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Stroke Supplement Reviews State-of-the-Art in Minimally Invasive Treatment and Management of Ischemic Stroke

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Fairfax, Virginia (January 19, 2004) – The field of interventional radiology is making great advances in the treatment of stroke, our nation's number three killer. In the last decade, rapid advances in imaging technology, diagnosis, medical therapy, and interventional treatment have had a significant impact on this disease. To ensure that the medical community is up-to-date on the range of advances occurring in stroke, the Society of Interventional Radiology (SIR) and the American Society of Interventional and Therapeutic Neuroradiology (ASITN) have collaborated to develop a comprehensive stroke supplement to the January *Journal of Vascular and Interventional Radiology (JVIR)*. Members of both Societies include interventional radiologists and interventional neuroradiologists, physicians who specialize in minimally invasive neurological procedures using imaging guidance to treat stroke. This special supplement includes nationally recognized experts in the field of stroke and discusses the state-of-the-art in diagnosis, treatment and management of ischemic stroke, a review of the clinical trials to date, current and future directions of treatments, devices in clinical trials or in use, and practical approaches for developing a "stroke center of excellence."

The supplement addresses ischemic stroke, the most common type of stroke characterized by a lack of blood flow and oxygen to the brain, usually caused by a blood clot or clogged arteries from atherosclerosis. Interventional radiologists and interventional neuroradiologists utilize imaging to diagnose stroke and to guide a catheter to the tiny arteries in the brain and place the clot-busting drug directly within the clot or break up the clot mechanically. This treatment, known as intra-arterial thrombolysis, restores blood flow to the brain and gives a treatment option to stroke victims who are past the three-hour window for standard intravenous (IV) treatment, currently the majority of patients. They also perform angioplasty and stenting of blocked carotid arteries, to improve blood flow and correct the underlying condition if this was the cause of the stroke, or to prevent stroke in high-risk patients.

In this supplement, experts discuss the "state-of-the-art" approaches to the pathophysiology of acute ischemic stroke, the hemodynamic and molecular basis of carotid and cerebral atherosclerosis, and the monitoring and anesthetic considerations of the acute stroke patient. Critical care assessment, imaging of the cerebral blood flow, computed tomography (CT), magnetic resonance (MR) imaging, and cerebral angiography assessment of the stroke patient are reviewed.

The supplement also provides an overview of all the past and current thrombolytic trials in acute ischemic stroke, including the NIH t-PA trial (tissue plasminogen activator), which was the basis for the FDA approval of intravenous t-PA as the standard treatment within the

three-hour time window. It also reviews all of the current intra-arterial thrombolytic stroke trials, as well combination drug therapies now under investigation.

Current and future directions of ischemic stroke treatments are discussed including novel drug therapies and mechanical devices for cerebral clot removal including snare devices, laser devices and suction-thrombectomy devices. Most of these devices are in phase I or II trials, or are approved for other uses. Practical approaches for developing a “stroke center of excellence” to coordinate stroke treatment within local hospitals is also discussed. Visit www.jvir.org to view the stroke supplement.

About Stroke and Interventional Radiology

Stroke occurs when a blood vessel carrying oxygen and nutrients to the brain is blocked by a blood clot or bursts, causing the brain to starve. If deprived of oxygen for even a short period of time, the brain nerve cells will start to die. Blood clots that block the artery are ischemic (is-KEM-ik) strokes and the most common type, causing between 70-80 percent of all strokes. When a blood vessel ruptures, it causes a bleeding or hemorrhagic (hem-o-RAJ-ik) stroke. Once the brain cells die from a lack of oxygen, the part of the body that section of the brain controls is affected through paralysis, loss of language, loss of motor skills, or decreased vision.

Treatment

Interventional radiologists are a critical part of the stroke team in hospitals. First it must be determined which kind of a stroke the patient has had so the proper treatment can be given. The interventional radiologist interprets the non-contrast CT (computed tomography) imaging brain scan to determine if acute stroke patients are candidates for clot-busting drugs. CT is quick, inexpensive, and readily available. If the stroke is due to a blood clot, a clot-busting (lytic) drug, can be given intravenously, if the patient is treated within three hours of the onset of symptoms. Currently, most patients arrive at the hospital too late, or make it through the emergency room, hospital processing, and differential diagnosis too late to receive this standard treatment.

However, interventional radiologists that specialize in minimally invasive neurological procedures are trained to thread a catheter to the tiny arteries in the brain and place the clot-busting drug directly within the clot or to break up the clot mechanically. When given locally this way, lytic drugs can be administered up to six hours after the onset of stroke symptoms. In many cases, the ambulance drivers will take a stroke victim past the three-hour window directly to the interventional radiology suite for assessment for this direct thrombolytic therapy. Often a significantly disabled stroke patient who receives this treatment can return to normal life with minimal or no aftereffects from the stroke.

The interventional radiologist will also assess what caused the clot, such as a clogged carotid or other artery, and can correct the underlying problem to prevent future strokes from occurring. Unfortunately, many hospitals in this country do not have stroke teams that can rapidly assess patients and provide treatment within the three-hour window. Interventional radiologists are actively involved in creating more stroke teams across the

country. Stroke teams generally consist of emergency room physicians, neurologists, interventional neuroradiologists and interventional radiologists.

Prevention – Treating Carotid Artery Disease

As vascular experts, interventional radiologists treat atherosclerosis, “hardening of the arteries,” throughout the body. In some patients, atherosclerosis, specifically in the carotid artery in the neck, can lead to ischemic stroke. Plaque in the carotid artery may result in a stroke by either decreasing blood flow to the brain or by breaking loose and floating into a smaller vessel, depriving a portion of the brain of blood flow. In patients at high risk of having a stroke, the narrowed section of artery may be re-opened by an interventional radiologist through angioplasty and reinforced with a stent, thereby preventing the stroke from occurring. Vascular stents are typically made of woven, laser-cut or welded metal that permits the device to be compressed onto a catheter and delivered directly into the hardened artery. In addition to diagnosing and treating those at risk for stroke, interventional radiologists use their expertise in imaging, angioplasty and stenting to treat those having an acute stroke.

STROKE FACTS

Prevalence

- It is the nations #3 killer behind heart disease (#1) and cancer (#2)
- Every 45 seconds someone in the U.S. has a stroke
- Every 3 minutes someone dies from a stroke
- There are 4.4 million stroke survivors with disability

Stroke Symptoms

- 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

Risk Factors

- Obesity, high blood pressure and high cholesterol all increase the risk of stroke. These risk factors can be greatly reduced with healthy lifestyles or medication.
- High blood pressure puts pressure on the arteries, making them more susceptible to rupture and more prone to clot formation, which can block the artery.
- High cholesterol can lead to blockage in the carotid artery that takes blood from the neck to the brain. A piece of this plaque can break off and travel to the brain, causing a stroke.
- Obesity can cause high blood pressure and high cholesterol.

- Untreated atrial fibrillation causes the heart's upper chamber to beat irregularly, which allows the blood to clot. If a clot breaks off and enters the blood stream to the brain, a stroke will occur.
- Sickle cell anemia makes red blood cells less able to carry blood to the body's tissues and organs, as well as stick to the walls of the blood vessels that can block arteries to the brain causing a stroke.
- Family history
- Smoking

Facts

- Stroke is a medical emergency with a narrow time frame for treatment – people should call 911 immediately
- Nearly one-third of all stroke victims die before emergency medical personnel arrive or within 24 hours
- 4.4 million Americans live with disabilities caused by a stroke
- 600,000 Americans will have a new or recurrent ischemic stroke each year – of them, 160,000 will die
- Strokes may be treated intravenously with a clot-busting drug, if it is given within three hours of the onset of symptoms.
- Persons who have a transient ischemic attack (TIA), also known as a mini-stroke, are likely to have another one. Transient ischemic attacks cause brief stroke symptoms that go away. People often ignore these symptoms, but they are an early warning sign and 35 percent of those who experience a TIA will have full-blown stroke, if left untreated.
- Stroke is not just an older person's disease – 28 percent of strokes occur in people under age 65
- More men than women have strokes – although more women die from them
- African Americans are at much higher risk. In part, this is because African Americans are at increased risk for obesity, high blood pressure and diabetes, which increase the risk of stroke.
- May is "Stroke Awareness" Month

About the Society of Interventional Radiology

Interventional radiology is the medical specialty devoted to advancing patient care through the innovative integration of clinical and imaging-based diagnosis and minimally invasive therapy. Interventional radiologists are physicians who specialize in minimally invasive, targeted treatments performed using imaging for guidance. Interventional radiology procedures are a major advance in medicine that do not require large incisions – only a nick in the skin about the size of a pencil tip – and offer less risk, less pain and shorter recovery times compared to open surgery. More information can be found at www.SIRweb.org.

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