

Comparison of the success rates of vaginal sonography and hysteroscopy in diagnosis of intrauterine pathologies in infertile women

Abstract

Background and aim: Uterine anatomical anomalies play important roles in causing female infertility. This study was conducted to compare 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 was conducted by SPSS 16 using *t*-test and Mann-Whitney test, and the sensitivity and specificity were measured with reference to the standard test.

Findings: The sensitivity rates of TVS in diagnosing polyp, endometrial hyperplasia, and myoma were respectively 60%, 25%, and 100% and the specificity rates of this method in diagnosing polyp, endometrial hyperplasia, and myoma were respectively 85.82%, 92.30%, and 56.97%. The sensitivity rates of hysteroscopy in diagnosing polyp, endometrial hyperplasia, and myoma were respectively 60%, 75%, and 100% and the specificity rates of this technique in diagnosing polyp, endometrial hyperplasia, and myoma were respectively 71.65%, 30.92%, and 56.97%.

Conclusion: The results of this study demonstrated that vaginal sonography and hysteroscopy were suitable methods to detect the intrauterine pathologies in the infertile women with relatively similar sensitivity, but hysteroscopy had a better ability to diagnose endometrial hyperplasia compared to TVS.

Key words:Transvaginal sonography, hysteroscopy, uterine pathology, infertility

Introduction

Despite medical advances, uterine anomalies remain unknown in many cases with serious consequences such as infertility (1). Septate uterus, dysmorphic uterus, dysfused uterus, unilateral formed uterus, V, aplastic or dysplastic uterus uterine septum, endometrial polyps, arcuate and bicornuate uteri, and myomas are anomalies that cause repeated miscarriage in addition to clinical complications (2,3). Different technological devices can diagnose intrauterine abnormalities the most common of which are certain procedures such as hysteroscopy and transvaginal sonography (TVS) (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 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 compare 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.

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 implantation 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 pathologists 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 protocol of the study, the brands of the instruments, and the materials used to conduct the procedure.

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 in 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 .

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 (± 6.04) years and that of the women with secondary infertility was 34.05 (± 5.26) years without any statistically significant difference ($p=0.222$). The mean (\pm SD) duration of infertility was 6.5 (± 4.13) years in the women with primary infertility and 4.6 (± 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 60%; in other words, these two diagnostic techniques had equal sensitivity rate in diagnosing polyp in the studied women. The diagnostic specificity rate in diagnosing polyp in the infertile women was 82.85% that was higher than the corresponding diagnostic specificity of hysteroscopy (65.71%) (Table 3).

The statistical analysis indicated that the sensitivity rates of TVS and hysteroscopy to diagnose polyp in the women was 60%; in other words, TVS and hysteroscopy had equal sensitivity rate in diagnosing polyp in the studied women. The diagnostic specificity rate in diagnosing polyp in the infertile women was 82.85% and higher than the hysteroscopy corresponding diagnostic specificity (65.71%).

According to statistical analysis, the sensitivity rates of TVS and hysteroscopy in diagnosing the uterine polyp in the women was 100%; i.e. all cases of uterine polyp could be diagnosed by both techniques. The diagnostic specificity rate of both VTS and hysteroscopy in diagnosing polyp in the infertile women was 92.30%, and therefore the two methods had equal specificity rate in diagnosing uterine myoma in the studied infertile women (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 VTS and hysteroscopy in diagnosing endometrial hyperplasia in the infertile women was 56.97%, and therefore the two methods had equal specificity rate to

diagnose endometrial hyperplasia in our participants (Table 5).

Discussion

In the current study, the sensitivity rates of both VTS and hysteroscopy were 60% and 100% to diagnose polyp and uterine myoma, respectively, but the sensitivity rates of TVS and hysteroscopy in diagnosing endometrial hyperplasia were 25% and 75%, respectively.

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 VTS (12). A study showed that sonohysterography was a better technique to diagnose intrauterine lesions such as polyp, endometrial hyperplasia, submucousmyoma, 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-graphy and hysteroscopy (13). Babacan et al. studied the precision 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 premonopausal 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.

Conclusion

According to the findings of this study, it is argued that the sensitivity of TVS and hysteroscopic findings in diagnosing uterine abnormalities is relatively similar, but hysteroscopy has a better diagnostic ability to diagnose endometrial hyperplasia compared to VTS. Therefore, the findings

of TVS and hysteroscopy can be equally reliable.

References:

1. Hassan MA, Lavery SA, Trew GH. Congenital uterine anomalies and their impact on fertility. *Women's health (London, England)*. 2010;6(3):443-61.
2. Galamb A, Petho B, Fekete D, Petranyi G, Pajor A. [Uterine anomalies in women with recurrent pregnancy loss]. *Orvosihetelap*. 2015;156(27):1081-4.
3. Grimbizis GF, Campo R, On behalf of the Scientific Committee of the Congenital Uterine Malformations common Eshre/Esge working group: Stephan Gordtssbmgvttclcda. Clinical approach for the classification of congenital uterine malformations. *Gynecological Surgery*. 2012;9(2):119-29.
4. B.T V, Shivalingaiah N. Role of Transvaginal Sonography and Diagnostic Hysteroscopy in Abnormal Uterine Bleeding. *Journal of Clinical and Diagnostic Research : JCDR*. 2014;8(12):OC06-OC8.
5. Shokouhi B. Role of transvaginal ultrasonography in diagnosing endometrial hyperplasia in pre- and post-menopause women. *Nigerian Medical Journal : Journal of the Nigeria Medical Association*. 2015;56(5):353-6.
6. Ozturk E, Ugur MG, Balat O, Kutlar I, Dikensoy E, Cebesoy B. An analysis of hysteroscopy experience over a seven-year period. *Clinical and experimental obstetrics & gynecology*. 2010;37(2):150-1.
7. Aslam M, Ijaz L, Tariq S, Shafqat K, Meher un N, Ashraf R, et al. Comparison of Transvaginal Sonography and Saline Contrast Sonohysterography in Women with Abnormal Uterine Bleeding: Correlation with Hysteroscopy and Histopathology. *International Journal of Health Sciences*. 2007;1(1):17-24.

8. Li XH, Ouyang Y, Lu GX. Value of transvaginal sonography in diagnosing heterotopic pregnancy after in-vitro fertilization with embryo transfer. *Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology*. 2013;41(5):563-9.
9. Turocy JM, Benacerraf BR. Transvaginal sonography in the diagnosis of deep infiltrating endometriosis: A review. *Journal of clinical ultrasound : JCU*. 2017.
10. Palshetkar N, Pai H, Pisat S. Role of Hysteroscopy Prior to Assisted Reproductive Techniques. *Journal of Gynecological Endoscopy and Surgery*. 2009;1(1):27-30.
11. Goyal BK, Gaur I, Sharma S, Saha A, Das NK. Transvaginal sonography versus hysteroscopy in evaluation of abnormal uterine bleeding. *Medical Journal, Armed Forces India*. 2015;71(2):120-5.
12. Vitner D, Filmer S, Goldstein I, Khatib N, Weiner Z. A comparison between ultrasonography and hysteroscopy in the diagnosis of uterine pathology. *European Journal of Obstetrics and Gynecology and Reproductive Biology*. 171(1):143-5.
13. Farquhar C, Ekeroma A, Furness S, Arroll B. A systematic review of transvaginal ultrasonography, sonohysterography and hysteroscopy for the investigation of abnormal uterine bleeding in premenopausal women. *Acta obstetrica et gynecologica Scandinavica*. 2003;82(6):493-504.
14. Babacan A, Gun I, Kizilaslan C, Ozden O, Muhcu M, Mungen E, et al. Comparison of transvaginal ultrasonography and hysteroscopy in the diagnosis of uterine pathologies. *International Journal of Clinical and Experimental Medicine*. 2014;7(3):764-9.
15. Feitosa IMSD, Feitosa HN, Carvalho FHC, Pereira SM, Medeiros FdC. Comparison between transvaginal ultrasonography and sonohysterography in the assessment of patients with

abnormal uterine bleeding. *Radiologia Brasileira*. 2011;44(3):156-62.

16. El-khayat W, Sleet ME, Mahdi EY. Comparative study of transvaginal sonography and hysteroscopy for the detection of pathological endometrial lesions in women with perimenopausal bleeding. *Middle East Fertility Society Journal*. 2011;16(1):77-82.

17. Ryu JA, Kim B, Lee J, Kim S, Lee SH. Comparison of transvaginal ultrasonography with hysterosonography as a screening method in patients with abnormal uterine bleeding. *Korean journal of radiology*. 2004;5(1):39-46.

18. Scruggs W, Fox JC, Potts B, Zlidenny A, McDonough J, Anderson CL, et al. Accuracy of ED Bedside Ultrasound for Identification of gallstones: retrospective analysis of 575 studies. *Western Journal of Emergency Medicine*. 2008;9(1):1-5.

19. Yuan F, Necas M. Retrospective audit of patients presenting for ultrasound with suspicion of appendicitis. *Australasian Journal of Ultrasound in Medicine*. 2015;18(2):67-9.

20. Phillips CH, Benson CB, Ginsburg ES, Frates MC. Comparison of uterine and tubal pathology identified by transvaginal sonography, hysterosalpingography, and hysteroscopy in female patients with infertility. *Fertility Research and Practice*. 2015;1(1):20.

21. Vitner D, Filmer S, Goldstein I, Khatib N, Weiner Z. A comparison between ultrasonography and hysteroscopy in the diagnosis of uterine pathology. *European journal of obstetrics, gynecology, and reproductive biology*. 2013;171(1):143-5.

22. Niknejadi M, Haghighi H, Ahmadi F, Niknejad F, Chehrazhi M, Vosough A, et al. Diagnostic Accuracy of Transvaginal Sonography in the Detection of Uterine Abnormalities in Infertile Women. *Iran J Radiol*. 2012;9(3):139-44.

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

	Variable	Frequency	Percent
Patient history	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
Number of failures	Once	5	33.33
	Twice	4	26.66
	Three times	3	20
	Four times	2	13.33
	Five times	1	6.66
The type of drug used	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
Type of intervention in patients with a history of surgery or endometrial manipulation	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 anomalies 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
Hysteroscopy finding	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
Pathology finding	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	Negative	Total	SN= 60 % SP= 65.71 %
		Positive	6	12	18	
		Negative	4	23	27	
		Total	10	35	45	
	TVS		Positive	Negative	Total	SN= 60 % SP=82.85 %
		Positive	6	3	9	
		Negative	0	36	36	
		Total	6	39	45	

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
Myomas	Hysteroscopy (screening test)		Positive	Negative	Total	SN=100 % SP=92.30 %
		Positive	6	3	9	
		Negative	0	36	36	
		Total	6	39	45	
	TVS		Positive	Negative	Total	SN=100 % SP=92.30 %
		Positive	6	3	9	
		Negative	0	36	36	
		Total	6	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
Endometrial hyperplasia	Hysteroscopy (screening test)		Positive	Negative	Total	SN= 75 % SP=97.56 %
		Positive	3	1	4	
		Negative	1	40	41	
		Total	4	41	45	
	TVS		Positive	Negative	Total	SN=25 % SP=97.56 %
		Positive	1	1	2	
		Negative	3	40	43	
		Total	4	41	45	