

SCIATICA

Sciatica is a term that refers to a burning, stinging, and/or numbing pain that is felt in the buttock, thigh, leg, and/or foot; it may or may not be associated with low back pain but almost always travels below the knee and into the foot. (Note: other types of referred pain can mimic sciatica as it travels into the thigh and rarely the leg. Common sources of referred pain include the disc, the facet joints, and SI joints).

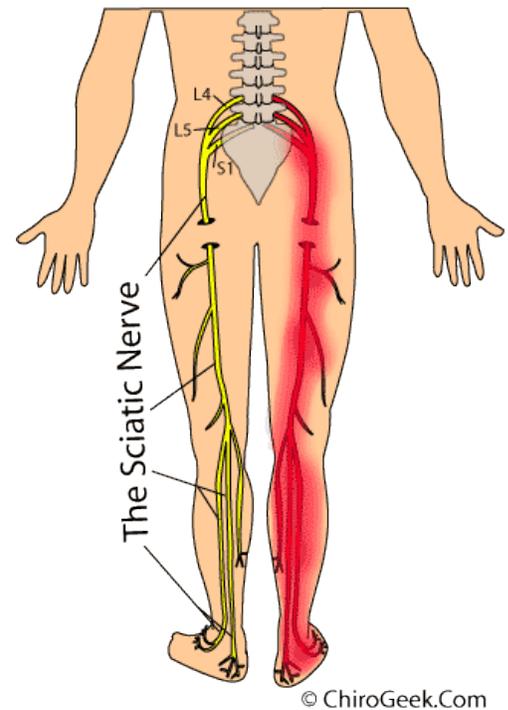
This torturous leg pain is a relatively common problem that affects approximately 5 to 10 of every 1000 people on an annual basis.

The good news for those of you that come-down with sciatica for the first time (which may or may not be accompanied with lower back pain) is that 60%--80% will recover to a non-disabling level within a period of 6 weeks. However, the recurrence rate is approximately 10 to 15%, so for some of you the problem will be ongoing. Those of you who have severe sciatica most likely will still be suffering significant pain at the one year time point.

What is the cause of Sciatica? Sciatica is caused by a pinching and/or irritation of one of the three lowest lumbar nerve roots that make up the giant sciatic nerve (that glowing red line to the right). Any pinching / irritation of these delicate nerve roots may not only cause lower back pain but may also ignite the entire sciatica nerve into a pain state!

Fig. #1

Sciatica



Fig#1 shows the general location of the giant sciatica nerve (yellow) which is the thickest and longest nerve in the human body. When this nerve gets aggravated (red), there is often a lot of pain involved over a large portion of the body (the lower limb). Note that there are three main 'spinal nerve roots' (within the lower back) that leave the spine and blend together within the pelvis and form the sciatic nerve. These are labeled L4, L5, and S1.

Not all lower extremity pain is classified as 'true sciatica': Sciatic pain may be classified as radicular and non-radicular pain. Radicular pain is pain radiating from the low back, past the knee, and into the dermatome. Non-radicular pain is pain radiating in the lower limb (usually not past the knee) in a non-dermatomal pattern.

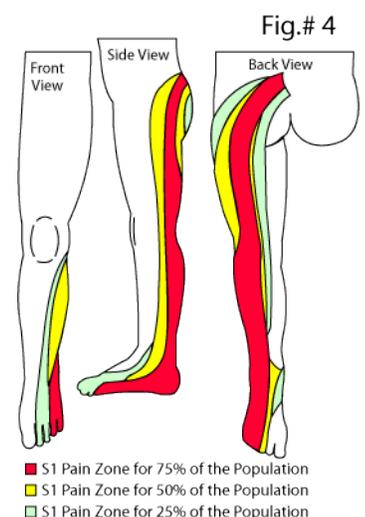
Which Type of Sciatica do you have?

The terms Sciatica, Radicular Pain, Radiculopathy, Radiculopathic Pain, and Root pain are all words describing the same thing, the pain is coming from the spinal root level as opposed to a referred pain from a facet joint, SI joint, or other spinal structure. The term 'sciatica' is not very specific and only indicates that the patient has lower limb pain, which may or may not be caused from nerve root compression/irritation. The different types of sciatica that we will be discussing will be: S1, L5, and L4 radicular pain.

S1 Radicular Pain:

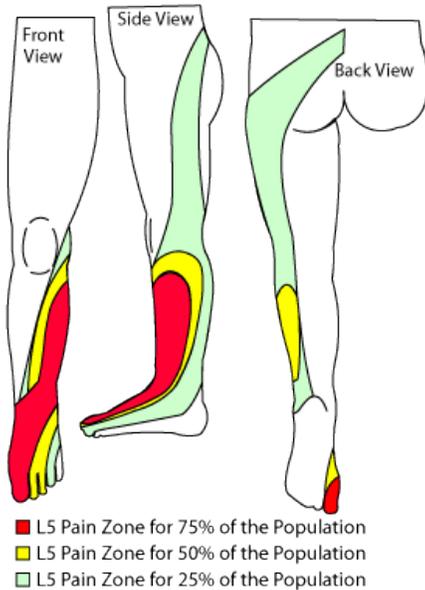
If the L5 disc herniates into the 'lateral recess' and compresses / irritates the descending S1 nerve root, the patient may suffer an **S1 radicular pain**. **Fig#4** shows the regions in the lower limb where the patient will most likely suffer the symptoms of S1 sciatica. As you can see, the majority of patients suffer the burning, stinging, and numbing pain of sciatica in the lateral foot, posterolateral leg, thigh, and butt, as well as, the bottom, outer 1/2 of the foot. These pains are the result of damage and irritation to the 'sensory portion' (portion of the nerve root which connects to skin) of the nerve root.

If the 'motor portion' (portion of nerve root which connects to muscle) of the S1 nerve root is damaged or irritated by the disc herniation, the patient may suffer weakness and/or atrophy in the Gastrocnemius muscle (calf), the peroneal muscles (foot evertors), and/or the muscles which flex or curl the 'big toe'. The Achilles' Reflex and Plantar Reflex may also be diminished or absent. If severe,



the patient will be unable to do 'calf raises' with the effected foot. Calf raising is the 'gold standard' muscle test for S1.

Fig.# 5



L5 Radicular Pain:

If the L4 disc herniates into the 'lateral recess' and compresses / irritates the descending L5 nerve root, the patient may suffer an **L5 radicular pain** (aka: L5 root-pain, or L5 Sciatica). **Fig # 5** shows the regions in the lower limb where the patient will most likely suffer the symptoms of L5 sciatica. As you can see, the majority of patients suffer the burning, stinging, and numbing pain of sciatica in the top and inner surface of the foot, the outer-front of the leg, and the bottom of the big toe. These pains are the result of damage and irritation to the 'sensory portion' (portion of the nerve root which connects to skin) of the nerve root.

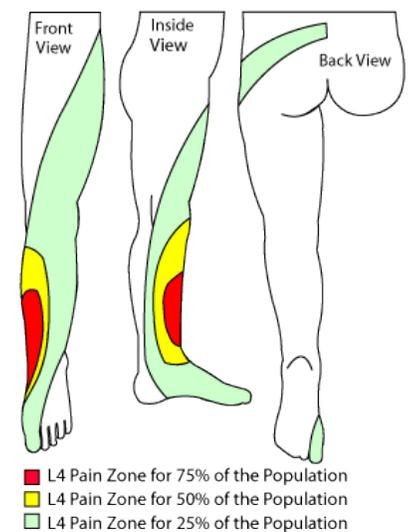
If the 'motor portion' (portion of the nerve root which connects to muscle) of the L5 nerve root is damaged or irritated by the disc herniation, the patient may suffer weakness in the Extensor Hallusis Longus muscle (muscle that lifts the big toe - classic finding) or the muscles that dorsi-flex the foot (lift the foot up) upward. If severe, the patient will be unable to 'walk on their heels' with their toes and ball-of-the-foot off the ground. There is no reliable reflex test for this nerve root.

L4 Radicular Pain:

If the L3 disc herniates into the 'lateral recess' and compresses / irritates the descending L4 nerve root, the patient may suffer an **L4 radicular pain** (aka: L4 root-pain, or L4 Sciatica). **Fig # 6** shows the regions in the lower limb where the patient will most likely suffer the symptoms of L4 sciatica. As you can see, the majority of patients suffer the burning, stinging, and numbing pain of sciatica in the top and inner surface (dorsum) of the foot, the outer-front of the leg, and the bottom of the big toe. These pains are the result of damage and irritation to the 'sensory portion' (portion of the nerve root which connects to skin) of the nerve root.

If the 'motor portion' (portion of the nerve root which connects to muscle) of the L4 nerve root is damaged or irritated by the disc herniation, the patient may suffer weakness in the quadriceps muscle (muscle that extend the knee). If severe, the patient will be unable to perform a squat or get out of a chair because. If the problem is severe, the patient will often have a diminished or absent Patellar Reflex (aka: knee jerk).

Fig.# 6



The Causes of Sciatica:

As I see it, there are three main possible "causes" of acute sciatica: **1) disc herniation induced sciatica**; the posterior of the disc herniates into the adjacent sciatica nerve root which in turn physically compresses and irritates that nerve root into a painful state; **2) grade V annular tear induced sciatica**; the disc rips open and allows biochemical (cytokines) to leak out and soak the adjacent sciatica nerve root(s), which in turn inflames the sciatica nerve root into a painful state; and **3) discogenic sciatica**; the patient may experience a "referred" pain down the lower limb from severe irritation of the tiny sensory nerve fibers that live **within** the outer 1/3 of the annulus of the disc.

Lumbar Disc Herniation:

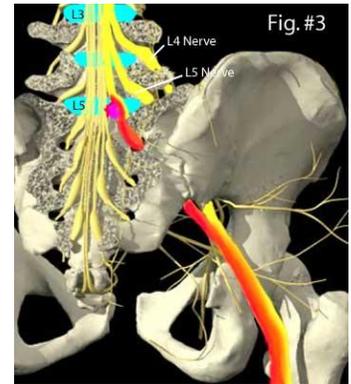
It has been known for years and is generally accepted that a compressive lumbar disc herniation is a common cause of sciatica, and the patients symptoms will usually depend upon which spinal nerve root is involved. Since 95% of lumbar disc herniations occur at either the L4 or L5 disc level, it's not at all surprising that sciatica is so very common. This high frequency of L4 and L5 disc herniation is also the reason why most EMG-confirmed radiculopathy occurs in the L5 or S1 root.

Fig #3 demonstrates a paracentral herniation (pink) of the L5 disc that is located within a region called the lateral recess. The herniation is compressing the right S1 nerve root which may cause 'radicular pain' in this patient's S1 dermatome (right lateral foot). This patient may also have a loss of 'motor function' in the right lower limb as well as loss of muscle strength in the gastrocnemius (calf) and peroneal muscles. There might also be a lost Achilles' reflex.

THE SCIATICA-HERNIATION CONUNDRUM:

Sciatica is more than a disc herniation, pinched sciatica nerve root, and pain distribution of the sciatica nerve. Some people have severe sciatica without any evidence of compressive disc herniation at all!

In a recent investigation by Karppinen, it was demonstrated that 20% of severely acute sciatica patients had no compressive disc herniation on MRI; all MRI images were negative for protrusion, extrusion, and/or sequestration, yet these patients were suffering from severe back and leg pain! These researchers concluded that the severity of sciatica and back pain are NOT related to the amount of disc displacement (size of herniation) or the amount of spinal nerve root compression!



So, if it's not a compressive disc herniation that's causing the suffering, then what it? One possible explanation was put forth by both Ohnmeiss and Milette. These investigators experimentally demonstrated that disruptions within the substance of the disc (anular tears) not only caused low back pain but also caused 'referred pain' into the lower limb; we may call this referred lower limb pain 'discogenic sciatica'.

Another explanation is based upon the investigations of Olmarke. This group has repeatedly demonstrated that the application of nucleus pulposus upon the spinal nerve root can create marked morphological change (axon damage) and functional change (decreased conduction speed) to the micro-anatomy of that nerve root, as well as cause 'pain-related behaviors' to occur within the test subjects.

Therefore, if this nucleus pulposus get 'loose' in the epidural space (most likely from a grade 5 posterior anular disc tear), it may well cause the pathological spinal nerve root changes described by Olmarker and result in a painful sciatica syndrome without nerve root compression. Researchers have termed this phenomenon "Chemical Radiculopathy".

The final theory on non-compression induced sciatica implicates the activation of the patients own immune system against the nucleus pulposus-soaked nerve root. This 'auto-immune' type reaction may help perpetuate the syndrome of chronic sciatic pain. Whatever the cause, it is clear that non-compressive disc defects (bulges and contained herniations) are just as painful and disabling as the classic large compressive disc herniation. Therefore the symptoms of sciatic patients without disc herniation in MRI should not be dismissed by the doctor.

DISC HERNIATIONS IN NORMAL ASYMPTOMATIC PEOPLE:

It's common knowledge that not all compressive disc herniations (as seen on MRI and CT scan) will result in back pain and/or sciatica and are commonly found in completely asymptomatic people (40-47). I've got a page on the phenomenon of disc herniations in asymptomatic people, but would like to give you all an example and then the 'bottom line' of my research into MRI false positives:

Risk Factors for the development of Sciatica:

Besides having bad genetics for disc building material, which is probably the number-one risk factor for disc herniation-associated sciatica, the line of work that you choose may significantly increase or decrease your livelihood of developing disc herniation-associated sciatica. Research has indicated that 'heavy manual labor' and 'sedimentary work' are the two types of employment most frequently associated with the development of sciatica. More explicitly, investigations have demonstrated that frequent heavy lifting, (frequent twisting and bending, exposure to vibration, and sedentary activity all increase the risk of developing sciatica. It seems that the "safest" type of work (work in which less people develop sciatica) is that which combines a combination of sitting, standing, and physical activity.