

The Role of Saline Infusion Sonohysterography in the Evalution of the Uterus of Infertile Patients

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ABSTRACT

Objective: Evaluation of the uterus is one of the indispensable components of routine infertility examinations. The aim of this study is to evaluate the utility of endometrial screening with contrast media during the assessment of the uterus with transvaginal ultrasonography (TvUSG) in infertility researches.

Methods: One hundred and two infertile patients who were referred to Süleymaniye Obstetrics and Gynecology Hospital because of infertility underwent saline infusion sonohysterography (SIS) at our clinic. The cases were informed about the procedure, and consent forms were obtained. Data was collected prospectively. Results were compared with a large patient cohort that was evaluated with only hysterography (HSG) and TvUSG for uterus assessment.

Results: Abnormal intracavitary findings were observed in 20.5% of the 102 infertile patients who had undergone SIS. This rate was 7.4% in the control group. Total abnormal intracavitary finding rate of the SIS group was significantly higher (p<0.01). The rates of the uterine anomalies were similar in two groups; 4.9% in the SIS group and 5.03% in the control group. There was no statistically significant difference between the uterine anomaly rates of the groups (p>0.05).

Conclusion: SIS is a practical, low-cost method that does not require specific equipment; in addition to these advantages, it is effective in the detection of intrauterine pathologies and for making differential diagnosis. In consideration of the higher frequency of uterine pathologies in infertile patients, SIS can be used as a routine test in infertility researches. (*JAREM 2015; 5: 102-6*)

Keywords: Infertility, hysterosalpingography, sonohysterography, hysteroscopy, transvaginal ultrasonography

INTRODUCTION

Evaluating the uterus is an inseparable part of routine infertility research. During the evaluation of the uterus through transvaginal ultrasound (TvUSG), endometrial imaging using contrast media has been used in clinical practice. This method is less invasive and cheaper than hysterosalpingography (HSG) and hysteroscopy (H/S). Saline infusion sonohysterography (SIS) comprises transcervical infusion of a sterile saline solution to the endometrial lumen during TvUSG. Saline expands the uterine cavity and forms a perfect contrast in defining the echogenic endometrium because it is anechoic. This technique was first described 27 years ago (1). Its high sensitivity and efficiency in detecting endometrial polyps, submucosal fibroids (myoma), synechiae, and uterine abnormalities have been proved in some studies (2, 3). In recent meta-analysis, SIS was compared with hysterectomy, H/S, and histological sampling, which are the gold standard diagnostic methods. It was found that SIS is easily applicable and has high accuracy in diagnosing abnormal uterine bleeding (4). In addition, SIS is less invasive and less expensive than HSG and H/S. In this study, we evaluated the uterus through SIS as part of routine infertility research. We planned a prospective study for this purpose. We investigated whether SIS could be used as a part of infertility research.

METHODS

Saline infusion sonohysterography was performed in 102 infertile women in our center for infertility research. Patients were informed about the procedure, and their written informed consent was obtained. After SIS, they were referred to the relevant departments for additional diagnostic and therapeutic procedures (laparoscopy or H/S) when required. Data were prospectively collected. The results that we obtained were compared with a large patient cohort where only HSG and TvUSG were used for uterine evaluation.

Women with regular menstrual cycles were examined in the follicular phase of their cycles. First, two-dimensional TvUSG was routinely performed. Then, SIS was performed. A 5-MHz frequency vaginal probe (Toshiba justvision 400, Tokyo, Japan) was used in both procedures. The cervix was reached with a standard bivalve disposable vaginal speculum. The cervix was wiped with povidone-iodine. Then, an 8-F balloon-tipped catheter was driven up to the back of the os through the cervical canal and placed. The balloon was inflated with 1 cc of saline. Then, the catheter was brought into the proper position by gentle pulling. After removing the speculum, the vaginal probe was placed again. The endometrial lumen was expanded by slowly injecting 20–50 mL of saline along with TvUSG. Images were taken in the midsagittal section. At the end of the process, the balloon was emptied and the catheter was pulled out. Analgesics, antibiotics, or sedatives were not used before or after the operation. The diagnoses made by SIS were divided into two and recorded as uterine cavity pathologies or uterine anomalies.

Uterine cavity pathologies:

- Normal uterine cavity; smooth endometrium and normal regular contours.
- Endometrial polyp; hyperechogenic peduncle lesion.
- Submucosal fibroids; mixed echogenic lesion disrupting endometrial continuity.
- Intrauterine adhesions; asymmetric dense echogenic lesion and hypoechoic cystic areas in the cavity.
- Intramural fibroids; well-circumscribed intramural lesion.

Uterine anomalies:

- Arcuate uterus; greater than 0.1 cm fundal indentation of the cavity between the two horns.
- Uterus bicornis.
- Uterus unicornis.
- Uterine septum.
- Uterus didelphys.

Statistical Analysis

When evaluating the results obtained in this study, statistical softwares NCSS 2007 and PASS 2008 (Utah, USA) were used for statistical analysis. While the data were evaluated, the Student's t-test was used for comparison of the quantitative data in addition to descriptive statistical methods (mean, standard deviation, and frequency). The chi-square test and Fisher's exact test were used in the comparison of qualitative data. Results were evaluated at the 95% confidence interval, and significance was set at p<0.05.

RESULTS

Saline infusion sonohysterography was performed in a total of 102 patients (9.7%) whose ages ranged from 18 to 41. The mean age of the patients was 30.15 ± 5.57 . SIS was not performed in 954 patients (90.3%); thus, they were designated as the control group. The average age of the control group was 31.49 ± 5.64 . The duration of infertility of the patients in whom SIS was performed ranged from 1 to 20 years and the average infertility duration was 8.99 ± 5.03 years. The infertility duration in the control group ranged from 1 to 24 years, and the average infertility duration was 7.11 ± 5.04 years. While the infertility type in 74.9% of the patients was primary, it was secondary in 25.1% (Table 1).

The average age of the patients in whom SIS was performed was statistically significantly lower than the mean age of the patients in the control group. Infertility duration of the patients who underwent SIS was statistically significantly higher than the than of the patients in the control group (p<0.01). No statistically significant difference was found between the distribution of infertility types between the two groups (p>0.05).

Saline infusion sonohysterography was successfully performed in a total of 102 patients. No difficulties or complications were encountered during or after the operation. While the result of SIS was normal in 70.6% of the 102 patients who underwent SIS, polyps were observed in 13.7%, uterus arcuatus in 5.9%, submucosal myoma in 3.9%, uterine septum in 2.9%, endometrial polyps+uterus arcuatus in 2%, and uterine synechiae in 1 patient (Table 2). More intracavitary abnormalities were observed in the SIS group than in the control group (Table 3).

Endometrial polyps were found in 15.6% of the 102 infertile patients who underwent SIS. This rate is 1.3% in the control group. The rate of polypendometrial diagnosis in the SIS group was detected to be statistically significantly higher (p<0.01). Submucosal myoma was seen in 3.9% of the 102 infertile patients who underwent SIS; this rate was 5.34% in the control group, and no statistically significant difference was seen between the rates of submucosal fibroids (p>0.05). Adhesion was seen in 0.9% of the 102 infertile patients who underwent SIS; this rate is 0.73% in the control group, and no statistically significant difference was seen between the rates of adhesion (p>0.05). Abnormal intracavitary findings were found in 20.5% of the 102 infertile patients who underwent SIS; this was 7.4% in the control group. The total proportion of abnormal intracavitary findings was found to be significantly higher in the SIS group (p<0.01).

Uterine anomalies were similar to each other in both groups (Table 4). While 5.03% in the SIS group, they were 4.9% in the control group. No statistically significant difference was seen between the rates of uterine abnormalities in the groups (p>0.05). The most frequent uterine anomaly detected in both groups was an arcuate uterus. The second most frequent uterine anomaly detected in both groups was a septate uterus. No known complications developed during and after the application of sonohysterography.

DISCUSSION

Saline infusion sonohysterography is an easy, safe, and well tolerated alternative when compared with diagnostic H/S because it offers comprehensive and unique advantages in imaging the uterus and adnexa. In addition, the endometrial imaging is better. Intrauterine pathologies and uterine anomalies are also better evaluated (3). The diagnostic accuracy of SIS in abnormal uterine bleeding was found equal with diagnostic H/S in a recently conducted meta-analysis conducted with 2278 people. It has 95% of

Table 1. The assessment of defining features according to the groups

	SIS group (n=102) Mean±SD	Control group (n=954) Mean±SD	•p
Age	30.15±5.57	31.49±5.64	0.023*
Infertility duration	8.99±5.03	7.11±5.04	0.001**
Type of infertility	n (%)	n (%)	+p
Primary	73 (71.6)	717 (75.2)	0.447
Secondary	29 (28.4)	236 (24.8)	0.417

SD: standard deviation; n: number; SIS: saline infusion sonohysterography; •Student's t-test was used; * p<0.05 *Chi-square test was used; ** p<0.01

Table 2. Distribution of SIS results					
	n	%			
Polyp	14	13.7			
Submucosal myoma	4	3.9			
Arcuate	6	5.9			
Septum	3	2.9			
Polyps+Arcuate	2	2.0			
Synechiae	1	1			
Normal	72	70.6			

SIS: saline infusion sonohysterography

Table 3. The prevalence of intracavitary abnormalities detected with SIS

Diagnoses of uterine cavity	SIS group (n=102)	Control group (n=954)	•p
Endometrial polyp	16 (15.6%)	13 (1.36%)	0.001**
Submucosal myoma	4 (3.9%)	51 (5.34%)	0.538
Adhesion	1 (0.9%)	7 (0.73%)	0.785
Total intracavitary abnormalities	21 (20.5%)	71 (7.4%)	0.001**

SIS: saline infusion sonohysterography

•: Chi-square test

** p<0.01

Table 4. The prevalence of uterine anomalies detected with SIS

Uterine abnormalities	SIS group (n=102)	Control group (n=954)	•p
Arcuate uterus	3 (2.9%)	27 (2.83%)	0.949
Septate uterus	2 (1.9%)	19 (1.99%)	0.983
Unicornuate uterus	0 (0.0%)	1 (0.10%)	⁺ 1.000
Bicornuate uterus	0 (0.0%)	1 (0.10%)	⁺ 1.000
Total uterine anomalies	5 (4.9%)	48 (5.03%)	0.95

SIS: saline infusion sonohysterography

•: Chi-square test

†: Fisher's exact test

the sensitivity and 88% of the specificity (4). The diagnostic accuracy of SIS was investigated in infertile patients and similar results were found (2, 5, 6). In this study, we used SIS for uterine imaging and investigated whether or not SIS could be a routine part of infertility examinations. In order to evaluate the uterus, routine SIS was performed in 102 patients admitted to our hospital with the complaint of infertility. Intracavitary abnormalities were detected in 20.5% of these patients (polyps, submucosal fibroids, adhesions, etc.). The results we found were similar to other studies in which SIS was performed for infertility research (5-7).

Kim et al. (6) performed routine SIS in 72 diseased patients before the IVF and detected intracavitary abnormalities at a rate of 11.1%. They also reported that the main pathology found was polyps. Lindheim and Sauer (7) performed SIS in 50 patients waiting for oocyte donation and determined uterine pathologies in 38% of them (polyps, submucosal fibroids, adhesions, and a bicornuate uterus).

The most detected pathology in our study was also polyps and fibroids, and this is consistent with other studies. de Kron et al. (4) detected intracavitary abnormalities in 56% of 877 patients who they gathered in a meta-analysis study. Endometrial polyp was the most frequently encountered intracavitary lesion in infertile patients.

The data supporting a polypectomy before infertility treatment are increasing. In a prospective randomized study conducted with 415 IVF patients, it was concluded that polypectomy was effective and increased pregnancy rates compared to the control group (8). In another study of 215 infertile patients where polypectomy was performed before intrauterine insemination, it was concluded that polypectomy increased the pregnancy rate 2.1 times (9). Studies have shown that polypectomy restores the reproductive capacity (10). Submucosal fibroids are the second most common lesion among intracavitary lesions in the patient group of SIS. There are several studies reporting that submucosal fibroids reduce the success of assisted reproductive treatment (11). Large fibroids have an adverse effect on fertility by disrupting the cavity. Indeed, increasing pregnancy rates compared to the control group after myomectomy support this claim. In this regard, the adverse effects of submucosal fibroids and polyps that distort the cavity on implantation can easily be understood.

In our study, the rate of uterine abnormalities was 4.9% in the infertile patient group of SIS. This rate was 5.03% in the control group and the rate of uterine anomaly was similar in both groups. In the literature, uterine anomaly rates in infertile patients range from 1% to 26%. This wide range of prevalence can be attributed to several limiting factors among studies. These reasons include population, diagnostic methods, classification systems, and the excluding of asymptomatic cases. The most common uterine anomaly found in our study was arcuate uterine in the infertile group of SIS. 2.9% of the SIS group and 60% of the anomalies were arcuate uterine. A septate uterus was the second most frequently found. In total, 1.9% of patients and 40% of the anomalies were a partial or complete septate uterus. Two studies in the literature have reported that the ratio of a septate uterus in the anomalies was 22% and 34.9% (12, 13). These rates are lower than those in our study. However, in these two studies, the ratio of an arcuate uterus in abnormalities was reported as 15% and 18.3% (12, 13). These are quite low rates when compared to the rate of 60% in our study. The reason for this may be that they considered a moderate arcuate uterus as a variant of normal. The relationship of an arcuate uterus with infertility is uncertain. It is usually interpreted that an arcuate uterus has no effect on fertility. Grimbizis et al. (13) concluded that an arcuate uterus reduced reproductive performance, but it was the anomaly that affects reproductive performance the least.

Uterine cavity appears as a line in two-dimensional TvUSG. However, both the uterine cavity and myometrium can be displayed simultaneously with the help of SIS. When the patients were evaluated with SIS, they are not exposed to radiation as in HSG. When compared with TvUSG and HSG, the two most commonly used techniques in uterine evaluation, SIS was reported in several studies to have many advantages.

Soares et al. (14) accepted H/S as the gold standard and investigated the diagnostic accuracy of SIS by comparing it with TvUSG and HSG. SIS has similar diagnostic accuracy rates with H/S for endometrial polyps and endometrial hyperplasia. However, the sensitivity of TvUSG for these two lesions was 75%. The sensitivity of HSG is 50% for endometrial polyps and 0% for endometrial hyperplasia. The sensitivity of SIS and HSG is similar only in intrauterine adhesions, and it is 75%. However, the sensitivity of TvUSG for adhesions is 0%. In another comparative study, H/S was taken as the gold standard and SIS was compared with TvUSG. Ragni et al. (3) included 98 infertile patients in this study. They found in this study that SIS had a higher diagnostic accuracy rate than TvUSG in intrauterine pathologies. When compared with H/S, the sensitivity of SIS was found to be 98% and the specificity was 95%; whereas the sensitivity of TvUSG was found to be 91% and the specificity was 83%. Considering all these, we can conclude that SIS is more advantageous than TvUSG and HSG.

SIS was shown to be more preeminent than TvUSG and HSG in the diagnosis of uterine malformations. Soares et al. (14) reported that the sensitivity of SIS was higher than that of TvUSG and HSG. The sensitivity of TvUSG and HSG is 44.5% and that of SIS is 77.8%. Alborzi et al. (15) examined 20 patients with recurrent pregnancy loss and an HSG diagnosis of a septate/bicornuate uterus. They reached the conclusion that SIS makes a better distinction of a septate/bicornuate uterus than HSG. The authors suggest that the distinction of a septate/bicornuate uterus can be made without laparoscopy in SIS.

Saline infusion sonohysterography can be easily used even in stimulated cycles because it does not disrupt the characteristics of the endometrium. The authors claim that the application of this method would be more appropriate especially in infertility cases before applying invasive and expensive hysteroscopic examinations and report that the sensitivity of SIS is 87.5%, specificity is 100%, positive predictive value is 100%, and negative predictive value is 91.6% in detecting any anomalies in the cavity. In assisted reproduction centers, SIS was reported to be more preeminent than TvUSG in determining submucosal cores of fibroids in a uterus with multiple fibroids cores. It is also a method that can easily differentiate a hyperplastic endometrium from a large polyp. In addition, the differential diagnosis of an arcuate uterus and uterine septum can be made easily and accurately with this method (16).

The predictivity of SIS was found to be 90% in infertility centers and was reported to have a higher rate of sensitivity and predictive values, as in HSG, in the detection of pathologies of the endometrial cavity. In the same study, the preeminence of SIS was emphasized in terms of better imaging of intrauterine pathology (17).

In addition to advantages such as easy implementation, low processing costs, and not requiring special equipment, SIS gives valuable results in the detection and differential diagnosis of intrauterine pathologies in particular. In the literature, the sensitivity and specificity of sonohysterography for intrauterine lesions vary from approximately 75% to 100% and specificity is higher than sensitivity at a rate of 2–20% in all studies. Sonohysterography is considered as the gold standard in intrauterine lesions, particularly in the detection of polyps and submucosal fibroids. In many studies, it is even recommended in H/S contraindications to reduce the cost of patient management.

Saline infusion sonohysterography increased the sensitivity of ultrasonography in intrauterine lesions from 62.5% to 96.9% (p=0.0006), specificity from 97.5% to 100% (p=0.1587), positive predictive value from 95.2% to 100% (p=0.1902), negative predictive value from 76.5% to 97.6% (p=0.0024), and the total value of diagnostic accuracy from 81.9% to 98.6% (p=0.0003).

Therefore, in cases where we are unsure of the diagnostic value and strength of ultrasonography or want to increase its strength, we should apply SIS.

CONCLUSION

Saline infusion sonohysterography can be used for the recognition of uterine pathologies of infertile patients because it is a safe, cheap, and well-tolerated technique. Moreover, it can be easily applied by many infertility clinics giving outpatient service because the hospitalization of patients is not required. Considering the high frequency of uterine pathologies in infertile patients, SIS should be used routinely in infertility research.

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Informed Consent: Written informed consent was obtained from patients who participated in this study.

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