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Abnormal Uterine Bleeding: The Role of Ultrasound

Steven R. Goldstein, MD

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Abnormal uterine bleeding accounts for up to 20% of gynecologic visits [1]. Any pregnancy event must first be excluded, and the use of inexpensive, rapid, monoclonal antibody urine human chorionic gonadotropin tests, readily available over-the-counter, makes this a relatively simple maneuver. When a pregnancy event has been excluded, the most likely cause of bleeding is dysfunctional anovulatory bleeding—what patients are often told is a "hormone imbalance." As women get older, however, organic pathology such as polyp, submucous myomas, hyperplasias, and even frank carcinoma become more likely. According to the SEER database [2], the incidence of endometrial carcinoma in women aged 30 to 34 years is 2.3/100,000, increases to 6.1/100,000 between ages 35 and 40 years, and rises dramatically to 36.2/100,000 in women aged 40 to 49 years. In postmenopausal women on no hormone replacement therapy, any bleeding is considered "cancer until proven otherwise," although the incidence of malignancy in such patients ranges from 2% to 10% depending on risk factors [3].

The role of the clinician in a patient who presents with bleeding is twofold: first, to exclude endometrial carcinoma in women older than 40 years [4], and second, to identify the source of bleeding so it can be stopped or managed.

Most patients who have abnormal bleeding will have dysfunctional uterine bleeding in association with episodes of anovulation (premenopausal) or endometrial atrophy (postmenopausal) that can best be managed hormonally or expectantly with reassurance. The main goal is to distinguish such patients from those who have organic pathologic conditions in a safe, painless, convenient manner.

Evolution of endometrial assessment

Initially, curettage was the "gold standard." First described in 1843 [5], its performance in the hospital became the most common operation performed on women in the world. As early as the 1950s, a review of 6907 curettage procedures [6] found the technique missed endometrial lesions in 10% of cases. Of these, 80% were polyps.

In the 1970s, vacuum-suction curettage devices allowed sampling without anesthesia in an office setting. The most popular was the Vabra aspirator (Berkeley Medevices, Berkeley, California). This device was found to be 86% accurate in diagnosing cancer [7]. Subsequently, less expensive, smaller,

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New York University School of Medicine, 530 First Avenue, Suite 10N, New York, NY 10016, USA
E-mail address: steven.goldstein@med.nyu.edu

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less painful plastic catheters with their own internal pistons to generate suction became popular. One of these, the Pipelle device (Unimar, Wilton, Connecticut), was found to have similar efficacy but better patient acceptance compared with the Vabra aspirator [8].

Rodriguez and colleagues [9] did a pathologic study of 25 hysterectomy specimens. The percentage of endometrial surface sampled by the Pipelle device was 4% versus 41% for the Vabra aspirator.

In one widely publicized study [10], the Pipelle had a 97.5% sensitivity to detect endometrial cancer in 40 patients undergoing hysterectomy. The shortcoming of that study was that the diagnosis of malignancy was known before the performance of the specimen collection.

In another important study, Guido and colleagues [11] also studied the Pipelle biopsy in patients who had known carcinoma undergoing hysterectomy. Among 65 patients, a Pipelle biopsy provided tissue adequate for analysis in 63 (97%), but malignancy was detected in only 54 patients (83%). Of the 11 with false-negative results, 5 (8%) had disease confined to endometrial polyps and 3 (5%) had tumor localized to less than 5% of the surface area of the cavity. The surface area of the endometrial involvement in that study was 5% or less of the cavity in 3 of 65 (5%); 5% to 25% of the cavity in 12 of 65 (18%), of which the Pipelle missed four cases; 26% to 50% of the cavity in 20 of 65 (31%), of which the Pipelle missed four; and greater than 50% of the cavity in 30 of 65 patients (46%), of which the Pipelle missed none. These results provide great insight about the way endometrial carcinoma can be distributed over the endometrial surface or confined to a polyp. Because tumors localized in a polyp or a small area of endometrium may go undetected, the investigators in that study concluded that the "Pipelle is excellent for detecting global processes in the endometrium."

From these data, it seems that undirected sampling, whether through curettage or various types of suction aspiration, is often fraught with error, especially in cases in which the abnormality is not global but focal (polyps, focal hyperplasia, or carcinoma involving small areas of the uterine cavity).

Transvaginal ultrasound

Introduced in the mid-1980s, the vaginal probe uses higher frequency transducers in close proximity to the structure being studied. It yields a degree of image magnification that has been dubbed sonomicroscopy [12]. In the early 1990s, it was used in women who had postmenopausal bleeding to see if it could predict which patients lacked significant tissue and could avoid dilation and curettage or endometrial biopsy and its discomfort, expense, and risk [13,14]. Consistently, the finding of a thin, distinct endometrial echo 4 to 5 mm or less has been shown to effectively exclude significant tissue in women who have bleeding. It is unfortunate that the corollary is not nearly as helpful. The positive predictive value of an endometrial echo greater than 5 mm is not so useful, although in the author's experience, many clinicians have inappropriately used a thick echo on ultrasound as an indicator of pathology. Such inappropriate application of transvaginal ultrasound is especially worrisome in patients who have no bleeding and in whom the finding is incidental.

Endometrial thickness should be measured on a sagittal (long-axis) image of the uterus, and the measurement should be performed on the thickest portion of the endometrium, excluding the hypoechoic inner myometrium. It is a "double-thickness" measurement from basalis to basalis [15].

If fluid is present, then it is usually associated with cervical stenosis and atrophy [16]. The layers are measured separately and should be symmetric. It should be remembered that the endometrial cavity is a three-dimensional structure, and attempts must be made to image the entire cavity. Recognizing the potentially pivotal role of transvaginal ultrasound in diagnostic evaluation, a statement should be included in the report regarding the technical adequacy of the scan. A well-defined endometrial echo should be seen taking off from the endocervical canal [Fig. 1]. It should be distinct. Often, fibroids, previous surgery, marked obesity, or an axial uterus may make visualization suboptimal. If so, it is acceptable and appropriate to conclude "endometrial echo not well visualized" [Fig. 2]. In these cases, ultrasound cannot be relied on to exclude disease. The next step for such patients who have bleeding should be hysteroscopy or saline infusion sonohysterography depending on the skill set and preference of the physician and patient.

Although the use of fluid enhancement was described with abdominal ultrasound for uterine and tubal observations [17], it never gained widespread use. The introduction of the vaginal probe changed that practice considerably [18,19]. The use of fluid instillation into the uterus coupled with such high-resolution transvaginal probes allows tremendous diagnostic enhancement with an inexpensive, simple, well-tolerated office procedure (see the article by R.B. Goldstein elsewhere in this issue).

In a prospective pilot study, saline infusion sonohysterography was performed in 21 women who had abnormal perimenopausal uterine bleeding [20]. Of the 21 patients, 8 had obvious polypoid lesions [Fig. 3] and were triaged for operative