Stroke Imaging

A stroke is a sudden event that leads to change or loss of brain function. When a stroke is caused by decreased blood flow to the brain, it is an ischemic stroke. When the cause is bleeding into the brain, it is a hemorrhagic stroke. When the bleeding is on the surface of the brain, it is a subarachnoid hemorrhage. The September 21, 2011, issue of JAMA includes an article on depression and stroke.

TESTS TO DIAGNOSE STROKE

It is important to diagnose the specific type of stroke because each may require a different treatment. There are several tests that can be used to diagnose the type of stroke:

- A computed tomography (CT) scan uses x-rays to produce a 2-dimensional or 3-dimensional picture of the brain. A noncontrast CT scan (without intravenous injection of fluid) is very fast (less than 1 minute) and can accurately detect blood, so it is used to look for hemorrhagic stroke or subarachnoid hemorrhage. A computed tomography angiography (CTA) scan uses intravenous contrast fluid to visualize the arteries in the brain; it can help diagnose ischemic stroke by determining its cause (such as a clot in an artery) and can provide guidance for thrombolytic treatment (dissolving a clot).

- Magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) use the response of water molecules to powerful magnets to produce a detailed picture of the brain and its arteries. Although equally good as CT at finding blood, MRI is more accurate in the diagnosis of acute ischemic stroke and its cause. MRI and MRA can assess brain damage and its reversibility as well as the risk of complications from the stroke. MRI can also provide guidance for thrombolytic treatment but is not suitable for persons with cardiac pacemakers or certain other metal or electronic devices implanted in their bodies.

- Ultrasonography uses high-frequency sound waves above the hearing threshold. Carotid ultrasound examines the arteries in the neck that provide blood to the brain. It can show blood clots, atherosclerotic plaques (blockages), and other problems that can cause ischemic stroke. Transcranial Doppler measures the direction and speed of blood flow in arteries in the brain. It can be used to find the position of an embolus (a clot in the artery) or the narrowing of an artery. Both carotid ultrasound and transcranial Doppler are used to confirm the findings of CTA and MRA and measure the effects of thrombolytic treatment.

- Digital cerebral angiography is the most accurate test for problems with brain arteries, such as aneurysms or clots, but it requires surgical insertion of a catheter (tube) into an artery in the leg. It plays a limited role in acute stroke because it is riskier, takes a longer time, and requires more equipment and professional staff than the other imaging tests. However, digital cerebral angiography allows for a direct intravascular (from inside the artery) removal of an embolus, widening the artery with a balloon, putting in a stent (tube to keep the artery open), or injecting thrombolytic drugs to dissolve a clot. Thus, some stroke centers are using digital cerebral angiography for carefully selected patients.