

# Noninvasive Testing of PAD

Treating the patient, not the picture.

BY JAMES BENENATI, MD

**D**iagnosis of peripheral arterial disease (PAD) may not be as rewarding as treating the condition, but it is the key to successful patient care. At our clinic, we have found noninvasive physiologic testing to be the most appropriate initial approach to PAD diagnosis. It is not only time and cost efficient, but it provides the most comprehensive picture of the patient's condition because it helps determine if he or she has PAD, whether treatment is necessary, and what type of treatment is likely to be most successful; it provides benchmarks for comparison on follow-up. Noninvasive physiologic testing also provides important detailed information to help the patient fully engage in the treatment decision process.

Many of these issues will be addressed at the upcoming 20th anniversary meeting of the International Symposium on Endovascular Therapy (ISET), January 20 through 24 in Hollywood, Florida. The meeting kicks off on Sunday with a daylong symposium on noninvasive vascular diagnosis, including testing for PAD, as well as other conditions beyond the scope of this article, such as abdominal aortic aneurysm, carotid arterial disease, and venous disease. Further, all of the patients participating in the live cases at ISET will receive a complete noninvasive physiologic workup before treatment and will have noninvasive testing as a follow-up afterward.

## PAST PROTOCOL: DIRECT TO TREATMENT

Until recently, the standard protocol for suspected PAD typically involved a physical exam and history and an ankle-brachial index (ABI). If the patient were symptomatic and the ABI suggested likely stenosis, the patient was scheduled for angiography, immediately followed by angioplasty if a treatable blockage were detected. In fact, this remains the typical approach at many centers today.

On the surface, this approach seems reasonable. Why not choose a diagnostic method that allows treatment of the condition immediately? The problem is that it is

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expensive, it is invasive, and most importantly, it does not provide all of the information needed to ensure the best treatment—including whether treatment is even warranted. For instance, even when a patient complains of pain and a lesion is identified, there is no proof the two are related. Many of these patients have disc disease, neuropathy, and diabetes, which can also make their legs hurt. In my experience, invasive treatment that does not result in pain relief can make for a very unhappy patient.

Increasingly, vascular physicians have come to recognize the value of noninvasive testing but may be too quick to employ sophisticated high-tech tests, such as MRA and CTA. These are excellent tests and are at times appropriate, but they are expensive, time-consuming, and therefore are not necessarily the best way to begin a workup. We generally reserve MRA and CTA for patients we know truly have advanced arterial disease.

## THE NONINVASIVE PHYSIOLOGIC TESTING PROTOCOL

We have found the best initial approach to be a physical exam and history followed by a complete physiologic workup. This noninvasive approach can tell us nearly everything we need to know: if the patient has arterial disease, and if so, whether the disease is causing the symptoms; the disease's location; and the disease's severity. It also provides an excellent benchmark for future evaluation because it is inexpensive and very reproducible.

Although a thorough physical examination and learning the patient's history is the important first step, the information this provides is far from complete. For instance, a patient may say that he claudicates, but it is important to determine whether in fact the pain is due to PAD, and only further testing can determine that. When employing the history and physical examination alone, approximately one in five people who have significant PAD remain unidentified, and conversely, approximately one in five people who are thought to have PAD actually do not have the disease and should not be treated for it.

The next logical step is noninvasive vascular testing, either via physiologic testing—including segmental pressure indices (such as ABI), waveform analysis via Doppler or ultrasound probe, and pulse volume recordings (PVR)—or duplex ultrasound.

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### WHAT PHYSIOLOGIC TESTING CAN TELL US

ABI is the most frequently performed test, and understandably so. It is a simple test that can be performed quickly and readily reveals whether there is physical disease as indicated by a drop in blood pressure between upper and lower limbs. However, ABI is not a good stand-alone test because it tells us nothing more than that PAD exists. Waveform analysis and PVRs are necessary to determine bloodflow through the vessels in specific areas and provide another important piece of the puzzle, helping to pinpoint the area of concern more accurately.

In patients with suspected claudication, we place blood pressure cuffs on the patient's legs and have him or her perform a treadmill exercise test to confirm that the pain is related to PAD. As soon as the patient complains of the same pain typically experienced while walking, we perform PVRs and an ABI to document that the pain is related to PAD.

Exercise testing is not appropriate in patients with rest pain and ischemic ulcers. For these patients, we find waveform analysis is extremely valuable in evaluating the severity of PAD. The major concern with these patients is the potential to heal if amputation or some other treatment is performed, and no CTA, MRA, or Doppler ultrasound can predict healing—only physiologic testing can do that.

These three parts of the physiologic test—the ABI, PVRs, and Doppler waveform analysis—will provide a complete noninvasive examination and determine whether invasive steps should be considered. Most physicians who treat PAD use combinations of the physiologic tests when appropriate. Doppler and PVRs may not be needed at all levels; for instance, we typically do not perform PVRs at the ankles at our clinic.

Doppler ultrasound is an excellent test that can provide an accurate picture of the vessel, but it is very time-consuming to perform from aorta to ankle. Many physicians use it to supplement the waveform analysis once the problem location has been identified.

Once we have all of the physiologic testing results, we can determine the location of the disease, whether the lesion is heavily calcified, if it is occluded or patent, if it is diffuse or localized, and the size of the vessels. These simple, relatively inexpensive tests give you quite a bit of information for your armamentarium.

Also, because none of the treatments we offer last forever and complications can arise, it is important that the patient has reasonable expectations before treatment. All of this information helps educate the patients and lets you know what you can offer them, what the various approaches are, and how long it might last before retreatment is necessary. At desired intervals after the treatment, physiologic testing can be repeated to get an indication regarding whether restenosis has occurred and if retreatment will be necessary sooner rather than later.

### LAB ACCREDITATION IS KEY

Physiologic testing is only as good as your laboratory and technicians, and it takes a commitment on the part of the vascular physician and technologist. The best way to ensure quality is to have the lab accredited. Accreditation ensures that the physicians know how to read the results, that the interpretations are accurate, and that the tests are being uniformly performed.

Several bodies accredit vascular labs. The largest multidisciplinary organization that accredits vascular labs is the Intersocietal Commission for the Accreditation of Vascular Laboratories. Further, in more than 30 states, CMS will not reimburse for testing performed by nonaccredited labs.

Once the patient has been worked up and PAD is confirmed, more sophisticated testing, such as CTA and MRA, may be warranted. The great part is we can get a map of the entire arterial tree noninvasively. From there, we can determine the very best course of treatment, whether it is angioplasty, stenting, debulking, or surgery.

### MRA VERSUS CTA

The choice of MRA versus CTA often depends on the technology available at the facility performing the study and personal preference. However, there are distinct advantages and disadvantages to each modality. CTA is excellent for evaluating the aorta and iliac vessels because the timing of the bolus of contrast is easy. CTA has better spatial resolution than MRA but is often not as valuable in lesions below the knees, and heavily calcified vessels are difficult to evaluate. MRA is advantageous because there is no radiation and no need for iodinated contrast. Alternatively, the physician could proceed to angiography/angioplasty from the noninvasive exam without performing MRA or CTA, but that approach involves more use of contrast and longer procedures.

In patients with poor renal function, CTA is not recommended because of the risk of renal failure, and MRA is not recommended because of the small but real risk of nephrogenic systemic fibrosis. We rely on duplex imaging to help map the problem in these patients.

Patients with mild disease typically would not be recommended for the more sophisticated tests but will likely be placed in a walking program or given medication. The noninvasive test provides enough information to evaluate and follow these patients.

At our clinic, we have found physiologic testing is the superior approach to evaluating most if not all patients, and we believe it should be performed before any other testing. It is simple, inexpensive, very reproducible, and most importantly, it tells us everything we need to know to treat the patient most appropriately. In other words, it helps us to treat the patient, not just the picture. ■

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