Brachial plexus paresis

Anatomy

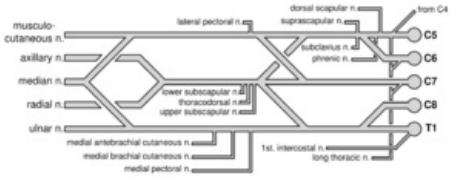
The brachial plexus (C4–Th1) is formed by the connection of the anterior branches of C5–C8, to which the connector from C4 arrives on the cranial side, and most of the fibers from Th1 connect to them caudally. Connections from C4 to Th1 are individually variable.[1] The ventral branches of C5–Th1 join into three primary bundles (truncus superior, medius, and inferior).

These bundles pass through the fissure between the scalenus anterior and medius muscles (fissura scalenorum) together with the subclavian artery and are placed above the artery. The primary bundles braid down further caudally and laterally behind the clavicle into the axilla. The clavicle divides the entire plexus into pars supraclavicularis and pars infraclavicularis. From the pars supraclavicularis depart the motor nerves supplying mainly the girdle muscles.[2]

Below the clavicle, the three primary bundles (trunks) of the brachial plexus are further divided, each primary bundle is divided into an anterior and a posterior branch, and the joining of these branches creates secondary bundles - fasciculi plexus brachialis. These gradually bypass the trunk of the axillaris artery, and their own peripheral nerves only emerge from them.[1]

Brachial plexus paresis

Brachial plexus paresis is a peripheral paresis, that most often arises due to ischemic-compressive or traumatic etiology. Considering that the brachial plexus conducts both motor and sensitive and autonomic innervation, we find not only motor but also sensitive and autonomic symptoms. We distinguish between complete and incomplete paresis of the brachial plexus.



Brachial plexus and its anatomical distribution

Complete brachial plexus paresis

With a complete lesion of the entire plexus, weak plegia of the entire upper limb (plexus, arm and hand) occurs. All that remains is the shoulder elevation ability. Hearing is impaired except for the inside and back. It can be Horner's syndrome from disturbed sympathetic innervation. There is a C5-8 areflexia, in a chronic stage of severe atrophy.

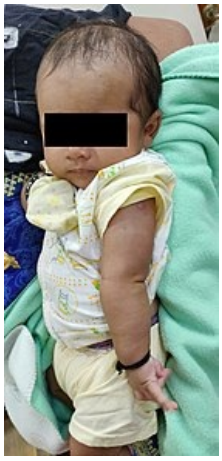
The stated condition often has traumatic causes, such as the result of tearing out the roots from the spinal cord.

Incomplete paresis of the brachial plexus

We distinguish between upper and lower type paresis.

- **Upper type palsy – Duchenne-Erb's palsy**

In the paresis of the plexus of the upper type (C5–6), there is a motor lesion in the area of the shoulder and part of the arm. Motor innervation of the own hand is normal. We characterize the disorder as "a good hand on a paralyzed shoulder and arm." The position of the limb is referred to as the so-called "waiter tip position", the shoulder is in adduction, internally rotated, the elbow is extended in pronation and the wrist is in flexion. In newborns, this palsy can be manifested by an asymmetric Moro reflex. In newborns, the most common cause is an incorrect passage through the birth canal. There is C5–6 areflexia (bicipital and brachioradial).


Duchenne-Erb's palsy.

- **Paralysis of the lower type - Klumpkova-Dejerin's palsy**

We characterize paresis of the lower type (C8–Th1) as a “paralyzed hand on the good shoulder and arm”. C8 areflexion (r. finger flexors). Contemporary Horner's syndrome is common.[3] Příčinou je silné táhnutí paže vzhůru nad horizontálu.

Causes of emergence

Damage to the plexus occurs for a variety of reasons. Traumatic causes, especially motorcycle traffic accidents, are among the most common. [4]

- **Traumatic causes**

The most common injury is the traction mechanism.[3] It occurs after violent stretching, e.g. after motorcycle accidents. The prognosis is very poor.[5]

In the case of traumatic paresis, it is important to distinguish between a traumatic lesion of the plexus and the pulling out of the roots from the spinal cord. A supraganglionic lesion has a minimal chance of repair. A neurosurgical solution is possible for infraganglionic lesions [6]

Postpartum paresis of the brachial plexus is caused by a traction mechanism during difficult births. The most common is the upper type.[3]

- **Upper thoracic outlet syndromes (TOS = thoracic outlet syndrome)**

These syndromes are determined by the anatomical conditions in the area of the upper thoracic aperture, where there is often pressure damage to the nerve-vascular structures passing through here. It is not always possible to prove exactly the pathogenic mechanism [6]

These syndromes include:

- cervical rib syndrome,
- scalene syndrome,
- costoclavicular syndrome,
- hyperabduction (Wright) syndrome,
- paresis of the brachial plexus from oppression by the tumor.[6]

- **Malfunction**

It should be borne in mind that this may be a combined disorder. Upper thoracic aperture syndrome itself is a combination of several functional disorders. A key role is played by a muscle imbalance in the area of the shoulder girdle, causing tension in the upper fixators of the scapula, and the upper type of breathing, during which the scalene muscle is overloaded.

This increased tension is transferred to the muscles of the arm and forearm, where it manifests itself most in the form of epicondylalgia. Soon there will also be limited mobility of the movement segments of the spine and the joints of the upper limb and this increases the muscle spasm again. Pain radiating from the neck to the shoulder precedes pain in the elbow region and in the styloid process radii, then follows the carpal tunnel syndrome and associated dysesthesias caused by the blockade of the first rib, which again causes spasm of the scalenes and the upper part of the trapezius muscle.[7]

Links

Related Articles

- Brachial plexus
- Horner's syndrome

Source

1. ČIHÁK, Radomír. Anatomy 3: peripheral nervous system. 2., upr. a dopl. vyd. Praha: Grada, 2004, 673 s. ISBN 80-247-1132-X.
2. DRUGA, Rastislav. Systematická, topography and clinical anatomy: peripheral nervous system. 1. vyd. Praha: Univerzita Karlova – Vydavatelství Karolinum, 1996, 126 s. ISBN 80-7184-116-1.
3. AMBLER, Zdeněk. Fundamentals of neurology: a textbook for medical students. 7. ed. Praha: Galén, 2011, 351 s. ISBN 978-80-7262-707-3.
4. PFEIFFER, Jan a Jiří OBENBERGER. Neurology in rehabilitation: for study and practice 1. ed. Praha: Grada, 2007, 350 s. ISBN 978-80-247-1135-5.
5. SEIDL, Zdeněk a Jiří OBENBERGER. Neurology for study and practice: the peripheral nervous system. 1. vyd. Praha: Grada, 2004, 363 s. ISBN 80-247-0623-7.
6. NEVŠÍMALOVÁ, Soňa, Evžen RŮŽIČKA a Jiří TICHÝ. Neurology. 1. ed. Prague: Galén, 2002, xiv, 367 s. ISBN 80-246-0502-3.
7. LEWIT, Karel. Manipulation treatment in myoskeletal medicine. 5. reworking ed. Praha: Sdělovací technika, c2003, 411 s. ISBN 80-86645-04-5.