

# Syndromes of peripheral nerve involvement

## Upper limb

### Lesions of the nervus radialis

- **Anatomy:** The n. radialis has fibers from C5-C7 roots and separates from the n. axillaris. During its course on the lateral side of the arm, it sends out cutaneous and motor branches (*m. triceps brachii*). It mainly controls extension of the elbow, wrist and metacarpophalangeal joints.
- **Clinical picture:** the arm falls over volarly, dorsal flexion and extension of the fingers are impaired. Abduction and extension of the thumb are impaired. The patient is unable to make an intense fist. Sensory impairment may not be significant, possibly affecting the area of the 1st and 2nd metacarpal dorsally.
- **Causes:**
  1. *lesions in the axilla area* - motor fibres for *m. triceps brachii* are also affected, leading to impaired extension at the elbow (e.g.: compression with high crutches);
  2. *lesions in the sulcus n. radialis area* - innervation of the triceps is normal, hand and finger extensors are affected (e.g.: Saturday night palsy - pressure of the edge of a bench or chair in the axilla area in heavily drunk people);
  3. *fractures of the humerus* - need to investigate hand mobility; there may be twisting between fragments, either in the injury or in subsequent repositioning or surgery;
  4. *Supinator tunnel syndrome* - oppression when passing through the *m. supinator*;
  5. *oppression in the wrist area where it presses tightly on the radius* - impairment of sensory innervation (e.g.: tight watch strap, metal cuffs).

### Lesions of the nervus ulnaris

- **Anatomy:** The N. ulnaris is formed by fibers from the C8-Th1 roots and runs along the medial side of the arm. In its course it is located in two places very superficially under the skin - in the *sulcus nervi ulnaris* and at the level of the wrist next to the os pisiforme. In the palm it runs from the hypothenar to the thenar. It sends motor branches to the forearm and especially to the hand itself (the whole hypothenar, *mm. interossei* and part of the thenar).
- **Clinical picture:** Semiflexed posture of the 4th and 5th fingers, invaded first interosseous space, abducted pinky, atrophy of all interosseous muscles with prolonged paresis. The image of a **clawed hand** emerges. The sufferer feels paresthesias in the area of the 4th and 5th fingers.
- **Causes:**
  1. *Cubital tunnel syndrome* - chronic microtraumatization during exertion at the elbow;
  2. *compression in Guyon's canal* - mainly motor disability, hypothenar is usually spared; atrophy of I. interosseus predominates;
  3. *chronic compression syndromes* - rheumatological diseases, arthritic defigurations, external compression when leaning on a support (e.g.: glass grinders);
  4. *Axillary lesions* - very rare (e.g.: compression by high crutches);
  5. *trauma* - fractures in the elbow area (e.g.: luxations and dislocated fractures), cutting injuries in the wrist area;
  6. *soft tissue tumours* - lipoma, fibroma.

### Lesions of the nervus medianus[edit] Main article.

- **Anatomy:**The N. medianus arises from the fibers of the C5-Th1 roots and runs along the inner side of the arm. It motor innervates the flexors, *m. pronator teres* and most of the muscles of the thenar and *mm. lumbricalis I* and II.
- **Clinical picture:** Mostly manifested by impairment of sensory innervation. Patients have problems with hypesthesia, allodynia or causalgia. In severe lesions there is atrophy of a part of the thenar that appears as a sinkhole.
- **Causes:**
  1. *Carpal tunnel syndrome*;
  2. *supracondylar fractures of the humerus*;
  3. *pronator tunnel syndrome* - often preceded by increased muscle strain, manifested predominantly by pain, rarely by paresis;
  4. *trauma in the wrist area* - cutting injuries.

## Lower limb

### Lesions of the nervus ischiadicus

- **Anatomy:** The N. ischiadicus receives fibers from the roots of L4-S3 and is the largest nerve of the sacral plexus. It sends motor fibers to the flexors of the posterior thigh and to the muscles of the tibia and leg, sensitively innervating the lateral and dorsal parts of the calf and the leg itself. In its course it divides into 2 main branches - *n. peroneus* and *n. tibialis*.

- **Clinical picture:** When both main branches are completely damaged, the dorsal and plantar flexion of the leg is impaired. However, isolated damage to the *n. peroneus* is more common. This is due to its localization closer to the body surface, disproportionately smaller vascular supply to its size, and greater traction in its course. There is paresis of the knee flexors and hip extensors, but this may be quite subtle. It is often compensated by the gluteal and calf muscles.
- **Causes:**
  1. *Trauma* - pelvic luxation and fractures, posterior hip luxation;
  2. *iatrogenic damage* - peroperatively during hip alloplasties (mechanism of compression, traction or ischemia), misapplication of i.m. injection into the gluteal region (especially in cachectic patients and children);
  3. *oppression* - unconscious patients, haematomas in the gluteal region, tumours;
  4. *m. piriformis syndrome* - manifested by pain in the buttock area with radiation to the hip and thigh.

## Lesions of the nervus femoralis

- **Anatomy:** The N. femoralis is formed by fibers from the roots of L2-4. It motor innervates the *m. iliopsoas*, *m. sartorius* and *quadriceps femoris*, and provides sensory innervation to the inner thigh and inner tibia. It allows flexion at the hip and extension at the knee.
- **Clinical picture:** There is a predominant impairment of the motor function of the *quadriceps*, due to which patients have problems with walking up stairs, climbing a chair, and when walking down stairs, their lower limb is bruised. With prolonged duration of damage, the *quadriceps* atrophies.
- **Causes:**
  1. *trauma in the pelvic area* - fractures, luxations;
  2. *consequence of surgery* - hip surgery, groin extirpation, etc.;
  3. *iatrogenic* - misapplication of i.m. injections, hematomas after angiography;
  4. *oppression in the area of the inguinal canal* - tumours, enlarged nodes, aneurysm of a. femoralis.

## Lesions of the nervus tibialis

- **Anatomy:** The N. tibialis is formed by fibers from the roots of L5-S2. It separates from the n. ischiadicus, sends out several motor branches (*m. triceps surae*, *m. tibialis post.*, *m. flexor digitorum longus* and *flexor hallucis longus*) and sensitively innervates the posterior aspect of the calf and lateral part of the leg (forming a junction with the *n. peroneus* to form the sensory *n. suralis*). It passes behind the inner ankle and its terminal branches are the *n. plantaris medialis et lateralis* innervating the small muscles of the leg.
- **Clinical picture:** Weakening of plantar flexion of the foot and toes. Patients are unable to walk on tiptoe. The foot is numb and the Achilles tendon reflex often disappears.
- **Causes:** Compared to the *n. peroneus*, it is significantly less fragmented.
  1. *Knee trauma* - luxations and dislocated fractures;
  2. *trauma in the area of the passage behind the inner ankle* - cuts and cuts, ankle fractures, oppression by plaster bandage, etc.;
  3. *tarsal tunnel syndrome* - initially manifested as intermittent pain shooting into the plantar region, with prolonged duration of constant paresthesia and pain.

## Lesions of the nervus peroneus

- **Anatomy:** The n. peroneus receives its fibers from the roots of L4-S1. It splits off from the n. ischiadicus as the common trunk of the *n. peroneus communis*, and divides into superficial and deep branches at the area of penetration into the *m. peroneus*. In its course it encircles the head of the fibula, where it is deposited very superficially and is frequently injured at this point. It innervates the outer side of the calf in a positive manner. It motorises the everzi of the leg, the extensors of the anterior aspect of the tibia and the small muscles of the dorso-leg.
- **Clinical picture:** Because dorsal flexion of the foot is restricted, the patient is unable to walk on his heels and the toe falls over.
- **Causes:**
  1. *Oppression at the fibula head* - the nerve may be pressed against the bone and become crushed (e.g.: cast fixation, long-term immobilization, operative position on the side, long-term squatting position during gardening);
  2. *traction injuries* - a consequence of knee luxation or ankle distortion;
  3. *isthmus syndrome* - oppression by a ligamentous band in the fibular tunnel, anterior tarsal tunnel syndrome;
  4. *compartment syndrome*;
  5. systemic polyneuropathies - vasculitis, amyotrophic lateral sclerosis.

## Links

## Related articles

- Radial nerve
- Ulnar nerve
- Median nerve

- Cubital landscape
- Canalis cubitalis
- Guyon's canal
- Humerus
- Carpal tunnel syndrome
- Ischiadicus
- Femoral nerve
- Tibial nerve
- Nervus peroneus communis
- Inguinal canal
- Amyotrophic lateral sclerosis
- Vasculitis

## **Used literature**

- BEDNAŘÍK, Josef - AMBLER, Zdeněk - RŮŽIČKA, Evžen. *Klinická neurologie*. 1. edition. Triton, 2010. ISBN 978-80-7387-389-9.