

Evidence Discussion (PV 1.1)

- Ultrasonography and magnetic resonance imaging (MRI) are the imaging techniques of choice for the pregnant patient, they should be used prudently and only when use is expected to answer a relevant clinical question¹.
- CT is not generally warranted for evaluating pelvic anatomy because it is limited due to soft tissue contrast resolution. Computed tomography (CT) scans are generally not recommended during pregnancy unless the benefits clearly outweigh the potential risks². Computed tomography (CT) scan if necessary in addition to ultrasonography or MRI or if more readily available for the diagnosis in question, should not be withheld from a pregnant patient¹. The risk of adverse effects from ionizing radiation should always be weighed against the risk of not performing the procedure and the benefit derived from the procedure².
- Ultrasound is the recommended modality for imaging the female pelvis; no alternative modality has demonstrated sufficient superiority to justify routine use³, and transvaginal ultrasound is the optimal study to evaluate adult female pelvic pathology. Transabdominal pelvic ultrasound is a useful complementary study to transvaginal ultrasound and may substitute for transvaginal ultrasound in pediatric individuals or non-sexually active females. The American Institute of Ultrasound in Medicine (AIUM.org) launched an initiative in 2012 "Ultrasound First," which advocates the use of ultrasound examinations before other imaging modalities when the evidence shows that ultrasound imaging is at least equally, if not more, effective for the target anatomic area⁴. This applies particularly to obstetric and gynecologic patients for whom a skillfully performed and well-interpreted ultrasound image usually obviates the need to proceed to additional more costly and complex cross-sectional imaging techniques³.
- Transperineal ultrasound can be useful for cases of suspected urethral abnormalities, urinary incontinence, pelvic prolapse, or vaginal cysts^{5,6}. A study by Yang, et al confirmed transvaginal or transperineal ultrasound to be a non-invasive and cost-effective modality for diagnosis of urethral and periurethral masses⁵. Vaginal and urethral imaging is limited on transvaginal ultrasound due to the position of the endovaginal probe rendering the vagina out of the field, on computed tomography (CT) due to poor soft tissue discrimination of the vaginal walls and on magnetic resonance imaging (MRI). MRI of the vagina should be done with thin slice thickness and proper choice of the degree of angulation and used MR sequence, otherwise there is limited evaluation of the vagina⁶. Transperineal ultrasound is also a dynamic real-time examination, and can detect subtle abnormalities that are not seen in static imaging⁶.
- Scrotal ultrasound is supported for evaluation of scrotal pain or suspected mass^{7,8}. The American Urological Association recommends scrotal ultrasound for initial evaluation of unilateral or bilateral scrotal mass suspicious for neoplasm⁸.
- Three-dimensional (3D) rendering with ultrasound can be considered when ultrasound shows suspected uterine anomaly, uterine intra-cavitary lesion, hydrosalpinges or peritoneal cysts^{9, 10, 11, 12}. A study by Laskshmy et al found 3D ultrasound to be a highly sensitive and specific tool for accurately diagnosing congenital uterine anomalies⁹. 3D rendering has shown a high degree of concordance with MRI and laparoscopy for congenital uterine anomalies, and is non-invasive, readily available and relatively cost-effective¹⁰. Three-dimensional ultrasound is a noninvasive method for evaluation of adnexal pathology¹³.

- Doppler scan can be of benefit in addition to ultrasound for further evaluation of suspected uterine or ovarian abnormalities. Doppler flow mapping is useful in diagnosing submucosal fibroids and endometrial polyps¹⁴. Per ACOG (American College of Obstetrics and Gynecology), color Doppler ultrasonography is useful to evaluate the vascular characteristics of adnexal masses¹⁵.

MRI pelvis is useful in cases such as inconclusive ultrasound for adenomyosis, “MRI is a second-line examination in the diagnosis of internal adenomyosis, mainly after a non-conclusive US evaluation. In addition, MRI can differentiate between the subtypes of adenomyosis.”¹⁶

MRI pelvis is also useful for further evaluation of indeterminate adnexal masses. A study by Dirrichs, et al found MRI to improve sensitivity and specificity of diagnosis of indeterminate adnexal masses detected at TVUS, and use of MRI changed therapeutic management in 34% of cases¹⁷.

MRI can aid in the diagnosis of deep pelvic endometriosis¹⁸. MRI pelvis is useful for further evaluation of unexplained pelvic pain when ultrasound evaluation is inconclusive¹⁹.

Pelvic MRI is useful for evaluation of fibroids prior to uterine-sparing interventional techniques. “Although a high-quality ultrasonography (US) examination may be sufficient for evaluation in patients with straightforward cases of fibroids (for instance to estimate the size of a dominant fibroid), imaging evaluation is most reliably performed with magnetic resonance (MR) imaging to determine the characteristics, number, size, and location of fibroids and to assess for other pathologic conditions such as adenomyosis.”²⁰

References

1. Guidelines for diagnostic imaging during pregnancy and lactation. Committee Opinion No. 723. American College of Obstetricians and Gynecologists. Obstet Gynecol 2017;130:e210–6. Reaffirmed 2021.
2. ACR-SPR Practice Parameter for Imaging Pregnant or Potentially Pregnant Patients with Ionizing Radiation. Resolution 31, revised 2023.
3. Benacerraf BR, Abuhamad AZ, Bromley B, et al. Consider ultrasound first for imaging the female pelvis. American Journal of Obstetrics and Gynecology. 2015;212(4):450-455. doi:10.1016/j.ajog.2015.02.015
4. Minton K.K., Abuhamad A.Z., 2012 Ultrasound First Forum Proceedings. J Ultrasound Med. 2013; 32: 555-566.
5. Yang et al. Ultrasonographic Imaging Features of Female Urethral and Peri-urethral Masses. Ultrasound in Medicine and Biology. 2020;46 (8):1896-1907.
6. Hamed ST, Mansour SM. Surface transperineal ultrasound and vaginal abnormalities: applications and strengths. Br J Radiol. 2017 Dec;90(1080):20170326. doi: 10.1259/bjr.20170326.
7. Hartman MS, Leyendecker JR, Friedman B, et al. ACR Appropriateness Criteria® Acute Onset of Scrotal Pain—Without Trauma, Without Antecedent Mass. Last review date: 2019. <https://acsearch.acr.org/docs/69363/Narrative/>

8. Stephenson A, Eggener SE, Bass EB, et al. Diagnosis and Treatment of Early Stage Testicular Cancer: AUA Guideline. *Journal of Urology*. 2019;202(2):272-281. doi:10.1097/ju.0000000000000318.
9. Lakshmy S, Rose N, Ramachandran M. Role of three dimensional ultrasound in uterine anomalies - 3D assessment of cervix in septate uteri. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*. 2016;3563-3567. doi:10.18203/2320-1770.ijrcog20163445
10. Turkgeldi E, Urman B, Ata B. Role of Three-Dimensional Ultrasound in Gynecology. *Journal of Obstetrics and Gynaecology of India*. 2014;65(3):146-154. doi:10.1007/s13224-014-0635-z
11. Graupera B, Pascual MA, Hereter L, et al. Accuracy of three-dimensional ultrasound compared with magnetic resonance imaging in diagnosis of Müllerian duct anomalies using ESHRE-ESGE consensus on the classification of congenital anomalies of the female genital tract. *Ultrasound in Obstetrics & Gynecology*. 2015;46(5):616-622. doi:10.1002/uog.14825
12. Sakhel K, Benson CB, Platt LD, Goldstein SR, Benacerraf BR. Begin with the basics: role of 3-dimensional sonography as a first-line imaging technique in the cost-effective evaluation of gynecologic pelvic disease. *Journal of Ultrasound in Medicine*. 2013;32(3):381-388. doi:10.7863/jum.2013.32.3.381
13. Meng-Hsing Wu, Yueh-Chin Cheng, Chiung-Hsin Chang, Huei-Chen Ko, Fong-Ming Chang, Three-dimensional Ultrasound in Evaluation of the Ovary. *Journal of Medical Ultrasound*, Volume 20, Issue 3, 2012, Pages 136-141, ISSN 0929-6441, <https://doi.org/10.1016/j.jmu.2012.07.001>.
14. Cil AP, Tulunay G, Kose MF, Haberal A. Power Doppler properties of endometrial polyps and submucosal fibroids: a preliminary observational study in women with known intracavitary lesions. *Ultrasound Obstet Gynecol*. 2010 Feb;35(2):233-7. doi: 10.1002/uog.7470. PMID: 20101638.
15. Practice Bulletin No. 174 Evaluation and Management of Adnexal masses. *Obstetrics & Gynecology*. 2016; Reaffirmed 2021.128(5):1193-1195. doi:10.1097/aog.0000000000001763
16. Bazot M, Daraï E. Role of transvaginal sonography and magnetic resonance imaging in the diagnosis of uterine adenomyosis. *Fertility and Sterility*. 2018;109(3):389-397. doi:10.1016/j.fertnstert.2018.01.024
17. Dirrichs T, Bauerschlag D, Maass N, Kuhl CK, Schrading S. Impact of multiparametric MRI (mMRI) on the therapeutic management of adnexal masses detected with transvaginal ultrasound (TVUS): an interdisciplinary management approach. *Acad Radiol*. 2022;29(2):183-97. doi:10.1016/j.acra.2020.11.016
18. Macario S, Chassang M, Novellas S, et al. The Value of Pelvic MRI in the Diagnosis of Posterior Cul-DeSac Obliteration in Cases of Deep Pelvic Endometriosis. *American Journal of Roentgenology*. 2012;199(6):1410-1415. doi:10.2214/ajr.11.7898
19. Maturen KE, Akin EA, Dassel M, et al. ACR Appropriateness Criteria® Postmenopausal Subacute or Chronic Pelvic Pain. *Journal of the American College of Radiology*. 2018;15(11):S365-S372. doi:10.1016/j.jacr.2018.09.023.
20. Silberzweig JE, Powell DK, Matsumoto AH, Spies JB. Management of Uterine Fibroids: A Focus on Uterine-sparing Interventional Techniques. *Radiology*. 2016;280(3):675-692. doi:10.1148/radiol.2016141693

21. Zulfiqar M, Shetty A, Yano M, McGettigan M, Itani M, Naeem M, Ratts VS, Siegel CL. Imaging of the Vagina: Spectrum of Disease with Emphasis on MRI Appearance. Radiographics. 2021 SepOct;41(5):1549-1568. doi: 10.1148/rg.2021210018. Epub 2021 Jul 23.
22. AIUM Practice Parameter for the Performance of an Ultrasound Examination of the Female Pelvis J Ultrasound Med 2020; 9999:1-7
23. Practice Bulletin No. 175: Ultrasound in Pregnancy, Obstetrics & Gynecology: December 2016 – Volume 128 - Issue 6 - p e241-e25 Reaffirmed 2022