

Cerebrovascular Disease and Diagnostic Testing Methods

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The words "cerebrovascular" and "vascular" are made up of two parts: "cerebro" refers to the main region of the brain, while "vascular" refers to the arteries and veins. The term cerebrovascular refers to blood flow in the brain as a whole. All conditions in which a part of the brain is temporarily or permanently affected by ischemia or bleeding, and one or more cerebral blood arteries are involved in the pathological process, are referred to as cerebrovascular disease. Stroke, carotid stenosis, vertebral stenosis, intracranial stenosis, aneurysms, and vascular abnormalities are all examples of cerebrovascular illness.

Blood artery constriction (stenosis), clot development (thrombosis), blockage (embolism), and blood vessel rupture can all cause blood flow restrictions (hemorrhage). Ischemia (lack of blood supply to the brain) damages brain tissue and can lead to a stroke.

The Brain's Blood Flow

The carotid arteries and the vertebral arteries are two sets of arteries that carry blood from the heart to the brain. When you take your pulse just under your jaw, you feel the carotid arteries in the front of your neck. Near the top of the neck, the carotid arteries split into external and internal arteries, with the external carotid arteries delivering blood to the face and the internal carotid arteries supplying blood to the skull. The internal carotid arteries branch inside the brain into two major arteries, the anterior cerebral and middle cerebral arteries, as well as several minor arteries, the ophthalmic, posterior communicating, and anterior choroidal arteries. These arteries give blood to the brain's front two-thirds.

The vertebral arteries run parallel to the spine and are not visible from the outside. Towards the brain stem, near the base of the skull, the vertebral arteries combine to form a single basilar artery. Many minor branches of the vertebra basilar system enter the brain stem and branch off to produce the posterior cerebellar and posterior meningeal arteries, which supply the brain's back third. Blood leaves the brain through the jugular and other veins.

Because the brain's blood supply is limited to only two sets of major arteries, it's critical that these arteries stay in good shape. The underlying cause of an ischemic stroke is often a fatty deposit called plaque in the carotid arteries. An artery in or on the surface of the brain ruptures or leaks during a hemorrhagic stroke, producing bleeding and damage in or around the brain.

Whatever the underlying illness or cause, adequate blood flow

and oxygen to the brain must be restored as soon as possible. The affected brain cells are either injured or die within minutes of being deprived of oxygen and critical nutrients. When brain cells die, they are unable to repair, resulting in irreversible damage and, in certain cases, physical, cognitive, and mental problems.

Tests for Cerebrovascular Disease

Neurosurgeons can see the arteries and vessels in and around the brain, as well as the brain tissue itself, using these tests.

Cerebral angiography: Arteries are not visible on an X-ray, hence contrast dye is used in cerebral angiography (also known as vertebral angiogram, carotid angiogram). A local anaesthetic is administered to the patient, then an artery is perforated, generally in the leg, and a needle is introduced into the artery. The catheter (a long, narrow, flexible tube) is introduced into the artery through the needle.

Carotid duplex: Ultrasonography is utilised in the carotid duplex (also known as carotid ultrasound) technique to detect plaque, blood clots, or other abnormalities with blood flow in the carotid arteries. The transducer (a handheld instrument that sends high-frequency sound waves to the arteries being evaluated) is placed on the skin with a water-soluble gel.

Computed tomography (CT or CAT scan): After x-rays are read by a computer, a diagnostic image is formed. A drug may be injected into a vein to assist highlight brain areas in specific circumstances. The densities of bone, blood, and brain tissue are all highly different and can be easily recognised on a CT scan. Because

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blood may easily be seen on a CT scan, it is an effective diagnostic tool for hemorrhagic strokes. Damage from an ischemic stroke, on the other hand, may not be seen for several hours or days on a CT scan, and the specific arteries in the brain cannot be detected.

Doppler ultrasound: On the transducer (a handheld instrument that directs high-frequency sound waves to the artery or vein being tested) and the skin over the veins of the extremity being tested, a water-soluble gel is applied.

Electroencephalogram (EEG): A diagnostic procedure that involves placing small metal discs (electrodes) on a person's head to detect electrical impulses. As brain waves, these electrical signals are printed out.

Lumbar puncture (spinal tap): An invasive diagnostic technique that involves taking a sample of cerebrospinal fluid from the area around the spinal cord with a needle. A brain haemorrhage can produce bleeding, and this test can help detect it.

Magnetic Resonance Imaging (MRI): A diagnostic technique that uses magnetic fields and computer technology to create three-dimensional pictures of body structures. It can show different types of nerve tissue as well as good images of the brain stem and posterior brain.

Magnetic Resonance Angiogram (MRA): This is a non-invasive investigation that takes place in a Magnetic Resonance Imager (MRI). A computer assembles the magnetic images to create an image of the arteries in the head and neck. The MRA can assist discover obstruction and aneurysms by showing the actual blood arteries in the neck and brain.