

# Brainstem

The **Brainstem** is a lower (*infratentorial*) part of the brain, which consists of *medulla oblongata*, *pons Varoli* and midbrain (*mezenkephalon*). Pons and medulla are also sometimes called **bulbar region**. Brainstem is a connection between cerebrum and spinal cord and includes huge number of nerve fibres, so even small damage usually leads to severe clinical symptoms. All neural pathways have to pass this region (motor control and autonomic functions).

## Brainstem Functions

As it was said above, brainstem is a connection between cerebrum and spinal cord, so all **motor pathway** have to pass this relatively narrow region (mainly through *pons*). If there is any damage, we lost your voluntary movement ability, which is usually connected with total paralysis.

Brainstem is also a centre of **autonomic functions** of a body (especially *medulla*), which are necessary for survival (breathing, heart rate, blood pressure or digestion). Patients with brainstem injury need some kind of supportive therapy because of it (artificial nutrition or respirator).

Brainstem is also responsible for an **arousal**. We recognize few diseases, whose main symptom is connected with impaired consciousness – locked-in syndrome, apallic syndrome or persistent vegetative state.

**Sleep** and **attention** are also managed from this area of the brain.

Nearly all **cranial nerves** (excluding I and II) have their origin in the region of brainstem nuclei.

## Brainstem Injury

There are two common causes of brainstem syndromes – hypoxia and traumatic injury. **Traumatic injuries** are caused by the impact of the skull on the vulnerable area of brainstem, which is located on the base of the skull. The results of some trauma can be very variable:

1. **mild injury** – memory loss, short loss of consciousness, confusion
2. **moderate injury** – long-term confusion (weeks), cognitive impairment
3. **severe injury** – coma or persistent vegetative state

**The hypoxia** of brainstem is mainly connected with some vascular disorders of **basilar artery** (*arteria basilaris*), which is formed by two vertebral arteries and lies on ventral part of pons. People with ischemia of basilar artery suffer from vertigo, vomiting, diplopia or fault stability. Disorder of art. basilaris (it bifurcates into posterior cerebral arteries) can also leads to **stroke**.

## Brainstem Reflexes

If there is any injury (traumatic, ischemic,...) of the brain and we want to discover, if also the brainstem is affected, we can examine the brainstem reflexes:

1. Oculo-cephalic reflex;
2. Vestibulo-ocular reflex.

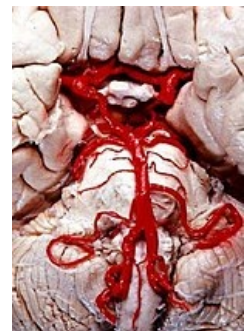
## Brainstem Syndromes

There are few specific syndromes connected with brainstem injury:

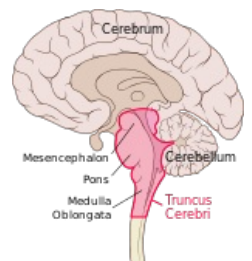
1. **Crossed paralysis-brainstem syndromes** (*hemiplegia alternans*);
2. Locked-in syndrome;
3. Apallic syndrome;
4. Persistent vegetative state;



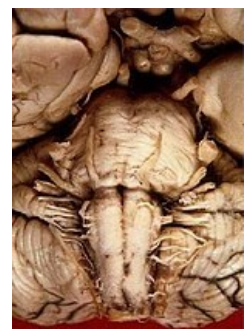
Location of brainstem



Human brainstem blood supply



Scheme of brainstem



Human brainstem

5. **Wallenberg´s syndrome** – nausea, vomiting, failure of sensitivity in face, *diplopia* (double vision);
6. **Decerebration and decortication rigidity.**

## Links

### Related articles

- Locked-in Syndrome
- Apallic Syndrome
- Persistent Vegetative State
- Brainstem Reflexes
- Cranial Nerves
- Autonomic Functions
- Spinal Cord

### External links

- Biology (<http://biology.about.com/od/anatomy/p/Brainstem.htm>)
- Brainstem injury (<http://wiki.injuryboard.com/topic/brain-stem-injury.aspx>)

### Bibliography

- AMBLER, Zdeněk. *Základy neurologie*. 7th edition. 2011. ISBN 978-80-7262-707-3.