

# ROLE OF SONOHYSTEROGRAPHY IN INFERTILITY

By

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## ABSTRACT

**Background:** Infertility is estimated to affect between 8-12% of reproductive aged couples worldwide, and is caused by a combination of factors in both parents to prevent conception from occurring. The tubal and uterine factors of infertility are responsible for the main percentage of female infertility, and hence evaluation of tubal patency and intact uterus represent a key step and basic investigation in the assessment of infertile women.

**Objective:** To observe the role of saline infusion sonohystrography (SIS) to find out endometrial pathology and tubal patency in infertility woman.

**Patients and Methods:** The present study was carried out at Radio-Diagnosis Department of Farafra Hospital during the period between January 2021 and March 2021 on 30 patients in reproductive age who presented with inability to conceive, 16 cases (53.3%) were of primary infertility, while 14 cases (46.7%) were of secondary infertility. All patients underwent the transvaginal scanning to evaluate any potential pathological condition without injection of saline. All patients underwent transvaginal scanning with injection of saline transcervically into uterine cavity.

**Results:** There were 16 (53.3%) as a primary group, and 14 (46.7%) as a secondary group. The mean age 27.23 and SD 4.20 years, and 8(26.7%) with age < 25 and 22(73.3%) with age > 25. There was a statistically significant difference between the two groups regarding age, and non-significant regarding endometrial hyperplasia, submucus fibroid, endometrial polyp, ovarian cyst/mass, hydrpsalpnix, synechiea, congenital, bilateral patencytube, bilateral block tube and unilateral block tube.

**Conclusion:** Saline infusion sonohystrography can be used as a simple, noninvasive, cost-effective and useful tool in the work up of infertility patient, with better compliance and better results, with no radiation exposure to patients in evaluation of female infertility.

**Keywords:** Saline infusion sonohystrography, Infertility.

## INTRODUCTION

Infertility may be further classified as primary infertility, in which no previous pregnancies have occurred, and secondary infertility in which prior pregnancy, although no necessarily a live birth, has occurred. Out of all causes of infertility in

woman, ovulatory dysfunction (30%) and tubal factor (25%) are the major factors. uterine factor includes endometrial and miomatrial lesions (*Adegbola and Akindele, 2013*).

Saline infusion sonohystrography (SIS) is a technique that help in

visualization of endometrial and endometrial cavity, differentiate lesion of endometrial and endometrial and assesses tubal patency (*Sabry et al., 2018*).

Sonohysterography or saline infusion sonohysterography (SIS) procedure is going popularity and is being widely practised and accepted as a screening role in assessing tubale patency in infertile woman and has become popular as a routine test for evaluation of uterine cavity in the investigation of infertility and upnormal uterine bleeding. SIS can be done with P mode and Doppler (*Singh et al., 2018*).

SIS refers to a procedure in which fluid is instilled into uterine cavity transervically through a catheter to provide enhanced endometrial visualization during transvaginal ultrasound examination. There are many subjects that suggest application of SIS in evaluating uterine defects in patient with recurrent pregnancy losses, as well as those undergoing IVF, to confirm uterine problems that may interfere with embryo implantation (*Gera et al., 2012*).

SIS can demonstrate a patent uterine tube. However, if blocked, site of block is difficult to elicit. SIS aids in improved sonographic detection of endometrial pathologies such as polyp, hyperplasia, leiomyoma and adhesions. In addition, it can help in avoiding invasive diagnostic procedures in some patients as well as optimize the pre-operative evaluation process for that woman who requires therapeutic intervention (*Woźniak and Woźniak, 2017*).

SIS is well tolerated technique could easily and rapidly performed at minimal cost, and have virtually lower risk of

adverse effects and serve complications (*Gera et al., 2012*).

SIS should be performed between day 4 and 10 of the patient's menstrual cycle when the endometrium at its thinnest and physiologic changes during the secretory phase that may simulate pathologic conditions. Before day 4, the presence of blood may either obscure or simulate pathologic condition. In woman with a regular menstrual cycle, performing SIS before ovulation help avoid the possibility of flushing out a fertilized ovum during procedure. In patient with an irregular menstrual cycle, a preprocedure pregnancy test may be performed (*Allison et al., 2011*).

**The aim of the present study was to** observe the role of saline infusion sonohysterography to find out endometrial pathology and tubal patency in infertility woman.

## PATIENTS AND METHODS

The present study was carried out at Radio-Diagnosis department of Farafra hospital during the period between January 2021 and March 2021 on 30 patients in reproductive age who presented with inability to conceive.

**Inclusion criteria:** Primary and secondary infertile female patients in reproductive age.

**Exclusion criteria:** All patients having active pelvic inflammatory disease, active vaginal bleeding, malignancy of genital tract, suspected pregnancy cervical erosion or vaginitis, and abnormal semen analysis of the husband.

All eligible patients were properly counseled and gave informed consents

before entry into the study. Detailed menstrual, obstetric and medical histories of each patient were obtained.

**Technique of SIS:**

All patients were subjected to transabdominal ultrasonography with full bladder using low frequency probe and transvaginal. Sonography was applied with empty bladder with high frequency transvaginal probe.

Initially, all patients were evaluated with abdominal transducer to evaluate any potential pathological condition outside the focal length of the vaginal transducer.

Following this, the patients were put in the dorsal position, perinium painted with betadine and draped and vagina was cleaned with a sterile swab.

Following this, using Cusco's speculum, uterine cavity was exposed to rule out cervical erosion. The cervix was cleaned with sterile swab; the semi-rigid silicon Foley's catheter 8 French or 6 French was directed into uterine cavity, using artery forceps. Then, the balloon was inflated with 2ml of normal saline and pulled back to occlude the internal OS of the cervix. In the present study, we tried to fix the balloon in the cervical canal, but were painful and refused by subjected patient.

**Following this, vaginal transducer was introduced into the posterior fornix when uterus was retroverted and into the anterior fornix when it was anteverted to evaluate:**

Uterus observations included size, shape, and echotexture of uterus and cervix in the sagittal and axial planes. The

endometrial thickness was measured at the broadest diameter in sagittal plane.

Ovaries observation included detected for size, shape, echotexture and position of the ovaries.

Fallopian's tubes for detection of any abnormalities before saline injection.

Pouch of Douglas was tested for fluid collection before saline injection.

Then, 20-30 ml of normal saline (maximum 50 ml) was injected slowly through catheter into uterine cavity.

Once adequate distension of uterine cavity achieved in sagittal plane. An axial scan from cornu to cornu was performed followed by sagittal scan from fundus to cervix was performed by transvaginal transducer.

The uterine cavity was evaluated for the presence of any abnormalities, subsequently; each tube was visualized separately to visualize the presence of fimbrial turbulence (waterfall sign or flow of air and fluid) which was taken as a sign of tubal patency. The presence of fluid in pouch of Douglas after SIS was also taken as a sign of tubal patency.

In the presence of obstructed tubes, the uterine cavity was expanded in size and no waterfall sign was observed. The patient also experienced discomfort and complained of pain. The pain subsided by deflation of the balloon and removal of the catheter.

All patients were allowed to rest for 2 hours before were sent home. The procedure was performed between 5<sup>th</sup> - 10<sup>th</sup> days of menstrual cycle.

**Statistical Analysis:**

Data were collected, revised, coded and entered to the Statistical Package for the Social Science (IBM SPSS) version 20. The qualitative data were presented as number and percentages while quantitative data were presented as mean, standard deviations and ranges. The comparison between two groups with qualitative data were done by using Chi-

square test or Fisher exact test was used instead of Chi-square test when the expected count in any cell was found less than 5. The comparison between two independent groups with quantitative data was done by using Independent t-test. The confidence interval was set to 95% and the margin of error accepted was set to 5%. P value < 0.05 was considered significant.

**RESULTS**

There was 16 (53.3%) primary group and 14 (46.7%) secondary group. The mean age 27.23 and SD 4.20 years and

8(26.7%) age < 25 and 22(73.3%) age > 25 (**Table 1**).

**Table (1): Distribution of the studied cases according to type of infertility and age**

Type of infertility	No.	%
Primary Group	16	53.3%
Secondary	14	46.7%
<b>Age</b>	<b>No. = 30</b>	
Mean ± SD	27.23 ± 4.20	
Range	20 – 37	
< 25	8 (26.7%)	
> 25	22 (73.3%)	

There was a statistically significant difference between two groups regarding age. There was non-statistically significant difference between two groups regarding endometrial hyperplasia.

Submucous fibroid, endometrial polyp, ovarian cyst/mass, hydrpsalpinx, synechiea, congenital, bilateral patency tube, bilateral block tube and unllateral block tube (**Table 2**).

**Table (2): Comparison between primary group and secondary group regarding age, endometrial hyperplasia, submucous fibroid, endometrial polyp, ovarian cyst/mass, hydrpsalpinx, synechiea, congenital, bilateral patency tube, bilateral block tube and unllateral block tube**

Parameters	Groups	Primary group (No.= 16)	Secondary group (No.= 14)	P-value
	Age	Mean ± SD	25.75 ± 4.46	
	Range	20 – 37	22 – 33	
Endometrial hyperplasia	Negative	15 (93.8%)	13 (92.9%)	0.922
	Positive	1 (6.3%)	1 (7.1%)	
Submucous fibroid	Negative	16 (100.0%)	12 (85.7%)	0.209
	Positive	0 (0.0%)	2 (14.3%)	
Endometrial polyp	Negative	13 (81.3%)	12 (85.7%)	0.743
	Positive	3 (18.8%)	2 (14.3%)	
Ovarian cyst/mass	Negative	10 (62.5%)	12 (85.7%)	0.151
	Positive	6 (37.5%)	2 (14.3%)	
Hydrpsalpinx	Negative	16 (100.0%)	12 (85.7%)	0.209
	Positive	0 (0.0%)	2 (14.3%)	
Synechiea	Negative	15 (93.8%)	13 (92.9%)	0.922
	Positive	1 (6.3%)	1 (7.1%)	
Congenital	Negative	16 (100.0%)	11 (78.6%)	0.09
	Positive	0 (0.0%)	3 (21.4%)	
Bilateral patency tube	Negative	5 (31.3%)	3 (21.4%)	0.544
	Positive	11 (68.8%)	11 (78.6%)	
Bilateral block tube	Negative	12 (75.0%)	12 (85.7%)	0.464
	Positive	4 (25.0%)	2 (14.3%)	
Unllateral block tube	Negative	15 (93.8%)	13 (92.9%)	0.922
	Positive	1 (6.3%)	1 (7.1%)	

**DISCUSSION**

Our study included 30 patients, 16 cases (53.3%) were of primary infertility, while 14 cases (46.7%) were of secondary infertility. The age ranged between 20-37 years (mean of 27.30 + 4.2 SD). There was a statistically significant difference between primary and secondary groups regarding age.

Singh et al. (2018) compared the results of SIS with that of HSG in

infertility evaluation and observed the role of SIS to find out endometrial pathology and tubal patency, they found that endometrial hyperplasia (5%), submucous fibroid (5%), endometrial polyp (15%), ovarian cyst / mass (25%), hydrosalpinx (5%), intrauterine synechia (5%) and congenital uterus (10%). Tubal patency and blockage were Bilateral (74.68%), bilateral block (18.98%) and unilateral tubal block (6.32%).

The results of our study was approximately comply with the results of a comparative study of SIS and HSG for evaluation of female infertility which was performed by *Bhattacharya and Ramesh (2020)* which was carried out on 82% primary infertility and 18% secondary infertility. They found hydrosalpinx (8.5%), bilateral tubal patency (74.46%) and bilateral tubal block (14.89%).

The results of the current study approximately comply with the results of a comparative study of tubal patency by hysterosalpingogram (HSG), transvaginal Sonosalpingography and laparoscopy performed by *Anuradha et al. (2016)* who found bilateral patency; (72%) bilateral block (24%) and unilateral block (8%).

The results in *Dasan and Basawaraj (2016)* in the comparative study of SIS versus HSG in evaluation of infertility, found that the patients age ranged 20-40 years (65.7% primary infertility and 34.3% secondary infertility) approximately comply with the results of our study.

*In Draz et al. (2017)*, the results of a comparative study of SIS versus hysteroscopy in evaluation of uterine cavity in women with unexplained infertility which was carried out on patients in the age ranged 20-34 years, approximately comply with the results of our study in endometrial polyp 12%, submucous fibroid 10%, congenital uterus 6% and endometrial hyperplasia 4% and don't comply with our result in intrauterine synechia 2%.

A comparative study of SIS and diagnostic laparoscopy for evaluation of tubal patency in infertile women performed by *Singh et al. (2018)* which

was carried out on patients was 75% primary infertility and 22% secondary infertility approximately complies with our results in tubal patency (76%) and hydrosalpinx (8%).

SIS was superior to HSG in the evaluation of uterine and ovarian factors of female infertility and has fairly comparable sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) in comparison to HSG in evaluation of tubal patency (*Robertshaw et al., 2016*).

In a comparative study of tubal patency by transvaginal sonosalpingography (TVS) and laparoscopy performed by *Anuradha et al. (2016)* in the group of patients with bilateral patency, there was an agreement between TVS and laparoscopy being 94%. In the group of patients with bilateral block, there was 100% agreement between TVS and laparoscopy and In the group of patients with unilateral block. There was an agreement between TVS and laparoscopy by 67%. Laparoscopy, sonosalpingography and hysterosalpingography play complementary roles in the investigation of the infertile female and are not competitive investigative procedures. The important points to be considered are that transvaginal sonography provides information on tubal factors, uterine factors, pelvic factors, and endocrine factors. Thus, one could combine the benefits of laparoscopy, HSG, hysteroscopy and endocrine evaluation in one simple noninvasive test (transvaginal sonosalpingography).

SIS is quite efficient in analyzing various endometrial Pathologies such as endometrial polyp, submucous fibroid,

intrauterine adhesion, septa and many other congenital uterine anomalies. Hence any patient suspected of having an endometrial pathology on conventional scan, SIS must be done before advising Hysteroscopy especially as there are few studies depicting comparable accuracy in detecting these pathologies (*Singh et al., 2018*).

*Draz et al. (2017)* in SIS versus hysteroscopy in evaluation uterine cavity with unexplained infertility (Tanta university) found that hysteroscopy was more sensitive (100 vs. 85%), with same specificity (100 vs. 100%) and more accurate (100 vs, 94%) than SIS. Hysteroscopy is still gold standard to diagnose intrauterine pathology as it is more sensitive and more accurate than SIS, however SIS has the advantages of being simple non-invasive, well tolerated, cheap, affordable, shorter duration and accurate method for uterine cavity evaluation.

3D SHG possesses advantages of making the important distinction between myometrial (adenomyosis and fibroids) and endometrial lesion. 3D SHG exhibits a very high distinctions rate. However, it can't be used to exclude the presence of early or focal adenomyosis (*Van den Bosch and Van Schoubroeck, 2018*).

Laparoscopy considered the gold standard for evaluation of tubal patency, is often not performed due to invasive nature and need for anaesthesia. In additional to tubal occlusion, HSG can reveal abnormal tubal morphology including hydrosalpinges, peritubal adhesion and proximal tubal nodularity that is characteristics of salpingitis isthmica nodosa. Disadvantages of HSG include

exposure to ionizing radiation, risk of iodine allergy, need for technical facilities, pain and risk of infection (*Vander Borgh and Wyns, 2018*).

In *Singh et al. (2018)* to compare performance of SIS in diagnosing tubal patency, in comparison to HSG, the test result of that study revealed sensitivity of 91%, specificity 76%, positive predictive value of 95%, negative predictive value of 66% and accuracy of 89% of SIS in evaluating tubal potency. SIS released sensitivity of 83.3%, Specificity of 60%, PPV of 75%, NPP of 75% and accuracy of 72% in detecting pelvic pathology. SIS for tubal potency diagnosis, particularly with 2d sonography has limitation as it is highly observer dependent and only accurate in the hands of experienced investigators (*Robertshaw et al., 2016*).

## CONCLUSION

SIS can be used as a simple, noninvasive, cost-effective and primary diagnostic tool with no radiation exposure to patients in evaluation of female infertility. SIS can prove to be useful tool in initial workup of infertility patients with better compliance, better results and low cost in single visit.

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## دور تصوير الرحم في العقم

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**خلفية البحث:** يصيب العقم ما بين 8-12% من الأزواج في سن الإنجاب في جميع أنحاء العالم، وينتج عن مجموعة من العوامل في كلا الوالدين لمنع حدوث الحمل. وعوامل العقم البوقي والرحمي هي المسؤولة عن النسبة المئوية الرئيسية لعقم النساء، وبالتالي فإن تقييم سلامة الرحم يمثل خطوة رئيسية واستقصاءً أساسياً في تقييم النساء المصابات بالعقم.

**الهدف من البحث:** مراقبة دور التصوير فوق الصوتي بالتسريب الملحي لاكتشاف أمراض بطانة الرحم وسلاح البوق في النساء المصابات بالعقم.

**المریضات وطرق البحث:** أجريت هذه الدراسة في قسم التشخيص الإشعاعي بمستشفى الفرافرة في الفترة ما بين يناير 2021 حتى مارس 2021 على 30 مریضة في سن الإنجاب ممن يعانون من عدم القدرة على الإنجاب، 16 حالة (53.3%) كانت من العقم الأولي، بينما كانت 14 حالة (46.7%) من العقم الثانوي. وقد خضع جميع المریضات لفحص عبر المهبل لتقييم أي حالة مرضية محتملة دون حقن محلول ملحي، ثم خضع جميع المریضات لفحص عبر المهبل بحقن محلول ملحي عبر عنق الرحم في تجويف الرحم.

**نتائج البحث:** كان هناك 16 (53.3%) مجموعة ابتدائية و 14 (46.7%) مجموعة ثانوية. وكان متوسط العمر 27.23 و 4.20 سنة و 8 (26.7%) عمر >25 و 22 (73.3%) عمر <25 سنة. وكان هناك فرق معتد به إحصائياً بين المجموعتين فيما يتعلق بالعمر. وكان هناك فرقاً غير معتد بها إحصائياً فيما يتعلق بتضخم بطانة الرحم، والورم الليفي تحت المخاط، وورم بطانة الرحم، وكيس كتلة

المبيض، وأنبوب السالب الخلفية، والأنبوب التناسلي، والأنبوب الخلفي، وأنبوب السداد الثنائي، والأنبوب الكتلي الثنائي وأنبوب الكتلة غير الجانبي.

**الاستنتاج:** يمكن استخدام التصوير فوق الصوتي بالتسريب الملحي كأداة بسيطة وغير جراحية وفعالة من حيث التكلفة وأداة مفيدة في متابعة مريض العقم مع إمتثال أفضل ونتائج أفضل دون التعرض للإشعاع للمرضى في تقييم العقم عند النساء.

**الكلمات الدالة:** تصوير الموجات الصوتية بالتسريب الملحي، العقم.