



## **Success Rates of Vaginal Sonography and Hysteroscopy for Diagnosis of Intrauterine Pathologies in Female Infertility**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author MY designed the study and wrote the protocol. Author MAD performed the statistical analysis and wrote the first draft of the manuscript. Authors MF, FZ and MAD managed the analyses of the study. Author NM managed the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Background and Aim:** Uterine anatomical pathologies play important roles in causing female infertility. This study was conducted to survey the efficiency of hysteroscopy and vaginal sonography in detecting the intrauterine pathologies in infertile women.

**Methods:** This cross-sectional study was conducted on all the infertile women referring to the Endometriosis Research Center between December 22, 2013 and August 22, 2015. Forty five women were recruited and the data on the examinations of uterine lesions were analyzed by transvaginal sonography (TVS), hysteroscopy, and pathology as the standard test. Data analysis

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was conducted by SPSSv16 using *t*-test and Mann-Whitney test, and the sensitivity and specificity were measured with reference to the standard test.

**Findings:** For diagnosing polyp, endometrial hyperplasia, and myoma, TVS showed the 75%, 25%, and 85.71% sensitivity, respectively, and specificity of 92.30%, 92.30%, and 56.97% respectively. For them, hysteroscopy showed the 60%, 75%, and 75.71% sensitivity respectively, and specificity of 71.65%, 30.92%, and 56.97% respectively.

**Conclusion:** According to the findings of this study, the sensitivity of TVS and hysteroscopic findings in diagnosing uterine pathologies is relatively high, but the sensitivity of TVS was low to diagnosis of endometrial hyperplasia.

*Keywords: Transvaginal sonography; hysteroscopy; uterine pathology; infertility.*

## 1. INTRODUCTION

Despite medical advances, uterine pathologies remain unknown in many cases with serious consequences such as infertility [1]. Septate uterus, dysmorphic uterus, dysfused uterus, unilateral formed uterus, aplastic or dysplastic uterus uterine septum, endometrial polyps, arcuate and bicornuate uteri, and myomas are pathologies that cause repeated miscarriage in addition to clinical complications [2,3]. Various devices, including hysteroscopy and transvaginal sonography (TVS), can diagnose intrauterine pathologies [4]. TVS is a diagnostic device that allows the examination of intrauterine and endometrial abnormalities [5].

Hysteroscopy is an endoscopic diagnostic-therapeutic intrauterine method and is conducted with local or general anesthesia in the operating room to detect the causes of abnormal hemorrhage or certain problems in the uterine structure [4]. These two methods have their own advantages and disadvantages. Although TVS has recently become an efficient device to detect cases with intrauterine abnormalities, this method is a screening technique and plays a fundamental role in presurgical diagnosis. In contrast, hysteroscopy is simultaneously a diagnostic and therapeutic technique but requires local and relatively invasive anesthesia [6-9]. Examining for and diagnosing uterine abnormalities can affect the result of assisted reproductive technology (ART) and is considered one of the important therapeutic procedures before treatment of infertility [10].

Therefore, removing the intrauterine pathologies is an important step before the ART. Besides that, comparing TVS and hysteroscopy is a current issue and it has not yet been determined that which one is preferable over the other one. We conducted this study to survey the findings of TVS and hysteroscopy on infertile women as well

as histopathological results on such women to determine the status of TVS and hysteroscopy in diagnosis of uterine pathologies.

## 2. MATERIALS AND METHODS

The study population of this cross-sectional study consisted of all the infertile women referring to the Endometrium and Endometriosis Research Center of the Hamedan University of Medical Sciences between December 22, 2013 and August 22, 2015. Of this population, 45 patients with the inclusion criteria were recruited by census sampling. The women with primary or secondary infertility whose lesions had been observed in TVS or had history of repeated unsuccessful uterine implantations accompanied by normal vaginal sonography were enrolled in this study. Suspected diagnosis, acute cervicitis, pelvic inflammatory diseases, and unwillingness to participate in the study were considered the exclusion criteria. Vaginal sonography was conducted on all the patients by two gynecologists with infertility fellowship. In addition, all of them underwent hysteroscopy.

Besides that, the specimens taken from the patients were examined for the type of pathology by a pathologist and the results were reported. In this study, the examination of the pathological specimens was considered a standard method to determine the sensitivity and specificity of TVS and hysteroscopy in diagnosing the intrauterine pathologies in the infertile women. The data of the patients such as age, height, weight, infertility type, and previous treatments, diagnostic findings in TVS and hysteroscopy, and pathology were recorded in a checklist as they underwent TVS and hysteroscopy.

All patients provided informed consent to participate in the study, and the study protocol was approved by the Iranian Registry of Clinical Trials with approval no.: IRCT201510049014N80.

The data were analyzed by SPSS 16. To investigate the difference between the S ratio of the two studied techniques, chi-square test. To investigate the precision of TVS and hysteroscopy in diagnosing the intrauterine abnormalities, the statistical indices sensitivity, specificity, positive predictive value, and negative predictive value (in comparison with gold standard histopathology method) were calculated in the two groups. In this study, the level of statistical significance was considered < 0.05.

### 3. RESULTS

The mean age of the participants was 32.7 years. The cause of infertility was primary in 27 (61.3%) participants and secondary in 18 (38.7%) participants. The mean [ $\pm$  standard deviation (SD)] age of the women with primary infertility was 31.85 ( $\pm$  6.04) years and that of the women with secondary infertility was 34.05 ( $\pm$  5.26) years without any statistically significant difference ( $p=0.222$ ). The mean ( $\pm$  SD) duration of infertility was 6.5 ( $\pm$  4.13) years in the women with primary infertility and 4.6 ( $\pm$  2.5) in the women with secondary infertility with no statistically significant difference ( $p=0.098$ ). The descriptive data on the patients' medical history, the frequency of failure, the types of pharmacotherapy, and the type of intervention in

patients with previous surgery or endometrial manipulation are shown in Table 1.

The TVS results demonstrated that the most frequent finding was oncogenic and thick endometrium followed by irregular endometrium and polyp. The hysteroscopic results demonstrated that polyp and irregular endometrium were the most frequent findings. Besides that, according to the examinations of the histopathological specimens, proliferative endometrium was the most frequent diagnosis (Table 2).

Because the examination of the pathological specimens was considered the standard method to determine the sensitivity and specificity of the two methods, the diagnostic sensitivity was investigated by submucosal myoma, polyp, and oncogenic and thick endometrium whose equivalents, in the pathological examinations, are myoma, polyp, and endometrial hyperplasia, respectively. No cases of septate in TVS and hysteroscopy were sent for pathological examinations. According to statistical analysis, the sensitivity rates of TVS and hysteroscopy in diagnosing polyp in the women was 75% and 60% respectively. The diagnostic specificity rate in diagnosing polyp in the infertile women was 92.30% and in hysteroscopy was 65.71% (Table 3).

**Table 1. The frequency distribution of medical history, failure, and types of pharmacotherapies and interventions in patients**

Patient history	Variable	Frequency	Percent
	Menstrual abnormalities	23	51.11
	PCOS	18	40.00
	IVF failure	15	33.33
	Hormonal treatments	14	31.11
	Endometrial manipulation or surgery	10	22.22
	Without history	11	24.44
<b>Number of failures</b>	Once	5	33.33
	Twice	4	26.66
	Three times	3	20
	Four times	2	13.33
	Five times	1	6.66
<b>The type of drug used</b>	FSH	9	20
	LH	7	15.55
	Agonist GnRH	6	13.33
	Estradiol	4	8.88
	Progesterone	3	6.66
	Dopamine agonist	2	4.44
	Estrogen	2	4.44
<b>Type of intervention in patients with a history of surgery or endometrial manipulation</b>	Cesarean	5	50.00
	Courtage	4	40.00
	Myomectomy	1	10.00

**Table 2. The frequency distribution of the results of transvaginal sonography, hysteroscopy, and pathological examinations in patients**

TVS finding	Diagnosis pathologies type	Frequency	Percent
	Oncogenic endometrium	25	55.55
	Irregular endometrium	13	28.88
	Polyp	12	26.66
	Submucousmyoma	9	20
	Uterine cavity deformity	2	4.44
	Endometrial hyperplasia	2	4.44
	Septa	1	2.22
	Trinomial endometrium	1	2.22
	Endometrial atrophy	1	2.22
	Normal	5	11.11
<b>Hysteroscopy finding</b>	Polyp	18	40.00
	Irregular endometrium	12	26.66
	Submucousmyoma	9	20.00
	Normal	8	17.77
	Endometrial hyperplasia	4	8.88
	Septa	4	8.88
<b>Pathology finding</b>	Proliferative endometrium	31	68.88
	Endometrial secretory	10	22.22
	Polyp	10	22.22
	Myoma	6	13.33
	Endometrial hyperplasia	5	11.11
	Inadequate	1	2.22
	Normal	1	2.22

**Table 3. The sensitivity and specificity of hysteroscopy and transvaginal sonography in diagnosing the uterine polyp based on the standard test of uterine polyp diagnosis in histopathological specimens**

Procedure		Histopathology (standard test)			Sensitivity and specificity	
Polyp	Hysteroscopy (screening test)	Positive	6	12	18	SN= 60 % SP= 65.71 %
		Negative	4	23	27	
		Total	10	35	45	
TVS		Positive	6	3	9	SN= 75 % SP=92.30 %
		Negative	2	36	36	
		Total	8	39	45	

According to statistical analysis, the sensitivity rates of TVS and hysteroscopy in diagnosing the uterine myoma in the women was 85.71% and 75.71% respectively. The diagnostic specificity rate of both TVS and hysteroscopy in diagnosing myoma in the infertile women was 92.30% (Table 4).

According to statistical analysis, the sensitivity rates of TVS and hysteroscopy in diagnosing endometrial hyperplasia in the women were 25% and 75%, respectively. The diagnostic specificity rate of both TVS and hysteroscopy in diagnosing

endometrial hyperplasia in the infertile women was 56.97% (Table 5).

#### 4. DISCUSSION

Our results showed, for diagnosing polyp, endometrial hyperplasia, and myoma, TVS showed the 75%, 25%, and 85.71% sensitivity, respectively, and specificity of 92.30%, 92.30%, and 56.97% respectively. For them, hysteroscopy showed the 60%, 75%, and 75.71% sensitivity respectively, and specificity of 71.65%, 30.92%, and 56.97% respectively.

**Table 4. The sensitivity and specificity of hysteroscopy and transvaginal sonography in diagnosing myomas based on the standard test of myoma diagnosis in histopathological specimens**

Procedure		Histopathology (standard test)			Sensitivity and specificity
<b>Myomas</b>	<b>Hysteroscopy (screening test)</b>	<b>Positive</b>	<b>Negative</b>	<b>Total</b>	SN=75.71 % SP=92.30 %
		Positive	3	9	
		Negative	36	36	
		Total	39	45	
<b>TVS</b>	<b>Hysteroscopy (screening test)</b>	<b>Positive</b>	<b>Negative</b>	<b>Total</b>	SN=85.71 % SP=92.30 %
		Positive	3	9	
		Negative	36	36	
		Total	39	45	

**Table 5. The sensitivity and specificity of hysteroscopy and transvaginal sonography to diagnose endometrial hyperplasia based on the standard test of endometrial hyperplasia diagnosis in histopathological specimens**

Procedure		Histopathology (standard test)			Sensitivity and specificity
<b>Endometrial hyperplasia</b>	<b>Hysteroscopy (screening test)</b>	<b>Positive</b>	<b>Negative</b>	<b>Total</b>	SN= 75 % SP=97.56 %
		Positive	1	4	
		Negative	40	41	
		Total	41	45	
<b>TVS</b>	<b>Hysteroscopy (screening test)</b>	<b>Positive</b>	<b>Negative</b>	<b>Total</b>	SN=25 % SP=97.56 %
		Positive	1	2	
		Negative	40	43	
		Total	41	45	

A study on the comparison of TVS and hysteroscopy sensitivity rates showed that the sensitivity and specificity rates of TVS were 95.23% and 94.82%, respectively, while according to the hysteroscopy results, 59 women with abnormal uterine bleeding among 100 non-healthy women were healthy. Therefore, TVS is the best method of examining for abnormal uterine bleeding [11]. Consistent with these results, a study to investigate the sensitivity of TVS and hysteroscopy in diagnosing uterine lesions, reported that hysteroscopy was more sensitive in diagnosing intrauterine fibroids while TVS was more sensitive in diagnosing retained products of conception.

Besides that, hysteroscopy had higher diagnostic ability to detect uterine hyperplasia cases compared to the TVS [12]. A study showed that sonohysterography was a better technique to diagnose intrauterine lesions such as polyp, endometrial hyperplasia, submucous myoma, and malignancy, and therefore allowed more appropriate decisions through accurate differentiation of focal and diffused endometrial lesions [4]. Farquhar et al. review study showed

that the precision of TVS in diagnosing submucous fibroids was higher than saline hystero-raphy and hysteroscopy [13]. Babacan et al. studied the accuracy of transvaginal ultrasonography and hysteroscopy in diagnosing uterine lesions.

Babacan et al. study showed that, in diagnosing polyps of any size, hysteroscopy was more sensitive, and overall hysteroscopy was more sensitive in diagnosing uterine pathologies than transvaginal ultrasonography [14]. Consistently, Feitosa et al. study demonstrated that transvaginal ultrasonography and sonohysterography had relatively similar sensitivity and specificity in diagnosing uterine bleeding [15]. However, inconsistent with the current study, a study to compare the sensitivity and specificity of TVS and hysteroscopy in the women with premenopausal bleeding showed that hysteroscopy had diagnostic ability in 28% of the cases, while endometrial hyperplasia was diagnosed in only 20% of the cases. Hysteroscopy had low sensitivity and high specificity in diagnosing endometrial hyperplasia and adenomyosis, but TVS had high sensitivity to

diagnose polyp as well as high precision and specificity to diagnose adenomyosis [16].

Notably, the precision of diagnosis of these diagnostic methods is affected by certain factors such as operator skill [17-19], lesion site [20], and lesion type [7,14], such that the women with sessile or focal lesions (such as endometrial polyp and submucosal fibroids) are recommended to undergo hysteroscopic biopsies rather than other procedures [7,13].

It is therefore essential to take into account such issues in examining for and diagnosing intrauterine abnormalities. In addition, evidence has indicated that integrating diagnostic methods cannot necessarily improve the results [21]. TVS is an inexpensive and non-invasive technique [22] but cannot reach the precision of hysteroscopy in diagnosing some uterine lesions in certain conditions. As a result, a safe and specific method (in cases where the physician is suspected of a specific complication) is essential to diagnose uterine lesions.

## 5. CONCLUSION

According to the findings of this study, the sensitivity of TVS and hysteroscopic findings in diagnosing uterine pathologies is relatively high, but the sensitivity of TVS was low to diagnosis of endometrial hyperplasia.

## 6. LIMITATIONS

The limitations of our study include being aware of the TVS data and then employing hysteroscopy, making subsequent interpretations potentially biased, and different applications served by hysteroscopy and TVS with respect to diagnosis and treatment.

## CONSENT AND ETHICAL APPROVAL

All patients provided informed written consent to participate in the study, and the study protocol was approved by the Iranian Registry of Clinical Trials with approval no.: IRCT201510049014N80.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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