

Piedmont Triad Edition

M.D. NEWS

A BUSINESS AND LIFESTYLE MAGAZINE FOR PHYSICIANS



André J. Duerinckx, M.D., Ph.D

Director of Cardiac CT, MRI and Nuclear Imaging
Forsyth Radiological Associates
Offers State-of-the-Art Cardiac CT and MR Imaging

Improved Detection of Early Cardiac Disease

Forsyth Radiological Associates Offers 64-Slice Coronary CT Angiography

Noninvasive coronary imaging using spiral Computed Tomography (CT) has emerged as a diagnostic tool that permits assessment of coronary lumen and coronary plaques. Advances in CT technology have led to the development in 2004 of a CT scanner capable of acquiring

64 slices of image data in 330 milliseconds, allowing incredible three-dimensional images of the heart and the coronary vessels. Forsyth Radiological Associates (FRA) was the first radiology group in North Carolina to purchase and install such a super fast cardiac-gated CT

scanner in October of 2004. We at FRA think that reliable noninvasive coronary imaging will help revolutionize the current diagnosis and management of asymptomatic high-risk individuals and symptomatic patients with known or unknown coronary artery disease. We hope that this article will serve as a concise quick reference for the understanding of the indications for coronary CT angiography.

We would like to illustrate the power of this new technology with a testimonial. A local reporter who helped with this article is a 60-year-old male with no family history of heart disease, a nonsmoker and regular walker. He had undergone a recent physical exam and lab tests. All results (except for the admonition to lose some weight) scored good to excellent. This reporter experienced first-hand a high-resolution CT of the heart at Greystone Imaging Center operated by FRA doctors. The study was performed using the state-of-the-art 64-slice Somatom Sensation Cardiac CT scanner manufactured by Siemens Medical Solutions, Inc. (Germany). Dr. Duerinckx supervised and interpreted the CT examination. The closing paragraph of Dr. Duerinckx's analysis jolted the reporter, and also captured the attention of his primary care physician: Some of the coronary arteries were severely diseased. Dr. Duerinckx diagnosed significant diffuse disease in the proximal and mid-left anterior descending (LAD) coronary artery, and in portions of the circumflex coronary artery, two main vessels supplying blood to the heart muscle. The coronary calcium score was 236, which is relatively high in an asymptomatic unsuspecting patient. The

Dr. Duerinckx preparing a patient for a Cardiac CTA at Greystone Imaging Center.



“coronary calcium score” is an indirect calculation of the accumulation of disease in the coronary blood vessels using techniques pioneered by the famous Dr. Agatston from South Beach in Florida. These results were discussed with the patient, and it was recommended that the patient see his primary care provider and possibly a cardiologist for further evaluation.

THE NONINVASIVE CARDIAC IMAGING TEAM AT FRA AND ITS LEADER, DR. ANDRE J. DUERINCKX, M.D., PH.D.

Dr Duerinckx joined FRA as the director of Cardiac CT, MR and Nuclear Imaging on November 1, 2004. His goal is to build a first-class Noninvasive Cardiac Imaging Program in the Triad region, integrating the best of CT and Magnetic Resonance (MR) imaging techniques with existing nuclear cardiology and other cardiac imaging services. Both FRA and Forsyth Medical Center have committed to a large investment

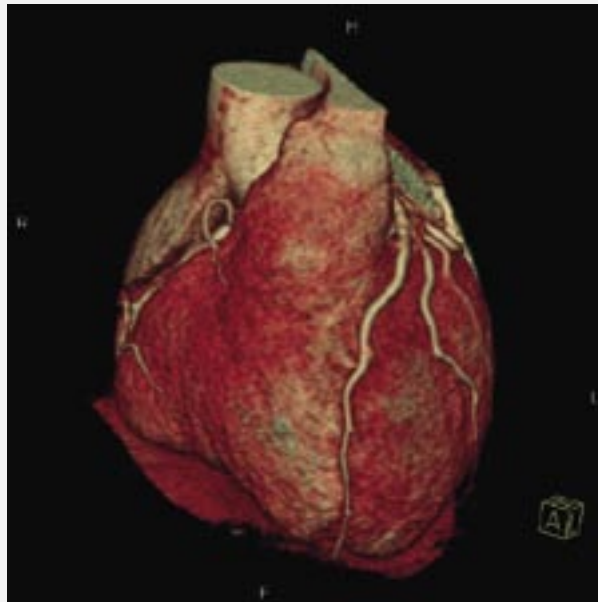
in equipment, infrastructure and people to provide this new level of clinical care and imaging services. The 64-slice Somatom Sensation Cardiac CT scanner from Siemens was the first piece of expensive imaging equipment purchased by FRA to provide a new class of non-invasive cardiac and coronary CT imaging services. Forsyth Medical Center (FMC) and Novant Health have purchased three state-of-the-art cardiac capable 1.5 Tesla MRI scanners (also from Siemens) to provide the MRI portion of the services. Dr Duerinckx is in the process of training other physicians and technologists at FRA and in the community to build a “Cardiac Imaging Team” capable of delivering these new cardiac imaging services.

Dr. Duerinckx is originally from Belgium (Europe) and holds both a Ph.D. in electrical engineering from Stanford University and an M.D. from the University of Miami School of Medicine. He has practiced from coast-to-coast. Dr Duerinckx is a former professor and vice-chairman of Radiology and professor of Medicine at The University of

Potential Indications for Coronary CT Angiography

- Evaluation of chest pain in patients with atypical chest pain and an equivocal stress test;
- Evaluation of coronary anomalies;
- Early detection of atherosclerosis in high-risk patients;
- Evaluation of coronary atherosclerosis in asymptomatic patients with known coronary artery disease;
- Coronary risk evaluation in patients undergoing major noncardiac surgery;
- Evaluation of chest pain in the Emergency Department (future);
- Evaluation of thrombolytic therapy in ST-segment elevation acute myocardial infarction;
- Evaluation of post-bypass surgery patients;
- Evaluation of in-stent restenosis;
- Evaluation of lifestyle, dietary or pharmacological interventions on progression/regression of coronary atherosclerosis.

For more information, we refer the reader to a textbook titled: *Computed Tomography of the Coronary Arteries*, edited by Pim de Feyter and Gabriel Krestin, published by Taylor & Francis, a Martin Dunitz Book (2005), 209 pages. To order this book in the U.S.A., contact CRC Press I LLC at 1-800-272 7737.



Three-dimensional image of the heart showing the major blood vessels and the cardiac chambers with portions of the coronary arteries visualized.



Three-dimensional image of the coronary arteries after elimination of the right ventricle, pulmonary outflow tract, left atrial appendage and pulmonary veins.

Texas Southwestern Medical Center. He is on the board of directors of The North American Society for Cardiac Imaging (NASCI; www.nasci.org), where he was president from November of 1999 to October of 2001. He is a member of the interim board of directors of the new Society for Cardiovascular Computed Tomography (SCVCT; www.scvct.com). He is editor-in-chief of *The International Journal of Cardiac Imaging*, and was associate editor of the *Journal of Magnetic Resonance Imaging*. He has authored and coauthored more than 130 scientific publications and four medical textbooks on cardiac imaging.

THE EVOLUTION OF CORONARY CT ANGIOGRAPHY TECHNOLOGY

Sixty-four slice CT Angiography allows a look at the coronary arteries around the heart without performing an invasive procedure. There are numerous advantages to the 64-slice CT over other CT technology now widely available. Older single slice spiral CT scanners acquire only one slice per second. The 16-slice CT scanners, which acquire 16 slices in 400 to 500 milliseconds have been around since 2002, and have been successfully used to perform the first reliable noninvasive coronary CT angiograms, but are not capable of doing so in all patients. The newer 64-slice CT scanners became available in the summer of 2004. The 64-slice CT provides better spatial and temporal resolution than the previous generation of 16-slice CT scanners, but most importantly, it allows diagnostic quality coronary CT Angiography studies in a much larger group of patients.

PATIENT PREPARATION PRIOR TO A CORONARY CT ANGIOGRAM AND POSSIBLE CONTRAINDICATIONS AND PROBLEMS

Patients can eat as usual and take all of their medications. We only ask that patients not drink any coffee or caffeinated drinks the

morning of or prior to the CT exam, as the images are much better at low heart rates. We prefer to see heart rates as low as 55 beats per minute (bpm), and will not guarantee good image quality if the heart rate is more than 70 bpm. The test does not take a long time, as described next. However, if the heart rate is elevated, we will need to give a medication, an oral beta-blocker (a single pill given via mouth with water) to slow the heart rate. This oral medication may take one to two hours to take effect. We recommend that all patients come prepared to read a book or have other activities if they have to wait for the heart rate to be slowed down with medication. The images produced by the coronary CT angiogram are often not optimal if the patient weighs over 250 pounds, or in patients with contra indications to beta-blockers (such as severe asthma or COPD) who have elevated heart rates.

HOW IS A CORONARY CT ANGIOGRAM PERFORMED?

For the patient, it is the same experience as with any clinical CT study where X-ray contrast is injected: It involves a prick in the arm, the injection of an X-ray contrast agent (also called a “dye”) and the actual CT scanning which only takes 16 – 20 seconds. The whole procedure, in and out of the scanner, takes about 15 to 20 minutes total, except if the patient presents with a high heart rate (see above). Mary Beth Kitts, RT-R, our cardiac CT technologist, and Dr. Duerinckx work closely together when performing or supervising these studies. They are in the process of training more people at FRA to perform these tests. There is virtually no danger to the patient. Routine precautions are taken as with all X-ray studies requiring the injection of a dye: We always check for allergies to X-ray contrast agents and for problems with kidney function. All images are sent to a powerful computer for post-processing and three-dimensional renderings of the heart and coronary vessels are created.

WHAT CAN A CORONARY CT ANGIOGRAM SHOW THE PHYSICIAN AND THE PATIENT?

Coronary CT angiography goes way beyond coronary calcium scoring. Calcified plaques are often only the tip of an iceberg, with significant amounts of “soft” plaque also present (but not seen during a “calcium scoring exam”). This global plaque burden can only be visualized with coronary CT angiography or invasive intravascular ultrasound (IVUS) during a coronary angiogram. It is important for the physician and patient to understand that noninvasive coronary CT angiography will not always be able to replace traditional invasive coronary X-ray angiography. The main reason for this is that the coronary CT angiogram shows a lower resolution image of the coronary arteries and a lower resolution image of plaque when compared to intravascular ultrasound (IVUS)



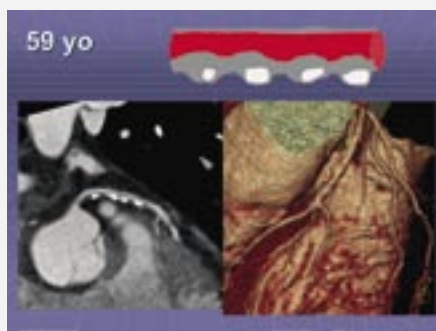
Dr. Duerinckx discusses a Cardiac CT with Mary Beth Kitts, RT-R, CT, team leader for the CT departments at FRA.



Coronary CT angiogram in a 49 year old man with two areas of soft and calcified plaque formation in the LAD. On the left is the actual CT angiogram, and on the right an artist rendition of the findings. The "red" area is the lumen of

the vessel, which is almost normal. The grey areas are the wall of the vessel, with soft plaque represented as thickening of the wall. The white areas represent the calcified areas of plaque.

Coronary CT angiogram in a 59 year old man with four areas of soft and calcified plaque formation in the LAD. On the left is the actual CT angiogram, on the right a three-dimensional representation, and on top an artist rendition of the findings. The colors on the artist rendition are described in the other figure.



studies performed during coronary angiography. On the other hand, coronary CT angiography often detects more disease than traditional X-ray angiography alone (which only shows the vessel lumen), by also providing visualization of the soft and calcific plaque and remodeling of the coronary vessel walls. For example, a coronary CT angiogram can be abnormal and show early plaque formation, but no luminal narrowing; in such a case there would often (but not always) be no need to do further imaging or testing, as most follow-up cardiac stress testing or traditional angiography would be negative.

A coronary CT angiogram might be helpful as an initial noninvasive look at the coronary vessels for many patients when their doctor is not absolutely sure that they need invasive diagnostic coronary X-Ray angiography. If the coronary CT angiogram test is normal, it could prevent the next more invasive step. The coronary CT angiogram can also be a great complement to a physical exam and a work-up for heart disease (such as screening for risk factors, and a blood pressure and cholesterol profile blood test), especially if the patient has a family history of heart disease, or other preexisting conditions, or elevated cholesterol. A noninvasive coronary CT angiogram is also excellent for cardiac surgeons to follow up patients after coronary artery bypass surgery (CABG) or for invasive cardiologists after balloon angioplasty or stent placements. Its use will probably become very common in the emergency departments of hospitals. When a patient presents with chest pain, CT angiography of the chest, if done with the proper equipment, can provide three major tests in one: It can diagnose and distinguish between pulmonary embolism, aortic dissection and coronary heart disease.

Educational Courses in Noninvasive Cardiac CT and MR Imaging

Dr Duerinckx offers international short courses for radiologists, cardiologists, MRI and CT technologists and students. (All courses will be held in Winston-Salem, NC).

For more information on, or to register for the Cardiac MR or CT courses, please contact: Judy Taylor, RT-R, course coordinator at (336) 794-4106, cell: (336) 416-5192 or e-mail: j.taylor@forsythradiology.com.

For specific questions relating to your clinical training needs, please contact Dr Duerinckx at (336) 794-4117, or via e-mail at: andrejd@earthlink.net.

CORONARY CT ANGIOGRAPHY IN ASYMPTOMATIC PATIENTS

For Dr. Duerinckx, the early discovery and visualization of coronary and cardiac problems with coronary CT angiography in asymptomatic patients can be very rewarding and helpful. Many asymptomatic patients might have a strong family history of heart disease, or borderline high blood pressure or elevated cholesterol. They might already have started therapy for their heart disease, like exercise, better diet, stopping smoking, etc. A coronary CT angiogram can encourage and motivate these patients to be more compliant and start or continue to make lifestyle changes by showing them actual three-dimensional images of their heart and blood vessels, and early disease in those vessels. It may even indicate the need to start more aggressive medical therapy using drugs like statins.

CARDIAC MRI

Besides coronary CT angiography, Dr. Duerinckx and his FRA cardiac imaging team also offer cardiac Magnetic Resonance Imaging (MRI). Cardiac MRI can accurately depict cardiac structure, function, perfusion and myocardial viability. Although it has been used extensively in cardiac imaging research, it has seen less use in clinical practice. MR evaluation of ventricular function is well established. Studies have shown that quantification of ventricular volumes with MR is accurate, and more reproducible than echocardiography. But echocardiography is used more often in clinical practice, because it is more available and less expensive.

In patients with known coronary artery disease, MR can play a critical role in the identification and differentiation of viable from nonviable myocardium. Cardiac MR imaging has made dramatic progress with delayed hyper-enhancement techniques (DE-MRI). Cardiac MRI acquires T1-weighted gradient echo images after the administration of a MR contrast agent; viable tissue is dark, whereas nonviable (fibrotic or scarred) tissue is enhanced. The amount of enhancement is inversely correlated with recovery of function following revascularization. DE-MRI can show small, subendocardial areas of infarction, which even PET scans may miss.



Dr. Duerinckx in front of the Siemens 1.5 Tesla Avanto MR Unit located at Salem MRI Center.

CONCLUSIONS

A new array of advanced state-of-the-art noninvasive coronary and cardiac imaging services are now available from Forsyth Radiological Associates. Dr Duerinckx, M.D., Ph.D. is the director of Cardiac CT, MR and Nuclear Medicine at FRA, and

is available for consultations and advice about the best choice of noninvasive cardiac testing for each individual patient. Coronary CT angiography with a 64-slice scanner is a noninvasive tool to measure total atherosclerotic plaque burden, which may become a much more important application of CT than the mere detection of significant coronary lesions. The impact of our ability for early plaque burden detection in asymptomatic populations is unknown, and remains the topic of ongoing debate, research and investigations. ■

Ordering a Coronary CT Angiogram or Cardiac MRI

Just Call the FRA schedulers at 336-794-XRAY (9729).

Reimbursement Issues:

A coronary CT angiogram is reimbursed by most insurance carriers under CPT code for "Chest CTA" when an appropriate cardiac diagnosis is provided.

Selecting the best cardiac CT or MR imaging test for your patient:

If a provider needs advice with selecting the most appropriate noninvasive cardiac CT or MR imaging test, please contact Dr Duerinckx at (336) 794-4117, or via e-mail at: andrejd@earthlink.net.

