Evaluation and Treatment of Acute Back Pain in the Emergency Department

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KEYWORDS
- Back pain
- Epidural compression
- Epidural abscess
- Herniated disc
- Vertebral osteomyelitis

KEY POINTS
- Back pain is a common presenting complaint in the emergency department (ED).
- Most patients have a benign etiology for their symptoms, requiring only a red flag focused history and physical examination without any diagnostic testing or imaging.
- Most patients with a herniated disc do not require emergent imaging in the ED.
- Suspected spinal infection and epidural compression syndromes are emergent conditions that require imaging with MRI in the ED.

INTRODUCTION: NATURE OF THE PROBLEM

Low back pain is a significant problem that has an annual incidence of 5% and affects up to 90% of the population at some point in their lives. It is the fifth most common cause for physician visits and accounts for approximately 3% of emergency department (ED) visits in the United States.1–4 Approximately 30% of patients who present to the ED with back pain undergo diagnostic imaging with plain radiography; 10% undergo CT (Computed Tomography) or MRI.5 Low back pain is the most common cause of work-related disability in persons younger than 45 years and the second most common cause of temporary disability for all ages. Approximately 2% of the US work force is compensated for back pain annually.

Most studies show that up to 85% to 90% of patients with acute low back pain resolve their symptoms in 4 to 6 weeks without any clear cause determined for their symptoms.1–3,6 Because it is such a common complaint with a benign outcome for most, the provider can be lulled into a false sense of security and potentially miss clues to more serious disease that can have significant morbidity and mortality. To help...
prevent this, the provider should approach every patient with a complaint of back pain systematically, with a focus on “red flags” in the history and physical examination that are markers for more serious disease, and use the presence or absence of these to drive the diagnostic and treatment plan.

The “red flags” of back pain are important historical and physical features that point to potentially dangerous conditions. Identification of a red flag warrants close attention and potentially further evaluation with diagnostic testing. These red flags were defined in a set of guidelines on acute low back pain published by the Agency for Health Care Policy and Research.6

PATIENT HISTORY

A focused history is the most critical tool for identifying risk factors for serious disease in a patient who presents with low back pain. Directing the history toward the red flags allows for an efficient, cost-effective assessment (Table 1).

Duration of Symptoms

- Low back pain falls into 3 categories based on duration:
  - Acute pain lasts less than 6 weeks;
  - Subacute pain continues for 6 to 12 weeks; and
  - Chronic pain persists for longer than 12 weeks.
- Pain lasting longer than 6 weeks is a red flag because 80% to 90% of episodes have resolved by that time.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Clues in the history that raise a “red flag” in the evaluation of low back pain</th>
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</thead>
<tbody>
<tr>
<td>Red Flags</td>
<td>Possible Cause</td>
</tr>
<tr>
<td>Duration &gt;6 wk</td>
<td>Tumor, infection, rheumatologic</td>
</tr>
<tr>
<td>Age &lt;18 y</td>
<td>Congenital defect, tumor, infection, spondylolysis, spondylolisthesis</td>
</tr>
<tr>
<td>Age &gt;50 y</td>
<td>Tumor, infection, intra-abdominal process (abdominal aortic aneurysm, pancreatitis, kidney stone)</td>
</tr>
<tr>
<td>Major trauma, or minor trauma in elderly</td>
<td>Fracture</td>
</tr>
<tr>
<td>Cancer</td>
<td>Tumor</td>
</tr>
<tr>
<td>Fever, chills, night sweats</td>
<td>Tumor, infection</td>
</tr>
<tr>
<td>Weight loss</td>
<td>Tumor, infection</td>
</tr>
<tr>
<td>Injection drug use</td>
<td>Infection</td>
</tr>
<tr>
<td>Immunocompromised status</td>
<td>Infection</td>
</tr>
<tr>
<td>Recent genitourinary or gastrointestinal procedure</td>
<td>Infection</td>
</tr>
<tr>
<td>Night pain</td>
<td>Tumor, infection</td>
</tr>
<tr>
<td>Unremitting pain</td>
<td>Tumor, infection</td>
</tr>
<tr>
<td>Pain worsened by coughing, sitting, or Valsalva maneuver</td>
<td>Herniated disc</td>
</tr>
<tr>
<td>Pain radiating below knee</td>
<td>Herniated disc or nerve root compression below the L3 nerve root</td>
</tr>
<tr>
<td>Incontinence</td>
<td>Epidural compression syndrome</td>
</tr>
<tr>
<td>Saddle anesthesia</td>
<td>Epidural compression syndrome</td>
</tr>
<tr>
<td>Severe or rapidly progressive neurologic deficit</td>
<td>Epidural compression syndrome</td>
</tr>
</tbody>
</table>
• A common ED presentation is the patient who has had pain for 4 to 6 weeks without any medical evaluation or treatment regimen. In these cases, it is reasonable to delay the workup and to have them followed closely by their primary care provider, as long as there are no other red flags.

• Another common, yet higher risk, presentation is the patient who has chronic back symptoms but has acute worsening of the pain. In these patients, review the previous evaluation to ensure it has been thorough and that important findings have not been overlooked.

**Age**

• Back pain in patients younger than 18 or older than 50 years is a red flag.

• In both of these age groups, a serious etiology, such as tumor or infection, should be considered.

• Patients under age 18 have also have an higher incidence of congenital and bony abnormalities, such as spondylolisthesis or spondylolysis.

• Patients older than 50 years are more likely to have nonmechanical causes, such as a rupturing abdominal aortic aneurysm or other intra-abdominal processes.

• Spinal stenosis is more common in persons older than 65 years.

**Location and Radiation of the Pain**

• Pain that originates from muscular or ligamentous strain, or from degenerative disc disease without nerve involvement, is located primarily in the back, although it may radiate into the buttocks or thighs.

• Pain that radiates below the knee is a red flag for a herniated disc or nerve root compression below the L3 nerve root.
  - This is based on the dermatomal distribution of the nerve roots and the fact that the pain associated with compression or inflammation is referred along the entire pathway of the nerve.
  - More than 90% of herniated discs occur at the L4-5 or the L5-S1 disc space. This means that they impinge on the L5 or S1 nerve roots respectively, and produce a radiculopathy that extends into the lower leg and foot along the pathway of that nerve root.¹,⁷

• The location of the pain helps to distinguish mechanical low back pain from sciatica.
  - Sciatica is a radicular pain that travels into the legs in the distribution of a lumbar or sacral nerve root and is accompanied often by sensory and motor deficits.¹,⁷
  - Sciatica may be associated with low back pain, but patients with sciatica typically complain primarily about the leg symptoms more so than the back pain.
  - Only 1% to 3% of patients with low back pain have associated sciatic symptoms.¹,⁷,⁸

**History of Trauma**

• Major trauma is a red flag for the possibility of fracture and should prompt the physician to order plain radiographs of the involved spine.

• Minor trauma in the elderly, such as falling from a standing or seated position, should also raise concern for fracture owing to osteoporosis.

**Systemic Complaints**

• Constitutional symptoms, such as fever, chills, night sweats, malaise, or unintended weight loss, suggest infection or malignancy.
Constitutional symptoms are especially worrisome if the patient is immunocompromised, including diabetes, or has other risk factors for infection, such as a recent bacterial infection or injection drug use.

- Back pain in an injection drug user is generally assumed to be a spinal infection until ruled out with imaging studies.
- A recent pneumonia, urinary tract infection, or genitourinary or gastrointestinal procedure may predispose the patient to infection secondary to bacteremia.

*Atypical Pain Features*

- Benign low back pain is typically described as a dull, aching pain that generally worsens with movement and improves with lying still.
- Red flags for tumor and infection include pain that is much worse at night or is unrelenting, despite appropriate analgesia and rest.
- Pain from a herniated disc may be worsened by coughing, sitting, or the Valsalva maneuver and is relieved by lying supine.7–9
- Spinal stenosis is a bilateral sciatic pain worsened by activities such as walking, prolonged standing, and back extension, and is relieved by rest and forward flexion.
- In the author’s experience, night pain and unrelenting pain are the most worrisome symptoms that are commonly overlooked in the evaluation of patients with back pain.

*Associated Neurologic Deficits*

- Most patients with a benign etiology for low back pain will have no neurologic deficits.
- Any severe or rapidly progressive neurologic deficit is a red flag.
  - Consider an epidural compression syndrome, such as spinal cord compression, cauda equina syndrome, or conus medullaris syndrome, in a patient who reports bowel or bladder incontinence with low back pain.
  - Patients with a history of urinary incontinence (whether just 1 episode or many) may be evaluated by measuring a postvoid residual volume.
    - A large postvoid residual indicates overflow incontinence. In the setting of low back pain, this suggests significant neurologic compromise and mandates an immediate evaluation for an epidural compression syndrome.
    - A negative postvoid residual rules out significant neurologic compromise.1,10
  - Other neurologic complaints, such as paresthesias, numbness, weakness, and gait disturbances, need to be further evaluated during the history and physical examination to determine whether the symptoms involve single or multiple nerve roots.

*History of Cancer*

- Patients with a history of cancer are at risk of spinal metastases. The more common malignancies that involve the spine are breast, lung, thyroid, kidney, and prostate cancers, and myeloma, lymphoma, and sarcoma.
- In more than 90% of these patients, back pain is the initial symptom of spinal metastases.1,11–13

*Urinary, Abdominal, or Chest Complaints*

- Review these areas to avoid overlooking disease processes referring to the back.
- The most serious of these is a ruptured abdominal aortic aneurysm. Other potential causes of pain referred to the back include pancreatitis, a posterior lower lobe pneumonia, nephrolithiasis, and renal infarct.
PHYSICAL EXAMINATION

The examination is neither complicated nor prolonged. It is directed toward ruling out red flags and identifying specific neurologic deficits (Table 2).

Vital Signs

- Fever strongly suggests infection.
  - The sensitivity of fever is low: 27% for tuberculous osteomyelitis, 50% for pyogenic osteomyelitis, 60% to 70% for pyogenic discitis, and 66% to 83% for spinal epidural abscess.\(^{10,14-16}\)
  - Approximately 2% of patients with nonspecific back pain present with a fever that is not owing to a spinal infection. In these cases, it is usually attributed to a concomitant viral illness.\(^10\) Noting this, the principal concern should still be for spinal infection until further history, examination, and possibly diagnostic testing rule it out.

General Appearance

- The patient with benign back pain is most comfortable when lying still.
- In the patient who is writhing and cannot get comfortable, consider spinal infection, abdominal aortic aneurysm or dissection, and nephrolithiasis.

Abdomen

- All patients require an abdominal examination evaluating for masses, tenderness, or evidence of an aortic aneurysm.

Back

- Examine for any signs of underlying disease.
- Erythema, warmth, and purulent drainage are signs of infection.
- Contusion or swelling raises a red flag for trauma.
- Point tenderness to percussion is found with fractures and bacterial infection, with a sensitivity of 86% and specificity of 60% for infection.\(^10\)

Perform a Straight Leg Raise Test

- With the patient lying supine, passively lift each leg individually to approximately 70° in an attempt to produce pain.
- A positive result consists of the reproduction of the patient’s radicular pain that travels below the knee of the affected leg.
  - This radicular pain is worsened by ankle dorsiflexion and improved with ankle plantar flexion or decreased elevation.

Table 2
Red flags in the physical examination

<table>
<thead>
<tr>
<th>Red Flags</th>
<th>Possible Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>Infection</td>
</tr>
<tr>
<td>Unexpected anal sphincter laxity</td>
<td>Epidural compression syndrome</td>
</tr>
<tr>
<td>Perianal/perineal sensory loss</td>
<td>Epidural compression syndrome</td>
</tr>
<tr>
<td>Major motor weakness</td>
<td>Nerve root compression</td>
</tr>
<tr>
<td>Point tenderness to percussion</td>
<td>Fracture or infection</td>
</tr>
<tr>
<td>Positive straight leg raise test result</td>
<td>L5 or L1 herniated disc</td>
</tr>
</tbody>
</table>
Reproduction of the patient’s back pain or pain in the hamstring area does not constitute a positive result.

- A positive straight leg raise is about 80% sensitive for an L4-5 or L5-S1 herniated disc.
- Radicular pain in the affected leg when the asymptomatic leg is lifted (positive crossed straight leg raise) is highly specific but not sensitive for a herniated disc.\(^1,2,7,8\)

**Neurologic Examination**

- This is the most important portion of the examination.
- Test sensation using light touch initially, followed by a pinprick, temperature, proprioception, and vibration if there are abnormalities on the initial examination.
- Test strength and reflexes by focusing on each muscle group and reflex innervated by a specific nerve root.
- Spinal nerve root examination:
  - The L1 through L3 nerve roots supply sensation over the anterior thigh and provide strength to the hip flexors. There is no well-defined reflex for these nerve roots.
  - The L4 nerve root provides sensation over the medial surface of the leg and foot, including the medial surface of the great toe, but not the first dorsal web space. The motor component of L4 involves leg extension (L2–L4) and ankle dorsiflexion and inversion. The patellar reflex is innervated predominantly by the L4 nerve root, with some contribution from L2 and L3.
  - The L5 nerve root provides sensation over the lateral leg and the dorsum of the foot, including the first dorsal web space. The muscular innervation from L5 is the extensor hallucis longus (great toe dorsiflexion) and dorsiflexors of the foot. There is no well-defined reflex for L5.
  - The S1 nerve root provides sensation over the plantar and lateral surface of the foot. It innervates the peroneal muscles, which evert the foot and, along with the S2 nerve root, is responsible for the muscles that plantarflex the foot and allow toe walking. The S1 nerve root innervates the Achilles’ reflex.
  - The S2 through S4 nerve roots supply sensation to the perineum, forming concentric rings surrounding the rectum. They are responsible for innervating the bladder and intrinsic muscle of the foot. They innervate the anal wink reflex.

**Rectal Examination**

- A rectal examination is not mandated for all patients with low back pain. It is indicated in those patients with red flags, especially those with neurologic complaints or severe pain.
- Evaluate rectal tone and sensation, for prostatic and rectal masses, and for abscess.
- Poor rectal tone in association with back pain and saddle anesthesia indicates an epidural compression syndrome.

**IMAGING AND ADDITIONAL TESTING**

In the majority of patients, no testing is required. However, diagnostic testing is indicated in the ED if the physician has a concern for fracture, infection, epidural compression, spinal metastases, or rheumatologic causes of the back pain.
Laboratory Tests

- Order a complete blood count, erythrocyte sedimentation rate (ESR), and urinalysis when considering spinal infection, neoplastic disease, or rheumatologic disease.
- With infection, the white blood cell count may be normal or elevated, but one cannot rely on a normal white blood cell count to rule out infection.
- With infection, the ESR is typically elevated (>20 mm/h), even in those with immunocompromise, with a sensitivity of 90% to 98% for an infectious etiology of spine pain.\textsuperscript{14–18} The ESR is also elevated in patients with a rheumatologic etiology of their symptoms, as well as in the majority of patients with neoplastic disease of the spine.\textsuperscript{1,19}
- C-reactive protein is a commonly ordered test and it is increased with acute spinal infection.\textsuperscript{1,14,20}
- Urinalysis is obtained to rule out urinary tract infection as an infectious source.
- Blood cultures should be drawn if there is a concern for spinal infection because they are frequently positive and help with long-term management.

DIAGNOSTIC IMAGING

Plain Radiographs

- Obtain plain radiographs if there is suspicion of a fracture.
- Only anteroposterior and lateral films of the lumbar spine are necessary; oblique projections add little information and more than double gonadal radiation exposure and cost.\textsuperscript{8}

MRI

- MRI is the preferred imaging modality for most patients with low back pain.
- MRI offers the best resolution of lesions in the vertebral bodies, soft tissue, spinal canal, and spinal cord, and provides excellent visualization of disc disease.
- Emergent MRI is the gold standard study for the evaluation of suspected spinal infection and epidural compression syndrome.
- MRI is indicated for routine or urgent use in the evaluation of neoplastic processes of the spine and of disc disease or when the patient’s symptoms fail to resolve after 6 to 8 weeks.

Computed Tomography

- CT is most useful in evaluating vertebral fractures, the facet joints, and the posterior elements of the spine.
- Its widespread availability makes it useful in emergencies when MRI is either unavailable or unsuitable.
- CT myelography is the best alternative when lesions involving the spinal canal are suspected and MRI is unavailable or if the patient is unable to undergo MRI.

DIFFERENTIAL DIAGNOSIS

Nonspecific Back Pain

Most patients with acute low back pain have conditions that may be generally classified as having nonspecific back pain; a more precise diagnosis is never made in up to 85% of these patients.\textsuperscript{1,2} The patient typically complains of a mild to moderate low back pain that is aggravated with movement and relieved with rest. There is usually no significant identifiable cause of the pain, nor are there any remarkable findings
on the physical examination. The evaluation of any red flags noted in the history or on physical examination reveals no significant underlying condition.

**Treatment options**

- These patients can be treated conservatively and monitored for 4 to 6 weeks to see if symptoms improve before requiring diagnostic evaluation. This is because 85% to 90% of these patients will recover spontaneously during this period.\(^1\)\(^,\)\(^6\)
- If any red flags appear or if the patient fails to improve, then diagnostic testing is indicated.\(^1\)\(^,\)\(^6\)
- Relapses of nonspecific low back pain occur in approximately 40% of patients within the first 6 months.\(^2\)\(^1\) A recurrence unaccompanied by red flags may not require immediate referral or further diagnostic evaluation.

**PHARMACOLOGIC TREATMENT OPTIONS**

**Nonsteroidal Anti-inflammatory Drugs**

- Nonsteroidal anti-inflammatory drugs (NSAIDs), which are all equally efficacious, are considered as first-line therapy for acute low back pain.\(^1\)\(^,\)\(^2\)\(^2\)\(^–\)\(^2\)\(^4\)
- However, 1 meta-analysis showed that NSAIDs vary in their side effect profiles and toxicity.\(^2\)\(^5\) Ibuprofen was the least toxic, particularly with regard to upper gastrointestinal tract bleeding. The concomitant use of misoprostol or omeprazole reduces the risk of clinically important gastrointestinal tract bleeding during NSAID therapy.\(^2\)\(^5\)

**Acetaminophen**

- There is no definitive evidence that NSAIDs are more effective than acetaminophen for symptomatic relief of low back pain.\(^1\)\(^,\)\(^2\)\(^5\)
- The author recommends using acetaminophen in combination with NSAIDs or as the sole initial agent when treating patients at risk for adverse effects of NSAIDs.

**Opiate Analgesics**

- Opiate analgesics may be prescribed for patients with moderate to severe pain. It is best not to prescribe more than 1 to 2 weeks of medication.
- When prescribing combination opiate–acetaminophen analgesics, warn patients not to combine them with other acetaminophen products.

**Muscle Relaxants**

- Muscle relaxants are as effective as NSAIDs, but they do not have a synergistic benefit when used in combination with NSAIDs.\(^1\)\(^,\)\(^2\)\(^2\)

**Steroids**

- Systemic steroids are not recommended, because their benefit has not been demonstrated.\(^1\)\(^,\)\(^2\)\(^2\),\(^2\)\(^6\)

**NONPHARMACOLOGIC TREATMENT OPTIONS**

**Activity Modification**

- Patients who resume their normal activities to the extent tolerable recover faster than those who stay in bed or perform back mobilizing exercises.\(^1\)\(^,\)\(^2\)\(^7\),\(^2\)\(^8\)
- Counsel patients to continue their routine activities, using their pain as the limiting factor.
Spinal Manipulation

- Spinal manipulation is among the more controversial treatments of acute low back pain.
- Research has shown that manipulation administered acutely was no better than physical therapy and only slightly better, in terms of patient satisfaction with care at 1 and 4 weeks, than an inexpensive educational booklet.\(^2^9\)
- A second study demonstrated that clinical outcomes with manipulation were no better than with standard medical therapy.\(^3^0\)
- A Cochrane review concluded that spinal manipulative therapy was no better than standard interventions for acute low back pain.\(^3^1\)

Other Physical Modalities

- None of the following have been proven effective for acute low back symptoms: traction, diathermy, cutaneous laser treatment, exercise, ultrasound treatment, and transcutaneous electrical nerve stimulation.\(^1,2\)
- Heat or ice may provide temporary symptomatic relief in some patients.

HERNIATED DISC

Patients with a herniated disc typically present with back pain and radicular symptoms, commonly called sciatica. Sciatica affects only 1% to 3% of all patients with low back pain, but is present in 95% of patients with a symptomatic herniated disc.\(^1,2,7,8\) A herniated disc is the most common cause of sciatica; others include foraminal stenosis, intraspinal tumor or infection, extraspinal plexus compression, piriformis syndrome, and lumbar canal stenosis (spinal stenosis).

Patients who present with low back pain owing to a herniated disc complain more frequently about the radicular symptoms than the back pain. Because more than 95% of disc herniations occur at the L4-5 or L5-S1 level, the radicular pain typically extends below the knee in the dermatomal distribution of that specific nerve root.\(^1,2,7,8\) This radicular component is useful in differentiating true sciatica from nonsciatic conditions, such as trochanteric bursitis, hip osteoarthritis and meralgia paresthetica.\(^9\) The approximately 5% of patients who have disc herniation above the L4-5 level are older persons. In this group, there is a relatively increased risk of disc herniation at the L2-3 and L3-4 levels. These herniations cause pain in the anterior thigh, weakness of the quadriceps, and a diminished patellar reflex on the affected side.\(^7,8\) An additional distinguishing feature of sciatica caused by a herniated disc is that the pain is aggravated by sitting, coughing, or Valsalva maneuver and is relieved by lying supine.\(^2,7-9\) The physical examination generally demonstrates localization of pain and a neurologic deficit in a unilateral single nerve root, and usually a positive result on the straight leg raise test.

Treatment Options

- If the patient has no other red flags, treat him or her conservatively and do not perform any diagnostic tests for the first 4 to 6 weeks of symptoms.\(^1,2,7-9\) In the ED, the physician should explain to the patient why radiographs are not being ordered, because this is a common patient expectation.
- If the patient has a demonstrable neurologic deficit, the physician may consider obtaining plain radiographs. These will not diagnose the herniated disc, but are used to rule out other possible causes of the patient’s symptoms, such as tumor, fracture, spondylolisthesis, and infection.
• If the patient’s condition worsens or the sciatica fails to improve, order an imaging study, preferably an MRI.32

PHARMACOLOGIC TREATMENT OPTIONS
Nonsteroidal Anti-inflammatory Drugs, Acetaminophen, and Muscle Relaxants

• The use of analgesics and muscle relaxants is the same as that described for nonspecific back pain.

• Interestingly, NSAIDs are less effective for herniated disc than they are for nonspecific back pain.1,7,22,24

Steroids

• Systemic steroids are no better than placebo and not recommended.8,33

• Although not an ED procedure, epidural steroid injection is a treatment that may be offered to a patient with a herniated disc as a follow-up option.

• Epidural steroid injection may provide a short-term improvement in leg pain and sensory symptoms. However, no long-term benefit has been demonstrated.22,33,34

NONPHARMACOLOGIC TREATMENT OPTIONS
Activity Modification

• The treatment mirrors that of patients with nonspecific back pain.

• In 1 study, 2 weeks of bed rest was no more effective than watchful waiting when factors such as intensity of pain, bothersomeness of symptoms, and functional status were assessed. If a patient’s symptoms are severe enough to warrant bed rest, the shortest possible period is recommended, in most instances no longer than 2 to 3 days.1,27,35

Manipulation and Other Physical Modalities

• The use of manipulation as treatment for sciatica is more controversial than its use in nonspecific back pain.

• Manipulation is generally not recommended for the routine management of symptoms from a herniated disc.6,8,36

• Forceful manipulation may cause or aggravate neurologic deficits.8

• Other physical modalities have not been shown to be useful in managing sciatica, although, as in the case of nonspecific back pain, heat or ice may provide temporary relief.

Surgical Treatment Options

• It is important to understand the surgical considerations for patients who present with a herniated disc so that the physician may appropriately educate them about their options.

• Most patients with a herniated disc can be treated and monitored without specialist referral; more than 50% recover in 6 weeks and approximately 80% of patients improve with nonsurgical therapy.1,2,7,8,37

• Most spine surgeons agree that surgery is appropriate only when all of the following criteria are met7,37:
  • Definitive evidence of herniation on an imaging study.
  • A corresponding clinical picture and neurologic deficit.
  • Failure of conservative treatment to produce improvement in 4 to 6 weeks.

• Emergency decompressive surgery is required only in patients with acute epidural compression syndromes.8,37
Conservative nonsurgical treatment has been compared with surgery for herniated discs in several studies. The results showed that patients who underwent surgery had improved function and fewer symptoms at 1 and 2 years postoperatively, compared with those treated conservatively; however, by 4 and 10 years postoperatively, the results in both groups were comparable.2,8,37,38

SPINAL INFECTION

Spinal infections (vertebral osteomyelitis, discitis, and spinal epidural abscess) are uncommon but serious causes of back pain. Although these are different entities, they may all be part of the continuum of spinal infection. The most important issue is that, when the emergency physician considers spinal infection, those patients should be evaluated thoroughly owing to the potential morbidity and mortality from a delay in diagnosis. Unfortunately, these infections are missed commonly on initial assessments; some patients with vertebral osteomyelitis have symptoms for longer than 3 months.14,17,39

A concerning history is that of unremitting back pain and night pain in association with fever or other constitutional symptoms in a patient who is at risk for infection. Risk factors for infection include immunocompromised states (diabetes, human immunodeficiency virus infection, and organ transplant recipients), alcoholism, recent invasive procedures, spinal implants and devices, injection drug use, and skin abscesses.14,15,17,20 On physical examination, approximately one-half of patients have a fever.14,39 The white blood cell count may be normal but the ESR and C-reactive protein are almost always elevated, although this is nonspecific.14,15,20,39–41 Blood cultures are positive in approximately 40% to 60% of cases and should be obtained routinely when spinal infection is considered. For all spinal infections, MRI is the gold standard imaging study that should be obtained to rule out infection. CT detects osteomyelitis and discitis; however, it does not visualize inside the spinal canal very well and as such may miss an epidural abscess.

Treatment Options

- Spinal infection requires emergent evaluation and management by a spine surgeon.
- In most cases of epidural abscess, the patient will undergo surgery, but there are situations beyond the scope of this review wherein the patient may not be taken to the operating room and will only be treated with intravenous (IV) antibiotics.
- Most cases of vertebral osteomyelitis and discitis are treated with IV antibiotics alone; however, the spine surgeon should direct the definitive treatment.
- All spinal infections require IV antibiotics. For vertebral osteomyelitis and discitis, consult with a spine surgeon before antibiotic administration, because antibiotics may result in negative culture results from a bone biopsy. However, do not withhold antibiotics unless specifically directed by the spine surgeon.
- Empiric antibiotic therapy should be directed against *Staphylococcus aureus*. Parenteral piperacillin–tazobactam and vancomycin, or similar agents with broad-spectrum coverage, can be given until culture results are available.14,40–42

EPIDURAL COMPRESSION SYNDROME

Epidural compression syndrome is a general term that encompasses spinal cord compression, cauda equina syndrome, and conus medullaris syndrome. Although the diagnosis of a complete epidural compression is obvious, evaluating patients with early signs and symptoms is more difficult because the initial differential diagnosis is broad and includes most conditions that cause weakness, sensory changes,
or autonomic dysfunction. The history and physical examination enables the physician to narrow the differential to a potentially compressive lesion of the spinal cord or cauda equina. When the emergency physician has a suspicion of epidural compression, this clinical suspicion should be confirmed with an MRI.

The history of patients with epidural compression usually includes back pain with associated neurologic deficits, incontinence, and sciatica in 1 or both legs. The duration of symptoms does not help to differentiate these syndromes from benign causes of back pain. Important features are a history of malignancy and rapid progression of neurologic symptoms, especially bilateral symptoms.

The physical examination findings depend on the level of compression and the extent to which the spinal cord or cauda equina is compressed. The most common finding in cauda equina syndrome is urinary retention with overflow incontinence; it has a sensitivity of 90% and a specificity of about 95%.1,10 This measure proves useful in patients who present with back pain and an ambiguous history of urinary incontinence. Evaluate these patients by checking urinary postvoid residual volume. The absence of a postvoid residual volume has a negative predictive value for cauda equina syndrome that approaches 99.9%.10 However, this test alone should not constitute the entire evaluation of a patient who presents with other major neurologic deficits. Other common findings in patients with epidural compression include weakness or stiffness in the lower extremities, paresthesias or sensory deficits, gait difficulty, and abnormal results on straight leg raising.10 The most common sensory deficit is “saddle anesthesia,” which is diminished to absent sensation over the buttocks, posterolateral thighs, and perineal regions. Anal sphincter tone is decreased in 60% to 80% of patients.10

The differential diagnosis for a patient who presents with an epidural compression includes spinal canal hemorrhage, spinal canal infections, massive midline disc herniation, and spinal tumor. Although less common, clinicians should have concern for spinal canal hemorrhage in the patient who is on anticoagulants and presents with a sudden onset of back pain and a neurologic deficit. Transverse myelitis is a noncompressive condition that may present exactly like a compressive lesion of the spinal cord.

**Treatment Options**

- When epidural compression is suspected clinically, especially when it may be associated with a tumor, administer corticosteroids before ordering tests or attempting to make a definitive diagnosis.
- The acute use of steroids in the patient with epidural compression from disc herniation, epidural abscess, and hematoma is controversial and there is no definitive recommendation.
- For the patient with potentially metastatic disease, the current recommended approach is to administer 10 to 16 mg of dexamethasone IV to the patient with known cancer and signs of epidural compression.11,12,43,44
- After administering the dexamethasone, the patient requires emergent imaging with MRI. In the past, the recommendation was to obtain plain radiographs initially and then to use those to help determine whether further imaging was necessary. This is no longer recommended because plain films add time and expense, but not much important information to the initial evaluation.12,43
- If epidural compression resulting from cancer is suspected, an MRI of the entire spine is recommended. This is because 10% of patients with vertebral metastases have additional silent epidural metastases that would be missed by a localized imaging study.12,43,44 The presence of these tumors remote from the symptomatic site may change the management strategy.
If cauda equina syndrome resulting from a massive central disc herniation is suspected, it is reasonable to obtain a localized MRI.

Consult a spine surgeon to direct the management once the etiology for the symptoms is diagnosed.

For patients who have epidural compression attributable to tumors, the outcome depends on presenting symptoms.
- Patients who cannot walk before treatment rarely walk again.
- Those who are too weak to walk without assistance but who are not paraplegic have a 50% chance of walking again.
- Those who are able to walk when treatment begins are likely to remain ambulatory.\(^{12,43–45}\)
- Of patients who require a catheter for urinary retention before treatment, most continue to require the catheter afterward.\(^{12,43,45}\)

**BACK PAIN IN THE PATIENT WITH A HISTORY OF CANCER**

The best approach is to divide patients into 3 groups based on symptoms.

1. **Group I: Patients with New or Progressive Symptoms**
   a. This group includes patients with new or progressing signs or symptoms of epidural compression that have developed over several hours to days.
   b. Treat this group with immediate corticosteroid therapy and obtain an emergent MRI.\(^{11,12,44,46}\)

2. **Group II: Patients with Stable Symptoms**
   a. This group includes patients with symptoms that are not progressive and have been present for several days to weeks.
   b. Stable signs include an isolated Babinski sign or radiculopathy without other neurologic deficits or evidence of cord compression.
   c. Radiculopathy is characterized by radicular pain, weakness, sensory changes, or reflex changes involving only one nerve root. Involvement of more than 1 nerve root places them in group I.
   d. Evaluation and treatment are similar to those for group I, although MRI can be obtained within 24 hours if not available emergently.
   e. If MRI cannot be performed within 24 hours, then obtain a CT of the involved area to look for evidence of metastatic disease.\(^{11,12,46}\)
      i. If there is evidence of metastatic disease, obtain an emergent MRI in the ED or transfer the patient to a facility that has MRI available.
      ii. If CT shows no evidence of metastatic disease, it is reassuring, but the patient should still undergo imaging with MRI in the future to better evaluate for disease in the spinal canal or spinal cord.
   h. One should administer 10 mg of oral dexamethasone while awaiting definitive diagnostic evaluation.\(^{44}\)

3. **Group III: Patients without Neurologic Signs or Symptoms**
   a. Group III includes those patients with back pain only without any neurologic signs or symptoms.
   b. In the ED, obtain anteroposterior and lateral radiographs of the involved spine.
      i. If any focal bony lesions are discovered, obtain an MRI of the entire spine.
      ii. Normal findings on plain radiographs do not exclude the presence of epidural metastases. In fact, more than 60% of patients with lymphoma and epidural metastases have normal plain radiographs.\(^{44}\)
      iii. If plain films are negative, refer the patient for follow-up by their primary physician within 5 to 7 days.

ED Evaluation and Treatment of Acute Back Pain
SUMMARY

Low back pain is a common presenting complaint to the ED that usually has a benign etiology and improves in most patients in 4 to 6 weeks. A red flag–focused history and physical examination will drive the diagnostic evaluation, if one is even necessary. For those benign etiologies for the low back pain, conservative management with NSAIDs, acetaminophen, limited opiates, and activity modification is the primary treatment regimen. When considering serious etiologies for the symptoms, laboratory testing is helpful, but MRI is the gold standard study that should be obtained. Consider treatment with steroids early before embarking on a prolonged diagnostic evaluation in those patients whose symptoms may be owing to neoplastic disease of the spine.

REFERENCES


