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**COMPARISM OF THE DIAGNOSTIC ACCURACY OF  
LAPAROSCOPY WITH DYE TEST AND  
HYSTEOSALPINGOGRAPHY IN THE EVALUATION OF  
INFERTILE WOMEN IN NNEWI, NIGERIA**

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## **ABSTRACT**

**Aim:** This study compared the diagnostic accuracy of laparoscopy with dye test and HSG in the evaluation of infertile women.

**Methodology:** This is a prospective survey carried out in Life Specialist Hospital, Nnewi, Nigeria over a four year period. Data was collected with a structured questionnaire which included the sociodemographic characteristics, HSG and laparoscopic findings in various abdomino-pelvic organs. The infertile women who had done HSG and consented to do laparoscopy with dye test were included in the study. Data was analysed using EPI Info version 3.3.2 for windows.

**Results:** A total of 57 patients were included in the study. Their ages ranged from 22 years to 45 years, with a mean age of  $34.46 \pm 5.81$  years. Majority, 46[80.70%] were nulliparous and 30[52.63%] had primary infertility. HSG demonstrated unilateral tubal occlusion in 13[22.80%] patients and bilateral tubal occlusion in 22[38.60%] patients. The laparoscopy with dye test also demonstrated unilateral tubal occlusion in 12[21.05%] patients and bilateral tubal occlusion in 21[36.84%] patients. The difference in the findings of both tests on tubal patency was not statistically significant [ $p > 0.05$ ]. Laparoscopy revealed some other tubal and non tubal pathologies not evident in HSG.

**Conclusion:** This study revealed that both HSG and laparoscopy with dye test are effective in evaluating tubal patency with no significant difference in accuracy. Both tests are therefore complementary in this regard. However, laparoscopy with dye test has an important advantage as regards a higher capacity to demonstrate other tubal and non tubal pathologies.

## INTRODUCTION

Reproduction requires the interaction and integrity of the female and male reproductive tracts, which involves the release of a normal preovulatory oocyte, the production of adequate spermatozoa, the normal transport of the gametes to the ampullary portion of the fallopian tube where fertilization occurs, and the subsequent transport of the cleaving embryo into the endometrial cavity for implantation and development.

Infertility is the failure to conceive (regardless of cause) after 1 year of unprotected regular sexual intercourse<sup>1</sup>. Infertility affects approximately 10-15% of reproductive-aged couples<sup>1,2</sup>. Its overall prevalence has been stable during the past 50 years; however, a shift in aetiology and patient age has occurred. As a woman's age increases, the incidence of infertility also increases<sup>1</sup>.

Infertility is caused by male and/or female factors. Male and female factors each account for approximately 35% of cases. Often, there is more than one factor, with male and female factors combined causing 20% of infertility. In the remaining 10% of cases, the etiology is unknown<sup>1</sup>. A study conducted in Nnewi, Nigeria revealed a high prevalence of male infertility of which oligozoospermia and asthenozoospermia were the most common aetiological factors<sup>3</sup>. Female factor infertility can be divided into several categories: cervical or uterine, ovarian, tubal, and other. Abnormalities or damage to the fallopian tube interferes with fertility and is responsible for abnormal implantation such as ectopic pregnancy. Obstruction of the distal end of the fallopian tubes may result in hydrosalpinx and pyosalpinx. Other tubal

factors associated with infertility are either congenital or acquired. Congenital absence of the fallopian tubes can be due to spontaneous torsion in utero followed by necrosis and reabsorption. Elective tubal ligation and salpingectomy are acquired causes. Tubal factors are responsible for 25-30% of infertility cases, with salpingitis being the most common cause, representing more than half of the cases.<sup>4</sup> Salpingitis partly contributes to the increased number of infertility cases as the occurrence has increased over the past 2 decades<sup>5-7</sup>. Estimates show that after one episode of PID, an 11% risk of tubal infertility is present. This risk increases to 23% after 2 episodes of PID and to as high as 54% after 3 episodes<sup>5-7</sup>.

Tubal obstruction can involve the distal, proximal, or entire tubal segment and can be partial or complete. The degree of obstruction is best diagnosed using hysterosalpingogram (HSG)<sup>7-10</sup>. Some experts advocate using laparoscopy, in addition to HSG, to establish the extent of the disease<sup>8,9</sup>. Laparoscopy determines the size of hydrosalpinx and the extent of pelvic adhesions, if present. The extent of the disease, its location, and the amount of remaining healthy tubal segment determines the prognosis of successful pregnancy following tubal reconstructive surgery and whether IVF will provide a better outcome<sup>8,9</sup>.

Distal tubal obstruction is much more common (70%) than proximal obstruction. It can be caused by hydrosalpinges, pelvic adhesions, or fusion of the fimbriae<sup>8,9</sup>. According to Schlaff et al, the presence of rugal pattern on HSG, the presence of small hydrosalpinges less than 15 mm in diameter, the absence of significant pelvic adhesions, and the presence of identifiable fimbriae with patent ostium during laparoscopy were all associated with good prognosis following tubal reconstructive surgery. About 80% of those

women with mild tubal disease conceived. Patients with moderate and more severe disease had a much worse prognosis of achieving intrauterine pregnancy, and the risk of ectopic pregnancy was as high as 30% in some series<sup>11</sup>.

Proximal tubal obstruction is most commonly caused by infection, endometriosis, myomas, salpingitis isthmica nodosa (SIN), or dried mucus. It can be misdiagnosed during HSG due to a spasm of the intramural segment when the contrast is injected. This can be avoided by slowing the speed of injection, but if this fails, laparoscopy with dye test is indicated<sup>10</sup>. Laparoscopy is also beneficial in examining the distal portion of the tube in case of proximal obstruction. The extent of the disease determines the success of microsurgical tubocornual reanastomosis.

With the recent advances in reproductive medicine, hysterosalpingography has become a relatively quick and noninvasive examination to evaluate fallopian tubes and uterine cavity. It remains the best modality to image fallopian tubes. Congenital uterine malformations, technical artefacts and pathological findings are depicted. Pathological findings that can be detected on hysterosalpingography include salpingitis isthmica nodosa, tubal blockage, peritubal adhesion, submucosal leiomyoma, endometrial polyp, endometrial carcinoma, synechiae and adenomyosis<sup>12</sup>.

During the last 35 years, gynecologic laparoscopy has evolved from a limited surgical procedure used only for diagnosis and tubal ligations to a major surgical tool used to treat a multitude of gynecologic indications. Today, laparoscopy is one of the most common surgical procedures performed by gynecologists. For many procedures, such as removal of an

ectopic pregnancy, treatment of endometriosis, or ovarian cystectomy, laparoscopy has become the treatment of choice<sup>13</sup>. In laparoscopy and dye test, the dye test will demonstrate if the fallopian tubes are blocked. The laparoscopy will help identify endometriosis, pelvic infection, adhesions, ovarian cysts or fibroids. Some minor treatments can be performed at the same time<sup>14</sup>.

A study done in Osaka Japan demonstrated that diagnostic laparoscopy was beneficial for patients with unexplained infertility and normal HSG findings, as diagnostic laparoscopy was able to help detect the cause(s) of infertility in the pelvic cavity and helped to design a suitable management plan, which could lead to postoperative pregnancy. It was therefore suggested that patients with unexplained infertility and normal HSG findings should undergo diagnostic laparoscopy prior to ART<sup>15</sup>. Likewise, a study conducted in Diyarbakir, Turkey comparing laparoscopy with HSG reported that laparoscopy is a superior method for the research of tubal and pelvic pathologies in the evaluation of infertility, while HSG is a more economical and elementary method suitable for evaluation of endometrial and tubal pathologies, and that laparoscopy is an appropriate method for examining the external part of tubes, fimbriae, the relation of tubes and ovary, endometriosis, adhesions, tuberculosis, and other pathologies<sup>16</sup>. It therefore concludes that these 2 methods are not alternative, but complementary.

The additional value of laparoscopy was investigated with respect to diagnosis and further treatment decisions after abnormal hysterosalpingography (HSG) and prior to intrauterine insemination (IUI) in Amsterdam, Netherlands<sup>17</sup>. This revealed that the agreement between abnormalities found by HSG and abnormalities found by laparoscopy

requiring IVF treatment was poor even when HSG showed bilateral pathology. It was thereafter suggested that laparoscopy should be mandatory after abnormal HSG findings in the work-up prior to IUI to prevent over-treatment with IVF. On the contrary, a study done in Israel in women without a previous history suggestive of tubal disease and who have a normal HSG, it was demonstrated that the probability of clinically relevant tubal disease or endometriosis was very low and that laparoscopy did not seem justified or cost effective. Also, in the minority of the cases, laparoscopy revealed minimal or mild endometriosis or peritubal adhesions. In those cases, either surgery or medical treatment had not been proven to improve fecundity<sup>18</sup>.

Studies have also shown that sonohysterosalpingography (SHG) has a good diagnostic value in the detection of uterine abnormalities and tubal patency, when compared with other diagnostic methods among patients with infertility<sup>19-22</sup>.

Laparoscopic procedures were started recently in this environment and few studies have been done in this environment on it. Also, no study has been done in this environment, comparing the laparoscopic findings with the findings of HSG amongst infertile women. This study is therefore necessary as it will help in demonstrating the relative importance of each as well as help in recommending possible diagnostic management options for infertile women with suspected tubal pathologies especially in a low resource setting as ours.

## **OBJECTIVE**

This study is to compare the diagnostic accuracy of diagnostic laparoscopy with dye test and HSG in the evaluation of infertile women.

## **METHODOLOGY**

This was a prospective survey carried out in Life Specialist Hospital, Nnewi, Southeast Nigeria between January 2005 and December 2008 (4-year period). Life Specialist Hospital Limited is a private specialist facility with interest in fertility. It offers services including laparoscopy and assisted reproduction. It is one of the private specialist hospitals that offer diagnostic and operative laparoscopy in South-eastern Nigeria. Nnewi is the second largest city in Anambra State. The predominant economic activity of the people is commerce. Attendance to the hospital is by self referral, and referral from both public and private hospitals. The hospital receives referrals mainly from Anambra, Enugu, Kogi, Delta, Ebonyi, Imo, Rivers and Abia states.

During the period of study, a structured questionnaire was designed which included the socio-demographic characteristics, HSG findings and laparoscopic findings in various abdomino-pelvic organs. The subjects were married women with various years of infertility. They first had a HSG performed and those with or without any abnormality in the HSG but had not conceived after three months were counselled for laparoscopic evaluation. Those that gave their informed consent had diagnostic laparoscopy and dye test and were included in the study. The cost of



laparoscopy and dye test was three times that of HSG. The information was extracted and subsequently analysed using EPI INFO Version 3.3.2 for windows. The results were displayed in frequency tables and percentage. Test of significance was done using 95% confidence intervals.

## **RESULTS**

A total of 57 patients were included in the study. Their ages ranged from 22 years to 45 years, with a mean age of  $34.46 \pm 5.81$  years. Majority, 46[80.70%] were nulliparous. All the patients were married and still living with their husbands. Most, 48[84.21%] of the patients had tertiary level of education. The socio-demographic characteristics of the respondents are shown on table (I).

Majority, 30[52.63%] of the patients had primary infertility, while the others, 27[47.37%] had secondary infertility.

The hysterosalpingogram [HSG] performed on the patients demonstrated unilateral tubal occlusion in 13[22.80%] patients, bilateral tubal occlusion in 22[38.60%] patients, and bilateral tubal patency in 22[38.60%] patients. Hydrosalpinges, suspected peritubular adhesions and fibroids were found in 6[10.53%], 4[7.02%] and 6[10.53%] of the patients respectively.

The diagnostic laparoscopy with dye test findings included unilateral tubal occlusion in 12[21.05%] patients, bilateral tubal occlusion in 21[36.84%] patients, and bilateral tubal patency in 24[42.11%] patients. Some other laparoscopic findings included small uterine fibroids 33[57.89%], hydrosalpinges/megasalpinges 25[43.86%], tubal adhesions 24[42.11%], ovarian adhesions 21[36.84%], adhesions in pouch of Douglas 15[26.32%], tubal congestion/hyperaemia 8[14.04%], ovarian cysts/masses 7[12.28%], omental adhesions 7[12.28%]. Fitz Curtis syndrome, endometriotic

cysts/deposits, twisted tubes, caecal adhesions, enlarged ovaries, inactive ovaries, urinary bladder adhesions, appendicitis and chronic cholecystitis, were also identified on laparoscopy.

## TABLES

**TABLE (I): Socio-Demographic Characteristics of the infertile women.**

<b>VARIABLE</b>	<b>NUMBER</b>	<b>PERCENTAGE</b>
<b>AGE [IN YEARS]</b>		
21-25	2	3.51
26-30	19	33.33
31-35	11	19.30
36-40	16	28.07
>40	9	15.79
<b>Total</b>	57	100.00
<b>PARITY</b>		
0	46	80.70
1	6	10.53
2	2	3.51
3	3	5.26
<b>Total</b>	57	100.00
<b>EDUCATIONAL LEVEL</b>		
Secondary	9	15.79
Tertiary	48	84.21
<b>Total</b>	57	100.00

**TABLE(2): Findings on Hysterosalpingogram and Diagnostic Laparoscopy with Dye Test**

VARIABLES	HSG		Laparoscopy with Dye Test		Statistical Tests		
	No.	%	No.	%	X <sup>2</sup>	df	P value
<b>FINDINGS ON TUBAL PATENCY</b>							
Bilateral Tubal Occlusion	22	38.60	21	36.84	0.164	1	p>0.05
Unilateral Tubal Occlusion	13	22.80	12	21.05	0.051	1	p>0.05
Bilateral Patent Tubes	22	38.60	24	42.11	0.146	1	p>0.05
<b>Total</b>	57	100.00	57	100.00	-	-	-
<b>OTHER FINDINGS</b>							
Hydrosalpinx/megasalpinx	6	10.53	25	43.86	5.212	1	P<0.05
Peritubular adhesions	4	7.02	24	42.11	7.030	1	P<0.05
Uterine filling Defects / Fibroids	6	10.53	33	57.89	28.412	1	p<0.05

**TABLE (3): Other Pelvic and Abdominal Findings on Laparoscopy with Dye Test**

<b>FINDINGS</b>	<b>No.</b>	<b>%</b>
Ovarian Adhesions	21	36.84
Adhesions in Pouch of Douglas	15	26.32
Tubal hyperaemia/congestion	8	14.04
Ovarian Cysts/Masses	7	12.28
Omental Adhesions	7	12.28
Fitz Curtis Syndrome	5	8.77
Endometriotic Cyst/Deposit	3	5.26
Twisted Tubes	3	5.26
Caecal Adhesions	2	3.51
Enlarged ovaries	2	3.51
Inactive ovaries	1	1.75
Chronic Cholecystitis	1	1.75
Bladder Adhesions	1	1.75
Appendicitis	1	1.75

## **DISCUSSION**

This study has shown that both HSG and diagnostic laparoscopy with dye test were able to detect abnormalities of the fallopian tubes in infertile women with suspected tubal factor infertility. It revealed similar findings on both HSG and laparoscopy with dye test as regards demonstration of tubal patency. The differences however, are not statistically significant [p>0.05]. This is at par with findings from several studies including the works done by Snowden EU and co-workers<sup>19</sup>, Tsuji I and co-workers<sup>15</sup> and Sakar MN and

co-workers<sup>23</sup>. This differs from the findings of a study done in Amsterdam, Netherlands on women requiring in-vitro fertilization [IVF]<sup>17</sup> in whom there was poor correlation between results of HSG and laparoscopy, even when HSG demonstrated bilateral tubal occlusion.

Aside demonstration of tubal patency, laparoscopy with dye test was able to demonstrate far more tubal and non tubal pathologies when compared with HSG. This is not surprising because in the former, the surgeon has direct view of the tubes, uterus, ovaries and other intra-abdominal organs. This finding is also in keeping with the reports from other similar studies such as the work done by Sakar MN and co-workers<sup>23</sup> as well as La Sala BG and co-workers<sup>16</sup>. These tubal and non-tubal findings besides demonstration of tubal blockage, may reveal the actual cause(s) of infertility in a patient, hence, laparoscopy is very essential in management of infertility especially in patients with suspected tubal pathology or those with unexplained infertility. The cost of diagnostic laparoscopy and dye test is about three times higher than that of HSG and this might affect the decision of patients regarding the procedures. Hence, several patients in a low resource setting like ours will resort to having only HSG, even when there are indications for further evaluation with laparoscopy.

In conclusion, both HSG and laparoscopy with dye test are comparable in detection of tubal patency with no significant difference in accuracy. However, laparoscopy with dye test has an important advantage as regards a higher capacity to demonstrate other tubal and non tubal pathologies. HSG, being less expensive could be used as a screening tool, but laparoscopy and dye test should be recommended for all infertile women early enough to aid with decision for assist reproduction when the woman is young and will benefit from this treatment. It is therefore recommended that doctors should

be trained properly to be able to perform laparoscopy with dye test as it will help reduce the burden of infertility as well as prevent late referral for IVF procedures.

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