

The Pressure Point

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From the American Heart Association

Stroke Awareness Month

With Stroke... Time Lost Is Brain Lost.

Learn to recognize a stroke and act quickly.

TAKE CONTROL BY KNOWING YOUR RISKS.

Check all boxes below that apply to you.

◇ **AGE and SEX.** . . You are a man over age 45, OR a woman over 55, OR you've passed menopause or had your ovaries removed and aren't taking estrogen.

◇ **FAMILY HISTORY.** . . Your mother, father, sister, brother or grandparent had a stroke, OR your father or brother had a heart attack before age 55, OR your mother or sister had a heart attack before age 65.

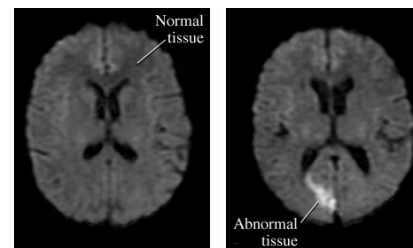
◇ Your **BLOOD PRESSURE.** . . is 120/80 or higher, OR a health professional has said your blood pressure is too high, OR you don't know what your blood pressure is.

◇ You **SMOKE.** . . OR live or work with people who smoke

- ◇ Your **HDL.** . (good) cholesterol is less than 35, OR you don't know your HDL level.
- ◇ Your **PHYSICAL ACTIVITY.** . . is less than a total of 30 minutes on most days.
- ◇ **MEDICAL HISTORY.** . . You have been told you have carotid artery disease, OR you've had a stroke or
- ◇ TIA (transient ischemic attack) or "mini stroke," OR you have a disease of the leg arteries, a high red blood cell count or sickle cell anemia.
- ◇ You have atrial fibrillation, coronary heart disease or other heart condition(s), OR had a heart attack.

If you checked one or more boxes, you are at an increased risk for stroke. See a healthcare provider for a complete assessment of your risks!

Stroke is our nation's No. 3 killer and a leading cause of disability.



- On average, one stroke occurs every 45 seconds.
- Every 3 minutes, someone dies of stroke.
- Each year, about 700,000 Americans have a stroke.

- tobacco regularly
- ◇ You have **DIABETES.** . . a fasting blood sugar of 126 or higher, OR you need medicine to control your blood sugar.
 - ◇ Your **CHOLESTEROL.** . . is 240 or higher, OR you don't know your level.

Stroke Awareness...

(Continued from page 1)

- 15-30% of stroke survivors are permanently disabled.

Stroke takes a serious toll in the workplace.

- Stroke will cost our nation an estimated \$56.8 billion in 2005 (medical costs, lost productivity).

Stroke affects people of all ages, ethnicities and socioeconomic levels

- About 40,000 more women than men suffer a stroke each year.
- The lifetime risk for stroke is greater than one in six after age 55.
- Blacks have almost twice the risk of first-ever stroke compared to whites. The overall death rate for stroke is 56.2%, but for black women it was 71.8% and for black men it was 81.7%.
- Hispanics age 35-54 have a 1.3 times greater relative risk for stroke than non-Hispanic whites.

Stroke Warning Signs

- Sudden numbness or weakness of the face, arm or leg, especially on one side of the body
- Sudden confusion, trouble speaking or understanding
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance or coordination
- Sudden severe headache with no known cause

If you or someone near you have any of these symptoms, call 9-1-1 immediately.

Time lost is brain lost.



DANGEROUS MYTHS ABOUT HIGH BLOOD PRESSURE

1. COMMON SIGNS INCLUDE NERVOUSNESS, SWEATING AND TROUBLE SLEEPING.

Wrong. High blood pressure has no symptoms. The only way to know if you have it is to check your blood pressure.

2. STRESS GIVES EVERYONE HIGH BLOOD PRESSURE. IT'S JUST A FACT OF LIFE I DON'T NEED TO WORRY ABOUT.

Stress can increase your risk so check your blood pressure often. People with uncontrolled hypertension have a much greater risk of heart disease, heart failure and stroke.

3. WHEN I VISIT THE DOCTOR, MY BLOOD PRESSURE IS HIGH BECAUSE I'M NERVOUS. I'M SURE IT'S OK AT HOME.

Some people have higher blood pressure in a doctor's office due to nervousness. Things that can affect blood pressure include physical exertion, strong emotion and stress. Home monitoring is one way to help your doctor measure your true pressure.



Never ignore several readings indicating that you may have high blood pressure.

4. WOMEN NEEDN'T WORRY. IT'S A MAN'S PROBLEM.

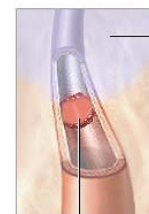


False. Some things may put women at even greater risk for hypertension: using birth control pills, being pregnant, overweight, postmenopausal or African-American, or having a family history of high blood pressure.

Right:

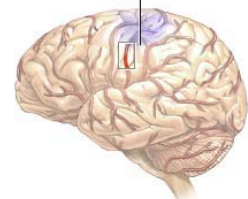
Strokes secondary to cardiogenic embolism are caused by emboli (moving blood clots) that develop in the heart.

The embolus travels through the bloodstream and becomes stuck in a small artery in the brain.



Embolism (blood clot)

Death of brain tissue due to lack of blood supply

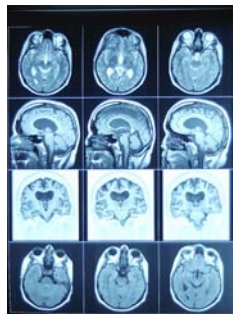


(Continued on page 5)

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Does the Mismatch Match the Penumbra?

Magnetic Resonance Imaging and Positron Emission Tomography in Early Ischemic Stroke



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Background and Purpose— In ischemic stroke, diffusion-weighted (DW) and perfusion-weighted (PW) magnet resonance imaging (MRI) is used to define the mismatch as the therapeutic target. With positron emission tomography (PET), we characterized the metabolic patterns of tissue compartments identified by MRI and compared the volumes of mismatch to those of PET-defined penumbra.

Methods— In 6 acute (median, 5.2 hours) and 7 chronic (median, 10 days) stroke patients in whom a mismatch was defined by PW/DW MRI, PET was performed (median, 120-minute delay). Cerebral blood flow (CBF), oxygen metabolism (CMRO₂), and oxygen extraction fraction (OEF) was determined in the areas of DWI lesion, mismatch, and oligemia. Then, the mismatch volume was compared with the volume of penumbra.

Results— DWI lesions showed impaired tissue integrity (low CMRO₂ and low OEF). Mismatch areas were viable (normal CMRO₂) but showed largely varying OEF. Oligemic areas had metabolic patterns comparable to normal tissue. A mismatch volume was found in all 13 patients. However, only 8 of 13 had a corresponding penumbra volume that covered only a part of the mismatch.

Conclusion— Our comparative PET/MRI study confirmed the current pathophysiological hypothesis for the DWI lesion and for the oligemic areas. However, the mismatch area did not reliably detect elevated OEF and overestimated the penumbra defined by PET.

Key Words: cerebral blood flow • magnetic resonance imaging • perfusion • stroke, acute • tomography, emission computed

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Unexpected Nocturnal Hypoxia in Patients With Acute Stroke



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Background and Purpose— Patients who have had a stroke are at risk of hypoxia through alterations in the central regulation of respiration, through aspiration, and through respiratory muscle weakness. Sleep-related breathing disorders are common and may lead to episodes of nocturnal hypoxia even when daytime oxygenation is normal. The aim of this study was to assess the prevalence of unexpected nocturnal hypoxia in stroke patients.

Methods— Consecutive adult patients with stroke were recruited within 72 hours of admission to hospital. Patients with indications for oxygen treatment were excluded. Older adults from the local community were recruited as control subjects. Oxygenation was assessed by pulse oximetry (Minolta 3i) for 5 minutes when awake before bedtime and continuously from 11 PM until 7 AM.

Results— Of the 238 potentially eligible stroke patients, 120 were excluded because they required oxygen, 118 were recruited, and 100 had adequate pulse oximetry data. The mean±SD age was 74±8 years for stroke patients and 72±8 years for control subjects (n=85). Mean awake oxygen saturation (SO₂) was 94.5±1.7% for the stroke group and 95.8±1.7% for the control group (P<0.001). Mean nocturnal SO₂ was 93.5±1.9% in stroke patients and 94.3±1.9% in control subjects (P<0.01). Stroke patients had a higher oxygen desaturation index (ODI 4%) (8.9 versus 2.1, P<0.001). In addition, 23% of stroke patients spent >30 minutes with SO₂ <90% during the night.

Conclusions— Oxygen saturation at night is 1% lower than when awake. Almost a quarter of stroke patients who are normoxic at screening during the day spend >30 minutes with an oxygen saturation <90%.

Key Words: hypoxia • oximetry • oxygen • stroke • stroke, acute

Stroke. 2004;35:616. © 2004 American Heart Association, Inc.

Transient Ischemic Attacks Before Ischemic Stroke:

Preconditioning the Human Brain?

A Multicenter Magnetic Resonance Imaging Study



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Background and Purpose— We investigated whether transient ischemic attacks (TIAs) before stroke can induce tolerance by raising the threshold of tissue vulnerability in the human brain.

Methods— Sixty-five patients with first-ever ischemic territorial stroke received diffusion- and perfusion-weighted MRI within 12 hours of symptom onset. Epidemiological and clinical data, lesion volumes in T2, apparent diffusion coefficient (ADC) maps and perfusion maps, and cerebral blood flow and cerebral blood volume values were compared between patients with and without a prodromal TIA.

Results— Despite similar size and severity of the perfusion deficit, initial diffusion lesions tended to be smaller and final infarct volumes were significantly reduced (final T2: 9.1 [interquartile range, 19.7] versus 36.5 [91.2] mL; $P=0.014$) in patients with a history of TIA ($n=16$). This was associated with milder clinical deficits.

Conclusions— The beneficial effect of TIAs on lesion size in ADC and T2 suggests the existence of endogenous neuroprotection in the human brain.

Key Words: ischemic attack, transient • ischemic preconditioning • magnetic resonance imaging • neuroprotection • stroke

Stroke. 2000;31:1615. © 2000 American Heart Association, Inc.

Cerebral Oxygenation Declines in Healthy Elderly Subjects in Response to Assuming the Upright Position

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Background and Purpose—With increasing age, assuming the upright position is more often accompanied by symptoms such as dizziness and lightheadedness, possibly as a result of a diminished oxygen supply to the brain due to impaired cerebral autoregulation. We aimed to quantify postural changes in cerebral oxygenation and systemic hemodynamics in healthy elderly and young subjects.

Methods—In 18 healthy elderly subjects (aged 70 to 83 years) and 10 healthy young subjects (aged 22 to 45 years), frontal cortical oxygenation and hemodynamic responses were continuously monitored by near infrared spectroscopy and Finapres, respectively, before and during 10 minutes of active standing.

Results—Cortical oxyhemoglobin concentration [O_2Hb] decreased by -4.6 ± 2.2 $\mu\text{mol/L}$ ($P<0.001$) and cortical deoxyhemoglobin concentration increased by 1.5 ± 2.4 $\mu\text{mol/L}$ ($P<0.05$) in the elderly subjects after posture change, whereas these variables did not change significantly in the young subjects. The postural hemodynamic changes tended to be attenuated in the elderly subjects, except for the increases in systolic blood pressure (BP). Smaller postural increases in diastolic BP were related to larger [O_2Hb] decreases ($r=0.53$, $P<0.01$, corrected for the age effect).

Conclusions—Assuming the upright position evokes an asymptomatic decrease in frontal cortical oxygenation in healthy elderly subjects but not in healthy young subjects. Cortical [O_2Hb] changes are affected by diastolic BP changes. These findings may indicate that regulation of cerebral oxygenation alters with increasing age.

Key Words: aging • cerebral circulation • hypotension, orthostatic • oxygen • spectroscopy, near-infrared

Stroke. 2003;34:1311. © 2000 American Heart Association, Inc.

Hyperbaric Oxygen Reduces Neuronal Death and Improves Neurological Outcome After Canine Cardiac Arrest

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Background and Purpose— Studies suggest that hyperbaric oxygen (HBO) is neuroprotective after experimental cerebral ischemia, but the mechanism is unknown. This study tested the hypotheses that postischemic HBO affords clinical and histopathological neuroprotection after experimental cardiac arrest and resuscitation (A/R) and that this neuroprotection results from improved cerebral oxygen metabolism after A/R.

Methods— Anesthetized adult female beagles underwent A/R and randomization to HBO (2.7-atm absolute [ATA] for 60 minutes, 1 hour after A/R) or control (PO₂=80 to 100 mm Hg; 1 ATA). Animals underwent neurological deficit scoring (NDS) 23 hours after A/R. After euthanasia at 24 hours, neuronal death (necrotic and apoptotic) in representative animals was determined stereologically in hippocampus and cerebral neocortex. In experiment 2, arterial and sagittal sinus oxygenation and cerebral blood flow (CBF) were measured. Cerebral oxygen extraction ratio (ER_c), oxygen delivery (DO_{2c}), and metabolic rate for oxygen (CMRO₂) were calculated (baseline and 2, 30, 60, 120, 180, 240, 300, and 360 minutes after restoration of spontaneous circulation).

Results— NDS improved after A/R in HBO animals (HBO, 35±14; controls, 54±15; *P*=0.028). Histopathological examination revealed significantly fewer dying neurons in HBO animals; the magnitude of neuronal injury correlated well with NDS. HBO corrected elevations in ER_c (peak, 60±14% for controls, 26±4% for HBO) but did not increase DO_{2c} or CMRO₂, which decreased 50% after A/R in both groups.

Conclusions— HBO inhibits neuronal death and improves neurological outcome after A/R; the mechanism of HBO neuroprotection is not due to stimulation of oxidative cerebral energy metabolism.

Key Words: cerebral ischemia • hyperbaric oxygenation • neurological deficits • oxygen • dogs

Dangerous Myths...

(Continued from page 2)

5. I FEEL FINE, SO I CAN STOP TAKING MY BLOOD PRESSURE MEDICINE.

Absolutely not. Hypertension is a lifelong disease that can be controlled but not cured. Take medication exactly as prescribed. Cutting back or quitting is dangerous.



6. I CAN TAKE ANY OVER-THE-COUNTER COLD OR FLU MEDICINE.

Wrong. Certain cold, cough and flu medicine with decongestants can be dangerous for people with high blood pressure. They can increase blood pressure and interfere with blood pressure drugs.

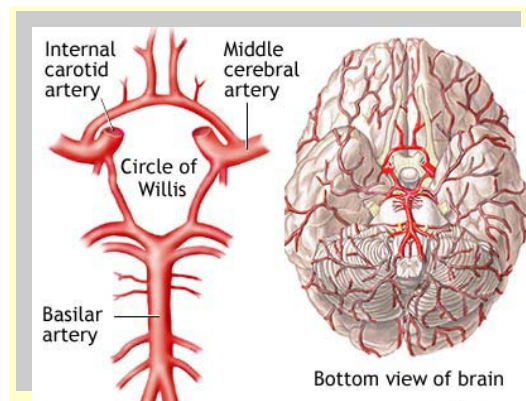
7. I DON'T NEED TO CHECK MY BLOOD PRESSURE UNTIL MIDDLE AGE.



Wrong. Start checking pressure early. Children as young as age 6 can have high

blood pressure.

Heavier, more sexually mature teens tend to have higher pressure; those with high blood pressure and extra pounds can have thicker arteries by age 30.



The Circle of Willis is the joining area of several arteries at the bottom (inferior) side of the brain. At the Circle of Willis, the internal carotid arteries branch into smaller arteries that supply oxygenated blood to over 80% of the cerebrum.

Lacunar Stroke: A Closer Look

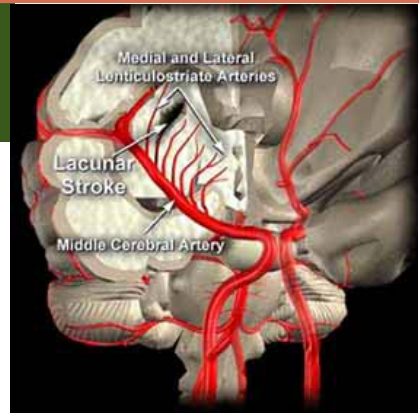
Lacunar Strokes. Lacunar infarcts are a series of very tiny, ischemic strokes, which cause clumsiness, weakness, and emotional variability. They injure deeper structures underneath the cortex

They are actually a subtype of thrombotic stroke and constitute about 38% of this major group.

In some populations, such as among Japanese, they are the most common stroke subtypes. They can also sometimes serve as warning signs for a major stroke.

A lacunar stroke occurs when one of the arteries that provide blood to the brain's deep structures is blocked. These arteries are small, and are uniquely vulnerable. Unlike most arteries, which gradually taper to a smaller size, the arteries of a lacunar stroke branch directly off of a large, high-pressure, heavily muscled main artery. High blood pressure (hypertension) can lead to lacunar strokes because it causes a pounding pulse.

Lacunar strokes account for about 20% of all strokes in the United States



In a lacunar stroke, brain cells in a relatively small area (3 millimeters to 2 centimeters) are damaged or killed by lack of oxygen. These small areas of brain destruction are called lacunes. Lacunar strokes involve only small areas of the brain, but they cause significant disability.

Extra Oxygen May Help Stroke Patients



Re-examining a simple concept—Oxygen!!!

NEW YORK (Reuters Health)

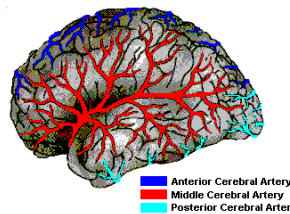
For some patients suffering a sudden stroke, extra oxygen therapy improves their clinical symptoms deficits and brain abnormalities seen on an MRI a small, pilot study suggests.

The study was performed with "a carefully selected group of patients," lead investigator Dr. Aneesh B. Singhal of Massachusetts General Hospital, Boston, told Reuters Health. "Our results, though preliminary, raise

the exciting possibility that stroke patients...may benefit simply by breathing large amounts of oxygen as soon as possible after symptom onset."

Singhal and colleagues randomly assigned 16 patients who had started to have a stroke less than 10 hours beforehand to 8 hours of treatment with high-flow oxygen delivered via facemask, or to normal room air.

Stroke severity scores were similar in both groups to begin with, but tended to improve with oxygen therapy after 4 hours, and improved significantly after 24 hours in oxygen-treated patients," the researchers report in the American Heart Association's journal *Stroke*.



The average amount of brain damage visible on an MRI was significantly reduced after 4 hours in the oxygenated patients, and blood flow within the affected brain regions improved.

"Our research also suggests that oxygen therapy may be a practical means of extending the narrow—3-hour—time window for administering the clot-busting drug TPA, which is the only (US) FDA-approved acute stroke treatment," Singhal added.

SOURCE: *Stroke*, April 2005.

Carotid and Basilar Artery Blockages

Symptoms From Blockage in the Carotid Arteries. The carotid arteries stem off of the aorta (the primary artery leading from the heart) and lead up through the neck around the windpipe and on into the brain. When TIAs or stroke occur from blockage in the carotid artery, which they often do, symptoms may occur in either the retina of the eye or the cerebral hemisphere (the large top part of the brain).

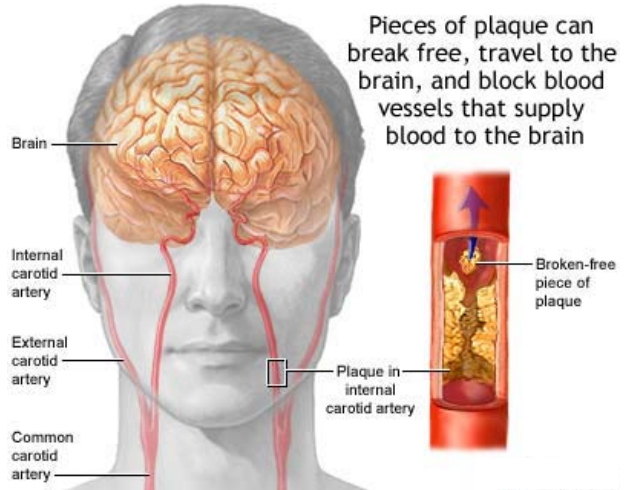
They include the following:

When oxygen to the eye is reduced, people describe the visual effect as a shade being pulled down. People may develop poor night vision. About 35% of TIAs are associated with temporary lost vision in one eye. Although such events are risk factors for future stroke, they pose a lower risk for a stroke and its complications than more widespread TIA symptoms.

When the cerebral hemisphere is affected, a person can experience problems with speech and partial and temporary paralysis, drooping eyelid, tingling, and numbness, usually on one side of the body. The stroke victim may be unable to express thoughts verbally or to understand spoken words. If the stroke injuries are on the right side of the brain, the symptoms will develop on the left side of the body and vice versa.

Uncommonly, patients may experience seizures.

Symptoms From Blockage in the Basilar Artery. The other major site of trouble, the basilar artery, is formed at the base of the skull from the vertebral arteries, which run up along the spine and join at the back of the head. When stroke or TIAs occur here, both hemispheres of the brain may be affected so that symptoms occur on both sides of the body. *The following symptoms may develop:*



The build-up of plaque in the internal carotid artery may lead to narrowing and irregularity of the artery's lumen, preventing proper blood flow to the brain. More commonly, as the narrowing worsens, pieces of plaque in the internal carotid artery can break free, travel to the brain and block blood vessels that supply blood to the brain. This leads to stroke, with possible

ies, which run up along the spine and join at the back of the head. When stroke or TIAs occur here, both hemispheres of the brain may be affected so that symptoms occur on both sides of the body. *The following symptoms may develop:*

- Temporarily dim, gray, blurry, or lost vision.
- Tingling or numbness in the mouth, cheeks, or gums.
- Headache, usually in the back of the head.
- Dizziness.
- Nausea and vomiting.

(Continued on page 8)

Test:

Are you getting enough oxygen?

from Dr. Hamner



Most people can check their own oxygen levels with this simple test...

Stand in front of a step. Relax for a moment, then check your resting heart rate. To do this: Place the tips of your index and middle fingers on the thumb side of your wrist. Count your heart-

beats for 30 seconds, then multiply by two.

Rapidly step onto and off of the step for one minute. Check your heart rate again. It probably has risen quite a bit—from say, 80 beats to 120 beats per minute.

Rest for one minute, then check your heart rate again. If it returned to the resting level, your blood is carrying adequate oxygen. If it stayed elevated above the resting level for more than one minute, your heart is trying to compensate for low blood levels of oxygen.



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May is Stroke Awareness Month



The International Hyperbarics Association is a coalition of doctors, parents, patients, corporate chamber-industry professionals, hyperbaric center owners, and above all members who are committed to the cause of medical hyperbarics.

Our members come to us from all geographical areas with one common goal— to share their knowledge and information regarding the latest hyperbaric news.

Our driving force is our members, who are committed to do all we can “to give life to the world.”

— “Mundo vitam dare”



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Carotid and Basilar Artery Blockages



(Continued from page 7)

- Difficulty swallowing.
- Weakness in the arms and legs, sometimes causing a sudden fall.

Such strokes usually occur in the brain stem, which can have profound affects on breathing, blood pres-

sure, heart rate and other vital functions, but does not affect thinking or language.

Speed of Symptom Onset. The speed of symptom onset of a major ischemic stroke may indicate its source:

If the stroke is caused by a large embolus (a clot that has traveled to an artery in the brain), the onset is sudden. Headache and seizures can occur within seconds of the blockage.

When thrombosis (a blood clot that has formed within the brain) causes the stroke, the onset usually occurs more gradually, over minutes to hours. On rare occasions it progresses over days to weeks.