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RESEARCH ARTICLE

COMBINED DIAGNOSTIC APPROACH OF HSG AND DIAGNOSTIC HYSTEROLAPAROSCOPY IN EVALUATION OF FEMALE INFERTILITY.

Sujata Singh, Lucy Das, Swarnima Das and Pravat Chandra Das.

Department Of Obstetrics & Gynaecology, S.C.B. Medical College & Hospital, Cuttack, Odisha, India.

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 tubal blockage(BTB).

Abstract

Background: Since the history of mankind, human infertility has been a source of personal misery and social stigma. The aim of the present study is to assess the combined diagnostic approach of HSG and DHL in the evaluation of female infertility both primary and secondary and to identify the incidence of the various pathological conditions in the female reproductive tract leading to infertility and to study the advantages of diagnostic hysterolaparoscopy over hysterosalpingography.

Method: The present study is a prospective observational study, conducted in the department O & G, SCBMCH, Cuttack. One hundred infertile patients were included in this study. All patients underwent both HSG and DHL. The standard protocols for HSG and DHL were followed. All reports on the 100 selected patients were reviewed.

Result: In our study, 68% patients are in primary infertility and 32% in secondary infertility. Maximum number of patients with primary infertility were in the age group of 26- 30 years i.e. 50% and 56.3% in secondary infertility.

Tubal pathologies were the commonest of all followed by filling defects like myoma, polyps, synechiae and uterine anomalies in both HSG and DHL in both the primary and secondary infertility groups.

Surgical interventions were done in 84% of primary infertility cases and in 97% of secondary infertility cases. The therapeutic measures were taken like polypectomy, myomectomy, septum resection during hysteroscopy. Most commonly done procedure in this study was adhesiolysis in 22 – 24% of cases followed by cannulation in 15-22% cases.

Conclusion: Our study found that Hysterosalpingography is simple, inexpensive, safe and rapid diagnostic modality for tubal patency then laparoscopy. Laparoscopy is considered the Gold Standard for diagnosing tubal and peritoneal disease. HSG and Laparoscopy are not alternative, but complimentary to each other but hysterolaparoscopy is more informative and operative intervention can be done in the same sitting.

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Corresponding Author:-Sujata Singh.

Address:-Department Of Obstetrics & Gynaecology, S.C.B. Medical College & Hospital, Cuttack, Odisha, India.

Introduction:-

Infertility affects about 10-15% of reproductive age couples.¹ Reproductive endocrinologist, consider a couple to be infertile if;

1. The couple has not conceived after 12 months of contraceptive free intercourse if the female is under the age of 34 years. 12 months is the lower reference limit.
2. The couple has not conceived after 6 months contraceptive free intercourse if the female is over the age of 34 years.^{2,3}

A clinical definition of infertility by the WHO and ICMART 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.⁴ Infertility can further be broken down into primary and secondary infertility. Primary infertility refers to the inability to give birth either because of not being able to become pregnant, or carry a child to live birth, which may include miscarriage or a stillborn child.^{5,6} Secondary infertility refers to the inability to conceive or give birth when there was a previous pregnancy or live birth. Incidence of female infertility is 45.67%, male infertility is 54.33% and may be both can get involved in some of cases, range varies from region to region.⁷

The major causes of infertility include;

1. Male factors (20-30 %)
2. Female factors (40-55 %)
3. Both male and female factors (10-40 %)
4. Unexplained infertility (10-20 %)⁸

The important causes of female infertility are:

1. Tubal factors (20-40 %)
2. Ovulatory dysfunction (20-40 %)
3. Miscellaneous causes (10-15 %)⁹

Tubal factors account for (20-40 %) of infertility. The mechanism responsible for tubal factor infertility involves anatomic abnormalities that prevent the union of sperm and ovum. Proximal tubal obstructions prevents sperm from reaching the distal fallopian tube where fertilization normally occurs. Distal tubal occlusions prevent ovum capture from the adjacent ovary whereas the proximal tubal obstruction is an all or none phenomenon. The most common initial diagnostic tests for the evaluation of an infertile couple are the mid-luteal phase progesterone assay; a test for tubal patency, such as hysterosalpingography (HSG) for females and semen analysis for males. Laparoscopy is reserved for further diagnosis or may be used in combination with endoscopic surgery (Crosignani and Rubin 2000).¹⁰ Visualizing the uterine cavity and identifying the possible pathology has made hysteroscopy an equally important tool in infertility evaluation. Combining hysteroscopy with laparoscopy has become a standard tool of evaluation though the absolute role of hysteroscopy in unexplained infertility is yet to be elucidated.¹¹⁻¹⁴

Aim

The aim of the present study is to assess the combined diagnostic approach of hysterosalpingography (HSG) and diagnostic hysterolaparoscopy (DHL) in the evaluation of female infertility both primary and secondary and to identify the incidence of the various pathological conditions in the female reproductive tract leading to infertility and to study the advantages of diagnostic hysterolaparoscopy over hysterosalpingography.

Method:-

The present study is a prospective observational study, conducted in the department of Obstetrics and Gynecology, S.C.B. Medical College and Hospital, Cuttack during the period of September 2015 to January 2017. One hundred infertile patients were included in this study. All the hundred patients underwent both HSG (Hysterosalpingography) and DHL (Diagnostic hysterolaparoscopy). The standard protocols for HSG and DHL were followed. All reports on the 100 selected patients were reviewed. In all cases in which pathology was described in the report, the images were re-evaluated. The size and morphology of the uterine cavity were assessed. This included searching for uterine filling defects, contour abnormalities of the cavity as well as abnormal positioning. The images were reviewed to determine if the fallopian tubes were existent and patent. Tubal pathologies were categorized by occlusion, tubal irregularity (post infectious) and peritubal adhesions (e.g., PID). The degree and distribution of contrast spillage were recorded. Abnormalities of the uterine cavity were categorized into Müllerian duct anomalies (e.g., uterus bicornis) and filling defects (myoma, scars/adhesions).

Inclusion criteria:

1. General physical examination and systemic examination was done to all patients and a complete history of couple was taken.
2. All our 100 cases of infertility undergoing both HSG and DHL.

Exclusion criteria:

1. Any contraindications to Hysterosalpingography procedure like:-
2. Acute lower genital infection.
3. Genital Koch's.
4. Abnormal uterine bleeding.
5. Suspected pregnancy.
6. Any contraindications to Diagnostic Laparoscopy procedure like Severe Cardiopulmonary Disease, Generalized Peritonitis, Intestinal Obstruction, Anti Coagulation Therapy etc.

Consent

Informed written consent was taken from all the patients participating in the study.

Statistical analysis:

The data collected was entered in Microsoft excel 2007 and analyzed by using SPSS version 20. All the data was expressed in percentage and Pearson's chi square test was used to calculate the difference between percentages. P value less than 0.05 was considered statistically significant. Sensitivity, specificity, positive predictive value and negative predictive value was calculated for filling defects, uterine anomaly observed in HSG and DHL.

Results:-**Table 1: Prevalence of primary and secondary infertility cases(n=100)**

Type	no of cases	Percentage
Primary infertility	68	68%
Secondary infertility	32	32%

Our study evaluated a total of 100 patients. Among them primary infertility comprises of 68 (68%) cases and secondary infertility comprises of 32 (32%) cases.

Table 2:-Age wise distribution of primary and secondary infertility cases

Age group	total	Primary infertility	Secondary infertility	p value
20-25	24(24%)	21(30.9%)	3(9.4%)	0.089
26-30	52(52%)	34(50%)	18(56.3%)	
31-35	17(17%)	9(1.2%)	8(25%)	
36-40	7(7%)	4(5.9%)	3(9.4%)	
total	100	68	32	

Maximum number of patients with primary infertility were in the age group of 26- 30 years i.e.50% followed by those belonging to age group of 20-25 years i.e. 30.9%. In secondary infertility maximum number of patients were in the same age group as that of primary infertility i.e. 26-30 years i.e. 56.3% followed by those belonging to 31-35 years i.e. 25%. Mean age on infertility was 28.7 years. By using Pearson's Chi square test, it is found that age in determining infertility is statistically not significant (p value>0.05).

Table 3:-Mean age duration and married life of primary and secondary infertility patients

Duration(years)	Total	Primary infertility	Secondary infertility	p value
1-3yrs	22(22%)	16(23.5%)	6(18.8%)	
4-6yrs	52(52%)	36(52.6%)	16(50%)	
7-9yrs	18(18%)	10(14.7%)	8(25%)	
10-12yrs	6(6%)	4(5.9%)	2(6.3%)	
>12yrs	2(2%)	2(2.9%)	0	

total	100	68	32	
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Maximum number of cases of primary infertility and secondary infertility reported after a period of 4 – 6yrs of infertility i.e. 52% and 52.6% respectively, followed by the period of 1-3yrs in primary and 7-9yrs in secondary infertility cases. No case of secondary infertility was reported after 12yrs of infertility in this study. Duration of infertility is also not statistically significant (p value>0.05).

Table 4:-Tubal status on HSG and DHL.

Column1	HSG		DHL	
	no of cases	%	no of cases	%
BP	37	(37%)	64	(64%)
BTB	29	(29%)	14	(14%)
RB	16	(16%)	15	(15%)
LB	18	(18%)	7	(7%)

As evident from the above table, diagnostic hysterolaparoscopy is more efficiently diagnosing bilateral patency (64%) of the tubes as compared to hysterosalpingography (37%). Bilateral tubal block is seen in 29% cases of HSG and 14% cases of DHL.

Table 5:-HSG Findings

Findings	Primary infertility	Secondary infertility	Total(n=100)
Tubal pathology	41 (70%)	22(66.6%)	63(70%)
Filling defect	9(15.5%)	7(21.21%)	16(17.5%)
Endometriosis	0	0	0
Adnexal adhesion	2(3.5%)	0	2(2%)
Ovarian pathology	0	0	0
Uterine anomalies	6(11%)	4(12.12%)	10(11%)
Total	58	33	91

Out of all the factors in HSG, tubal pathology 41 cases (60%) in primary infertility and 22 cases (68%) in secondary infertility accounts for the highest followed by filling defects (17.5%) and uterine anomalies (11%). HSG could not detect endometriosis and ovarian pathology.

Table 6:-Laparoscopic Findings

Findings	Primary infertility	Secondary infertility
Myoma	2(3%)	2(8%)
Endometriosis	9(13%)	3(13%)
Adnexal adhesion	4(6%)	5(21%)
Tubal pathology	24(38%)	12(50%)
Ovarian pathology	17(25%)	2(8%)
Uterine anomaly	3(4%)	0
PID	10(15%)	0
total	69	24

The most common laparoscopic pathology was tubal pathology same as that of HSG i.e. 38% in primary infertility cases and as high as 50% in secondary infertility cases followed by ovarian pathology in primary and adnexal adhesions in secondary infertility cases. Other attributing pathologies were endometriosis (26%), uterine anomalies (4%) and PID (15%)

Table 7:-Hysteroscopy findings

Findings	Primary infertility	Secondary infertility
Myoma	3(14%)	0
Polyps	4(19%)	1(7%)

Uterine anomaly	11(52%)	4(27%)
Synechiae	3(14%)	10(66%)
total	21	15

The most common hysteroscopic pathology was uterine anomalies (52%) like septate, subseptate, bicornuate, unicornuate in primary infertility cases and uterine synechiae (66%) in secondary infertility cases secondary infertility. Other attributing pathologies in hysteroscopy were Submucousmyoma (14%), endometrial polyp (26%).

Table 8:-Pathology findings

Associated pathology	HSG	DHL
Tubal pathology	63(69%)	37(31%)
Filling defect	16(18%)	21(18%)
Endometriosis	0	12(10%)
Adnexal adhesion	2(2%)	15(12%)
Ovarian pathology	0	20(17%)
Uterine anomaly	10(11%)	15(12%)
total	91	120

Tubal pathologies were the commonest of all followed by filling defects like myoma, polyps, synechiae and uterine anomalies in both HSG and DHL and in both the primary and secondary infertility groups. Adnexal adhesions (12%) were easily diagnosed by DHL. DHL can more specifically diagnose endometriosis (10%) and ovarian pathologies (17%) which could not be diagnosed by HSG.

Table 9:-Surgical intervention done in DHL

Intervention	Primary infertility	Secondary infertility
Adhesiolysis	15(22%)	16(24%)
TCRM	3(4%)	0
T CRS	6(9%)	3(9%)
LOD	8(12%)	1(3%)
Salpingectomy	4(6%)	1(3%)
Cystectomy	5(7%)	2(6%)
Cannulation	10(15%)	7(22%)
Polypectomy	4(6%)	1(3%)
Cervical dilatation	2(3%)	0
Total	57(84%)	31(97%)

Surgical interventions were done in 84% of primary infertility cases i.e. in 57 patients and in 97% of secondary infertility cases i.e. in 31 patients. During the procedures necessary therapeutic measures were taken like polypectomy, myomectomy, septum resection during hysteroscopy. During laparoscopy adhesiolysis, ovarian drilling, ovarian cystectomy, tubal cannulation and myomectomy was done as per the pathology detected. Most commonly done procedure in this study was adhesiolysis in 22 – 24% of cases followed by cannulation in 15-22% cases.

Discussion:-

In table-1[Prevalence of primary and secondary infertility cases(n=100)], 68% patients were suffering from primary infertility and 32% patients were suffering from secondary infertility.

Similar studies have been done by various authors previously and got similar results as mentioned below

Principal author	Year	Sample size	Type of infertility	
			Primary	Secondary
GokhanGoynumer et al. ¹⁵	2008	100	69.00%	31.00%
FatemehForoozanfard et al. ¹⁶	2013	62	69.30%	30.70%
Neerja,JainKuldeep. ¹⁷	2011	200	75.00%	25.00%
M Heis et al. ¹⁸	2011	281	42.30%	57.60%
In this study	2017	100	68.00%	32.00%

In table-2 (**Age wise distribution of primary and secondary infertility cases**), maximum number of patients with primary infertility were in the age group of 26- 30 years i.e.50%. In secondary infertility maximum number of patients were in the same age group as that of primary infertility i.e. 26-30 years i.e. 56.3%. Mean age on infertility was 28.7 years.

In table-3 (**Mean age duration and married life of primary and secondary infertility patients**), maximum number of cases of primary infertility i.e. 36 out of 68 accounting for 52% of total cases reported after a duration of 4-6 years of infertility. Among cases of secondary infertility, 16 out 32 i.e. 52.6% of all total infertility cases consulted after a duration of 4-6 years same as that of primary infertility.

In similar study conducted by Foroozanfard F et al.¹⁶ the average age in subjects of primary infertility was 26.25 years and in subjects of secondary infertility was 29.73 years. Mean duration of primary infertility was 5.79 ± 3.19 years and for secondary infertility was 5.97 ± 3.36 years. Maximum number of cases had duration of infertility between 1 to 4 years. In a similar study conducted by M Heis et al.¹⁸, overall the mean age (SD) was 31.5 (5.9) years, with maximum occurrence in 18-46 years. Mean (SD) duration of infertility was 4 (3.4) years. In a similar study conducted by Ben W.J. Mol et al.¹⁹ mean age was 29.6 years and mean duration of infertility was 3.5 years.

In table- 4 (**Tubal status on HSG and DHL**), HSG showed bilateral tubal patency in 37 cases (37%) while DHL showed tubal patency in 64 cases (64%). Thus DHL appeared to be better in determination of tubal patency than HSG. In 29 cases (29%) HSG showed tubal obstruction while DHL showed tubal obstruction in only 14 cases (14%). Thus there were 15 false positive cases detected by HSG. In a study by GokhanGoynumer et al (2008), they found that of the twelve cases of bilaterally occluded tubes detected by HSG, only 3 (25%) were confirmed to have bilateral occlusion during laparoscopy¹⁵. In a study by Mol BW, Collins et al, of the 794 patients who were included, 114 (14%) showed one-sided tubal occlusion and 194 (24%) showed two-sided tubal occlusion on HSG. At laparoscopy, 94 (12%) showed one-sided tubal occlusion and 96 (12%) showed two-sided tubal occlusion¹⁹. HSG can clearly detect the site of tubal blockage which is not very possible with DHL. HSG thus has an upper hand here as knowledge of the site of blockage is very essential to decide for the planning of treatment.

In my study, in table -5 (**HSG Findings**), tubal pathologies were detected in 41 cases out of total 68 cases of primary infertility and 22 cases of out 32 cases of secondary infertility. HSG was able to diagnose filling defect in total 16 cases (16%) of all and uterine anomalies in 10 cases of all.It could diagnose only two cases of adnexal adhesions but not even a single case of endometriosis and ovarian pathology.

In my study,in table-6 (**Laparoscopic Findings**) the commonest abnormality in laparoscopy was tubal pathology (36%) in both primary and secondary infertility cases followed by ovarian pathology (17%) in primary infertility cases and adnexal adhesions (5%) in secondary infertility cases. In a study by Behuria et al (2016), they found that the most common pathology in laparoscopy was endometriosis (11%) in primary infertility and peritoneal and tuboovarian adhesions (15%) in secondary infertility. Hydrosalpinx was found in 4 cases where 2 cases had bilateral and 2 cases had unilateral hydrosalpinx. Other laparoscopic abnormalities detected were myoma (4%), ovarian cyst(4%), PCOD (3%), tubal block (both bilateral and unilateral) (7%), bicornuate uterus (0.85%) and adhesions (10%)²⁰.In another study by Sampija J. Shah et al (2014), laparoscopy revealed abnormal findings in 67% cases that included tuboperitoneal factors 38%, ovarian factors 31%, and uterine factors 9%. 23% cases showed normal laparoscopic findings²¹.

In my study, the table-7 (**Hysteroscopy findings**) shows uterine anomaly i.e. septate uterus was the commonest hysteroscopic abnormality found in 11 cases i.e. 52% followed by bicornuate, unicornuate, subseptate and one case

of arcuate uterus amongst primary infertility patients while synechiae was the commonest in secondary infertility patients in 10 cases i.e.66% cases. Other hysteroscopic findings were polyps (3%) and myoma (5%) of total 100 cases. Other than septate uterus, the major hysteroscopic abnormalities in our study were myomas and polyps similar to another study.²² The evidence to suggest that uterine myomas decrease fertility is inferential and relatively weak; the bulk of it is derived from studies that had compared the prevalence of myomas in fertile and infertile women or the reproductive performance of women with otherwise unexplained infertility before and after myomectomy.^{23,24}

On comparing on the basis of table-8 (**Pathology findings**) pathologies on DHL and HSG, tubal pathology was the commonest finding in both the HSG (69%) and DHL (31%) followed by filling defect in both HSG (18%) and DHL (18%). Other pathologies detected by DHL were adnexal adhesions (12%), uterine anomalies (12%), ovarian pathology (17%) and endometriosis (10%). While in HSG other findings were uterine anomalies (11%) and adnexal adhesions (2%). HSG was not able to diagnose ovarian pathology or endometriosis. The diagnostic laparoscopy is the gold standard in diagnosing tubal pathology and other intra-abdominal causes of infertility.^{12, 25, 26} In my study, the table-9 () shows laparoscopic intervention was done in 60 cases (60%) and hysteroscopic interventions done in 17 cases (17%). Adhesiolysis in primary infertility (22%) and secondary infertility (24%) was the commonest laparoscopic intervention done followed by cannulation. Others were laparoscopic ovarian drilling, cystectomy and salpingectomy. In hysteroscopy, commonest intervention done was transcervical resection of septum which was 9% in both primary and secondary infertility followed by transcervical resection of myoma and polypectomy.^{26,27,28}

Conclusion:-

When comparing HSG and laparoscopy, we should keep in mind that both procedures provide more information than the condition of the Fallopian tubes alone. Whereas HSG provides information on the status of the intrauterine cavity, laparoscopy allows inspection of the intra-abdominal cavity, for instance to see if endometriosis is present. The latter has become especially important, since it was recently shown that laparoscopic treatment of endometriosis improves fertility prospects by 13%. HSG demonstrated reduced positive predictive value especially for bilateral proximal tubal occlusion. Moreover, HSG has a limited value for accurately identifying tubal patency. Therefore, laparoscopy is necessary to rule out the existence of peritubal adhesions and mild and moderate endometriosis as causes of infertility in patients with abnormal HSG findings Thus, in the final decision on the clinical value of HSG and laparoscopy, one should consider issues other than solely tubal pathology.

Diagnostic Hysterolaparoscopy is most effective and safe method of evaluation of female infertility, mainly in detecting endometriosis, intraperitoneal adhesions and uterine malformation. These are all correctable abnormalities that can be missed by routine pelvic examination and usual imaging procedures. It is a very useful method that diagnose and treat multiple abnormalities in tubal, ovarian, peritoneal and uterus in the same setting, especially in couples with normal hormonal profile and male factor. Thus, when done by experienced hands and with proper selection of patients, hysterolaparoscopy can be considered as a definitive investigative daycare procedure for evaluation of female infertility and can be done directly without prior hysterosalpingography thus avoiding the risk of radiation, infection and extra investigation. Therefore, we believe that laparoscopy should be performed in cases of abnormal hysterosalpingograms and even in cases of normal hysterosalpingograms in the context of unexplained infertility. At last, I want to conclude that HSG and DHL are complimentary to each other in the diagnosis of female infertility.

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