Evaluation of Low Back Pain

The SEMC radiology department is dedicated to partnering with you to ensure comprehensive imaging workup of patients with low back pain. Below we provide a brief review of the array of imaging options for workup of low back pain offered at SEMC, and the appropriateness of each imaging type for patients in various clinical circumstances based on American College of Radiology criteria.

Evaluation of Low Back Pain

Acute low back pain (LBP) with or without radiculopathy 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. Uncomplicated acute LBP and/or radiculopathy is a benign, self-limited condition that does not warrant any imaging studies. Imaging may be indicated when low back is accompanied by one or more of the following (red flags):

1. Trauma, cumulative trauma.
2. Unexplained weight loss, insidious onset
3. Age > 50 years, especially women, and males with osteoporosis or compression fracture.
4. Unexplained fever, history of urinary or other infection.
5. Immunosuppression, diabetes mellitus.
7. Intravenous drug use.
8. Prolonged use of corticosteroids, osteoporosis.
9. Age > 70 years.
10. Focal neurologic deficit(s) with progressive or disabling symptoms, cauda equine syndrome (bilateral leg weakness, urinary retention, saddle anesthesia).
11. Duration longer than 6 weeks.

Imaging Modalities for LBP Workup

Radiographs

Lumbar radiographs may be sufficient for the initial evaluation of patients with recent significant trauma, osteoporosis or over 70 years of age. Radiographs can be used to evaluate lumbar spine alignment, instability, and scoliosis. They also have a role in postoperative evaluation of instrumentation and fusion.

Nuclear Medicine Bone Scan

Bone scan is useful in evaluation of tumor, infection or occult fractures of the vertebrae. It is a moderately sensitive test with limited specificity. High-resolution isotope imaging including SPECT may also be helpful in detecting and localizing the site of painful pseudoarthrosis following spinal fusion.
Computed Tomography

CT scans with multiplanar reformatted sagittal and coronal planes provide superior bone detail and are useful for evaluating bone structural problems such as spondylolysis, pseudoarthrosis, fracture, scoliosis and stenosis. They are also useful for postsurgical evaluation of bone graft integrity, surgical fusion, and instrumentation. Extradural soft tissue, intradural, and cord pathologies are poorly depicted on CT, even with IV contrast.

Myelography/CT Myelography

A combined Myelography/CT study is complementary to routine CT or MRI and occasionally more accurate in diagnosing disc herniation. It may also be useful in surgical planning. This is an invasive procedure which requires lumbar puncture and intrathecal contrast injection.

Discography/CT Discography

Discography can help localize the source of back pain that is indeterminate with other less invasive studies. The injection itself may reproduce or provoke the patient’s pain. Limitations include the necessity of disc space injections, variability of patient response, and limited specificity.
**Magnetic Resonance Imaging**

The most common indication for the use of MRI or CT is the clinical setting of LBP complicated by radiation (radiculopathy, sciatica), as well as cauda equina syndrome, neurogenic claudication, and spinal stenosis. MRI of the lumbar spine has become the initial imaging modality of choice in complicated LBP, displacing myelography and CT in recent years.

Disc abnormalities are common on MRI in asymptomatic persons. Acute back pain with radiculopathy suggests the presence of demonstrable nerve root compression on MRI. Plain and Gadolinium-enhanced MRI can demonstrate inflammatory, neoplastic, and most traumatic lesions. In postoperative patients, enhanced MRI allows distinction between disc and scar when tissue extends beyond the interspace.

**Figure 3**: Sagital T2, image showed large right side disc herniation and extrusion at L3-L4 level causing severe central canal stenosis and right neuroforaminal narrowing.

**Figure 4A and 4B**: Sagital T2 weighted MRI, and Sagital reformatted CT images of lumbar spine of a patient with breast cancer show extensive sclerotic and lytic metastatic lesions throughout lumbar spine vertebrae. Metastatic disease is also seen in lower thoracic spine vertebrae and bony sacrum.
Tailored Evaluation:

Based on the ACR appropriateness criteria, the imaging work-up for low back pain can be approached as follows:

- Uncomplicated acute low back pain and/or radiculopathy, nonsurgical presentation. No red flags: Imaging is usually unnecessary.

- Patient present with one or more of the following: low-velocity trauma, osteoporosis, focal and/or progressive deficit, prolonged symptom duration, age >70 years:
  - MRI of lumbar spine without contrast is the study of choice.
  - CT of lumbar spine without contrast if MRI is contraindicated or unavailable.
  - SPECT/CT may be useful for anatomic localization and problem solving.

- Patient with one or more of the following: suspicion of cancer, infection, and/or immunosuppression:
  - MRI lumbar spine without contrast is typically sufficient for metastatic disease evaluation if there is low risk of epidural and/or intraspinal disease.
  - MRI lumbar spine without and with contrast will be the study of choice if there is no contraindication to IV contrast (ie, GFR <30 mL/min/1.73m2) for patients with suspicion of primary neoplasm of the spine/spinal cord, metastatic disease to the epidural space, or infection.
  - CT without contrast (or very rarely with contrast) can be done if MRI is contraindicated or unavailable.
  - SPECT/CT may be useful for anatomic localization.

- Patient with low back pain and/or radiculopathy, surgery or intervention candidate:
  - MRI lumbar spine without contrast is the study of choice.
  - MRI lumbar spine without and with contrast if noncontrast MRI is nondiagnostic or indeterminate.
  - CT with or without contrast is useful if MRI is contraindicated or unavailable.

- Patient with prior lumbar spine surgery:
  - MRI lumbar spine without and with contrast is the study of choice.
  - CT lumbar spine without or with contrast is most useful in postfusion patients.
  - X-ray lumbar spine with flexion/extension views may be useful for evaluation of stability.
  - Bone scan with SPECT can help detect or localize painful pseudoarthrosis.

- Patient with Cauda equina syndrome, multifocal deficits or progressive deficit.
  - MRI lumbar spine without contrast is the study of choice.
  - MRI lumbar spine without and with contrast if neoplasm is suspected.
  - Myelography and postmyelography CT is useful if MRI is nondiagnostic or contraindicated.

We welcome your questions about imaging workup of low back pain. Please feel free to contact any of us by phone at 617-789-2740 or by Steward email.

Rebecca K. Schwartz, MD (Chair)
David Lee, MD (Vice chair)
Hemlata Daryani, MD
Jong Liu, MD
Ashley Davidoff, MD
Phoebe Olhava, MD
Allison Keel, MD
Geetanjali Kulkarni, MD
Christine Segal, MD
Scott Sequeira, MD