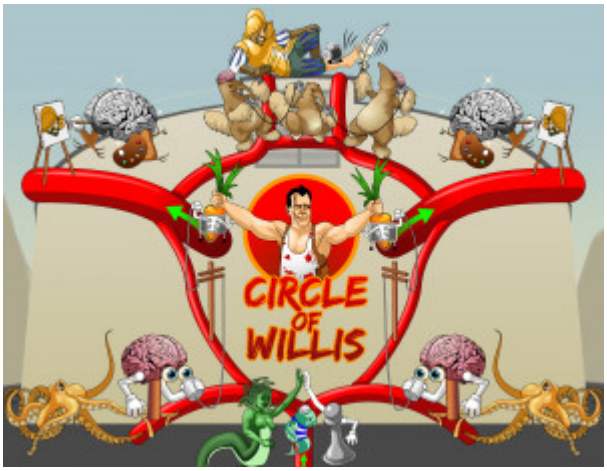
Circle of Willis

The circle of Willis, named after an English physician, is a part of the cerebral circulation that is made up of the AComm (anterior communicating artery), ACA (anterior cerebral artery), ICA (internal carotid artery), which branches to the MCA (middle cerebral artery), PComm (posterior communicating artery), PCA (posterior cerebral artery), and basilar artery. The circle is a site of anastomosis between the blood supplied by the carotid arteries and the vertebral arteries to the brain. ACA is the anterior cerebral artery that makes up the front part of the circle of Willis. This artery supplies blood to the motor and sensory cortex that controls the lower limbs. Therefore, stroke due to the ACA would lead to contralateral paralysis and loss of sensation in the lower limbs.The anterior communicating artery is the artery in the circle of Willis that bridges the right and left anterior cerebral arteries. This is a common site for berry aneurysm, which can impinge on the cranial nerves leading to visual field defects.The internal carotid artery is a branch off of the common carotid artery and supplies many important structures in the head. There is one on each side of the neck and head. This artery is part of the circle of Willis and connects with the ACA and the posterior communicating artery. The internal carotid also branches off into the MCA. The middle cerebral artery is technically not considered part of the circle of Willis because it is an extension from the internal carotid artery. In fact, the internal carotid artery comes into the circle and leaves the circle as the MCA. The MCA supplies the motor and sensory cortex for the upper limb and face. Therefore, stroke in the MCA leads to contralateral paralysis and loss of sensation in the upper limb and face.Posterior communicating artery is the part of the circle of Willis that connects the internal carotid artery to the posterior cerebral artery. Like the AComm, this is a common site for berry aneurysm, which can cause CNIII palsy. CNIII palsy can lead to ptosis, pupil dilation, and the classic down and out eyes.The posterior cerebral artery bifurcates from the basilar artery and supplies the occipital or visual cortex. Stroke in this artery can lead to visual problems, specifically, contralateral hemianopia with macular sparing. Finally, the basilar artery comes from the confluences of the vertebral arteries and then bifurcates to become the posterior cerebral arteries. This can be considered as the most posterior aspect of the Circle of Willis. The basilar artery has multiple branches that supply the pons and medulla.



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Characteristics

Anterior Cerebral Artery (ACA) Supplies Motor/Sensory Parts of the Cortex for Lower Extremities

Anteater Brain Tickling the Foot of the Leg Motor Cortez

ACA is the anterior cerebral artery making up the front part of the circle of Willis. This artery supplies blood to the lower limb motor and sensory cortices. An occlusion of the ACA leads to contralateral paralysis and paresthesia of the affected lower limb.

Anterior Communicating Artery (Acomm) Connects ACA to ACA

Anteater-communicator Connecting Anteater-brains

The anterior communicating artery (Acomm) is located in the anterior part of the circle of Willis and bridges the right and left anterior cerebral arteries (ACAs). This is a common site of berry aneurysms leading to impingement of the cranial nerves affecting eyesight.

Internal Carotid Arteries (ICA)

Internal Carrot

The internal carotid arteries (ICA) are supplied by the common carotid arteries and are one source of blood supply to the brain. There is one ICA bilaterally, located in the neck and head. They contribute to the circle of Willis and respectively branch into an anterior cerebral artery (ACA) and middle cerebral artery (MCA). The ICAs are also connected to the posterior cerebral arteries (PCA) by a posterior communicating artery (Pcomm).

Middle Cerebral Arteries (MCA) Supply Cortex for Upper Limbs and Face

Metal Brain with Upper Limbs painting Face

The middle cerebral arteries are not part of the circle of Willis, but they originate from the internal carotid arteries (ICA). There is one middle cerebral artery bilaterally. The MCAs supply blood to the upper limb and face motor and sensory cortices. MCA occlusion leading to stroke can result in contralateral paralysis and paresthesia of corresponding upper limb and face.

Posterior Communicating Artery (Pcomm) Connects ICA to PCA

Post Communicator Connecting Post Brain and Internal Carrot

The posterior communicating artery is part of the circle of Willis and connects an internal carotid artery to a posterior cerebral artery bilaterally. Like the AComm, this is a common site for berry aneurysm leading to CN III palsy. CN III palsy can lead to ptosis, pupillary dilation, and the classic "down and out" eyes.

Posterior Cerebral Arteries (PCA) Supply Occipital Cortex

Post Brain with eyes and Occipital-octopus

The posterior cerebral arteries (PCAs) originate from the basilar artery and are at the posterior part of the circle of Willis. They supply blood to the occipital (visual) cortex. A stroke occurring due to PCA occlusion can lead to contralateral hemianopia with macular sparing.

Basilar Artery Supplies Medulla, Pons, and PCA

Bass-sailor Artery Supplying blood to Medusa, Pawn, and Post Brain

The basilar artery originates from the confluence of two vertebral arteries between the medulla and the pons. The basilar artery (and its constituent arteries) supply the medulla and pons. The basilar artery terminates in the posterior cerebral arteries (PCAs). This is often considered the most posterior aspect of the circle of Willis.