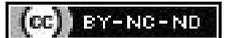


# Comparison of Diagnostic Performance of Pathologies of Uterine Cavity by Transvaginal Sonography, Hysterosalpingography and Hysteroscopy in Infertility

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## ABSTRACT

**Introduction:** The interpretation of uterine pathology as a cause of female infertility represents a cardinal step in the appraisal of the infertile women. Common diagnostic modalities useful for the clinical assessment of the uterine cavity include: Transvaginal Sonography (TVS), Hysterosalpingography (HSG), hysteroscopy, hydrosalpingography and laparoscopy.

**Aim:** To compare the diagnostic accuracy of TVS and HSG in evaluating uterine cavity in infertile women, considering hysteroscopy as gold standard.

**Materials and Methods:** A prospective cross-sectional study was performed in which all infertile out patients attending the Department of Reproductive Medicine of Sri Aurobindo Institute of Medical Sciences, Indore, Madhya Pradesh, India over the period of two years (October 2012-September 2014) were included. Patients diagnosed with primary and secondary infertility comprised of 321 infertile women with a mean

age 24.9 years (range 20-45 years) were included and who underwent the required tests i.e., HSG, TVS, Hysteroscopy. The diagnostic accuracy of the procedures was calculated for each uterine disease separately. Pearson's Chi-square and kappa test was used.

**Results:** Hysteroscopy was used as a gold standard and showed normal cavity in 67.9% of the cases, uterine adhesions in 17.7%, uterine anomalies including arcuate uterus, septate uterus, uni and bicornuate uterus in 9%, polyp in 4% and fibroid in 0.9% of the cases HSG reported a specificity and Positive Predictive Value (PPV) of 100% for polyps and fibroids. The agreement between the three tests was found to be fair. No complications were recorded during hysteroscopy.

**Conclusion:** The findings of HSG, TVS and hysteroscopy were fairly in agreement with each other and therefore it would be advised to choose the test in accordance to women's preference.

**Keywords:** Adhesions, Fibroids, Infertile female, Polyp, Uterine malformation

## INTRODUCTION

Female pelvic organ anatomy has a decisive role to play in study of infertility. Infertility patients should be scrutinised acknowledging the risks, benefits and costs of the tests involved [1-3]. Nearly eight to ten million couples in India are estimated to be without a child [4,5]. The prevalence of uterine malformation in infertile patients has been reported around 3.5% [6]. For evaluating infertility TVS, HSG and hysteroscopy are recommended [7,8].

HSG is the time honored test for infertility. It handles two objectives of detecting abnormality in uterine cavity as well as the tubes. It being an office operation along with low cost adds to its asset while its demerits are discomfort, pain and radiation exposure. HSG results may also be altered if the procedures are executed at different phases of the menstrual cycle due to the variable trophic changes of the endometrium. Sensitivity of the test decreases due to air bubbles, mucus and blood debris that could imitate filling defects, while small endometrial lesions can be obliterated from undue amount of contrast media manifesting as false negative findings [9]. Following uterine pathologies can be detected with the help of HSG: uterine congenital anomalies, submucosal uterine fibroids, uterine malignancy, adenomyosis and pelvic inflammation [1].

TVS is elementary, painless, easy, accessible investigative method for evaluating every infertile couple by means of uterine cavity and ovaries. This procedure is useful in evaluating the anatomy of the uterus and ovaries. Adnexal and cul-de-sac abnormalities related to infertility can also be visualised. Therefore, TVS seems to be additional and superior to HSG [10-13].

Hysteroscopy is the gold standard for the assessment of uterine cavity, especially when a pathology is in mind. It is a safe test for the straightforward and precise diagnosis of abnormalities within uterus [14]. It allows high resolution frank visualisation of uterine cavity, revealing the feature, position, pattern, size of any uterine cavity lesions. It also facilitates intervention for the treatment of any pathology. The main disadvantage of traditional hysteroscopy is the anesthesia requirement, its relative invasiveness and cost [15].

The aim of this study was to compare the diagnostic accuracy of TVS and HSG in evaluating uterine cavity in infertile women, considering hysteroscopy as the gold standard.

## MATERIALS AND METHODS

This study was a prospective cross-sectional study conducted for 321 infertility out patients attending the Department of Reproductive Medicine, Sri Aurobindo Institute of Medical Sciences, Indore, Madhya Pradesh, India over period of two years from October 2012- September 2014. The study protocol for all procedures was approved by the ethical committee of the institute.

Women from reproductive age group of 20-45 years who gave consent, with primary/secondary female infertility and normal male component were included while women with medical co-morbidities, past history or presentation with pelvic inflammatory diseases/acute abdomen, allergy to iohexol dye, known tubal/ovarian/endocrinal infertility were excluded.

HSG and TVS were performed as a part of routine diagnostic work-up for infertility patients. Whenever findings of either of the

tests were suggestive of any uterine cavity abnormality, they were corroborated with a hysteroscopy work-up (considering it as a gold standard) for direct inspection and possible treatment. HSG, TVS, and hysteroscopy were executed by specialised gynecologists, who were blinded to the conclusion of the other examinations.

For performing HSG, the priming with water soluble iodinated contrast was performed to avoid air bubbles and decrease false positive rate. It was conducted between day 7 from day of last menstrual cycle. Remarks were noted on appearance of uterus and tube, findings of an inverted triangle with well defined, smooth contours and bilateral spillage of dye from both the fimbrial ends was classified as normal. Findings on HSG were described as any focal lesion seen with regards to impression of a lumen filling defects like endometrial polyp, submucous fibroid, intramural fibroid, or congenital abnormalities of uterus and blocked tubes.

Transvaginal probe of 5.0 MHz was used to perform TVS to analyse position of uterus, adnexae, Endometrial Thickness (ET) and contour. The point of maximum thickness of the endometrium was measured on a frozen image to calculate ET. Findings on TVS were described as any focal lesion seen with regards to impression of an endometrial polyp, submucous fibroid, intramural fibroid, or uterine anomaly.

Hysteroscopy was done using a 4-mm operative hysteroscope with 30° optic telescope. Uterine cavity was systematically inspected including examination of the cervical canal, fundus, all walls and both tubal ostia. Abnormalities were corrected when indicated.

The diagnostic accuracy of the investigations was determined for each uterine disease individually.

## STATISTICAL ANALYSIS

Data was tabulated in Microsoft excel sheet and analysed by using Statistical Package for the Social Sciences (SPSS) software (version 25) using Pearson's Chi-square and kappa test. Findings of hysteroscopy were used as gold standards to measure sensitivities and specificities in reference to HSG and TVS.

## RESULTS

Hysteroscopy was used as a gold standard and showed normal cavity in (67.9%) of the cases, uterine adhesions in (17.7%), uterine anomalies including arcuate uterus, septate uterus, uni and bicornuate uterus in (9%), polyp in (4%) and fibroid in (0.9%) of the cases [Table/Fig-1].

Findings	Number	%		Number	%
Normal	218	67.9			
Adhesions	57	17.7			
Anomaly	29	9.03	Arcuate	5	1.5
			Septum	18	5.6
			Unicornuate	4	1.2
			Bicornuate	2	0.6
Polyp	14	4.3			
Fibroid	3	0.9			

[Table/Fig-1]: Findings of hysteroscopy.

Present study demonstrated fair agreement between TVS and hysteroscopy (Kappa=0.372, p<0.0001) and HSG and hysteroscopy (Kappa=0.352, p<0.0001) [Table/Fig-2,3].

In the study, for diagnosing adhesions, TVS demonstrated a sensitivity of (19%) whereas HSG demonstrated (10%) sensitivity. For diagnosing polyps and fibroid, TVS was more sensitive than HSG (46% vs 20%), (66% vs 33%), respectively [Table/Fig-4,5]. Specificity for diagnosing polyps and fibroids was 100% in case of HSG [Table/Fig-5]. No complications were recorded during hysteroscopy.

Definite diagnosis via hysteroscopy	Transvaginal sonography						Kappa value	p-value
	Normal	Adhesions	Anomaly	Polyp	Fibroid	Total		
Normal	203	6	3	4	2	218	0.372	<0.0001
Adhesions	44	11	1	1	0	57		
Anomaly	14	0	14	1	0	29		
Polyp	6	0	1	7	0	14		
Fibroid	1	0	0	0	2	3		
Total	268	17	19	13	4	321		

[Table/Fig-2]: Agreement of Transvaginal Sonography (TVS) with hysteroscopy. Pearson's Chi-square and kappa test was used

Definite diagnosis via hysteroscopy	Hysterosalpingography						Kappa value	p-value
	Normal	Adhesions	Anomaly	Polyp	Fibroid	Total		
Normal	215	1	2	0	0	218	0.352	<0.0001
Adhesions	48	6	3	0	0	57		
Anomaly	11	0	18	0	0	29		
Polyp	12	0	0	2	0	14		
Fibroid	2	0	0	0	1	3		
Total	288	7	23	2	1	321		

[Table/Fig-3]: Agreement of Hysterosalpingography (HSG) with hysteroscopy. Pearson's Chi-square and kappa test was used

TVS	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Adhesions	19	61	66	81	66.6
Anomaly	43	73	82	92	67.6
Polyp	46	63	63	95	65.4
Fibroid	66	50	50	99	63.8

[Table/Fig-4]: Validity of Transvaginal Sonography (TVS) in infertility. PPV: Positive predictive value; NPV: Negative predictive value

HSG	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Adhesions	10	85	85	81	68.8
Anomaly	62	90	90	94	72.5
Polyp	20	100	100	94	67.6
Fibroid	33	100	100	99	67.2

[Table/Fig-5]: Validity of Hysterosalpingography (HSG) in infertility. PPV: Positive predictive value; NPV: Negative predictive value

## DISCUSSION

In this study, the diagnostic accuracy of HSG and TVS to identify pathologies of uterine cavity in infertile women were compared. Alsannan BF et al., found in their study HSG had a sensitivity of 75%, specificity of 86.5%, PPV of 63% and Negative Predictive Value (NPV) of 91.8% in detecting intrauterine synechiae, Equivalent values for Mullerian congenital anomalies were found to be 86.6%, 76.3%, 48.1% and 95.7% [16]. Another study by Sarala K and Misra K, revealed TVS had sensitivity of 100%, specificity of 92.86%, the PPV and NPV is 98.85 and 100% to diagnose submucous fibroid [17].

In a study by Shukla P et al., infertility was explained by TVS in 52.5% of cases while hysteroscopy revealed the same in 95% cases. There was moderate overall agreement between both modalities (Kappa=0.414, p=0.0001) whereas, overall agreement between HSG and hysteroscopy was also found to be moderate (Kappa= 0.475, p=0.0001) [18]. Present study demonstrated fair agreement between TVS and hysteroscopy and HSG and hysteroscopy. Present study depicts sensitivity for TVS vs HSG (19% vs 10%), (43% vs 62%), (46% vs 20%), (66% vs 33%) and specificity (61% vs 85%), (73% vs 90%), (63% vs 100%), (50% vs 100%) for adhesions, anomalies, polyps and fibroids respectively.

Similar results were found in the study done by Shukla P et al., who demonstrated low sensitivity (51.21%, 90%) but high specificity (100%, 100%) with TVS and HSG, respectively [18]. El-Mazny A et al., in their study also found TVS had a low sensitivity of 41.7% and a high specificity 100% [19].

Several authors have discussed diagnostic accuracy of HSG, the TVS and hysteroscopy to detect uterine abnormalities in infertile patient. But, it is still not clear whether it is necessary to perform routine hysteroscopy for all patients. Of the many recommendations, routine diagnostic hysteroscopy is recommended by some authors, while others advise for its use to be limited to infertile patients having abnormalities detected on either HSG or TVS. Koskas M et al., recommend that hysteroscopy is unnecessary, unless used for confirmation of findings [20].

### Limitation(s)

In present study uterine cavity was not assessed with Saline Infusion Sonography (SIS) and hysterosalpingo-contrast sonography as these procedures are not a part of routine workup protocol at our institute.

### CONCLUSION(S)

The diagnostic accuracy of HSG, TVS and hysteroscopy were fairly in agreement with each other. All procedure were seem to be effective and could be implemented as a routine investigation in need of further diagnostic evaluation as per accordance with women's preference.

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