Lumbar Spine

Low back pain (LBP) is generally defined as being between the lowest ribs and the inferior gluteal folds.

The basic motion segment of the spine is a three-joint complex, consisting of one intervertebral disc between adjacent vertebra and two zygapophyseal joints. The intervertebral disc is composed of a central nucleus pulposus and the peripheral annulus fibrosus. Stability of the three-joint complex depends on the integrity of the intervertebral discs. Disc degeneration transfers weight bearing and rotational loads to the facet joints and may produce facet joint dysfunction, inflammation, arthropathy, and a degenerative cascade in the lumbar spine. The individual lumbar nerve roots exit bilaterally below the pedicle of each vertebra.

Muscular support of the lumbar spine is divided into anterior and posterior groups. The anterior group consists of:

- Abdominal muscles
- Psoas muscle

The posterior group contains superficial, middle, and deep layers. The superficial layer is the largest muscle group consists of long polysegmental muscles called the erector spinae. The erector spinae muscles are arranged in three vertebral columns - iliocostalis, longissimus, and spinalis, and are the chief tensors of the spinal column. The middle layer consists of short polysegmental muscles (multifidi), and the deep layer consists of small intersegmental muscles.

The anterior and posterior muscle groups alternate concentrically and eccentrically to control smooth trunk movement. Repetitive movements can fatigue the supporting structures of the lumbar spine and overwhelm the viscoelastic protec-
tive mechanisms of the intervertebral discs and ligaments. Muscle fatigue can lead to reflex muscle spasm and pain.

Cardinal movements of the lumbar spine include flexion, extension, side flexion, and rotation. Flexion and extension occur primarily at the lower two lumbar segments. Rotation at each lumbar segment is limited to only a few degrees because of the vertical orientation of the facets. Combined movements (flexion and rotation) carry the highest injury potential. The lumbar spine links the lower extremities and torso and coordinates transfer of power through the body via a kinetic chain.

Published Clinical Guidelines
The first major guidelines were those in the U.S. and U.K. in 1994. The U.K. guidelines were updated in 1996. The New Zealand guidelines followed in 1997. In 1999 back pain guidelines from Denmark were released. All these guidelines provide support for the chiropractic medicine approach to most patients with LBP: spinal manipulation, patient reassurance, and an early return to activities and work.

The AHCPR guidelines suggest that at the initial assessment potentially dangerous underlying conditions should be sought. In the absence of these red flags, there is no need for special studies.

The New Zealand guidelines recommend a full reassessment at 4 weeks. If red flags are present, consider referral to the appropriate specialist. If there are yellow flags, such as unsatisfactory restoration of activities, failure to return to work, or an unsatisfactory response to treatment, consider referral to multidisciplinary assessment and care. If there are no yellow or red flags, explain, reassure and encourage the patient to continue usual activities and return to work. Consider continuation of effective treatments. At 6 weeks conduct a full reassessment if
the patient has not recovered. Search for yellow flags, and if present, consider referral to multidisciplinary assessment and care.

**Assessment of LBP**

The initial assessment of a patient presenting with LBP should include a focused medical history and physical examination. The primary purpose of these evaluations is to determine if a serious underlying condition exists such as fracture, tumor, infection, or cauda equina. A few key questions can ensure that a serious underlying condition will not be missed. These questions include:

- Age
- History of cancer
- Unexplained weight loss
- Immunosuppression
- Duration of symptoms
- Responsiveness to previous therapy
- Pain that is worse at rest
- History of intravenous drug use
- Urinary or other infection

Waddell triages acute LBP into five categories:

- Nonspecific LBP
- Nerve root pain
- Serious spinal pathology
- Cauda equina syndrome
- Inflammatory disorders

Nonspecific LBP or simple backache includes a variety of disorders. The clinical presentation is usually at age 20-55 years, and situated in the lumbosacral region, buttocks and thighs. Pain is mechanical in nature in that it varies with physical activity and varies with time. The patient will also be well.

In nerve root pain, the involvement of more than one nerve root raises the possibility there may be a more widespread neurological disorder. A patient presenting with nerve root pain will have unilateral leg pain that is worse than the back pain, and the pain generally radiates to the foot or toes. Numbness or paresthesia can occur in the same distribution as the pain. Nerve irritation signs will be present such as reduced SLR, which reproduces the leg pain. Motor, sensory or reflex changes, limited to one nerve root, may be present.

Serious spinal pathology or red flags can be indicated by any of the following:

- Presentation age < 20 yrs or onset > 55 yrs
- Violent trauma, such as fall from height or MVA
- Constant, progressive, non-mechanical pain
- Previous history of cancer, use of systemic steroids, drug abuse, or HIV
- Systemically unwell, weight loss
- Persisting severe restriction on lumbar flexion
- Widespread neurological signs or symptoms
• Structural deformity
• ESR > 25
• Plain x-ray showing vertebral collapse or bone destruction

A patient with cauda equina syndrome or a widespread neurological disorder can have difficulty with micturition, loss of anal sphincter tone or fecal incontinence, saddle anesthesia about the anus, perineum or genitals, widespread (> one nerve root) or progressive motor weakness in the legs or a gait disturbance, and a sensory level.

Inflammatory disorders, such as ankylosing spondylitis and related disorders, will have a gradual onset before age 40 years and marked morning stiffness. There will also be persisting limitation of spinal movements in all directions with peripheral joint disorders. Iritis, skin rashes (psoriasis), colitis and urethral discharge may be associated, and there is usually a family history.

Seventy percent of patients with back pain have some radiation of pain to their legs. This referred pain can come from the fascia, muscles, ligaments, periosteum, facet joints, disc or epidural structures. Referred pain is usually a dull, poorly localized ache that spreads into the buttocks and thighs. It usually does not spread much below the knee. On the other hand, nerve root pain is sharp and well localized, and usually accompanied by tingling or numbness.

Radiographs of the spine are seldom necessary in the initial evaluation of acute LBP. At the first visit, AP and lateral radiographs should be considered if the patient has any of the following:
• Significant trauma
• Neurologic deficits
• Systemic symptoms
• Temperature > 100.4 F
• Unexplained weight loss
• History of cancer
• Corticosteroid use
• Drug or alcohol abuse
• Suspected ankylosing spondylitis

MRI or CT studies should be considered if the patient has worsening neurologic deficits, a suspected system cause for the back pain such as infection or cancer, or if referral for surgery is being contemplated. Remember though that disc degeneration and protrusion have been documented on MRI in 20% to 25% of asymptomatic individuals.

Electrodiagnostic studies should be considered if the clinical findings suggest radiculopathy or peripheral neuropathy. As electromyographic findings are usually not present until two to four weeks after the onset of symptoms, these studies
have a limited role in the evaluation of acute LBP. Electrodiagnostic tests are dependent on the skill of the examiner and should be performed by physicians who are specialists in electrodiagnostic medicine such as physiatrists and neurologists.

A bone scan can be helpful when radiographs of the spine are normal but the clinical findings suggest osteomyelitis, cancer, or stress fracture. However, if both the ESR and x-rays are normal, it is unlikely that a bone scan will be abnormal.

Surgical approaches to LBP are appropriate and usually successful once appropriate patients are selected for surgery. The primary purpose of back surgery is to correct an anatomical lesion in those patients who fail to show improvement with conservative care. The indications for surgery are:

- Progressive neurological deficit (including bowel or bladder dysfunction)
- Intractable pain despite an appropriate program of compliance and aggressive conservative pain management (multidisciplinary) over an appropriate period of time (2-3 months)
- Demonstration of a structural lesion requiring surgery
- Demonstration of reasonable compliance with all therapeutic measures

The reaction of a patient to spinous process percussion can help differentiate pain of mechanical joint dysfunction from serious vertebral disease. If the source of pain is the disc, jarring of the vertebra by percussion often aggravates or reproduces the radiating pain. If the pain is due to joint dysfunction, spine percussion produces a short, sharp pain. In bone or joint disease or an inflammatory epidural lesion, the pain is deep, dull and aching. It may also be a sickening, throbbing pain with percussion.

The T12/L1 area can refer pain to the iliac crest area and the groin. The SIJ refers pain to the buttock, and the L4-S1 area can refer pain into the buttock as well.
Because of overlapping pain referral patterns of the hip joint and SIJ, it is important to differentiate hip joint pain from SIJ pain. Both areas can be stressed with Fabere maneuver. The hip usually refers pain to the groin and medial thigh while SIJ pain is most often felt in the buttock. On the Fabere maneuver pain will be felt in the groin with hip joint involvement or over the SIJ with joint dysfunction or disease.

Causes of back pain with associated buttock and leg pain

**Lumbar Radiculopathy**
Nerve root compression from a disc (most common) or tumor or a narrowed intervertebral foramina, typically produces pain in the leg related to the dermatome or myotome innervated by that nerve root. Leg pain may occur alone without back pain and vary considerable in intensity.
The two nerve roots that account for most of these problems are L5 and S1. Most settle with time (6-12 weeks).

Disc Protrusion

Disc Herniation

Lumbar MRIs with disc herniation

Sensation is tested with pin and light touch.
Patellar and Achilles reflexes test the L4 and S1 nerve roots respectively.

Iliopsoas (T12-L2)    Quadriceps (L3, L4)    Tibialis anterior (L4, L5)    Extensor hallucis longus (L5)    Peroneals (S1)

Straight Leg Raising    Braggard's    Femoral Nerve Stretch

Spondylolisthesis and Spondylolysis
In spondylolisthesis pain is produced by stretching of the interspinous ligaments or of the nerve roots. Onset of back pain in many patients is due to concurrent disc degeneration rather than a mechanical problem.

Spondylolysis is caused by a stress fracture of the pars interarticularis, but may also result from an acute fracture. The L5 level is by far the most common site.

The stork test is used to indicate spondylolysis. The patient balances on the ipsilateral leg, then hyperextends the lumbar spine. The test is positive when the pain localizes to the site of the spondylolysis.
Lumbar Spondylosis

Degenerative osteoarthritis or degenerative osteoarthritis or osteoarthrosis, is a common wear and tear syndrome that may follow vertebral dysfunction, especially following severe disc disruption and degeneration.

Stiffness of the low back is the main feature of lumbar spondylosis. Progressive deterioration leads to narrowing of the spinal and intervertebral foramen causing spinal canal stenosis.

The patient is typically over 50 years with low back pain that may radiate into the buttocks. Pain is described as a dull nagging ache with acute episodes on a chronic background.

The Spondyloarthropathies

Seronegative (no RA factor) spondyloarthropathies are a group of disorders characterized by involvement of the sacroiliac joints (sacroilitis) with an ascending spondylitis and extraspinal manifestations such as oligoarthritis and inflammatory enthesopathies.

The pain and stiffness, which are characteristic findings of spinal involvement are typical of inflammatory disease; namely, worse in the morning, may occur at night and improves rather than worsens with exercise.

The main disorders in this group are ankylosing spondylitis, psoriatic arthritis, Reiter's disease, reactive spondyloarthropathies and the inflammatory bowel disorders. Hence the
importance of searching for a history of psoriasis, diarrhea, urethral discharge, eye disorders and episodes of arthritis in other joints.

The spondyloarthropathies have a slow insidious onset in young men 15-30 years old (rare after 40) with low back pain and radiation into the buttocks and posterior thigh, rare below knees, and can alternate sides. The pain is described as aching and throbbing, typical of inflammation, and it is commonly episodic. Pain is often worse at night and can wake the patient. Turning over in bed and rising in the motion aggravates the pain. Relief is obtained with activity including exercise. The patient may walk around at night for relief.

(a) Ankylosing spondylitis and psoriasis: main target areas on vertebral column and girdle joints.
(b) Crohn's disease and ulcerative colitis: main target areas of enteropathies.
(c) Reiter's disease: main target areas.

Malignant Disease
It is important to identify malignant disease and other space occupying lesions as early as possible because of the prognosis and the effect of a delayed diagnosis on treatment.

The typical profile is a person usually over the age 50 years, but the older the patient the greater the risk for malignant disease. Usually has an insidious onset with pain localized anywhere in the lumbar spine. With nerve root involvement pain can radiate into the buttocks or legs. The pain is a boring deep ache that is unrelenting, continuous and getting worse. Usual associa-
tions are malaise, fatigue, weight loss, muscular weakness, and night pain. Diagnosed with x-ray, serum alkaline phosphatase, ESR and bone scan.

**Vertebral Dysfunction**
This is a very common cause of low back pain thought to be due to dysfunction of the pain-sensitive facet joint. Clues suggesting joint dysfunction in the history include a sudden onset of pain that occurred after some unguarded movement, not associated with marked swelling or warmth, limited to one joint, lessened by rest and aggravated by activity.

To perform the posterior pelvic pain provocation test for confirming sacroiliac back pain, the examiner first positions the patient supine on
the examining table with one knee bent, the hip flexed to 90 degrees. He or she then stabilizes the opposite side of the pelvis while gently pressing the bent femur posteriorly. The test is positive if the maneuver reproduces the patient's pain on the bent knee side.

**Connective Tissue Joint Dysfunction** will present with diffuse pain and tightness throughout the involved area of the spine. The patient will state it feels like a deep ache and shove back of hand or fist onto the segments involved.

With **synovial joint disruption** of the hip joints the patient may complain of a deep ache at the base of the spine and place the hands over the iliac crests. The patient will state the back needs to be "popped" or "cracked" or that the back feels stiff. There will be tenderness and decreased joint play of the involved segment with palpation.

**Superficial fascial disruption** will present as spasm of the low back or as a squeezing pain or generalized numbness across the entire lower portion of the low back. The patient will squeeze the involved area when asked to indicate where it hurts. The distortion is treated using double thumb technique. With severe spasm it may be necessary to use very gentle and light double thumb technique. Let the muscle response be your guide. If applied correctly the muscle spasm will appear to melt away with treatment.

With back pain caused by **myofascial bands** the patient will complain of pulling or burning pain and will make a sweeping motion along the involved band. The bands are treated with ice massage followed with stroking release with the thumb.
Enthesopathy is indicated by the patient pointing with one finger to pinpoint areas of pain. If enthesopathies recur after appropriate treatment, then manipulation of the associated joint is indicated.

In chronic low back pain the fascial adhesions are treated first with myofascial band technique, and then the distortions are broken down into the appropriate disruptions and treated one by one.

For those patients with central stenosis or lateral recess stenosis, use traction/thrust manipulation with the patient in flexion. Sitting rotary manipulation is usually the most effective. It is important to test traction and flexion first before thrusting and apply it only when it gives relief.

Herniated trigger points are indicated by the patient pushing fingers or the thumb into the trigger point. Trigger points are usually treated with thumb pressure, but in the buttock an elbow or a special tool designed for trigger point work can be used.

Muscles capable of causing buttock pain include:
• Gluteus medius and minimus
• Quadratus lumborum
• Longissimus thoracis
• Piriformis

Piriformis muscle

Gluteus minimus
Muscles capable of causing pain over the sacrum include:

- gluteus medius
- quadratus lumborum
- gluteus maximus
- multifidi
- soleus

The muscles that can cause lumbar pain include the

- gluteus medius
- multifidi
- iliopsoas

Palpation of iliopsoas

Iliopsoas

References


