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OPINION ARTICLE

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The Pathophysiology and Causation of Stroke

Yixuan Du*
Department of Physiology and Pathophysiology, Capital Medical University, Beijing, China

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Description

A stroke is a medical disorder where there is insufficient blood supply to the brain, which results in cell death. Strokes can be ischemic (blood flow is reduced) or hemorrhagic (bleeding). Both result in the brain's various regions losing their correct functionality.

Stroke signs and symptoms can include difficulty speaking or understanding, dizziness, or a loss of vision on one side of the body. They can also include difficulty moving or feeling on one side of the body. When a stroke occurs, signs and symptoms frequently show up quickly.

Transient ischemic attack (TIA), often known as a mini-stroke, is the type of stroke that occurs when symptoms last less than one or two hours.

A severe headache could potentially be a symptom of a hemorrhagic stroke. A stroke may leave behind permanent symptoms. Pneumonia and a loss of bladder control are examples of long-term consequences.

Causes

In cases of thrombotic stroke, atherosclerotic plaques typically develop a thrombus. The progressive obstruction of the artery means that symptomatic thrombotic strokes begin more slowly than hemorrhagic strokes do.

If a thrombus breaks off and travels through the bloodstream, it is referred to as an embolus and can cause an embolic stroke.

A stroke caused by an embolus, a foreign object flowing through the arterial bloodstream, is referred to as an embolic stroke. A thrombus is an embolus most of the time, although it can also be made of fat, air, cancer cells, or collections of microorganisms.

Local therapy only provides a temporary fix since an embolus develops from somewhere else. Consequently, the embolus's origin needs to be found. The symptoms are typically at their peak at the beginning because the embolic occlusion develops suddenly. Additionally, once the embolus is partially reabsorbed, travels to a different place, or disappears entirely, symptoms may only last a short while. The heart is where emboli most frequently develop, though they can come from anywhere along the arterial tree. In a condition known as a paradoxical embolism, a deep vein thrombosis can travel from the heart's atrium or ventricular septum into the brain.

Pathophysiology

A portion of the brain loses blood flow, starting an ischemic cascade, and this result in an ischemic stroke.

Blood flow can be reduced as a result of atherosclerosis restricting the blood vessel lumen, allowing blood clots to develop inside the vessel, or by causing atherosclerotic plaques to dissolve and release showers of tiny emboli. When emboli that have already developed in the circulatory system, generally in the heart from atrial fibrillation or in the carotid arteries, break off, enter the cerebral circulation, then lodge in and block brain blood vessels, this is known as an embolic infarction.

The brain uses anaerobic metabolism in the area of brain tissue affected by ischemia because blood arteries in the brain are now blocked, leaving it low on energy. Less adenosine triphosphate (ATP) is produced during anaerobic metabolism, but lactic acid is released as a byproduct. Since it is an acid and disturbs the usual acid-base balance in the brain, lactic acid is an irritant that may potentially kill cells. The "ischemic penumbra" refers to the region of ischemia. Following the initial ischemia event, the tissue remodeling in the penumbra changes from one that is defined by damage to one that is marked by repair.

Contact: Yixuan Du, Email: Yixuan202@yahoo.com

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Based on the underlying pathophysiology, hemorrhagic strokes are categorized. Hypertensive haemorrhage, ruptured aneurysms, ruptured AV fistulas, transformation of earlier ischemic infarction, and drug-induced bleeding are a few causes of hemorrhagic stroke.

By compressing tissue as a result of an increasing hematoma or hematomas, they cause tissue damage. Additionally, the blood discharged by a brain haemorrhage appears to have immediate harmful effects on brain tissue and the vasculature, and the pressure may cause a loss of blood flow to the damaged tissue, resulting in infarction. Following a haemorrhage, inflammation plays a role in the development of secondary brain injury.