

# Root syndromes

As root syndromes, we refer to those pains that arise due to compression of the root in the intervertebral space. The spinal cord can be damaged unilaterally or bilaterally, mostly asymmetrically. Polyradicular involvement occurs more often in older patients due to long-term degenerative changes. In younger individuals, the symptoms arise rather spontaneously as a result of a known mechanism, it is mostly an isolated involvement of one root disc herniation. We divide them into cervical and lumbar.

## Types of pain in root syndromes

### Local pain

The pain is at the point of origin, it does not spread to the surroundings. We label it according to the location, e.g. lumbago.

### Radicular pain

Is pain that propagates along a given dermatome that is innervated by the damaged root. It is often an indicator of a herniated intervertebral disc and other degenerative changes of the spine, but it can also indicate Lyme borreliosis.

### Pseudoradicular pain

It is most often localized in the sacroiliac articulation or around the trochanters. It spreads through the groin or buttocks to the side of the thigh and does not cross the knee joint. It accompanies functional disorders of the joints or the spine.

## Clinical picture in general

Patients often report pain radiating to one limb, rarely to both, and often complain of limited mobility. Objectively, we often find limited mobility, muscle weakness and impaired sensation in the given sensitive area.

## Cervical root syndromes

Here we find frequent restrictions on the mobility of the cervical spine, some passive movements of the head can cause pain. Muscle weakness in cervical root syndromes is not as large and noticeable because one muscle is often supplied by multiple roots. Clinical manifestations in elderly patients with chronic degenerative Cp diseases often lack the classic clinical picture. Sensitive disorders of varying degrees prevail, which may not have a clear root distribution to the upper limb. Classic cutting pain occurs in only about half of patients due to passive extension and rotation of the head to the affected side. Motor disorders are mostly compensated, although studies show that up to 3/4 of patients have motor deficits and reduced reflexes. It is therefore very difficult to make a correct diagnosis.

### Root syndrome C2

Rarely occurs. It is accompanied by unilateral pain in the processus mastoideus or retrobulbar area. The pain is most likely caused by irritation of the posterior branch n. occipitalis major at the point of penetration of the muscle and fascia towards the occiput.

### Root syndrome C3 and C4

The clinical symptoms of these two root syndromes are almost identical, the only distinction is due to the sensitive innervation area, which is often very difficult. The pain occurs on the lateral side of the neck, through the m. trapezius to the acromioclavicular joint, sometimes it affects the upper chest as well. The pain is typically sharp, provoked by a change of position or Valsalva maneuver.

### C5 root syndrome

Pain radiates from the neck to the lateral side of the arm. There is a motor disorder m. deltoideus and thus a weakening of abduction in the shoulder. The shoulder rotators m. supraspinatus and m. infraspinatus are also slightly affected, the equipment of the bicipital reflex may be affected. Sensory denervation corresponds to dermatome C5.

### Root syndrome C6

Pain spreads along the radial side of the forearm up to the I. and II. finger. Motorly, flexion in the elbow and extension in the wrist are weakened. brachioradial reflex is impaired. Sensory denervation corresponds to dermatome C6.

### Root syndrome C7

The pain is spread along the dorsal side of the arm up to III. finger. Motorly, the m. triceps brachii weakens. The equipment tricipital reflex is affected. Sensory deficit corresponds to dermatome C7.

### Root syndrome C8

The pain spreads through the back of the shoulder, the ulnar side of the arm up to IV. and V. finger. mm. interossei, m. flexor carpi radialis and m. flexor digitorum profundus are motorically impaired, we find weakened finger flexion. Sensory deficit corresponds to dermatome C8.

## Lumbar Root Syndromes

Here we find many more causes than in neck syndromes. Most often, trunk compression occurs due to a herniated intervertebral disc, in up to half of the cases it is the L5/S1 segment. Prolapses in the L4/L5 segment are also common, less so in L3/L4. Other root syndromes hardly occur in the lumbar region. Another significant cause of root syndrome in this area is spondylitic changes in the spinal canal.

## Clinical picture

Subjectively, the pain shoots into the relevant limb, worsens with coughing, sneezing and defecation. Objectively, we find positive stretching maneuvers (Láseque, inverted Láseque, Thomayer's sign), sensitive denervation in the relevant segments, weakening of muscle strength and even manifestations of peripheral paresis.

### L1, L2 and L3 root syndrome

Their occurrence is very rare, together about 1-2% of all cases of lumbar root syndromes. The pain radiates down the front of the thigh. The sensory disturbance corresponds to the relevant dermatome L1, L2 or L3. The motor impairment is partly for m. iliopsoas and m. quadriceps femoris. The cremaster reflex tends to be limited.

### L4 root syndrome

About 5% of all diagnosed lumbar syndromes are caused by a disorder of the L3/L4 disc. The pain spreads along the front of the thigh, to the inner side of the lower leg and to the inner side of the planta. It is difficult for the patient to walk up the stairs, he does not walk "on the switch", but moves the affected limb up the stairs to the healthy one. Sensory denervation corresponds to the L4 segment. Dorsal flexion of the leg and knee extension are motorically weakened, mainly m. tibialis anterior and partially m. quadriceps femoris. The knee is less stable during fast movements and often "buckles". The equipment of the patellar reflex is violated. The corresponding stretching maneuver is the reverse Láseque.

### L5 root syndrome

Roughly 45% of the disability is due to a disorder of the L4/L5 intervertebral disc. The pain is projected on the outer side of the thigh and calf to the dorsum of the leg after the II-IV, sometimes even the I. toe. The sensory disturbance corresponds to the L5 dermatome. The main motor deficit is the inability to perform dorsiflexion of the thumb, weakening of dorsiflexion of the fingers and ankle. The patient is unable to stand on the heel, in case of a mild disability, he manages this position with the tip of the foot dropped. Clinically, the syndrome resembles peroneal nerve palsy, therefore it is referred to as **'pseudoperoneal paresis'**. The appropriate tensioning maneuver is the classic Láseque as for S1 root syndrome.

### S1 root syndrome

55% of cases show clinical signs of damage to the L5/S1 intervertebral disc. The pain spreads along the back of the thigh and can end up to the V. toe. The S1 dermatome is sensitively affected. Plantar flexion of the foot and pronation are motorically limited. The patient is unable to stand on tiptoe well, stumbles on the leg when walking and cannot manage to spring the foot on the tip. We often find a hypotonic gluteus maximus muscle. The flexibility of the Achilles tendon reflex is impaired.



Scheme of intervertebral disc herniation.

## Links

## References

- MUMENTHALER, Marco – BASSETTI, Claudio L. *Neurological differential diagnosis*. 5. edition. Prague : Grada, 2008. 369 pp. ISBN 978-80-247-2298-6.
- PFEIFFER, Jan. *Neurology in rehabilitation : for study and practice*. 1. edition. Prague : Grada, 2007. 327 pp. ISBN 978-80-247-1135-5.
- KASÍK, George, et al. *Vertebrogenic root syndromes : diagnosis and treatment*. 1. edition. Prague : Grada, 2002. ISBN 80-247-0142-1.
- ZEMAN, Miroslav. *Special Surgery*. - edition. Galen, 2004. 575 pp. ISBN 9788072622603.