Ultrasound of the Abdominal Wall

Jason M. Wagner, MD*, Justin C. North, MD

KEYWORDS

• Sonography • Abdominal wall • Superficial • Subcutaneous • Mass • Hernia

KEY POINTS

- The use of dynamic ultrasound techniques, including Valsalva maneuver and upright imaging, is recommended when evaluating for hernias.
- Ultrasound is highly accurate for the diagnosis of hernia in the setting of a palpable mass, but may have reduced accuracy in the setting of possible occult hernia.
- Inguinal hernias can be characterized based on their location. Indirect hernias arise superior and lateral to the inferior epigastric artery and direct hernias are inferior and medial.
- Dynamic compression imaging is useful to evaluate reducibility of hernias and to identify abscesses with hyperechoic contents.
- Lipomas are the most common neoplasm of the abdominal wall, but must be distinguished from fat-containing hernias.

Videos of an inguinal fat-containing hernia enlarging with Valsalva maneuver, transverse sonography of an indirect inguinal hernia containing fluid, and transverse sonography of a direct inguinal hernia containing bowel accompany this article at http://www.ultrasound.theclinics.com/

INTRODUCTION

Ultrasound is a highly valuable imaging modality for evaluation of the abdominal wall because of its high spatial resolution, lower cost, and lack of ionizing radiation. Ultrasound has the major advantage of allowing dynamic imaging, including imaging in the upright position, imaging during Valsalva maneuver, and imaging during dynamic compression. Doppler technology is useful in evaluation of vascular abnormalities of the abdominal wall.

The abdominal wall is affected by a wide variety of pathology, including hernias, fluid collections, tumors, and tumor-like conditions. Ultrasound is effective in the evaluation of a large number of these conditions and may also be used to guide drainage of fluid collections and biopsy of tumors when appropriate. This article reviews the anatomy of the abdominal wall, sonographic technique, and common pathologies involving the abdominal wall.

ANATOMY

Knowledge of a few key ultrasound-visible structures and adjacent structures of the abdominal wall is crucial to making accurate diagnoses. The abdominal wall is divided into the anterior, lateral, and posterior portions with the anterior and lateral portions being the most important for ultrasound evaluation.

The anterior abdominal wall consists primarily of the rectus abdominis, a paired midline muscle connected centrally by the linea alba (**Fig. 1**). It is divided into individual muscle bellies at tendinous intersections (**Fig. 2**). The rectus is contained by the rectus sheath, a continuation of the

Department of Radiological Sciences, University of Oklahoma Health Sciences Center, 940 Northeast 13th Street, Suite 4G4250, Oklahoma City, OK 73104-5008, USA
* Corresponding author.
E-mail address: jason-wagner@ouhsc.edu

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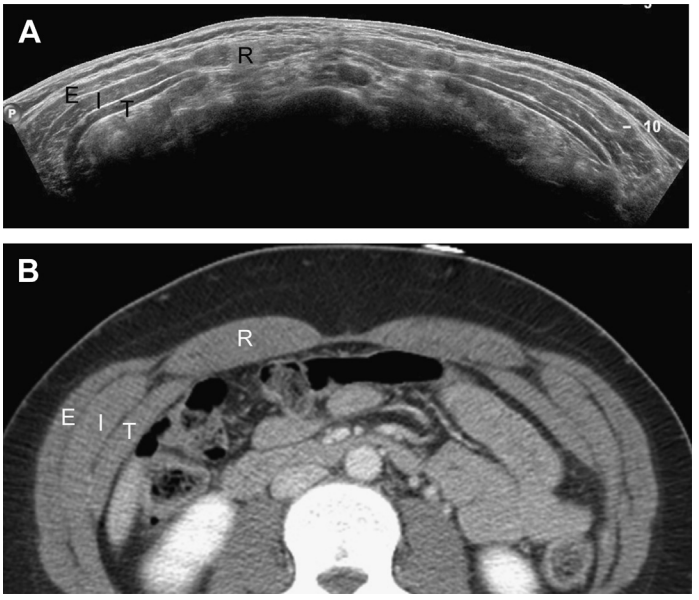

Fig. 1. Extended field of view transverse ultrasound (*A*) and contrast-enhanced computed tomography (CT) (*B*) of the abdominal wall demonstrate the paired rectus centrally, the layered muscles of the lateral abdominal wall, and their tendinous junctions. E, external oblique muscle; I, internal oblique muscle; R, rectus abdominus muscle; T, transversus abdominus muscle.

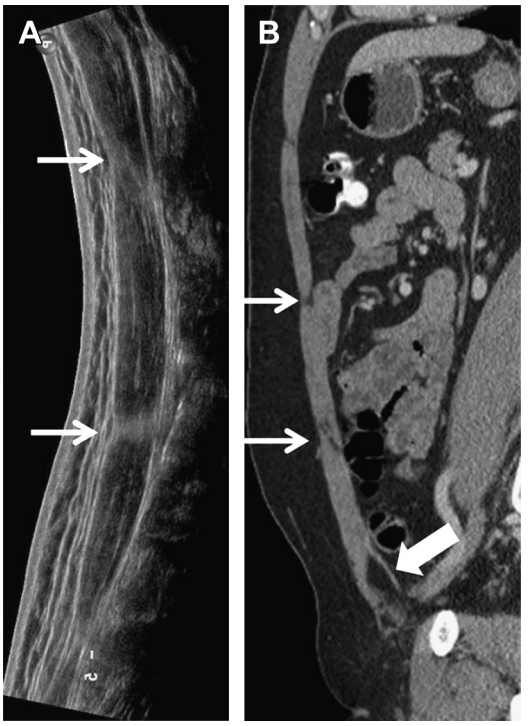

Fig. 2. Extended field of view longitudinal ultrasound (*A*) and sagittal reformatted CT image (*B*) through the paramidline rectus shows the tendinous intersections dividing individual muscle bellies (*thin arrows*). On the CT image, the inferior epigastric vessel (*thick arrow*) can be seen entering the muscle at the level of the arcuate line.

aponeurosis of the lateral abdominal wall musculature.[1] The deep aspect of the rectus sheath folds anterior to the rectus at the arcuate line, just below the level of the navel. Although the arcuate line is not visible by ultrasound, the superior epigastric vessels anastomose with inferior epigastric vessels at this level. This level can be identified as the superior epigastric vessels exit their course in the rectus and rectus sheath, and the inferior epigastric vessels run posterior to the rectus.

The lateral abdominal wall musculature consists of three layers. From superficial to deep these are the external oblique, internal oblique, and transverse abdominis (see **Fig. 1**). These attach medially to the rectus through the aponeurosis of the tendons of these muscles. They attach similarly to the iliac crest and inguinal ligament inferiorly.

Although the anatomy in the inguinal region is complex, most groin hernias can be correctly diagnosed according to their relation to the inguinal triangle (Hesselbach triangle). This triangle is formed by the intersection of the rectus muscle medially, the inferior epigastric vessels superolaterally, and the inguinal ligament inferiorly.

The superficial layers of the abdominal wall are also important because differential diagnosis is derived from the layer where the lesion arises. The layers from superficial to deep are epidermis, dermis, subcutaneous fat, fascia of the muscles of the abdominal wall, and the muscles themselves (**Fig. 3**).