

CLINICAL REVIEW

An Approach to the Differential Diagnosis of Sciatica in the Primary Care Setting

Pre-test Quiz



1. The sciatic nerve exits the pelvis through the greater sciatic notch, bounded superiorly by the piriformis and inferiorly by the gemelli (superior and inferior) and obturator internus muscles.
2. Deep gluteal pain serves as an umbrella term that largely includes muscular causes of sciatic pain including piriformis syndrome, gemelli-obturator internus syndrome, ischiofemoral impingement and proximal hamstring syndrome.
3. Sciatic patients usually have low back pain of equal or higher intensity than any associated leg symptoms.

ABSTRACT

Sciatica is a well-recognized complaint, with the hallmark presenting symptom of lancinating pain running down the back of the leg, along the path of the sciatic nerve. While it is typically caused by a herniated lumbar disc within the spinal canal, an understanding of the course of the sciatic nerve and associated regional anatomy is useful in forming a broader differential diagnosis. In rare cases, sciatica, usually bilateral, is associated with a loss of bowel or bladder function, indicating cauda equina syndrome, a medical emergency. Other degenerative conditions of the lumbar spine such as spondylolisthesis and spinal stenosis can occasionally produce sciatica while deep gluteal pain is often used to describe the muscular causes. Malignancy, trauma, vascular causes and ectopic endometrial tissue can cause compression of the lumbosacral plexus within the pelvis and produce similar symptoms. In this review, we highlight the common clinical presentations, physical examination and relevant diagnostic investigations for a broad differential diagnosis of sciatica.

KEYWORDS: Sciatica, leg dominant pain, nerve compression, straight leg raise.



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Introduction

Sciatica is lancinating leg pain radiating anywhere along the distribution of the sciatic nerve. The lifetime prevalence is estimated to be 13 to 40% of the population, most often affecting individuals between the ages 30 to 50 years.^{1,2} The term “sciatica” comes from the Greek *ischiadikos* meaning “pertaining to the hip”. Patients frequently describe a throbbing/stabbing/aching pain that seem to arise in that joint, more precisely from the posterior hip or buttock. Physicians historically ascribed these painful sensations to a plethora of aetiologies but in 1864 a French physician, Ernest-Charles Lasègue, showed that sciatica could be reliably produced by extending the knee with the hip flexed, attributing the pain to stretching of the sciatic nerve. His medical student, JJ Forst, was the first to describe the more common passive straight leg raise in his medical thesis of 1881; a diagnostic test still used in clinical practice today.³ Subsequently, Krause and Oppenheim recognized that the pain was caused by direct nerve root irritation and compression from a ruptured intervertebral disc.^{4,5}

Today, although it is recognized that herniated lumbar disc accounts for approximately 90% of sciatic cases, a systematic approach to a comprehensive differential diagnosis should be considered. Clinicians need to

consider gluteal region disorders, pelvic pathology, malignancy, infection, trauma and, muscular, adjacent nerve or vascular causes. An understanding of the course of the sciatic nerve and associated regional anatomy is useful in assessing a diagnosis.

Brief Anatomical Review

The sciatic nerve originates from the L4 to the S3 spinal nerves which travel in the spinal canal as the cauda equina, before emerging through their respective intervertebral foramina. The L4 and L5 nerve roots run in the retroperitoneal space within the psoas major muscle and contribute to the lumbosacral trunk, which joins with the sacral nerve roots within the sacral plexus to form the sciatic nerve. The sacral plexus is located on the anterior surface of the piriformis muscle, posterior to the iliac vessels and is covered by parietal peritoneum lining the pelvis. The sciatic nerve exits the pelvis through the greater sciatic notch, bounded superiorly by the piriformis and inferiorly by the gemelli (superior and inferior) and obturator internus muscles. The nerve runs deep to the gluteus maximus, and the biceps femoris muscles while providing innervation to the hamstrings. The nerve terminates in the popliteal fossa where it bifurcates into the tibial and common fibular nerves, which supply the posterior and anterior compartments of the leg respectively.

Lumbar Disc Herniation Causing Nerve Root Compression

Constant, lancinating pain radiating down the back of the leg along the path of the sciatic nerve is the hallmark of sciatica. This radiating pain is often accompanied by sensory deficits such as numbness and/or paresthesia. Rarely, bilateral sciatic symptoms may be associated with a loss of bowel or bladder function, indicating cauda equina syndrome, a medical emergency.⁶ It is important to rule out red flags that prompt urgent evaluation and management (Table 1).

Clinical Presentation

Patients usually have low back pain associated with their leg complaints but genuine sciatica from a herniated lumbar disc produces leg pain as the dominant symptom. Back dominant pain, with any direct nerve involvement, can extend into the leg, occasionally all the way to the foot, but unless the leg pain is more intense than the back pain, it is not sciatica. It is essential to take an accurate history to establish if

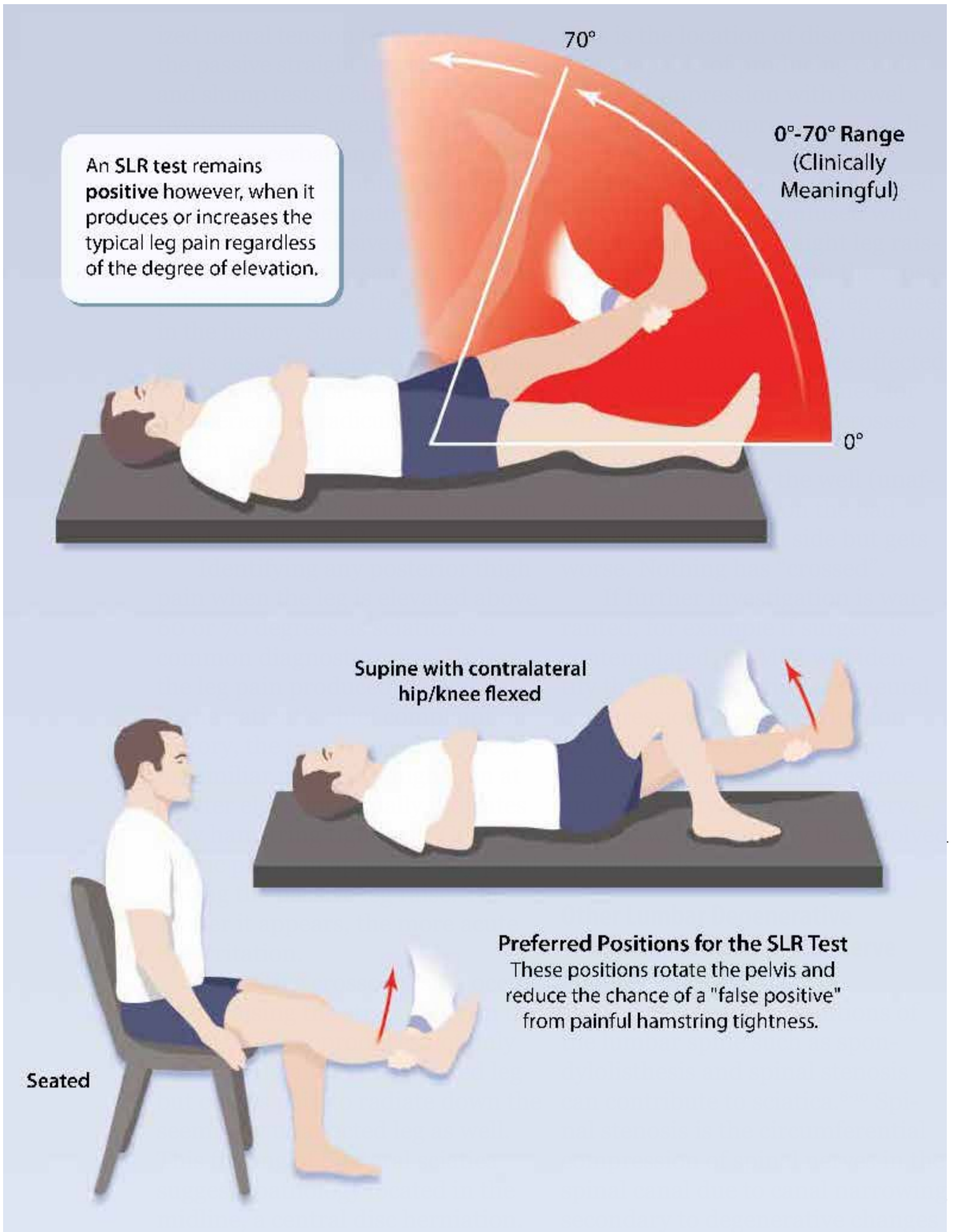
the leg pain is constant. Because the nerve root pain arises from inflammation as well as mechanical compression, sciatica is never fleeting but usually constant although it can fluctuate in intensity. The intensity of the leg symptoms can vary with position or the degree of root tension but because of the underlying sustained pathology, the pain never completely subsides. Activity, prolonged sitting or Valsalva maneuvers such as coughing or bearing down aggravate sciatic pain. A patient typically prefers to stand since sitting increases the pain. Four common clinical characteristics of sciatica are: pain more intense at or below the gluteal fold, leg pain worse than back pain, a positive neural tension test and neurological deficits that can be sensory, motor or reflexive in nature. All four findings are not essential for the diagnosis.⁷

Straight Leg Raise

The physical examination should include checking lower limb reflexes, dermatome and myotome assessment, upper motor neuron tests such as the plantar response and special-

Table 1: Red Flags Associated with Sciatica Indicating a Serious Underlying Condition

- Loss of bowel or bladder control
- Acute or rapidly progressive lower extremity weakness
- Recent trauma preceding a new onset of sciatica
- Symptoms of infection (fever, chills, night sweats)
- Symptoms of malignancy including (but not limited to) unexplained weight loss, constant pain, night pain, night sweats



of the intervertebral disc, facet joints and ligamentum flavum. This constriction typically presents as neurogenic claudication when pain and numbness in the buttocks, posterior thighs and legs worsens with standing and walking, but is relieved with sitting or bending forward (shopping cart sign). In neurogenic claudication neural tension tests are usually negative and the neurological assessment at rest may be normal. Sciatica can occur if a nerve root is compressed by a focal disc herniation, facet cyst or osteophyte adjacent to the facet joint or within the neural foramina.

Spondylolisthesis describes one vertebral body slipping anteriorly or posteriorly relative to the adjacent segment. The displacement can produce spinal stenosis and nerve root compression. This condition occurs most frequently with degenerative changes associated with facet joint osteoarthritis, degenerative disc disease or a defect in the pars interarticularis. Spondylolisthesis can present with both low back pain and sciatic radiculopathy. Upright lateral lumbar x-rays can identify the level and MRI can demonstrate the location of nerve root compression.

Gluteal Region Sciatic Nerve Compression

Deep gluteal pain serves as an umbrella term that largely includes muscular causes of sciatic pain including piriformis syndrome,

gemelli-obturator internus syndrome, ischiofemoral impingement and proximal hamstring syndrome.

Piriformis syndrome is the most common.¹¹ There are many variations of the relation between the sciatic nerve and the piriformis muscle,¹²⁻¹⁴ Piriformis syndrome most commonly results from muscle hypertrophy, trauma or overuse injury, but also less commonly from infection, inflammation, tumours or myofascial pain.¹⁵ Piriformis syndrome presents with posterior hip and buttock pain, worse with prolonged sitting, but may secondarily involve the sciatic nerve, manifesting the classical symptoms of sciatica running down the leg.¹¹ To distinguish piriformis syndrome from sciatica due to lumbar disc herniation, muscle tenderness with deep gluteal palpation and specialized piriformis stretch tests such as the FAIR, Pace and Beatty maneuvers are helpful (Table 2).¹⁴ MRI and CT scans may help rule out competing diagnoses, while nerve conduction and EMG studies may identify sciatic nerve involvement.

After exiting the pelvis, the sciatic nerve runs posterior to the gemelli and obturator internus muscles, where the nerve can be entrapped within the musculotendinous complex of these muscles, giving rise to the Gemelli-obturator internus syndrome. This condition can be difficult to disambiguate from piriformis syndrome and they

Table 2: Physical Examination Maneuvers for a Differential Diagnosis of Sciatica

Diagnostic test	Description
Straight leg raise (SLR)	With the patient lying supine, the affected leg is passively raised. Reproduction of history compatible leg dominant sciatic pain suggests sciatica; this finding must be distinguished from hamstring tension.
Crossover sign	Raising the straight leg on the affected side reproduces not only the typical sciatic pain in the affected leg but causes pain to radiate into the seemingly unaffected leg as well; this suggests cauda equina compression and may be a medical emergency.
Well leg lift	Raising the unaffected leg reproduces symptoms on the affected side; this indicates a highly irritable nerve root(s) on the affected side.
Slump test	With the patient sitting upright and legs hanging freely, patient is asked to “slump” forward by flexing spine, while keeping the pelvis neutral. Symptoms reproduced when the patient extends the knee and dorsiflexes the ankle indicate a positive test.
FAIR test	With the patient lying on the unaffected side, flexion, adduction and internal rotation of the affected hip joint puts tension on the piriformis muscle and produces deep gluteal pain.
Pace maneuver	In the sitting position, the patient is asked to adduct their hips against resistance; deep gluteal pain suggests piriformis involvement.
Beatty maneuver	While lying on the unaffected side, the patient is asked to abduct their affected hip against gravity; deep gluteal pain suggests piriformis involvement.
Ischiofemoral impingement test	With the patient lying on the unaffected side, the affected hip is extended and adducted; deep gluteal pain is reproduced in adduction, but not abduction, of the hip.
Modified bent knee stretch test	With the patient in supine, the symptomatic hip is maximally flexed while keeping the knee in flexed position; at the end of hip flexion, the knee is rapidly extended to reproduce hamstring pain.

occasionally occur together. The approach to diagnosis is the same.

The sciatic nerve passes between the ischium and the femur, where ischiofemoral impingement can produce deep gluteal and sciatic pain during hip extension, such as when climbing stairs.^{11,14} As the nerve enters the posterior thigh, it can become entrapped by fibrotic bands tethering it to the semimembranosus muscle, producing proximal hamstring tendinopathy. This condition affects sprinting or lunging activities, which place stress on the insertion of the hamstring into the ischium.^{11,16} The modified bent-knee stretch test is a reliable provocation test for ischiofemoral impingement (Table 2).¹⁷ Correct identification of the underlying gluteal region structures that may contribute to sciatic nerve compression is important. MRI provides soft tissue imaging to visualize affected muscles. Unfortunately, the proximity and possible interconnectedness of these structures occurring in 43% of cases makes specific diagnosis difficult.¹⁸

Pelvic Involvement of the Lumbosacral Plexus

In the absence of spinal or deep gluteal compression, a more extensive workup of lumbosacral plexopathy should be considered. Cyclical sciatic pain tied to menstrual cycles prompts consideration for catamenial sciatica, a condition where

endometrial tissue deposits near the sacral plexus can cause inflammation and compression of femoral and sciatic nerves. While pelvic ultrasound and MRI can support this finding, surgical and pathological examination confirm a definitive diagnosis.¹⁹ Catamenial sciatica is quite distinctive in its presentation, but not unique for sciatica arising from pelvic pathology.

Various malignancies within the pelvic region can produce sciatic type symptoms. Lymphoma can cause either direct lumbosacral plexus compression by enlargement of pelvic lymph nodes or by involvement of adjacent muscles and subcutaneous fat. Carcinomas, sarcomas and sacral chordomas may encase the plexus directly or compress it by deposits in adjacent tissues or into the plexus. Direct compression by aneurysmal dilatation of the distal aorta and iliac arteries may produce sciatic pain, along with involvement of iliohypogastric, ilioinguinal and obturator nerves.²⁰ Nerve conduction and EMG studies are useful in localizing a disease process to the lumbosacral plexus. CT and MRI pelvic imaging may help rule out these rare causes of sciatica.

Pelvic trauma, particularly involving fracture-dislocation of the pelvic ring or the sacroiliac region, can produce lumbosacral traction leading to sciatic type symptoms. Direct compression of the plexus may occur during protracted labour



KEY POINTS

1. Herniated intervertebral disc accounts for up to 90% of sciatica cases
2. An understanding of the course of the sciatic nerve and associated regional anatomy can be useful in forming a differential diagnosis; one should consider gluteal region sciatic compression disorders, pelvic pathology involving the lumbosacral plexus, malignancy, infection, trauma and conditions that mimic sciatica.
3. Patients usually have low back pain associated with their leg complaints, but genuine sciatica from a herniated lumbar disc produces leg pain that is the dominant symptom. Back dominant pain, with any direct nerve involvement, can extend into the leg, occasionally all the way to the foot, but unless the leg pain is more intense than the back pain, it is not sciatica.
4. The physical examination should include checking lower limb reflexes, dermatome and myotome assessment, upper motor neuron tests such as the plantar response and specialized neural tension tests such as the passive straight leg raise (SLR) and slump tests.
5. A positive crossover sign occurs when raising the straight leg on the affected side reproduces not only the typical pain in the affected leg but causes pain to radiate down the seemingly unaffected leg as well. This finding of bilateral sciatica suggests pathology located in the midline, a central disc herniation.

and delivery, particularly in cases of cephalopelvic disproportion or with use of mid-pelvic forceps.

Other Causes of Sciatica

Nerve sheath tumours that comprise the myelin sheath around nerves, may present with sciatica. Neurofibromatosis and Schwannomatosis can occur within the spinal canal, neural foramina and peripheral nerves, often presenting with sciatica pain and occasionally with muscle weakness.²⁰ When these tumours originate at the greater sciatic notch, a characteristic dumbbell appearance is seen on MRI, with a presentation of palpable mass and buttock tenderness at rest and with hip movements, in the absence of back pain.²¹

Infection and inflammation are other broad categories to consider

for pain in the sciatic distribution. Direct involvement of the sciatic nerve may occur with shingles (Varicella-Zoster) and Lyme disease (*Borrelia burgdorferi*) infections, which cause acute radiculitis affecting the sensory nerves. Indirect involvement of the sciatic nerve or associated roots arising from genitourinary, gastrointestinal infection, osteomyelitis and discitis and tuberculosis may occur from abscess in the psoas, pelvic, gluteal or epidural spaces.²⁰ Sciatic pain from inflammation is often less lancinating and more neuropathic in nature. Sciatica can occur from chronic inflammatory demyelinating polyneuropathy (CIDP) in the lumbosacral plexus, vasculitis or even diabetes mellitus type 2.²⁰

Conditions that Mimic Sciatica

Certain conditions can cause pain in a distribution that is similar to the sciatic nerve, but without involving the nerve directly. Greater trochanteric bursitis is a missed diagnosis in approximately 11% of sciatica referrals.²² This condition is likely of mechanical origin, often without neural involvement, although inflammation of hip muscles may coincidentally resemble a dermatomal distribution. Pain is typically over the lateral thigh, exacerbated by going up or down stairs and reproduced by direct pressure on the greater trochanter.

Meralgia paresthetica involves compression of the lateral femoral cutaneous nerve that exits under the inguinal ligament just medial

to the anterior superior iliac spine (ASIS).²³ Meralgia paresthetica is another cause of pain in the anterolateral thigh, characterized by numbness and burning sensation.

Neuropathic pain in the buttocks, low back and thigh may be the result of cluneal nerve entrapment. Superior cluneal nerves exit around the iliac crest and middle cluneal nerves pass through the sacroiliac ligament and gluteus maximus.

Conclusion

Sciatica is a well recognized clinical presentation in the primary care setting. The classical symptoms are lancinating leg pain that can begin at the bottom of the buttock and is of



CLINICAL PEARLS

True sciatica from a herniated lumbar disc is when the leg pain is the dominant symptom over back pain. Lancinating, constant, radicular pain down the posterior leg along the path of the sciatic nerve is the hallmark symptom. Activity, prolonged sitting or Valsalva maneuvers such as coughing or bearing down aggravate sciatic pain. A patient may prefer to stand because sitting is intolerable.

Neurogenic Claudication from spinal stenosis is distinctive from herniated lumbar disc sciatica. Unlike classic sciatica, lumbar spinal stenosis neural tension tests are often negative and the neurological assessment may be normal; however, the more classic sciatic presentation, may be present in spinal stenosis if a focal nerve root is also compressed.

To distinguish piriformis syndrome from sciatica, muscle tenderness with deep gluteal palpation and specialized piriformis stretch tests such as the FAIR, Pace and Beatty maneuvers may be helpful.

Greater trochanteric bursitis, meralgia paresthetica, and cluneal nerve entrapment are conditions that can cause pain in a distribution that is similar to the sciatic nerve, but without involving the nerve directly.

Identifying any posterior thigh pain when the leg is elevated above 60 or 70 degrees as sciatica is a common diagnostic error. Unless the leg pain produced is identical to the patient's chief complaint on history, the test is negative.

Post-test Quiz



1. Herniated lumbar disc accounts for approximately what percentage of all sciatica cases?
2. When does a sciatic patient need emergent medical attention?
3. What needs to be considered in the patient history to inform a diagnosis of sciatica?
4. The physical examination should include:
5. Performance of a correct straight leg raise test involves:

greater intensity than the associated low back pain. Sciatica can be accompanied by sensory or motor deficits and positive neural tension tests. A detailed history and a thorough physical exam should concur on the aspects of the pain, both in location and aggravating factors. When needed, MRI showing disc herniation causing compression of the suspected nerve root can confirm the diagnosis; nerve conduction tests and EMG studies may be used to aid the assessment. When presenting symptoms are atypical, show non-dermatomal distributions or demonstrate incongruent clinical and radiographic findings, the differential diagnosis should be expanded to include the possibility of gluteal and pelvic pathology, malignancy, infection, peripheral neuropathy and conditions that mimic sciatica.

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