Ultrasonography of Hernias

Jared S. Burlison, MD, PhD, Michael R. Williamson, MD*

KEYWORDS

• Hernia • Ultrasonography • Bowel • Spigelian hernia

KEY POINTS

- Femoral hernias move from superior to inferior in the proximal thigh and are located adjacent to the femoral vein.
- Indirect hernias move obliquely, indirectly, from superiolaterally near the anterior superior iliac spine in an inferior medial direction toward the pubic symphysis.
- Direct hernias move directly from posterior to anterior in the medial part of the lower quadrants of the abdomen.
- Umbilical hernias occur anywhere within 2 to 3 cm of the center of the umbilicus.

Videos of ultrasound technology being used on a range of hernias in different patients accompany this article at http://www.ultrasound.theclinics.com/

Ultrasound (US) evaluation of a possible hernia was seldom requested 20 years ago. Excluding umbilical and incisional hernias, we would receive approximately a half dozen requests per year for inguinal hernia evaluation. At present, we routinely perform US evaluation for all types of hernias (approximately 4–8 examinations per day at our institution). Our protocol requires that each of these examinations be evaluated in real time by a physician. Although many of our sonographers have become facile at these examinations, inadequate knowledge of the anatomy can lead to errors. The groin anatomy is complex and not easily understood. In addition, lack of fastidious scanning technique decreases the sensitivity of the examination. Therefore, the evaluation is initially performed by a sonographer, checked by a resident, and finally may be repeated by an attending. Cine clips can confirm and document the presence of hernias and are useful to the referring surgeon. It should be reemphasized that the hernia examination requires real-time participation by the physician. A well-trained sonographer can adequately perform these examinations, but only with enough prior physician supervised experience. Emergency room physicians often request hernia evaluation in the middle of the night. In this situation at our institution, it may not be possible for the examination to be repeated by a resident or attending. Therefore, it is essential that our sonographers be knowledgeable and capable of performing these examinations.

Pain in the lower quadrants and groin often poses a diagnostic challenge. With appendicitis, ovarian pathology, diverticular disease, and other colonic disorders in the differential diagnosis, we are often asked to evaluate for hernia when signs and symptoms are vague. Various musculoskeletal disorders such as rectus femoris muscle avulsions, sartorius muscle avulsions, iliopsoas injuries, and injuries to other pelvic and groin muscles may also produce symptoms that masquerade as a hernia.

Risk factors for hernia formation include congenital factors such as persistent processus vaginalis

Department of Radiology, The University of New Mexico, MSC 10 5530, 1 University of New Mexico, Albuquerque, NM 87131-0001, USA
* Corresponding author.
E-mail address: mwilliamson@salud.unm.edu

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in males or patent canal of Nuck in females; collagen abnormalities such as mucopolysaccharidoses, Ehlers-Danlos syndrome, Hunter-Hurler syndrome; family history; repeated pregnancies; obesity; surgical incisions; old age; poor muscle conditioning; peritoneal dialysis; ascites; and smoking. Frequent straining to urinate or defecate may also contribute.

A hernia is a fascial opening or defect through which tissues protrude from one anatomic compartment to another. Features of a hernia include the neck, defined as the size of the fascial defect, as well as the type and volume of the herniated contents (the hernia sac or the body of the hernia). The hernia sac is a diverticulum of peritoneum. The diverticulum contains tissues from the peritoneal cavity, usually fat and fluid, sometimes bowel, rarely other organs. Hernias may be reducible or irreducible, that is, the herniated contents can or cannot be returned to their normal anatomic compartment. Complications of small- or large-bowel herniation include luminal obstruction and vascular compromise (strangulation). There is almost always a small amount of fluid (peritoneal fluid) in the hernia sac.

Herniation may be exaggerated by maneuvers that increase intra-abdominal pressure such as the Valsalva maneuver, willful straining, or half sit ups (scanning while in an assisted half upright position). Imaging must be performed in both supine and standing positions. For example, many hernia examinations are in overweight and physically deconditioned patients who have poor abdominal muscle tone and cannot under any circumstance generate sufficient intra-abdominal pressure while supine. A complete examination cannot be performed if the patient cannot stand. However, there are occasional cases in which the hernia can only be seen with the patient supine.

The examination should be performed using a linear transducer (TD) with a wide field of view. Evaluating a large cross-sectional area is optimal as hernias are often identified several centimeters from where the patient indicates pain or symptoms. Therefore, it is important to evaluate the entirety of each cross section, as hernias are often initially seen at the corner or margin of an image. A variable-frequency TD with a range between 10 and 15 MHz is usually adequate for most hernia evaluations. A small percentage of obese patients require a lower-frequency TD for deeper penetration.

Hernias usually contain intraperitoneal or extraperitoneal fat. Extraperitoneal fat, also known as preperitoneal or properitoneal fat, lies between the peritoneal membrane and transversalis fascia, the deepest layer of the abdominal wall. However, US imaging cannot distinguish intraperitoneal from extraperitoneal fat. Although this limitation is usually inconsequential, it is important to understand that herniated intraperitoneal fat is often accompanied by bowel. As described earlier, herniated bowel is at risk for obstruction and/or strangulation, particularly if the hernia has a narrow neck. In the setting of a known hernia and acute abdominal pain, bowel ischemia should be considered since a delay in diagnosis and treatment can result in death. However, herniated fat can also produce pain if strangulated, an obviously less serious condition.

Therefore, detection of bowel within a hernia is of utmost importance. Bowel can be detected by the presence of peristalsis or intraluminal fluid levels, especially if fluid levels shift during the examination. Bowel gas within the herniated contents produces shadowing, and the combination of movement plus dirty shadows allows the diagnosis of bowel within the hernia with near certainty. Pressure and probing with the TD may aid in the detection of these features.

The US report should detail the sites and sides that were examined, that is, whether both spigelian and femoral hernia examinations, as well as direct and indirect hernia examinations, were performed and whether both right and left sides or just one side was examined. The size of the hernia sac and neck should be reported in 2 dimensions, which helps the surgeon determine the appropriate mesh size. The reducibility of the hernia should be commented on, as irreducible hernias are more likely to become strangulated. Finally, the contents of the hernia should be delineated, as the presence of bowel may necessitate surgical repair.

INGUINAL HERNIAS, THE QUICK VERSION

Before discussing the details of the US diagnosis of hernias, a short introduction to the 4 major types of inguinal hernias is given to familiarize the reader with each.

Indirect hernias protrude from superior-laterally at the anterior superior iliac spine in an inferior medial direction toward the pubic symphysis. These hernias always use the inguinal canal as their route and enter the groin indirectly from above.

Direct hernias are in the medial groin and protrude from posterior to anterior directly toward the US TD. They do not commonly use the inguinal canal as their route of travel.

Femoral hernias protrude inferiorly through the femoral canal, often into the medial thigh. The femoral canal is adjacent to and medial to the femoral vein.