

Ultrasound in the diagnosis of endometrial and intracavitary pathology: an update

Abstract

Over the last two decades, ultrasound evaluation of the endometrium and uterine cavity evolved from 2D grayscale evaluation of the endometrial thickness to a much more comprehensive examination including colour imaging, fluid instillation and 3D ultrasound. The International Endometrial Tumor Analysis (IETA) group recently published a consensus opinion paper on terms, definitions and measurements to describe the sonographic features on the endometrium and intrauterine lesions.

Keywords: endometrium, IETA, fluid instillation sonography, ultrasound.

Introduction

The use of ultrasound in the diagnosis of endometrial and intracavitary pathology was introduced in the late 1980s and early 1990s:¹⁻⁵ if the endometrial thickness measured in the midsagittal plane is thin, the risk for endometrial cancer is very low. In a patient with a clearly visible, thin and regular endometrium, further tests such as endometrial sampling, hysteroscopy or curettage are therefore not indicated unless symptoms persist.⁶⁻⁹ Ann Tabor, *et al.*⁷ calculated that using endometrial thickness measurement as first step evaluation in postmenopausal bleeding, would save further, more invasive diagnostic tests in about half of patients.

Although, due to its high sensitivity, the measurement of the endometrial thickness has proven its value in the exclusion of endometrial malignancy, the test has some limitations. If the endometrium cannot be visualised (e.g. due to cavity distortion or a stretched uterine position) the test is inconclusive. It has to be stressed that the endometrial thickness may not be recorded if the entire endometrium is not clearly visible from the right to the left corneal region and from the fundus to the isthmus of the uterus. In case the endometrium is not (or not entirely) visible it should be recorded as “not measurable”.¹⁰ A second limitation of the endometrial thickness measurement is its rather low specificity: a ‘thick’ endometrium does not equal endometrial cancer. A thickened endometrium can be caused by an endometrial polyp, endometrial proliferation associated or not with hyperplasia, an intracavitary fibroid or by an artifact (e.g. a blood clot in the cavity or the presence of small subendometrial cysts as seen in women on tamoxifen therapy).^{11,12} Finally, most studies on endometrial thickness, included only postmenopausal women who were

not on hormone replacement therapy. Before menopause and during hormone replacement therapy (especially with sequential schemes), the endometrium changes with time and is, on average, thicker than after menopause, affecting the test’s specificity.^{13,14} In those women, the ultrasound examination should therefore be performed early in the menstrual cycle just after (or at the end of) the menses/withdrawal bleeding days.

With the advent of higher resolution vaginal probes, colour and power Doppler imaging and 3D ultrasound, together with the use of fluid instillation sonography (FIS), the diagnostic potential of ultrasound examination of the endometrium and of the uterine cavity has increased substantially. Although every ultrasound examination should still start with a correct measurement of the endometrium, especially in those with a thickened endometrium the above mentioned ultrasound applications should be used to reach a more precise diagnosis (e.g. an endometrial polyp with the typical presence of a pedicle artery on colour Doppler; an intracavitary fibroid; irregular and highly vascularised endometrium highly suspicious for malignancy).^{15,16}

The IETA consensus

In an attempt to standardise the ultrasound examination of the endometrium and the uterine cavity, the International Endometrial Tumor Analysis (IETA) group, consisting of an international panel of physicians with a special interest in endometrial ultrasound wrote a consensus paper¹⁷ on how to perform an ultrasound examination of the endometrium and of the uterine cavity and on the terms and definitions to be used to report the ultrasound findings. Both unenhanced ultrasound (without

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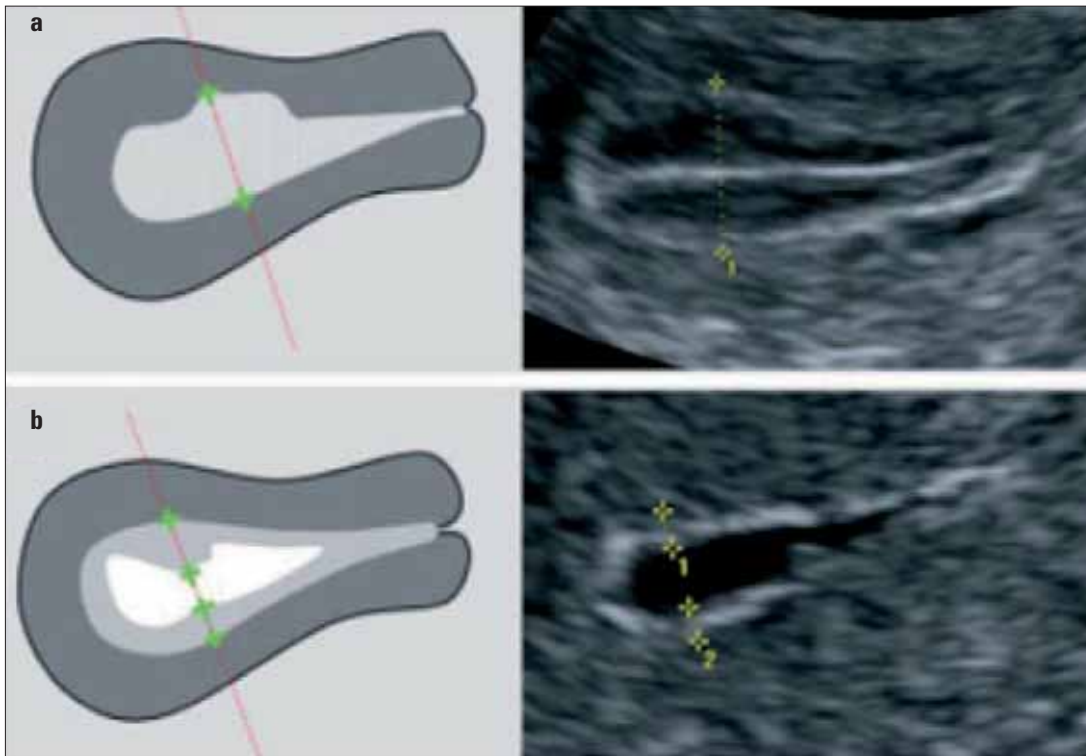


Figure 1: (a) The endometrium should be measured where it appears to be at its thickest. (b) When intra-cavitary fluid is present, the thickness of both single layers is measured in the sagittal plane and the sum is recorded. With permission from¹⁷ *Ultrasound Obstet Gynecol* 2010; 35: 103–12. Usually there are no vessels visible (deep) inside the endometrium. However, some peripheral vascularisation is frequently seen, especially in the late luteal phase of cycle. This is a normal finding; it should be reported together with the advice to refer the patient back just after the next menstruation for a more reliable examination.

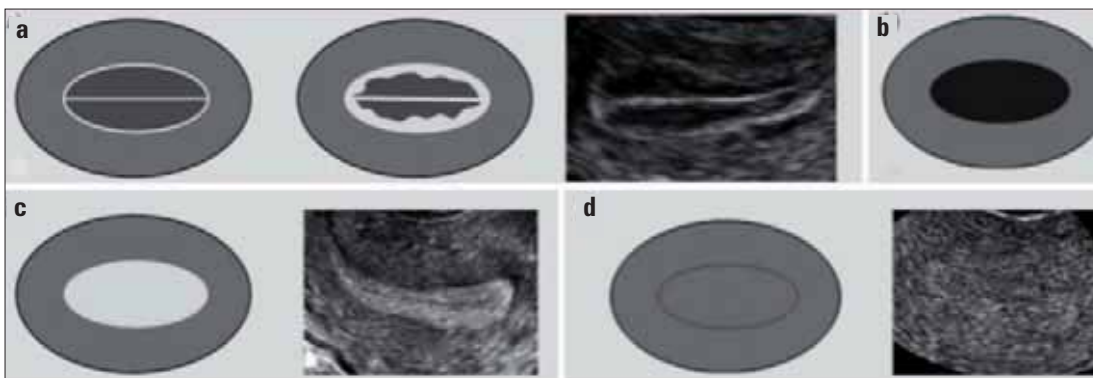


Figure 2: Uniform endometrial echogenicity: (a) three-layer pattern; (b) hypoechogetic; (c) hyper-echogetic; (d) isoechogetic. With permission from¹⁷ *Ultrasound Obstet Gynecol* 2010; 35:103–12.

FIS) and enhanced ultrasound (FIS) are discussed (<http://onlinelibrary.wiley.com/doi/10.1002/uog.7487/pdf>).¹⁷

The ultrasound examination should start with the acquisition of a proper midsagittal section of the uterus, followed by the measurement of the endometrium. The whole uterus should be scanned from right to left and from fundus to cervix. In case the endometrium is not readily visible at first glance, it can usually be traced starting from the endocervical canal and then moving up. Sometimes the uterus is twisted laterally, precluding the visualisation of a proper mid-sagittal view. In these cases, minimal manipulation of a 3D volume usually enables the sonographer to achieve the correct section. If 3D acquisition is not available, the endometrial thickness should NOT be measured (it should be reported as ‘not measurable’, together with a short explanation of the reason why). If the endometrium is not visible on unenhanced ultrasound, this may be due to distortion of the uterine cavity, to shadowing by overlying (calcified) fibroids or because the endometrium has (almost) the same echogenicity

as the surrounding myometrium. Especially in the last case, switching on the colour/power Doppler may help the orientation by visualising the vascularisation of the myometrium stopping at the basal layers of the endometrium. Fluid instillation sonography will usually highlight the endometrium enabling a reliable endometrial measurement.

The endometrium is measured in midsagittal section where the endometrium is considered to be at its thickest (and this is not necessarily in the fundus) (Figure 1).

After measurement, the examiner should report on the echogenicity of the endometrium (uniform or not uniform) (Figure 2), the endometrial midline, the endometrial-myometrial junction, the colour score (Figure 3) and, if applicable, the vascular pattern (Figure 4).

Fluid instillation sonography

The principle of FIS is that fluid (saline or gel) acts as a negative contrast agent (fluid being echolucent). Especially focal lesions

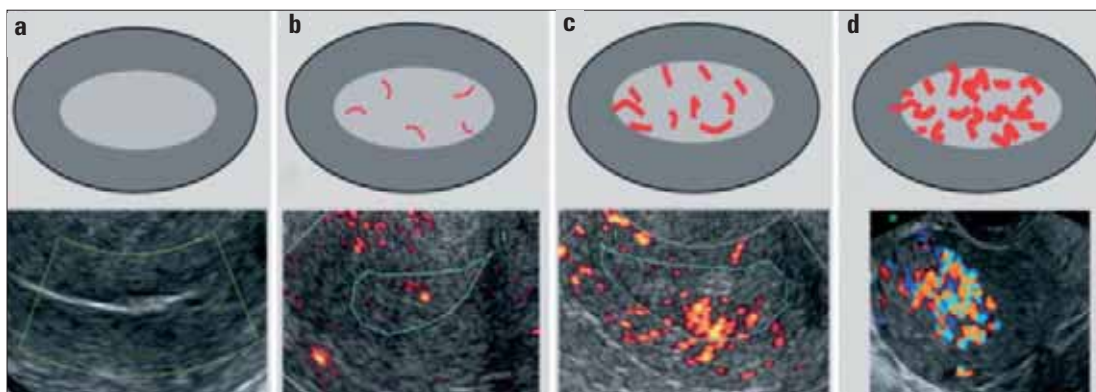


Figure 3: (a) colour score of 1: no colour; (b) colour score of 2: minimal colour (i.e. minimal flow); (c) colour score of 3: moderate colour (i.e. moderate flow); (d) colour score of 4: abundant colour (i.e. abundant flow). With permission from¹⁷ *Ultrasound Obstet Gynecol* 2010; 35: 103–12.

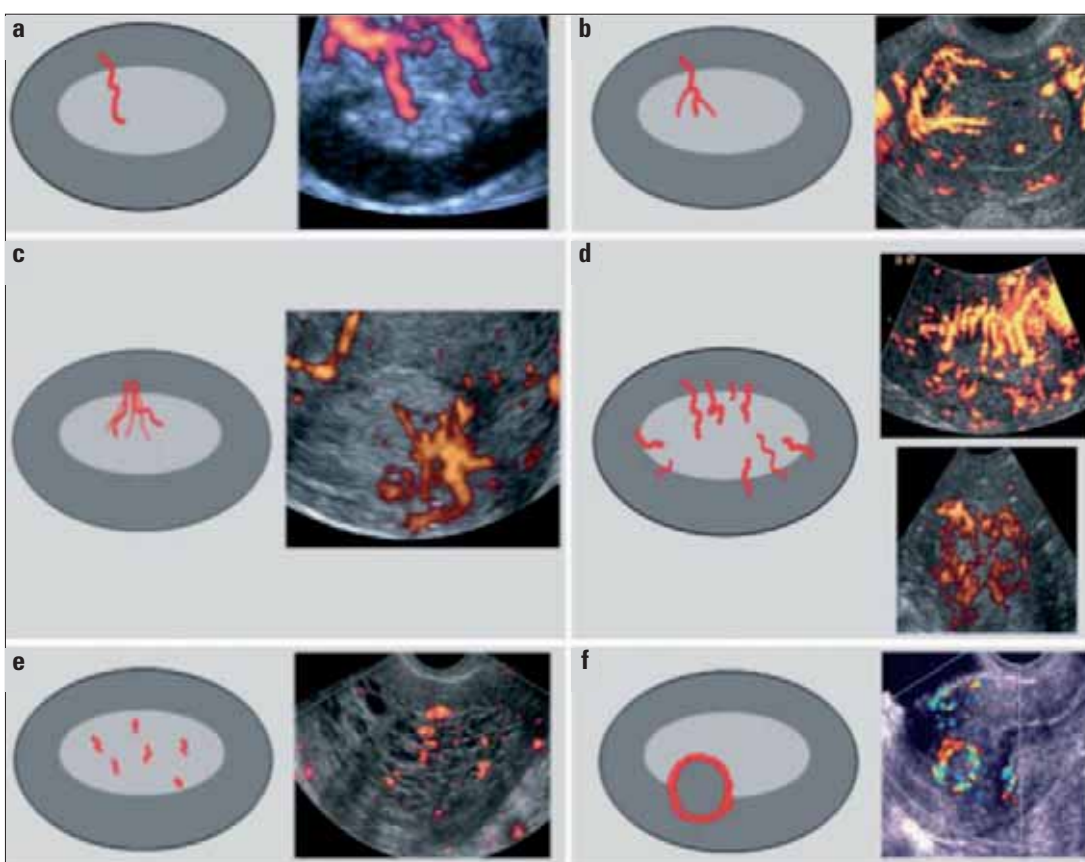


Figure 4: Vascular pattern: single ‘dominant’ vessel (a) without branching and (b) with branching; multiple vessels with (c) focal origin, (d) multifocal origin or (e) scattered vessels; (f) circular flow. With permission from¹⁷ *Ultrasound Obstet Gynecol* 2010; 35: 103–12.

protruding into the uterine cavity (such as polyps, fibroids) are highlighted against the echolucent background of the instilled fluid.¹⁸ An endometrial lesion may be localised or extended (Figure 5). A localised lesion may be pedunculated or sessile (Figure 6). An intracavitary fibroid should be graded as grade 0, grade 1 or grade 2 (Figure 7). The colour score and, if applicable, the vascular pattern within the lesion should also be described.

The technique of FIS is easy, simple and well tolerated by the patients.¹⁸ An open sided speculum is inserted to visualise the cervix, the cervix is cleaned with aqueous disinfectant and, using a swab forceps, a catheter is gently pushed through the cervical canal into the uterine cavity. This is usually readily achieved without the need of a tenaculum or a cervical dilator. Different catheters have been proposed: some catheters have a device to avoid backflow of fluid through the cervix (some having an

inflatable balloon at the tip; others having a small cone that can be pushed against the ectocervical os), while other catheters don't (e.g. a neonatal suction catheter). We use a 2 mm diameter neonatal suction catheter: it is cheap, soft, atraumatic and the diameter is small enough to be threaded through most cervixes, even after menopause or after conisation.

Once the catheter is inserted, the speculum is removed (hence the importance to use an open sided speculum). The vaginal probe is inserted and the fluid is slowly instilled under direct ultrasound vision. Usually 1 to 3 mL of fluid is sufficient to achieve enough separation of both anterior and posterior endometrial layers to be able to evaluate their regularity and to exclude lesions. Don't insufflate the cavity too much, to avoid pain. The higher the instillation rate and the higher the instilled volume, the higher the risk to cause pain to the patient.

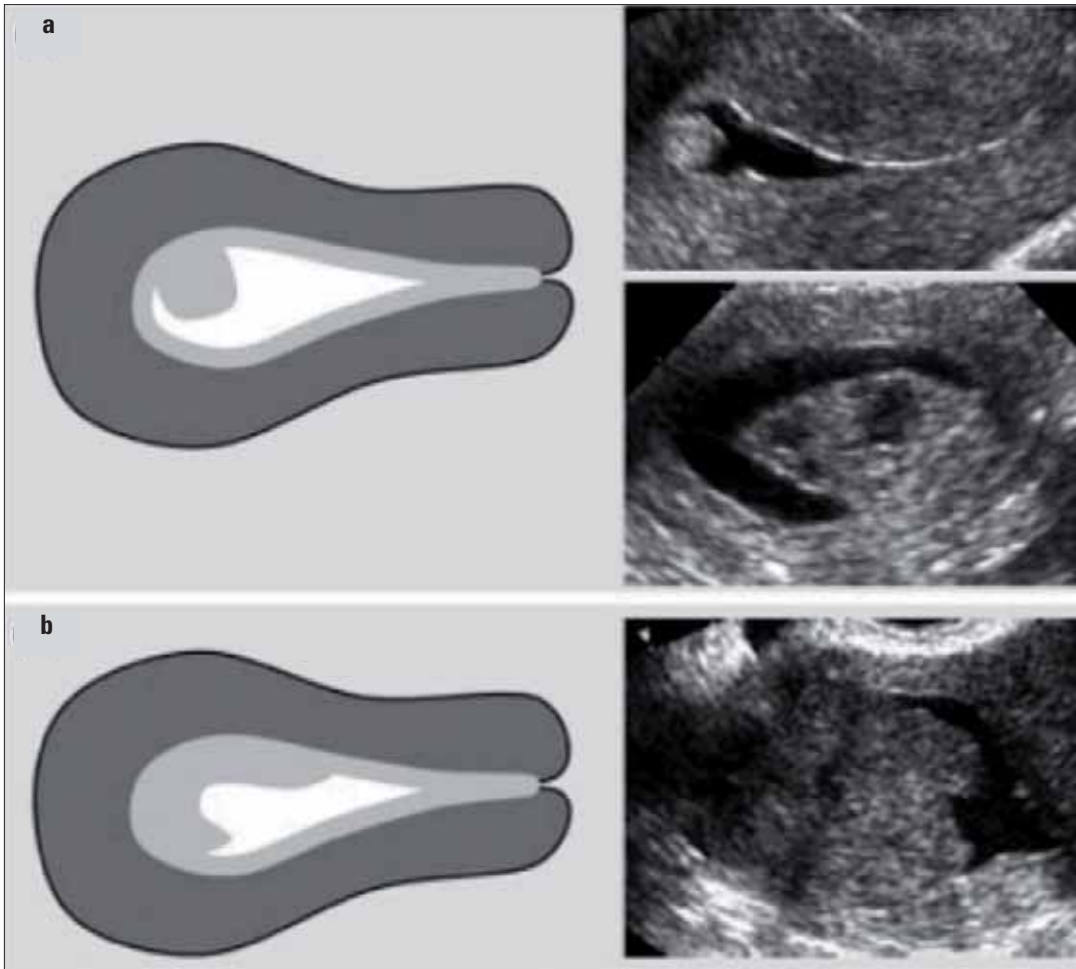


Figure 5: Estimation of the extend of an endometrial lesion: (a) localised, if the base of the lesion < 25% of the endometrial surface; (b) extended, if the base lesion³ of the endometrial surface. With permission from:¹⁷ *Ultrasound Obstet Gynecol* 2010; 35: 103–12.

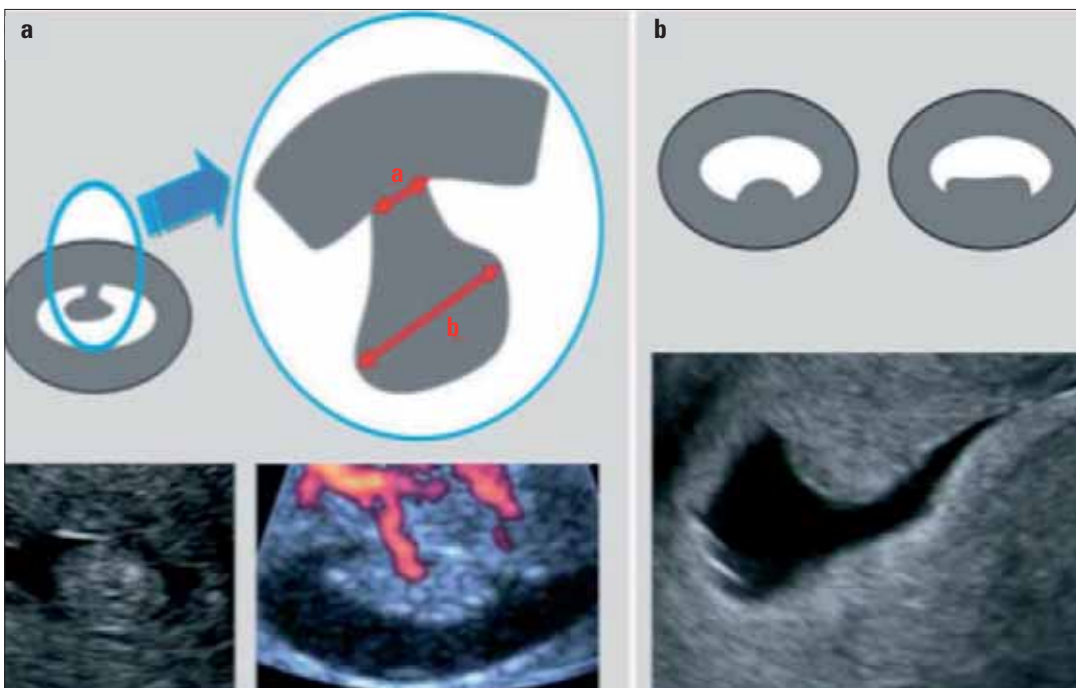


Figure 6: Type of localized lesion: (a) pedunculated if the a/b ratio < 1; sessile if the a/b ratio³ 1. With permission from¹⁷ *Ultrasound Obstet Gynecol* 2010; 35: 103–12.

Both saline (saline instillation sonography or (SIS)) or gel (gel instillation sonography or (GIS)) can be used for FIS.^{18,19} Having successfully performed SIS for years, we switched to GIS for the following reasons: Using saline, backflow through the cervix

often occurs, especially if a catheter without balloon is used. To compensate for this backflow, (some) more fluid has to be instilled. Therefore the sonographer needs an assistant injecting the fluid; in a single examiner setting this may be an issue. Overcompensating

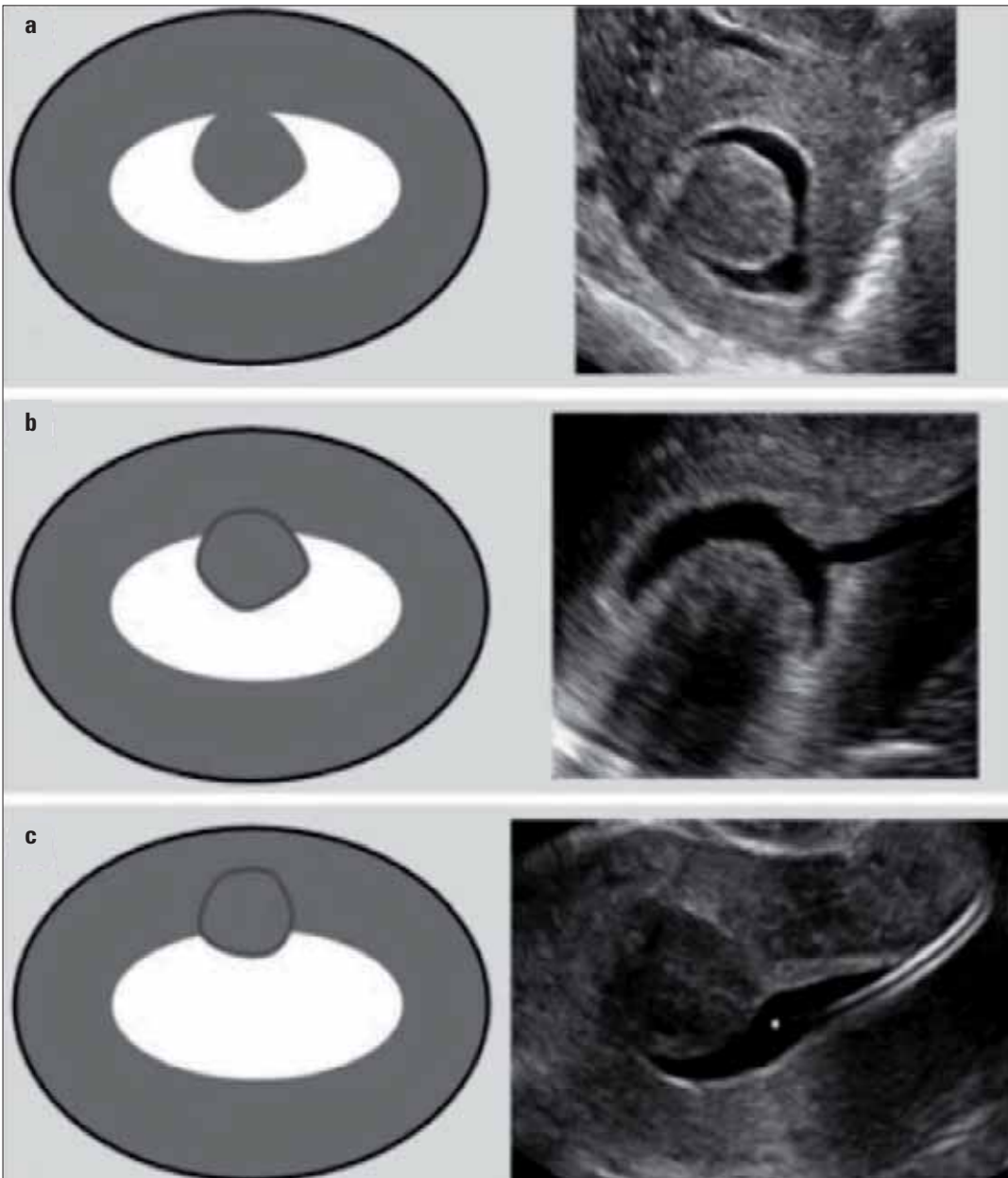


Figure 7: Proportion of the myoma protruding into the uterine cavity: (a) grade 0 (100% in the cavity); (b) grade 1 (\geq 50% in the cavity); (c) grade 2 (< 50% in the cavity). With permission from:¹⁷ *Ultrasound Obstet Gynecol* 2010; 35: 103–12.

the backflow (using a volume that is too high and an excessive instillation rate) may cause pain. Reflux through the cervix may also affect the stability of the cavity filling. Although, using the cine-loop, this is rarely a problem using 2D ultrasound, this may affect the image quality of a 3D-volume. Moreover, the backflow may become inconvenient and embarrassing for both the patient and the physician. Most of these problems may be overcome using e.g. a balloon catheter, but this increases costs (as compared with the use of a neonatal suction catheter). Moreover, using balloon catheters is associated with a higher risk for higher intracavitary pressure. Finally, during SIS potential malignant endometrial cells may be flushed through the tubes into the abdominal cavity. Although this has been documented for SIS and hysteroscopy, to date, it has not been demonstrated that this had any prognostic implications. However, oncologists, based on the precautionary principle, advocate the use of the smallest amount of fluid possible to avoid high instillation pressure. In case of a highly suspicious lesion at unenhanced ultrasound, sample the endometrium and

await histology before proceeding with SIS or hysteroscopy.

Owing to gel's higher viscosity, GIS greatly overcomes these SIS-related problems. GIS has been reported to have following advantages over SIS: lower failure rates,²⁰ a steady cavity filling enabling high quality 3D imaging,²¹ less procedure related pain,²² does not affect colour imaging,²³ and, due to its higher viscosity, a lesser risk for transtubal flow of potentially malignant endometrial cells. Moreover, office endometrial sampling is also possible immediately after GIS, without affecting the histological examination. If office endometrial sampling is performed immediately after GIS, the pipelle aspirations should be repeated till no gel is aspirated, after which a supplementary aspiration is completed to sample the endometrium. All aspirations are collected in a sample jar containing fixative.²⁴

Three types of gel licensed for intracavitary use have been used for GIS. The base of the different gels is identical, but one gel contains lidocaine and chlorhexidine, one only contains chlorhexidine, and one gel does not contain any additives. The

addition of lidocaine does not add any advantage in term of patient's discomfort or pain.²⁵ In women of fertile age who do not use contraception, especially in the second half of the cycle, one should be cautious about using FIS. If FIS is to be performed in those women, we advocate the use of gel without any additives.

Although FIS is usually very well tolerated, some women experience lower abdominal pain during or after the procedure, necessitating the use of paracetamol or of a non-steroidal anti-inflammatory drug.

Conclusion

The ultrasound evaluation of the endometrium and uterine cavity has moved from the simple reporting of the endometrial thickness (thus selecting those women at low risk for cancer) to a much more comprehensive examination and reporting of the ultrasound findings including not alone 2D gray-scale ultrasound, but also colour imaging, fluid instillation and 3D ultrasound.

The IETA consensus paper aimed to standardise the ultrasound evaluation when reporting. The implementation of IETA terms in daily practice may improve communication between ultrasonographers, clinicians and pathologists, and hence optimise women's care.

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