes pain that is intensifying or extending to a more distal site.

(20)-RIN:
Cauda equina syndrome is suspected in patients who present with bilateral sensory loss or significant motor deficits. For suspected cauda equina syndrome, see indication 300 within this criteria subset.

(21)-DEF:
Lumbar spinal stenosis is a syndrome of single or multiple level narrowing of the spinal canal. It is usually caused by degenerative changes involving the spine. Severe cases of lumbar spinal stenosis can result in cauda equina compression.

(22)
MRI is the imaging procedure of choice for suspected lumbar spinal stenosis. MRI is more sensitive than CT in demonstrating disc degeneration, disc protrusion, and nerve root compression. CT or MYL-CT is reasonable when MRI is unavailable or contraindicated (Sengupta and Herkowitz, Orthop Clin North Am 2003; 34(2): 281-295; Patel, J Neurol Neurosurg Psychiatry 2002; 73 Suppl 1: i42-48).

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(23)
Symptoms of pain in the buttocks, thighs, or calves with walking or after prolonged standing are known as neurogenic claudication.

(24)
Neurogenic intermittent claudication secondary to lumbar spinal stenosis is a degenerative condition generally affecting patients 50 years of age or older. Characteristic symptoms include back and leg pain, tingling, numbness, and weakness that are present depending on the patient's posture; symptoms become worse with spinal extension, such as with walking or after prolonged standing and are relieved with forward flexion.

(25)
Patients with spinal stenosis usually respond to conservative treatment; imaging is postponed until there is a need for an intervention (Watters et al., Spine J 2008; 8(2): 305-310).

(26)
Activity modification for lumbar spinal stenosis involves limiting activities that provoke or aggravate symptoms, and may include a brief period of rest. PT with exercises to improve posture and strengthen lumbar muscles, and flexion exercises (e.g., riding a stationary bike in a forward flexed position) may be beneficial in some patients (Sengupta and Herkowitz, Orthop Clin North Am 2003; 34(2): 281-295; Patel, J Neurol Neurosurg Psychiatry 2002; 73 Suppl 1: i42-48).

(27)-DEF:
The cauda equina (horse's tail) is a collection of dorsal and ventral nerve roots caudal to the termination of the spinal cord. Cauda equina syndrome is compression of these multiple nerve roots in the lumbar spinal canal, usually due to a large central herniated disc. The primary symptoms of cauda equina syndrome include lower extremity weakness, bowel and bladder dysfunction, diminished rectal sphincter tone, or perianal or perineal "saddle" anesthesia.

(28)
MRI is the preferred imaging procedure since it will better demonstrate the cause and extent of the cauda equina compression.

(29)
An isolated sensory deficit as the sole manifestation of cauda equina compression is rare. If an isolated sensory deficit is present, peripheral neuropathy (e.g., diabetic neuropathy) is more likely. The pattern of sensory loss in cauda equina compression is often diffuse (with overlapping nerve root distributions) and asymmetric or unilateral.

(30)
Urinary retention is a common symptom of cauda equina syndrome. Other urinary symptoms may include frequency, hesitancy, urgency, or incontinence.

(31)
Lumbar degenerative disc disease is described as disc space narrowing, vertebral end-plate sclerosis, and osteophyte formation often affecting several spinal levels. Over time, repetitive stresses and aging may lead to the biochemical degradation of the disc. Pain can radiate into the hips, buttocks, and thighs and is thought to be originating from the disc space; it should not be confused with radiculopathy in a nerve root distribution caused by a lumbar disc herniation.

(32)
Lumbar degenerative disc disease is a diagnosis based on imaging findings that distinguish it from chronic low back pain without underlying pathology; multiple levels may be involved.

(33)
The neurologic examination of patients with degenerative disc disease is usually normal with no deficits found in motor strength, sensation, and reflexes.

(34)
X-ray is appropriate for evaluating patients with nontraumatic back pain who fail to respond to conservative treatment. AP and lateral x-rays are taken to assess the levels of degeneration, evaluate alignment, and exclude occult fracture. Flexion and extension views are not routinely used in the initial evaluation of patients with lumbar pain (Hammouri et al., Spine 2007; 32(21): 2361-2364).

(35)
Activity modification for degenerative disc disease involves limiting activities that provoke or aggravate symptoms. Patients should avoid repeated or prolonged bending, lifting, or unsupported sitting.

(36)
A comprehensive rehabilitative program is required for patients with degenerative disc disease. The program should include back education and progressive exercise training. Manual therapy, which includes techniques such as mobilization, manipulation, or

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manual traction, may be used to reduce pain, or increase ROM.

(37)

MRI is performed as part of the preoperative evaluation to determine eligibility and appropriate levels for surgery.

(38)

MRI is the preferred test for imaging cord injuries, with its ability to differentiate cord contusion from cord compression (Daffner and Hackney, J Am Coll Radiol 2007; 4(11): 762-775). Cord injuries include cases with fracture and those without fracture (SCIWORA - spinal cord injury without radiologic abnormality). Often both CT and MRI are performed in this setting.

(39)

Nerve root compression by tumor should be suspected for patients with a history of cancer and new extremity pain. Most commonly this refers to metastatic cancer, although primary bone tumors may also cause nerve root compression.

(40)

Gadolinium-enhanced MRI (GdMRI) is the preferred imaging method for evaluating patients with suspected or confirmed primary tumor or metastatic intraspinal extension, suspected or confirmed disc space infection, or an epidural abscess (Chin, Semin Neurol 2002; 22(2): 205-220; Runge et al., Top Magn Reson Imaging 2001; 12(4): 231-263). Contrast improves lesion delineation, localizes regions likely to provide positive biopsy, and identifies active disease (Jacobs et al., NeuroRx 2005; 2(2): 333-347).

(41)

The weakness with nerve root compression affects muscles innervated in a specific nerve root distribution:
- Quadriceps weakness (L3)
- Quadriceps or anterior tibialis weakness (L4)
- Foot or toe dorsiflexor weakness (L5)
- Foot, toe plantar flexor, or hamstring weakness (S1)

The pain with nerve root compression is present in a specific nerve root distribution:
- Hip, thigh, and knee pain (L3)
- Hip, thigh, knee, and medial leg pain (L4)
- Hip, lateral thigh, and leg pain (L5)
- Buttock, posterior thigh, and calf pain (S1)

Anatomic variation can exist in these nerve root distributions. Early on the entire nerve root distribution may not be affected.

(42)

Metastases from primary breast, lung, and prostate cancer are the most common neoplasms of the spine (Ratliff and Cooper, South Med J 2004; 97(3): 246-253).

(43)-RIN:

For neurologic symptoms or findings, see indication 100, 200, 300, 500, or 600 within this criteria subset.

(44)

In patients with known cancer and bone pain, a bone scan is appropriate for initial staging.

(45)

Although a bone scan is positive in the vast majority of patients with spinal metastasis, it can be negative or nondiagnostic in some tumors, such as myeloma, lymphoma, and anaplastic tumors.

(46)

MRI is appropriate for single or multiple positive sites on bone scan to allow for accurate assessment of soft tissue extension or for preoperative planning.

(47)

MRI is an appropriate study if symptoms of bone pain return (Ratliff and Cooper, South Med J 2004; 97(3): 246-253). Gadolinium enhanced MRI (GdMRI) is used when epidural or soft tissue extension is not clearly visible on noncontrast MRI (Runge et al., Top Magn Reson Imaging 2001; 12(4): 231-263).

(48)

The assessment is generally performed about 6 weeks after radiation is completed or after the chemotherapy is completed.

(49)

Although relatively uncommon, vertebral osteomyelitis can occur in patients with recent spine surgery, or in those with DM, immunosuppression, IV drug use, or alcohol dependence. Early diagnosis and treatment can prevent serious complications that may include vertebral instability or collapse, or the development of an epidural abscess (Patel, J Neurol Neurosurg Psychiatry 2002; 73

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Suppl 1: i42-48; Tay et al., J Am Acad Orthop Surg 2002; 10(3): 188-197). MRI is the imaging modality of choice with 96% sensitivity and 93% specificity for diagnosing osteomyelitis compared with the 90% sensitivity and 78% specificity for bone scan (Jarvik and Deyo, Ann Intern Med 2002; 137(7): 586-597). Gadolinium-enhanced MRI is crucial in the evaluation of vertebral collapse due to osteomyelitis (Tehranzadeh and Tao, Semin Ultrasound CT MR 2004; 25(6): 440-460).

(50)

CT and MRI can both be used to image osteomyelitis. CT is used to reveal the location and amount of bone destruction, but it is less sensitive for detecting early marrow changes not associated with cortical bone abnormalities (Tay et al., J Am Acad Orthop Surg 2002; 10(3): 188-197). MRI is superior for assessment of bone marrow involvement, vertebral end plate destruction, and the spread of infection into the spinal canal, nerve roots, and soft tissue (Nikkanen et al., J Emerg Med 2002; 22(3): 279-283; Stabler and Reiser, Radiol Clin North Am 2001; 39(1): 115-135).

(51)

Disc space infection is most common in patients with prior spine surgery, and is often difficult to diagnose because the MRI changes seen in the disc space are often assumed to be normal postsurgical changes. TB may involve the disc space in patients without prior surgery; this occurs most frequently in the thoracic spine. Patients with DM are also prone to disc space infection.

(52)

If the patient is immunocompromised, fever may not be present and the WBC may be unchanged or low.

(53)

Although x-rays are commonly performed for suspected osteomyelitis or discitis and may be highly suggestive, MRI remains the definitive test to determine the extent of disease. In addition, vertebral osteomyelitis may not be found on initial x-ray, as infection is often present 2 to 3 weeks before radiologic changes are evident (Nikkanen et al., J Emerg Med 2002; 22(3): 279-283).

(54)

Spinal epidural abscess is rare and, without treatment, can result in CNS dysfunction and death. Symptoms and findings are nonspecific and range from low back pain to sepsis. Risk factors include immunocompromised states (e.g., AIDS, chronic renal failure), recent spinal surgery, or vertebral trauma (Tay et al., J Am Acad Orthop Surg 2002; 10(3): 188-197).

(55)

A high index of suspicion is warranted for patients who present with spinal pain or a neurologic deficit in conjunction with a fever or elevated ESR. Gadolinium-enhanced MRI should be performed in known or suspected cases to localize and define the spinal epidural abscess (Bluman et al., J Am Acad Orthop Surg 2004; 12(3): 155-163).

(56)

The frequency of assessment is a matter of clinical judgment, but in a patient with stable symptoms and findings, it is rarely necessary to perform a study more frequently than weekly. MRI is performed to monitor resolution of the abscess in response to antibiotic therapy. If there is no progress, surgical drainage may be necessary.

(57)-DEF:

A meningocele is a protrusion of the meninges through a bony defect in the vertebral column (usually lumbosacral). Meningoceles do not contain neural elements.

(58)

A meningocele is suspected when a CSF leak is noted following lumbar spine surgery. If a CSF leak is present, repair is performed urgently to prevent a CNS infection.

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