

# Accuracy of Hysterosalpingography as a Screening test for Evaluating Infertility

FAHMIDA YESHMINE

## Abstract:

**Background:** The aim of this study was to evaluate the accuracy of hysterosalpingography (HSG) for evaluating infertility. **Objective :** To measure the sensitivity & specificity of hysterosalpingography as a screening test to assess the uterine cavity & fallopian tubes of infertile patients. **Methodology :** A total of 100 adult subjects were selected in a private diagnostic center in Cumilla referred to radiology department from gynecologist private practice. Data for the present investigation were collected via an interviewer-administered questionnaire, which included questions on clinical & past medical history, drug history and also findings of HSG report, laparoscopy report were collected. Accuracy, sensitivity & specificity values of HSG in the diagnosis of uterine & tubal pathology were calculated by appropriate statistical formula. Here laparoscopic findings are the gold standard. **Result :** HSG showed a sensitivity of 80% compared with that of laparoscopy and a specificity of 78.12%, with a positive predictive value of 88.7% and a negative predictive value of 65.7% with accuracy about 80%. **Conclusion :** HSG is still a useful screening test for the evaluation of the uterine cavity in the study of primary or secondary infertility. In addition, HSG provides information concerning the assessment of tubal morphology and patency. We believe that these two procedures are complementary in the evaluation of the uterine cavity.

**Keywords:** Infertility, hysterosalpingography, laparoscopy.

## Introduction:

Infertility is a disease of male or female reproductive system defined by failure to achieve

**Author of correspondence:** Dr. Fahmida Yeshmine, Associate Professor, Department of Radiology and Imaging, BIRDEM. E mail: fahmida1968@gmail.com

pregnancy after 12 months or regular unprotected sexual intercourse. Infertility affects millions of people & has an impact on their families communities.<sup>1</sup> Estimate suggest that approximately one in every six people of reproductive age world wide experience infertility in their life time ( WHO). Infertility may be caused by a number of different factors, in either the male or female reproductive systems. However it is sometimes not possible to explain the cause of fertility. In female reproductive system, infertility may be caused by tubal, uterine, ovarian, endocrine disorders.<sup>2,3</sup>

For proper evaluation of uterine cavity & fallopian tube hysterosalpingography is the radiographic test, which done after injection of radio opaque contrast medium through the cervical canal. The study should be done during the follicular phase of the cycle so as not to interfere with possible early pregnancy. The best result is obtained by fluoroscopy with image intensifier. Although this procedure is considered diagnostic, it can prove to be therapeutic at times.<sup>4,5</sup>

A properly performed HSG will give an idea about the contour of the uterine cavity & the width of the cervical canal. Further injection will outline the cornua, isthmus & ampullary part of the tubes & evaluate the degree of spillage.

If the uterine cavity shows no abnormalities with a properly performed HSG, it is very unlikely the laparoscopy would reveal an abnormality. Other than noting spillage of dye from the fimbrial ends of the tubes, the degree of free spillage is important.<sup>6</sup>

HSG is considered a screening procedure for an infertility work up & despite the development of other diagnostic tools such as MR imaging, laparoscopy. HSG remains the main examination for the study of fallopian tubes.<sup>7,8,9</sup>

The aim of our study was to evaluate the diagnostic accuracy of HSG and laparoscopy in uterine cavity diseases in infertile patients with laparoscopy considered the gold standard.

**Material and methods:**

From January 2009 to December 2011, the cross sectional study was comprised of about 100 female married infertile patients. A total 108 patients were evaluated first who were referred from gynaecologist their private practice in a private diagnostic center, cumilla for HSG. After taking written consent from the patients, HSG was done by me & reported. Laparoscopic examination were done & reports prepared by gynaecologist. Out of 108 patients 100 were done laparoscopic examination. There were included for research. After collection of data they were checked & coded from primary source starting from clinical history HSG report. Accuracy, sensitivity & specificity values of HSG in the diagnosis of uterine & tubal pathology were calculated by appropriate statistical formula. Here laparoscopic findings are the gold standard.

Approximately 5-10 ml of a water-soluble contrast medium was introduced into the uterine cavity after placing a balloon catheter set for HSG. The soft rubber Foley catheter was inflated in the cervical canal under fluoroscopic control using a digital system. Premedication with anti-inflammatory drugs was not routinely administered. Six spot radiographs were systematically obtained, including an under filled view of the uterus to detect small endometrial lesions, an early filled view of the fallopian tubes, both anteroposterior and oblique projections of the entire genital tract showing the spill of contrast material at the peritoneum, and a postdrainage radiograph. Filling defects and uterine wall irregularities were the two main outcome measures on HSG. Single filling defects were diagnosed as polyps or submucosal myomas according to their morphology and uterine cavity configuration. Multiple diffuse nodular filling defects of the entire endometrial cavity were interpreted as endometrial hyperplasia. Uterine adhesions were seen as uterine wall irregularities, sometimes with sharply delineated filling defects of angulated contours.

Diagnostic laparoscopy was performed by a gynecologist as an office procedure and scheduled during the secretory phase of the cycle. Photographs were systematically obtained for both the patient's report and medical history.

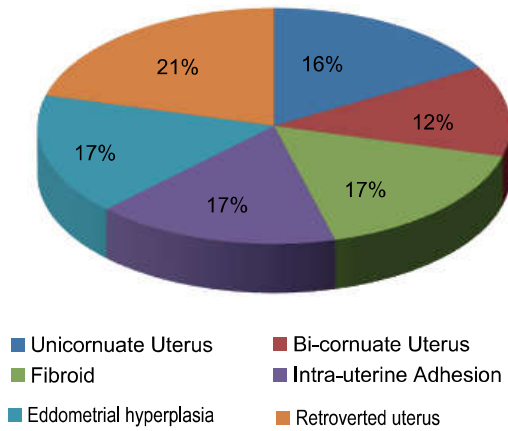
Findings on HSG and laparoscopy were reviewed retrospectively. The laparoscopic findings were used as a reference standard to calculate sensitivity, specificity, positive and negative predictive values.

**Result :**

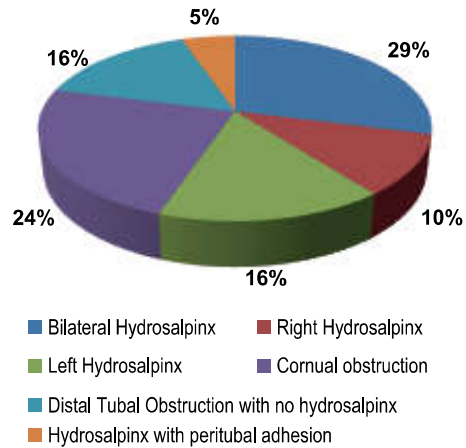
One hundred patients were included in the study. HSG showed a normal uterine cavity in 38% and some abnormalities in 62%. Laparoscopy revealed no abnormalities in 32% and showed abnormal findings in 68%. Comparative analysis showed intrauterine abnormalities seen on laparoscopy in 68% of patients with abnormal results on HSG, whereas in 32% findings on laparoscopy were considered norm

HSG showed a sensitivity of 80% compared with that of laparoscopy and a specificity of 78.12%, with a positive predictive value of 88.7% and a negative predictive value of 65.7% with accuracy about 80%. Laparoscopic examination of the 32 patients with normal findings on HSG showed five to have uterine cavity abnormalities including two cases of endometrial polyps, two cases of endometrial hyperplasia, and one submucosal myoma. In 15 of the 55 patients depicted on HSG as having endocavitary abnormalities, laparoscopy revealed no abnormality. HSG findings included single filling defect in four patients, irregular multiple filling defects suggestive of endometrial hyperplasia in four patients, irregular contour interpreted as small adhesions in four, unicornuate uterus in four, bicornuate uterus in three. Findings on HSG and laparoscopy correlated in 68 patients. The most common intrauterine finding was endometrial polyps followed by intrauterine adhesions, submucosal myomas, and endometrial hyperplasia. In one patient, HSG and laparoscopy showed abnormal but discordant findings, with endometrial hyperplasia with multiple filling defects seen on HSG but only one polyp seen on laparoscopy.

The study included 100 patients of 18 to 40 years of age. Mean age was 30 years. Data were analyzed according to the objectives. The result obtained as follows.



**Fig.-1:** Distribution of patients based on uterine findings in HSG



**Fig.-2:** Hysterosalpingographic findings in tubal abnormalities

**Table I**  
Accuracy of HSG for the diagnosis of infertility

HSG	Laparoscopy true +ve	Laparoscopy true -ve	Total
Test +ve	55	7	62
Test -ve	13	25	38
Total	68	32	100

Sensitivity of 80%, Specificity of 78.12%,  
Positive predictive value of 88.7%  
Negative predictive value of 65.7%  
Accuracy about 80%.

Above table shows seven false +ve cases – four cases were identified as cornual spasm and remaining three may be due to other causes like use of small volume of contrast medium was introduced in uterine cavity. Among thirteen false -ve cases, five cases were not interpreted correctly due to extravasation of contrast. Rest of the cases are due to free spillage from a pinpoint opening of a club shaped tube, suggestive of normal fimbrial function.



**Figure 2:** Bi-cornuate uterus



**Figure 1:** 32-year-old woman with normal uterus. Hysterosalpingogram shows triangular uterine cavity with bilateral tubal block & no free spillage of contrast



**Figure 3:** Right sided tubal block with left sided hydrosalpinx

**Discussion:**

HSG still has an essential role in screening for uterus-related primary or secondary infertility. Because of the high prevalence of uterine abnormalities, evaluation of the uterine cavity is routinely performed in the evaluation of infertile patients. In addition, HSG provides information about tubal patency.

HSG and laparoscopy are two different approaches to the uterine cavity. The accuracy of HSG and laparoscopy for detecting uterine abnormalities in infertile patients has been discussed by various authors.<sup>2,3,4</sup> Laparoscopy has an increased accuracy over HSG, although the magnitude of this discrepancy is controversial. Although some authors have suggested that HSG should be completely replaced by laparoscopy,<sup>10,11</sup> others have found that laparoscopy added little information when HSG results were negative.<sup>7</sup> HSG is considered to have a high sensitivity (60-98%) but a low specificity (15-80%), with elevated false-positive and false-negative rates. In our series, the sensitivity of HSG was 80% and its specificity 78.12% with a positive predictive value of 88.7% and a negative predictive value of 65.7% with accuracy about 80%. There was a high correlation between the findings of the two procedures, with an overall agreement of 73%. The results of this study show a high sensitivity and specificity in the detection of intrauterine lesions, a low false-negative rate, and a moderate false-positive rate. Compared with previously reported results (3), our series showed a higher specificity and a lower false-negative rate.

Further studies are needed to determine the possible bias originating from the fact that the two procedures were performed during different phases of the menstrual cycle and different cycles; these differences could affect the trophic changes of the endometrium (e.g. endometrial hyperplasia or polyps).

The advantages of HSG include the ease of the study, its safety, and cost-effectiveness in comparison with laparoscopy. In addition, HSG provides information about tubal patency or

blockage. Several disadvantages are inherent in the technique, including exposure to ionizing radiation, use of iodinated contrast material, and

often discomfort for the patient. The differential diagnosis of intrauterine filling defects includes polyps (endometrial hyperplasia, submucosal myomas intrauterine synechia and septa. False-positive findings can be caused by air bubbles, mucus, and debris that mimic filling defects. False-negative findings can result from an excessive amount of contrast media in the uterus that obliterates the shadows caused by small endometrial lesions.

Laparoscopy is a safe and quick examination for the direct and accurate diagnosis of intrauterine abnormalities. It permits direct visualization of the interior of the uterine cavity, revealing the nature and localization of endocavitary lesions; allows diagnosis of infectious, functional, and organic abnormalities; and allows guidance of endometrial biopsies and cultures for histologic evaluation. Moreover, if a therapeutic approach is indicated, laparoscopy surgery is widely accepted as the most effective (8,9).

The results of this study show that HSG is a reliable technique for diagnosing uterine abnormalities. The discrepancies between the diagnoses obtained on HSG and laparoscopy are expected because HSG localizes the defects, whereas laparoscopy visualizes them directly. Because of the valuable information that HSG provides about the cavity and tubes, it remains mandatory in the evaluation of infertility. When an intrauterine abnormality is detected, the nature, localization, and extent of the lesion should be determined by direct laparoscopy visualization. When HSG shows no abnormality, the indication of laparoscopy has been questioned. We believe that when HSG shows no abnormality, the indication of laparoscopy must not be discarded because it adds additional and exclusive information about hormonal, trophic, inflammatory, and infectious disorders that may be responsible for poor reproductive outcome in nearly 25% of cases.

**Conclusion:**

These two procedures are complementary in the evaluation of infertile women; each approaches the uterine cavity in a different way and each has advantages and limitations. HSG is a useful but indirect test and remains one of the first steps in

the evaluation of infertility, so laparoscopy should not totally replace HSG.

We should continue comprehensive analyses for such important issues as infertility.

### References

1. Fayez JA, Mutie G, Schneider PJ. The diagnostic value of hysterosalpingography and hysteroscopy in infertility investigation. *Am J Obstet Gynecol* 1987;156:558-60.
2. Jacques Barbot. Hysteroscopy and hystero-graphy. *Obstet Gynecol Clin North Am* 1995; 22:591-602.
3. Golan A, Eilat E, Ron-El R, Herman A, Soffer Y, Bukovsky I. Hysteroscopy is superior to hysterosalpingography in infertility investigation. *Acta Obstet Gynecol Scand* 1996; 75:654-6.
4. Gaglione R, Valentini A, Pistilli E, Nuzzi NP. A comparison of hysteroscopy and hysterosalpingography. *Int J Gynaecol Obstet* 1996;52:151-3.
5. Brown SE, Coddington CC, Schnorr J, Toner J, Gibbons W, Oehninger S. Evaluation of outpatient hysteroscopy, saline infusion hysterosonography, and hysterosalpingography in infertile women: a prospective, randomized study. *Fertil Steril* 2000;74: 1029-34.
6. Prevedourakis C, Loutradis D, Kalianidis C, Makris N, Aravantinos D. Hysterosalpingography and hysteroscopy in female infertility. *Hum Reprod* 1994; 9:2353-55.
7. Kessler I, Lancet M. Hystero-graphy and hysteroscopy: a comparison. *Fertil Steril* 1986; 46:709-10.
8. Anna Roma D, Belen U, Alicia U, Montse M. Diagnostic Value of Hysterosalpingography in the Detection of Intrauterine Abnormalities: A Comparison with Hysteroscopy. *American Journal of Roentgenology (AJR)* 2012;183(5):13-25.
9. Cicinelli E, Matteo M, Causio F, Schonauer LM, Pinto V, Galantino P. Tolerability of the mini-pan-endoscopic approach (transvaginal hydrolaparoscopy and minihysteroscopy) versus hysterosalpingography in an outpatient infertility investigation. *Fertil Steril* 2001; 76:1048-51.
10. Gordts S, Campo R, Puttemans P, et al. Investigation of the infertile couple: a one-stop outpatient endoscopy-based approach. *Hum Reprod* 2002; 17:1684-87.
11. Balmaceda JP, Ciuffardi I. Hysteroscopy and assisted reproductive technology. *Obstet Gynecol Clin North Am* 1995; 22:507-18.