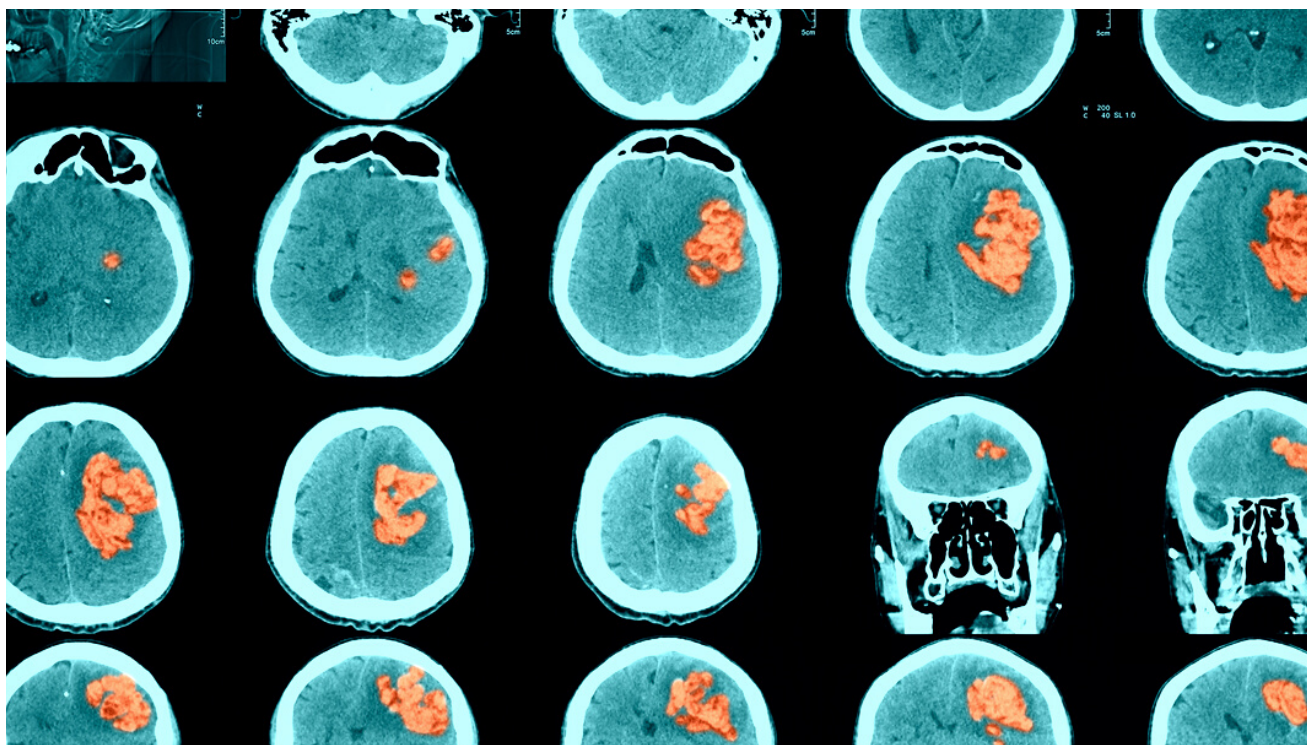


High Blood Pressure, Stroke, and Heart Health



Cause and Effect

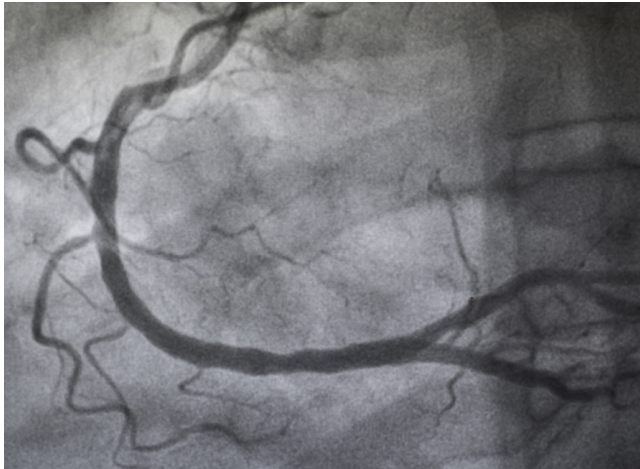
High Blood Pressure and Stroke are two Cardiovascular problems that affect your heart, body, and brain. High Blood Pressure can cause vascular damage and plaque to build up in the arteries causing a clot to form. If a clot breaks, it can cause a stroke, directly damaging the brain, affecting the areas of your body controlled by that part of the brain.

High Blood Pressure is a direct cause of stroke, it is the most important risk factor in those who develop cardiovascular disease.

Stroke

There are two types of stroke. An ischemic stroke (blockage), and a hemorrhagic stroke (bleed).

An ischemic stroke (blockage) is caused when a blood clot forms in the brain. A brain clot is formed usually by a clot in the brain that is carried through the bloodstream to an artery supplying a part of the brain. Or a blockage is formed deep within the blood vessels in the brain. A hemorrhagic stroke is less common and is caused when a blood vessel in the brain bursts (intracerebral hemorrhage) or when a burst on the surface of the brain causes bleeding into the brain.



The symptoms of stroke can include numbness, weakness, paralysis; slurred speech, difficulty finding words or understanding speech; blurred vision or loss of sight; sudden severe headache.

Stroke affects your body by damaging your brain. Your brain is like a chemical computer. Every part of it has a specific task. There are motor sections responsible for body movement, and parts responsible for your emotions, vision, and memory.

Brain damage on the left side of the brain may cause motor and sensory malfunction to the right side of the body, as well as speech and language difficulty.

Brain damage to the right side of the brain may cause motor and sensory malfunction to the left side of the body, as well as visual reduction in the left field of vision of each eye and memory problems.

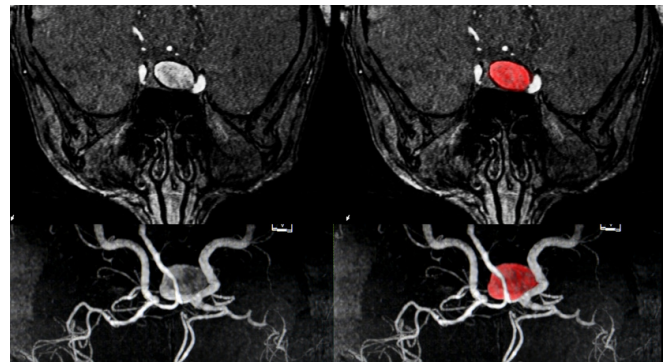
A stroke can damage any section of your brain.

High Blood Pressure

High Blood Pressure (Hypertension) is when the force of blood flowing through your blood vessels is consistently too high.

Blood pressure is measured by the force your heart exerts on the walls of the arteries during beats (Systolic), and the pressure your heart exerts on the walls of the arteries between beats (Diastolic). Blood Pressure is recorded as “120/80”. 120 is a normal Systolic blood pressure, and 80 is a normal Diastolic blood pressure. Any higher of a number and it is High Blood Pressure. A blood pressure reading of 125/85 is diagnosed as stage one hypertension.

High Blood Pressure causes damage to the interior lining of the artery walls. When fats in your diet enter your bloodstream it sticks to the artery. The constant pressure of blood moving through a weakened artery can over time cause a section of the artery wall to bulge (aneurysm). Bleeding can occur if left to continue which can cause life-threatening internal bleeding. Aneurysms are most common in the Aorta.



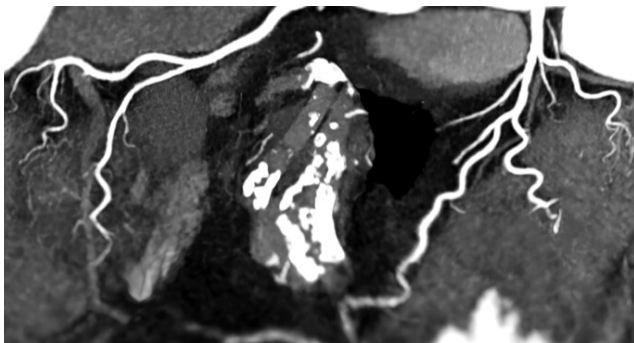
Heart Damage

High Blood Pressure can cause coronary artery disease where the arteries are narrowed and damaged by the excess pressure. The pressure causes trouble supplying oxygenated blood to the heart. Left ventricular hypertrophy (LVH) can occur when the pressure forces the left ventricle to work harder and thicken. Over time High Blood Pressure causing LVH can increase the risk of heart attack, heart failure, and sudden cardiac death.

Brain Damage

High Blood Pressure can cause a ministroke called a Transient Ischemic Attack (TIA) where the blood clots and hardened arteries caused by hypertension break and cause a stroke with no permanent damage.

A stroke is caused when oxygen and nutrients can no longer reach a section of the brain. Damage caused by High Blood Pressure on the blood vessels can cause clots to form in the arteries leading to your brain. These clots can break and block blood flow to the brain causing a stroke. Restricted arteries can cause blood flow to be limited to the brain.



This can lead to a type of dementia called vascular dementia. A stroke in the brain can also cause vascular dementia.

High Blood Pressure has also been linked to mild cognitive impairment in those who undergo symptoms of change in their understanding and memory.

Kidney Damage

High Blood Pressure can cause damage to the blood vessels in the kidneys. This damage can sometimes cause diabetes and is known to cause further damage in individuals who already have diabetes.

The condition glomerulosclerosis occurs when blood vessels within the kidney become damaged and are unable to effectively filter body fluids and waste. This condition can lead to kidney failure.

Kidney failure occurs when damaged blood vessels cause the organ to not function. This disease can require dialysis or even kidney transplantation.



Eye Damage

High Blood Pressure can damage the blood vessels that supply your eyes with blood.

Damage to the retina (retinopathy) is when the light tissue at the back of your eye (retina) causes bleeding, blurred vision, or complete loss of vision. Having diabetes along with high blood pressure increases the risk for retinopathy.

Fluid buildup under the retina called choroidopathy can result in visual distortion and scarring that impairs vision.

Optic Neuropathy is damage caused by blocked blood flow to the optic nerve which can lead to bleeding within the eye and even vision loss.

High Blood Pressure can cause Heart Attack, Stroke, Peripheral Artery Disease, and Heart Failure.

Hypertension affects almost every organ.

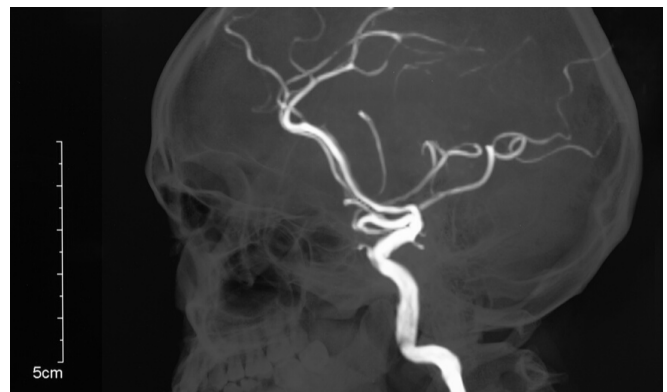
The Connection

High Blood Pressure is a direct cause of stroke. Excess pressure on the arteries causes damage that plaque builds on. That plaque can break free under pressure and flow into the blood vessels supplying the brain. When plaque is broken and flows into a vessel supplying the brain it can cut off the oxygen and nutrient supply to any tissue fed by the affected blood vessel. This blockage is called a clot, and the condition is called a stroke. The cognitive consequences can be permanent.

Diagnosis

High Blood Pressure is diagnosed with a pressure cuff. The cuff is placed around the upper arm and then is inflated. When inflated the cuff compresses the brachial artery. The cuff is then released slowly and measurements are taken while the heart beats (systolic) and while the heart relaxes (diastolic).

Stroke requires immediate emergency medical treatment. Headache, trouble speaking, and even paralysis may occur and is an immediate cause to seek medical attention.



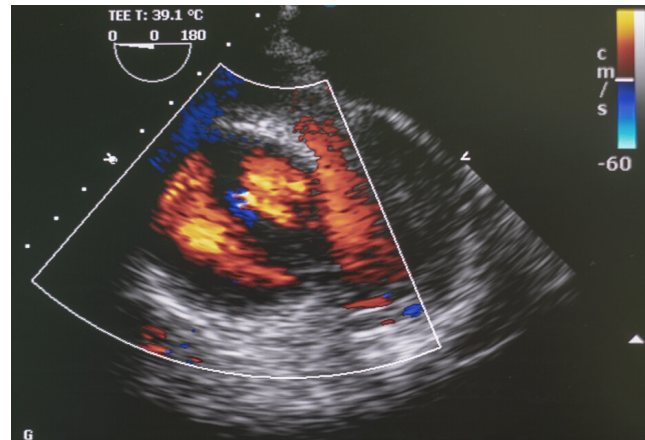
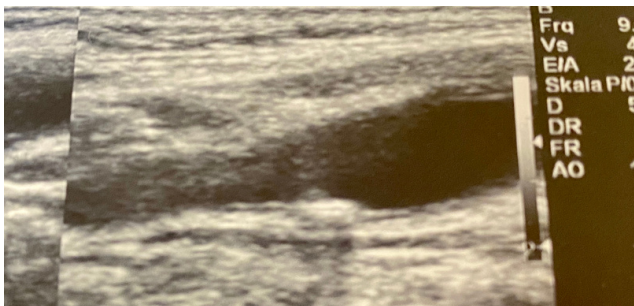
Once in the hospital, an MRI or CT scan will be ordered soon after arrival, and determine treatment for the found condition.

A physical exam will be ordered, blood pressure and heart sounds checked. Blood tests will determine how fast the blood clots, whether blood sugar is high or low, and if there is any possible infection.

Computerized Tomography (CT Scan) which uses X-rays to make a detailed image of the brain will show bleeding, clots, and tumors that may have caused the condition. An injected dye may also be used to view the blood vessels in the neck and brain in better detail.

Magnetic Resonance Image (MRI) is used to make a detailed image of the brain. An MRI detects damaged brain tissues during the event of an ischemic stroke or brain hemorrhage. An injected dye may also be used to better view arteries and veins while highlighting blood flow.

Carotid ultrasound which uses sound waves to create an image of the carotid in the neck shows the buildup of plaque in the carotid arteries.



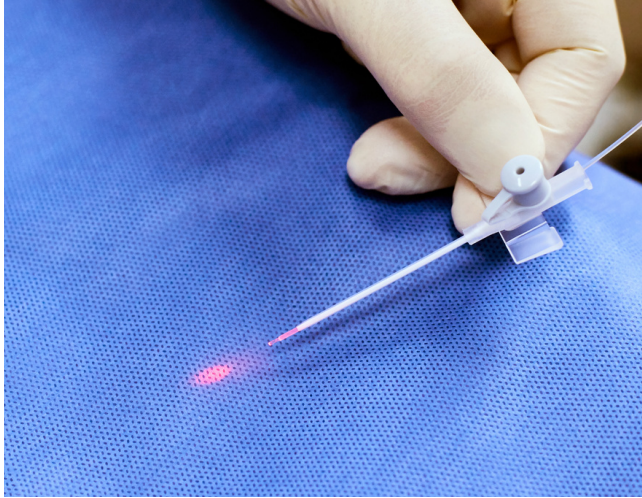
In some cases, a Cerebral Angiogram is used. A doctor uses a catheter to inject dye and view the blood vessels in the brain and neck during X-Ray imaging.

An Echocardiogram which uses sound waves to create an image of the heart is used to find the source of clots. Those broken clots may have followed the blood vessels to the brain and caused the stroke.

Treatment

Emergent IV Medication may be used that can break down a clot within four and a half hours. When given emergently, timing is the most important to ensure the damage in the brain is stopped and does not continue.

The standard IV injection treatment uses recombinant tissue plasminogen activators. Also called Alteplase, it is the standard treatment for an ischemic stroke. The drug dissolves the stroke-causing clot, restoring blood flow. This treatment helps individuals recover from a stroke more quickly, though the type of stroke is an important factor. Bleeding in the brain is possible under this -



treatment, and the risks associated will be weighed by the assigned doctor.

Emergency Endovascular Procedures are used to treat ischemic strokes directly in the blocked blood vessel. These procedures include directly delivered medications to the brain in order to dissolve the stroke-causing clot, or a stent clot retriever that directly removes the clot from the blocked blood vessel in the brain. Stents are often used when the clot-dissolving medication is not enough to clear the blood vessel.

In order to decrease the chance of another stroke or transient ischemic attack, a doctor may order a procedure that clears an artery narrowed by plaque.

Carotid Endarterectomy is used to directly remove the plaque blocking a carotid artery. This surgery reduces the risk of stroke but also involves the risk of surgery.

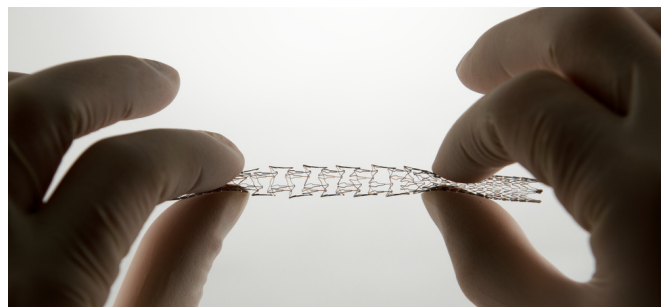
Angioplasty and Stents are used to expand narrowed arteries with an inflated balloon.

Emergency medications may be used to counteract blood thinning medication in order to decrease the chance of bleeding in the brain. Medication to lower blood pressure may also be used that often prevent blood vessels from spasming and prevent seizures induced by the condition.

Surgery to remove blood and relieve pressure on the brain may also be used. They may also use the surgery to repair damaged blood vessels associated with hemorrhagic stroke. Surgical procedures are used after a stroke, aneurysm, arteriovenous malformation, or any other blood vessel damage caused by a hemorrhagic stroke.

Surgical Clipping is used to clamp the base of an aneurysm stopping blood flow. This can stop the aneurysm from bursting, and can stop an aneurysm that has hemorrhaged from bleeding again.

Endovascular Embolization is used to block blood flow to an aneurysm. A catheter is used to place coils within the aneurysm causing the blood to clot. This treatment decreases the chance of bleeding within the brain.



If an arteriovenous malformation is caused, surgery may be used to remove the malformation in order to eliminate the risk of rupture and bleeding. This reduces the risk of hemorrhagic stroke though it is only possible if the arteriovenous malformation is not deep within the brain. The worse the malformation the higher the chance of brain damage.

Minimally invasive Stereotactic-Radiosurgery is used to repair blood vessel malformation. Multiple beams of radiation are focused on a blood vessel in order to damage the DNA of targeted cells forcing the body to create new healthy cells.

Recovery

After treatment for a stroke, the patient is monitored for at least one day. The care is focused on helping the individual recover as much brain function as possible.

The impact and recovery is determined on where the stroke occurred, and how much brain damage was caused.

Stroke survivors often entered into a rehabilitation program. There a doctor recommends the most rigorous therapy available based on age, health, and disability caused by the stroke.



Rehabilitation and Techniques

Motor Skill Exercises are used to help improve muscle strength and coordination.

Mobility Training offers aids such as walkers, canes, wheelchairs, and ankle braces to help support body weight while relearning how to walk.

Constraint-Induced Therapy restrains limbs while a patient practices moving in order to improve its function.

Range of Motion Therapy includes exercises and treatments that reduce muscle tension and help regain range of motion.

Functional Electrical Stimulation where electricity is applied to the weakened muscles causing them to contract, helping re-educated the affected muscles.

Robotic Technology is used to assist impaired limbs while practicing therapeutic motions in order to regain strength and function within the affected limb.



Wireless Technology is used such as an activity monitor to help increase activity after a stroke.

Virtual Reality is used to help stimulate the brain within a real-time environment.

Occupational and speech therapy can help with lost cognitive abilities such as memory, processing, problem-solving, social skills, judgment, and safety awareness.

Speech therapy can help regain lost abilities while speaking, listening, writing, and comprehension.

Emotional judgment may be tested and counseled individually or within group therapy.

Medication may even be recommended to help with alertness, agitation, movement, or even depression.

Speech and Language Pathologists help improve language skills and a person's ability to swallow if impaired.

Social Workers help connect those affected to financial and community resources, as well as new living arrangements if necessary. Psychologists help assess cognitive skills and address mental and emotional health. Therapeutic Recreation Specialists help individuals return to normal activities and jobs enjoyed before a stroke. Vocational Counselors help those affected by stroke return to work.

Outcome

Stroke recovery is variable depending on what damage to the brain has occurred.

Physical impairment may occur if the stroke damage is severe enough to affect cognitive and motor functions.

Social impairment may occur and require attention and support from friends and family.

Therapy needed is determined by the severity and is started early after the condition has occurred. The outcome will be determined by the severity of the stroke and the skill of the stroke rehabilitation team.



It may take twelve to eighteen months to recover from a stroke, and the rehabilitation directly after will determine the length of time it takes to recover. The path to recovery is often long and difficult. It will take dedication to gain the most improvement.

An Echocardiogram should be taken during and throughout the rest of a stroke victim's life. An Echocardiogram should be ordered first to view if the clot started in the heart and to determine the health of the heart. This information will tell whether or not they are at risk of the plaque causing further damage or another stroke entirely. Directly after the event, an Echocardiogram should be ordered once again to determine the post-trauma health of the patient's heart. Then throughout the victims life, ECG's and Echocardiograms should be ordered to determine their heart health and continued risk for stroke.

Prevention

Blood Pressure Monitoring is important to determine a person's risk for stroke. High Blood Pressure is known to increase the risk of plaque build-up in the heart. Blood Pressure is a determinant for stroke risk and is used to determine medication and therapy in prevention of heart disease and stroke.



An Echocardiogram can predict a stroke by visually identifying plaque formed in the heart. This can determine a person's risk of stroke as a deciding factor for treatment to prevent a stroke from occurring.

Diet can be a direct cause of stroke. The quality of the food eaten by any individual determines the level of cholesterol in the blood. That cholesterol is what builds as plaque in the heart and arteries, and if broken may directly cause a stroke to occur. Every person should have the knowledge that the food they eat determines the health of their entire body and directly determines their individual risk for heart disease and stroke. Clogged arteries caused by poor diet alongside high blood pressure is a recipe for the tragedy that is a stroke.

Exercise determines the body's ability to fend off occurrences such as a stroke. Physical activity is known to improve cholesterol levels by increasing healthy cholesterol and decreasing bad cholesterol.

Cardiovascular health makes it harder for cholesterol to stick to blood vessel walls making it more difficult for clots to form, cause damage, and break loose, causing a stroke.

Blood Pressure, Diet, and Exercise are directly affiliated with the risk for stroke and heart disease. Healthy Lifestyle Choices, Health Monitoring, and Echocardiogram tests are the way to prevent a stroke.

Resources

[What is a Stroke - **Stroke Association**](#)

[The Facts About High Blood Pressure- **AHA**](#)

[Sustained high blood pressure may damage brain vessels - **AHA**](#)

[Hidden Brain Risk: High Blood Pressure - **Hopkins Medicine**](#)

[Blood pressure chart: What your reading means - **Mayo Clinic**](#)

[Health Threats From High Blood Pressure - **AHA**](#)

[High blood pressure dangers: Hypertension's effects on your body - **Mayo Clinic**](#)

[How High Blood Pressure is Diagnosed - **AHA**](#)

[8 Negative Effects of Uncontrolled High Blood Pressure - **UPMC**](#)

[Transient ischemic attack - **Mayo Clinic**](#)

[What is blood pressure and how is it measured? - **NCBI**](#)

[Stroke Diagnosis & Treatment - **Mayo Clinic**](#)

[Stereotactic radiosurgery - **Mayo Clinic**](#)

[Effects of Stroke - **Hopkins Medicine**](#)

[Stroke rehabilitation - **Mayo Clinic**](#)
