Hysterosalpingography Versus Sonohysterography for Intrauterine Abnormalities

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ABSTRACT

Objective: The hysterosalpingogram is commonly used to evaluate the uterine cavity and the fallopian tubes in the workup of infertile couples. The sonohysterogram is gaining popularity as part of this evaluation. This study compares hysterosalpingography to sonohysterography for the detection of polyps, cavitary fibroids, adhesions, and septae in infertile patients.

Methods: We conducted a retrospective chart review of 149 infertility patients seen at a University Hospital Center, divisions of Reproductive Endocrinology and Interventional Radiology. Patients underwent hysterosalpingography and sonohysterography as part of their infertility evaluation. The reports were reviewed and findings like polyps, fibroids, adhesions, and septae were compared to the findings obtained at the time of hysteroscopy. Sensitivity, specificity, and accuracy of radiologic tests were the main outcome measures.

Results: The sensitivity of hysterosalpingography and sonohysterography was 58.2% and 81.8%, respectively. The specificity for hysterosalpingography and sonohysterography was 25.6% and 93.8%. The differences in sensitivity and specificity were both statistically significant. Hysterosalpingography had a general accuracy of 50.3%, while sonohysterography had a significantly higher accuracy of 75.5%.

Conclusion: Although hysterosalpingography is the standard screening test for the diagnosis of tubal infertility and can provide useful information about the uterine cavity, sonohysterography is more sensitive, specific, and accurate in the evaluation of the uterine cavity.

Key Words: Hysterosalpingogram, Sonohysterogram, Imaging in infertility, Intrauterine defects.

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INTRODUCTION

The hysterosalpingogram (HSG) is a contrast enhanced fluoroscopic and flat plate study used to evaluate the endometrial cavity and fallopian tubes. It has been a standard test in the workup of infertile couples as a minimally invasive method of evaluating tubal patency. In addition to crucial information about tubal patency and contour, HSG reports include information about uterine size and filling defects. HSG reports often present findings suggestive of fibroids, polyps, adhesions, and septa. The sonohysterogram (SHG) is a more recent addition for intrauterine evaluation. A number of studies have shown a benefit of SHG over HSG in evaluating uterine defects in patients with recurrent pregnancy loss as well as for uterine screening prior to IVF.[1–5] Other studies have suggested that the sensitivity and specificity of SHG are comparable to that of hysteroscopy for evaluating patients with abnormal uterine bleeding and postmenopausal bleeding.[6] Our study compares HSG to SHG in the evaluation of the endometrial cavity in infertile patients.

METHODS

IRB approval was obtained for this retrospective study. Over a 2-year period, 140 patients seen at our center underwent hysteroscopy as part of the evaluation or treatment of infertility. All were included in this study. All 149 patients had a prior HSG and 93 underwent SHG. In our practice, HSG is performed as part of the evaluation of women seeking assistance with conception. SHG is performed on infertile patients with suspicious uterine findings on transvaginal ultrasound performed during the initial evaluation.

The HSG was performed by members of the Interventional Radiology division. The procedure was performed under fluoroscopy in an outpatient office setting typically between days 5 and 11 of the menstrual cycle at least 24 hours after menses had ceased. Prophylactic antibiotics were prescribed. The patients were routinely premedicated with oral ibuprofen 600mg prior to the procedure.

A urine pregnancy test (QuickVue One-Step hCG Urine Test, Quidel, San Diego, CA) was performed immediately before the HSG procedure. HSG was performed in a standard fashion using a sterile technique. The patient was placed in a lithotomy position, and a vaginal speculum was inserted. After cleansing the external os with povidone-iodine solution, the cervical os was cannulated with a balloon catheter. A cervical tenaculum was not used. The balloon catheter was inflated within the endocervical canal or lower uterine cavity and contrast injection was performed with fluoroscopic control (OEC 9800, General Electric Company, Fairfield, CT). The balloon catheter was not routinely placed in the uterine cavity, because it may prevent or obscure opacification of underlying pathology in the lower uterine segment. A combination of pulse fluoroscopy (8 frames per second) and continuous fluoroscopy were used with automated exposure control. Static image capture was achieved by use of the fluoroscopic last image hold feature. Images of early and maximal opacification of the uterine cavity, fallopian tubes, and peritoneal contrast spillage were obtained. A completion image was obtained after removal of the balloon catheter to assess for abnormalities in the lower uterine segment and endocervical canal that may have been obscured by the presence of the balloon catheter. Selected static images were transferred to a picture archive and communications system (PACS).

SHG was performed during the follicular phase of the cycle by 1 of 2 examiners. An H-S catheter (Ackrad Labs, Cranford, NJ) was placed during a speculum examination, with the balloon distended intracervically. In some cases, the balloon distended with 1mL of saline would not remain in the cervix and either a tenaculum was placed occluding the exocervix or the balloon was placed in the lower uterine segment. After transvaginal sonographic evaluation of the adnexae, uterus, endometrium, and cul-de-sac, saline in a 10-mL syringe was instilled through the catheter during concomitant transvaginal sonography of the endometrium with sagittal and coronal views recorded.

A study was considered normal when serial sagittal and coronal views of the distended endometrial cavity failed to reveal any distortion, cavitary defect, or undistended regions. Incomplete separation of the anterior and posterior endometrium during saline instillation suggested intrauterine synechiae. A midline avascular extension into the uterine cavity in the absence of other evidence of intrauterine synechiae, and the presence of a normal serosal border of the fundus suggested a septum. While vascular myometrium found between 2 uterine horns combined with a midline dimpling of the serosal fundal border suggested a bicornuate uterus. Other intracavitary defects were described and a likely diagnosis was suggested.

Hysteroscopy was performed by 1 of 2 examiners in the operating room with the patient under general anesthesia. The cervix was grasped with a tenaculum and dilated to accommodate the 7-mm hysteroscope. The scope was advanced under direct visualization. Saline was instilled to gravity. Positive and pertinent negative findings were recorded, and any required therapeutic procedures were completed. When a myoma was anticipated or encountered, a 9-mm resectoscope was used.

The written reports from HSG, SHG, and hysteroscopy were reviewed. Data collected included presence of fibroids, polyps, adhesions, or a septum. In the absence of these findings, the cavity was described as normal.

Sensitivity, specificity, and accuracy were computed using findings at hysteroscopy as the confirmatory result.[7] Data are expressed as number of patients and percentage. Chi-square analysis was performed with SYSTAT 10.2. We use a P-value of $<.01$ as statistically significant.

RESULTS

Of the 149 patients who underwent HSG and hysteroscopy, 110 had hysteroscopic abnormalities. HSG detected abnormalities in 64 of these patients for a sensitivity of 58.2%. Of the 39 normal cavities on hysteroscopy, 29 were described as having an abnormality on HSG for a specificity of 25.6% **(Table 1)**.

Table 1.
Comparison of General Results for Sonohysterogram (SHG) and Hysterosalpingogram (HSG)

	SHG (%)	HSG (%)	p-value
Sensitivity	81.8	58.2	0.001
Specificity	93.8	25.6	<0.001
Accuracy	75.5	50.3	<0.001

Of the 93 patients who underwent SHG and hysteroscopy, 77 had hysteroscopic abnormalities. SHG described an abnormality in 63 of these patients for a sensitivity of 81.8%. Of the 16 normal cavities on hysteroscopy, 1 was described as abnormal on SHG for a specificity of 93.8%.

The positive predictive value of HSG and SHG are 68.8% and 98.4%, respectively. The negative predictive values are 17.9% and 51.7%, respectively.

For our study, we describe overall accuracy as:

The number of cavities with confirmed lesions + the number of confirmed normal cavities

Total number of uterine cavities evaluated

This is also described as:

________True Positive + True Negative________

True Positive + False Positive + True Negative + False Negative

HSG had an overall accuracy of 50.3%, while SHG had an accuracy of 75.5%. In addition to overall accuracy, we looked at the accuracy of each modality in detecting specific lesions (polyp, fibroid, adhesion, or septum) or a normal cavity **(Table 2)**.

DISCUSSION

HSG identified defects in 64 of the 110 abnormal cavities, missing almost 42%. SHG identified 63 of the 77 defects missing <20%. In addition, HSG described abnormalities in 29 of 39 normal cavities for a false-positive rate of 74.4%. In a similar study, Goldberg et al[8] found a false positive rate of 20%. This is consistent with other reports comparing HSG with hysteroscopy, which describe false-positive rates in the range of 10% to 30%.[9,10] The false-positive rate in our study may be higher than that in others due to a selection bias and the absence of blinding for clinicians. The patients selected for this study were infertile; as such, they entered with a high index of suspicion for intracavitary abnormalities. This is compounded by the fact that patients who had a normal HSG and SHG rarely underwent the hysteroscopy, which may have confirmed the negative findings.

Table 2.
Accuracy Results of Sonohysterogram (SHG) and Hysterosalpingogram (HSG) for Specific Lesions

	SHG (%)	HSG (%)	p-value
Fibroids	75	52.6	0.405
Polyps	69.4	38.8	0.008
Septum	52.9	40	0.517
Scaring	63.2	26.9	0.031
Normal	94.4	79.5	0.247

The sensitivity and specificity of SHG in our study are comparable to those found in prior studies. Krample et al[4] describe a sensitivity of 94% and specificity of 84%, Bonnamy et al[11] quote 95% and 77%, and Ragni et al[12] quote 98% and 94%.

Our secondary evaluation showed that SHG is more accurate than HSG in identifying the specific lesion distorting the endometrial cavity. This is similar to findings in a previous study of recurrent pregnancy loss[13] and an earlier study in infertile patients.[14] Accurately identifying the intracavitary lesion is important in preparing for operative management. For example, if an adhesion is expected, a hysteroscopic lysis procedure may be planned. However if a myoma is encountered, a resecting instrument may be required instead of a standard diagnostic hysteroscope.

This study was limited by its retrospective design and lack of blinding for the physicians. In addition, patients with normal-appearing cavities on SHG and HSG generally did not go on to hysteroscopy. This resulted in a lower specificity and negative predictive values for both HSG and SHG. Another limitation is that interpretation of the images of HSG and SHG depends on the experience and ability of the clinicians involved.[15] Finally, adhesions that may have been accurately diagnosed on HSG or SHG may have been lysed by a cervical dilator, uterine sound, or uterine manipulator prior to the introduction of the hysteroscope for confirmation.

CONCLUSION

SHG has greater sensitivity, positive predictive value, and accuracy than HSG has for detecting intrauterine lesions. Although HSG will continue to be an important screening tool in infertility for its proven ability to evaluate the architecture and patency of the fallopian tubes, SHG is a more reliable diagnostic tool for the evaluation of intrauterine defects.

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