

Ten ultrasound endometrial issues

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ABSTRACT

Abnormal uterine bleeding is probably the most frequent gynecological issue that leads women to a consult with a subsequent ultrasound. Transvaginal ultrasonographic evaluation represents the most sensitive method of endometrial evaluation, being more adequate than the transabdominal approach, especially when differentiating the benign lesions from the malignant ones. Transvaginal ultrasound is extremely useful in measurement, morphology and vascularization examination of the uterine cavity, especially the endometrium. We present 10 endometrial issues in which transvaginal ultrasound has proven its utility in the paraclinical evaluation of the patient: endometrial cycle phase, endometrial thickness, endomyometrial junction, endometrial vacuum line, cystic endometrium, endometrial vascularization, endometrial polyp, intracavitary development of leiomyomas, thick endometrium and endometrial cancer.

Keywords: endometrium, ultrasound, polyp, leiomyoma, cancer

INTRODUCTION

Transvaginal ultrasonography is a direct, sensitive method of monitoring ovarian follicular development and endometrial phase transformations that occur during the menstrual cycle, diagnosing and differentiating the main types of proliferative endometrial pathology, being superior to the transabdominal approach through an increased resolution of the aspects of the pelvic organs, especially in obese women and due to the absence of the uncomfortable need to fill the bladder (1).

The endometrium is delimited on one hand by the endomyometrial junction area represented by the myometrial hypoechoic inner layer and on the other hand by the fine, regular, uninterrupted, echogenic layer, with a thickness of 0.1-0.2 mm, of the uterine cavity whose endometrial surfaces are in contact at this level. Between the hypoechoic layer of circular muscle fibers and the endometrium itself, Prof. Pelinescu describes the existence of a hyperechoic fine, regular, continuous and easily identifiable area, corresponding to the basal layer (2).

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Blood flow in the uterine arteries is characterized by a high resistance during the follicular phase, resistance that decreases from the day before ovulation, reaches the lower limit 2 days postovulatory and remains constant during the secretory phase. 3D Power Doppler angiography shows an increase in the proliferative phase of both the endometrial and subendometrial vascular index and in the vascular flow index; the maximum level is reached 3 days preovulatory, and the minimum 5 days postovulatory, then gradually increasing during the early and middle secretory phases (3).

Endometrial peristalsis is due to subendometrial contractions that propagate from the cervix to the uterine body, reaching the uterine fundus in the proliferative phase, during which it increases in intensity and frequency until the periovulatory moment, after which the change in direction of propagation is evident on ultrasound; subendometrial contractions facilitate the transport of sperm and subsequently fundic implantation and maintenance of the blastocyst at this level, accompanying the contractile activity of the myometrium, which also records an ovulatory peak, being controlled during the luteal phase by systemic and local secretions of the luteal body (4-6).

In recent years, transvaginal ultrasound has significantly improved the diagnostic accuracy and management of intrauterine abnormalities. The examination of the endometrium in women with abnormal uterine bleeding in preclimax remains controversial (7,8), the description of the endometrium and uterine cavity, especially sonohysterographically, using different terms and definitions, sometimes of contradictory significance. If for this category of women the thickness of the endometrium has a limited value, its morphology can be a good predictor of endometrial pathology.

The Group (IETA), founded in 2008 in Chicago during the World Congress on Ultrasound in Obstetrics and Gynecology, published in January 2010 the consensus on standard terms, definitions and measurements recommendations for ultrasound description of endometrium and intrauterine lesions - in order to improve the risk predictability based on their sonographic appearance in B and colour mode, alongside to sonohysterography, as well as standardizing the language used in clinical trials (9).

The described uterine examination technique from the consensus specifies the use of routine transvaginal ultrasound due to the higher resolution, the transabdominal examination route being reserved for cases with large uterine fibroids, with global uterine growth, virgin intact patients, vaginismus cases or secondary vaginal stenosis; unsatisfactory transabdominal examination may be sup-

plemented in some cases with information obtained by transrectal approach.

The optimal interval for the ultrasonographic exploration of the uterus is in the premenopause early proliferative phase, respectively days 4-6 of the menstrual cycle and in climax, under hormone replacement therapy, days 5-10 after the last tablet with progestin (10,11).

Uterine examination begins with the identification of the urinary bladder and cervix, continues with the uterine position and uterine exploration in sagittal plane from one horn to the opposite side and in the transverse plane from the cervix to the uterine fundus. After the overall assessment, the examination should be extended as much as possible so that it includes not only the uterine body and its focused area of interest. The endometrium is generally easy to explore, with difficulties occurring in the case of the axial intermediate position of the uterus or in the case of rotation due to endometriosis or post-laparotomy adhesions. From personal experience, emptying the bladder or applying light transabdominal pressure usually corrects these inconveniences, but the position of the uterus is a factor that can greatly alter the study of endometrial morphology. The distorted appearance of the cavity may be due to benign pathology such as adenomyosis or uterine fibroids, while malignant pathology alters the endomyometric interface, which causes a poor definition of the endometrial cavity. In cases where the endometrium is difficult to examine, the assessment should be resumed at the endocervical canal, adjusting the insonance angle between the endometrium and the probe as close as possible to 90°, in order to optimize the image quality (9).

The overall improvement of the examination of the uterine cavity must be achieved by quantitative and qualitative evaluation of the endometrium, intrauterine lesions and intracavitary fluid, using B mode, color and power Doppler, as well as sonohysterography (9).

ISSUE 1: ENDOMETRIAL CYCLE PHASES

Desquamation period is characterized by the lack of a vacuum line, the uterine cavity being real, with inhomogeneous content, represented by hyperechoic fragments of scaly endometrium surrounded by hypoechoic and anechoic areas corresponding to accumulated menstrual blood and clots (1,2).

In the follicular phase, after menstruation, as a result of the loss of the functional layer, the endometrium appears as an echogenic thin line, the recovery beginning in the lower area of the uterine body (Figure1); the proliferation of the basal layer under estrogenic stimulus determines the appearance of the tristratified aspect due to the hypoecho-

ic endometrium between the hyperechoic shining vacuum line of the virtual endometrial cavity and the dense basal layer of the endometrium, also with increased echogenicity (Figure 2). By the end of the follicular phase, the endometrium measures approximately 8 mm (12,13); The imminence of ovulation is signaled by the anechoic cervical glare which relaxes the cervical canal. The relationship of endometrial thickness and texture to implantation results remains controversial (14). After ovulation, the three-layered endometrial appearance disappears, the endometrium becomes hyperechoic and reaches 8-14 mm (13) due to the elongation and tortuosity of the glands with mucin and glycogen deposits of the functional endometrium; the endometrial layers become similar in terms of echogenicity and can no longer be individualized, the secretion accumulated in the glands causing numerous interfaces that increase reflectivity (Figure 3) (1,2).

The qualitative assessment of the endometrium includes the specification of its echogenicity compared to that of the myometrium, against which the endometrium can be described as hyperechoic, isoechoic or hypoechoic, in accordance with the menstrual cycle phase.



FIGURE 1. Thin, hypoechoic endometrium in early proliferative phase endometrium (Roxana Bohîlțea personal collection) (1)



FIGURE 2. Tristratified, periovulator interval endometrium (Roxana Bohîlțea personal collection) (1)

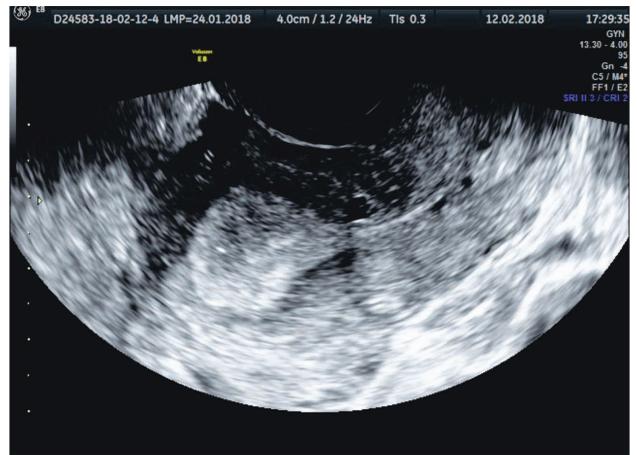


FIGURE 3. Hyperechoic, thick, secretory phase endometrium; various types of adenomyotic lesions in the myometrium (Roxana Bohîlțea personal collection)

ISSUE 2: ENDOMETRIAL THICKNESS MEASUREMENT

The assessment of endometrial thickness is done in the sagittal plane including both the endometrial layers, which must be measured and reported as a sum, but also separated in the case of endometrial asymmetry of the anterior and posterior walls or in the presence of intracavitary fluid.

The callipers must be positioned at the endometrial-myometric interface, perpendicular to the vacuum line, at a level subjectively assessed as the maximum of endometrial thickness, in case of proper maximum zoom of the image (Figure 4). In 10% of cases, the endometrium cannot be measured and must be specified correspondently (15). Endometrial lesions should be included in the endometrial thickness, except for clearly identified intracavitary fibroids. Intracavitary fluid is measured in the sagittal plane at the area of maximum accumulation (9).

By measuring the double endometrial layer, the upper limits of the normal thickness are considered of 10 ± 4 mm in the fertile age females, with a senificative variability between the authors and, respectively, a thickness of 4 mm for the menopausal woman (1).

ISSUE 3: ENDOMYOMETRIAL JUNCTION

The endomyometric junction area (EMJ) is a new anatomical landmark consisting of the layer of circular myometrial fibers that surrounds the endometrium, measuring approximately 5 mm (1). Highlighted by advances in imaging techniques (Figure 5), the endomyometric junction appears to be a distinct anatomical structure with specific features, given the Müllerian origin of the endometrium and the non-Müllerian origin of mesenchymal derivatives of the peripheral myometrium. In 1984, Koni-

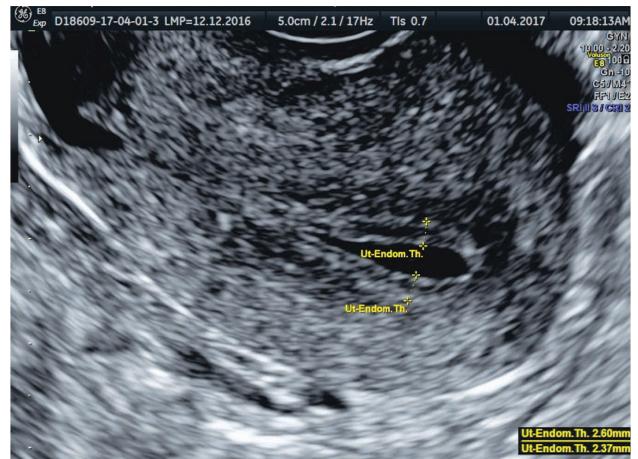
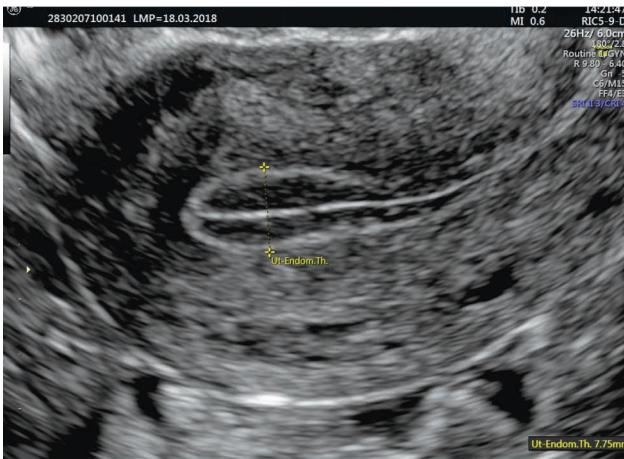


FIGURE 4. Echographic aspect of endometrial thickness measurement in absence (left side) or absence (right side) of intra-cavitary fluid (Roxana Bohîlțea personal collection) (1)

shi et al. (16) describe in early fetal development an individualized state of multipotent mesenchymal cells surrounding fused paramesonephrotic ducts. On fetal sections at 14 weeks, the first layer appears surrounded by a second layer with increased cellularity and elongated cells, provided the fact that the mesenchymal cells do not show characteristics of differentiation in smooth muscle tissue earlier than 16-18 weeks of gestation. The junction area appears to develop either from this second layer or to have a common origin with that of the endometrium from the first surrounding layer of the fused ducts. It is still unclear whether the area is experiencing monthly cyclical dimensional changes, but it seems to be steadily increasing with 20-50 years of age. Studies dedicated to menopausal substitution therapy ennuatiate the response of the junction to hormonal intake, and in the fertile age females it has been attributed exclusively to the myometrial peristaltic activity responsible for the variation of the thickness of this structure and also involved in reproductive processes, the contractions of this area being

regarding the amplitude, frequency and direction dependant on the phases of the menstrual cycle (1).

In recent years, the study of EMJ has become a diagnosis for adenomyosis and extremely important for the evaluation of endometrial pathology.

The EMJ should be described as regular, irregular, interrupted or indefinite (9).

ISSUE 4: ENDOMETRIAL VACUUM LINE

The endometrial emptiness line is defined as linear if the hyperechoicity of the endometrial interfaces is rectilinear and non-linear if it is undulated, wavy, irregular, or indefinite, in the absence of a distinct interface (Figure 6) (9).

The bright edge defines the echo formed by the interface between an intracavitary lesion and the endometrium (Figure 7) (15).

Synechia is the term used to describe the bands of tissue that cross the endometrium (Figure 8) (9).

ISSUE 5: CYSTIC ENDOMETRIUM

Qualitative evaluation of the endometrium includes specifying its homogeneity, respectively it may be uniform or uneven. Uneven echogenicity is when the endometrium is heterogeneous, asymmetric, or cystic (Figure 9) (11).

The thickness of the endometrium in most women on tamoxifen treatment is >4 mm. In addition, when such women undergo bioptic curettage, despite the apparently thick endometrium, the amount of endometrial tissue obtained is minimal. This paradox may result from: a change in endometrial consistency caused by tamoxifen; a change in the echogenicity of the myometrium underlying the endometrium, which thus appears similar and is incorporated into the measurement of the endometrium; an inaccurate measurement due to image obliquity. Any deviation from a longitudinal (sagittal)

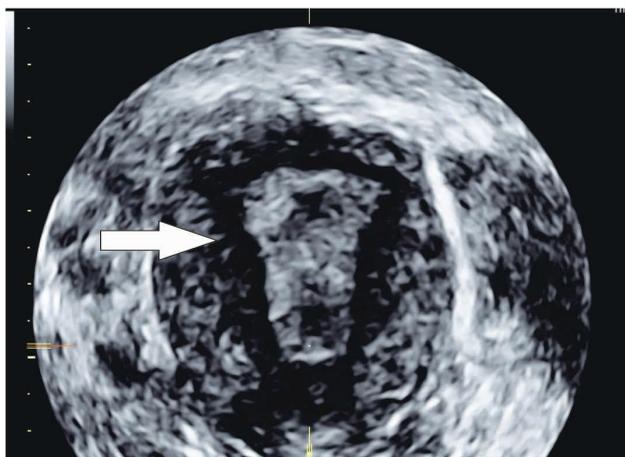


FIGURE 5. Echographic aspect of endomyometrial junction area by 3D reconstruction (Roxana Bohîlțea personal collection) (1)

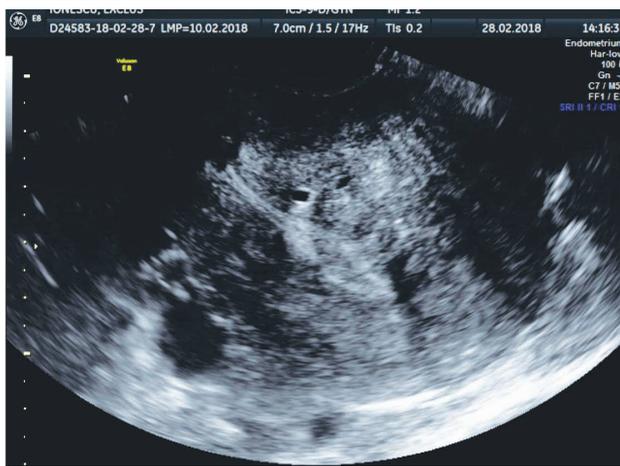
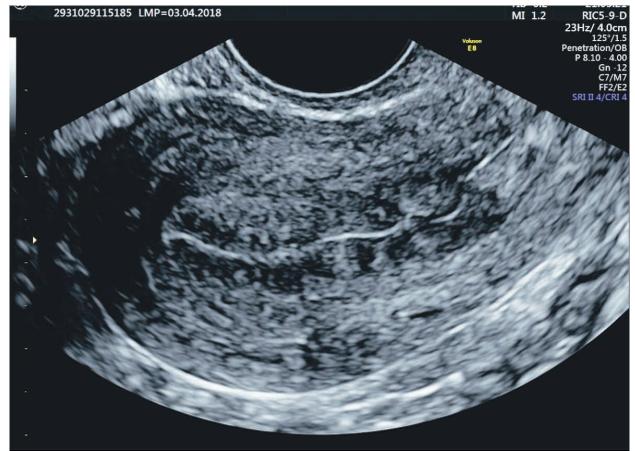


FIGURE 6. Endometrial vacuum line: linear (upper part, left side), non-linear undulated (upper part, right side); indefinite (lower part) (Roxana Bohiltea personal collection) (1)



FIGURE 7. Bright edge (Roxana Bohiltea personal collection) (1)

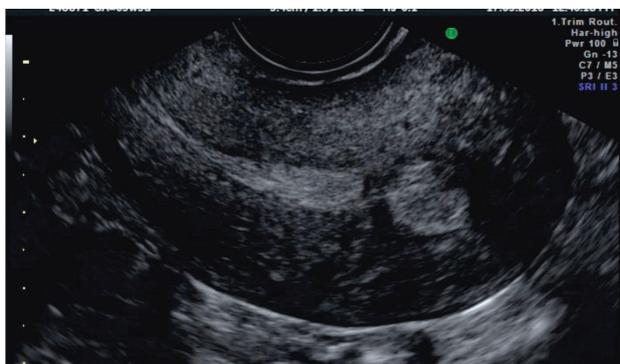


FIGURE 8. Endometrial synechia (blue arrow) (Roxana Bohiltea personal collection) (1)

tal) section can cause an apparent increase in endometrial thickness. Due to tamoxifen, the echo of the cavity vacuum line is often lost and therefore cannot be traced from the cervix to ensure a perfectly longitudinal section of the endometrium. Moreover, cystic areas of the subendometrial area, which could be foci of adenomyosis reactivated by tamoxifen, further alter the measurement. These cases benefit optimally from the instillation of intracavitary saline solution, the contrast medium thus created facilitating the correct measurement of the individual endometrial layers. Although high hopes have been placed on the discriminatory capacity of uterine artery velocimetry and subendometrial circulation, studies have not confirmed the benefit of Doppler monitoring of these patients, whose endometrium ≥ 5 mm should be biopsied.

ISSUE 6: ENDOMETRIAL VASCULARIZATION

Color and power Doppler exploration begins with the definition of the study window, which must include the endometrium and the surrounding myometrium. Image magnification and settings need to be adjusted for maximum sensitivity of blood flow (minimum frequency 5.0 MHz, repetitive pulse rate 0.3-0.9 kHz, wall filter 30-50 Hz, color power Doppler gain reduced until color artifacts disap-



FIGURE 9. Uneven endometrial echogenicity: homogenous endometrium with irregular cystic areas (Roxana Bohîlțea personal collection) (1)

pear) (11). Endometrial vascularization is quantified based on the same score applied to ovarian masses (16), IOTA score being a semi-quantitative subjective assessment: 1 - absent color signal, endometrium without vascularization, 2 - minimal present color signal, 3 - present moderate color signal and 4 - abundant color signal present, signifying increased blood flow (Figure 10). The essential element of the endometrial vascular pattern is the presence or absence of the dominant vessels defined as one or more distinct vessels coming from the arterial and/or venous circulation that cross the

endomyometric junction (Figure 11); the dominant vessels can be branched into the endometrium, ordered or chaotic disordered (11). The dominant vessel may be single, known as the “sign of the arterial pedicle” and may or may not have branches (8). Multiple dominant vessels can have both focal and multifocal origin at the endometrium-myometrium junction. Other endometrial vascular patterns are represented by the wasted vessels present as intra-endometrial color signals without visible origin at the endomyometric junction, as well as by the circular vascularization (Figure 11) (11).

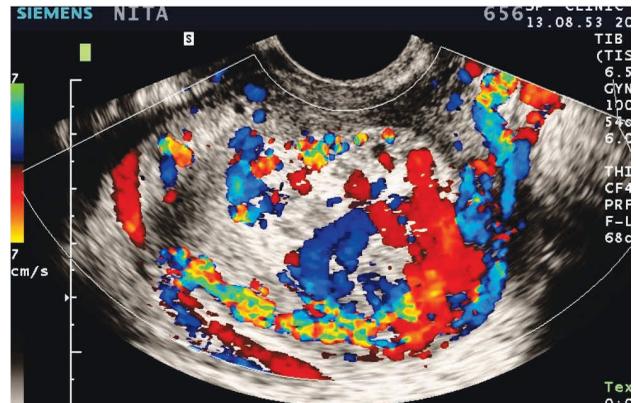
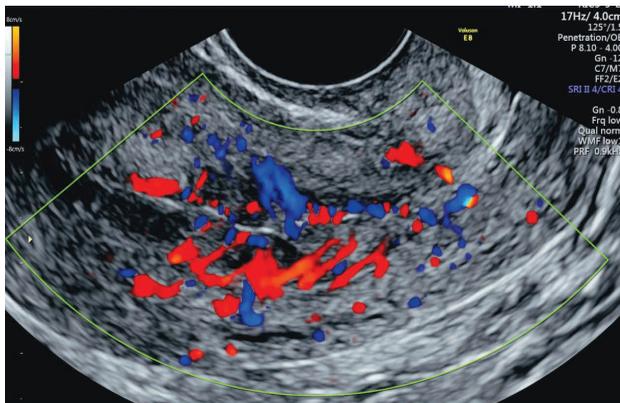
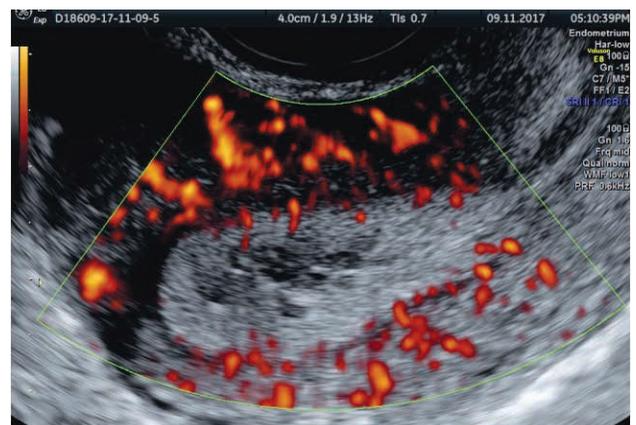
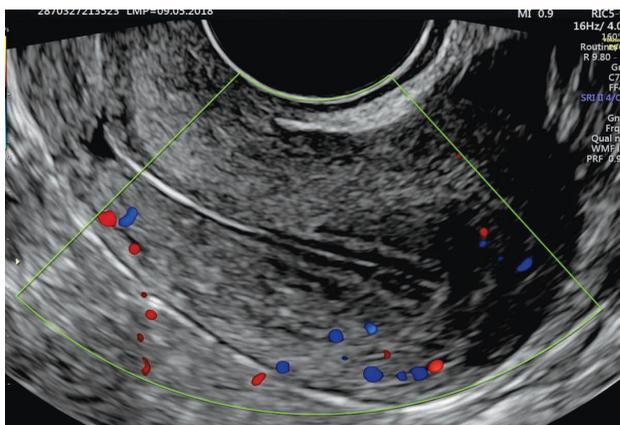


FIGURE 10. Color Doppler examination of endometrium – score stratification: 1 absent color Doppler (upper left), 2 minimum color Doppler (upper right), 3 moderate color Doppler (lower left), 4 abundant color Doppler (lower right). Thanks to Professor Dimitrie Pelinescu Onciul (lower right), Roxana Bohîlțea personal collection (upper left, upper right and lower left) (1)

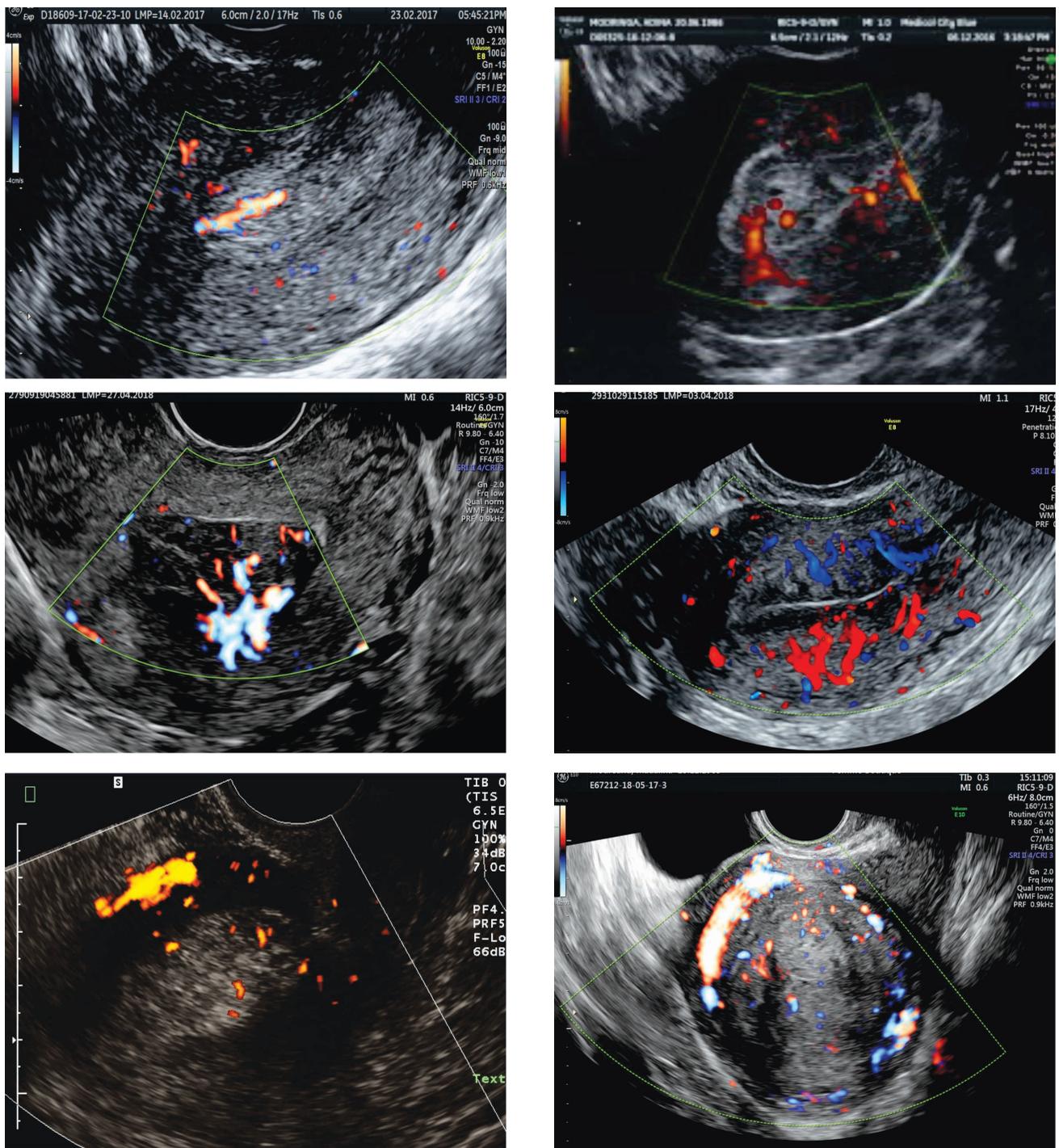


FIGURE 11. Endometrial vascular patterns: single dominant un-branched vessel (upper left), single dominant branched vessel (upper right), focal origin multiple vessels (medium left), multifocal origins multiple vessels at the endomyometrial junction (medium right), dispersed vessels without visible endometrial origin (lower left), circular flow (lower right). Thanks to Professor Dimitrie Pelinescu Onciul (lower left). Roxana Bohîlțea personal collection (upper left, upper right, medium left, medium right and lower right) (1)

ISSUE 7: ENDOMETRIAL POLYP

Endometrial polyps that occur as a result of hyperplasia of the endometrial glands and stromal tissue, with their own vascular pedicle, presents atypias twice more frequent in symptomatic women compared to those without abnormal uterine bleeding, the risk of endometrial cancer associated with their presence being nine times higher. The echo-

graphic aspect is dominated by the heterogeneous non-uniform endometrial thickening with hyperechoic formation usually appearing on their background, with a pathognomonic bright edge sign, respectively highlighting the interface between endometrium and polyp (Figure 12). Vascularization of endometrial polyps on color Doppler examination is also characteristic, with the constant visu-

alization of the polyp's single nutritive vessel, rarely double, sometimes branched, thus being able to mention the location of the implantation site; the single vessel, from a velocimetric point of view, always shows a positive diastolic flow with a resistance index > 0.45 . Polyps are optimally visualized in the early proliferative phase (1).

The diagnosis of endometrial polyps is based on conventional ultrasonographic imaging supplemented by sonohysterography or hysteroscopy. Transvaginal ultrasound, as the first line to explore abnormal uterine bleeding, is also effective in characterizing focal endometrial lesions; however, the instillation of saline, is useful, easy, in conditions of minimal discomfort for the patient, increases the specificity of the method and directs the patient with this type of lesion to diagnostic and therapeutic

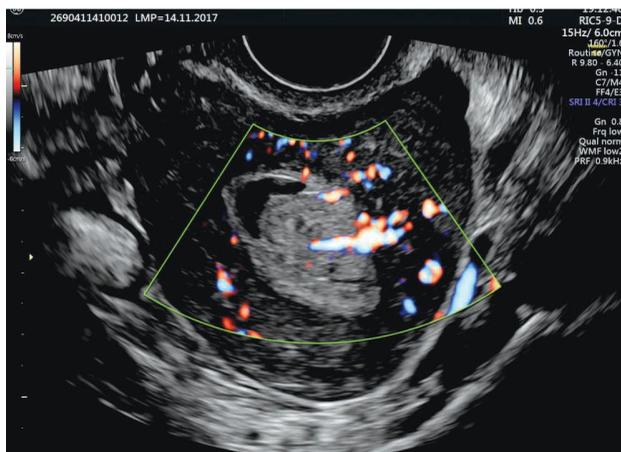


FIGURE 12. Real uterin cavity with heterogeneous content due to the presence of a hyperechoic, heterogeneous formation, with a single vessel with implantation base at the level of the anterolateral uterine wall, bordered by a blade of heterogeneous anocogenic fluid; heterogeneous hyperechoic endometrium, visible in the posterior wall of the cavity (Roxana Bohîlțea personal collection) (1)

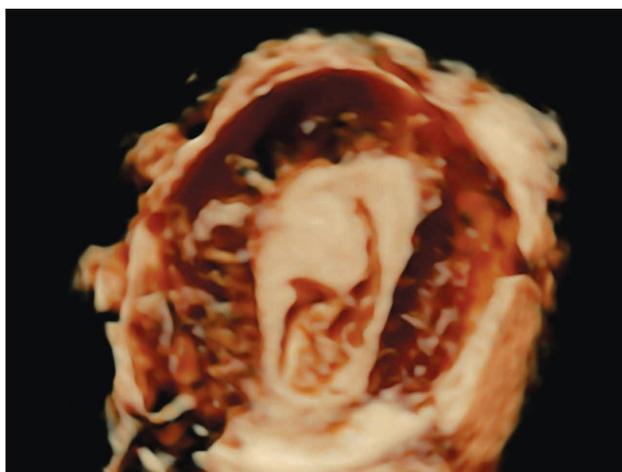


FIGURE 13. Endometrial polyp located on the right lateral wall of the uterus, in the presence of fluid in the endometrial cavity, visualized by 3D HDlive ultrasonography (Roxana Bohîlțea personal collection) (1)

hysteroscopy (Figure 13). Since 2003, Timmerman et al. states that Doppler detection of the single arterial pedicle has an apparent sensitivity for detecting endometrial polyps of 76.4%, a specificity of 95.3%, a positive predictive value (PPV) of 81.3% and a negative predictive value of 93.8%; while the extrapolation of the test to detect any focal intracavitary pathology reaches a PPV of 94.2%, which makes the second-line diagnostic tests such as sonohysterography and diagnostic hysteroscopy unnecessary, in the opinion of the authors (9).

ISSUE 8: INTRACAVITARY DEVELOPMENT OF LEIOMYOMA

Myometrial intracavitary lesions are defined by their echogenicity, which may be uniform or uneven, and by their grading, established based on the proportion of protrusion of the lesion in the uterine

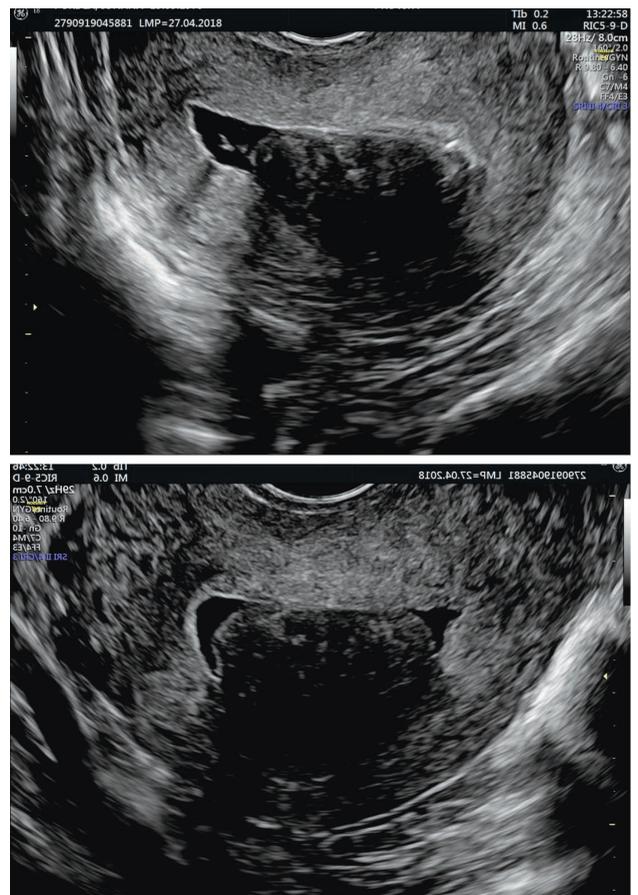


FIGURE 14. Real uterine cavity containing heterogeneous formation with mixed hypo and hyperechoic echogenicity, presenting on Doppler examination the pedicle with implantation base at the level of the posterior uterine wall, with multiple branched multifocal vessels, color score 2 (left and right); saline instillation reveals the smooth contour of the endometrial and lesional surfaces and establishes grade 0 of the pediculated fibroid with a clear indication of hysteroscopic excision or of supraseductive embolization of the uterine arteries (Roxana Bohîlțea personal collection) (1)

cavity. Grading of Leone et al. used in hysteroscopy comprises grade 0 (G0) - pediculated fibroids without intramural extension, located entirely inside the cavity; grade 1 (G1) - sessile fibroids with endocavitary location of >50% of their volume, and grade 2 (G2) - fibroids with <50% of the protruding volume intracavitary (Figure 14) (9).

ISSUE 9: THICK ENDOMETRIUM

Ultrasonography determines the structural causes of abnormal uterine bleeding and identifies the heterogeneous endometrium in case of hyperplasia and cancer of the endometrium, being the first imaging line to exclude other etiologies of abnormal uterine bleeding.

The measurement of endometrial thickness in premenopausal women is not a useful parameter, as I mentioned, due to the important variations that it registers during the menstrual cycle, and cannot be used as an alternative to endometrial biopsy. A



FIGURE 15. 2D ultrasound evaluation showing longitudinal uterine section (left) and cross section (right) with thick, heterogeneous endometrium, regular endomyometrial junction, wavy, non-linear empty line, early secretory phase; (HP: Simple endometrial hyperplasia without atypia) (Roxana Bohîlțea personal collection) (1)

study of 200 premenopausal women with abnormal uterine bleeding states the existence of endometrial pathology such as endometrial polyps or submucosal leiomyomas in 20% of women with an endometrial thickness <5 mm (17). In premenopausal asymptomatic women, endometrial evaluation should be based on a combination of factors including the results of cervical cytology with glandular or endometrial cell abnormalities, history of estrogenic excess or anovulation, corroborated with endometrial thickness. Persistent abnormal bleeding is always an indication for endometrial biopsy regardless of ultrasound appearance.

In endometrial hyperplasia, the thickness of the endometrium often exceeds 15 mm in premenopause and often 8 mm in postmenopause (1). Uniformly or unevenly thickened endometrium, often hyperechoic, appears morphologically heterogeneous, the line of emptiness is non-linear, wavy, due to the folds of the thickened mucosa, or is erased or absent. The endomyometrial junction is well marked and regular (Figure 15). Endometrial heterogeneity is often due to regular or irregular, anecogenic, small cystic areas, representing cystic dilated endometrial glands (Figure 16) (1).



FIGURE 16. 2D ultrasound evaluation showing the longitudinal uterine section with heterogeneous, hyperechoic, thick endometrium, with irregular cystic areas and undefined endomyometrial junction and emptiness line and at ovarian level, bilaterally, >30 cavities/ovary follicles peripherally disposed, abundant stroma with increased echodensity (HP atypical hyperplasia in a patient with amenorrhea for > 3 months due to polycystic ovary syndrome) (Roxana Bohîlțea personal collection) (1)

ISSUE 10: ENDOMETRIAL CANCER

Endometrial carcinoma has various ecostructural aspects: real endometrial cavity containing an imprecisely delimited, hyperechoic, relatively homogeneous formation surrounded by a hypoechoic band representing the peritumoral myometrium, or heterogeneous appearance with anecogenic or hy-

poechoic areas on a hyperechoic background. The endomyometric junction, characteristically, is erased, interrupted and irregular (Figure 17). In endometrial cancer, color Doppler transvaginal ultrasound examination reveals areas of intratumoral and peritumoral neovascularization with anarchic appearance, with multiple arborizations and anastomoses, with low resistance indices, but, also, with low diagnostic specificity, which makes the new predictive ultrasound scores for malignancy mainly based on vascular architecture to the detriment of velocimetry (1).

High-risk tumors (stage 1A, grade 3 or non-endometrioid, or stage >1B) have a significantly lower percentage of normal endomyometric demarcation limit (-23% difference, 95% CI -27 to -18 that are larger in volume) (average endometrial thickness +9 mm, CI 95% +8 to +11 mm), had more frequently an uneven echogenicity (difference of +10%, CI 95% +15%), the predominant vascularization of the vessel was multiple and multifocal (difference of +21%, CI 95% +16% to +26%), and had a moderate to high color score (difference of +22%, CI 95% +18% to +27%). The higher was the endometroid carcinoma,

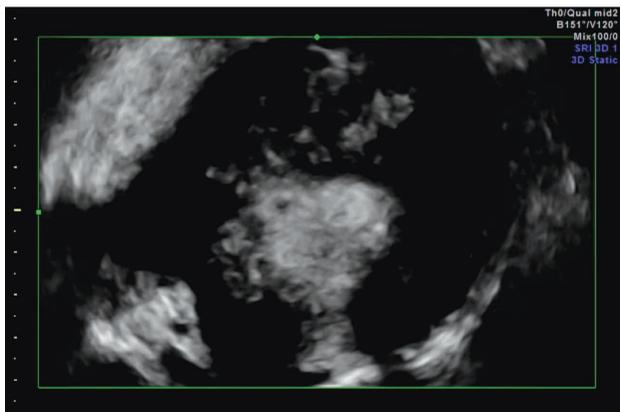


FIGURE 17. Endometrial tumor examined in 3D mode, which clearly shows the rupture of the endomyometric junction and the probable tumor invasion of the external myometrial half. (HP: endometrial carcinoma). Thanks to Professor Dimitrie Pelinescu Onciul



FIGURE 18. Ultrasound aspect of real cavity with fluid collection, irregular low echogenicity walls, fractured, poorly defined (Roxana Bohiltea personal collection) (1)

also the higher was the endometrial thickness and the higher the tumor volume, these characteristics, together with the endomyometric border irregularity and the high color score being the most discriminating elements in defining factors between high-grade and low-grade tumors (Figure 18) (1).

Other studies have also found that tumor size correlated with lymph node metastasis and disease-free survival in women with endometrial cancer (17). Other authors have reported the association of increased color density on color Doppler examination with increasing stage of the disease and the presence of lymph node metastases, the number of vessels with multifocal origin tending to increase in proportion with the stage of the disease and the infiltrative character, knowing that angiogenesis, measured by microvascular density, has been shown to play a key role in the prognosis of endometrial cancer (18,19) (1).

Practical experience confirms that the thick, heterogeneous, hyperechoic endometrium with interrupted or indefinite endomyometric junction and abundant vascularization is suggestive of malignant pathology. The low specificity, especially in preclimax, does not prevent the development of the abnormal uterine bleeding algorithm, but should not diminish the vigilance of exploring asymptomatic young females, given the significant number of cases of endometrial cancer, especially genetic, diagnosed in this population segment.

The simple measurement of endometrial thickness in females with abnormal uterine bleeding in the climax selects patients at low risk of developing endometrial cancer, the ≤ 4 mm endometrium decreasing the risk of this pathology by a factor of 10 in both users and non-users of hormone replacement therapy, and they are the patients who do not require endometrial biopsy, while an endometrium ≥ 5 mm requires the assessment of endometrial morphology and vascularization using mode B and Doppler, with or without sonohysterography, followed by endometrial biopsy techniques, in order to assess the risk of developing endometrial cancer. Given that most causes of abnormal uterine bleeding in the climax are focal lesions, of which Epstein states that most are omitted by uterine bioptic curettage, we can say that patients with abnormal uterine bleeding in the climax and endometrial thickness ≥ 5 mm benefit mostly from bioptic resection of focal lesions under direct hysteroscopic visual control; the diffuse character of the endometrial thickening proven by saline instillation has the indication of aspiration biopsy or curettage, the arguments being further exposed.

Therefore, in the postmenopausal period, the ultrasonographically determined endometrial thickness < 4 mm is used as a selection factor for patients

who do not require endometrial biopsy. Cancer becomes significantly more common compared to benign lesions as the endometrial thickness approaches > 20 mm, a value considered average for endometrial cancer in a study of 759 women with this diagnosis (20). American College of Obstetricians and Gynecologists (ACOG) and Society of Radiologists in Ultrasound (SRU) stated that both endometrial thickness measured by transvaginal ultrasound ≤ 4 mm (ACOG) and, respectively ≤ 5 mm (SRU), and endometrial biopsy are effective as the first line of diagnosis in postmenopausal women with bleeding. In addition, ACOG supports the usefulness of transvaginal ultrasound as a secondary diagnostic line in endometrial biopsy with insufficient tissue. In these cases, ACOG considers that in an endometrial thickness <4 mm the malignancy is very rare, in addition to ultrasound identifying other structural lesions. These recommendations are supported by a meta-analysis of 35 prospective studies that includes almost 6000 females with postmenopausal bleeding; the sensitivity and specificity of transvaginal ultrasound in detecting endometrial cancer at an endometrial thickness threshold of 4 mm are 96% and 53%, respectively, and at a threshold of 5 mm are 96% and 61%, respectively (21).

A topic of current debate is the extent to which further explorations are required in case of accidental determination of increased endometrial thickness or the presence of intracavitary fluid in asymptomatic women. Bleeding is absent in approximately 5-20% of endometrial cancers. Ultra-

sound measurement of endometrial thickness appears to have a lower predictive value for endometrial neoplasia in asymptomatic women compared to those who bleed.

According to this intensely cited analysis, conducted by Smith-Bindman et al., is stated that the need for endometrial biopsy in postmenopausal asymptomatic women who have an endometrial thickness > 11 mm and those with an endometrium < 11 mm, but who have fluid in the endometrial cavity on ultrasound examination. In most cases, the fluid is due to a degree of cervical stenosis (21). Observational studies consistently state that asymptomatic postmenopausal women with intracavitary fluid and endometrial thickness < 3 mm are not a risk for endometrial cancer or atypical hyperplasia; the increase in the risk of these women is correlated with the increase in endometrial thickness > 3 mm, which is why biopsy of these cases must be performed. Persistence even in conditions of an endometrium < 4 mm requires biopsy.

CONCLUSIONS

In the exploration of endometrial pathology, ultrasonography must first answer the three most important questions: Is there endometrial pathology? What is the most probable etiology diagnosis of abnormal uterine bleeding (endometrial polyps, endometrial hyperplasia, endometrial carcinoma, endometritis, endometrial atrophy, adenomyosis, submucosal leiomyomas)? Is a biopsy required?

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