CMPMedica
United Business Media

THE SECOND OF TWO SUPPLEMENTS FOCUSED ON CARDIOVASCULAR IMAGING October 2006

Cardiovascular imaging

A Special Supplement to DIAGNOSTIC IMAGING

CTA TRAINING

SPECIAL SECTION

SPONSORED BY AN EDUCATIONAL GRANT FROM VITAL IMAGES

Cardiac CT angiography training picks up steam

Cardiologists and radiologists sift through differing requirements, find opportunities to study either together or apart

By Tony DeFrance, M.D.

Cardiovascular CT angiography (CCTA) has become one of the hottest areas in both radiology and cardiology and is a growing application for CT imaging in general. The proliferation of meetings, symposia, and lectures at conferences of the American College of Radiology and the American College of Cardiology dedicated to CCTA is unprecedented.

More than 800 physicians attended the first annual meeting of the Society of Cardiovascular CT. Radiology and cardiology groups, as well as hospitals, are buying 64-slice CT scanners at an incredible rate. Many sources believe that this technology will change the face of cardiovascular disease diagnosis and its treatment.[1]

Dr. Tony DeFrance

As increasing numbers of physicians become involved in CCTA, the demand for training has exploded. Both the ACR and the ACC, along with the American Heart Association, have issued competency guidelines for cardiac CT angiography (Table 1).[2] The societies' guidelines have differing requirements. The ACC/AHA guidelines have a grandfather period until July 2008. Physicians are rushing to meet this deadline, since training requirements after this date will become more time-intensive. Many radiologists are opting to meet the ACC credentialing guidelines, which require higher volumes of mentored cases.

My experience in training radiologists and cardiologists has shown that the higher number of procedures required by the ACC/AHA competency guidelines results in an increased level of expertise, regardless of specialty. The ACC/AHA guidelines are more complex and difficult to meet. Many radiologists also favor the cardiology guideline competency courses because they allow increased interaction with cardiologists. This provides a better understanding of the clinical implications of the test and of the content cardiologists need in terms of reporting.

Estimates of the number of physicians who will require training vary widely. Currently, about 25,000 cardiologists and 34,000 radiologists practice in the U.S. If even 20% of them seek training, then 12,000 doctors will need programs. A bottleneck is forming as these physicians scramble to find high-quality training options. A number of factors exacerbate this bottleneck: the significant amount of time needed to learn this technology, the smaller class sizes required because of the need for individual workstation train-

Dr. DeFrance is an interventional cardiologist and medical director of the Cardiovascular CT Angiography Education Center in San Francisco. He is also director of CVCTA for Liberty Pacific Medical Imaging, based in California, and a member of the Toshiba Medical Systems speakers bureau.

ing, and the need for high instructor-to-student ratios.

Cardiologists and radiologists have different skill sets, so training programs must be set up to accommodate the varied needs of these physicians (Table 2). Many programs train cardiologists and radiologists together, which I strongly advocate. The interaction of the two specialties and the different strengths they bring to the table greatly enhance the learning environment for everyone.

WHAT AND HOW TO LEARN

Learning how to perform and interpret cardiac CT angiographic studies takes time and a highly focused learning environment. Unlike many techniques learned after residency and fellowship training, CCTA requires mastering a whole new set of manual skills in addition to new didactic information (Table 3). It also requires an understanding of how to integrate this technology into clinical practice.

While the didactics can be learned by reading books or listening to lectures, most of the interpretation requires hands-on individualized instruction on 3D workstations led by experienced faculty. It also requires involvement in the acquisition of studies, which means that at least some of the training must be done at a busy imaging center. Clinical integration of this technology into practice takes a detailed understanding and appreciation of the strengths and weaknesses of the technology in relation to other cardiovascular diagnostic modalities.

After training hundreds of physicians to perform and read CCTA, I do not believe you can become an expert in the interpretation of these studies without a significant amount of experience reviewing cases on your own 3D workstation. How many cases it takes to become competent depends on the person. Some people are competent after reviewing 100 cases, and some need 200.

The key to really learning this technology is to be the one actually operating the 3D workstation and reviewing cases. It must be an interactive situation in which you are manipulating the data set.

Doctors become comfortable with a workstation in about a day to a day and a half. During that time, they can also learn a systematic approach to thoroughly and comprehensively reviewing a cardiac CTA, including all of the cardiovascular structures imaged. We have found that an organized review system that is repeated over and over is essential. I find it analogous (albeit more complex) to the systems we learned so that we could efficiently read a chest x-ray, ultrasound, or ECG. Having a system allows you to have an efficient, streamlined workflow process and reduces the time it takes to read a study.

Once you have this core knowledge and basic skill set, you need to interactively go through many CCTA cases with a wide variety of pathology to really become an expert. We introduce didactic concepts as part of the cases to improve retention. Once you are comfortable with a workstation, it takes about 15 minutes to go through a case, so you can get through about four cases an hour. It then takes a faculty member 15 to 30 minutes to review these four cases with you to highlight the important findings and improve your skills. That means you can realistically get through 20 to 25 cases a day. These are long days, and physicians leave tired and saturated with information.

Another requirement is to perform 50 live cases, and there has been a great deal of confusion about the exact definition of a live case. The Society of

TABLE 1. ACC COMPETENCY GUIDELINES PRIOR to JULY 2008 (GRANDFATHER PERIOD)

Documentation of competence	Training guidelines	Proof of competence
Training completed before July 1, 2008	Level 2 training OR interpretation of at least 150 studies (50 of which the candidate is physically present and involved in acquisition and interpretation of case) and attendance in at least 20 hours of devoted CCT classes Level 3 training OR interpretation of at least 300 studies (100 of which the candidate is physically present and involved in acquisition and interpretation of case) and attendance in at least 40 hrs of classes devoted to CCT	Letter or certificate of competency from program director. Get as much documentation as possible.
Maintenance of competence	Contrast CCT examinations per year to be performed and interpreted: Level 2: 50 Level 3: 100	

Source: Budoff MJ, Cohen MC, Garcia MJ, et al. ACCF/AHA clinical competence statement on cardiac imaging with computed tomography and magnetic resonance: a report of the American College of Cardiology Foundation/American Heart Association/American College of Physicians Task Force on Clinical Competence and Training. JACC 2005;46(2):383-402.

TABLE 2. GENERAL TRAINING NEEDS AND STRENGTHS OF CARDIOLOGISTS AND RADIOLOGISTS

Cardiologists' needs	**Radiologists' needs**
Increased knowledge of CT operation, CT components, CT physics, and image formation	Concepts of gating CT cardiovascular studies and retrospective reconstruction
Radiation safety review	Review of 3D cardiac anatomy
Understanding of contrast kinetics, administration, and safety	Understanding of clinical implications of technology (i.e., where it fits in)
Cardiologists' strengths	**Radiologists' strengths**
Understanding of cardiovascular testing modalities in clinical practice	Understanding of CT operation, image formation, and radiation safety
Detailed knowledge of how cardiac findings will impact care	Comfort with review of CT images and workstations
Understanding of 3D cardiac structures	Understanding of contrast administration and dynamics

TABLE 3. KNOWLEDGE BASE FOR CARDIAC CTA

Understanding of the sensitivity, specificity, accuracy, utility, costs, advantages, and disadvantages of cardiac CT as compared with other cardiovascular imaging modalities
Basic physics of CT in general and of cardiac CT in particular
Cardiac anatomy
Contrast administration and kinetics, including any important patient historical factors that might increase the likelihood of adverse reactions to contrast media
Principles of radiation protection and the hazards of radiation exposure to both patients and CT personnel
Appropriate postprocedure patient monitoring
Thorough understanding of the many morphologic and pathophysiologic manifestations and artifacts demonstrated on CCT images
Understanding of the various types of CT scanners available for cardiovascular imaging
Principles of 3D imaging and postprocessing:
• CT scan collimation (slice thickness)
• CT scan temporal resolution (scan time per slice)
• table speed (pitch)
• field-of-view
• window and level view settings
• algorithms used for reconstruction
• postprocessing techniques and image manipulation on 3D workstations

Cardiovascular CT is releasing a position paper to clarify the ACC/AHA competence statement. The society's position is that a live case must fulfill three elements summarized in Table 4. The society has gone on to state that in 25 of the required 50 live cases, either the physician must be present in the control room or there must be a live video feed of the case being done. The other 25 live cases can come from an archive video of the procedure being done. It is important to note, however, that in all 50 live cases, the physician must manipulate the data set. In other words, he or she must review the images and come to a conclusion on a 3D workstation and engage in an interaction with an instructor.

LIVE CASE REQUIREMENT

The intention of the live case requirement is to teach the techniques and pitfalls of acquiring CCTA studies and extracting as much data from the studies as possible on a wide variety of patients to further clinical knowledge. Data extraction involves optimizing the postprocessing of the data obtained. To understand the fine points of postprocessing requires the physician to review raw, unfiltered, ungroomed cases as they come from the scanner. This step will teach the physician how to obtain different reconstructions, use different filter techniques, and deal with the artifacts that are part of CCTA.

Given all of the knowledge and skills that are needed to become an expert in CCTA, we do not believe it is currently reasonable to complete a Level 2 course in less than five days onsite. Physicians are completely saturated after four or five eight to 10-hour days of CCTA training. Since this amount of time onsite will not allow the physician to meet all of the requirements, there is an offsite mentored case component as well.

It is my personal belief that watching other people review cases should not count toward the numbers needed to fulfill the ACC or ACR requirements. Physicians learning to read these studies must do so on their own 3D workstation in a comprehensive, interactive manner. The new SCCT recommendations, however, have softened the guidelines so that 50 of the 150 total cases may be

obtained by watching a CME-quality video of CCTA cases being reviewed by an expert.

Credentialing bodies will become increasingly strict in the very near future about what constitutes a mentored case and what constitutes a live case. The SCCT is in the process of securing a third-party company to monitor and verify training numbers and credentialing. You do not want to think you have fulfilled the competency guidelines only to find out that you have not met the criteria. Most important, you want the best training possible to produce quality interpretations that will provide better clinical care for your patients. The SCCT is also in the process of certifying CCTA training programs, so it will be important to attend a certified program in the near future.

We are observing a trend of physicians getting handfuls of cases from different sources and focusing more on meeting the numbers portion of the guidelines than on becoming an expert in CCTA. Often, physicians who have 50 or 100 cases documented have never touched a 3D workstation or have very limited skills. It is my experience that 80% of the interpretation of CCTA is expertise with the 3D workstation, becoming able to efficiently and accurately identify or rule out pathology. The other 20% is image acquisition expertise and didactic knowledge.

Currently, there is a push to create technologies so that physicians can review some of the required cases in their offices or at home through Internet-based technology. Although this area holds promise, it is unclear what the credentialing bodies will require and whether they will accept these as mentored cases. Physicians are buying cases on DVDs, but the validity of this approach is unproven. As this remote review technology develops, I believe the key component will be the ability of the physician to do an interactive review remotely (review the data in 3D) and commit to a diagnosis that the mentor can confirm.

TABLE 4. NEW SCCT RECOMMENDATIONS FOR LEVEL 2, 150 CASE REQUIREMENT

Breakdown of 150 mentored case requirement
50 live cases
50 mentored cases from a case library that physician must manipulate and be mentored on
50 cases from a CME-quality CD with an expert reviewing CCTA cases
Elements of a live case
For 25 of the 50 cases, trainee must be present in the room or there must be a video feed of a live case. The other 25 can come from an archived video of a case being performed.
In all 50 cases, trainee must interact with the data set. In other words, trainee must manipulate the data on a 3D workstation.
There must be an interaction with an instructor in all of these cases.

WHERE, WHY, AND WHEN

Since the introduction of credentialing criteria, many training centers have sprung up across the country. The SCCT's Web site at www.scct.org offers a list of programs. Finding a training program can be a daunting task. Certain key components must be present in a program to create an optimal learning situation. When making your selection of courses, ask detailed questions of each center.

Cardiac CTA is here to stay. It will affect all areas of cardiovascular disease diagnosis and treatment, including outpatient, emergency room, and inpatient care. Primary-care physicians are well aware of this technology, and many order this test directly rather than referring to a cardiovascular specialist.

Increasing numbers of patients are aware of cardiac CTA, as it has been featured on television and national magazines. Patients are increasingly active consumers of healthcare who are asking physicians for less invasive options and a more proactive approach to health.

Embracing new technology that promises to improve patient care in the right hands is part of what makes our field exciting and unique. The potential of this technology to help identify the large number of people with undiagnosed cardiovascular disease and to affect the sudden death rate is also very exciting. Although the technology is outpacing the clinical research, many clinical trials are under way. All of the data to date look extremely promising for cardiac CTA's ability to favorably affect the diagnosis and treatment of cardiovascular disease.

Given the July 2008 deadline for grandfathering in under ACC guidelines, if you have even a slight interest in getting involved with this technology, now is the time to do it. Many courses have waiting lists, and it will take time to fit the right course into your busy schedule. ■

References

1. Advisory Board Document on CT Angiography, 2006.
2. Budoff MJ, Cohen MC, Garcia MJ, et al. ACCF/AHA clinical competence statement on cardiac imaging with computed tomography and magnetic resonance: a report of the American College of Cardiology Foundation/American Heart Association/American College of Physicians Task Force on Clinical Competence and Training. JACC 2005;46(2):383-402.

CVCTA Education
www.cvcta.com
325 Sacramento Street
San Francisco, CA 94111
phone: 415.772.0908
email: info@cvcta.com