BRAIN ATTACK: MOVING SWIFTLY TO TREAT STROKE

The EMT's Role in Stroke Management in the Field

by CHARLES J. PRESTIGIACOMO, MD

Objectives

After reading this article the EMT will be able to:

- describe the general structure of the brain and cerebral vessels and localize various functions of the brain;
- identify the major types of stroke and their causes;
- list the signs and symptoms of stroke;
- describe the appropriate prehospital assessment and treatment for the stroke patient;
- use the Cincinnati Prehospital Stroke Assessment;
- describe to the patient and family the emergent treatment available to patients with different types of stroke.

At 11:25 a.m., you arrive at a residential address for a "man down." After assuring scene safety, you approach the 65-year old male who is lying supine next to an overturned chair on the kitchen floor. The man's brother tells you that at 11 a.m. he left the house for 15 minutes and returned to find the patient on the floor dragging his right leg. "My brother was fine, sitting in a chair when I left," he says anxiously. The patient is awake, but unable to speak. The right side of his face appears to droop. His eyes continually gaze to the left. He begins to whimper and cry when you question him.

What are you going to do?

Introduction: Time is Brain

Just as the "Golden Hour" requires EMTs to swiftly manage trauma patients, so must prehospital providers quickly assess, recognize, treat and transport stroke victims to the hospital – without delay. Today's technological and pharmacological advances have demonstrated that with early intervention, the damage from a stroke can be reduced and the patient's overall outcome improved. Although some of these treatments are still controversial, EMTs continue to play a pivotal role as the first prehospital care professionals called upon to evaluate a patient with an altered mental status and/or other neurological deficits. It is up to you to recognize signs and symptoms of a stroke-in-evolution and take action to get the patient as safely and quickly as possible to a facility that provides appropriate stroke treatment.

During my years as an EMT, I enjoyed the challenge of patient assessment, especially evaluating patients with altered levels of consciousness. I pieced together signs and symptoms and wrestled with ideas of different possible causes:

> ***"A stroke victim is not necessarily doomed to permanent disability or death."***

alcohol and/or drug use, head injury, perhaps stroke. But at that time, little could be done for stroke victims. Today, however, due to huge advances in medical technology and pharmacology, a stroke victim is not necessarily doomed to permanent disability or death.

In this article, we will define stroke, its signs and symptoms, and review the anatomy and physiology (structure and function) of the brain and its circulation. Several important statistics about stroke and its different causes and manifestations will also be discussed. Attention will then be directed towards prehospital assessment and treatment of stroke victims as well as the in-hospital management of this disease.

Epidemiology

A cerebrovascular accident (CVA), commonly called stroke, occurs when blood circulation to an area of the brain is blocked and vital brain tissue dies due to lack of oxygen and nutrients. The sensitive cells of the brain are permanently damaged after only four to five minutes without oxygen and glucose. When an area of the brain is deprived of these nutrients, that portion of the brain dies and the function it provided is altered.

Stroke affects more than 700,000 individuals annually in the United States (approximately one person every 45 seconds), with 35% making a complete or near-complete recovery. Unfortunately, 40% of patients will have moderate to severe disability requiring some form of skilled nursing care or admission into a skilled nursing facility and approximately 15% will not survive. As such, it is the third-leading cause of death and one of the leading causes of disability in the United States with an annual cost of over $40 billion. In addition, since stroke crosses all economic, social and age barriers, its impact on society in terms of loss of productivity is immeasurable.

"Four out of five families will be somehow affected by CVA over the course of a lifetime."

Although four out of five families will be somehow affected by CVA over the course of a lifetime, fewer than half of individuals over 50 are actually aware of what stroke is, its signs and symptoms and the importance of seeking immediate medical attention. This requires all health care professionals to make the public aware of the serious nature of this disease. Through your direct interactions with the patient and family, you now have the additional responsibility to raise public awareness of this now potentially reversible problem.

Anatomy and Physiology

As an EMT, you need to have a basic understanding of the anatomical and physiologic characteristics of the central nervous system in order to understand the ways in which stroke affects the patient. Therefore, let us now review some neurological basics.

The human brain weighs just a bit more than a quart of milk, approximately three pounds, and contains over 100 billion neurons, or nerve cells, and their supporting cells, known as glia. Once dead, neurons do not regenerate.

The brain is covered by three distinct membranes, which provide a

Stroke Glossary

aneurysm: a blood-filled dilation of a blood vessel

collateral circulation: side branches of blood vessels

central nervous system: brain and spinal cord

cerebral: of or pertaining to the brain

embolus: a clot propelled by the bloodstream

fibrinolytics: "clot-busting" drugs used in CVA patients meeting certain criteria *(see Figure 5)*

hemorrhage: bleeding

hypoxia: subnormal level of oxygen

infarction: tissue death

intraarterial: within an artery

intracranial: within the skull

intravenous: within a vein

ischemia: temporary disruption of oxygen to cells

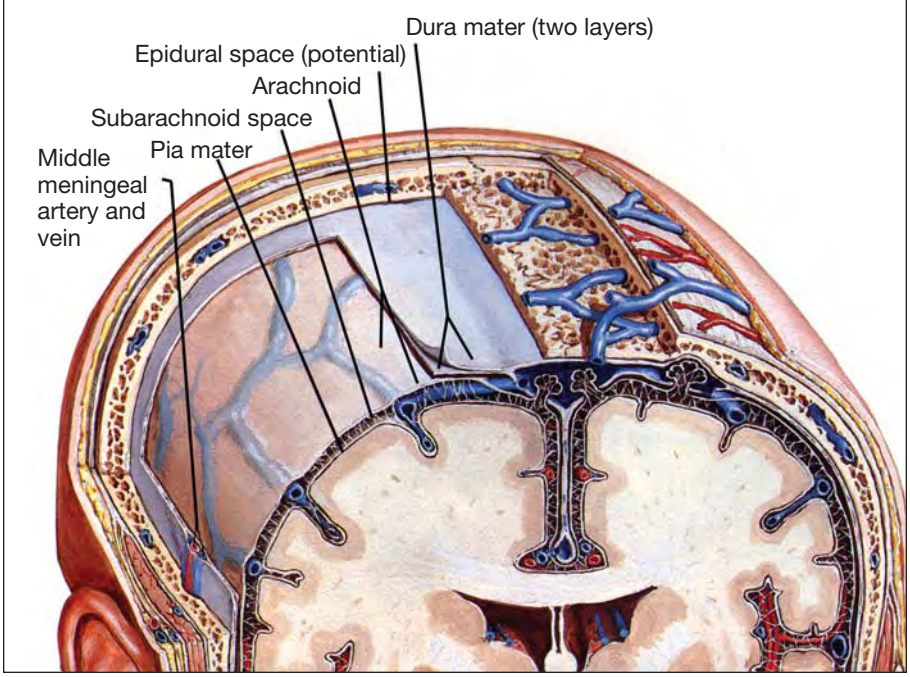
occlusion: become closed or obstructed

thrombus: a build-up of plaque, fats, etc. which occludes a blood vessel

vasculature: blood vessels

Figure 1

The Meninges



protective layer, collectively called the meninges. The outermost layer, the dura mater (Latin for "tough mother"), is followed by the arachnoid (Greek for "spiderweb-like") membrane, with the innermost layer, or pia mater (Latin for "tender mother") membrane closest to the brain itself. *(Figure 1)* Of importance here is the fact that there exists a space between the second layer, the arachnoid membrane, and the third layer, the pia mater. This ***sub***arachnoid space is filled with cerebrospinal fluid (CSF), serum-like fluid, which forms a bath in which the brain is essentially suspended. The subarachnoid space provides a labyrinth of interconnecting passageways throughout the brain. Furthermore, it is in this space that all the major arteries of the brain are located, which is important to the physician in determining the type of CVA the patient is experiencing.

The brain is divided into different parts, each with differing functions. *(Figure 2)* The cerebrum, the largest part of the brain, is the area principally involved in conscious thought and intellectual function. It is the center of initiation of movement and processing of all sensory information (such as vision and hearing) and the production and understanding of speech. Each of these specific functions is located in discrete areas of the cerebrum with minor variations.

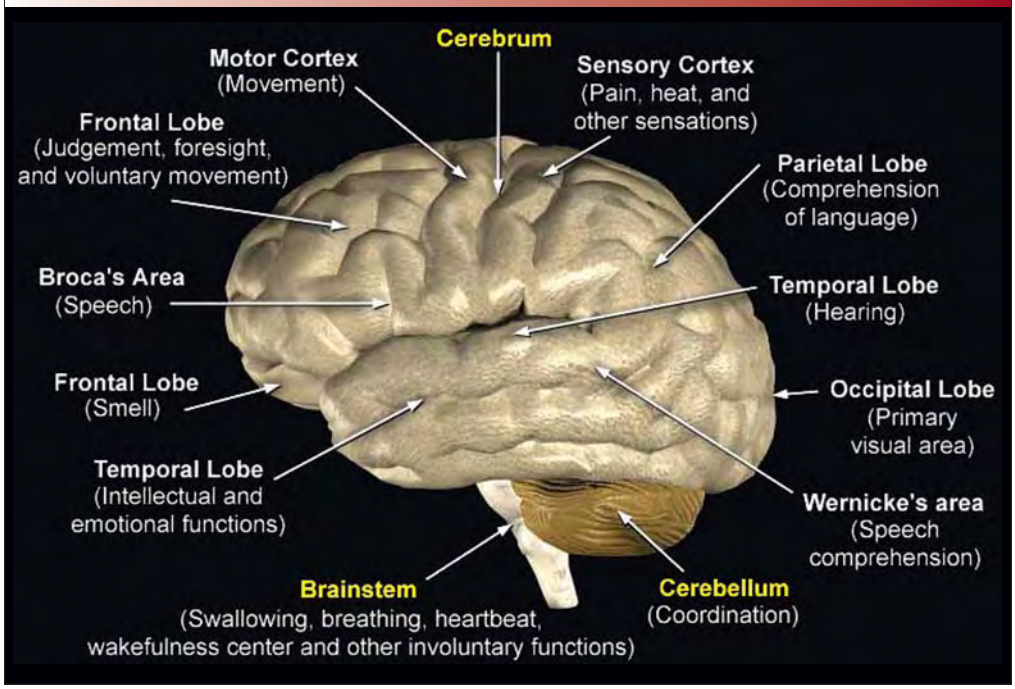
For instance, it is well-known that the right cerebral hemisphere processes sensory input and controls motor function of the left side, while the left hemisphere does so for the right. In addition, language skills, such as comprehension and speech production are predominantly (over 90% of the time) represented in the left hemisphere whereas spatial recognition is usually represented on the right hemisphere. The voluntary gaze centers are located in the frontal lobes of the cerebrum and initiate the complex cascade necessary for conjugate eye movements to one side or the other. The posterior poles of the hemispheres are predominantly involved with the processing of visual information.

The posterior part of the cranial vault houses the cerebellum and brainstem. The cerebellum occupies 10% of the intracranial space yet holds approximately 50% of all the neurons. It is responsible for the coordination and fine-tuning of voluntary movements and maintaining balance. It also serves as a "comparator," which compensates for errors in movement by comparing one's intentions with the actual performance of a task.

The brainstem, centrally located within the cranial vault, has three primary functions. First, it is involved in sensory input and motor output for the head by way of the cranial nerves. In addition, it functions as a thoroughfare for information trafficking between the brain and spinal cord. Finally, it regulates the individual's state of arousal and other vital functions of the body such as respiration,

Figure 2

Divisions and Functions of the Brain



blood pressure and heart rate.

Because stroke is a disruption of blood flow to the brain, it is essential to understand cerebral circulation. Blood is supplied to the brain by four major arteries: the anteriorly located internal carotid arteries and the posteriorly located vertebral arteries. *(Figure 3)* These vessels are variably connected in the subarachnoid space at the base of the brain via the Circle of Willis. These side-by-side connections, or "collateral pathways," (anastomoses) allow blood another route if one blood vessel becomes obstructed. This is important and will be further discussed in the next section.

Neurons cannot survive for longer than several minutes without a continuous supply of oxygen which is, of course, carried in the red blood cells. It is this relative or absolute lack of oxygen that results in neuronal death, and ultimately, loss of function.

Types of Stroke

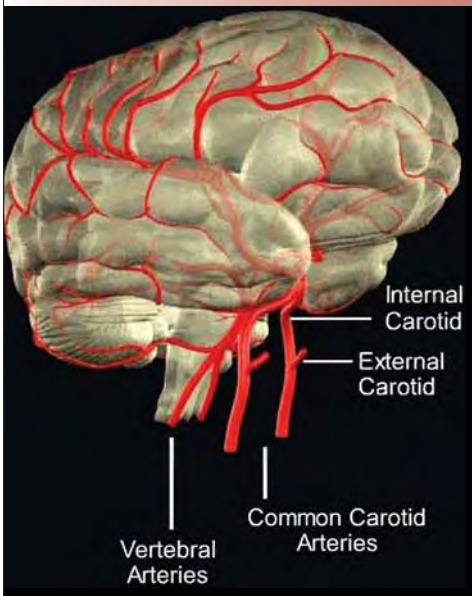
The term "stroke" originated from the concept that the illness caused a person to be suddenly struck down as if by the "stroke" of God's hand. This idea also reflected the apparent helplessness that was felt by the public as well as the medical community in treating this disease, let alone preventing its occurrence. However, in the last three decades dramatic changes have taken place in how the medical community and the public consider stroke. We now refer to this disease as a "cerebrovascular accident," (CVA) thus pointing to a definitive cause while also eliminating its inevitable fatal connotation. In order to impress upon the public the emergent nature of this disease (like "heart attack"), and the fact that the acute deficits need not necessarily be permanent, the term "brain attack" has now been adapted.

There are two major types of stroke: ischemic and hemorrhagic. *(Figure 4)*

• **Ischemia** is a local decrease in blood supply due to mechanical means such as a narrowed or plugged artery. Most often this is caused by a build-up of plaque in the arteries, a

Figure 3

Major Blood Vessels of the Brain

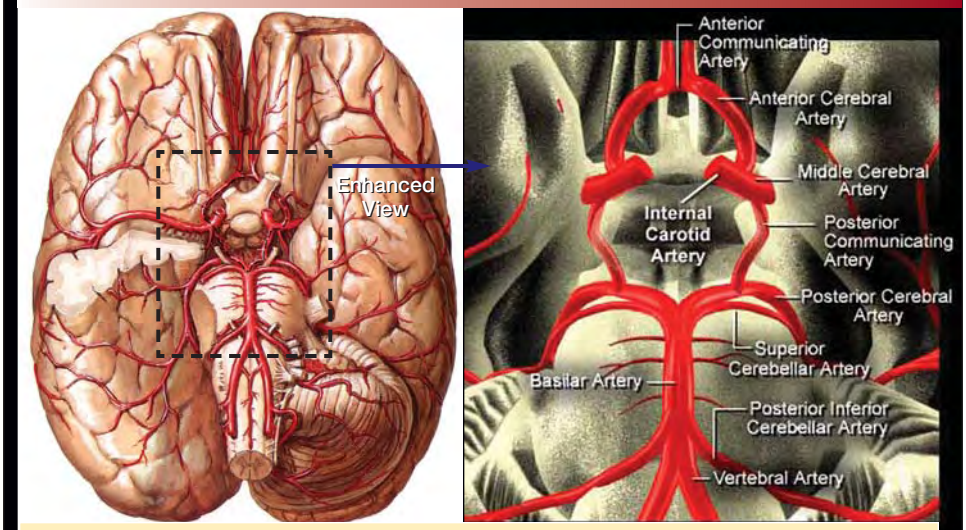


Blood is supplied to the brain, face, and scalp via two major sets of vessels: the right and left common carotid arteries and the right and left vertebral arteries.

The common carotid arteries have two divisions. The external carotid arteries supply the face and scalp with blood. The internal carotid arteries supply blood to the anterior three-fifths of cerebrum, except for parts of the temporal and occipital lobes. The vertebrobasilar arteries supply the posterior two-fifths of the cerebrum, part of the cerebellum, and the brain stem.

Any decrease in the flow of blood through one of the internal carotid arteries may bring about some impairment in the function of the frontal lobes. This impairment may result in numbness, weakness, or paralysis on the side of the body opposite to the obstructed artery.

Circle of Willis



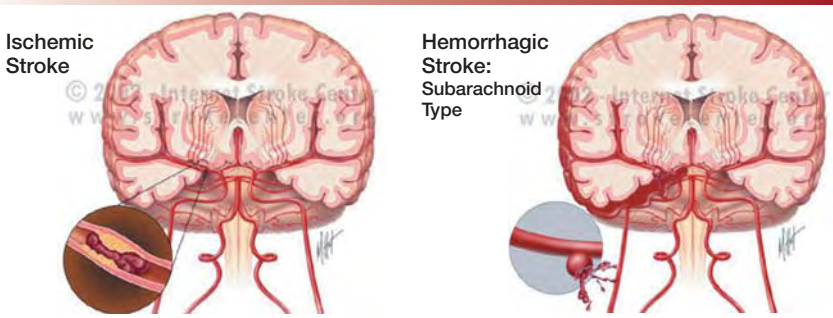
At the base of the brain, the carotid and vertebrobasilar arteries form a circle of communicating arteries known as the Circle of Willis.

From this circle other arteries – the anterior cerebral artery (ACA), the middle cerebral artery (MCA), the posterior cerebral artery (PCA) – arise and travel to all parts of the brain.

Because the carotid and vertebrobasilar arteries form a circle, if one of the main arteries is occluded, the distal smaller arteries that it supplies can receive blood from the other arteries (collateral circulation). *Annotated brain illustrations courtesy of Genentech.*

Figure 4

Origin of Ischemic & Hemorrhagic Strokes



The most common type of stroke is caused by a clot or other blockage within an artery leading to the brain.

This type of stroke is caused by the sudden rupture of an arterial aneurysm.

Illustrations: Internet Stroke Center

well-known condition called atherosclerosis. The cells within the area become ischemic, or oxygen-starved. If the condition is not reversed, the cells infarct, or die.

A cerebrovascular accident occurs when a blood vessel in the brain becomes obstructed by a clot (thrombus) which may have formed in a narrowed artery or may have originated in a different site and traveled through the blood stream to the vessels of the brain. Once obstructed, the area of brain cells becomes ischemic, and if the condition is not reversed, infarcts.

A clot that originates at one site and travels to another is called an embolus. Where do they originate?

Emboli can be fat globules, air bubbles or most commonly, bits and pieces of atherosclerotic plaque such as lipid debris that have detached from a diseased carotid artery or elsewhere. The bloodstream moves the embolus to another site, such as a pulmonary artery or the brain where it becomes lodged. Patients with a cardiac condition called atrial fibrillation can develop clots within the heart's atrium which then break off and emoblize into the cerebral circulation. Other patients at risk of developing thrombi and possible CVA include women who take birth control pills which makes the blood more prone to form clots. (Others at risk will be discussed later in this article.)

"A clot that originates at one site and travels to another is called an embolus."

- **Hemorrhagic CVA** occurs when there is a sudden rupture of a blood vessel in the brain. This may be caused by the effects of severe hypertension or drug use (e.g., cocaine), which results in bleeding within the brain. Hemorrhage may also be the result of a ruptured aneurysm, or a tear of a weakness along a wall of an artery supplying the brain. (Studies have demonstrated that approximately 90% of aneurysms that occur within the brain are located around the Circle of Willis.) In this case, the blood usually collects in the subarachnoid space and can severely compromise brain function.

Unlike an ischemic stroke, hemorrhagic strokes can present with a sudden onset of severe ("thunderclap") headache. During assessment, a patient may report "the worst headache" of his life. The sudden increase in blood volume within the rigid skull causes a sudden increase in intracranial pressure which may result in a loss of consciousness, or even death.

The Circle of Willis plays a very important role in both types of CVA; it can be a blessing or a bane. Because this structure provides alternate pathways for blood flow to detour to different regions of the brain, a clot or occlusion may not necessarily result in a large infarction. Likewise, when a stroke is caused by hemorrhage, the circle provides an alternate pathway for blood volume and reduces the amount of tissue damage.

"The Circle of Willis provides alternate pathways for blood flow to detour to different regions of the brain."

The circle, however, gives rise to other problems. The price we pay for having this "emergency bypass circuit" is that the flow of blood through this system exposes the vessel walls to stress which can result in the formation of aneurysms. Studies have shown that 90% of cerebral aneurysms occur around the Circle of Willis.

Other collateral pathways along the surface of the brain are also critical in reducing the overall amount of tissue death, or infarction. However, if the circle is incompletely formed – as it is in 80% of individuals – the collateral circulation may not help in limiting the size of the infarction.

Although it is not your job as an EMT to distinguish between types of stroke in the prehospital field, it is imperative that you recognize signs and symptoms of stroke, understand a CVA may be in progress and take immediate steps to maximize the functional outcome of the patient.

Transient Ischemic Attack

At times, symptoms of CVA occur and disappear within 24 hours of onset. The EMT is dispatched for

"possible CVA" and arrives to discover the patient speaking and moving about normally. This situation, though not a CVA per se, represents a temporary obstruction of blood flow through a narrowed vessel, thus a relatively mild period of hypoxia to a part of the brain. The temporary condition is aptly termed a transient (or "passing") ischemic attack (TIA). Patients may sometimes describe a "veil" or "window shade" partly covering the vision of one eye which resolves spontaneously after several minutes. This in fact represents the temporary blockage, or occlusion, of the retinal artery to the eye by an embolus. There may also be dizziness, imbalance and generalized weakness. Patients experiencing new onset or recurrent TIAs need medical evaluation urgently as left untreated, the condition may result in a CVA.

Pre-Hospital Evaluation and Management

Recognizing a stroke may be difficult. As an EMT, you need to evaluate clues from the patient, family/witnesses and the surrounding environment. It is important to note that many other disease processes may mimic stroke, such as tumors, infections (meningitis), head injury and hypoglycemia. It is not your role, however, to distinguish between the the many things that can mimic stroke. It is imperative that you recognize the ***possibility*** that a CVA is in progress and then provide the necessary in-field supportive treatment and rapid transportation to a facility that can effectively treat acute stroke. In New Jersey, advanced life support (ALS) is usually dispatched for suspected CVA.

• ***Assessing the Scene:*** It is important to extract as much information from the scene as possible, especially in the setting where the patient is unable to communicate with you and no witnesses to the event are present. Time of onset of symptoms is very important in determining if a patient is a candidate for some new therapies for CVA. *(Figure 5)* Therefore, assess the scene for clues as to when the event may have occurred.

• ***Initial Assessment:*** At times, the general impression of the patient may clearly suggest a stroke: A patient who is not moving his left arm and

Figure 5

TIME IS BRAIN!
Stroke Treatment Evolves

Ischemic CVA: The treatment of stroke has evolved dramatically over the last six years. Prior to the advent of new techniques, the treatment of stroke was supportive in-hospital care, aggressive rehabilitation, and initiating anticoagulant or antiplatelet treatment in order to prevent a second stroke.

Over time, however, clinical studies demonstrated that by removing atherosclerotic plaques from the carotid arteries in the neck (a procedure called "carotid endarterectomy"), the risk of stroke was substantially lowered. However, there was still no effective way of treating patients when the CVA actually occurred, or during its acute phase.

In the mid-90's, several studies evaluated the use of intravenous drugs – known as "clot-busters" or fibrinolytics – that actively dissolve clots and demonstrated a significant improvement in the patient's recovery. However, the window of opportunity was very narrow. Patients treated within three hours of the onset of CVA symptoms made better recoveries with fewer complications (intracranial hemorrhage) when compared to patients treated more than three hours after symptom onset. Based on this strong clinical data, the American Heart Association recommended the use of intravenous fibrinolytic therapy in selected patients for ischemic CVA within three hours of symptom onset. This is why "Time is brain!"

Further studies assessing whether delivering the drug directly to the clot within six hours of onset, or mechanically disrupting the clot, also suggest a benefit. This technique however, is more invasive, but fewer drugs are needed and it may reduce the rate of intracranial hemorrhage.

Where once there was no option in the active treatment of an acute CVA, now patients have the potential to undergo these "rescue" techniques so as to help restore blood flow to the brain. When patients arrive at the emergency department, a rapid evaluation by the stroke team is performed and a CT scan is obtained which reveals bleeds and infarction in the brain. If there is no evidence of infarction or hemorrhage, and provided the patient meets other important criteria, intravenous fibrinolytics can be initiated.

Hemorrhagic CVA: The causes for hemorrhagic stroke vary. The effects of chronic hypertension may cause a bleed which may necessitate surgery.

Another source of hemorrhagic CVA is an aneurysm in the subarachnoid space caused by the rupture of a weakened wall of an artery supplying the brain. This type of bleed requires "surgical clipping" whereby the surgeon dissects through the planes of the subarachnoid space and places a metal clip across the neck of the aneurysm to prevent further blood from entering the subarachnoid space.

In addition, in the early 1990's, a technique was developed whereby aneurysms can be treated by introducing platinum coils intraarterially, thereby blocking flow into the aneurysm and preventing rerupture. This technique, called "endovascular coiling" has become an important alternative to aneurysm treatment, and is now the preferred treatment for certain types of aneurysms.

Patients with possible hemorrhagic strokes should preferably be transported to medical facilities that can perform both types of surgery, if the patient is stable. Such patients are usually treated within 24 hours of the event.

leg, and is persistently looking to the right, must be quickly triaged as a strong candidate for CVA. Numbness, weakness or paralysis on one side of the body are all signs of stroke. So is a persistent gaze to one side or the other. After assessing the mental status, obtain the chief complaint, if possible. Ask the patient what is wrong. Pay particular attention to his speech pattern to determine if his words are slurred or incomprehensible. Does what he says make sense?

While assessing the A-B-Cs, pay attention to possible airway obstruction such as dentures, blood or saliva. If there are snoring or gurgling respirations, be prepared to suction. When assessing for breathing, remember to put a nonrebreather mask with 100% oxygen on any patient with a depressed level of responsiveness. Be prepared to use positive pressure ventilations (bag valve mask with oxygen) if the patient is breathing inadequately.

After assessing the A-B-Cs, quickly evaluate the conscious patient for CVA by performing the Cincinnati Prehospital Stroke Scale. *(Figure 6)* This is a rapid method which within seconds assesses the patient's facial muscles, arm movement and speech function.

- Ask the patient to smile. Is there any degree of facial asymmetry or lopsidedness? This is an abnormal finding.
- Ask the patient to close his eyes and hold out his arms. Again, if one arm drifts down or does not move equally, the finding is abnormal.
- Ask the patient to repeat: "You can't teach an old dog new tricks." Abnormal findings include slurring of words (dysarthria), saying inappropriate words (dysphasia), or not speaking at all (aphasia).

Figure 6

Cincinnati Prehospital Stroke Scale

Try to elicit one of the following signs. Abnormality in any one is strongly suggestive of stroke.

- **Facial Droop:** Have patient show teeth or smile:
  Normal: both sides of face move equally well
  Abnormal: one side of face does not move as well as the other side
- **Arm Drift:** Have patient close eyes and hold both arms straight out for 10 seconds:
  Normal: both arms move the same or both arms do not move at all
  Abnormal: one arm does not move or one arm drifts down
- **Abnormal Speech:** Have the patient repeat: "You can't teach an old dog new tricks."
  Normal: patient uses correct words with no slurring
  Abnormal: patient slurs words, uses the wrong words or is unable to speak

Any abnormal findings on the Cincinnati Prehospital Stroke Scale should make you aware that the patient is probably having (or has had) a CVA and should be treated as a high priority patient. Definitive treatment critically depends upon arriving at the hospital within a short time of onset. En route you can complete the focused history and detailed physical exam.

"The presence of headache or seizure activity is usually associated with hemorrhagic CVA."

- ***SAMPLE History:*** When obtaining a complete SAMPLE history, you need to identify certain important parameters either from the patient, witnesses or family. As previously stated, ***it is vital to note the time signs and symptoms began.*** *(Figure 7)* If there were no witnesses at the time of onset, it is important to find out who the last person was to see the patient without symptoms and estimate the time that the event occurred. This should be carefully documented as it could determine whether a patient can be treated with current intravenous or intraarterial therapies.

It is also important to note if the patient had headaches or seizures associated with the onset of symptoms. The presence of headache or seizure activity is usually associated with hemorrhagic CVA.

A list of the patient's medications is very important in this situation as it can provide further clues to assist in the diagnosis. If the patient is on anticoagulants (e.g., Coumadin® or Lovenox®) or antiplatelets (e.g., aspirin, Ecotrin®, Plavix®, Ticlid®), you must find out why and how long the patient has taken these medications. Though these medications have many indications for use, including TIAs, they may also result in intracranial hemorrhage. If the patient is taking such medications, determine if there has been recent trauma, since minor head trauma while taking these medications can result in potentially life-threatening intracranial hemorrhages.

Obtaining a past medical history should include whether the patient has a history of hypertension, prior CVA or TIA, diabetes, or coronary artery disease.

- ***Physical Examination:*** Careful assessment of vital signs is important in helping a physician to diagnose the problem. For instance, a patient with left-sided weakness and a blood pressure of 220/100 may have sustained a

Figure 7

Signs & Symptoms of Stroke

- altered mental status
- aphasia
- confusion/agitation
- dysarthria
- gait disturbance/uncoordinated movement
- headache
- hemiparesis (one sided-weakness)
- hemiplegia (one-sided paralysis)
- hypertension
- lethargy/stupor/coma
- seizures
- uneven pupils
- vision disturbances

hypertensive intracerebral hemorrhage and not an ischemic CVA. EMTs should be aware that blood pressure will sometimes be very high. (When taking a blood pressure of a possible stroke patient, pump-up the cuff to at least 200 mmHg before auscultating a pressure.) The pulse will be bounding on palpation. Pupils may be unequal or unreactive.

A focused physical examination was already initiated with the use of the Cincinnati Prehospital Stroke Scale. The presence or absence of a gaze preference is important to clinicians at the receiving hospital.

"His respirations are 18 per minute and unlabored but because his LOC is altered, you immediately administer 100% oxygen via nonrebreather."

Stoke patients may not be able to express themselves and/or may not understand what is happening around them, or what you are saying or asking them to do. Nonetheless, they may be quite aware that something is dreadfully wrong. At all times you must reassure the patient and keep him as calm as possible. Always explain what actions are being taken to help him.

- ***Transport:*** Once you have assessed the patient and suspect he might be having some type of CVA, transport him immediately. Conscious patients should be placed on the litter in a position of comfort. Unconscious, unintubated (non-trauma) patients need to be transported with an oropharyngeal or nasopharyngeal airway in place and the head elevated 20-30° to protect against aspiration. Although ALS should be dispatched, do not delay transport waiting on scene. In addition, it is important to alert the receiving hospital and provide pertinent information so that the necessary personnel can be ready to quickly evaluate the patient and initiate treatment, if necessary.

Case Scenario Continued...

Your 65-year old male patient is unable to speak but his airway is clear. His respirations are 18 per minute and unlabored but because his level of consciousness is altered, you immediately administer 100% oxygen via nonrebreather. His pulse is 80 and regular. His skin is warm, dry and pale. His blood pressure is 170/95. You note no obvious bleeding or trauma. You and your partner immediately determine that he is a priority patient owing to his present altered level of consciousness. Your local MICU has been dispatched and is en route.

You look at your watch: It is now 11:30 a.m. Taking another minute on scene, you continue your focused history and physical exam. Because you suspect a stroke, you assess the patient using the Cincinnati Prehospital Stroke Scale. When asked to hold both arms out straight with his eyes closed, the patient is unable to lift his right arm. He is, however, able to follow commands with his left hand. He is unable to repeat any phrases you say. When asked to smile, the left side of his face moves appropriately, but the right side droops.

The brother states the patient has a history of coronary artery disease and took Coumadin® "for his heart" but stopped taking it five days ago when the presciption expired. He denies his brother had any recent head trauma.

You and your partner quickly transfer the patient to the litter with his head elevated in the semi-Fowler's position. You continue oxygen therapy at 15 lpm via nonrebreather. You load the man into the ambulance, all the time reassuring him that you are taking him to a hospital for treatment. Finally dispatch informs you that the medics are stuck in traffic and you elect to transport immediately. The brother chooses a hospital that will provide the patient an option of various stroke therapies. En route, you radio the emergency department with your assessment findings. You determine an onset of symptoms approximately 35 minutes ago. Transport is rapid, but safe, and the patient is quickly transferred to the emergency department for further evaluation and stroke management.

"Conscious patients should be placed on the litter in a position of comfort."

Diagnosis: The patient sustained an acute ischemic infarction of the left cortical hemisphere. This can be concluded based on the presence of the right-sided weakness and aphasia (difficulty speaking), both functions usually found in the left hemisphere. In addition, the gaze preference to the left (i.e. away from the weakness) further confirms this diagnosis.

A subsequent CT scan reveals a blockage of the internal carotid artery with no bleeding. Therefore the patient is a prime candidate for intraarterial fibrinolytics, or "clot-busters."

The EMS crew is recognized for its swift recognition, competent treatment and undelayed transport of the patient to a stroke facility.

Charles J. Prestigiacomo, MD *is Assistant Professor of Cerebrovascular/Endovascular Surgery in the Departments of Neurological Surgery and Radiology, Neurological Institute of New Jersey, New Jersey Medical School, University of Medicine and Dentistry of New Jersey. He is a former volunteer EMT with the Georgetown Emergency Response Medical Service (aka GERMS).*