Post-EVAR Surveillance: Perspectives on the Role of Duplex Ultrasound and Long-Term Monitoring

Dr. Rabih Chaer describes the benefits and limitations of duplex ultrasound, protocols in standard- and high-risk patients, and tips for obtaining optimal ultrasound results.

Do you think radiation exposure is a significant issue for patients after they have undergone endovascular aneurysm repair (EVAR)?

CT with intravenous contrast injection is currently the standard for long-term EVAR surveillance; however, it is associated with increased cost and radiation exposure, which has been associated with an increased risk of solid organ and bone marrow cancer. It could also contribute to the decline in renal function seen after EVAR as a result of contrast nephropathy.

Can you envision post-EVAR follow-up of patients without CT scanning?

Post-EVAR surveillance recommendations have undergone significant updates. Original practice guidelines included a 30-day postoperative CTA study, repeated at 6 months, 1 year, and annually thereafter. There is increasing evidence that imaging frequency after EVAR should be decreased. Specifically, eliminating the 6-month follow-up study and substituting for CTA beyond or even at 1 year with color flow duplex ultrasound (CDUS) has been suggested. The follow-up protocol remains ill defined if a type II endoleak is diagnosed. Although current guidelines suggest CTA at 6 months upon type II endoleak detection on the postoperative CTA study, accumulating evidence suggests omission of this follow-up visit and repeated imaging at 12 months with either CTA or CDUS (combined with radiography) or noncontrast-enhanced CT to check for sac growth with subsequent annual CDUS is an adequate approach, provided that the sac does not expand.

I can envision post-EVAR surveillance with CDUS and minimal CT scanning, perhaps at 30 days and every 5 years to detect remote aneurysmal changes or other structural defects. However, this may not be applicable for patients with initial suboptimal anatomy for EVAR who may be at a higher risk for future complications, patients being concomitantly followed for a thoracic aortic aneurysm, and those with excessive bowel gas, ascites, or a challenging body habitus.

How do you define standard versus high risk for the purposes of follow-up in EVAR cases, and what are your follow-up protocols for each?

Surveillance with only annual DUS can potentially be applied to most standard-risk patients after EVAR if there is significant shrinkage of the aneurysm sac to any size or if they have a stable aneurysm without enlargement regardless of whether a type II endoleak is present. Patients with contrast allergy or significant renal insufficiency (serum creatinine > 2 mg/dL) will particularly benefit from this surveillance regimen, depending on aneurysm size and presence or absence of endoleaks.

High-risk patients for DUS surveillance include patients with initial suboptimal anatomy for EVAR and at a higher risk for future complications, patients with an endoleak and enlarging abdominal aortic aneurysm (AAA) sac, those who are being concomitantly followed for a thoracic aortic aneurysm, and patients with excessive bowel gas, ascites, or a challenging body habitus. There is no universal protocol for monitoring high-risk patients, but imaging with DUS at 6-month intervals is common practice and is typically individualized to every patient at the discretion of their physician.

When weighing the risks and benefits of CT evaluation, what are you most concerned about when making your decisions?

When making a decision on whether to use CT, I weigh the benefit of avoiding radiation exposure and contrast-induced nephropathy versus the risk of missing a serious endoleak on DUS. This should be a rare event, because serious endoleaks are associated with AAA sac enlargement, which should easily be detected on DUS surveillance.

What are the limitations of DUS in post-EVAR evaluation?

DUS surveillance is limited in patients with excessive bowel gas, ascites, or a challenging body habitus. It may also not allow the accurate characterization of the nature of an endoleak in the setting of limited visualization. Other limitations of DUS surveillance include operator dependence, suboptimal examinations, and availability as well as time commitment, which limit broader application. In addition, DUS cannot identify all graft-related adverse events that may require a reintervention, such as graft migration or kinking.

How would you briefly describe the data that support your protocols, including their limitations?

Recent EVAR surveillance data using modern ultrasound equipment have documented a high sensitivity and negative predictive value with DUS in detecting endoleaks requiring intervention, allowing for better identification of the type of endoleak compared to CT. DUS also has the specific advantage of not only detecting low flow but also flow direction and characterizing the type of endoleak. However, the limitations of DUS must be recognized, as previously described.

How has DUS technology improved in recent years such that it is a viable imaging option, obviating the need for CT in select cases?

The availability of modern ultrasound equipment and technology and the use of contrast-enhanced ultrasound have improved the sensitivity and specificity of DUS surveillance in endoleak detection, obviating the need for CT in most patients after EVAR.

In what ways do you anticipate DUS can further improve in the near future?

DUS surveillance can further improve with the adoption of universal structured imaging protocols, more routine use of contrast enhancement, and training of vascular technologists in accredited vascular labs. A standard examination protocol for EVAR surveillance should be predetermined and validated in each vascular laboratory.

Do you have any specific tips for DUS techniques, how to gain the ideal views, or what not to do?

The examiner should instruct the patient to fast for 6 to 8 hours before the exam to minimize the amount of bowel gas present at the time of the study. Smoking or gum chewing should be discouraged on the morning of the exam due to the fact that it may increase the amount of air swallowed, therefore increasing the occurrence of bowel gas. The exam is performed with the patient lying supine with the head slightly elevated to a comfortable level. The lateral decubitus position may be useful when supine acoustic windows prove to be inadequate or for individuals who have a large abdominal girth.

Some examination guidelines include the use of B-mode imaging and Doppler spectral analysis of flow dynamics. Color and power Doppler imaging is strongly desirable to complement the examination. In addition, the imaging transducer frequency should be set between 2 and 4 MHz (curved linear probe) for adequate penetration, and the Doppler transducer frequency must also be set between 2 and 4 MHz for adequate penetration.

Imaging in different positions can be useful in detecting suspected endoleaks that are difficult to image. If an endoleak is suspected but cannot be clearly defined, turning the patient to a left and/or right decubitus position and rescanning the area in question can prove to be helpful. ■

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