See beyond invasive coronary angiography

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Abstract: Computerized tomography angiography and magnetic resonance angiography are rapidly positioning themselves as the emerging imaging technology for diagnosing coronary artery disease. [Nurs Manage 2004:35:(7):49-50]

While cardiac catheterization (coronary angiography) has long been considered the gold standard for diagnosis of coronary artery disease, newer non-invasive imaging modalities challenge its position. Computerized tomography angiography (CTA) and magnetic resonance angiography (MRA) are rapidly emerging imaging modalities that providers use to diagnose coronary artery disease.

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Diagnostic cardiac catheterization

Long endorsed by the American College of Cardiology, cardiac catheterization provides excellent imaging of the coronary anatomy and allows for evaluation of valve and ventricular function. An advantage of the procedure is that the cardiologist can obtain complete information regarding coronary anatomy, valve function, and left ventricle wall motion. Further, the technology is widespread and accessible to patients in many community hospital settings. Likewise, reimbursement is readily available from Medicare and all insurance carriers.

Some of the disadvantages include radiation exposure, use of radiographic contrast agents (to which some patients are allergic or sensitive), and the invasive technique used to access the vasculature. Because cardiac catheterization takes 45 minutes to an hour, with some additional time needed for preparation and recovery, it can be time-consuming and labor-intensive, generally requiring three staff members (scrub, monitor, and circulator) in the room during the procedure and one RN for pre/postcare.

Despite the challenge that coronary CTA and MRA present to cardiac catheterization, there will continue to be a need for the cardiac catheterization laboratory for selected diagnostic cases and for the performance of coronary interventions such as balloon angioplasty, coronary stenting, and electrophysiology studies.

CTA's advantages

CTA has evolved over the last 3 to 5 years and is beginning to surpass electron-beam CT scanning for usefulness in coronary diagnostics. Conventional CT scanning in its earlier years couldn't adequately image the heart and heart structures due to motion artifact, thus limiting studies to slender patients with a regular heart rhythm and a heart rate less than 65 beats per minute. However, the advent of multislice CT scanners helped expand its utility for studying the heart, as this technology helps to reduce this motion artifact.

CTA provides advantages to both the patient and the hospital because CT scanners are readily available in most hospital settings, providing a rapid, noninvasive test that requires little patient preparation and no recovery time. This allows for quick patient throughput, increasing the volume of patients a facility can accommodate. Likewise, if the hospital's cardiac patient volume doesn't support a CT scanner dedicated solely to cardiac, clinicians can use the equipment to provide other diagnostics, such as thoracic and abdominal. Using the equipment for multiple reasons helps to offset the hospital's $1.2 to $1.5 million investment in the equipment.

CTA doesn't require the advanced hemo-

dynamic monitoring that's used in cardiac catheterization, and most patients don't require sedation. Labor costs related to CT scanning are less, as only one radiology technician (specifically trained in cardiac CT) is required to manage the equipment and perform the scan. For higher acuity patients, a nurse may need to remain with the patient, but the examination is of short duration (as little as 15 minutes) with no recovery time, thus minimizing nursing time.

Most likely the greatest advantage of CTA is its negative predictive value: The patient who presents with cardiac symptoms can receive the CTA, and if results are negative there's great certainty that the symptoms aren't of cardiac etiology, eliminating a costly invasive workup. Those with positive results would then be referred for cardiac angiography, intervention, or surgery.

While all of the information presented makes CTA appear to be an obvious choice for cardiac diagnostics, there are other issues to be considered, such as the debate over which physician specialty will interpret the cardiac study. Another concern is patient exposure to radiation; in some instances it's higher than that of a cardiac catheterization procedure. Researchers are developing newer techniques to help reduce exposure. Further, CTA includes the injection of a contrast media, which presents the potential for allergic reactions or sensitivities in patients.

Finally, for general acceptance of CTA as the primary diagnostic tool for coronary artery disease, several elements must exist, namely, published data to establish the credibility of the modality, agreement among the medical disciplines regarding use, interpretation and referrals, and a reimbursement fee schedule that will make the examination financially realistic for the facility.

The benefits of MRA

The second noninvasive modality, MRA is capable of providing two- and three-dimensional images of the blood vessels and other parts of the body by using timed pulses or radio waves emitted within the magnet interacting with the hydrogen atoms in the patient's body. Gadolinium, the contrast agent used with MRA, vividly illuminates the vascular system.

Currently, MRA is a primary diagnostic tool for peripheral vascular diseases and has reduced the need for invasive peripheral angiography. It also demonstrates superiority to echo and thallium scans for cardiac viability, left-ventricular function, and perfusion. These additional applications will give it an advantage over conventional cardiac angiograms because the practitioner will have the ability to obtain a comprehensive cardiac evaluation in one noninvasive testing session. Cardiac MRA is a reimbursable procedure for function and structure; it's still considered experimental for coronary angiography.

The procedure requires one radiology technician trained in magnetic resonance with additional training in cardiac imaging. A nurse may screen the patient, monitor him or her during the procedure, and administer contrast. A radiologist with additional cardiovascular magnetic resonance training sets up the imaging protocols and interprets the images.

Certain limitations to magnetic resonance have slowed the progression of this diagnostic modality for coronary anatomy. The presence of implanted devices (pacemakers, stents, and surgical clips) interferes with the imaging quality over the area. The beating heart and respirations also cause distortions. Visualization of distal coronary arteries isn't as clear as conventional angiography, due to their small size. Patients with certain forms of metal in their bodies won't be able to have an MRA because the magnet may move or heat up the metal. Additionally, the procedure requires 40 minutes to 1 hour per patient to complete a session, limiting patient volumes for a day. A magnetic resonance imaging unit is costly at $2 to $3 million, restricting many health care facilities from purchasing additional units or dedicating a unit to only cardiac patients.

To overcome these limitations, research has focused on procedural changes, contrast agents, magnet power, and new anatomical coils. Experts in the field indicate that the expected transition to this modality will likely occur around 2007. NM

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