

FEATURES OF CEREBRAL BLOOD SUPPLY

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Introduction. The brain is the main organ of the human body, the normal functioning of which depends on its blood supply. Diseases and disorders caused by a violation of the blood-supply to the brain are very common and economically important. In recent years it has been studied that there are clinical associations between cerebral circulation, migraine and stroke.

Aim. The aim of this study was to present modern scientific data on blood supply of the brain.

Material and methods - results of studies about the features of blood supply of the brain in 1990-2016 (14 articles PubMed).

Results.

The brain receives blood from two sources: the internal carotid arteries, which arise at the point in the neck where the common carotid arteries bifurcate, and the vertebral arteries (Figure 1.). The internal carotid arteries branch to form two major cerebral arteries, the anterior and middle cerebral arteries. The right and left vertebral arteries come together at the level of the pons on the ventral surface of the brainstem to form the midline basilar artery. The basilar artery joins the blood supply from the internal carotids in an arterial ring at the base of the brain (in the vicinity of the hypothalamus and cerebral peduncles) called the circle of Willis. The posterior cerebral arteries arise at this confluence, as do two small bridging arteries, the anterior and posterior communicating arteries. Conjoining the two major sources of cerebral vascular supply via the circle of Willis presumably improves the chances of any region of the brain continuing to receive blood if one of the major arteries becomes occluded.

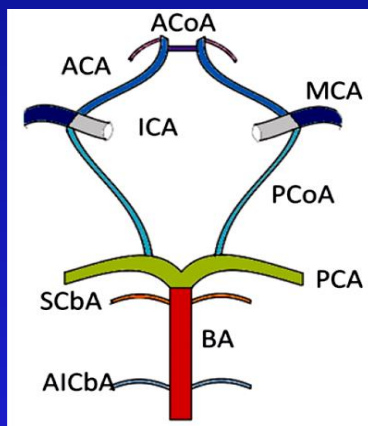


Figure 1. Circle of Willis. **ACA:** anterior cerebral artery; **ACoA:** anterior communicating artery; **AICbA:** anterior inferior cerebellar artery; **BA:** basilar artery; **ICA:** internal carotid artery; **MCA:** middle cerebral artery; **PCoA:** posterior communicating artery; **PCoA:** posterior cerebral artery; **SCbA:** superior cerebellar artery

The circle of Willis is a highly variable anatomical complex. The classical anatomical variant is symmetrical with a complete contour, while 50% of the healthy brains and 80% of the dysfunctional brains present other variants (Figure 2,3). Although the anatomical variants do not directly impair brain perfusion, they may increase the risk of neurological diseases by two main mechanisms: they may influence collateral perfusion, leading to vascular and neurological surgery complications, cerebral infarcts, migraine, or even psychiatric diseases, or the imbalanced branching geometry present in some variants can predispose to wall shear stress associated with the formation and rupture of intracranial aneurysms and with atherosclerosis. How each particular variant influences these processes is not fully understood. Thus, this study aimed to investigate the correlations between the characteristics of the arteries and branching points of some anatomical variants and the geometric features known to increase the cerebrovascular risk. Therefore, timely CT scan can save the patient's health and life (Figure 4.).

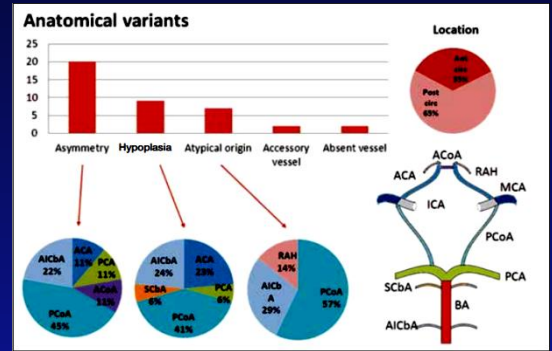


Figure 2. The distribution of the anatomical variants

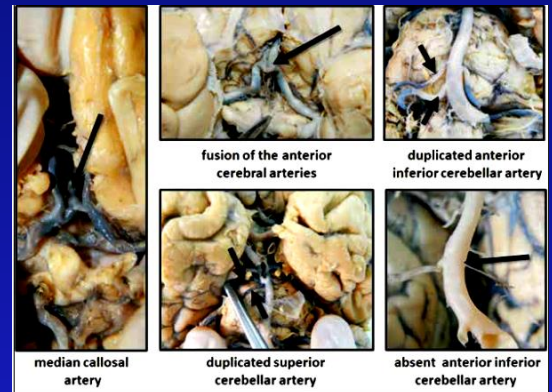


Figure 3. Examples of anatomical variants encountered among the brain specimens. Each variant is indicated with arrows.

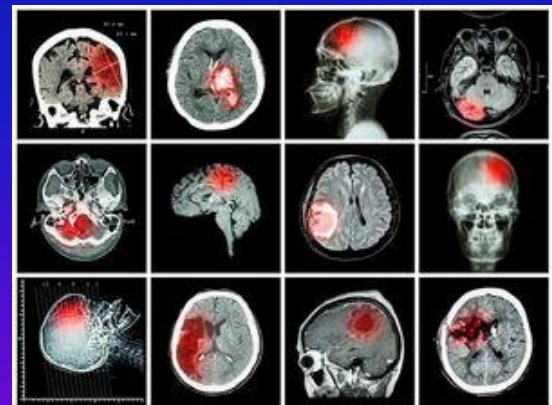


Figure 4. CT scan of the brain

Conclusions.

- The circle of Willis is the anastomotic system that connects the four sources of brain vascular supply
- The presence of anatomical variations in the circle of Willis can modify the hemodynamics of the cerebral blood flow. Timely CT scan can save the patient's health and life.