

Point-of-Care Pelvic Ultrasonography in Emergency Medicine

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KEYWORDS

• Point-of-care ultrasonography • Obstetrics • Acute pelvic pain • Pelvic imaging • Vaginal bleeding

KEY POINTS

- Visualization of the yolk sac on transvaginal ultrasonography should be used as a criterion for diagnosing intrauterine pregnancy by emergency physicians.
- Values of β -human chorionic gonadotropin should not be used to exclude the diagnosis of ectopic pregnancy in patients with a nondiagnostic ultrasonogram.
- The presence of arterial waveforms on Doppler imaging of the ovaries does not rule out adnexal torsion.
- The use of clinical algorithms that include ultrasonography in the diagnosis of appendicitis can decrease ionizing radiation without decreasing diagnostic accuracy.

INTRODUCTION

Point-of-care (POC) pelvic ultrasound by emergency physicians allows for a rapid and safe diagnosis of a multitude of pathologies during the acute phase of disease in both the obstetric and nonobstetric patient. Ultrasonography has become the gold standard for evaluation of acute pelvic pathology. History and physical examination are notoriously unreliable, with poor interexaminer reliability.^{1,2} Emergency medicine physicians' expertise in performing POC ultrasonography has been well-documented in the literature on a wide variety of applications. Its integration into clinical practice is supported by the American College of Emergency Physicians (ACEP).³

INDICATIONS

Patients presenting with complaints of pelvic pain, abdominal pain, abdominal distention, palpable abdominal mass, vaginal bleeding, or decreased

fetal movement are amenable to evaluation with POC ultrasonography. Additionally, undifferentiated patients with a history of traumatic injury, hemodynamic instability, vague symptoms of syncope, fatigue, dizziness, back pain, or flank pain may benefit from the use of POC pelvic ultrasonography.

SONOGRAPHIC TECHNIQUE

Transabdominal sonography (TAS) and transvaginal sonography (TVS) are the gold standard for the evaluation of the pelvic organs. However, both have inherent limitations and advantages that need to be weighed by the clinician. TAS provides a greater field of view, allowing the clinician to evaluate the surrounding structures such as the splenorenal and hepatorenal spaces for free peritoneal fluid. It allows for assessment of the spatial relationship of the pelvic organs to other abdominal structures, which is ideal for imaging

Funding Sources: None.

Conflict of Interest: None.

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Ultrasound Clin 9 (2014) 173–184

<http://dx.doi.org/10.1016/j.cult.2014.01.008>

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large masses. In addition, it is more rapidly performed at the bedside and can be used as a preliminary assessment when TVS is planned. Alternatively, TVS provides better visualization of the pelvic organs, owing to the proximity of the probe to the pelvic organs, as well as improved spatial resolution, as it is a higher-frequency probe; this is particularly true in obese patients whose pelvic organs may not be visualized on TAS. Also, the endocavitary probe can be used to separate pelvic organs, revealing additional abnormalities such as an ectopic pregnancy. The endocavitary probe may also directly probe organs of interest to see if they are the cause of a patient's pain, in effect performing a hyperaccurate physical or bimanual examination. However, TVS is limited in its field of view, requires patient positioning and cooperation, and is a more invasive examination. These two modalities are complementary. In most robust emergency medicine practices the endovaginal examination is done immediately at the time of the pelvic evaluation and TAS is performed only if additional views are needed.^{4,5}

For TAS, the bladder should be full, as it provides an optimal acoustic window to visualize the uterus and adnexa. The bladder should not be overly distended because this results in the pelvic organs being displaced posteriorly, thus negatively affecting imaging quality. By contrast, TVS is best performed with a completely empty bladder. A distended bladder pushes the uterus posteriorly and distorts the anatomy, pushing it further from the probe.

Special considerations are necessary for the patient's comfort when performing TVS. Consent should be obtained. The procedure should be explained in detail to the patient, as well as the possible need for additional imaging by other specialties (Radiology or Obstetrics/Gynecology [OB/-GYN]). Analgesia may be required by some patients with pelvic pain. For the patient's comfort,

the examination can be performed along with the speculum and bimanual examination. In addition, the patient needs to be positioned appropriately to allow unobstructed motion of the endocavitary probe, which involves the use of a bed with stirrups. If one is not available it is possible, though not ideal, to elevate the patient's pelvis by using several folded blankets or a blanket-wrapped, face-down bedpan. The motor skills required for successful TVS are unlike those for most emergency sonography. The endocavitary probe is directed to different areas of the pelvis using the midpoint of the probe as a fulcrum in such a way that to visualize anteriorly, the probe handle should be moved posteriorly, and to visualize to the left the probe handle is directed to the right.

The operator should obtain two orthogonal views of each organ and structure, sweeping the ultrasound probe to fully evaluate the entire organ. Images of the uterus should be obtained in the sagittal and transverse planes, identifying the cervix, the fundus, and the endometrial stripe. The characteristics of the endometrial stripe change throughout the ovulatory cycle. Before ovulation, it is thin and has a multilayered appearance. During the secretory phase, it becomes thicker and more echogenic.⁶ For the evaluation of the adnexa, the iliac vessels are used as a landmark. The ovaries normally lie adjacent or anterior to the iliac vessels. Ovaries are identified by their characteristic oval appearance with multiple hypoechoic follicles within the isoechoic ovarian tissue (**Fig. 1**). The ovaries should be assessed in two planes. Adjacent structures, free fluid, complex fluid collections, and masses should be sought and documented.

THE OBSTETRIC PATIENT

Vaginal bleeding or pelvic pain in a first-trimester pregnancy is a common presenting complaint in

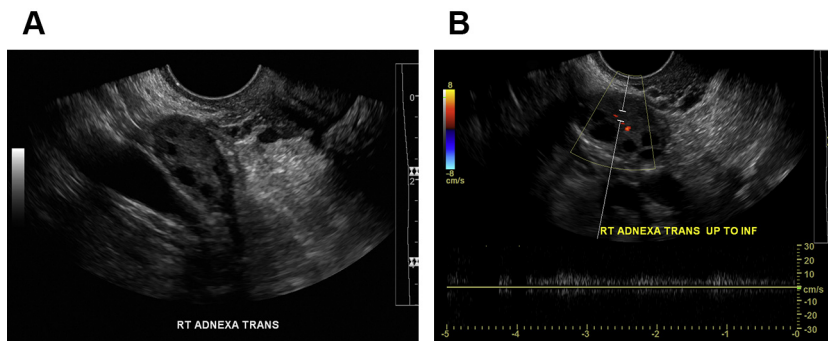


Fig. 1. (A) Transvaginal gray-scale image of the right adnexa shows a normal right ovary with multiple follicles. (B) Spectral Doppler flow image of the right ovary shows a normal venous waveform.

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