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**INTERNATIONAL JOURNAL OF  
 ADVANCED RESEARCH (IJAR)**

Article DOI:10.21474/IJAR01/5663  
 DOI URL: <http://dx.doi.org/10.21474/IJAR01/5663>



### RESEARCH ARTICLE

## LAPAROSCOPIC FINDINGS OF DIFFERENT FACTORS AFFECTING TUBAL PATENCY IN INFERTILE WOMEN AT ZAGAZIG UNIVERSITY HOSPITAL.

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### Manuscript Info

#### Manuscript History

Received: 19 August 2017  
 Final Accepted: 21 September 2017  
 Published: October 2017

### Abstract

**Aim:** The aim of this work is to evaluate different factors affecting tubal patency in both primary and secondary infertile women using laparoscopy.

**Patients and methods:** This study included 130 women with a diagnosis of infertility secondary to tubal factor. The patients were selected from gynecology outpatient clinic or the family planning clinic, Zagazig University Maternity Hospital. All patients had blocked fallopian tubes on HSG. All patients were offered diagnostic/operative laparoscopy.

**Results:** There was a statistical significance differences between laparoscope & HSG in diagnosis of proximal & distal occlusion, adhesion and hydrosalpinx in fallopian tubes.

**Conclusion:** HSG should be considered first-choice imaging modality in the assessment of tubal patency. Laparoscopy with dye test is the procedure of choice in the patient with abnormal HSG for further confirmation and assessment.

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### Introduction:-

Infertility affects 10% to 15% of reproductive age couples. Infertility is a complex disorder with significant psychosocial, medical and economical aspects. It is a unique medical condition as it involves a couple rather than a single individual. The most important cause of female infertility is post-infection tubal damage<sup>(1)</sup>.

Postoperative intra-abdominal adhesions remain an unsolved problem despite significant progress in the surgical procedures. They often lead to small-bowel obstruction, chronic abdominal and pelvic pain, as well as female infertility. The loss of mesothelial cells and several components of the inflammatory system following injury to the peritoneum results in fibrin formation and angiogenesis. The remaining fibrin matrix and angiogenesis lead to formation of fibrous band and adhesion<sup>(1)</sup>.

Hysterosalpingography (HSG) is the gold standard in assessing the patency of the fallopian tubes, which is the most common causes of female factor of infertility, making this technique the most frequent first-choice imaging modality in the assessment of female infertility<sup>(2)</sup>.

Tubal occlusion is the commonest HSG finding in infertile women and is the commonest cause of infertility seen in gynecological clinics. HSG is a simple safe and cost effective radiographic study of the uterine cavity and the fallopian tube with 65% sensitivity and 83% specificity for detecting tubal blockage<sup>(1)</sup>.

Laparoscopy with dye test is the procedure of choice in the patient with abnormal HSG for further confirmation and assessment. Proximal occlusion of tubes seen on HSG is often due to tubal spasm which may not occur under general anesthesia during laparoscopy. Furthermore laparoscopy will reveal additional causes of infertility such as endometriosis and other causes of pelvic adhesions and where the resources are available it also offers the option of performing laparoscopic surgery<sup>(3,4,5)</sup>.

The aim of this work is to evaluate different factors affecting tubal patency in both primary and secondary infertile women using laparoscopy.

### **Patients And Methods:-**

This cross section study was conducted in the Laparoscopy unit and Department of Obstetrics and Gynecology, Zagazig University Maternity Hospital, in the period from June 2014 to June 2016.

This study included 130 women with a diagnosis of infertility secondary to tubal factor. The patients were selected from gynecology outpatient clinic or the family planning clinic, Zagazig University Maternity Hospital. All patients had blocked fallopian tubes on HSG. All patients were offered diagnostic/operative laparoscopy.

Patients were first seen in the gynecology outpatient clinic or the family planning clinic. Here they were clerked by a senior house officer where the presenting medical history, the past medical history, family and social history were recorded. A physical examination was performed and the findings recorded. Relevant laboratory and radiological examinations were ordered including HSG.

Patients with contraindications for general anesthesia; severe hip disease precluding the use of the dorsolithotomy position; documented significant cardiopulmonary disease or inadequate bone marrow, renal, and hepatic function were not included in the study.

**At laparoscopy**, a systematic inspection of the upper and lower abdomen had been performed. The liver had been seen for sign of pelvic inflammatory diseases (PID). The patient could then be placed in the Trendelenburg position to facilitate visualization of the pelvis. An ancillary puncture site was necessary to help in pelvic examination. The uterus was lowered and the anterior wall of the uterus as well the uterovesical reflection was examined, not to miss endometriotic implants at these areas. The uterus was raised and the posterior surface was examined. The adnexa were then viewed. The medial and lateral surface was seen with the use of the ancillary probe. The ovaries were raised carefully to examine the lateral surface. The fallopian tubes were then carefully inspected to the presence of endometriosis or adhesions. Posteriorly, the broad and uterosacral ligaments were examined.

Multiple ancillary puncture sites were necessary for extensive operations. Proper placement of the second, third and even fourth puncture site was necessary to manipulate, and adhesiolysis of pelvic tissues. Those sites were below the costal margin at the edge of the lateral rectus and to the left approximately 2 fingers breadths.

**Primary outcomes include** proportion of patients correctly diagnosed to have proximal and distal blockage on HSG; proportion of patients correctly diagnosed to have adhesions and proportion of patients correctly diagnosed to have hydrosalpinx.

Statistical analysis was performed using the Statistical Package for Social Science for Windows (SPSS, Inc., Chicago, IL) version 14. A P value < 0.05 was considered statistically significant. Independent t test was used for statistical analysis; Variables with normal distribution were expressed as mean and 95% CI  $\pm$  standard deviation.

### **Results:-**

The majority of participants seeking medical help due to infertility were between 26 and 30 years (79.3%) .

As regard the distribution of infertility among cases, primary infertility was found in 44 cases (33.8%), while secondary infertility was found in 86 cases (66.2%) .

When HSG results were compared to laparoscopic findings regarding tubal factors of infertility , both tubes were apparently normal findings in 72 cases (55.4%), distal occlusion of fallopian tubes were found in 18 cases (13.8%), proximal occlusion were found in cases 11 cases (8.5%), showed adhesion in 23 cases (17.7%), showed hydro/pyosalpinx in 6 cases (4.6%).

By laparoscopy it was found that both tubes were apparently normal in 76 cases (64.9%), distal occlusion was found in 13 cases (10.9%), proximal occlusion were found in 7 cases (5.9%), showed adhesion in 15 cases (12.6%), and showed hydro/pyosalpinx in 8 cases (6.7%) .

**Table (1):-**Demographic data of the studied group:

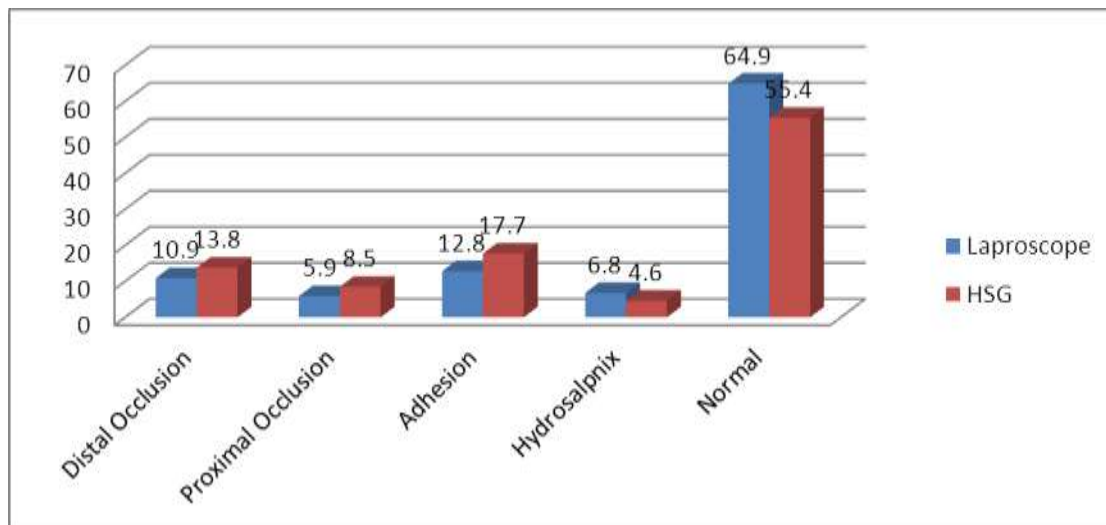
Variable	(n=130)			
	No	%	Mean $\pm$ SD	Range
<b>Age:</b>				
$\leq 20$	2	1.5	34.23 $\pm$ 1.27	18 – 45
21 – 25	48	37		
26 – 30	55	42.3		
31 – 35	17	13		
36 – 40	5	3.8		
$\geq 41$	3	2.4		
<b>Parity &amp; Infertility</b>				
Nullipara (1ry infertility)	44	33.8		
Multipara (2ry infertility)	86	66.2		

**Table (2):-**Laparoscopic findings of both tubes among the studied group:

Variable	(n=130)	
	No	%
<b>Visualized</b>		
Completely visualize	119	91.5
Incompletely visualized	6	4.6
Can't be visualized	3	2.3
Unilateral surgically removed	1	0.8
Bilateral surgically removed	0	0
Unilateral congenitally absent	1	0.8
Bilateral congenitally absent	0	0
<b>Findings</b>		
Variable	(n=127)	
	No	%
Normal	102	80.3
Hypoplastic	2	2
Endometriosis	7	5.5
Hydrosalpinx	7	5.5
Pyosalpinx	1	0.8
Adhesions	8	6.3
TB	0	0
Torsion	0	0
Carcinoma	0	0
<b>Culde Sac:</b>		
Normal	121	93.1
Obliterated	9	6.9

**Table (3):-**Comparison between Laparoscopic findings & HSG of studied tubes among the studied group:

Variable	Laparoscopic (n=119)		HSG (n=130)		Kappa	P
	No	%	No	%		
Normal	76	64.9	72	55.4	0.37	<0.001**
Distal Occlusion:	13	10.9	18	13.8	0.67	<0.001**
Proximal Occlusion:	7	5.9	11	8.5	0.64	<0.001**
Adhesion:	15	12.8	23	17.7	0.63	<0.001**
Hydrosalpinx, Pyosalpinx	8	6.8	6	4.6	0.85	<0.001**

**Figure (1):-**Comparison between Laparoscopic & HSG findings of studied tubes among the studied group**Table (4):-**Validity of HSG in diagnosis of distal occlusion of the tubes in comparison to Laparoscopy as Gold standard test:

HSG:	Laparoscopy		Total
	+ve	-ve	
+ve	11	7	18
-ve	2	99	101
Total	13	106	119
Validity	Sensitivity: 84.6% PVP: 61.1% LRP: 12.82		Specificity: 93.4% PVN: 98% LRN: 0.16
Accuracy	92.4%		

**Table (5):-**Validity of HSG in diagnosis of proximal occlusion of the tubes in comparison to Laparoscopy as Gold standard test:

HSG:	Laparoscopy		Total
	+ve	-ve	
+ve	6	5	11
-ve	1	115	116
Total	7	120	127
Validity	Sensitivity: 85.7% PVP: 54.5% LRP: 20.4		Specificity: 95.8% PVN: 99.1% LRN: 0.15
Accuracy	95.3 %		

**Table (6):-**Validity of HSG in diagnosis of adhesion of the tubes in comparison to Laparoscope as Gold standard test:

<b>HSG:</b>	<b>Laparoscope</b>		<b>Total</b>
	<b>+ve</b>	<b>-ve</b>	
<b>+ve</b>	<b>13</b>	<b>10</b>	<b>23</b>
<b>-ve</b>	<b>2</b>	<b>105</b>	<b>107</b>
<b>Total</b>	<b>15</b>	<b>115</b>	<b>130</b>
<b>Validity</b>	<b>Sensitivity: 86.7%</b> <b>PVP: 56.5%</b> <b>LRP: 9.97</b>	<b>Specificity: 91.3%</b> <b>PVN: 98.1%</b> <b>LRN: 0.15</b>	
<b>Accuracy</b>	<b>90.8%</b>		

**Table (7):-**Validity of HSG in diagnosis of hydrosalpinx of the tubes in comparison to Laparoscope as Gold standard test:

<b>HSG:</b>	<b>Laparoscope</b>		<b>Total</b>
	<b>+ve</b>	<b>-ve</b>	
<b>+ve</b>	<b>6</b>	<b>0</b>	<b>6</b>
<b>-ve</b>	<b>2</b>	<b>117</b>	<b>119</b>
<b>Total</b>	<b>8</b>	<b>117</b>	<b>125</b>
<b>Validity</b>	<b>Sensitivity: 75%</b> <b>PVP: 100%</b> <b>LRP: 0</b>	<b>Specificity: 100%</b> <b>PVN: = 98.3%</b> <b>LRN: 0.25</b>	
<b>Accuracy</b>	<b>98.4 %</b>		

**Discussion:-**

Infertility is a common problem encountered in couples of reproductive age. The leading cause for both types of infertility was tubal blockade, followed by pelvic adhesions. Over the years the infections contributing to tubal occlusion and pelvic adhesions have been the main etiological factor responsible for infertility<sup>(1)</sup>.

The clinical implications of an obstruction that is detected by HSG, include a high probability that the tube is opened (approximately 60%); however, when HSG shows patency, there is a low probability that the tube is occluded (approximately 5%)<sup>(2)</sup>.

Laparoscopy provides a general view of the pelvic organs and any bowel and/or pelvic peritoneal adhesions; therefore, this procedure may be used to identify milder forms of distal tubal occlusive diseases, such as fimbrial agglutination or fimbrial phimosis. In addition, it can detect minimal and mild endometriosis, which may not be detected on pelvic ultrasonography (USG) or HSG. Most importantly, at the time of diagnosis, diseases may be treated laparoscopically<sup>(6,7)</sup>.

Even in the presence of open fallopian tubes, as detected by HSG, deficient fimbrial movement that is inadequate for ovum retrieval may cause infertility. Therefore, laparoscopy can determine fimbrial function in addition to the patency of tubes, which is vital for ovum retrieval. Laparoscopy is currently regarded as the most reliable tool in the diagnosis of tubal causes of infertility. Since laparoscopy visualizes morphological abnormalities of the Fallopian tubes directly, it is generally accepted as the reference standard for determination of the accuracy of other diagnostic tools for tubal pathology such as HSG<sup>(8,9)</sup>.

For evaluation of the tubal factors using laparoscopy after HSG in the current study, both tubes were completely visualized in 119/130 cases (91.5%), incompletely visualized in 6 cases (4.6%), could not be visualized in 3 cases (2.3%), unilateral surgically removed in one case (0.8%), and unilateral congenital absence in one case (0.8%). The tubes were apparently normal in 102 cases (80.3%) and hypoplastic in 2 cases (2%). Endometriosis was found in 7 cases (5.5%), hydrosalpinx were found in 7 cases (5.5%), pyosalpinx was found in 1 case (0.8%), and adhesion was found in 8 cases (6.3%).

**Kumar et al.**,<sup>(10)</sup> said that normal pelvic findings on laparoscopy were found in (27.4%) cases. Abnormal findings were seen in (72.6%) cases. Out of which tubal blockade was the leading cause of infertility in (44.1%) cases

followed by pelvic adhesions in (24.7%). Endometriosis was found in (16.1%), PCOD in (13.4%) and fibroid in (10.8%) cases. Multiple factors contributing to infertility were found in (15%) cases. Other findings like PID, tuberculosis and uterine anomaly seen in small percentages.

A study carried out by **Mondal et al.**,<sup>(11)</sup> showed the tubal blockage due to endometriosis as the leading factor contributing to infertility was found in (16.1%) patients, mainly with unexplained infertility. **Tsuji et al.**,<sup>(12)</sup> found a higher incidence of endometriosis in patients with unexplained infertility.

In the current study the sensitivity of HSG in diagnosis of hydro/pyosalpinx of the tubes was 82.475%, specificity was 100% and accuracy was 98.4%. Predictive value of positivity (PVP) was 100%, Predictive value of negativity (PVN) was 98.3%, likelihood ratio of positivity (LRP) was 0, and likelihood ratio of negativity (LRN) was 0.25.

These findings concur with those by **Tsuji et al.**,<sup>(12)</sup> who found that HSG had a high specificity of diagnosing proximal tubal occlusion or hydrosalpinx and lower sensitivity in cases with peritubal adhesions. The data showed that laparoscopy is a superior technique as far as detection of hydrosalpinx is concerned.

**Mol et al.**,<sup>(13)</sup> said that HSG was found to have a relatively high specificity for detection of proximal obstruction. This method was particularly poor in the detection of distal obstruction, complications arising from hydrosalpinx and tubal adhesions. The reproducibility of HSG-based detection was also found to be particularly low and the likelihood ratio for the presence of hydrosalpinx was found to be high. Using this method, proximal tubal obstruction detected on HSG was found to change the pre-test probability from 16 to 50% while proximal tubal patency detected on HSG was shown to change the pre-test probability from 16 to 9%. This study therefore concluded that HSG is of limited use in diagnosing distal tubal obstruction and hydrosalpinx, and has no value in the detection of peritubal adhesions.

In the current study, there was significant difference between HSG and laparoscope for diagnosing tubal occlusion. The sensitivity of HSG in diagnosis of distal occlusion of tubes was 84.6%, specificity was 93.4% and accuracy was 92.4%. Predictive value of positivity (PVP) was 61.1%, Predictive value of negativity (PVN) was 98%, likelihood ratio of positivity (LRP) was 12.8, and likelihood ratio of negativity (LRN) was 0.16, while the sensitivity of HSG in diagnosis of proximal occlusion of tubes was 85.7%, specificity was 95.8%, accuracy was 95.3%, predictive value of positivity (PVP) was 54.5%, predictive value of negativity (PVN) was 99.1%, likelihood ratio of positivity (LRP) was 20.4, and likelihood ratio of negativity (LRN) was 0.15.

As regard the diagnosis of tubal adhesion, the sensitivity of HSG in diagnosis of tubal adhesions was 86.7%, specificity was 91.3%, accuracy was 90.8%, Predictive value of positivity (PVP) was 56.5%, Predictive value of negativity (PVN) was 98.1%, likelihood ratio of positivity (LRP) was 9.97 and likelihood ratio of negativity (LRN) was 0.15 table .

This compared well with those published by **Kumar et al.**,<sup>(10)</sup> who indicated that the sensitivity and specificity of HSG in diagnosing distal tubal occlusion were approximately 80% and 92% respectively, but in diagnosing proximal tubal occlusion were 81%, 92% respectively. This concurs with the findings by **Tsuji et al.**,<sup>(12)</sup> who conducted a study to find out the impact of patient characteristics such as female age, duration of sub-fertility, and a clinical history without risk factors for tubal pathology. From their study, they estimated that the pooled sensitivity and specificity of HSG were 85% and 87% respectively for any tubal pathology. showed that patients with secondary infections were more likely to have tubal adhesion. Most of the participants (18/60) tested negative on HSG but had moderate adhesions confirmed by laparoscopy. The sensitivity of HSG in diagnosing adhesions in the fallopian tube was estimated to be 17.9% and specificity of 85.7%. These researcher's conclusion was that although HSG is of limited use for detecting tubal patency because of its low sensitivity; its high specificity makes it a useful test for ruling in tubal obstruction. Laparoscopy confirmed bilateral tubal patency in 16 cases (17.8%) in whom HSG had diagnosed tubal occlusion<sup>(12)</sup>.

The reduced sensitivity of HSG may be due to under filling or cornual spasm as a result of pain and/or reaction to iodine in the contrast medium. It may sometimes be difficult to differentiate tubal obstruction with bilateral cornual spasm and those due to technical reasons such as under filling. Drugs such as Terbutaline, Glucagon and spasmolytic have been used in an attempt to overcome muscular tubal spasm. This interstitial obstruction can also be overcome by turning the patient into a prone position and instilling additional contrast materials. Cornual spasms are

characterized radiologically as rounded smooth cornual margin, whereas cornual occlusion is characterized by pointed or irregular cornual margin. These radiological features are difficult to be evaluated objectively <sup>(14)</sup>.

In conclusion, laparoscopy enables exact evaluation of the fallopian tube and selection of the optimal management plan in infertile patients with suspected tubal pathology revealed by HSG. Therefore laparoscopy should be performed in infertile patients with suspected tubal pathology revealed by HSG, because it is of diagnostic importance <sup>(15)</sup>.

In conclusion HSG should be considered first-choice imaging modality in the assessment of tubal patency. HSG is a simple safe and cost effective radiographic study of the uterine cavity and the fallopian tube. Laparoscopy with dye test is the procedure of choice in the patient with abnormal HSG for further confirmation and assessment. Proximal occlusion of tubes seen on HSG is often due to tubal spasm which may not occur under general anesthesia during laparoscopy. Furthermore laparoscopy will reveal additional causes of infertility such as endometriosis and other causes of pelvic adhesions and where the resources are available it also offers the option of performing laparoscopic surgery.

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