

Robert S. Schwartz, MD

A leader in cardiac imaging discusses the advanced imaging program at Minneapolis Heart, the importance of detecting vulnerable plaque, and where cardiology needs to grow.

Please tell us about your practice and the imaging program at Minneapolis Heart Institute Foundation. We have an extensive advanced cross-sectional imaging program that is focused on MRI and cardiac CTA, imaging modalities that integrate well with traditional imaging methods, such as echo, nuclear, and the catheterization lab. We believe this integration is essential because the advanced imaging practice adds substantial clinical benefit to the more traditional imaging methods.

We have been performing advanced imaging for 4 years. By growing slowly and deliberately, we have established credibility within the clinical aspects of the group, to the point that we are currently imaging between 10 and 25 patients a day in the CT scanner alone. Concurrently, we also perform between eight and 15 cardiac MRI scans day. As such, both programs are very busy.

Credit for the success of this program must be given to John Lesser, MD, who assembled the program. The training, precision, and calculated expansion of the program all came together to produce a very productive and cost-effective imaging center.

What do you think will be the next big development in cardiac imaging in the next 5 to 10 years? One goal is to take advanced imaging methods, CT or MR, into the therapeutic arena so that they are not only diagnostic technologies, but they also become therapeutic technologies. There is a long journey in terms of image display and acquisition as well as interpretation. Such a leap will involve significant synergy between advanced hardware and user participation in software development. It will be necessary to enhance user interfaces and understanding of true 3D imaging, which goes beyond simple cross-sectional imaging. Cross-sectional imaging will always play a role, but it is very important to understand that the body in general, and the heart

specifically, is a complex 3D structure, whether normal or pathologic. The same holds true for the peripheral vasculature, whether normal or diseased. At this point, there is no definitive technology to display the anatomy in a quick and simple true 3D manner. These developments are on the near horizon, in large part as a result of the revolution in information technology and computing systems.

What is the current focus of your research energy?

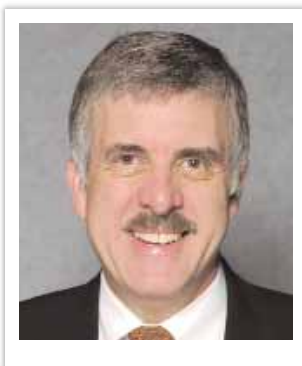
Currently, our research energy is in multiple directions, principally in coronary artery disease and its early detection. We have multiple early detection protocols. One involves correlating genetic markers and gene expression in early coronary disease-related plaque visualized by cardiac CT. We are also studying asymptomatic marathon runners (men who have completed at least one marathon yearly for 25 consecutive years). This study uses CT to understand the impact of extreme training on coronary artery disease.

At the other end of the spectrum, our research energy is focused on developing preventive algorithms to understand who is at risk of having acute coronary syndrome and acute myocardial infarction. Such an algorithm would allow us to determine these problems in patients before they actually happen, rather than treat them after they occur.

Another area of focus is in patients with atypical chest pain. We are working with several protocols (including CT-STAT) that look at utilization of coronary artery detection in the emergency room. In patients with atypical chest pain and in patients in the clinic who have atypical chest pain, CT appears to be a very good tool.

We hope to soon begin examining coronary artery disease and plaque with micro-CT, a method that permits exquisite 3D spatial resolution (down to 10 μm) to

(Continued on page 73)



(Continued from page 74)

aid in understanding stents in coronary arteries and also plaque characterization.

Last, we are exploring integration of advanced imaging into therapeutic arenas so that patients with known disease who are undergoing a procedure will benefit from optimal therapy and then use that imaging to guide therapy in the catheterization lab. Certainly, imaging spans the entire spectrum of coronary artery disease and, as it relates to coronary disease, it also applies to structural disease.

How far have we come in determining the importance of vulnerable plaque and its diagnostic evaluation and treatment? Not very far. We understand now that there are implications to noncalcified plaque. Dr. Tom Knickelbine in our group has carefully studied noncalcified plaque and its clinical impact—the noncalcified plaque seems to be quite significant. As of now, can we better understand which plaques are vulnerable, or at least understand which plaques are at risk of being vulnerable? Can imaging technology evaluate them invasively with novel technologies now becoming available such as virtual histology and intravenous ultrasound? Only further research will tell.

How capable are current imaging modalities of detecting vulnerable plaques? The answer is unclear, although I think that they will be detectable. If one considers that any plaque could theoretically be vulnerable, whether it is a ruptured fibroatheroma, a plaque erosion with hemorrhage, or a calcium spicule, improved spatial and temporal image resolution may be able to better detect these potentially dangerous lesions. We can certainly determine which patients have plaque and whether it is noncalcified or calcified. These simplistic findings may permit prognostication.

What areas of cardiology need the most attention from physicians and industry in the next several years? In general, biotechnology involving cells, proteins, genes, and molecules is interacting very strongly with device technology. Research into this biology has much to gain from advanced imaging modalities. I think it is important to recognize the concept that genetics/cells/molecular biology is assuming an increasingly important role in clinical medicine.

Our ability to noninvasively image events at a microscopic level, rather than simply making inferences is exciting and will lead to new therapy and a better understanding of patients. The synergy between imaging, biotechnology, and devices is rapidly leading to exciting results. ■