

# The Fast Lane to Diagnosis

Cardiac CT revolutionizes cardiology – now a dedicated software is needed. Siemens engineers have been working on a customized solution for over a year. During a visit to the company's CT division, they presented its current capabilities.

By Roland Fath



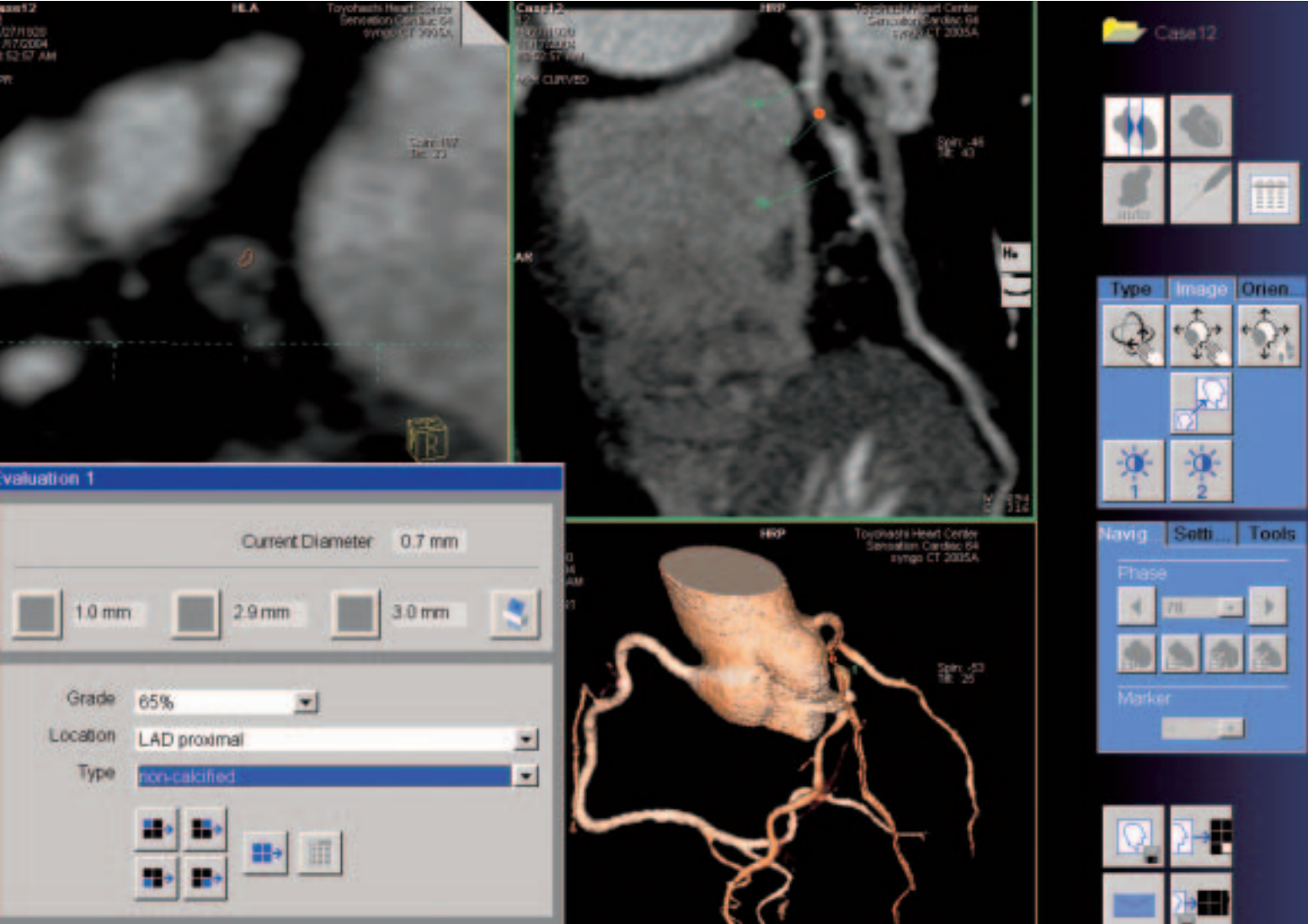
**LARS HOFMANN, M.D.,** explains the various advancements of the new software.

A single mouse click suffices: the heart is displayed in three-dimensional format on the screen, ...click, the coronary arterial tree is segmented, ...click, the degree of stenosis is calculated or plaque composition analyzed. The new software with the proven *syngo* interface will soon make the evaluation of cardiac CT images much easier for cardiologists. When coronary heart disease is suspected and clarification is required, cardiac CT is increasingly being used. For non-invasive radiography procedures, 16-slice computed tomography systems have already paved the way to cardiac applications. Last year's delivery of the first 64-slice system specially optimized for cardiac and vascular imaging represented a major leap forward: the results were even higher image resolution and reduced examination times. Since then, more than 200 SOMATOM Sensation® 64 systems have been installed worldwide, according to Lars Hofmann, M.D., global product and marketing manager for cardiac CT at Siemens Medical Solutions. "More than 80 of these systems are working in dedicated cardiovascular institutions." Acquiring 64 slices in a single gantry rotation takes only 0.33

seconds. The high temporal resolution of 83 milliseconds practically freezes cardiac motion. For an examination of the coronary vessels, patients only have to hold their breath for nine seconds, compared to 17 seconds with a 16-slice system. An ECG-gated scan of the entire thorax requires only 15 seconds of breath-hold time and generates images with a resolution of below 0.4 millimeters.

## All Functions in One Interface

The new software promises cardiologists the optimum platform for image evaluation. "It was important to bundle all functions used to evaluate cardiac CTs into a single interface and tailor it to cardiac workflow," states Hofmann. "An accurate but fast diagnosis is crucial in cardiovascular imaging in order to ensure the best quality of care for the patient. This is why workflows must be extremely fast and well organized." With the software, physicians can evaluate both the morphology and function of the heart as well as coronary plaque. An arbitrary number of cardiac phases in highest image quality can be loaded and analyzed in one step. On



**THE EASY HANDLING** is impressive: the software segments the artery tree with only a few clicks. The new software with the proven *syngo*<sup>®</sup> interface will soon make the evaluation of cardiac CT images much easier for cardiologists.

screen, cardiac motion can be simulated, the coronary vessels can be segmented and rotated in space, or the examining physician can use the mouse to move step-by-step through the individual slice images of the heart.

Development of the new software has been ongoing for a year. Cardiologists' requests have been at the forefront of development, according to engineers Daniel Rinck and Christian Asbeck. The new software concept is optimized for clinical workflow and thus far exceeds previous approaches to cardiovascular postprocessing. Depending on clinical needs, the physician can assess vessels, morphology, and cardiac function with the modular program – and summarize the results in one report. As a result, there is no longer any need to load data multiple times in various programs, or to write and integrate several reports. Users can switch between

the various program functions, as well as between the conventional manual mode and a semiautomated mode. "Physicians want to make as few mouse clicks as possible," is how Asbeck describes the desires of software customers. And this is exactly what the Siemens experts have achieved. "The new software helps to facilitate and increase the workflow of physicians with busy clinical practices by incorporating intuitive reporting functionality and integrating many time-saving, accurate, and guided procedures for the rapid examination of cardiac CT studies," says Michael Poon, M.D., Director of Cardiology at the Cabrini Medical Center and associate professor at the Mount Sinai School of Medicine, New York.

### One Click Isolates the Heart

Rinck loads a patient's data set into the system. The screen displays a three-dimensional

»The software's guided workflow means that even physicians who are not familiar with *syngo* applications find their way easily.«

Christian Asbeck, CT Division, Siemens Medical Solutions



■ DANIEL RINCK (left) and Christian Asbeck explain the functions of the new software.

»Our new application with its dedicated tools and innovative visualizations enables an exact view into the structure and composition of coronary lesions.«

Daniel Rinck, CT Division,  
Siemens Medical Solutions

view of the thorax and heart. With a single mouse click, the heart is automatically cropped and displayed without the surrounding ribcage. It can then be rotated in space for a complete view. After an additional click on the aorta above the coronary outlets, the coronary arterial tree is segmented and displayed in a separate window. Rinck navigates through one of the coronary arteries using the mouse. Each stage of the virtual trip can be tracked in the slice images of the heart in the other three windows on the screen. Thereby the physician can control his immediate position in the acquired coronary view as CPR (Curved Planar Reformat), in a 3-dimensional view, and as a slice having been orthogonally calculated according to the central vessel axis. Rinck navigates toward a vascular stenosis and sets a marker. "Our new application with its dedicated tools and innovative visualizations enables an exact view into the structure and composition of

coronary lesions," says Rinck. The marker can be seen in all selected views of the heart. If desired, the software calculates the degree and expansion of the stenosis. "CT-based quantification of stenosis as mild, moderate, or severe has a high correlation to diagnostic findings from cardiac catheter examinations," explains Asbeck. Additionally, the software can evaluate the composition of plaque. Calcified areas can be differentiated from those with high lipid content. All diagnostic findings can be documented in a drop-down menu.

### Fast, Intuitive Workflow

The data are not only used for final assessment of the degree of the patient's coronary heart disease, but also for the precise planning of surgery. As a result, the physician knows prior to the operation how far the stenosis is from the ostium, what the stent's dimensions should be to bridge the constriction, or where to connect a bypass.

The 3D and 4D processing of very large data sets using the new software also enables comprehensive functional cardiac evaluations. In VRT (Volume Rendering Technique) visualization, the entire cardiac volume is displayed in 3D. "The image quality is excellent," demonstrates Asbeck on-screen. If images of multiple cardiac phases are loaded, the movement of the beating heart can be analyzed and problems such as akinesia of the ventricular wall can be detected. The left ventricle is automatically segmented with a click of the mouse. All cardiac volumes, for example ejection fraction, cardiac input/output, etc., can be determined precisely. "The workflow enables fast and intuitive functional evaluation of the images in less than two minutes," stresses Asbeck. The physician can manually switch between all cardiac phases using different view directions (long axis, short axis, four chamber view).

In MPR (Multiplanar Reformatting) mode, the axial, coronal, and sagittal imaging procedure, slice images are displayed in two-dimensional format. If all structures cannot be detected in this mode, the physician can easily switch to MIP (Maximum Intensity Projection) display. Thicker slices, but only the brightest pixels, are displayed when using this mode. This improves the display of contrast-filled vessels, explains Asbeck.

At the conclusion of the examination, the physician has a number of ways to create a report, which contains the diagnostic findings and may also contain images and videos. The handling is also intuitive, so within a few seconds all lesions can be characterized and described. The evaluation of lesions found is saved directly with the respective image. For example, the data can be burned directly to CD-ROM, which the patient can take to his next doctor visit, states Hofmann.

This comprehensive tool for physicians enables the optimum evaluation of the data sets from modern CT systems for cardiac and vascular imaging. Clinical evaluation will start in May. Market introduction is expected for fall 2005.

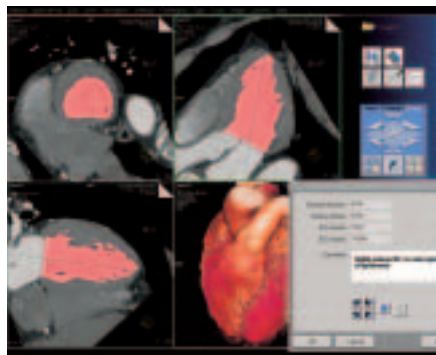
»It was important to us to bundle all functions to evaluate cardiac CT into a single interface and tailor it to cardiac workflow.«

Lars Hofmann, M.D., CT Division, Siemens Medical Solutions

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### Bundled Cardiac CT Information

The innovative 3D imaging software bundles all diagnostic capabilities for evaluating cardiac CT images into a single application. The program is equally suited for the evaluation of cardiac morphology and for functional examinations. In addition, coronary plaque can be evaluated and interventions can be planned. The software is based on the *syngo* interface, which is known from other Siemens software solutions and guarantees a guided, intuitive workflow. Many applications offer "single-click convenience." Volume displays of the heart in 3D and 4D are specially tailored to the user's wishes and are made possible by processing large volumes of data. The entire heart, as well



as individual segments such as the coronary arterial tree or left ventricle, can be rotated in space to provide different views. The software solution offers comprehensive documentation capabilities for the diagnostic findings. Market introduction is planned for fall 2005.