

Evaluation of Tubal Factor In Infertility: A Comparative Study by Laparoscopy and Hysterosalpingography

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Abstract

Introduction: In women, the causes of infertility include tubal disease, ovulatory dysfunction, endometriosis, immunological factors, congenital abnormalities and sexual dysfunction or it could be unexplained. Tubal infertility is one of the commonest causes of infertility in India. **Aims and Objective:** To evaluate and compare the tubal and peritoneal factors in infertile women through hysterosalpingography and laparoscopy. **Materials and Methods:** The present prospective study was conducted in the Department of Obstetrics and Gynaecology, Gauhati Medical College and hospital, Guwahati, Assam. A total of 50 cases of both primary and secondary infertility attending Gynaecology OPD were recruited. Initially HSG was done for all patients followed by laproscopic evaluation. **Results:** Majority of the patients were of primary infertility, and in age group between 25-29 years. It was observed that sensitivity of the HSG was 100% and specificity was 85%. Laparoscopy is a better diagnostic tool for diagnosis of peritubal adhesion and pelvic pathology. There were 36% cases showing associated pelvic pathology in laparoscopy, while it could be picked up in only 8% patients with hysterosalpingography. **Conclusion:** Laparoscopy along with HSG is very effective method in evaluating cases of infertility especially tubal blockage. HSG should be done first followed up by laparoscopy. Laparoscopy complements and broadens the diagnostic scope of HSG. Both procedures have their own importance and none can substitute the other in diagnosing tubal factors in infertility.

Keywords: Hysterosalpingography, laparoscopy, tubal factor and infertility.

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Introduction

Infertility or childlessness is a problem as old as the history of human civilization. Infertility is not fatal; it is not counted as a sickness, but a curse of disgrace, an additional burden of social stigma and a sense of personal failure. In women, the causes of infertility include tubal disease, ovulatory dysfunction, endometriosis, immunological factors, congenital abnormalities and sexual dysfunction or it could be unexplained. Tubo-peritoneal factors are responsible for about 30-40% of cases of female infertility [1, 2]. Tubal block is the most common cause of infertility [3, 4]. Based on the diagnostic criteria established by the WHO, data from 34 centers in 25 developed and developing countries, diagnosed with infertility problems showed that in women tubal occlusion and other tubal abnormalities contributed the most (almost 41%) to infertility[5]. HSG and laparoscopy are valuable diagnostic tools in the field of infertility. HSG is widely used as a first-line approach to assess tubal patency due to simple OPD procedure, noninvasive nature, low cost, requires no anesthesia, detecting uterine anomalies and gives permanent record in routine fertility workup [6, 7]. However, laparoscopy with chromoperturbation has been the gold standard for investigating tubal patency [7]. In HSG, false negative result can be due to tubal spasm or cornual plugging with endometrium. HSG has a sensitivity of 85% to 100% in identifying tubal occlusion. The specificity of HSG in identifying PID related tubal occlusion approaches 90% [8, 9].

Detection of minimal tubal pathologies like peritubal adhesion, condition of ampulla, fimbria and other associated pelvic pathology like T.B. and endometriosis which are often missed in HSG, can also be diagnosed by laparoscopy. Diagnostic laparoscopy with chromoperturbation helps in assessment of tubal patency.

Aims and Objective

To evaluate and compare the tubal and peritoneal factors in infertile women through HSG and laparoscopy.

Materials and Methods

The present prospective study was conducted in the Department of Obstetrics and Gynaecology, Gauhati Medical College and hospital, Guwahati, Assam. We randomly enrolled 50 cases of both primary and secondary infertility attending Gynae OPD. Married females who were trying to conceive for at least one year between 20 years to 40 years were included. Male factor for infertility cases were excluded from the study. The patients were subjected to HSG prior to expected ovulatory day. Diagnostic laparoscopy was done usually after one month of HSG in post-ovulatory period. HSG was done as an OPD procedure in the postmenstrual phase from eighth to eleventh day of cycle in department of radiology under fluoroscopic control. HSG cannula was used for administration of water soluble contrast medium. About 10 cc of contrast medium Urografin 76% was filled in a 10 ml syringe and injected by HSG canula. One film was taken when the uterine cavity becomes full and another after 5 minutes and next after 20-30 minutes to visualize the fallopian tubes and to see the spill of contrast medium. Each film was then studied with help of a radiologist. HSG was considered normal if both fallopian tubes filling normally and showing free intra-abdominal

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spill of contrast medium without pocket formation. If tubes filled but no spill occurred, distal tubal block was diagnosed. If the passage of contrast medium was arrested at uterine cornu or at the proximal end of the tubes, diagnosis of cornual block was considered. Failure of contrast medium to spread freely within peritoneal cavity after spill or pocketing was interpreted as peritubal or pelvic adhesions. Laparoscopy was performed as an indoor procedure, in the post menstrual phase of the cycle under general anaesthesia. During laparoscopy after an orienting survey, systemic inspection of pelvic organs commenced. Chromopertubation was done with 10 ml of 0.5% methylene blue solution. Laparoscopic finding was said to be normal when uterus, tubes, ovaries, uterovesical pouch and pouch of Douglas have normal appearance with no endometriotic/ tubercular spots or adhesion and on chromopertubation both tubes showed progress of dye symmetrically and spillage occurred at the same time without any appreciable dilatation of the ampulla prior to the passage of dye. Fallopian tubes watched carefully in whole length and considered to be patent when dye was passing from the fimbria and collected in pouch of Douglas. Partial block was diagnosed when greater pressure was required to push the dye through the intrauterine cannula and dye passed through the fimbria in drops. Fimbrial occlusion of the tubes was diagnosed when there was no passage of

dye through fimbria and dilatation with blue coloration in any part of the tube. Bilateral cornual block was diagnosed when in spite of greater pressure in pushing the dye, there was no change in the tube with absence of dye in the pouch of Douglas. Associated pelvic pathology like uterine malformation, fibroid, ovarian pathology, endometriosis and pelvic tuberculosis is also noted. The findings of HSG and laparoscopy were compiled, tabulated and subjected to statistical analysis by using Chi square test and Fishers exact test to find out the comparison between the two procedures.

Results

The present study is undertaken to study the tubal factor of infertility including patency of tubes, diagnostic accuracy of HSG and Laparoscopy in the evaluation of tubal factor and to assess the safety and limitation of these procedures. In our study 66% cases are of primary infertility and 34% cases are of secondary infertility, 70% are from urban area, majority of patients 76% hailed from middle income group and 2% from higher income group. Age of the patient range from 21-38 years, maximum number of patients (50%) of both primary and secondary infertility were found in the age group of 25-29 years. Majority of the patients, 64% in our study sought medical advice within 1-5 years duration of infertility in both primary and secondary infertility group.

Table 1:Details of previous pregnancy in secondary infertility patients

Outcome of pregnancy in secondary infertility cases		No. of cases	%
Full term pregnancy and live birth		7	41.17
Still birth		1	5.88
Spontaneous abortion(s)		4	23.52
MTP		5	29.41
Total		17	100
Post-partum and post-abortion period in secondary infertility		No. of cases	%
Uneventful		12	70.58
Fever with no obvious sign of PID		3	17.64
Fever with sign and symptoms of PID		2	11.76
Generalized septicemia		0	0
Total		17	100

The commonest outcome of last pregnancy of secondary infertility group was full term live birth in 41.17%, followed by MTP in 29.41% cases. Positive history of puerperal and post abortion sepsis was obtained in (29.40%) cases while 70% cases of secondary infertility had uneventful puerperal and post abortion period (table 1).

Table 2:Type of pathology in patients showing abnormal findings at HSG and Diagnostic Laparoscopy

Sl. No.	Procedure	Type of pathology						Total
		Cornual block	%	Fimbrial block	%	Others (Adhesions)	%	
1.	Laparoscopy	12	40	10	33.33	8	26.66	30
2.	HSG	16	57.14	10	35.71	2	7.14	28

HSG shows abnormal findings in 28 (56%) patients, out of these 28 cases fimbrial block in 10 cases, cornual block in 16 cases and

peritubal adhesions in 2 cases. While diagnostic laparoscopy detected abnormal findings in 30 (60%) cases (table 2).

Table 3:Laparoscopic findings in patients showing abnormal HSG

Sl. No.	Finding	HSG	Laparoscopy					
			Both patent		Both blocked		One blocked	
1.	Tubal Patency	Both blocked (20)	3	11.53%	17	65.38%	0	—
		One blocked (6)	1	3.84%	0	—	5	19.23%
2.	Total	26	4	15.38%	17	65.38%	5	19.23%

Tubal abnormalities that we observed in HSG were bilateral tubal block in 20 cases while out of these 20 cases laparoscopic examination shown 17 cases with bilateral tubal block and 3 cases

turned out with bilateral patent tubes. Unilateral tubal block observed in 6 cases by HSG, while laparoscopy shown 5 cases with unilateral tubal block (table 3).

Table 4:Study of peritubal adhesions

S. No.	HSG Diagnosis	Laparoscopic Diagnosis			Total
		Peritubal adhesions with tubal patency	Peritubal adhesions with tubal block	No adhesions with or without patency	
1.	Peritubal adhesions with tubal patency (2)	2	0	—	2
2.	Peritubal adhesions with tubal block (0)	—	—	—	0
3.	No adhesions with or without patency (48)	6	7	35	48
4.	Total (50)	8	7	35	50

HSG shows peritubal adhesions in 2 cases with patent tubes while on laparoscopy we found adhesions in 15 cases, peritubal adhesions

with patent tubes in 8 cases and 7 cases of adhesions with blocked tubes (table 4).

Table 5: Diagnosis of tubal patency

Procedures	B/L Patency	B/L Block	U/L Block	Statistical conclusion of the difference of results
HSG (50 cases)	24	20	6	P>0.05
Laparoscopy (50 cases)	28	17	5	

A complete agreement between results of HSG and laparoscopy in detection of tubal block, patency and peritubal adhesion was observed in 66% patients. While in the diagnosis of tubal patency complete agreement is seen in 58% cases. In the diagnosis of hydrosalpinx 100% agreement was reached between the two procedures (table 5).

There is no statistically significant ($p>0.05$) difference between two procedures in the results of tubal block. In our series HSG has 100% sensitivity and 85.71% specificity in detection of tubal block. On HSG Predictive value of positive test is 84.61% and Predictive value of negative test is 100%. There was no false negative test on HSG and percentage of false positive test was 14.28%.

Table 6:Diagnosis of peritubal adhesions

Procedures	Peritubal adhesion	Without Peritubal adhesion	Statistical conclusion of the difference of results
HSG (50 cases)	2	48	P<0.001
Laparoscopy (50 cases)	15	35	

HSG shows peritubal adhesion in 2 patients while laparoscopy revealed peritubal adhesion in 15 cases. The difference of results between the two procedures was statistically highly significant ($p<0.001$). Laparoscopy was found to be superior to HSG in diagnosing peritubal adhesion (table 6). No major complications were encountered during and after HSG. 23 patients (46%) complained of mild to moderate degree of lower abdominal pain. Other minor complications were bleeding per vagina during procedure in 2 (4%) cases, fever in 1 (2%) and headache in 1 (2%) case, nausea and vomiting in 2 (4%) cases. No serious complications were encountered during laparoscopy. Only 1 (2%) patient had developed parietal emphysema requiring monitoring and longer hospital stay. Difficulty encountered during procedures are mainly false tract of veress needle in 1 case (2%), clouding of lens in 4 (8%), bowel and omental interference in 2 (4%) cases. The minor post operative complications were nausea and vomiting in 5 (10%) cases, shoulder pain in 1 (2%) and pain abdomen in 3 (6%) cases. In our study in 2 cases there is filling defect (fibroid) on HSG and 2 cases shows signs of PID. Other laparoscopic pelvic findings were endometriosis in 6% cases, polycystic ovary in 6%, fibroid in 6%, tuberculosis in 4% cases, and finding suggestive of PID in 14% cases.

Discussion

Investigation and treatment of tubal factor in infertility is a complex procedure requiring expert gynaecological skills and a well planned approach. Before introduction of laparoscopy, gynecologist had to depend on HSG and on laparotomy findings, but now it has been replaced to a great extent by laparoscopy in investigations of tubal factors of infertility. So, doubts have arisen about the needs of HSG. Multiple studies opined that both procedures are essential for complete evaluation of infertile women [10-13].

Hysterosalpingography has been extensively employed to assess the status of fallopian tubes in infertility and HSG provides valuable information regarding the tubal lumen [11-13]. Present study shows that laparoscopy has detected abnormality more frequently (60%) than HSG (56%). HSG has given more false positive results in the form of tubal block, while laparoscopy has detected more number of additional findings like adhesions, fibroids, ovarian cyst etc. which may have a role in infertility. In our present series, tubal abnormalities were observed in 52% cases on HSG which are comparable to similar studies [10, 14], while in few other studies lower incidence of tubal abnormalities also noted [11, 15, 16].

The incidence of tubal factor in infertility was 44% in present series. We found bilateral patent tube in 24 (48%) patients in HSG, out of this 22 patients had normal HSG while 2 patients had patent tube with adhesions. Our findings regarding bilateral patency of tubes on

HSG are almost similar with El. Minawi, et al [10] (47.7%), whereas Philipson, et al [14] (32%) showed a lower incidence and Ismajovich, et al [11] (59.5%) showed higher incidence in bilateral patency. From the present study, it is observed that cornual block is seen in 16 cases by HSG while laparoscopy confirmed it in 12 cases. This difference can be due to tubal spasm in HSG which was obliterated during laparoscopy under general anaesthesia. Also this study shows fimbrial block in 10 cases by HSG which was also found in laparoscopy. 4 cases out of these 10 of fimbrial block showed hydrosalpinx on HSG and laparoscopy findings were same. This study shows that cornual occlusion is more common than fimbrial occlusion. Sensitivity of the laparoscopy was found to be 100% (i.e. the ability of laparoscopy to identify correctly all those who have blocked tubes). Specificity of laparoscopy in our study was 100% (i.e. the ability of the test to identify those who have either one of the patent tubes). Our study shows that sensitivity of HSG and laparoscopy was 100% but specificity of laparoscopy (100%) was more than HSG (85.71%). On HSG Predictive value of positive test is 84.61% and Predictive value of negative test is 100%. There was no false negative test on HSG and percentage of false positive test on HSG was 14.28%.

Hydrosalpinx

In our study 8% cases shows hydrosalpinx on HSG, which was almost similar to the findings of Chakraborty, et al, 9.2% whereas in Swart, et al [12] study it is seen in 17% cases.

Adhesions

In our study we found peritubal adhesion on HSG in 2 (4%) cases. It is comparable to those of Rajan, et al [18] who reported 4.3%, but El Minnawi, et al [10] reported a quite higher incidence of peritubal adhesion (21.6%). The reliability of diagnosis of peritubal adhesion by HSG is very much doubtful and such cases should be further explored by laparoscopy [10, 11, 18].

Laparoscopy is most reliable and sensitive and specific method for detection of peritubal adhesion. We found 30% cases of peritubal adhesion among our patients on laparoscopy, which coincides with many studies [13, 15] while Chakraborty, et al [17] found it in higher number of cases 78.6%. A significant advantage of laparoscopy over HSG is that it permits detection of other pelvic pathology which contributes to infertility which cannot be achieved by HSG. This is particularly important in assessing the feasibility of their surgical removal. This additional advantage of laparoscopy makes the procedure essential for complete evaluation of infertility cases.

Complete agreement of tubal findings in HSG and laparoscopy

The present study found difference of results in 17 (34%) cases, HSG shows tubal block in 26 cases while laparoscopy shows in 22 cases, HSG shows adhesion in 2 cases while laparoscopy shows in 15 cases.

So complete agreement of tubal findings in 33 (66%) cases in the assessment of tubal patency and peritubal adhesion of fallopian tube by both procedures. Complete agreement in most of the comparative study between HSG and laparoscopy by different author varies from 45% to 68% [10, 11, 14, 15]. This variation can be explained by the differences in the numbers and nature of the population under study, the degree of accuracy achieved in the technique and the interpretation of the method used and the differences of time interval between the two procedures. Though HSG seems to over diagnose the tubal obstruction, the differences with the result of laparoscopy is statistically insignificant ($p > 0.05$). And results in the diagnosis of peritubal adhesions was statistically highly significant ($P < 0.001$). Thus the study demonstrates that accuracy of HSG and laparoscopy in the diagnosis of tubal patency or tubal blockage is almost similar. And laparoscopy is a better diagnostic modality in the peritubal adhesions. Advantages of diagnostic laparoscopy over HSG are as it is more reliable tubal patency test than HSG because of direct visualization of tubes and its sensitivity and specificity is 100%. It is useful in detection of minimal tubal pathologies like peritubal adhesions, conditions of ampulla & fimbrial end which are often missed at HSG. It also gives definite diagnosis of any associated pelvic pathology like TB, endometriosis, PID etc. It can be used for aspiration of tubal, follicular and peritoneal fluid. Biopsy of ovary and tubes can also be taken in this procedure and adhesiolysis can also be done. Laparoscopic selection of cases for tuboplasty has been found to improve the results as patients with minimal tubal pathology are more likely to get benefit from tuboplasty while patients with gross pelvic pathology can be avoided. HSG is a more simple and safe procedure than laparoscopy. HSG examination gives valuable information about the fallopian tubes at low risk and with some therapeutic effects. Though we are unable to diagnose peritubal adhesion or endometriosis which has relation with tubal infertility, it provides a potentially useful initial data of fallopian tubal patency. According to Swart et al [7] laparoscopy is not a perfect gold standard. Sometimes tubal obstruction at laparoscopy is due to artifacts, because of technical failure and differences in resistance between the two tubes. However laparoscopy is the best standard available.

Laparoscopy complements and broadens the diagnostic scope of HSG. Both procedures have their own importance and none can substitute the other in diagnosing all the diseases. As HSG is a much less invasive procedure than laparoscopy and yields valuable information regarding the tubes, it should be done first followed by the more invasive procedure e.g. laparoscopy. It should be appreciated that HSG and Laparoscopy are complimentary rather than competitive procedures. The accuracy of diagnosis is enhanced when two procedures are combined especially in those cases where the result of one of the tests is doubtful.

Conclusion

Laparoscopy along with HSG is very effective method in evaluating cases of infertility especially tubal blockage. HSG should be done first followed up by laparoscopy if needed. Laparoscopy complements and broadens the diagnostic scope of HSG. Both procedures have their own importance and none can substitute the other in diagnosing tubal factors in infertility.

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