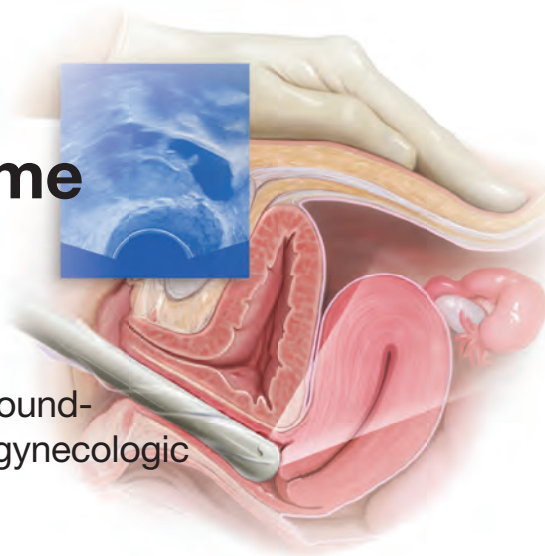


Dynamic ultrasonography: An idea whose time has come

Steven R. Goldstein, MD, NCMP, CCD

An ultrasound expert makes the case for using ultrasound-enhanced bimanual examination as a routine part of gynecologic care to assist in diagnosis and enhance patient care



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Ultrasonography truly has revolutionized the practice of obstetrics and gynecology. Initially, transabdominal ultrasonography was mainly a tool of the obstetrician. Early linear array, real-time equipment had barely enough resolution to perform very limited assessments, such as measure biparietal diameter and identify vertex versus breech presentation, and anterior versus posterior placenta location. The introduction of transvaginal probes, which employ higher frequency and provide closer proximity to structures, yielded a degree of image magnification that was dubbed *sonomicroscopy*.¹ In other words, we are seeing things with our naked eye that we could not see if we could hold them in our hand at arm's length and squint at them. An example of this is the cardiac activity clearly visible in a 3-mm embryo at 45 days from the last menstrual period. One would not appreciate this without the low power magnification of the vaginal probe.

The concept of dynamic imaging

As early as 1990, I realized that there is a difference between an ultrasound “examination” performed because of referral for imaging, which generated a report back to the referring health care provider, and “examining” one’s own patient with ultrasonography at the time of bimanual exam. I coined the phrase “the ultrasound-enhanced bimanual exam,” and I believed it should become a routine part of gynecologic care. I put forth this thesis in an article entitled, “Incorporating endovaginal ultrasonography into the overall gynecologic examination.”² The idea is based on thinking: What exactly are we are trying to discern from a bimanual exam?

Clinicians perform the bimanual exam thousands of times. The bimanual examination consists of 2 components, an objective portion and a subjective portion. The objective component attempts to discern information that is totally objective, such as, Is the ovary enlarged? If so, is it cystic or solid? Is this uterus normal in shape and contour? If so, does it feel like leiomyomas or is it globally enlarged as with adenomyosis? The subjective component of the bimanual examination attempts to determine whether or not tenderness is present or if there is normal mobility of the pelvic organs.

The objective component can be replaced by an image in very little time if the examiner has the equipment and the knowledge and



Dr. Goldstein is Professor of Obstetrics and Gynecology, New York University Grossman School of Medicine, Director of Gynecologic Ultrasound, and Co-Director of Bone Densitometry, New York University Langone Medical Center, New York. He serves on the OBG MANAGEMENT Board of Editors.

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ILLUSTRATION BY KIMBERLY MARTENS FOR OBG MANAGEMENT

skill. The subjective component, however, depends on the experience and often the nuance of the examiner. That was my original thought process. I wanted, and still want, the examining clinician to use *imaging* as part of the overall exam. But now, I want the imager to use *examination* as part of the overall imaging. (Read the online version of this article at mdedge.com/obgyn to view **VIDEOS 1A AND 1B**, as well as the rest of the videos referenced in this article.) This is the concept of *dynamic imaging*. It involves the liberal use of the abdominal hand as well as an in-and-out motion of the vaginal probe to ascertain aspects of the examination that in the past I deemed “subjective.” Mainly, this involves the aspects of mobility and/or tenderness.

Guidelines concerning pelvic ultrasound do not consider dynamic imaging

Until now, most imagers take a myriad of pictures, mostly still snapshots, to illustrate anatomy. Most imaging physicians then look at a series of such pictures and may never even hold the transducer. This is increasingly true in instances of remote teleradiology. Even for the minority of imagers who utilize video clips (**VIDEOS 2A–2C**), these are still representations of *anatomy*.

One need look no further than the guidelines that underpin the expectation of those who scan the female pelvis. The American Institute of Ultrasound in Medicine (AIUM) published a practice parameter for the performance of ultrasonography of the female pelvis, developed in collaboration with the American College of Radiology, American College of Obstetricians and Gynecologists, Society for Pediatric Radiology, and Society of Radiologists in Ultrasound.³ Nowhere does this document mention anything other than what images to obtain, where to look, and how to measure. Nowhere is there any mention of dynamic imaging—the concept of using one’s other hand on the abdomen, eliciting pain with the vaginal probe, checking for mobility, asking the patient to bear down. The document lists indications for pelvic sonography that include but are not limited to 19 different indications, such as pelvic

pain, evaluation of dysmenorrhea, evaluation for signs or symptoms of pelvic infection, and evaluation of incontinence or pelvic organ prolapse (**TABLE**).³

Dynamic ultrasonography can aid in the diagnosis of certain conditions

Specifically, what can dynamic ultrasonography add to anatomic imaging? The main considerations are pain, adhesions, endometriosis, and pelvic organ prolapse.

Pelvic pain or tenderness

How can you evaluate a patient’s pelvic pain with an anatomic image? Perhaps pain can be corroborated if there is a classic ovarian endometrioma (**FIGURE 1**, page 52) (**VIDEOS 3A, 3B**) or classic hydrosalpinx (**FIGURE 2**, page 52) (**VIDEOS 4A–4C**). But can we evaluate pelvic pain with only an anatomic image? No, absolutely not. Evaluating pain requires dynamic assessment. As described above, in a dynamic ultrasound assessment, liberal use of the abdominal hand and the tip of the vaginal probe can elicit where the patient’s pain exists and whether the pain can be recreated.

Adhesions

Pelvic adhesions can be a significant source of pelvic pain and, also, sometimes infertility. The adhesions themselves may not be visible on anatomic imaging. This is where the concept of the *sliding organ sign* is paramount, a concept first described by Dr. Ilan Timor-Tritsch in his book *Transvaginal Sonography*.⁴ He stated, “Diagnosis of pelvic adhesions becomes possible by the ‘sliding organ sign.’ The transducer tip is pointed at the uterus, ovaries or any pelvic finding, and a gentle push-pull movement of several centimeters is started. If no adhesions are present, the organs will move freely in the pelvis. This displacement of organs is perceived on the screen as a sliding movement.”⁴ Thus, if structures are in fact adherent, they will move in tandem with each other as evidenced by this dynamic assessment. If they are not adherent,



FAST TRACK

Dynamic ultrasonography can be used to aid in the diagnosis of pelvic pain, adhesions, endometriosis, and pelvic organ prolapse and incontinence

TABLE Some indications for pelvic sonography³

- Evaluation of pelvic pain
- Evaluation of pelvic masses
- Evaluation of endocrine abnormalities, including polycystic ovaries
- Evaluation of dysmenorrhea
- Evaluation of amenorrhea
- Evaluation of abnormal bleeding
- Evaluation of delayed menses
- Follow-up of a previously detected abnormality
- Evaluation, monitoring, and/or treatment of infertility patients
- Evaluation in the presence of a limited clinical examination of the pelvis
- Evaluation for signs or symptoms of pelvic infection
- Further characterization of a pelvic abnormality noted on another imaging study
- Evaluation of congenital uterine and lower genital tract anomalies
- Evaluation of excessive bleeding, pain, or signs of infection after pelvic surgery, delivery, or abortion
- Localization of an intrauterine contraceptive device
- Screening for malignancy in high-risk patients
- Evaluation of incontinence or pelvic organ prolapse
- Guidance for interventional or surgical procedures
- Preoperative and postoperative evaluation of pelvic structures

they will move slightly but independently of each other (VIDEOS 5A-5G).

Endometriosis

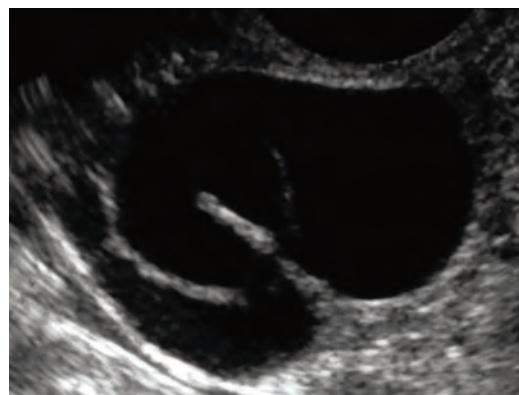
Dynamic ultrasonography can be a significant part of a nonlaparoscopic, *presumptive* diagnosis of endometriosis when there is no obvious ovarian endometrioma.⁵ The evidence for this comes from a classic paper by Okaro and colleagues, “The use of ultrasound-based ‘soft markers’ for the prediction of pelvic pathology in women with chronic pelvic pain—can we reduce the need for laparoscopy?”⁶ In that study, 120 consecutive women with chronic pelvic pain scheduled for laparoscopy underwent vaginal ultrasonography. Hard markers were defined as structural abnormalities, such as classic endometriomas or hydrosalpinges.

These markers demonstrated a 100% correlation (24 of 24 women) with laparoscopic findings, as one might have suspected. In addition, soft markers (VIDEOS 6A-6C) were defined as reduced ovarian mobility, site-

FIGURE 1 Ultrasound still image of a classic endometrioma



FIGURE 2 Ultrasound still image of a classic hydrosalpinx



specific pelvic tenderness, and the presence of loculated peritoneal fluid in the pelvis. These were predictive of pelvic pathology in 73% of these women (37 of 51).⁶

Thus, women who have soft markers on dynamic scanning but no obvious anatomic abnormalities can be treated with a high degree of sensitivity without the need for laparoscopic intervention.

Pelvic organ prolapse and incontinence

With the vaginal probe in place, and even a small amount of urine in the bladder, the patient can be asked to bear down (Valsalva maneuver), and cystocele (VIDEO 7) and/or hypermobility of the urethra (VIDEO 8) is easily discerned with dynamic ultrasonography. This information is not available on static anatomic imaging.

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A tool that enhances patient care

Dynamic ultrasonography is an important and emerging topic in gynecologic imaging. Static images and even cine clips will yield only anatomic information. Increasingly, whoever holds the transducer—whether it

be the gynecologist, radiologist, or sonographer—needs to examine the patient with the probe and include liberal use of the abdominal hand as well. Incorporating this concept will enhance the overall diagnostic input of ultrasound scanning, not just imaging, into better and more accurate patient care. ●

References

1. Goldstein SR. Pregnancy I: Embryo. In: *Endovaginal Ultrasound*. 2nd ed. Wiley-Liss; 1991:58.
2. Goldstein SR. Incorporating endovaginal ultrasonography into the overall gynecologic examination. *Am J Obstet Gynecol*. 1990;162:625-632.
3. AIUM practice parameter for the performance of an ultrasound examination of the female pelvis. *J Ultrasound Med*. 2020;39:E17-E23.
4. Timor-Tritsch IE, Rottem S, Elgali S. How transvaginal sonography is done. In: Timor-Tritsch IE, Rottem S, eds. *Transvaginal Sonography*. Elsevier Science Publishing Company, Inc; 1988:24.
5. Taylor HS, Adamson GD, Diamond MP, et al. An evidence-based approach to assessing surgical versus clinical diagnosis of symptomatic endometriosis. *Int J Gynaecol Obstet*. 2018;142:131-142.
6. Okaro E, Condous G, Khalid A, et al. The use of ultrasound-based 'soft markers' for the prediction of pelvic pathology in women with chronic pelvic pain—can we reduce the need for laparoscopy? *BJOG*. 2006;113:251-256.

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VIDEO 1A Liberal use of your nonscanning hand on dynamic scanning shows “wiggling” of debris classic of a hemorrhagic corpus luteum

VIDEO 1B Liberal use of your nonscanning hand helps identify a small postmenopausal ovary

VIDEO 2A Dynamic scanning can give the correct diagnosis even though clips were used! This clip appears to show a relatively normal uterus

VIDEO 2B Dynamic scanning can give the correct diagnosis even though clips were used! Same patient as in Video 2A showing what appears to be a solid adnexal mass

VIDEO 2C Dynamic scan clearly shows the “mass” to be a pedunculated fibroid

VIDEO 3A Video clip of a classic endometrioma

VIDEO 3B Classic endometrioma showing no Doppler flow internally

VIDEO 4A Video of dynamic assessment in a patient with pain symptoms with a hydrosalpinx

VIDEO 4B Another example of video of dynamic assessment in a patient with pain symptoms with a hydrosalpinx

VIDEO 4C Another example of video of dynamic assessment in a patient with pain symptoms with a hydrosalpinx

VIDEO 5A Sliding organ sign with normal mobility (Courtesy of Dr. Ilan Timor-Tritsch)

VIDEO 5B Sliding sign showing adherent ovary (Courtesy of Dr. Ilan Timor-Tritsch)

VIDEO 5C Normal mobility (Courtesy of Dr. Ilan Timor-Tritsch)

VIDEO 5D Left ovary: Normal mobility (Courtesy of Dr. Ilan Timor-Tritsch)

VIDEO 5E Right ovary: Normal mobility (Courtesy of Dr. Ilan Timor-Tritsch)

VIDEO 5F Normal mobility even with a classic endometrioma (Courtesy of Dr. Ilan Timor-Tritsch)

VIDEO 5G Adherent ovary (Courtesy of Dr. Ilan Timor-Tritsch)

VIDEO 6A Dynamic scanning shows the ovary to be “stuck” in the cul-de-sac in a patient with endometriosis

VIDEO 6B Dynamic scanning in another patient with endometriosis showing markedly retroverted uterus with adherent bowel posteriorly

VIDEO 6C Dynamic scanning in another patient with endometriosis showing markedly retroverted uterus with adherent bowel posteriorly

VIDEO 7 Cystocele or urethral lengthening are key elements for the diagnosis of incontinence with or without pelvic relaxation

VIDEO 8 Urethral lengthening is a key element for the diagnosis of incontinence with or without pelvic relaxation