STROKE

MASSACHUSETTS
GENERAL HOSPITAL

VASCULAR CENTER

ABOUT THE MASSACHUSETTS GENERAL HOSPITAL VASCULAR CENTER

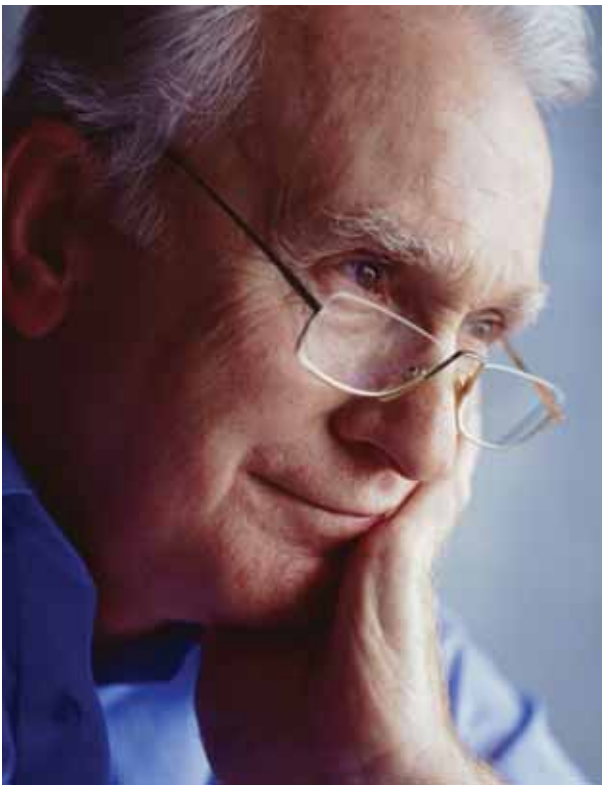
The Massachusetts General Hospital Vascular Center is a fully integrated, multi-specialty center of excellence created to provide comprehensive diagnosis and management of patients with vascular disorders.

The Vascular Center is the only center in the nation that has assembled all the medical and surgical specialists in one place dedicated to the prevention, diagnosis, management and treatment of all types of vascular disease, including stroke. The multidisciplinary center is comprised of seven clinical disciplines, including cardiology and vascular medicine, cardiac surgery, vascular and endovascular surgery, vascular radiology, neurology, neurosurgery and nephrology. The team closely collaborates to ensure that patients are provided with an unparalleled level of sophistication in managing the entire spectrum of vascular disease.

STROKE CARE

Massachusetts General Hospital offers the most comprehensive stroke care that can be found anywhere. The Neurology Stroke Service has the longest history of any program of its kind in the nation and is the largest in the world. Physicians from many disciplines work together to treat patients with all forms of stroke. These physicians come with special skills from Neurology, Neurosurgery, Neuroradiology, Cardiology, Vascular Surgery, Vascular Medicine, the multi-disciplinary Neurointerventional Service and the Stroke Neurology/ Neurointensive Care Service.

The Neurology Stroke Service offers complete care for all persons with suspected or diagnosed stroke. This includes a unique telestroke service that allows our specialists to view patient diagnostic results at remote hospitals and provide expert consultation for patients being seen in their communities. The Massachusetts General Hospital Clinical Stroke Research Center, and our commitment to training the future leaders in the stroke field distinguish our care from all others.



STROKE

Stroke is a serious public health issue. More than 700,000 Americans each year will have a new or recurrent stroke. Of those, about one third are fatal; and about one third of those who experience stroke each year become disabled. Prevention, treatment and rehabilitation are essential when it comes to stroke.

In the United States alone, someone has a stroke every 45 seconds. Someone dies of stroke every three minutes.

- Stroke is the number one cause of long-term disability
- Stroke is the third leading cause of death in the US

WHAT IS STROKE?

A stroke results when blood vessels in or near the brain are blocked by a blood clot (a thrombosis) or the vessel ruptures and blood escapes into the brain tissue itself. Blockage of a blood vessel prevents vital oxygen and nutrients from reaching all areas of the brain. The brain cells affected begin to die. Motor and cognitive function levels will be affected, depending on the location and severity of the stroke.

TYPES OF STROKE

Ischemic strokes make up about 80% of strokes. They occur when blood flow is disrupted from the build up of fatty deposits called "plaque" (atherosclerosis, or hardening of the arteries). This can cause blood clots of different types:

- *Cerebral thrombosis*, a blood clot that forms right where the vessel is clogged; or
- *Cerebral embolism*, a blood clot that forms in the heart, chest or neck and then travels to the brain

Ischemic stroke results when the embolism breaks loose and enters the brain by traveling through the blood vessels until it reaches one too small to move through. Another cause of embolism is atrial fibrillation, a type of irregular heartbeat that can cause blood clots to form in the heart, then dislodge and travel to the brain.

Transient Ischemic Attacks (TIAs) or mini-strokes affect almost 6% of the population. TIAs, a temporary decrease of blood supply to the brain, have the same causes as strokes (see above), but the disruption in blood supply is short-lived and the situation usually corrects itself. A TIA can be considered a warning sign for stroke. **One in three people with TIA will have a stroke, most within three weeks of the event.** TIA is therefore an important warning sign to seek appropriate stroke evaluation.

Hemorrhagic strokes account for about 20% of all stroke cases. This type of stroke involves two types of blood vessels that become weakened, rupture and cause bleeding in or near the brain.

The two types of abnormal blood vessels are:

- *Aneurysms*, blood vessels that are weakened or bulging; or
- *Arteriovenous Malformations (AVMs)*, a cluster of malformed blood vessels

Both situations compress brain tissue, and one of two types of hemorrhagic strokes will occur:

- *Intracerebral hemorrhage,* which means the bleeding is in the brain itself; or
- *Subarachnoid hemorrhage*, the bleeding is on the surface of the brain

CAROTID STENOSIS

The left and right carotid arteries in the neck supply much of the blood flow to the brain. Over time, atherosclerosis or hardening of the arteries can develop and narrow the arteries so blood flow is restricted. Patients with carotid stenosis are at high risk for stroke if they experience temporary neurologic symptoms, such as:

- Transient Ischemic Attack (TIA)
- Difficulty speaking or understanding others
- Blurring in one eye or vision loss
- Numbness in an arm or leg or loss of strength in either

People with carotid stenosis who don't exhibit these symptoms have about a two percent chance of stroke. **Therefore it is vitally important to pay attention to symptoms that could signal a high risk for stroke**.

MINIMIZING RISK FACTORS

The good news is that you can take steps to reduce your risk for stroke. Maintaining a healthy lifestyle is very important.

Help control your risk for stroke by:

- Maintaining a healthy blood pressure
- Eating a healthy diet to decrease the risk of narrowed arteries
- Controlling your cholesterol level, especially low-density lipoprotein (LDL) cholesterol
- Not smoking
- Maintaining a healthy weight
- Exercising regularly
- Avoiding excessive use of alcohol
- Managing diabetes mellitus properly
- Seeking care if you experience or are diagnosed with an irregular heart rhythm (atrial fibrillation)

Also, talk to your doctor about taking a low dose of aspirin. And if you experience loud snoring and excessive daytime sleepiness, you may be at risk. If you repeatedly gasp for air during sleep, see a specialist. Studies have shown that sleep apnea is a risk factor for stroke.

Some risk factors for stroke cannot be controlled, but you should talk to your doctor about how to minimize your risk.

These are risk factors for stroke you can't control:

- Having a previous stroke or pre-existing cardiovascular disease
- Having a previous Transient Ischemic Attack (TIA)
- Being age 60 or older
- Having a family history of stroke
- Having Type I diabetes
- Being of African American, Asian or Hispanic descent

SIGNS AND SYMPTOMS OF STROKE

The signs of stroke can appear suddenly. **If you notice any of these signs, call 911 immediately.** The sooner you receive treatment for stroke symptoms, the better your chances for minimizing long-term, debilitating health effects.

Symptoms of stroke or TIA occur suddenly and may include:

- Numbness or weakness of the face, arm or leg, usually on one side of the body
- Confusion, trouble speaking or understanding
- Difficulty seeing in one or both eyes
- Difficulty walking
- Dizziness with slurred speech or double vision
- Loss of balance or coordination
- Severe headache of unknown cause

STROKE DIAGNOSIS

Acute stroke is an emergency situation. If the brain is starved of blood flow and oxygen, its cells die quickly. This can result in permanent damage. *Fast and accurate diagnosis is the most important first step.* To diagnose stroke, specialists from our Neurology Stroke Service care team are on call 24/7 to the Mass General Emergency Department, and use the most innovative, non-invasive tools to detect the cause, location and extent of damage. Planning begins with the stroke care team, who begin swiftly to stop the bleeding in a hemorrhagic stroke or eliminate a clot in an ischemic stroke.

Non-invasive diagnostic tests are used to identify brain injury and/or abnormal blood vessels:

Doppler Ultrasound - an imaging test that uses high frequency sound waves to examine blood flow through major arteries and veins of the arms, legs neck and brain. It is also used to detect blood clots.

CT Scan - an imaging test that uses computer technology to create a series of X-ray pictures that appear as snapshots or "slices" of different sections of the brain. A CT scan can reveal moderate or large strokes. Mass General Radiology and our Stroke Service have pioneered innovative, advanced CT perfusion imaging. This technique gives stroke specialists unprecedented clarity to identify regions of brain with abnormal blood flow in just a few minutes.

MRI Scan - an imaging test that uses magnetic waves instead of X-ray to produce detailed, 3-dimensional images of internal structures and organs in the body. Mass General Radiology and Stroke Service pioneered some of the newer technologies that identify stroke injury within minutes.

Left to right: Dr. Christopher Ogilvy, Dr. Joshua Hirsch & Dr. Walter J. Koroshetz, Director of Stroke Service

Functional MRI - an imaging test that highlights the brain's motor, sensory and language centers. This type of test monitors the brain's activity in response to a specific activity. It outlines brain areas important for essential neurological function like speaking, movement, etc.

Magnetic Resonance Angiography - an imaging test that utilizes the magnet waves of the MRI scanner to map the body's network of arteries and veins. Dye is administered by a simple intravenous injection.

Angiography - an imaging test that utilizes X-ray technology to map the body's network of arteries and veins. Veins and arteries are visualized through an injection of dye that outlines them on an X-ray. This technique is also the basis for neuroendovascular treatment of stroke. Neurointerventional specialists are skilled at catheter techniques to open blocked arteries. Angiography is also the technique used by cardiologists, vascular surgeons and neurointerventionalists to treat carotid stenosis using endovascular angioplasty and stenting.

OUR TEAM APPROACH TO CARE

Massachusetts General Hospital has all the resources needed in one place for stroke care. This includes prevention, treatment and rehabilitation programs to help restore patients' functional and cognitive levels as much as possible. In an emergency, specialists are available around the clock. The Stroke Service has the best minds in neurology, vascular medicine, and intervention working together to ensure the best possible outcome for each patient. A collaborative environment includes a partnership with each patient and family.

TREATMENT OPTIONS

Treatment therapies exist to stop bleeding or dissolve blood clots, reduce the risk of subsequent strokes, and improve functioning to overcome disabilities.

Treatments for acute ischemic stroke can include:

- Clot-dissolving medications or clot removing devices
- Neurointensive care of the stroke patient
- Urgent revascularization by endarterectomy or angioplasty/stent
- Investigational treatments of high dose oxygen or clot dissolving medications

Treatments for acute intracranial hemorrhage include:

- Surgical removal of the blood clot
- Surgical clipping or endovascular coiling of aneurysms that have bled
- Surgical resection or endovascular occlusion of arterial malformations
- Neurointensive Care

There are two general types of interventional treatments for carotid stenosis.

Carotid Endarterectomy

A surgical procedure which involves the removal of fatty deposits from the carotid artery. In some cases it can be performed under local anesthesia and the patient return home in a day or two.

Carotid Artery Stent/Angioplasty

Skilled endovascular physicians from the Vascular Center can enter the carotid artery by accessing the vascular highway through an artery in the leg. A shield is placed in the high carotid to catch any debris that is shed from the artery when a stent is placed to dilate the narrowed vessel.

REHABILITATION

Rehabilitation of the stroke patient is a critical step in the recovery process and takes place at Mass General's affiliate, Spaulding Rehabilitation Hospital. There, physiatrists, therapists, nurses and neurologists work with stroke patients to restore function. Novel investigative strategies are also tested for their ability to improve recovery after stroke.

MORE INFORMATION

For more information on our Stroke Service and the Massachusetts General Hospital Vascular Center, call us at 877-MGH-8346 or visit our website at massgeneral.org/vascularcenter.

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