Imaging Advancements and Screening Initiatives

Bart Muhs, MD, PhD, discusses his experience with various imaging modalities, as well as the vital role of AAA screening.

Although abdominal aortic aneurysms (AAAs) are known as "silent killers," there are some known risk factors. What would you propose in terms of the ideal screening plan for those who may be at high risk for AAA rupture?

Dr. Muhs: An effective screening program needs to be cost effective, simple to perform, reproducible, and have a low false-positive rate. Ultrasound has proven to be an effective screening modality. However, the issue of cost-effectiveness remains. It is clearly not cost-effective to screen the entire population; therefore, a method needs to be outlined that selects those at the highest risk. Obvious risk factors are smoking, male gender, increasing age, and family history. The Centers for Medicare & Medicaid Services (CMS) has recognized these risk factors and the importance of screening, and as such, has agreed to pay for first-time entrants into Medicare who fit these criteria, which is known as the SAAAVE (Screen for AAA Very Effectively) bill. An ideal screening program would likely look very similar to the current Medicare screening program but without the current limitation to new entrants only. It seems a little odd to me that on the one hand, policy makers pay service to the importance of screening by agreeing to pay for new entrants, yet on the other hand, prevent screening for patients who are already in the system. If screening is important, which I believe it is, it should be important for all high-risk individuals.

The cost of screenings is obviously a significant factor. In what ways do you think the benefits of screening should be weighed in terms of cost efficiency?

Dr. Muhs: It should be relatively easy to determine if screening is cost-effective. There should be thousands of people who have undergone screening as part of their entry into Medicare after fitting the described inclusion criteria. Due to the limitations on payment, there is likely an equal or greater number of people who have failed to receive their screening. With such a large population, cost information should be obtainable. Screening costs per patient will also come down with increasing utilization of services.

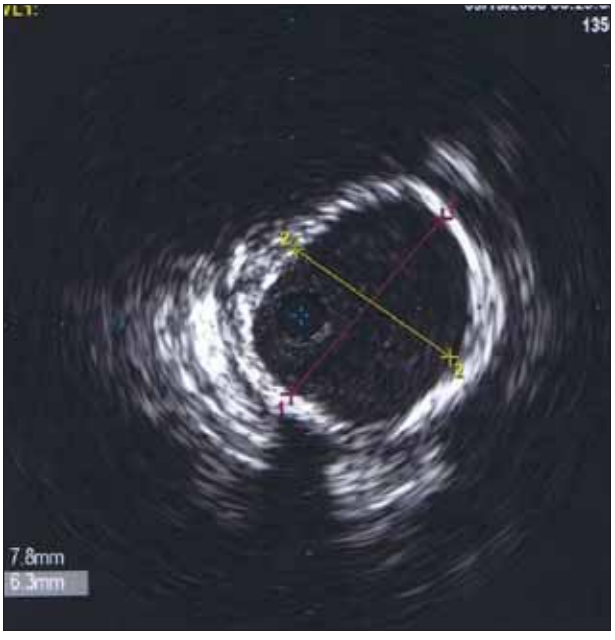

Figure 1. Intravascular ultrasound (IVUS) allows for accurate sizing and minimization of contrast. In this above image, the access arteries (iliacs) are measured and noted to be suitable for the introduction of a 20-F device. This allows for the entire abdominal or thoracic aortic endovascular repair (EVAR or TEVAR) to be performed without contrast and with minimal radiation exposure to the patient and staff.

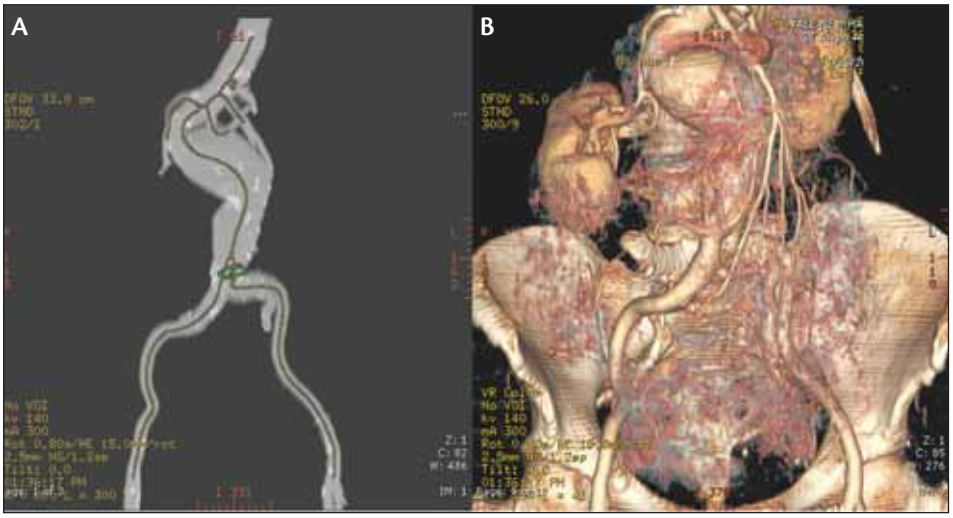

Figure 2. Three-dimensional reconstructions and maximum intensity projections allow for better case planning (A). This three-dimensional computed tomographic (CT) angiogram demonstrates difficult proximal neck anatomy (B). Visualization before the procedure improves patient outcomes. In this particular patient, the left arm was prepped for a "body floss" technique to straighten out the neck and allow safe delivery of the endoprosthesis.

If screening programs are not expanded by CMS, are there any other ways to increase awareness among those who may be at risk?

Dr. Muhs: There are certain public advocacy groups that have been increasing AAA awareness. The American Vascular Association (AVA) is a foundation of the Society for Vascular Surgery, the nation's largest group of dedicated vascular specialists. One of the main goals of the AVA is to increase public awareness about vascular problems such as aneurysms. The AVA sponsors an annual national screening program to detect aneurysms. Other groups are also acting to increase awareness. However, it is my perception that vascular surgeons are lacking the cohesive and constant "on-target" message that many of our colleagues seem to have mastered. For example, the importance of screening is well publicized in areas such as mammography for breast cancer, recognition of heart attacks, and screening for colon cancer. Vascular surgeons have a ways to go to match the effectiveness of organizations like the American Heart Association and the American Cancer Society.

How do imaging advancements factor into a greater role for AAA screening? Do you foresee an improvement in screening with the emergence of new imaging technology?

Dr. Muhs: I do not think that recent imaging advancements will improve screening efforts. A critical component of successful screening is a relatively inexpensive screening tool. Ultrasound fits this description with an admirable positive predictive value. Current imaging is fine for screening purposes. Advanced imaging will very likely play a role in improving AAA treatment and follow-up effectiveness but play a small role in improved access to screening.

Having adopted IVUS technology for guiding some of your EVAR cases, can you tell us about any differences in how you now plan and perform your procedures?

Dr. Muhs: I have widely incorporated IVUS into my aneurysm practice (Figure 1). Initially, I used IVUS only in patients at risk for contrast-induced nephropathy, typically patients with an elevated glomerular filtration rate. This was done in an effort to limit contrast exposure. However, as I became more comfortable with the imaging, I have found myself routinely using IVUS. Anecdotally, in addition to the obvious benefit of decreased contrast utilization, I noted that my cases were finishing in less time and with substantially decreased radiation exposure to myself and to the staff. When reviewing my last 30 EVAR cases using IVUS, I found that contrast and radiation exposure were both approximately half of non-IVUS EVAR cases. As a follow-up to this observation, I am currently conducting a randomized trial comparing IVUS to non-IVUS imaging in EVAR and TEVAR. I expect the trial will be finished by mid 2010.

In which AAA patients is IVUS an advantageous option?

Dr. Muhs: As I mentioned, I find that IVUS is advantageous in the vast majority of my EVAR and TEVAR patients. I think it improves sizing, limits contrast and radiation exposure, and speeds up the procedure. These advantages are beneficial for all patients. I have been particularly pleased with the Volcano Corporation (San Diego, CA) system. The images are very clear, and the

(Continued on page 49)

(Continued from page 44)

system is simple to use. I look forward to future IVUS probes that will allow for color duplex imaging. This will help in identification of potential endoleaks and make contrast a luxury rather than a necessity.

What other technological advances in imaging have helped make EVAR for AAA a smoother procedure?

Dr. Muhs: It's not a recent advance, but three-dimensional imaging with the ability to truly visualize the anatomy of the aortic lesion and the path and lie of the stent graft, and to better predict obstacles along the way, has definitely made EVAR a smoother procedure (Figure 2). At Yale University, we have incorporated gated CT imaging into our TEVAR preoperative imaging protocols. This has allowed us to accurately assess coronary anatomy and ejection fraction and evaluate for valvular disease during the preoperative sizing scan without additional testing. I believe this has improved patient outcomes by allowing better optimization before TEVAR.

What impact has there been on your follow-up protocols?

Dr. Muhs: I have moved to a much more ultrasound-based follow-up protocol. The historical 1-, 6-, 12-month, and annually thereafter CT follow-up protocol exposed our patients to very large radiation and contrast doses. This schedule was largely a legacy of the pivotal trials for the US Food and Drug Administration device approval and has not been validated as an effective means to prevent rupture after EVAR. In my practice, I have virtually eliminated the 1-month CT scan. Assuming there is a pristine completion angiogram, every patient receives both a CT and ultrasound at 6 months, 1 year, and annually for 3 years. Often after 3 years, I rely solely on ultrasound with a low threshold for CT if any abnormality is suspected. ■

Bart Muhs, MD, PhD, is Codirector of the Endovascular Program and Assistant Professor of Surgery and Radiology at Yale University School of Medicine in New Haven, Connecticut. He has disclosed that he receives grant/research funding from and is a shareholder in Volcano Corporation. Dr. Muhs may be reached at (203) 785-2564; bart.muhs@yale.edu.