Lesions of the Sciatic Nerve

Lesion of peripheral nerves causes motor deficits, reflex disorders, sensory disturbances, vegetative deficits, trophic disorders, pain and irritation syndromes, and much more. In the following article you will find an overview of the sciatic nerve, what causes lesions, how they are diagnosed and treated, which differential diagnoses have to be taken into account and which treatments are appropriate.

Definition of Sciatic Nerve Lesion
The **sciatic nerve** is a peripheral nerve emerging from the spinal cord segments L4-S3. It is defined as the strongest nerve in the body and is composed of all the ventral branches of the **sciatic plexus**.

Motorically, it innervates the **ischio-crural muscles** and all muscles of the lower leg and foot. A large part of the skin on the lateral and dorsal surface of the lower leg, as well as the skin of the foot is supplied sensitively by the **sciatic nerve**. The only exceptions are the **medial ankle region** as well as a narrow strip along the medial border of the foot, which are innervated by the **saphenous nerve**.

It leaves the pelvis through the **infra piriform foramen** and runs covered from the **gluteus maximus muscle** to the **obturator internus**, the **Mm. gemelli** and the **quadratus femoris muscle**. It runs distally between the **tibial** and **fibular flexors** of the thigh, below the long head of the **biceps femoris**.

The **sciatic nerve** splits into the **tibial nerve** and the common **fibular nerve** at the junction of the middle third of the **femur distal**, at the latest before transferring to the **popliteal fossa**.

Being the largest nerve in the human body, the sciatic nerve is susceptible to injuries throughout its anatomic course. The nerve is responsible for the supply of motor functions to the lower limb. Its sensor distribution entails the upper part of the leg as well as the lower part of the leg with the exception of the saphenous territory.

### Etiology of Sciatic Nerve Lesion

#### Causes of sciatic nerve lesion

The causes of sciatic nerve lesion are varied. The following causes have been diagnosed:

- After implantation of a hip prosthesis
- Due to external pressure
- Circulatory disorder
- **Gunshot wound**
- Fracture of the pelvis
- Femur fracture
- Tumors
- Injection damage
- Infections

Ischiadicus lesion through intramuscular injections is the most common amongst all damages, in which an intense foreign body reaction occurs around the nerve and the nerve is strangled by the **dense scar tissue** surrounding it.

Approximately 20% of all **sciatic nerve** lesions occur during total endoprostheses of the hip. Apart from transectioning, which can happen during detachment of external rotators, pressure damage caused by surgical instruments as well as splintering of bone fragments is possible. In addition, mechanical damage by drills, saws, etc. have been observed.

In approximately 14% of all cases in which external pressure was applied, as a result of strain and sprain in flexion of the hip joint to distal, lesions of the **femoral nerve** were detected. Nervous strain damage is regularly observed during lengthening osteotomies of the femur with length increases of more than 3 cm, provided they are made unilaterally.

Furthermore, **sciatic paresis** can be caused by exogenous application of pressure and positioning. Especially in children and lean people, compression damage can be caused through prolonged sitting on hard surfaces.

Circulatory disorder, as a result of **atherosclerotic stenosis** of the common **iliac artery**, leads to **unilateral painful sciatica** with vague and not clearly delineated atrophy of the leg muscles. Usually, it then leads to sciatic compression with pain and paresis.

Tumors mainly appear in **nerve vicinity** and in this case, despite being rare, in the sciatic stem, detected by MRI or CT, respectively. A tumor can affect the sciatic nerve even before leaving the **pelvis**.

Infections are rare, nevertheless a **Staphylococcus aureus** abscess in piriformis has led to **severe sciatica** in the past.

### Symptoms and Clinic of Sciatic Nerve Lesion

#### Symptoms of sciatic nerve lesion

Symptoms of sciatic include pain that starts in the back and moves down to the leg and may move into the foot. Weakness, tingling, and numbness in the leg may also occur. The symptoms can get worse through sitting, standing for a long time or movements that cause the spine to flex. The intensity of the pain is difficult to quantify, however facial expressions are useful while making observation on the patient.

Also the following symptoms in relation to the location of the lesion may occur:

**Pelvic outlet**

Active flexion of the knee is no longer possible when the **sciatic nerve** is damaged in the **pelvic** outlet.
Common fibular nerve (popliteal or head of the fibula)

If damage occurs in this area, the patient suffers from complete paralysis of dorsiflexion of the foot and toe as well as a penchant to pronation of the foot. Furthermore, sensitive damages to the lateral lower leg and dorsum of the foot and drop foot occur.


Deep peroneal nerve

The patient shows the same symptoms as in damages to the common fibular nerve. When the deep fibular nerve is damaged, lifting of the lateral margin of the foot is still possible. Sensitivity is also “only” disturbed in the dorsal ridge of the foot.

Tibial proximal (e.g. popliteal)

In proximal damage to the tibial nerve, the patient can no longer actively flex the foot and the toes, supinate the foot or spread the toes. Sensory disturbances are found dorsal on the lower leg and on the soles.

Tibialis mid lower leg

In case of damage in this lesion area, clawing of the toes is observed in patients. The malfunction manifests itself through a slight plantar flexion weakness of the foot, with a possible supination weakness as well as a plantar flexion weakness of the toes. Sensory loss can be observed on the whole sole of the foot.

Tibialis behind internal malleolus

Tibial nerve damage behind the medial malleolus results in pareses of the spreading of the toes, often associated with symptoms of pain and dry soles of the feet. Sensory loss on the soles of the feet is also diagnosed.

Injections

Damages to the sciatic nerve through injections in the buttocks area are noticeable.
Damage arises most commonly from misplaced gluteal injections. Syringe paralysis can occur, which usually causes radiating pain in the leg and results in sensory and motor deficits. In some patients, pareses of foot and toe extensors ensue after a few hours or days. It depends on the severity of the damage, if irritation or deficits dominate the clinical picture.

**Diagnosis of Sciatic Nerve Lesion**

As mentioned above, tumors, fractures and bruises, which are responsible for damages to the *sciatic nerve*, can be detected by means of CT and MRI.

Besides visible movement restrictions, pathological deformities of the feet, pain symptoms, etc., diagnosis of *sciatic nerve* lesion are also possible through clinical function tests, amongst other things. The examiner can check the function of the knee flexors to diagnose a lesion.

Ideally, the function of the knee flexors is examined when the patient is lying on their front. The patient bends their knee to about 60 % and the test pressure of the examiner on the distal lower leg will go towards extension. With tension, the medial (*Mm. Semitendinosus* and *semimembranosus*) and lateral (*biceps femoris*) tendons, that form the boundary of the *popliteal fossa*, are palpable.

**Differential Diagnosis**

**Similar clinical patterns to sciatic nerve lesion**

When studied carefully, other mono pareses of the leg can hardly be confused with *sciatic nerve* lesion, nevertheless, incipient amyotrophic lateral sclerosis can feign sciatic paresis if considered superficially. However, sensory disturbances will be absent.

**Therapy of Sciatic Nerve Lesion**

Sciatic injuries are treated surgically.

Clean sectionings and smaller defects are treated with end-to-end neurorrhaphy (nerve suture) while slight flexion is applied to the knee joint. These usually occur along the thigh up to the division point above the knee pit and are mainly caused by cuts or gunshot wounds.

Only in case of major defects is a performance of a nerve transplant required. In cases of complete injury of the *sciatic nerve*, absence of protection sensitivity of the soles of the feet is possible. Adequate protection is therefore often considered a success. Restoration of plantar flexion and dorsal extension to a reasonable extent, are also considered satisfactory rehabilitation results.

The main preventive measure should be preventing dropping of foot and contracture of calf muscles. An aluminum night-shoe should be worn at night and a shoe with plastic inserts during the day.

**Alternative Sciatic Nerve Pain Treatment**

- Chiropractor spinal adjustments
- Yoga and stretching
• Acupuncture and massage therapy
• Avoidance sitting for long periods
• Usage of heating pads
• Reduction of inflammation

Review Questions

The answers are located below the references.

1. Which 3 muscles are critical in diagnostic muscle function tests to check a femoral nerve lesion?
   
   A. M. iliopsoas, hamstrings and rectus femoris  
   B. M. tibialis anterior, M. Sartorius and rectus femoris  
   C. M. tibialis anterior, M. Sartorius and hamstrings  
   D. M. iliopsoas, M. Sartorius and rectus femoris  
   E. M. iliopsoas, tibialis anterior and hamstrings

2. Which cause of sciatic nerve lesions is classed as a “rare”?

   A. After implantation of a hip prosthesis  
   B. Infections  
   C. Through external pressure  
   D. Circulatory disorders  
   E. Injection damage

3. Which incipient disease may feign sciatic paresis if considered superficially?

   A. Polymyositis  
   B. Myatrophische lateral sclerosis  
   C. Multiple Sclerosis  
   D. Parkinson’s disease  
   E. Myasthenia gravis sources

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Correct answers: 1D, 2B, 3B

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