

Study supports value of advanced CT scans to check for clogged arteries

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In a development that researchers say is likely to quell concerns about the value of costly computed tomography (CT) scans to diagnose coronary artery blockages, an international team led by researchers at Johns Hopkins reports solid evidence that the newer, more powerful 64-CT scans can easily and correctly identify people with major blood vessel disease and is nearly as accurate as invasive coronary angiography.

Reporting in the *New England Journal of Medicine* online Nov. 26, researchers at nine medical centers say the faster, 64-CT scans were 93 percent as precise as invasive, conventional imaging, better known as cardiac catheterization and virtually 100 percent accurate in detecting people with at least one artery dangerously clogged by the buildup of cholesterol and plaque.

Comparison of CT and catheterization results also showed for the first time that they were equally useful in patients with heart attack symptoms, such as chest pain and shortness of breath, for predicting the need for cardiac bypass surgery or angioplasty to restore their blood flow. The CT scans accurately predicted 84 percent of invasive procedures performed, and catheterization predicted 82 percent. More than a quarter-million Americans undergo coronary bypass surgery each year, and another 1.2 million people undergo angioplasty.

Announcement of the latest findings is timed to coincide with the annual meeting of the Radiological Society of North America being held this week in Chicago, after initial results were reported last year at an annual

meeting of cardiologists.

Senior study investigator and Johns Hopkins cardiologist João Lima, M.D., says 64-CT scans are not a substitute for catheterization, but the scans, which take between five and 10 seconds to perform, are "an alternative diagnostic tool" physicians can use to "rule in or rule out" coronary blockages when other, more indirect tests for reduced blood flow, such as cardiac stress testing, are unclear or unsafe for a particular patient.

Cardiac catheterization, which also checks the function of heart valves and muscle, takes longer, between 30 minutes and 45 minutes to perform, and requires more than an hour for recovery. Potential complications from the invasive procedure include infection, heart attack and stroke; however, these events are rare.

Lima, a professor of medicine and radiology at The Johns Hopkins University School of Medicine and its Heart and Vascular Institute, says the 64-CT scans, first introduced to the United States and tested at Hopkins in 2005, could reduce as much as one-fifth of the 1.3 million cardiac catheterizations performed each year nationwide that show no blockages.

CT scans for heart disease, although not yet covered by many private health plans, could also serve as an alternative to cardiac stress testing, which generally cannot safely be performed on the weak and elderly because the test uses hard exercise to speed up blood flow and measure heart function.

Lima says previous research had shown that older, less-powerful 16-CT scans were only a quarter to a third as precise as the newer tests, "fuelling much heated debate as to whether or not use of the technology could ever be justified.

"But our latest findings weigh heavily in favor of the more advanced 64-CT scans," he adds, citing additional study results showing that the scans could pinpoint with 91 percent certainty the precise artery blocked. At four times the strength of the more widely available 16-CT scanner, Lima says the 64-CT scans "provided our first real view of the whole picture of what is going on in the artery, precisely where the blockage is, even if it is only a partially obstructed."

Lead study investigator and interventional cardiologist Julie Miller, M.D., says the advanced scanners are so good that physicians can for the first time measure blockages in blood vessels as small as 1.5 millimeters in diameter. Older 16-CT scanners, she says, are best suited for looking inside bigger arteries, those greater in diameter than 2 millimeters.

Each of the 291 men and women, all over the age of 40, selected to participate in the new study were already scheduled to have cardiac catheterization to check for blocked arteries. Every participant had a 64-CT scan prior to catheterization and was then monitored through regular check-ups, starting in 2005 and set to continue through 2009, to identify who developed or did not develop any heart problems, who required subsequent bypass surgery or angioplasty, and who did not need any procedure.

Researchers found that 90 percent of the patients without any major blockages were correctly diagnosed with 64-CT scans.

The disadvantages of using 64-CT, Miller says, are radiation exposure and the rare potential in some people to have an allergic reaction or to develop kidney problems resulting from the contrast dyes injected into the body to enhance the images.

"CT technology has come a long way in the last decade," says Miller, the leader of angiographic research and an assistant professor at Hopkins.

She cites improvements that cut the average amount of radiation exposure and time required for a CT scan to less than 20 millisieverts with 16-CT scanners (which took about 12 seconds to perform), on average, to less than 15 millisieverts with 64-CT devices (at close to 6 seconds), and less than 6 millisieverts with the 320-CT (at less than a second.)

She says the cost of the newer CT scans – approximately \$700 – compares favorably with that of current nuclear stress testing for reduced blood flow, in which radioactive dyes are used to detect arterial clogs, at nearly \$1,000.

In cardiac catheterization, a thin tube is threaded into a blood vessel in the groin area to the heart's arteries, where a dye is released to produce a clear X-ray image of the beating heart and its arterial blood supply. The procedure usually costs in excess of \$1,500.

In CT imaging, computer-driven machinery passes X-rays through the body, producing digitized signals from multiple angles that are detected and reconstructed for a precise picture.

Miller points out that early detection of blockages is critical to preempting a heart attack, allowing time for drug therapy, angioplasty or heart bypass surgery to be used to keep arteries open. In coronary artery disease, hardened bits of fat and dead tissue, called plaque, build up along the inside wall of the blood vessels, impeding the body's natural blood flow and leaving the narrowed opening more vulnerable to formation of blood clots.

Lima says the team's next steps are head-to-head comparison studies using either CT or nuclear stress testing, which gauges reduced blood flow in parts of the heart to reveal clogging arteries. Included in the next analysis will be scans performed using an even more advanced scanner,

the 320-CT. The latest imaging device was also tested at Johns Hopkins in 2006, and it can obtain images in less than a second, with significant reductions in radiation exposure.

According to researchers, nearly 5,000 64-CT scanners are installed worldwide, but not all of the centers are equipped to perform and read cardiac CTs. Miller notes that special training and certification are required by technicians and physicians to accurately perform, read and interpret the scanned images. The American Heart Association and the American College of Cardiology Foundation in 2005 jointly established training guidelines.

Source: Johns Hopkins Medical Institutions

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