

# Saline Infused Sono-Hysterosalpingography; A Step Forward in the Diagnosis of Infertility Due to Tubal Blockage

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## Abstract

**Background:** Saline infused Sono hysterosalpingography (SSG) is the new and safe modality as compared to conventional hysterosalpingography (HSG) for diagnosis of tubal blockage.

**Objective:** To determine the diagnostic accuracy of saline infused Sono hysterosalpingography, for detection of fallopian tube blockage, in cases with infertility taking conventional hysterosalpingography as gold standard.

**Methodology:** This was a cross sectional study conducted in Department of Radiology, Sheikh Zayed Hospital, Rahim Yar Khan, conducted from 1<sup>st</sup> May to 30<sup>th</sup> November, 2017. A total of 150 cases, with age range of 20-40 years, irrespective of type and duration of infertility, were included. Findings of tubal blockage with saline infused Sono hysterosalpingography (SSG), were compared to conventional hysterosalpingography (HSG). Sensitivity, Specificity, PPV, NPV and Diagnostic accuracy of saline infused Sono-hysterosalpingography, for detection of fallopian tube blockage, in cases with infertility were calculated, taking conventional hysterosalpingography as gold standard.

**Results:** A total of 150 cases were examined, with mean age 32±5 years and mean duration of infertility was 3.51±1.86 years. Overall, 99 (66%) cases had primary infertility. Tubal obstruction was seen in 92 (61.33%) cases on HSG and 90 (60%) on SSG. The sensitivity of SSG for tubal obstruction was 77.14%, PPV 78.89% and diagnostic accuracy 75.33% with p=0.001. The specificity and PPV was 100% in cases with age 30-40 years with p=0.001. The diagnostic accuracy in multiparous women was 81.82. (p=0.001)

**Conclusion:** Saline infused sono hysterosalpingography revealed high sensitivity, specificity, PPV, NPV and diagnostic accuracy, which were comparable with conventional hysterosalpingography.

**Key words:** Infertility; Tubal blockage; Saline infused Sono hysterosalpingography (SSG); Hysterosalpingography (HSG); Diagnostic accuracy.

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## Introduction

Infertility is defined as the failure to conceive after one year of regular unprotected intercourse. It affects 10% to 15% of couples.<sup>1</sup> Main causes of infertility in women include an-ovulatory cycles, a tubal or peritoneal factor, uterine and cervical pathologies and idiopathic infertility.<sup>2</sup> The role of a tubal factor in infertility is increasing, and currently, it determines about 10% to 50% of all infertility cases.<sup>3</sup> There are multiple etiologic factors responsible for the involvement of the fallopian tubes in infertility, which include tubal damage from pelvic inflammatory disease (PID), the use of intrauterine devices, a history of a perforated appendicitis, ectopic pregnancy, and septic abortion.<sup>1</sup> Tubal adhesions and tubal obstruction can also be due to endometriosis and previous surgical trauma.<sup>2</sup>

Infertility investigation in women, reviews the morphologic, physiologic, functional and pathologic aspects of the fallopian tubes and female reproductive system.<sup>3</sup> Sono hysterosalpinography (SSG) detects tubal blockage, while normal saline is infused through the foley's catheter in the uterine cavity.<sup>4</sup> It can be used as primary technique for detection of tubal obstruction so that it may alleviate the need for invasive investigations as hysteroscopy particularly in IVF centers as this technique also offers the opportunity to rule out endometrial canal pathology simultaneously like polyps or adhesions etc.<sup>5</sup>

It is easier, time efficient investigative modality and has more acceptability and well tolerated as compared to other investigative methods and can be considered as screening tool as compared to HSG.<sup>6,7</sup> Due to limited resources, most of infertility cases

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may be ignored or patient would have to travel a long distance to get hystero-salpingography (HSG), which is routinely used for establishment of diagnosis and needs a dedicated radiology unit.<sup>8</sup> Most commonly this facility is available at tertiary health care systems. At the same time this procedure has hazards of ionizing radiations. Although laparoscopic chromopertubation is also an option as it has high diagnostic yield further more corrective surgery can also be performed simultaneously but again it is not freely available facility nor its expertise.<sup>4,7</sup> Being an operative procedure it poses patients to many surgical complications.<sup>8-11</sup>

Ultrasound guided hysterosalpingography using normal saline as source of contrast can be used as an OPD based procedure especially in unprivileged areas as no special set up is needed.<sup>12</sup> No special contrast is needed which further reduces the cost and secures the patient from hazards of iodinated contrast used in conventional HSG like contrast allergy and anaphylactic shock etc. This study was conducted to determine the diagnostic accuracy of saline infused Sono-hysterosalpingohgraphy, for detection of fallopian tube blockage, in cases with infertility taking conventional hysterosalpingo-graphy as gold standard.

## Methodology

This descriptive, cross sectional study was performed from 1<sup>st</sup> May, to 30<sup>th</sup> November, 2017, after approval from local ethical review committee. A total 150 patients fulfilling the inclusion criteria such as; all females having age 20 to 40 years irrespective of gravida and parity with suspected tubal obstruction related infertility, irrespective of primary and secondary; of at least one year, were included as assessed by history and medical record, were included. An informed written consent was taken.

Socio demographic data like age (in years), weight in kilogram, height in meters and BMI, was taken and other data like duration of infertility, type of infertility (primary/secondary), gravida, parity, history of any abdominal surgery, abortion and use of intrauterine contraceptive device (IUCD), were recorded on a specially designed proforma.

Patient was called between 5<sup>th</sup> to 14<sup>th</sup> day of her

menstrual cycle. On day first saline infused sono hysterosalpingography was performed. Patient's endometrial canal was cannulated with foley's catheter and 10 to 50 ml of sterilized normal saline was infused. Fallopian tubes were visualized simultaneously while performing real time imaging using trans-abdominal approach. Presence of fluid in pouch of Douglas was considered as patent fallopian tubes. The absence of spillage at fimbrial ends was labelled as tubal blockage. One ml steroid was given diluted with 5 ml normal saline while performing saline infused sono-hysterosalpingography to avoid any future endometrial adhesion or inflammation due to endometrial irritation.

Similarly next day patient underwent conventional HSG. Urograffin 5-10 ml was given through cannula into endometrial cavity and radiographs of pelvis AP view were taken at baseline and then after 5 and 15 minutes. Furthermore, to avoid procedure related infection antibiotic cover with capsule Vibramycin 100 mg B.D and Tab. Flagyl 400 mg T.D.S was given for 5 days with Tab Ponstan for analgesia after the procedures. Data analysis was done by SPSS version 20.

## Results

In this study, a total 150 cases were examined. The mean age was 32±5 years. The mean duration of infertility was 3.51±1.86 years. There were 99 (66%) cases that had primary infertility. There were 22 (14.67%) cases with previous history of abdominal surgery, 57 (38%) had history of abortion and 31 (21.99%) cases that had prior history of IUCD. Tubal obstruction was seen in 92 (61.33%) cases on HSG and 90 (60%) on SSG. The sensitivity of SSG for tubal obstruction was 77.14%, PPV was 78.89% and diagnostic accuracy was 75.33% with p= 0.001 as in table I. The specificity and PPV was 100% in cases with age 30-40 years with p= 0.001. (Table II)

In cases with BMI less than 30 there was significantly better accuracy seen in 100% of cases with SSG and reverse was seen in BMI more than this as in table III. In terms of duration and type of infertility there was significant difference in both the parameters. The diagnostic accuracy in multiparous women was 81.82 (p=0.001). There were significant better diagnostic accuracies regarding lesser number of parity, and where there was no history of abdominal surgery, abortion and previous IUCD.

**Table I: Diagnostic Accuracy of SSG for Detection of Tubal Blockage (n=150)**

Obstruction on SSG	Obstruction on HSG		P.value
	Yes	No	
Yes	TP 71	FP 19	0.01
No	FN 21	TN 39	

TP= True positive      TN= True negative  
 FN= False negative    FP= False positive  
 Sensitivity= 77.17,    Specificity= 67.24,  
 PPV= 78.89,          NPV= 65,  
 Accuracy= 73.33

**Table II: Diagnostic Accuracy of SSG for Detection of Tubal Blockage with Respect to Age Groups (n=150)**

Age Groups (years)	Obstruction on SSG	Obstruction on HSG		p value
		Yes	No	
20-29	Yes	TP 20	FP 19	0.92
	No	FN 10	TN 09	
30-40	Yes	TP 20	FP 19	0.001
	No	FN 10	TN 09	

TP= True positive      TN= True negative  
 FN= False negative    FP= False positive

**For age group 20-29 years**

Sensitivity= 66.67,      Specificity= 32.14,  
 PPV= 51.28,            NPV= 47.37,  
 Accuracy= 50

**For age group 30-40 years**

Sensitivity= 82.26,      Specificity = 100,  
 PPV= 100,              NPV= 73.17,  
 Accuracy= 88.04

**Table III: Diagnostic Accuracy of SSG for Detection of Tubal Blockage with Respect to BMI (n=150)**

Obstruction on SSG	Obstruction on HSG		P value
	Yes	No	
Yes	TP 71	FP 19	0.01
No	FN 21	TN 39	

TP= True positive      TN= True negative  
 FN= False negative    FP= False positive

Sensitivity= 77.17,      Specificity= 67.24,  
 PPV= 78.89,            NPV= 65,  
 Accuracy= 73.33

**Discussion**

It was seen that obstruction irrespective of the site on SSG was seen in 90 (60%) of the cases while on HSG it was seen in 92 (61.33%) of the cases. This reveals that the both the modalities were comparable in terms of detection of the tubal blockage. The sensitivity of SSG for tubal obstruction was 77.14%, PPV was 78.89% and diagnostic accuracy was 75.33% with  $p= 0.001$ . These findings were comparable to previous study with slighter lower accurate results by a study done by Dasan TA et al.<sup>9</sup> In their study, as compared to HSG, the sensitivity, specificity, positive predictive value, and negative predictive values (NPVs) of SSG in detecting tubal patency were 94.28%, 75%, 97.05%, and 50%, respectively. The sensitivities of SSG in diagnosing tubal patency were similar to other studies, Inki et al<sup>10</sup> (90.2%), Deichert et al<sup>11</sup> (89%), whereas the specificities obtained were slightly higher in Inki et al<sup>10</sup> (83.3%) and Deichert et al<sup>11</sup> (100%) as compared to the present study (66.66%).

In another study, they focused on correlation between SSG and HSG for establishment of tubal patency in a study by Madhok R et al<sup>12</sup> and it was observed that there was 92.3% agreement (Kappa value = 0.923, Standard error = 0.437, 0.95 CI = 0.8373-1) between SSG and HSG which suggests that SSG is at least similar to or slightly better to HSG in its effectiveness for evaluating tubal patency. In the present study, the SSG revealed better results

than HSG in many cases. This factor can be explained by the fact that, the injection of the contrast led to spasm of the fallopian tubes which may be falsely interpreted as tubal blockage. But in SSG tubal spasm usually not occurred and false results can be avoided.

These findings were in contrast to a studies done by Oguntoyinbo AE, Amok AOD and Komolafe reported that there is no statistically significant difference ( $p = 0.237$ ) between the results of the two methods (HSG and SSG). SSG is found to be a reliable, relatively inexpensive diagnostic and therapeutic (guided hydrotubation) procedure in the management of female infertility.<sup>13</sup>

The specificity and PPV was 100% in cases with age 30-40 years with  $p= 0.001$  and the cases with BMI less than 30 where there was accuracy of 100% seen in cases with SSG as compared to HSG. This can be explained by the factor of lesser BMI and better visualization of fallopian tubes as compared to the females with higher BMI where there is difficulty in visualization as fat in abdominal wall attenuate ultrasound beam making its penetration into pelvic cavity difficult.

In terms of duration and type of infertility there was significant difference in both the parameters. The diagnostic accuracy in multiparous women was 81.82 ( $p=0.001$ ) as and furthermore there was significant better diagnostic accuracies regarding lesser number of parity, and where there was no history of abdominal surgery, abortion and previous IUCD with saline infused sono hysterosalpingography as compared to HSG. The data is lacking regarding this extensive evaluation about these above mentioned parameters. These are the reasons of overall better prediction of SSG as compared to HSG for tubal obstruction. HSG revealed better prediction of tubal blockage in cases that had previous history of abdominal surgery, abortion and IUCD. This can be explained as previous surgeries lead to disrupted anatomy and needing more saline to be infused to detect the structural changes as compared to HSG where it was still possible with 5-10 ml of urograffin and was found a better modality.

In contrast to this there were many strengthening points that this study used a newer modality in the form of saline infused sono hysterosalpingography and it also extensively

evaluated various confounding variables like gravida, parity, duration and types of infertility which were not studied before.

## Conclusion

Saline infused sono-hysterosalpingography is safe and reliable for diagnosis of tubal blockage. It has advantage over conventional hysterosalpingography as it has no ionizing radiation, less chances of tubal spasm and easy availability. Sensitivity and specificity of SSG is comparable with conventional hysterosalpingography.

## Author Contribution

**ZM:** Conception of work , design of work and revising. **HW:** Design of work, Acquisition and analysis of data and drafting. **SM:** Interpretation of data and revising. **AR:** Interpretation of data, revising.

All authors critically revised and approve its final version.

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