

Assessment of Tubal Patency by Sonohystrography in Infertile Women

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ABSTRACT:

BACKGROUND:

Tubal problem is one of the causes of infertility in infertile couples. For that, evaluation of fallopian tubes forms an important part of evaluation in infertile woman.

OBJECTIVE:

To assess the diagnostic accuracy of Sonohysterography (SHG) in comparison with hysterosalpingography (HSG) in infertile women.

PATIENTS AND METHODS:

this cross sectional study included 50 women, 37women with primary infertility and 13women with secondary infertility. The study was conducted in Al-Imamian Al-Kadhimian medical city/Baghdad/Iraq from 1st of October 2017 to 30th of July 2018. All underwent clinical and physical examination. This was followed by Sonohysterography on day 7th or 8th of menstrual cycle and Hysterosalpingography on the same day.

RESULTS:

Fifty infertile women were included in this study with mean age of 27.9 ± 5.9 years. Mean infertility duration of studied women was 3.6 ± 2.4 years; 68% (N=34) of infertile women had duration of less than 5 years and 32% (N=16) of them had duration of 5 years and more. The history of previous surgical operation was detected in 28% (N=14) of infertile women. The final diagnosis of hysterosalpingography (SHG) revealed that 89% (N=89) patent fallopian tubes and 11% (N=11) obstructed tubes. The final hysterosalpingography (HSG) revealed that 85% (N=85) patent fallopian tubes and 15% (N=15) obstructed tubes. No significant difference between women with patent and obstructed fallopian tube by SHG regarding history of parity ($p=0.6$), abortion ($p=0.7$), type of infertility ($p=0.1$), infertility duration ($p=0.6$), history of previous operation ($p=0.5$) and history of previous diagnostic intervention ($p=0.6$). Sonohysterography (SSG) has 100 % sensitivity and 60 % specificity in comparison to hysterosalpingography (HSG). Analysis of the raw data gave positive predictive value of 95.7% and negative predictive value of 100 %. From the results of this study it clear that there is no statistically significant difference ($p = 0.001$) between the results of the two methods (SSG and HSG) with an accuracy of 96%.

CONCLUSION:

Sonohysterography has higher sensitivity and good specificity and is lesser invasive. It can be used primarily to assess tubal condition in infertile women.

KEYWORDS: Sonohysterography (SHG), infertile women

INTRODUCTION:

Infertility is defined as failure to conceive after one year of regular unprotected intercourse ⁽¹⁾. Infertility can be either primary or secondary; Women whose pregnancy spontaneously miscarries, or whose pregnancy result in a still

born child, without ever having had a live birth would present with primary infertility; those who repeatedly spontaneously miscarry or whose pregnancy result in a stillbirth, or following previous ability to do so, are then not unable to carry a pregnancy to a live birth would present with secondarily infertile ⁽²⁾.

Tubal factor infertility (TFI) in female infertility caused by diseases, obstructions, damage, scarring, congenital malformations or other factors which impede the descent of a fertilized or unfertilized ovum into the uterus

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through the Fallopian tubes and prevents a normal pregnancy and full term birth. Tubal factors cause 25-30% of infertility cases⁽³⁾.

The hysterosalpingography (HSG) is a common efficient screening tool of patency for fallopian tubes and the inside cavity of uterus, although it does not give us a well-defined picture of ovarian morphology. HSG procedure carries higher risk of ionizing radiation and allergy of contrast media. Additionally, the use of HSG is sometimes associated with slight bleeding and pelvic pain⁽⁴⁾. Although hysterosalpingography [HSG] is the standard screening test for the diagnosis of tubal infertility the new studies confirm the higher sensitivity and acceptability of sonohysterography [SHG] compared to HSG for the evaluation of tubal patency in infertile women⁽⁵⁾. Recently, SHG is used as the initial step for the assessment of fallopian tube patency because it is a simple, safe, and well tolerated technique with a low risk of adverse effects and severe complications^(6,7). This method shown to be valuable and safe diagnostic procedure and it shows an effect in increasing spontaneous pregnancy rate⁽⁸⁾. SHG can be provided in an outpatient setting and it is associated with minimal discomfort and a low risk of infection⁽⁹⁾. The sonohystrography consists of an instillation of sterile saline through a catheter inserted through the cervix with simultaneous transvaginal sonography, it depends on distention of intrauterine cavity with isotonic saline that help in delineation of contour, identification of intrauterine pathology and endometrial thickness and measurement of fluid in the pouch of Douglas⁽¹⁰⁾. It is highly accurate in identifying intrauterine disorders and thickness measurement of endometrium and assessing the patency of fallopian tubes⁽¹¹⁾. The SHG is simple, safe and easier than HSG with no radiation and allergy risks⁽¹²⁾.

AIM OF STUDY:

To assess the diagnostic accuracy of sonohysterography (SHG) in comparison with hysterosalpingography (HSG) for the evaluation of tubal patency in infertile women.

PATIENTS AND METHODS:

The present study is a cross sectional study conducted in the radiology department at Al-mamain Al-Khadhimian Medical City/ Baghdad/ Iraq for period from 1st of October 2017 to 30th of July 2018. The study enrolled 50 women who were discovered to have either primary or secondary infertility with suspected tubal factor as main cause. Inclusion criteria include infertile women with no medical history aged between 18-40 years with suspected tubal factor as main cause of either primary or secondary infertility. Exclusion criteria include women who are less than 18 years and above 40 years, women who have pelvic inflammatory disease (PID) or free fluid in pouch of Douglas, male cause of infertility, allergic history to contrast, ovarian and hormonal abnormalities and contra-indication of both SHG and HSG (recent D and C, bleeding, tubal and uterine surgery, severe renal and cardiac disease). Ethical considerations: research approval was taken from Institutional Review Board/ Al-ahrian College of medicine. Written informed consent was taken from patient before being enrolled in the study. All the patients initially undergo routine evaluation that includes a complete history and physical examination. Ultrasound Examination: machine: PHILIPS HD11XE ultrasound with endovaginal probe with high frequency (8MHZ).

Procedure: sonohysterography (SHG) and hysterosalpingography (HSG) should be performed during proliferative phase, on 7th or 8th day from the 1st day of the menstrual cycle, this ensures that there is no pregnancy present, trans-vaginal sonography were performed to exclude presence of fluid in the cul-de-sac (retro-uterin space) before SHG. Prophylactic oral antibiotics in the form of doxycycline 100mg one hour before and 200mg after 6 hour from the procedure and analgesics in form of diclofenac 50mg orally half an hour prior to examination. Patient should be placed on gynecologic table in lithotomy position. The vulva and the Vagina washed with an antiseptic solution (povidon), sterile Cusco speculum inserted and the cervix washed with an antiseptic solution. The anterior lip of the cervix grasped with a single toothed tenaculum and SHG

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catheter (7F) length 28cm with balloon to be introduced into the lower uterine cavity. The catheter was introduced through the external os and the balloon was distended with 5mL of normal saline to prevent retrograde leakage of saline in the vagina, 50 ml syringes loaded with 0.9% saline solution attached to the external end of catheter after removal of speculum and tenaculum, and ultrasound probe introduced into the vagina, then 25-50ml sterile saline was injected slowly through the catheter under continuous sonographic control, flow of fluid can be seen in each tube as anechoic linear pattern directed from the uterine side toward the ovarian side indicate tubal patency. In cases when this flow cannot be detected, the patency of fallopian tubes will be determined by the presence of fluid in the Douglas pouch which indicates the patency of at least one tube. Absences of fluid indicate bilateral tubal occlusion. Then patient taken to HSG department using digital X-ray machine, patient put in same position and sterilized technique as for SHG, but with injection of low osmolar iodinated contrast material (LOCM) 370 mg I ml-1/ 10-20 ml under fluoroscopic control. Typical fluoroscopic examination include a preliminary frontal view of the pelvis, as well as subsequent spot images that demonstrate uterine endometrial contour, filled fallopian tubes and bilateral intraperitoneal spill of contrast, to establish tubal patency, contrast help to highlight fallopian tube from tissue surrounding them .

Statistical analysis: all infertile women's data entered using computerized statistical software;

Statistical Package for Social Sciences (SPSS) version 20 was used. Descriptive statistics presented as (mean \pm standard deviation) and frequencies as percentages. Multiple contingency tables conducted and appropriate statistical tests performed, Fishers exact test was used for categorical variables. Two by two validity table was used to acquire validity results of SHG in comparison to HSG. In all statistical analysis, level of significance (p value) set at ≤ 0.05 .

RESULTS:

Fifty infertile women were included in this study with mean age of 27.9 ± 5.9 years. Nulliparity was seen among 74% (N=37) of infertile women and multiparity was seen in 24% (N=12). Previous history of abortion was observed among 26% (N=13) of infertile women.

Primary infertility was present in 74% (N=37) while secondary infertility constituted 26% (N=13). Mean infertility duration of studied women was 3.6 ± 2.4 years; 68% (N=34) of infertile women had duration of less than 5 years and 32% (N=16) of them had duration of 5 years and more. The history of previous surgical operation was detected in 28% (N=14) of infertile women

The final diagnosis of hysterosalpingography (SHG) according to number of tubes revealed that 89% (N=89) patent fallopian tubes and 11% (N=11) obstructed tubes. The final hysterosalpingography (HSG) revealed that 85% (N=85) patent fallopian tubes and 15% (N=15) obstructed tubes. All these findings were shown in table 1.

Table 1: Final diagnosis of SHG and HSG for infertile women.

Variable	No.	%
Final SHG diagnosis		
Patent tubes	89	89.0
Obstructed tubes	11	11.0
Total	100	100.0
Final HSG diagnosis		
Patent tubes	85	85.0
Obstructed tubes	15	15.0
Total	100	100.0

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No significant difference between women with patent and obstructed fallopian tube by SHG regarding history of parity (p=0.6), abortion (p=0.7), type of infertility (p=0.1), infertility duration (p=0.6), history of previous operation (p=0.5) and history of previous diagnostic intervention (p=0.6). All these findings were shown in table 2.

Table 2: Distribution of Type and duration of infertility, history of previous surgical or diagnostic intervention according to SHG finding.

Variable		Patent uni- or bilateral		Obstructed bilateral		P
		No.	%	No.	%	
Parity	Nulliparity	35	74.4	2	66.6	0.6* NS
	Multiparity	12	23.4	1	33.3	
Abortion	No	35	74.5	2	66.6	0.7* NS
	Yes	12	25.5	1	33.3	
Type of infertility	Primary	36	76.6	1	66.6	0.1* NS
	Secondary	11	23.4	2	33.3	
Infertility duration	<5 years	33	70.2	1	33.3	0.6* NS
	≥5 years	14	29.8	2	66.6	
History of previous operation	Positive	12	25.5	2	66.6	0.5* NS
	Negative	35	74.5	1	33.3	
History of previous diagnostic	Positive	2	4.2	0	-	0.6* NS
	Negative	45	95.8	3	100.0	

* Fishers exact test, NS=Not significant.

The validity results of SHG regarding patency of fallopian tubes in comparison to HSG were sensitivity (100%), specificity (60%), +ve predictive value (95.7%), -ve predictive value (100%) and accuracy (96%). All these findings were shown in tables 3.

Table 3: Validity test results of SHG findings in comparison to HSG for diagnosis of fallopian tube patency.

Validity test		HSG		
			Obstructed: no. (%)	Total: no. (%)
SHG	Patent: no. (%)	45 (95.7)	2 (4.3)	47 (100.0)
	Obstructed: no. (%)	0 (-)	3 (100.0)	3 (100.0)
	Total: no. (%)	45 (90%)	5 (10%)	50 (100.0)
Sensitivity		100%		
Specificity		60%		
Positive predictive value (PPV)		95.7%		
Negative predictive value (NPP)		100%		
Accuracy		96%		

DISCUSSION:

Fallopian tube pathology was found to be the main cause of low fertility among 25-35% of infertile women. Assessment of fallopian tubes represented the cornerstone in diagnosis of infertility among women. Many investigative techniques were applied in last decades to explore the patency of fallopian tubes, commonly the hysterosalpingography (HSG) and sonohysterography (SHG) ⁽¹³⁾.

The present study showed that about 74% of studied infertile women had primary infertility while 26% of them had secondary infertility. This finding is close to results of Taha et al ⁽¹⁴⁾ study in Iraq which revealed that 63% of infertile women in Erbil had primary infertility and 37% of them had secondary infertility. The mean infertility duration of women in this study was 3.6 years. This mean duration is lower than that found by Al-Asadi et al ⁽¹⁵⁾ study in Iraq which stated that mean infertility duration of included infertile women was 6.3 years. This difference might be attributed to difference in inclusion criteria between the 2 studies. History of previous surgical operation was detected in 28% of infertile women while history of previous diagnostic intervention was found in 4% of them. This finding is consistent with results of Abdullah study in Iraq which reported history of surgical operation among 28% of infertile women ⁽¹⁶⁾.

The present study showed that final diagnosis of SHG is patent fallopian tubes in 94% of infertile women (including women with one patent tube in this category) and obstructed tubes in 6% of women including only bilateral obstruction. These findings are higher than results of Suttipichate et al ⁽¹⁷⁾ study in Thailand which documented that 78% of infertile women were detected with patent tubes with SHG. The final HSG revealed that 90% of infertile women had patent fallopian tubes and 10% of women had obstructed tubes. This finding is higher than results of Khetmalas et al ⁽¹⁸⁾ study in India which found 70% of infertile women were with patent fallopian tubes. These higher patency rates in the current study in SHG and HSG may be due to the cause of infertility incorrectly thought to be due to tubal factor and other causes should be encountered.

The current study showed a highly significant association between both patent tubes detected by SHG and patency detected by HSG ($p < 0.001$). This finding is consistent with results of Kulkarni et al ⁽¹⁹⁾ study in India.

Our study showed that the validity results of SHG regarding patency of fallopian tubes in comparison to HSG were sensitivity (100%), specificity (60%), positive predictive value (95.7%), negative predictive value (100%) and accuracy (96%). Our validity findings are close to results of Dasan et al ⁽²⁰⁾ study in India which reported validity findings of SHG in detecting patency of tubes as sensitivity (94.8%), specificity (75%), positive predictive value (97%), negative predictive value (50%) and accuracy (90%). The current study validity results of SHG in comparison to HSG is lower than results of Malek-Mellouli et al ⁽⁷⁾ study in Tunisia of sensitivity of 75% and specificity of 87.5%. Moreover, our results regarding validity of SHG are lower than results of Jeanty et al ⁽²¹⁾ study in USA which found SHG sensitivity of 85.7%, specificity of 77.2% in detection of fallopian tube patency. The low specificity of SHG in present study that lead to higher false positive cases is similar to results of many previously reported studies ^(22, 23). Anuradha et al ⁽²⁴⁾ suggested the use of SHG as a screening tool for detecting patency of fallopian tube among infertile women that needed the HSG and laparoscopy for definite diagnosis. The limitation in this study was small sample size and no follow up of patients by laparoscopy.

CONCLUSIONS:

The sonohysterography procedure appear to be the most comprehensive study, it enables examiner to simultaneously evaluate ovary, uterine cavity contour and myometrial structure and tubal architecture and patency. Sonohystrography has higher sensitivity than HSG with good specificity. It can be used primarily to assess tubal condition in infertile women. The SHG can be used instead of HSG for assessment of tubal patency.

REFERENCES:

1. ESHRE Capri Workshop Group. Diagnosis and management of the infertile couple: missing information. *Hum Reprod Update* 2004; 10:295–307.
2. World Health Organization, human reproduction programme. Maya N. Mascarenhas, SethR.Flaxman, TiesBoerma, Shhery Vanderpoel, GretchenA. Stevens; 2012
3. Bardawil, MD, Tarek. Lucidi, MD, Richard Scott, ed. "Fallopian Tube Disorders". Medscape.2015.
4. Saunders RD, Shwayder JM, Nakajima ST. Current methods of tubal patency assessment. *FertilSteril* 2011; 95(7):2171-2179.
5. Kupesic S, Kurjak A. Interventional ultrasound in human reproduction. In: Kupesic S, De Ziegler D (eds). *ultrasound and Infertility*. New York, NY: Parthenon Publishing 2000: 253–263.
6. Hajishafiha M, Zobairi T, Zanjani VR, Ghasemi-Rad M, Yekta Z, Mladkova N. Diagnostic value of sonohysterography in the determination of fallopian tube patency as an initial step of routine infertility assessment. *J Ultrasound Med* 2009; 28(12):1671–1677.
7. Malek-Mellouli M, Gharbi H, Reziga H. The value of sonohysterography in the diagnosis of tubal patency among infertile patients. *Tunis Med* 2013; 91(6):387–390.
8. Kim AH, McKay H, Keltz MD, Nelson HP, Adamson GD. Sonohysterographic screening before in vitro fertilization. *FertilSteril* 1998; 69:841–844.
9. Verma SK, Lev-Toaff AS, Baltarowich OH, Bergin D, Verma M, Mitchell DG. Adenomyosis: sonohysterography with MRI correlation. *AJR Am J Roentgenol* 2009; 192:1112– 1116.
10. Kore S, Hegde A, Nair S. Sonography for assessment of tubal potency: our experience. *J ObstetGynecol India*. 2000; 50(2):636.
11. Rahman M, Sinha DK. A cost-effective approach in the evaluation of female infertility. *ObstetGynecol Ind*. 2002; 52(1):105-107.
12. Lakshmi CS, Sampath K, Varthini P. Evaluation of tubal patency by sonohysterography is as good as hysterosalpingography in infertile women. *Int J ReprodContraceptObstetGynecol* 2017; 6:5129-5134.
13. Panchal S, Nagori C. Imaging techniques for assessment of tubal status. *Journal of Human Reproductive Sciences* 2014; 7(1):2-12.
14. Taha AB, Rashid KH. Etiology of infertility in couples attending maternity hospital in Erbil. *Zanco J Med Sci* 2013; 17 (1): 322-330.
15. Al-Asadi JN, Hussein ZB. Depression among infertile women in Basrah, Iraq: Prevalence and risk factors. *J Chin Med Assoc* 2015; 78(11):673-677.
16. Abdullah AM, Al- Ogaili SSC. Risk Factors of Infertility among Young Women at AlNajaf City. *International Journal of Scientific and Research Publications* 2016; 6 (12): 21-30.
17. Suttipichate J, Sroywattana C, Dejthevaporn D, Virojchaiwong P, Sripramote M. Transvaginal Saline Sonohysterography for The Assessment of Tubal Patency. *Thai Journal of Obstetrics and Gynaecology* September 2002; 14: 223-229.
18. Khetmalas SM, Kathaley MH. A Study Evaluation of Tubal Factors of Infertility by Hysterosalpingography and Diagnostic Laparoscopy. *MVP Journal of Medical Sciences* 2016; 3(1): 11-17.
19. Kulkarni NN, Patel R, Patel NR, Patil AB. Comparative study of sonohysterography versus hysterosalpingography for tubal patency test. *Int J ReprodContraceptObstetGynecol* 2016; 5:3300-3303.
20. Dasan TA, Basawaraj NG. A comparative study of saline infused sonohysterography and conventional hysterosalpingography in the evaluation of female infertility. *Radiation Oncology-Medical Physics Journal* 2016; 23 (2): 124-129.
21. Jeanty P, Besnard S, Arnold A, Turner C, Crum P. Air-contrast sonohysterography as a first step assessment of tubal patency. *J Ultrasound Med* 2000; 19(8):519-527.
22. Dwivedi A, Jain M, Tripathi S, Garg S, Jain S. Diagnostic Accuracy of Sonohysterography for Assessing Tubal Pathology in Women with Secondary Infertility Taking Laparoscopy as Gold Standard. *Surgical Science* 2012; 3 (8): 414-417.

23. Singhal A, Agrawal K, Khuteta R. Comparison of Transvaginal Sonohysterography to Chromolaparoscopy for Evaluation of Tubal Patency in Infertile Patients. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 2016; 15 (7): 47-49. Available at: www.iosrjournals.org
24. Anuradha J, Arunakumari K, Sujatha . Comparative study of tubal patency by hysterosalpingography, transvaginal sonohysterography and laparoscopy. IAIM 2016; 3(9):126-133.