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Original Research Article

A Comparative Study of Hysterosalpingography and Diagnostic Laparoscopy in Assessment of Tubal Factors for the Investigation of Infertility

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Abstract: Infertility is a critical component of reproductive health. The tuboperitoneal factors are responsible in about 25-37% cases of female infertility and hence evaluation of tubal patency represents a key step and a basic investigation in the assessment of infertile women. To carry out diagnosis of tubal factors by HSG and diagnostic laparoscopy and observe efficacy and to compare the effectiveness. This was a comparative study in a tertiary health care centre attached to a medical college. A total number of 50 cases of primary and secondary infertility were evaluated for tubal factors of infertility. All cases underwent HSG on day 6th to day 12th of menstrual cycles and diagnostic laparoscopy was done during proliferative phase of next menstrual cycle. Statistical analysis was done using statistical package for social science ver.18 and instat software. Chi square test was used for comparison and p-value <0.05was taken as significant. HSG is as accurate as laparoscopy in the diagnosis of tubal patency or blockage. The finding of present study shows that neither procedure can be substituted by the other at the present state. Laparoscopy is better than HSG in diagnosis of peritubal adhesions. There is no significant difference in the morbidity of both the procedures.
Keywords: HSG, Dignostic laparoscopy, tubal factors, infertility

INTRODUCTION

The clinical definition of infertility used by the World Health Organization (WHO) is ‘‘a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse’’, while the WHO’s epidemiologic definition is ‘‘women of reproductive age at risk of becoming pregnant who report unsuccessfully trying for a pregnancy for more than two years’. The condition is further classified as primary infertility, in which no previous pregnancies have occurred, and secondary infertility, in which a prior pregnancy, although not necessarily a live birth, has occurred [1-3].

In 2010, 1.9% of child-seeking women aged 20–44 yrs were unable to have a first live birth (primary infertility), and 10.5% of child-seeking women with a prior live birth were unable to have an additional live birth (secondary infertility) [4]. Levels of infertility are almost similar in 1990 and 2010. The extent of female contribution to infertility is 25-37% (FIGO manual 1990)

The tuboperitoneal factors are responsible in about 30-40% cases of female infertility and hence evaluation of tubal patency represents a key step and a basic investigation in the assessment of infertile women [5-7].

Hysterosalpingography (HSG) is a fluoroscopic study performed by instilling radiopaque dye into the uterine cavity through a catheter to determine the contour of the uterine cavity and patency of the fallopian tubes. It is a simple OPD procedure and requires no anesthesia.

Diagnostic laparoscopy provides a direct visual access to inner pelvic anatomy without resorting to major abdominal surgery. The physiology of the ovaries, fallopian tubes and uterus can be studied in more detail. Diagnostic laparoscopy used with chromopertubation helps in assessment of tubal patency. It also gives diagnosis of other associated pelvic pathology.

AIMS AND OBJECTIVES

1. To carry out the diagnosis of tubal factors by HSG and laparoscopy
2. To observe the efficacy of both procedures
3. To compare the effectiveness in diagnosing tubal and peritubal factors

MATERIALS AND METHODS

The study was carried out in the department of obstetrics and gynaecology at Gauhati Medical College and Hospital, Guwahati, Assam. A total 50 cases of both primary and secondary infertility attending gynaecology OPD were selected at random in between the period August 15 to July, 2016. Detailed history, examinations and required investigations for both partners were taken.

Exclusion Criteria for diagnostic Laparoscopy

- Hernias: - Diaphragmatic, incisional.
- Peritonitis, bowel obstruction, paralytic ileus.
- Recent history of epilepsy.
- Severe cardio respiratory illness.
- Women who became pregnant after HSG.

Exclusion Criteria for HSG

- Patient with menstruation / Bleeding per vaginum.
- Evidence of lower genital tract infections.
- History of recently active salpingitis.

HSG procedure

All HSG were done on outpatient basis on postmenstrual dates between day 6^{th} to day 12^{th} of menstrual cycle. Injection Hyoscine 1 amp IM was given routinely 20 min before the procedure to avoid vasovagal attack and to get smooth muscle relaxation around the cornu as premedication. The procedure was properly explained to the patients and they were instructed to come on empty stomach on the day of the procedure. A water based contrast mediun Urograffin 76% was used. The procedure was performed at the radiology department of the Gauhati Medical College and Hospital,

Guwahati, in association with a radiologist as an outdoor procedure under fluoroscopic control.

After voiding the bladder, the patient was placed in dorsal lithotomy position. And position of the uterus was assessed by pervaginal examination. A Sim's double bladed speculum was introduced in the vagina and anterior lip of the cervix was grasped with the help of a Tenaculum forceps by a transverse bite and the length of the uterine cavity was measured by passing a uterine sound. After that HSG cannula was inserted into the cervical canal and position of the cannula was confirmed by fluoroscopy and the patient was placed supine with legs extended and slightly separated. About 10 ml of the contrast medium Urograffin 76% was slowly injected through the cannula under fluoroscopic control. During injection of the contrast medium, some positive pressure was maintained to prevent backflow of the contrast medium.

First HSG film was taken when the uterine cavity becomes full with the contrast and second after 5 minutes and next after 20-30 minutes to visualise the fallopian tubes and to see the spill. No dye was introduced, if sufficient resistance was felt during the injection of the contrast medium. The patients were observed for an hour for any complications and were sent home the same day. A course of antibiotic Tab Doxycycline 100mg twice daily for 7 days was given.

Diagnostic laparoscopy procedure

It was done on outpatient basis in the post menstrual phase of cycle. Patients were admitted a day before the procedure whenever required and kept nil per orally for atleast 12 hours. Preoperative management and anaesthesia fitness were taken. A written informed consent was taken. All the cases were performed under general anaesthesia. Patient was placed in the lithotomy position and preliminary bimanual vaginal examination was done to confirm the size, mobility and position of the uterus as well as relationship to the adjacent organs. The uterine elevator is introduced and the cannula was inserted in the cervix and 2% methylene blue solution was kept ready for chromopertubation.

The abdominal wall was scrubbed with antiseptic solution and draped with sterile gown and the operation table tilted to 15-30 degree Trendelenburg position. A small transverse incision of approximately 1cm in length was made subumbilically. The lower abdominal wall was grasped by the left hand a little above the symphysis and with the right hand the verres' needle was pushed through the infraumbilical incision, keeping the direction of the needle towards the centre of pelvic brim. When the needle entered into abdominal cavity, a loss of resistance was felt. After verifying that the needle was correctly placed, it was connected to the insufflation apparatus and CO_2 was insufflated @ 1 litre per minute. Abdomen was frequently percussed to determine whether a pneumoperitoneum was being symmetrical. Trocar with sleeve was introduced at an angle of 45° towards the pelvis with a firm direct push after elevating the abdominal wall. The laparoscope with light source connected was introduced through the cannula. The pelvic organs were inspected by manipulating the uterus with the intrauterine cannula. A second trocar and cannula were inserted through the lower abdominal wall midway between the umbilicus and symphysis pubis under direct vision of laparoscope. A grasping forceps was passed through the second port for manipulating the tubes and ovaries for complete visualization. After inspection of the pelvic organs, 2%

of methylene blue was injected through the intrauterine cannula. The tubes were carefully watched in whole length. The fallopian tubes were considered patent when dye was observed to pass from the fimbria and collected in pouch of Douglas. At the end of the procedure, laparoscope was removed, patient returned to horizontal position and gas from the peritoneal cavity was expelled through the sleeve of the trocar following which the sleeve was also be taken out gradually. Abdominal wound closure was done by 1-0 chromic catgut stitch which included subcutaneous fascia and skin, and sterile dressing applied. Postoperative management was done with antibiotics and IV fluids. Analgesics were given when required.

ETHICAL CONSIDERATION

This study was undertaken after its review and approval by the institutional ethics committee meeting of Gauhati Medical College & Hospital held on 12th August 2015.

RESULTS

Out of total 50 patients selected randomly in this study, 58% patients had primary infertility and 42% patients had secondary infertility. 78% cases belonged to urban area whereas only 22% cases belonged to rural area. Most of the cases (40%) belonged to age group 26-30 years.

Table-1: Age wise distribution of the subjects

Age group	Primary infertility cases	Secondary infertility cases	Total
20-25yrs	12 (24%)	0	12 (24%)
26-30yrs	11 (22%)	9 (18%)	20 (40%)
31-35yrs	4 (8%)	9 (18%)	13 (26%)
36-40yrs	2 (4%)	3 (6%)	5 (10%)
Total	**29**	**21**	**50**

Most common abnormality detected on Laparoscopy & HSG was cornual block i.e. 37.03% and 50% respectively. Peritubal adhesions with patent tubes were seen in 29.62% cases in laparoscopy and 15.39% in HSG.

Table 2: Distribution of patients with abnormal findings at HSG and Diagnostic laparoscopy

Procedure	Cornual block	Fimbrial block	Others (Adhesion)	Total abnormal cases cases
Laparoscopy	10 (37.03%)	9 (33.33%)	8 (29.62%)	27 (54%)
HSG	13 (50%)	9 (34.61%)	4 (15.39%)	26 (52%)

Bilateral tubal occlusion was seen in 19 patients on HSG, out of which 15 were confirmed on diagnostic laparoscopy. And 7 cases showed unilateral block on HSG, out of which 6 cases were confirmed on diagnostic laparoscopy and 1 case showed bilateral patent tubes.

Table 3: Laparoscopic findings in patients showing abnormal HSG

Si. No.	Finding	HSG			Diagnostic Laparoscopy			
			Both patent		Both blocked		One blocked	
1	Tubal Patency	Both tube blocked (19)	4	15.83%	15	57.69%	0	-
		One tube blocked (7)	1	3.84%	0	-	6	23.07%
2	Total	26	5	19.22%	15	57.69%	6	23.07%

HSG showed patency of tubes in 24 cases. All of these were true negative. They had bilateral patency on both HSG and laparoscopy. Out of 26 cases showing blocked tube, 21 cases truly predicted the blockage of tube (i.e. true positive) whereas 5 cases erroneously showed absence of peritoneal spill due to peritoneal adhesion or tubal spasm (i.e. false positive).

Table 4: Accuracy of HSG findings in detecting tubal patency

Results	No. of blocked tubes at Laparoscopy		No. of patent tubes at Laparoscopy		HSG Results	
No peritoneal spill	17	34%	0	-	20	40%
U/L	6	12%	0	-	7	12%
B/L Peritoneal spill	0	-	22+5	54%	24	48%
Total	**23**	**46%**	**27**	**54%**	**50**	**100%**

In 46 cases without peritubal adhesions on HSG, laparoscopy reveals peritubal adhesions in 17 cases. Both HSG & laparoscopy agreed in diagnosis of peritubal adhesion in only 4 cases.

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Table 5: Study of peritubal / periovarian adhesions on both modalities

		Laparoscopic diagnosis			
Sl. No	**HSG Diagnosis**	**Peritubal adhesions with tubal patency**	**Peritubal adhesions with tubal block**	**No adhesions with or without patency**	**Total**
1	Peritubal adhesions With tubal patency (4)	4	0	-	4
2	Peritubal adhesions (0)	-	-	-	0
3	No adhesions with or without patency (46)	5	8	33	46
4	**Total (50)**	**9**	**8**	**33**	**50**

It has been observed that there was no statistical significance of difference between the results of HSG and laparoscopy in the diagnosis of tubal patency (P=O.8333). Both procedures were equally reliable in the diagnosis of tubal patency.

Table 6: 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	19	7	P>0.05
Laparoscopy (50 cases)	27	17	6	

Analysis of results in the diagnosis of peritubal adhesions was statistically highly significant (P=0.0014).

Table 7: Diagnosis of peritubal adhesions

Procedures	Peritubal adhesions	Without Peritubal adhesions	Statistical conclusion of the difference of results
HSG (50cases)	4	46	P<0.05
Laparoscopy (50 cases)	17	33	

DISCUSSION

In the present study we compared findings of HSG and laparoscopy in infertile women in regard to tubal factors responsible for the infertility.

In our study of 50 patients; 29 (58%) were of primary infertility while 21 (42%) cases were of secondary infertility. In a study done by Shrikant *et al*. [8], primary infertility was in 58.80% cases and secondary infertility in 41.20% cases. The study includes infertile patients from age 20 years to 40 years and maximum number of the patients (40%) belongs to age group 26-30 years. The incidence in age group of 20-25 years is 24%. Shraddha *et al*. [9] states 62% cases in age group 21-30 years. The mean age of the patients was 29.16 years. Fatemeh *et al*. [10] states mean age of 29.71 years.

Study shows that laparoscopy has detected abnormality in 27 patients (54%) & HSG in 26 patients (52%) cases. Out of these cases, most common abnormality detected on Laparoscopy & HSG was cornual block i.e. 37.03% and 50% respectively. The difference can be due to tubal spasm in HSG, which is

abolished during laparoscopy under general anaesthesia. Peritubal adhesion with patent tubes were seen in 29.62% cases in laparoscopy and 15% in HSG which implies that peritubal adhesion by itself can cause infertility though the tubes may be patent. 4 cases showed hydrosalpinx on both HSG and also laparoscopy and were included as fimbrial block. In a study done by preeti *et al*. 2002 on HSG 50% cases had abnormalities and shrikant *et al*. [8] found 55.26% cases with abnormality on laparoscopy.

Bilateral tubal occlusion was seen on HSG in 19 patients, out of which 15 were confirmed on diagnostic laparoscopy and 4 cases showed normal tubal patency. And 7 cases showed unilateral block on HSG, out of which 6 cases were confirmed on diagnostic laparoscopy and 1 case showed bilateral patent tubes. So on statistical calculation, out of 26 cases of occluded tubes on HSG, there were 5 cases (19.22%) which gave false positive results.

In this study, HSG showed patency of tubes in 24 cases. All of these were true negative. They had bilateral patency on both HSG and laparoscopy. Out of 26 cases showing blocked tube, 21 cases truly predicted the blockage of tube (i.e. true positive) whereas 5 cases erroneously showed absence of peritoneal spill due to peritoneal adhesion or tubal spasm (i.e. false positive). So on statistical calculation, HSG has sensitivity of 100% and specificity is 82.75%.

Author	year	Sensitivity of HSG	Specificity of HSG
Robabeh *et al*. [11]	2012	92%	70%
Fatemeh *et al*. [10]	2013	77.8%	52.9%
In this study	2016	100%	82.75%

In this series, laparoscopy showed positive results i.e. patency of either one of the tubes in 32 cases and all of these contributing to true negative. There was not a single case found to be false positive by laparoscopy. 18 cases found to have blocked tubes were true positive and no case was found as false negative in laparoscopy. Here by, sensitivity of the laparoscopy is 100% and specificity is also 100%.

HSG and laparoscopy have complete agreement in 60 % of the cases. . It has been observed that there was no statistical significance of difference between the results of HSG and laparoscopy in the diagnosis of tubal patency (P=O.8333). Both procedures were equally reliable in the diagnosis of tubal patency. And laparoscopy is a better diagnostic modality in the peritubal adhesions. According to Rajan and Joseph (1979), Ismajovich (1986) El Minawi (1977), the reliability of diagnosis of peritubal adhesion by HSG is very much doubtful and such cases should further be explored by laparoscopy.

Laparoscopy has an extra advantage that we can visualise the surrounding pelvic structure and can detect abnormalities specially endometriosis, genital tuberculosis etc. which have strong relation with tubal infertility. In the present study, we found that laparoscopy showed endometriosis in 2% cases, features suggestive of genital tuberculosis in 2% cases, PID in 16% cases, PCOD in 2% cases and ovarian cyst in 10% cases.

CONCLUSION

HSG is as accurate as laparoscopy in the diagnosis of tubal patency or blockage; also it is a non-invasive and cost effective method and should remain an integral part of female infertility investigation. The finding of present study shows that neither procedure can be substituted by the other at the present state. HSG is better diagnostic tool for detection of inner pathology of uterus and tubes. Laparoscopy is better in diagnosis of unsuspected pelvic pathology. Laparoscopy is better than HSG in diagnosis of peritubal adhesions. There is no significant difference in the morbidity of both the procedures. Both procedures are essential for complete workup of infertile women.

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