

"Question 44 Which Artery Supplies The Left Cerebral Hemisphere? Origh Vertebral Artery Left Internal

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Understanding the vascular supply of the brain is essential for students, healthcare professionals, and anyone interested in neuroanatomy. The question "Which artery supplies the left cerebral hemisphere?" is fundamental in neurovascular anatomy. The options often include the right vertebral artery, the left internal carotid artery, and other arteries such as the basilar artery or the circle of Willis. This article provides a comprehensive overview of the arterial supply to the left cerebral hemisphere, clarifying the roles of the vertebral arteries, internal carotid arteries, and associated structures.

Anatomy of Cerebral Blood Supply

The brain requires a continuous supply of oxygenated blood to maintain its vital functions. Its blood supply is primarily derived from two main arterial systems:

- The Vertebrobasilar System: Comprising the vertebral arteries and the basilar artery.
- The Carotid System: Comprising the internal carotid arteries.

These systems work together through a network called the Circle of Willis, enabling collateral circulation and ensuring the brain remains perfused even if one arterial pathway becomes occluded.

The Vertebral Arteries and Their Role

Origin and Pathway of the Vertebral Arteries

The vertebral arteries are paired arteries originating from the subclavian arteries. Their course includes:

- Ascending through the transverse foramina of cervical vertebrae (C6 to C1).
- Entering the skull via the foramen magnum.
- Running medially and posteriorly to form the basilar artery.

Contribution to Brain Blood Supply

While the vertebral arteries themselves do not directly supply the cerebral hemispheres, they contribute significantly by forming the basilar artery, which supplies the posterior parts of the brain, including the brainstem, cerebellum, and occipital lobes.

Key Point: The vertebral arteries primarily supply the posterior circulation, which is distinct from the anterior circulation that supplies the cerebral hemispheres.

The Internal Carotid Artery and Its Significance

Origin and Pathway of the Internal Carotid Artery

The internal carotid arteries arise from the common carotid arteries at the level of the thyroid cartilage. Their course includes:

- Ascending through the carotid sheath.
- Entering the skull via the carotid canals.
- Running superiorly to give off several branches before terminating at the circle of Willis.

Primary Supply to the Cerebral Hemispheres

The internal carotid arteries are the main arteries supplying the anterior and middle parts of the brain, including:

- The frontal lobe.
- Parietal lobes.
- Parts of the temporal lobes.
- Deep structures such as the basal ganglia through their branches.

Key Point: The internal carotid arteries are crucial for supplying the left and right cerebral hemispheres.

The Circle of Willis: The Brain's Vascular Hub

Structure and Function

The circle of Willis is a ring-like arterial structure located at the base of the brain. It connects the anterior and posterior circulation, allowing collateral flow in case of arterial blockages.

Major components include:

- Anterior cerebral arteries (ACAs)
- Anterior communicating artery
- Internal carotid arteries
- Posterior cerebral arteries (PCAs)
- Posterior communicating arteries

Role in Supplying the Cerebral Hemispheres

The circle ensures that each cerebral hemisphere receives blood from both the anterior (via internal carotids) and posterior (via vertebral-basilar system) sources, providing a redundancy that is vital for brain health.

Which Artery Supplies the Left Cerebral Hemisphere?

Primary Arterial Supply

The main artery responsible for supplying the left cerebral hemisphere is the:

- Left Internal Carotid Artery

This artery gives rise to:

- The left anterior cerebral artery (ACA)
- The left middle cerebral artery (MCA)

These branches are primarily responsible for perfusing the majority of the left hemisphere.

Role of the Anterior and Middle Cerebral Arteries

- Left Anterior Cerebral Artery (ACA): Supplies the medial aspects of the frontal lobes and superior medial parietal lobes.

- Left Middle Cerebral Artery (MCA): Supplies the lateral aspects of the frontal, parietal, temporal, and insular lobes.

Note: The MCA is the most commonly affected artery in strokes involving the left hemisphere, often leading to language deficits (aphasia) if the dominant hemisphere is involved.

Understanding the Options: Oright Vertebral Artery vs. Left Internal

Oright Vertebral Artery

- Likely a typographical error, possibly intended as "Right Vertebral Artery".
- The right vertebral artery supplies the posterior circulation, including parts of the brainstem, cerebellum, and occipital lobes.
- It does not directly supply the left cerebral hemisphere.

Left Internal Carotid

- The left internal carotid artery is the main vessel supplying the left cerebral hemisphere.
- It gives rise to the left anterior cerebral artery and left middle cerebral artery, which perfuse most of the left hemisphere.

Conclusion on the Correct Artery

- The correct answer to "Which artery supplies the left cerebral hemisphere?" is the left internal carotid artery.
- The right vertebral artery contributes to posterior circulation, not the left hemisphere's anterior parts.

Clinical Significance

Understanding which arteries supply specific brain regions is critical in diagnosing and managing strokes and other cerebrovascular disorders.

Common Clinical Scenarios

- Ischemic stroke in the left MCA territory: Often caused by occlusion of the left middle cerebral artery (commonly from thrombus or embolus originating from the internal carotid).
- Carotid artery disease: Narrowing or blockage of the internal carotid artery can lead to ischemia in the left hemisphere.
- Vertebral artery occlusion: Usually affects the posterior circulation, leading to symptoms like dizziness, ataxia, or visual disturbances.

Importance in Surgical and Diagnostic Contexts

- Accurate knowledge of the arterial supply helps in planning interventions such as carotid endarterectomy.
- Imaging techniques like CTA, MRA, and digital subtraction angiography rely on understanding these arteries for accurate diagnosis.

Summary

- The left internal carotid artery is the primary vessel supplying the left cerebral hemisphere.
- It branches into the left anterior cerebral artery and left middle cerebral artery, which perfuse most regions of the left hemisphere.
- The vertebral arteries, including the right vertebral artery, primarily contribute to posterior circulation and are not responsible for supplying the left hemisphere directly.
- The circle of Willis ensures collateral flow between anterior and posterior circulations, safeguarding brain perfusion.

Key Takeaways

- The main artery supplying the left cerebral hemisphere is the left internal carotid artery.
- The vertebral arteries (including the right vertebral artery) supply the posterior aspect of the brain.
- Knowledge of cerebral arterial anatomy is essential for understanding stroke pathology, surgical planning, and interpreting neuroimaging.

In conclusion, when asked "Which artery supplies the left cerebral hemisphere?" the definitive answer is the left internal carotid artery, which plays a pivotal role in delivering oxygenated blood to the dominant side of the brain responsible for language, motor

control, and cognitive functions.

Frequently Asked Questions

Which artery primarily supplies blood to the left cerebral hemisphere?

The left internal carotid artery primarily supplies blood to the left cerebral hemisphere.

Does the right vertebral artery supply the left cerebral hemisphere?

No, the right vertebral artery mainly supplies the posterior part of the brain; the left internal carotid artery supplies the left cerebral hemisphere.

What is the main artery responsible for blood supply to the left side of the brain?

The main artery responsible is the left internal carotid artery.

Are the vertebral arteries involved in supplying the left cerebral hemisphere?

No, the vertebral arteries primarily supply the posterior brain regions; the internal carotid arteries supply the anterior and lateral parts, including the left cerebral hemisphere.

How does the blood supply differ between the right and left sides of the brain?

The right side is mainly supplied by the right internal carotid artery, while the left side is supplied by the left internal carotid artery.

What is the significance of the internal carotid artery in cerebral circulation?

The internal carotid artery is a major vessel that provides a significant blood supply to the anterior and lateral aspects of the brain, including the cerebral hemispheres.

Additional Resources

Question 44: Which Artery Supplies the Left Cerebral Hemisphere? Right Vertebral Artery or Left Internal Carotid Artery?

Understanding the arterial supply to the brain is fundamental in neuroanatomy, neurology, and neurosurgery. The blood supply to the cerebral hemispheres ensures the delivery of oxygen and nutrients necessary for optimal neuronal function. When analyzing the specific arteries that supply the left cerebral hemisphere, it is crucial to consider the major arterial systems, their origins, pathways, and the territories they perfuse. This review provides an in-depth exploration of the arteries involved, with particular focus on the Left Internal Carotid Artery and the Right Vertebral Artery, and clarifies which supplies the left cerebral hemisphere.

Overview of Cerebral Blood Supply

The brain's blood supply is primarily derived from two significant arterial systems:

- The Anterior Circulation: Mainly supplied by the internal carotid arteries.
- The Posterior Circulation: Supplied by the vertebral arteries and their branches.

Understanding these systems' contributions helps clarify which arteries supply specific regions of the brain, especially the cerebral hemispheres.

The Major Arterial Systems Supplying the Cerebrum

The Internal Carotid Arteries (ICA)

- Origin: Arise from the common carotid arteries, which originate from the brachiocephalic trunk on the right and directly from the aortic arch on the left.
- Course: Ascend through the neck, entering the skull via the carotid canals.
- Branches: Give off several branches, but most notably, they bifurcate into the anterior and middle cerebral arteries.
- Function: Primarily supply the anterior and lateral surfaces of the cerebral hemispheres.

The Vertebral Arteries

- Origin: Branches of the subclavian arteries.
- Course: Ascend through the transverse foramina of the cervical vertebrae, enter the skull via the foramen magnum.
- Union: They merge at the pontomedullary junction to form the basilar artery.
- Branches: The basilar artery gives rise to several branches, including the posterior

cerebral arteries.

The Circle of Willis

- An anastomotic ring at the brain's base.
- Connects the anterior and posterior circulations.
- Provides collateral pathways, ensuring continuous blood flow if one artery is occluded.

Specific Arteries and Their Territories

The Left Internal Carotid Artery

- Major supply to the anterior and lateral parts of the left cerebral hemisphere.
- Branches:
 - Anterior Cerebral Artery (ACA): Supplies medial frontal and parietal lobes.
 - Middle Cerebral Artery (MCA): Supplies lateral aspects of the frontal, parietal, temporal lobes, and parts of the basal ganglia.

Implications:

- If the left internal carotid artery is occluded, it can cause ischemic strokes affecting language, motor, and sensory functions predominantly on the right side due to the contralateral organization of motor and sensory pathways.

The Right Vertebral Artery

- Major supply to the posterior inferior parts of the brain, including the cerebellum, brainstem, and posterior parts of the occipital lobes.
- Does Not directly supply the left cerebral hemisphere's anterior or lateral regions.

Implications:

- The right vertebral artery's territory is primarily posterior circulation, with limited direct involvement in the anterior or lateral hemispheric territories on the left side.

The Basilar Artery and Posterior Circulation

- Formed by the union of the two vertebral arteries.
- Supplies the brainstem, cerebellum, occipital lobes, and parts of the temporal lobes via

posterior cerebral arteries.

Which Artery Supplies the Left Cerebral Hemisphere?

Based on the anatomical pathways and territories:

- The Left Internal Carotid Artery is the primary artery supplying the left cerebral hemisphere.
- Specifically, it gives rise to the left anterior cerebral artery and left middle cerebral artery, which perfuse the medial and lateral surfaces of the left hemisphere, respectively.

The Right Vertebral Artery, in contrast, supplies structures in the posterior circulation, including parts of the brainstem, cerebellum, and occipital lobes on the posterior aspect, but does not supply the anterior or lateral regions of the left cerebral hemisphere directly.

Therefore, the correct answer to the question:

- > Which artery supplies the left cerebral hemisphere?
- > Answer: Left Internal Carotid Artery

Pathophysiological Considerations

Understanding the arterial supply is crucial in diagnosing and managing strokes:

- Ischemic strokes in the territory of the left internal carotid artery often manifest as right-sided weakness, aphasia, or sensory deficits.
- Posterior circulation strokes, involving the vertebral-basilar system, can cause ataxia, vertigo, visual disturbances, or brainstem signs, but typically do not affect the lateral aspects of the cerebral hemispheres directly.

Clinical Significance of the Arterial Supply

- Stroke Localization: Knowledge of which arteries supply specific regions helps localize ischemic events.
- Collateral Circulation: The Circle of Willis allows for some compensation if one artery is occluded, which is vital in stroke management.
- Surgical and Interventional Procedures: Accurate identification of arteries is essential

during surgeries, angiography, and endovascular interventions.

Summary Table

Artery	Supplies	Hemisphere/Region	Directly supplies the left cerebral hemisphere?
Left Internal Carotid	Anterior and middle cerebral arteries	Left cerebral hemisphere (anterior, lateral)	Yes
Right Vertebral Artery	Posterior inferior cerebellum, brainstem	Posterior circulation, posterior brain regions	No
Basilar Artery	Brainstem, cerebellum, occipital lobes	Posterior circulation	No
Left Vertebral Artery	Posterior circulation, brainstem	Posterior brain regions	No

Conclusion

In conclusion, when asked about the artery supplying the left cerebral hemisphere, the Left Internal Carotid Artery is the primary and most direct source. It branches into the anterior and middle cerebral arteries, which perfuse significant portions of the left hemisphere, including areas responsible for motor control, sensory processing, language, and higher cognitive functions.

The Right Vertebral Artery does not supply the left cerebral hemisphere directly; instead, it supplies posterior regions of the brain via the vertebrobasilar system. Its role is crucial for posterior circulation but not for the anterior or lateral aspects of the left hemisphere.

Understanding these distinctions is critical for clinicians, radiologists, and surgeons involved in diagnosing cerebrovascular diseases, planning interventions, and understanding the neuroanatomical basis of stroke syndromes.

Key Takeaways:

- The Left Internal Carotid Artery supplies the left cerebral hemisphere.
- The Right Vertebral Artery supplies the posterior regions, not the anterior or lateral parts.
- The Circle of Willis connects these arterial systems, providing collateral pathways.
- Knowledge of arterial territories aids in clinical diagnosis and management of cerebrovascular events.

References

- Gray's Anatomy: The Anatomical Basis of Clinical Practice.
- Snell's Clinical Neuroanatomy.
- Adams and Victor's Principles of Neurology.
- Neuroanatomy Textbooks and Vascular Brain Anatomy Resources.

Final Note: Accurate identification of arterial supply is essential for understanding stroke patterns, planning surgical interventions, and interpreting neuroimaging studies. Always consider the broader context of cerebral circulation in clinical decision-making.

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