

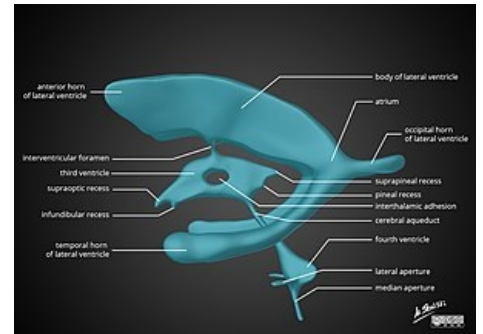
Cerebrospinal fluid circulation

The vast majority of cerebrospinal fluid is formed by filtration of blood plasma through fenestrated capillaries and the apical side of the epithelium of the **choroid plexus** in the ventricles. Some cerebrospinal fluid is produced by extrachoroidal sources, primarily by filtration due to hydrostatic pressure through cerebral capillaries. The total volume of CSF is about 150 ml, which is renewed every five to six hours.

Circulation

The outdated concept of the so-called **bulk flow** circulation ^[1] is based on the hypothesis that the cerebrospinal fluid circulation is one-way and clearly determined according to the following scheme:

1. from the side chambers the cerebrospinal fluid drains to **III. chambers** by the interventricular foramen
2. further to **IV. ventricles** using aqueductus mesencephali (Sylvia's canal)
3. from here it enters the **subarachnoid space** through the median aperture, the so-called *foramen Magendi*, *et aperturæ laterales ventriculi quarti* or *foramina Luschkae*;
4. part of the fluid flows caudally around the spinal cord, part flows around the brainstem and then rises upwards along the lateral surfaces of the hemispheres.



Anatomy of the ventricular system.

The described model depends on the hydrostatic forces that mediate the gradient between the choroid plexuses and arachnoid granulations, where the cerebrospinal fluid is absorbed according to this concept. However, current MRI studies ^{[2][3]} have shown that this model lacks several basic assumptions. It is obvious that the hydrodynamics of cerebrospinal fluid itself is much more complex, depending not only on its momentum, but also on the momentum of blood, arterial nodal waves, venous pressure or respiratory waves. Therefore, based on these findings, another concept was introduced, the so-called **pulsatile flow model**, which takes these factors into account. Currently, fluid circulation is explained by the interaction of both the bulk and pulsatile flow models with the basic concepts of intercellular exchange within the intracerebral parenchyma ^{[4][5][6]}.

Absorption

Historically, it has been established that the largest amount of cerebrospinal fluid is absorbed into the venous system of the *sinus durae matris* by means of *pachion granulations*, in the spinal cord into the *plexus venosi vertebrales interni* ^{[7][8]}. Again, however, this hypothesis is refuted, mainly due to new discoveries by the so-called glymphatic system, whose role is discussed in detail in recent research not only in physiological models but also in pathophysiological mechanisms of many neurodegenerative diseases, including Alzheimer's disease, Parkinson's disease or patients with normotensive hydrocephalus ^{[9][10][11]}. Innovations in imaging systems confirm the trend that cerebrospinal fluid is not only absorbed through arachnoid granulations into the venous circulation, but is also partially absorbed through the glymphatic system, ie through the cranial and spinal nerve sheaths, ependymal tissue or extracellular fluid from where it enters the interstitial fluid and through the perivascular spaces further, inter alia directly into the lymphatics, where it is definitively absorbed ^{[12][13][14]}.

Links

Related articles

- Examination of cerebrospinal fluid
- The ventricular system of the brain
- Cerebrospinal fluid
- Medulla spinalis
- Brain

References

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Reference

- [ws: Cirkulace mozkomíšního moku]]

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