

Role of Hysterosalpingography and its Comparison with Laparoscopy in Diagnosis of Female Infertility

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ABSTRACT

Introduction: Higher rate of infertility and childlessness is one of the most common reproductive health problems in developing countries like India. The objective of present study was to assess the diagnostic value of hysterosalpingography (HSG) in cases of primary and secondary infertility and compare the results of HSG with Laparoscopy in evaluation of tubal patency and uterine abnormalities in patients suffering from female infertility.

Material and Methods: Present study was carried out in Department of Obstetrics and Gynaecology (U.I.S.E. Maternity Hospital) in collaboration with Department of Radiodiagnosis & Department of Pathology, G.S.V.M. Medical College, Kanpur. Study included sixty cases of both primary and secondary infertility in women. A detailed clinical history especially marital and obstetric history of the patients was taken. Thorough gynaecological examination was done and all necessary investigations were done. Written consent form was taken from all the patients. HSG and laparoscopy was done for assessment of tubal patency, uterine factors and pelvic adhesions.

Results: Most common (58.3%) age of the patients was between 26-30 years. Primary infertility was the most frequent type of infertility (63.33%). sensitivity of HSG is 97.22% and specificity of HSG is 66.67%. Positive predictive value of HSG is 81.39% and negative predictive value is 94.11%. Thus in determining the tubal patency, HSG and laparoscopy were in agreement in 81.3% cases. Sensitivity of HSG in diagnosing uterine finding is 60% while specificity is 94%.

Conclusion: HSG is of limited diagnostic value in tubal factor female infertility and is of low diagnostic value for pelvic adhesions. Diagnostic laparoscopy has been considered as important tool in diagnosis of female infertility.

Keywords: Laparoscopy, Infertility, Hysterosalpingography, Tubal Patency.

cost as compared to laparoscopy.^{7,8} However, diagnostic laparoscopy is considered gold standard investigation for investigating tubal patency because of higher false positivity in case of HSG.⁷ Therefore aim of present study is to carry out HSG in cases of primary and secondary infertility and compare the results of HSG with Laparoscopy in diagnosis of tubal and uterine factors of female infertility at GSVM Medical College & associated hospital, Kanpur (U.P.).

MATERIAL AND METHODS

Present study was carried out in Department of Obstetrics and Gynaecology (U.I.S.E. Maternity Hospital) in collaboration with Department of Radiodiagnosis & Department of Pathology, G.S.V.M. Medical College, Kanpur. Study included sixty cases of both primary and secondary infertility in women. We included only those infertile ladies whose husbands showed normal semen analysis. A detailed clinical history especially marital and obstetric history of the patients was taken.

Thorough gynaecological examination was done and all necessary investigations (baseline endocrinal investigations, post coital study, cervical mucus study and ovulation study) were done. Written consent form was taken from all the patients. Infertile women were investigated by HSG and laparoscopy during the study period for assessment of tubal patency, uterine factors and pelvic adhesions.

All HSG were performed between 7th to 10th day of menstrual cycle and water soluble contrast medium was used. Images were taken when the fallopian tubes and uterine cavity were filled with contrast material and when an overflow was seen at both sides of the tubes or when maximal filling of the tubes was observed without any overflow. After half an hour, a late film was made to assess the contrast material diffusion. On that basis, HSG findings were classified as having no tubal occlusions, one-sided occlusion or bilateral proximal or distal tubal occlusion. Uterine cavity abnormalities were

INTRODUCTION

Infertility has important social, religious and psychological implications besides being the cause of anxiety and unhappiness to the sterile couple.¹⁻³ Tubo-peritoneal factors especially tubal occlusion are most important causes of female infertility, accounting for about 30-40% of cases. Hence, evaluation of tubal patency is an essential investigation in the assessment of infertile women.⁴⁻⁶ Hysterosalpingography (HSG) and diagnostic laparoscopy, both can be used to evaluate tubal patency and pelvic adhesions. Hysterosalpingography is widely used as a first-line approach to evaluate tubal patency and uterine anomalies in female infertility due to its non-invasive nature and low

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How to cite this article: Singhvi N, Kumar J, Khan S, Khan S. Role of hysterosalpingography and its comparison with laparoscopy in diagnosis of female infertility. International Journal of Contemporary Medical Research 2020;7(10):J5-J9.

DOI: <http://dx.doi.org/10.21276/ijcmr.2020.7.10.11>



also recorded.

Diagnostic laparoscopy was performed under general anaesthesia, during the follicular phase of the menstrual cycle before the ovulatory period. Correct appreciation of size, contour and pathology (adhesions, structural abnormalities of the uterus, endometriosis and fallopian tube patency) were studied on diagnostic laparoscopy. On laparoscopy, tubal patency was classified as no tubal occlusion, one-sided or two-sided proximal or distal tubal occlusion. HSG findings on tubal occlusions, hydrosalpinx and pelvic adhesions were compared with findings detected at diagnostic laparoscopy.

RESULTS

Table 1 depicts the distribution of cases according to the age groups. Maximum number of cases (58.33%) was in the age group 26-30 years followed by age group 31-35 years (20%). The minimum number of cases (16.67%) was in the age group 36 & > 36 years. Amongst these cases, 52 cases (86.6%) belonged to urban population and 8 cases (13.3%)

Variables	Patients; N=60	
	No of Cases	Percentage (%)
Age Range (Years)		
21-25	10	16.67
26-30	35	58.33
31-35	12	20.0
36 & above	03	5.0
Population		
Urban	52	86.6
Rural	8	13.3
Type of infertility		
Primary	38	63.33
Secondary	22	36.67

Table-1: General Patient Characteristics

belonged to rural population. Out of these, 39 cases (63.33%) were of primary infertility and 22 cases (36.67%) were of secondary infertility.

There were 60 cases of infertility under study. Out of these 32 cases (53.34%) had no associated findings, but tubes were bilateral blocked in 20 cases (33.33%), unilateral patency of tube was present in 4 cases (6.67%) and bilateral patency of tube was present in 8 cases (13.33%). In 10 cases (16.67%), peritubal adhesions were present and both tubes were occluded. In one case (1.67%), peritubal adhesions were suspected but tubes were bilaterally patent.

In 5 cases (8.33%), beaded tubes were present with both tubes occluded. In one case (1.67%) elongated and tortuous tubes were present. In 2 cases (3.33%), bilateral hydrosalpinx was present with tubes occluded. In 4 cases, there were unilateral hydrosalpinx, out of which 3 cases (5%) had bilateral occlusion of tubes and one case (1.67%) had unilateral occlusion. There were 5 cases with associated uterine findings, out of which 3 cases (5%) had bilateral occlusion, one case (1.67%) had unilateral occlusion and one case (1.67%) had unilateral patency. (Table 2)

Out of the 60 cases studied HSG showed blocked tubes in 43 cases (71.6%) and 17 cases (28.3%) showed patent tubes. 36 cases (60%) were diagnosed to have blocked tubes by laparoscopy and 24 cases (40%) were diagnosed to have patent tubes. (Table 3)

Table 4 shows that in total 60 cases, uterine abnormality was found in 5 cases (8.34%) hysterosalpingography. Unicornuate uterus was diagnosed to be present in 2 cases (3.33%) by HSG while it was not found on laparoscopy. Bicornuate uterus was present in 1 case (1.67%) on HSG while it was not diagnosed on laparoscopy. Fibroid uterus was diagnosed in 1 case (1.67%) on both HSG and laparoscopy.

Tubal Patency	Total no. of cases	No. of associated findings	Peritubal adhesion	Beaded tubes	Elongated & tortuous tube	Hydrosalpinx		Assoc. Uterine findings
						B/L	U/L	
B/L occlusion	43 (71.66%)	20(33.3%)	10 (16.67%)	5 (8.33%)	-	2 (3.33%)	3(5%)	3(5%)
U/L patency	6 (10%)	4(6.67%)	-	-	-	-	1 (1.67%)	1 (1.67%)
B/L patency	11 (18.3%)	8 (13.33%)	1(1.67%)	-	1 (1.67%)	-	-	1 (1.67%)
Total	60	32(53.34%)	11	5	1	2	4	5

Table-2: Tubal Findings on HSG

S.No.	Findings	H.S.G		Laparoscopy	
		No.	%	No.	%
1	Blocked tubes	43	71.6	36	60
2	Patent tubes	17	28.3	24	40

Table-3: Tubal findings on HSG as confirmed by Laparoscopy

S. No	Findings	H.S.G		Laparoscopy	
		No.	%	No.	%
1	Unicornuate Uterus	2	3.33	0	-
2	Bicornuate Uterus	1	1.67	3	5
3	Uterine synechia	1	1.67	-	-
4	Fibroid Uterus	1	1.67	1	1.67

Table-4: Uterine Findings on HSG as confirmed by Laparoscopy

DISCUSSION

Meticulous examination of the female genital tract is essential elements of assessment of infertility in women. With the help of diagnostic laparoscopy, we can find not only panoramic view of the pelvic reproductive anatomy but also magnified view of pelvic organs and peritoneal surfaces. Diagnostic laparoscopy is considered as gold standard procedure in diagnosing tubal pathology and other intra-abdominal causes of infertility.⁹⁻¹¹ Hysterosalpingography (HSG) is utilized for assessment of tubal status and detection of intra uterine anatomical defects in infertility cases. Hysterosalpingography has less reliability in comparison of laparoscopy in determination of tubal patency status. Hysterosalpingography has good reliability for diagnosis of proximal tubal blockage making laparoscopy unnecessary in cases of In Vitro Fertilisation.¹²⁻¹³ Reported sensitivity and specificity differed between studies concerning tubal occlusions.^{4,7,14,15}

Evaluation of tubal dysfunction is of particular importance in the investigation of female infertility. The diagnostic reliability of HSG and laparoscopy is a matter of marked controversy. Kistner et al¹⁶ claimed that HSG may be more reliable than laparoscopy. We studied 60 patients with HSG and following findings were detected-

The HSG was normal i.e. bilateral patency was present in 11 cases (18.3%), bilateral tubal occlusion was present in 43 cases (71.7%) and unilateral occlusion was present in 6 cases (10%). Percentage of normal HSG quoted by Duignan¹⁷ 55%, Swalin & Rosenkrantz 53%, Kistner and Vandermallen¹⁶ 18%, Hutchins¹⁸ 8%, Seth and Krishna 48%, M.Singh et al¹⁹ 17.3%, Bose et al²⁰ 27.69%. Thus our findings are quite similar to those of Kistner et al¹⁶, Bose et al²⁰ and M. Singh et al.¹⁹

There were no associated findings in 32 cases (53.34%) out of the 60 cases studied. In 20 cases (33.3%), bilateral tubal block was present and in 4 cases (6.67%), unilateral tubal block was present. HSG detected significant pelvic pathology in 46.7% cases. Maathius et al²¹, Maghiese & Sim²² and Survey and Tzigounis (1978) found significant pelvic pathology in 56%, 58% and 19.8% respectively. Since no abnormality was detected in 53.3% cases on HSG, the tubal occlusion might have been due to genital tuberculosis or pathology of the endosalpinx like chronic pelvic inflammation. As Jeffcoate (1975) and Shaw (1975) have mentioned that if there is no apparent pathology explaining the sterility, T.B. must be considered as the cause. In 8 cases (13.33%) with bilateral tubal patency, causes other than tubal pathology may be responsible for infertility.

Peritubal adhesions: In 11 cases (18.34%), peritubal adhesions were present. In 10 cases (16.67%), peritubal adhesions were associated with bilateral tubal block while in one case (1.67%), bilateral patency was present. There are many causes of pelvic adhesions. The most important is old healed pelvic inflammation, the cause of which is postpartum or post abortal sepsis. In our study in

22 cases there was a history of sterility after abortion or normal delivery. Endometriosis is also an important factor of unexplained infertility as shown by various workers (Musich²³, Duignan¹⁷, Peterson²⁴, Fear²⁵). In endometriosis firm and dense adhesions are commonly seen which cause tubal distortion and occlusion. Peritubal adhesions were detected in 41.3% cases of Minawi et al²⁶, 4.6 cases by Bose et al²⁰, 2.2% cases by Duignan et al¹⁷ and in 20% cases by M. Singh et al.¹⁹ Thus our findings correspond with those of M Singh et al.¹⁹

Beading of Tubes: In 5 cases (8.33%), only beaded tubes were found and these tubes were completely occluded. In tuberculous endosalpingitis, the lesions and obstructions are typically multiple and the tube wall is thickened and inflamed. In the healing stage, caseation and fibrosis leads to beading which again goes in favour of tuberculosis (Jeffcoate, 1975). Beaded tubes were seen in 9.23% cases by Bose et al²⁰, 11.02% cases by M.Singh et al¹⁹ and in 4% cases by Kistner et al.¹⁶ Similar findings were present in our study i.e. in 8.33% cases.

Hydrosalpinx: In 2 patients (3.33%), bilateral hydrosalpinx and in 3 cases (5%), unilateral hydrosalpinx was found. According to Jeffcoate (1975) and Shaw (1975), the most important among the causative factors of sterility is genital TB. TB may lead to obstruction of the distal end of the tube resulting in Hydrosalpinx. Our findings of bilateral hydrosalpinx are quite similar to those of Bose et al²⁰ (4.61%) and those of unilateral hydrosalpinx with those of M.Singh et al¹⁹ (3.94% cases). Bilateral hydrosalpinx was present in 3.15% cases in the series of M.Singh et al¹⁹ and unilateral hydrosalpinx was detected in 15.38% cases by Bose et al.²⁰

Uterine findings on HSG

In 2 cases (3.33%), Unicornuate uterus was found. In one case, the tubes were occluded and in the other they were patent. There was one case (1.67%) of bicornuate uterus with both tubes patent. In this case conception was possible but probably did not occur due to difficulty in implantation or there may be some other associated cause of infertility. Filing defect in the uterine cavity was present in 2 cases (3.33%). In one case (1.67%), synechiae were present and in other case (1.67%), submucous fibroid was suspected. Unicornuate uterus was detected in 1.06% cases by K. Garewal et al. 2.37% cases by M.Singh et al.¹⁹ The higher incidence in our series may be because of septate uteri in which the dye may have gone into one half of the uterus. Bicornuate uterus was detected in 1.58% by M Singh et al¹⁹ which is quite similar to our finding. The incidence reported by various authors is Duignan et al¹⁷ (0.6%), Bellina (0.9%), Gabos (0.85%) and Verma et al (2.4%). Uterine synechiae were detected by M Singh et al in 1.57% cases which is quite close to our finding. A higher incidence was reported by Kierse et al¹⁶ in 5% cases. Fibroid uterus was reported in 2.12% cases by K. Garewal et al and 6% by Kierse et al. Our incidence is less than that reported by the various authors.

Tubal Findings of HSG as confirmed by laparoscopy

As shown in the table, 35 cases (58.3%) were diagnosed to have tubal block by both HSG and laparoscopy. 8 cases (13.3%) were shown to be false positive by HSG as they were found to be patent by laparoscopy. One case (1.67%) was shown to be patent by HSG i.e. false negative, as it was shown to be blocked by laparoscopy. 16 cases (26.67%) were shown to be patent by both HSG and laparoscopy. Thus sensitivity of HSG is 97.22% and specificity of HSG is 66.67%. Positive predictive value of HSG is 81.39% and negative predictive value is 94.11%. From this we have concluded taking laparoscopy as the standard procedure. Thus in determining the tubal patency, HSG and laparoscopy were in agreement in 81.3% cases. They were not in agreement in 18.7% cases. In various series of comparison between HSG and laparoscopy, our findings are in close correspondence with that of Moghissi et al²², Kistner et al¹⁶, Hutchins et al.¹⁸ Thus it seems that the diagnostic reliability of HSG and laparoscopy is a source of marked controversy. The discrepancy of tubal block by HSG can be explained by the use of an improper technique in HSG e.g. Injection of insufficient contrast medium or too rapid an injection of contrast medium. Other causes include tubal spasm which is possibly eliminated under anaesthesia (as used for laparoscopy) and the lower viscosity of the indigocarmine as compared to lipoidal. A variation in tubal calibre may allow filling of one tube before the other thus giving the erroneous appearance of unilateral block.

Uterine Findings on HSG as Confirmed By Laparoscopy

Unicornuate uterus was seen in 2 cases (3.3%) by HSG while it was not seen on laparoscopy. This discrepancy can be due to the fact that these could have been septate uteri or bicornuate uterus where the dye may have gone into only one half of the uterus. Thus both the diagnostic aids supplement each other and result in a better evaluation of the infertile couple. Bicornuate uterus was seen in only one case (1.67%) by HSG while it was seen in 3 cases (5%) on laparoscopy. The sensitivity of HSG in diagnosing uterine finding is 60% while specificity is 94%. It is less sensitive because it does not diagnose the abnormalities accurately and certain misinterpretations are made.

There is a great discrepancy in diagnosis of pelvic adhesions by HSG and laparoscopy. HSG is of no value in diagnosis of pelvic adhesions in association with tubal occlusion. Even in patients with patent tubes, HSG provides only suggestive evidence in some of these cases. A false positive HSG result may be explained by increased amount of dye injected, the presence of a deep ovarian fossa or distension of the pelvic colon with subsequent loculation all of which may suggest intraperitoneal spill of lipoidal dye.

Laparoscopy is the only sure method, short of laparotomy, which permits a definite diagnosis of adhesions. Furthermore, it provides additional information concerning the site of adhesions whether periovarian, peritubal, the extent of adhesions, the effect on the course of tube and the anatomic relation between fimbrial and ovary.

Comparative evaluation of diagnosis of TB by various methods

Tuberculosis was diagnosed by endometrial biopsy in 4 cases (6.67%). HSG diagnosed it by the presence of beaded tubes in 5 cases (8.34%) and laparoscopy in 6 cases (10%). Kleir and colleagues claimed that HSG provides a sensitive screening test for genital T.B. as it has a false negative rate of at least 50%. Although the number of cases encountered in our study does not permit us to make statistically valid conclusions. We suggest that laparoscopy provides a higher index of suspicion than HSG, besides having the advantage of obtaining additional information if tubal biopsies are taken.

CONCLUSION

HSG is a proficient method for ascertaining structural and functional characteristics of the female genital organs in both the numbers and abnormal states. We used it for the study of tubal patency as well as diagnosing many gynaecological conditions, in planning their further investigation and treatment. By comparing both these diagnostic aids it can be concluded that tubal occlusion was seen in more cases on HSG than laparoscopy. HSG showed some associated findings which could itself be the cause of infertility. These findings were mainly related to uterine lumen which could not be seen on laparoscopy. Laparoscopy showed some findings other than tubal occlusions. These were mainly the abnormalities related to pelvic cavity, ovaries and tubes. These were missed on HSG. It was observed that among the infertility investigation, laparoscopy is superior to HSG in assessment of tubal patency because of false positive findings of the latter technique. Laparoscopy is also helpful in detection of ovarian and other associated pelvic pathology. However, HSG, still seemed to have its importance, provided proper technique and correct interpretation of results are undertaken. We conclude from this study that laparoscopy should not be considered a replacement for conventional diagnostic techniques of infertility rather these techniques should be considered complementary and not mutually exclusive.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 05-09-2020; **Accepted:** 15-09-2020; **Published:** 31-10-2020