

## Original Article

# Comparison of transvaginal ultrasonography and hysteroscopy in the diagnosis of uterine pathologies

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**Abstract:** A thorough evaluation of the uterine cavity is frequently required in gynecology practice. The aim of this study was to compare the diagnostic values of transvaginal ultrasound examination and hysteroscopy in detecting uterine abnormalities in a group of patients within a range of menopausal status and symptomatology. This study included 285 patients admitted with complaints of abnormal uterine bleeding, postmenopausal bleeding, lower abdominal pain, abnormal vaginal discharge or for a routine gynecological examination. All patients had available transvaginal ultrasonography and hysteroscopy data for evaluation. A biopsy was obtained from all patients during the hysteroscopy session. Sensitivity, specificity, positive predictive value, negative predictive value and likelihood ratio were calculated for both methods and compared, considering the histopathological diagnosis as the gold standard. The mean age of the patients was  $49.5 \pm 12.9$  years (range, 24-89 y). Majority of the patients admitted for abnormal uterine bleeding (n=198, 69.4%). For the diagnosis of polyps of any size, hysteroscopy had better sensitivity ( $p < 0.001$ ), however, specificities did not differ ( $p = 1.0$ ). On the other hand, hysteroscopy did not have a sensitivity advantage over TVU in diagnosing polyps greater than 1 cm ( $p = 0.077$ ), although this time hysteroscopy had better specificity ( $p < 0.001$ ). Combined approach did not offer diagnostic advantage for any of the specific pathologies. Although TVU represents a practical approach for the initial evaluation of uterine pathologies, hysteroscopy seems to offer better diagnostic value for uterine pathologies in general, and uterine polyps in particular.

**Keywords:** Uterine pathology, transvaginal ultrasound, hysteroscopy, uterine polyps

## Introduction

Abnormal uterine bleeding, non-bleeding symptomatic uterine conditions and incidental findings on screening studies require a thorough evaluation of the uterine cavity. Abnormal uterine bleeding is one of the leading causes of seeking gynecological advice. In the perimenopausal age group in particular, 70% of all gynecological consultations are for abnormal uterine bleeding [1].

During the last decades, several methods including transvaginal ultrasonography (TVU), saline infusion sonography, and hysteroscopy, have been developed to assess uterine cavity, with their own advantages and disadvantages. Although TVU is a simple examination allowing clear visualization of most uterine conditions [2], several concerns have been raised regarding its accuracy [3-5]. Hysteroscopy on the other hand, allows direct visualization and sam-

pling of the uterine cavity and has an established diagnostic value for many uterine conditions [6-14]. However, the latter modality is not as cost-effective and convenient as ultrasonographic imaging modalities, which are associated with relatively less patient discomfort and do not necessitate anesthesia. Thus, currently available modalities are far from being perfect [15].

This study aimed to compare the diagnostic values of transvaginal ultrasonography and hysteroscopy in detecting uterine abnormalities in a large group of patients with wide range of menopausal status and symptomatology.

## Material and methods

### Patients

Patients admitted to our outpatient clinic with complaints of abnormal uterine bleeding, post-

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**Table 1.** Diagnostic value parameters of the two methods in diagnosing uterine pathology

	Sensitivity	Specificity	PPV	NPV	LR (+)
Any pathology (n=198)					
TVU	96.0 (91.9-98.1)	13.8 (7.6-23.2)	71.7 (65.8-77.0)	60.0 (36.4-80.0)	1.1 (1.0-1.2)
Hysteroscopy	92.9 (88.2-95.9)	41.4 (31.1-52.4)	78.3 (72.4-83.3)	72.0 (57.3-83.3)	1.6 (1.3-1.9)
Combined	100.0 (97.6-100.0)	41.4 (31.1-52.4)	79.5 (73.9-84.2)	100.0 (88.0-100.0)	1.7 (1.4-2.0)
Polyp (n=133)					
TVU	54.9 (46.0-63.4)	84.9 (77.9-90.0)	76.0 (66.0-83.9)	68.3 (61.0-74.7)	3.6 (2.4-5.4)
Hysteroscopy	82.0 (74.1-87.9)	84.9 (77.9-90.0)	82.6 (74.8-88.4)	84.3 (77.4-89.5)	5.4 (3.7-8.0)
Combined	86.5 (79.2-91.6)	78.9 (71.4-85.0)	78.2 (70.5-84.4)	87.0 (80.0-91.9)	4.1 (3.0-5.6)
Polyp >1 cm (n=115)					
TVU	55.7 (46.1-64.8)	88.7 (81.9-93.2)	80.0 (69.3-87.8)	71.0 (63.6-77.5)	4.9 (3.0-8.0)
Hysteroscopy	86.1 (78.1-91.6)	91.5 (85.3-95.3)	89.2 (81.5-94.0)	89.0 (82.4-93.3)	10.1 (5.9-17.5)
Combined	88.7 (81.1-93.6)	85.1 (77.9-90.3)	82.9 (74.9-88.9)	90.2 (83.5-94.4)	6.0 (4.0-8.9)
Atrophy (n=27)					
TVU	18.5 (7.0-38.7)	99.6 (97.5-100.0)	83.3 (36.5-99.1)	92.1 (88.1-94.9)	47.8 (5.8-394.1)
Hysteroscopy	66.6 (46.0-82.8)	99.6 (97.5-100.0)	94.7 (71.9-99.7)	96.6 (93.5-98.3)	172.0 (23.9-1238.6)
Combined	70.4 (49.7-85.5)	99.2 (96.9-99.9)	90.5 (68.2-98.3)	97.0 (93.9-98.6)	90.8 (22.3-368.9)

Numbers in parenthesis denotes 95% confidence intervals. TVU, transvaginal ultrasonography, PPV, positive predictive value; NPV, negative predictive value; LR (+), positive likelihood ratio.

menopausal bleeding, lower abdominal pain, abnormal vaginal discharge or for a routine gynecological examination between 2007 and 2010 in GATA Haydarpasa Training Hospital Department of Obstetrics and Gynecology who underwent both transvaginal ultrasound examination and hysteroscopy were included in this retrospective study. A biopsy was obtained from all patients during the hysteroscopy session.

### Transvaginal ultrasound examination

Transvaginal ultrasound examination was done using PowerVision 6000 SSA-370A ultrasound equipment (Toshiba Medical Systems Co. Ltd., Tokyo, Japan) with a 5.0 to 7.5 MHz transvaginal transducer. Ultrasonographic examination findings were considered normal if a hyper-echoic line was observed in the middle of the uterus along with a homogeneous endometrial lining and distinct margin with the myometrium. In premenopausal patients, normal limits of anteroposterior diameter of the endometrium was defined as 4-8 mm in proliferative phase, 8-14 mm in the secretory phase and 6-10 mm in the periovulatory phase. An increase above these limits or presence of heterogeneous echogenicity was considered abnormal. In postmenopausal patients, a normal endometrium was defined as having a double-wall thickness <5 mm consisting of a thin basal layer. Abnormalities were defined as follows: endo-

metrial polyp, uterine myoma, atrophy, and placental residual material. In addition, a non-specific increase in endometrial echogenicity or presence of fluid in the endometrial cavity is classified as non-specific abnormal finding.

### Hysteroscopy

Hysteroscopy was done using a 5 mm hysteroscope with 30 optic telescopes (Storz Telecam SL 11 camera with a light source of Xenon Nova, Germany). Resectisol was used to distend the uterine cavity. Diagnostic sampling, resection or curettage was done and samples were sent for histological examination. Hysteroscopy appearances were categorized as follows: normal, endometrial polyp, endometritis, atrophy, uterine myoma, malignancy, hyperplasia, residual placental material or hyperplasia. In addition, non-specific findings of proliferation and hypertrophy and synechia were categorized as non-specific findings.

### Statistical analysis

SPSS version 21 was used for statistical analysis. Diagnostic parameters including sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of transvaginal ultrasonography, hysteroscopy and a combined approach were calculated for the diagnosis of endometrial conditions. A positive finding with at least one of the methods

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was sufficient for a positive test finding in the combined approach. Sensitivities and specificities were compared using Pearson chi-square test statistic. A  $p$  value smaller than 0.05 was considered as an indication for statistical significance.

### Results

Two hundred eighty-five female patients were included in this retrospective study. The mean age of the patients was  $49.5 \pm 12.9$  years (range, 24-89 y). Majority of the patients admitted for abnormal uterine bleeding ( $n=198$ , 69.4%). In 74 patients (26.0%), a suspicious finding was found on routine gynecological examination, and in the remaining 13 patients (4.6%) examinations were done as a part of infertility workup. One hundred and nine patients were postmenopausal (38.2%,  $n=109$ ). Based on the histopathological examination of the samples obtained during hysteroscopy session, final diagnoses of the patients were as follows: endometrial polyp ( $n=133$ , 46.7%), atrophy ( $n=27$ , 9.5%), endometritis ( $n=13$ , 4.6%), uterine myoma ( $n=12$ , 4.2%), cancer ( $n=6$ , 2.1%), retained products of conception ( $n=4$ , 1.4%), and hyperplasia ( $n=3$ , 1.1%). An abnormal finding could not be found in 87 patients (30.5%).

**Table 1** shows diagnostic parameters of the two modalities and the combined approach for the detection of most common pathologies (i.e. endometrial polyp and atrophy). For diagnosing any pathology, hysteroscopy had better specificity ( $p < 0.001$ ) although the two methods did not differ with regard to sensitivity ( $p = 0.188$ ). For the diagnosis of polyps of any size, hysteroscopy had better sensitivity ( $p < 0.001$ ), however, specificities did not differ ( $p = 1.0$ ). On the other hand, hysteroscopy did not have a sensitivity advantage over TVU in diagnosing polyps greater than 1 cm ( $p = 0.077$ ), although this time hysteroscopy had better specificity ( $p < 0.001$ ). As expected, hysteroscopy had sensitivity advantage in diagnosing atrophy ( $p < 0.001$ ); however, specificities did not differ ( $p = 1.0$ ). Other pathological conditions had low frequency not allowing direct comparisons between the methods. Nevertheless, respective sensitivities were as follows for hysteroscopy versus TVU: endometritis, 30.8 vs. 0%; uterine myoma, 100% vs. 50%; malignity, 50% vs. 0%; retained products of conception, 75%

vs. 50%; hyperplasia, 33.3% vs. 0%. The only advantage of the combined approach over both methods was its superior sensitivity in diagnosing any pathology. For other conditions, combined approach did not seem to offer an advantage over both of the methods.

### Discussion

This study examined the diagnostic value of TVU and hysteroscopy for uterine pathologies in a large sample of women with abnormal uterine bleeding or suspicious findings. Almost half of the cases were finally diagnosed with uterine polyps. To our knowledge, this study for the first time directly compared the two modalities for the diagnosis of uterine polyps with consideration of polyp size. Overall, hysteroscopy seems to perform better for most uterine conditions evaluated, although frequencies of endometritis, myoma, cancer, retained products of conception and hyperplasia were relatively low to allow direct comparisons of the two methods. Particularly, its advantage is more prominent when all sizes of the polyps including the smaller ones ( $< 1$  cm) were considered.

Several studies have compared the diagnostic values of transvaginal ultrasonography and hysteroscopy in diagnosing uterine pathologies. However, distributions of the uterine conditions vary in those samples. A recent study by Vitner et al. found higher sensitivity and specificity for hysteroscopy in diagnosing uterine myomas, when compared to TVU; whereas, TVU had higher sensitivity for diagnosing the retained products of conception [4]. On the other hand, they failed to find a statistical difference between the two methods for the diagnosis of the polyps. In that study, the frequencies of endometrial polyps, uterine myomas and retained products of conception were close to each other: 27, 32 and 38% of the sample population, respectively. In contrast, uterine polyps comprised a great proportion of the patient sample in this study ( $n=129$ , 47%), and we found better sensitivity and specificity for diagnosing polyps with hysteroscopy; however, the sensitivity advantage of this modality was not evident for polyps greater than 1 cm. On the other hand, a direct comparison of the two diagnostic modalities was not possible for retained products of conception since this condition was present in only 1.4% of the study population.

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Similar to the findings in this study, Mukhopadhyay et al. found a high sensitivity (71.4%) and specificity (100.0%) for hysteroscopy for diagnosing polyps [16]; with strong agreement with biopsy findings ( $k=0.81$ ). Soguktas et al. found better diagnostic value for hysteroscopy when compared to both saline infusion sonography and transvaginal ultrasonography in detecting uterine polyps; however, for detection of any uterine pathology, hysteroscopy and saline infusion sonography had similar efficacy but better than transvaginal ultrasonography [7]. Similarly, Mathlouthi et al. [17] and Yela et al. [8] found diagnostic values in favor of hysteroscopy for the diagnosis of uterine pathologies. In the study by Yela et al., the specificity of TVU in particular was remarkably low (7.4%) for the detection of uterine disease [8]. Kasraeian et al., examined the diagnostic value of transvaginal ultrasonography in non-bleeding postmenopausal women and found only moderate accuracy to diagnose uterine pathologies [3].

In the study by Vitner, et al., the diagnostic value of the combined approach was also examined and authors concluded that the combination of the two methods did not seem to improve the results [4]. This is in line with the findings of our study, in which only the sensitivity of combined approach was superior to both methods in detecting any uterine pathology. For polyps and atrophy, combined approach did not seem to offer sensitivity or specificity advantage over both methods.

Sonohysterography or saline infusion sonography (SIS) was described in 1981 [18], and involves the distention of uterine cavity with saline, in an attempt to provide better visualization. Although not as practical as transvaginal ultrasonography, SIS has emerged as an alternative to the tools for diagnosing uterine pathologies. Current evidence suggests that SIS offers better diagnostic value when compared to transvaginal ultrasonography [7, 19-21]. Even some investigators proposed that diagnostic accuracy of SIS for endometrial polyps and submucous myomas are equal to hysteroscopy [22]. On the other hand, Dasgupta et al. compared the diagnostic accuracies of transvaginal ultrasonography and saline infusion sonography in the assessment of the endometrial cavity in perimenopausal women on oral progesterone for abnormal uterine

bleeding [5]. Those authors concluded that although saline contrast improves the diagnostic accuracy, this improvement was not enough to make it an alternative to hysteroscopy [5]. They recommended hysteroscopy and guided biopsy as the best option, particularly in that specific group of patients in which hormone induced endometrial changes make imaging studies less accurate [5].

Transvaginal ultrasonography is a widely available, relatively cheap and practical method to evaluate uterine pathologies. It is non-invasive and causes minimal discomfort to the patient. Therefore, it is mostly used as the initial modality in patients with abnormal uterine bleeding or non-bleeding symptomatic patients. Its relative simplicity and availability makes it a very helpful tool for screening. However, its relatively modest diagnostic value for most of the uterine pathologies makes interpretation of the findings rather challenging for the physician. Although encouraging results have been obtained with saline infusion sonography, several studies found inferior diagnostic value for this modality when compared to hysteroscopy. According to these findings, hysteroscopy remains the best option for the assessment of endometrium owing to its established accuracy when compared to ultrasonographic imaging modalities. It allows direct visualization of the cavity and sampling for histopathological examination, in the expense of some discomfort since most of hysteroscopy sessions require some degree of anesthesia.

The main limitation of this study is the low number of patients with conditions other than uterine polyps thus not allowing direct comparison of the two methods for myoma, placental residual material, hyperplasia and cancer.

In conclusion, although TVU represents a practical approach for the initial evaluation of uterine pathologies, a hysteroscopy examination would be necessary in most of the suspicious cases. Hysteroscopy seems to offer better diagnostic value for uterine pathologies in general, and uterine polyps in particular.

### Disclosure of conflict of interest

None.

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