

## Routine Screening for Abdominal Aortic Aneurysm in the Echocardiography Laboratory Using a “Modified” Abdominal Aortic Examination Protocol

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A 64-year-old female underwent transthoracic echocardiography (TTE) for a diagnosis of angina pectoris. Routine screening of the abdominal aorta from a subcostal window revealed an abdominal aortic aneurysm (AAA) (Fig. 1) not previously known, and not suspected by physical examination. The patient's history included that of hypertension, diabetes mellitus, carotid disease, and coronary artery disease with chronic angina pectoris.

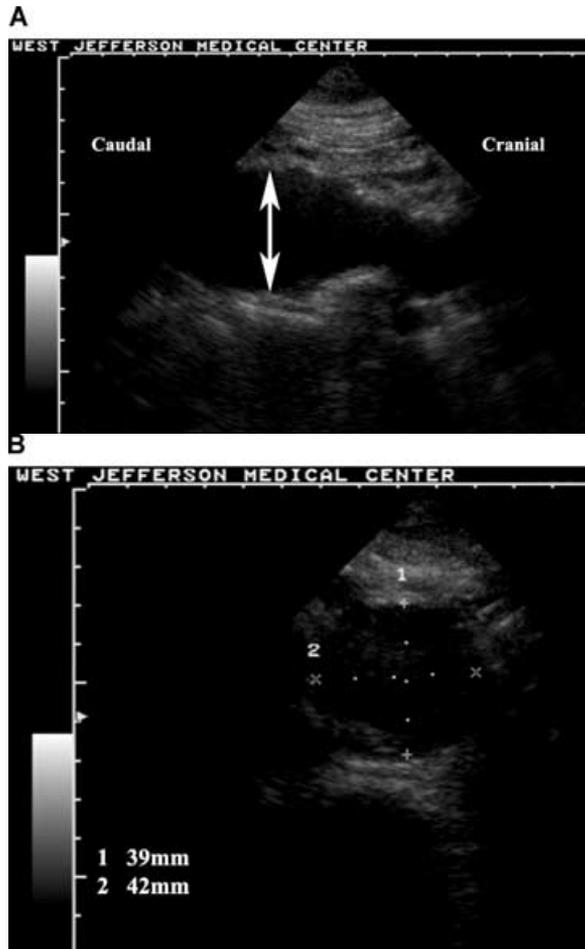
Several studies have reported results of screening for previously undiagnosed AAA using TTE,<sup>1-3</sup> and also a handheld portable personal ultrasound imaging device.<sup>4</sup> Defining an AAA as focal enlargement of the aorta  $\geq 3$  cm, a significant number of unsuspected AAAs were found in these studies, with the incidence a function of patient risk factors. The incidence of an “occult” AAA in the general population is  $\sim 1\%$ – $2\%$ ,<sup>4,5</sup> with  $1\%$ – $2\%$  of deaths in the elderly population due to a ruptured AAA.<sup>6</sup> Identifying

known risk factors for an AAA increases that incidence in a given population of patients. Persons between ages 68 and 80 years are reported to have an AAA incidence of  $2.7\%$ ,<sup>7</sup> but when the combination of hypertension, male gender, and age  $>55$  years is used, the AAA incidence is  $13.4\%$ .<sup>8</sup>

Most reported studies from laboratories whose primary function is TTE, perform a “modified” abdominal aortic examination (MAE),<sup>1-3</sup> to quickly screen for an AAA; however, a more complete examination is performed by others.<sup>9</sup> An MAE is generally performed with a low-frequency cardiac sector transducer, during the subcostal part of the TTE study.

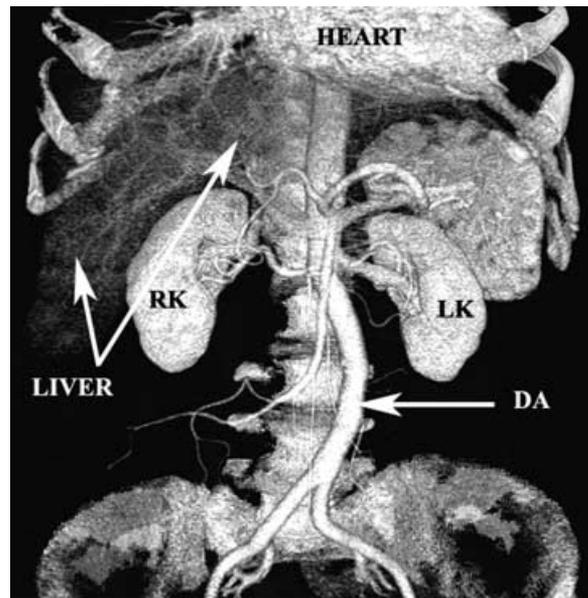
Imaging of the abdominal aorta is performed from subcostal and abdominal positions. Visualization of the abdominal aorta is performed just below the diaphragm caudally toward the aortic bifurcation. The abdominal aorta lies anterior to the spine and to the left of the midline (Fig. 2). Both longitudinal and transverse aortic planes are used for scanning toward the bifurcation, to particularly evaluate the infrarenal aorta.<sup>2</sup>

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**Figure 1.** Subcostal imaging (sector scanner; harmonic 3.6 MHz, 15 cm depth, 6 cm focus) of the abdominal aorta reveals a previously unrecognized small infrarenal abdominal aortic aneurysm. **A.** Subcostal aortic long-axis imaging reveals a maximum diameter of 41 mm (arrow). Cranial and caudal directions are noted in this long-axis image. **B.** Subcostal aortic short-axis image revealed aneurysm measurements of 39 mm (vertical) and 42 mm (transverse). Each "tick" on the vertical axes of these images represent 1 cm depth.

Longitudinal aortic imaging is first performed, with the transducer index marker pointing toward the patient's feet. Imaging first begins from a subcostal position and continues toward the umbilical area, which is usually the level of the aortic bifurcation. The transducer should follow both iliac vessels longitudinally, as an AAA may extend into these vessels.<sup>9</sup> Short-axis aortic plane images should next be obtained, with the transducer index mark pointing toward the patient's left side. Imaging begins in the subcostal window, and



**Figure 2.** Contrast enhanced computed tomography with three-dimensional reconstruction of the abdomen in a patient with a normal abdominal aorta (anterior projection) helps identify anatomy for the echocardiographer. During subcostal imaging, when the liver (LIVER) is noted "adjacent" to the aorta, it is usually suprarenal. The infrarenal descending abdominal aorta (DA) lies to the left of the spine, and the aortic bifurcation is at about the level of the umbilicus. In this image the manubrium is "cut away" to reveal the diaphragmatic surface of the heart and right ventricle (HEART). LK = left kidney; RK = right kidney.

proceeds caudally, with images obtained every 1–2 cm.

Measurement of aortic diameter is performed from the longitudinal plane (anteroposterior dimension) and the transverse plane (anteroposterior and lateral dimensions), most often using a leading-edge-to-leading-edge,<sup>2</sup> or inner-edge-to-inner-edge<sup>1</sup> method. Outside-to-outside wall measures, however, best correlate with surgical findings.<sup>9</sup>

Diagnostic quality image yield has been reported from echocardiography laboratories to be in the range of 86%<sup>3</sup>–95%,<sup>2</sup> despite no special abdominal preparation before examinations were performed. The false-negative rate is difficult to calculate as most patients do not undergo further testing for AAA. The false-negative rate is felt, however, to be low, as good images of the abdominal aorta are most often obtained.<sup>10</sup> Nevertheless, this "screening" protocol in the echocardiography laboratory is beneficial, as otherwise undiagnosed occult AAAs are found.

Laboratories report an added “scan” time to perform a MAE as approximately 6–7 minutes.<sup>2</sup> If an AAA is found, many laboratories report it in the TTE report, but a negative “screen” for an AAA will not be mentioned.

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