

Evaluation of abnormal uterine bleeding by transvaginal 3-D hysterosonography and diagnostic hysteroscopy

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Summary

Aim: To compare 3-D hysterosonography (3-DHS) and diagnostic hysteroscopy in women with abnormal uterine bleeding.

Materials & Methods: Of 248 women with abnormal uterine bleeding who were referred to our department, 3-D hysterosonography and hysteroscopy were performed in 242 women and the results were estimated. In six women 3-DHS could not be performed because of cervical stenosis. Sensitivity and specificity of 3-DHS compared to those of hysteroscopy.

Results: From the 242 women who underwent examination, we found 30 patients with polyps, 22 with myomas, four with müllerian anomalies, ten with endometrial cancer, 12 with adhesions and 165 with a normal uterine cavity. There was agreement between the two methods in 28 cases of polyps, 22 cases of myomas, four cases of müllerian anomalies, ten cases of endometrial cancer, eight cases of adhesions and in 165 cases of normal endometrium. The sensitivity and specificity of 3D hysterosonography was 93.5% and 99.4%, respectively, with a positive prognostic value (PPV) of 98.6% and a negative prognostic value (NPV) of 97%. The sensitivity and specificity of hysteroscopy was 98.7% and 99.4%, respectively, with a PPV of 98.7% and a NPV of 99.4%.

Conclusions: Three-D hysterosonography accurately assessed intrauterine pathology.

Key words: 3-D ultrasound; Hysterosonography; Hysteroscopy; Intrauterine lesions; Abnormal uterine bleeding.

Introduction

Pathology of the endometrial cavity is a common finding in women with abnormal menstrual cycles (metrorrhagia, menometrorrhagia, amenorrhea, oligomenorrhea, polymenorrhea).

Transvaginal ultrasonography (TVS) and the use of hydro-hysterosonography (B-mode transvaginal ultrasound with sterile saline instillation into the uterine cavity) are valuable tools in the diagnosis of uterine cavity pathology [1]. Modern imaging techniques as 3-D imaging of the endometrial cavity and 3-dimensional hysterosonography (3-DHS) improve the diagnostic accuracy of sonography, combining TVS and hysterosalpingography advantages [2]. Three-DHS evaluates every surface of the uterine cavity in great detail, after mild distention with normal saline solution through an intracervical probe. The information is digitally stored as data which can be further analyzed by more examiners in such a way that allows the visualization of the organ from different angles and planes. As a result final diagnosis can be achieved at a later time and not only by the initial examiner. Diagnostic hysteroscopy permits direct imaging of the uterine cavity and exact determination of endometrial pathology. Hysteroscopic findings can be recorded in order to use them for quality control cases, but the data cannot be modified or further analyzed and the initial operator only determines the diagnosis.

In our study we present the results from the use of 3-DHS and diagnostic hysteroscopy in 242 women with abnormal uterine bleeding of undetermined reasons.

Material and Methods

This prospective study was performed in the 1st Department of Obstetrics and Gynecology Clinic of the University of Athens, "Alexandra" Hospital, from June 2004 to February 2006. Two hundred and forty-eight women with abnormal vaginal bleeding of undetermined etiology were referred to our department and underwent both diagnostic hysteroscopy and 3-DHS saline infusion. The mean age of the patients was 39.5 years (range 20-59 years). Patients with active vaginal bleeding, pregnancy and pelvic inflammation were excluded from the study. Of 242 women, 50 presented with mild vaginal bleeding every 15-20 days lasting three to four months, 150 women had had recent vaginal bleeding for five to ten days (but not at the examination time), 12 had oligomenorrhea and ten amenorrhea. Forty-eight women had been in menopause for 8-12 years and 24 women had had their last period 8-14 months before. All women were initially evaluated with intravaginal sonography followed by 3-DHS. The examination was performed between the fifth and tenth day of the menstrual cycle. Sonography with a Voluson 730D and intravaginal probe 5-7 MHz with three-dimensional ability was performed. After cleaning and antisepticism of the vagina, an intrauterine double lumen insemination catheter was placed in the endometrial cavity under sonographic imaging and infusion of 10-60 ml normal saline (0.9% NaCl) was performed. After the distention of the uterus with sterile saline a complete survey of the uterine cavity was performed and representative images from suspicious areas were obtained providing valuable data for the diagnosis. Endometrial thickness was measured as the maximal distance between the two myometrial interfaces in a longitudinal scan. All the findings from the endometrial cavity were recorded and analyzed. The next day, all women underwent diagnostic hysteroscopy according to the Siegler technique. The procedure was performed by means of a 2.7 mm mini-hysteroscope, with a 30° force-oblique optical lens and a 3.2 mm diagnostic sheath. Illumination was provided by a high-intensity cold light source via an optic fiber,

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Fig. 1



Fig.

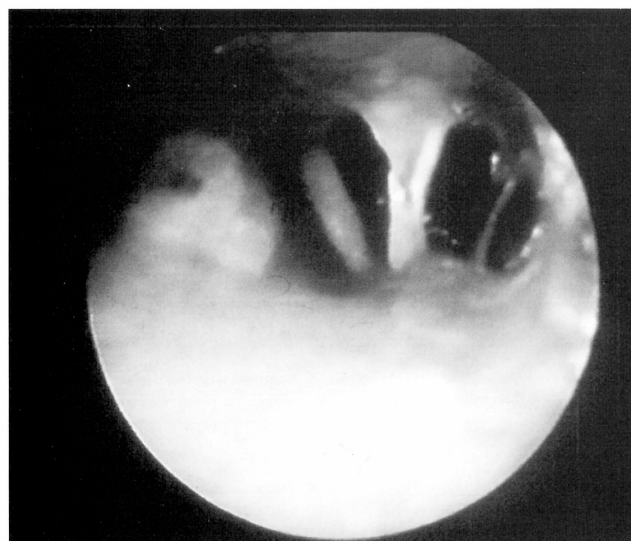


Fig. 3

Figure 1. — Endometrial polyp by 3-DHS.

Figure 2. — Synachiae into the endometrium by 3-DHS.

Figure 3. — Clear view of endometrial synachiae by hysteroscopy.

and all procedures were monitored. The distention of the uterine cavity was achieved with carbon dioxide via an electronic HAMOU hysteroflator (Wolf-Germany), adjusted to a flow rate of 45 ml/min, and intrauterine pressure not exceeding 100 mmHg. Findings from both methods were correlated with the pathologic diagnoses from biopsy samples. Finally the results of the two methods were compared. Statistical analysis was performed by the McNemar test (χ^2 -like test used on matched pairs). In our study 3-DHS and hysteroscopy were compared with histology, which was considered the true result.

Results

The mean age of the patients was 39.5 years (range 20-59 years). Diagnostic hysteroscopy was characterized as complete in all cases (complete examination of the entire uterine cavity including both ostia). Two cases of 3-DHS were inconclusive due to inadequate distention of the uterine cavity. The procedure was successfully repeated after one month. In six cases neither method was applied due to patient anxiety. Pathological examination of the endometrial specimens revealed 30 polyps (12.3%), 22 submucous myomas (9%), ten cases with endometrial cancer (4.13%) four cases with hyperplasia of the endometrium

(1.7%) and 164 cases with normal endometrium (67.8). In order to better analyze our results a final histological diagnosis classified patients in two categories: positive (polyps, myomas, endometrial cancer, hyperplasia), and negative (normal endometrium). Cases in which hysteroscopy revealed adhesions ($n = 12$) were considered as positive. Evaluation of predictive power was based on sensitivity, specificity positive and negative predicting values. Of 242 women 3-DHS showed 28 cases with endometrial polyps (11.57%) (Figure 1), eight cases with endometrial adhesions (3.3%) (Figure 2), 23 cases with submucous myomas (9.5%), ten cases with endometrial cancer (4.13%) four cases with hyperplasia of the endometrium (1.7%) and 169 cases with normal endometrium (69.8%). Diagnostic hysteroscopy revealed 29 cases with endometrial polyps (11.9%), 12 adhesions (4.95%) (Figure 3), 22 submucous myomas (9%), ten cases with endometrial cancer (4.1%), four cases with hyperplasia of the endometrium (1.7%) and 165 cases with normal endometrium (68.1%). The two methods were completely concordant in all patients with fibromyomas, hyperplasia and endometrial cancer. There were slight differences in cases with polyps ($p = 1$) and in cases with adhesions ($p = 0.1$).

The sensitivity and specificity of 3-D hysterosonography was 93.5% and 99.4%, respectively, with a PPV of 98.6% and a NPV of 97% (Table 1). The sensitivity and specificity of hysteroscopy was 98.7% and 99.4%, respectively with a PPV of 98.7% and a NPV of 99.4% (Table 2).

Table 1. — Correlation between 3-DHS and histology.

		Histology		
		Positive	Negative	Total
3-DHS	Positive	72	1	73
	Negative	5	164	169
	Total	77	165	242
Sensitivity	93.5%			
Specificity	99.4%			
PPV	98.6%			
NPV	97%			

Table 2. — Correlation between hysteroscopy and histology.

		Histology		
		Positive	Negative	Total
Hysteroscopy	Positive	75	1	76
	Negative	1	165	166
	Total	76	166	242
Sensitivity	98.7%			
Specificity	99.4%			
PPV	98.7%			
NPV	99.4%			

PPV = positive prognostic value

NPV = negative prognostic value

Discussion

Three-dimensional intravaginal hysterosonography can be used for the demonstration of endometrial polyps, fibromyomas, endometrial hyperplasia and endometrial cavity adhesions [4, 5]. It is a technique with greater sensitivity than the two-dimensional intravaginal hysterosonography which can improve accuracy in the evaluation of the endometrial cavity [6]. In relation to conventional ultrasonography 3-DHS can show in greater detail every surface of the endometrium separately, thus aiding the diagnosis of pathologic conditions. Bomnany *et al.* [7] and Williams, and Marshbury [8], showed that hysterosonography sensitivity is more efficient compared to intravaginal ultrasonography. Endometrial cavity distention can be achieved with normal saline solution, Ringer's solution, 1.5% glycine and sterilized water [9]. Three-DHS can be performed on an outpatient basis without the use of anesthesia or analgesia. Three-DHS demonstrates endometrial polyps as an ultrasonic area characterized by local thickening of the endometrium, often tending to have a thin stem because of the specific vascularity around the base of the polyp, with a resistance index (RI) calculated above 0.42. Polyps may be multiple

and highly echogenic due to the variable echogenic density of the surrounding liquid [10] (Figure 1). In our study hysteroscopy missed one polyp. The disagreement between 3-DHS and hysteroscopy was not statistically significant ($p = 0.1$).

Submucosal fibromyomas are heterogeneous neoplasms interrupting the endometrium. Submucosal fibromyomas often have a halo and mimic polyps. In our study 3-DHS diagnosed a myoma instead of a polyp. Nevertheless, the wide-based, irregular shaped polyp with mixed echogenicity and the myomas RI calculated from 0.55 to 0.75 eliminate any difficulty in diagnosis [11]. Bellen *et al.* showed that 3-DHS is a valuable tool because of its imaging accuracy and its ability to show the locus of submucosal fibromyomas [12]. In our study 3-DHS and hysteroscopy showed no differences in the detection of myomas.

Postmenopausal uterine bleeding is an alarming symptom that requires accurate diagnosis in order to exclude cervical and endometrial diseases. In our study all women with endometrial cancer were in menopause. Endometrial thickness > 5 mm in postmenopausal women was considered suspicious for cancer. With 3-DHS we are able to observe an endothytic growth toward the uterine cavity and the myometrium. The clear visualization of myometrial invasion suggests that 3-DHS may be useful in the future in the staging of endometrial cancer. There was a complete diagnostic correlation between 3-DHS, hysteroscopy and histologic findings in cases of endometrial cancer.

Contraindications for 3-DHS are stenosis of the cervix, active pelvic inflammation and isthmic symphysis. Insufficient distention of the endometrial cavity can occur due to leakage of the liquid through tubes or in patients with an incompetent cervix, while ambilateral obstruction of the tubes can cause painful distention of the endometrial cavity. Many studies have described the theoretical danger from malignant cell dissemination to the endometrial cavity via the ostia to the pelvis [13]. The estimated risk is extremely low as liquid quantity is small and is injected with low pressure. Diagnostic hysteroscopy eliminates the possibility of dissemination of cancer cells by the use of CO₂ for the distention of the uterus.

Although diagnostic hysteroscopy is the method of choice for the diagnosis of endometrial pathology, the high sensitivity and specificity of 3-DHS can provide an alternative solution in the definition of abnormal vaginal bleeding.

Conclusion

Three-dimensional intravaginal hydro-hysterosonography is an easy, safe and well-tolerated method that provides useful information for endometrium pathology in women with vaginal bleeding of unknown origin. Although it is reasonable to expect that 3-DHS will have multiple applications in gynecology in the near future much more experience and prospective studies are needed before this expectation becomes a reality.

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