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Original Research Article

Comparative evaluation of sonohysterosalpingography (Sono HSG) to diagnostic laparo-hysteroscopy in infertility

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ABSTRACT

Background: Aim was to study whether sonohysterosalpingography (sono HSG) can be used for tubal and uterine assessment in primary and secondary infertility instead of invasive methods like diagnostic laparo-hysteroscopy (DLH).

Methods: This was prospective interventional study. This study conducted at Obstetrics and gynecology Department, Lala Lajpat Rai Memorial Medical College Meerut, India in infertile women. Bilateral tubal patency and various uterine pathologies were first evaluated by sono HSG followed by DLH. The results were compared.

Results: Sono HSG was found to be sensitive and highly specific in diagnosing tubal/uterine factors with a sensitivity of 86.6%/58.33% and specificity of 80%/97.22%. The positive and negative predictive values were 92%/93.33% and 66%/77.78%.

Conclusions: Thus transvaginal sono HSG with its accuracy and safety, is a promising screening and diagnostic technique in the evaluation of tubal patency on an ambulatory basis. In the future, it can replace the hysterosalpingography.

Keywords: Female factor infertility, Laparohysteroscopy, Sonosalpingography, Tubal patency, Ultrasonography

INTRODUCTION

To become pregnant and have a healthy child is the right of every woman. If a lady is unable to conceive, it can devastate her socially, emotionally, and financially. Usually, 80% of normal couples conceive within one year of unprotected intercourse. If they are unable to achieve pregnancy within the stipulated time it is an indication to investigate the couple.¹

If a couple is not able to achieve pregnancy within one or more years of regular unprotected intercourse, termed as infertility. It is termed primary if pregnancy has never occurred and secondary if the patient has a history of prior conception. Incidence varies from 5 to 15%, with male and female factors 30-40% and 40-55% subsequently. According to the FIGO manual (1990), in females the causes are tubo peritoneal factors 25-35%, ovulatory

factors 30-40%, endometriosis 1-10% uterine factors 10% and cervical factors 5%.²

In India tubal factors are estimated approximately 40% (3) and is due to increased frequency of pelvic and tubal surgeries, use of IUCDs, ectopic pregnancies and more frequently because of pelvic inflammatory disease (PID).^{4,5} Hysterosalpingography (HSG), the earliest Diagnostic evaluation of tubal Pathology was introduced by Cary in 1914 who instilled radio Opaque medium and followed its course through the fallopian tube via uterus by x-ray photography. It is also useful in diagnosing uterine anomalies but radiation exposure, pain and false negative results are its certain disadvantages.

Laparoscopy and hysteroscopy has the advantage of direct visualization of tubes and uterus, detection of peritubal adhesions and fimbrial pathology but exact site of tubal block may not be diagnosed. It is also associated with

hazards of anesthesia as well as invasive and expensive procedure, not afforded by everyone but considered to be gold standard method to diagnose various factors of infertility.

Sono HSG is a dynamic imaging procedure that can be monitored on an image display screen during sterile isotonic saline introduction through the cervical canal with added advantage of non-exposure to ionizing radiation. Sterile isotonic saline causes less pain than hyperosmolar ionic contrast medium. It is believed that sono SHG rather than HSG should be a first line OPD based diagnostic procedure in the evaluation of tubal patency. Thus the study was planned.

Aims was to find out whether Sono HSG can be used for assessment of tubal and uterine factors in infertile females initially, instead of invasive methods like diagnostic laparo-hysteroscopy (DLH) which are considered to be gold standard.

METHODS

A prospective interventional study was conducted on 120 patients of primary and secondary infertility. After taking institutional ethical committee clearance all infertile couples were thoroughly evaluated in terms of detailed history and general physical examination. All male partners underwent semen analysis after 3 days of abstinence. If the HAS was found to be normal no further evaluation for male infertility was done, otherwise patient referred to surgical OPD for further management.

Routine investigations {like hemogram, blood sugar, VDRL, HIV, HbsAg, HCV, urine analysis, Mx test and other investigations for preanaesthetic check-up(PAC)} of female partners were also done. After complete reevaluation females were explained about the procedure. Written informed consent for the procedure was taken.

Inclusion criteria

Inclusion criteria was the patients who gave consent for the procedure enrolled for the study.

Exclusion criteria

Women who were having systemic disorders, male factor infertility, active genital infections, were unfit for anesthesia as well as refused the procedure, were excluded from the study.

Sonohysterosalpingography (sono HSG)

After evacuation of bladder transvaginal Sono HSG was done on USG machine using 7.5 MHz vaginal transducer. Patients were administered 20 MG of hyoscine-N-butyl bromide (buscopan) intramuscularly one hour before the procedure in an attempt to eliminate tubal spasm which otherwise might lead to an erroneous diagnosis of tubal

obstruction. Patient made to lie down in supine dorsal position with buttocks at the edge of the table. Vaginal instrument applied, cervix and posterior fornix were thoroughly cleaned with antiseptic solution and 8F Foley's catheter was inserted transcervically. Two to three ml of saline was then injected into the Foley's bulb to stabilize it. Small amount of coupling gel was applied to the inner surface of the top of condom to assure contact. Once the preparation was completed, the transducer was gently inserted into the vagina.

The 3 scanning maneuvers used were, side-to-side movement within the upper vagina for sagittal imaging, transverse orientation for imaging in semi axial/axial planes, and cervical imaging by gradual withdrawal of probe.

Images of uterus with the Foley's catheter in situ were obtained in the sagittal coronal planes then concentrated on an area between the left cornua of the uterus and the left ovary. About 20 -30 cc of sterile saline with air was pushed through the Foley's catheter. The left tube if patent distended and mixture of saline with air bubbles gushed pass the ovary to give rise to what is known as 'the waterfall signs' on Sono HSG. The procedure was repeated on right side. The catheter was then deflated and pulled out. The following sonographic features were regarded as evidence of tubal patency as presence of free fluid in a) Both adnexa and around the pelvic part of bowel loops; b) Either of the adnexa indicating patency of ipsilateral fallopian tube; c) Pouch of Douglas alone; d) all of the above sites. Any intrauterine pathology as fibroid, polyp, adhesions etc. were also recorded.

Diagnostic laparo-hysteroscopy (DLH)

After sono HSG patient was shifted to operation theatre. Procedure was carried out under general anesthesia with controlled ventilation and muscle relaxants. After proper positioning 30 degree hysteroscope introduced and NS instilled through hysteroscope. Any positive finding like polyp, fibroid etc. were visualized and recorded. The laparoscopic was introduced through a small Infra-umbilical incision. After the examination of internal organs, tubal patency was checked by instilling 20 ml of sterile methylene blue solution (0.1%) into the uterus through uterine elevator. Intratubal occlusion was diagnosed if tubal filling and distension was noted within the tube proximal to the fimbrial end and distal occlusion if similar fillings and distension extended up to the fimbrial end. The results were recorded and analyzed by appropriate statistical methods. A 5-days course of doxycycline and metronidazole was given. Subjects were discharged on the same day or one day after the operation.

RESULTS

Out of 120 patients of infertility maximum cases were between 26 - 30 years of age (60%). Eighty-six (71.67%) had primary infertility while 34 (28.63%) had secondary

infertility. Duration of infertility is ranged from 1-15 years with the majority of patients (71.67%) showing infertility of 2-5 years' duration. Out of 120 patients 64 (53.33%) were Montoux reactive while 56 were non-reactive (Table 1).

Table 1: Demographic parameters.

Age distribution		
Age groups (years)	No of patients	Percentage
20-25	36	30
26-30	72	60
31-35	8	6.67
36-40	4	3.33
Type of infertility		
Primary infertility	86	71.67
Secondary infertility	34	28.33
Duration of infertility (years)		
2-5	86	71.67
6-10	30	25
11-15	4	3.33
Montoux test		
Positive	64	53.33
Negative	56	46.67

Sono HSG revealed bilateral tubal patency in 80 cases, B/L tubal block in 18 cases and right and left sided tubal blocks in 12 and 6 cases respectively. Inconclusive results drawn in 4 patients and other associated findings were also noted (Table 2).

Table 2: Findings on Sono hysterosalpingography (sono HSG).

Findings	No. patients	Percentage
B/L tubal patency	80	70
B/L tubal block	18	15
Right tubal block	12	10
Left tubal block	6	5
Poor tubal image with inconclusive results	4	3.33
Cystic ovary	4	3.33
Endometriosis	4	3.33
T.O. mass	4	3.33
Hydro salpinx	4	3.33
PCOD	4	3.33
Fibroid	8	6.67
Congenital abnormalities	2	1.67
Hypertrophic endometrium	12	10
Irregular uterine cavity	4	3.33
Intra uterine adhesions	4	3.33
Mucosal polyp	4	3.33

Diagnostic laparoscopy revealed bilateral tubal patency in 90 cases. Bilateral tubal block in 14 cases, right and left side tubal block in 10 and 6 cases respectively. Other

findings like cystic ovary, hydro salpinx, congenital abnormalities were also noted. Diagnostic hysteroscopy revealed hypertrophic endometrium in 12 cases, irregular uterine cavity in 4, deep seated corneal openings in 16 cases. Normal endometrial cavity was noted in 70 cases (Table 3). When various findings on Sono HSG and laparohysteroscopy were compared, endometriosis, TO mass, tubercles, adhesions, PCOD, fibroid uterus etc. were better detected on the laparoscopy and deep seated corneal openings, congenital abnormalities, intrauterine adhesions were better detected on hysteroscopy (Table 4).

Table 3: Findings on diagnostic laparohysteroscopy (DLH).

Laparoscopic findings	No. patients	Percentage
B/L tubal patency	90	75
B/L tubal block	14	11.67
Right tubal block	10	8.33
Left tubal block	6	5
Mild to moderate endometriosis	14	11.67
Cystic ovary	6	5
T.O. mass	6	5
Hydro salpinx	6	5
Congenital abnormalities	6	5
Fibroid	6	8.33
PCOD	4	3.33
Tubercles	8	6.67
Adhesion	8	6.67
Frozen pelvis	4	3.33
Hysteroscopy findings		
	No. patients	Percentage
Normal endometrial cavity	70	58.33
Hypertrophic endometrium	6	5
Irregular uterine cavity	4	3.33
Deep seated cornua	16	13.33
Congenital abnormalities	6	5
Intrauterine adhesion	12	10
Mucosal polyp	6	5

Comparison of Sono HSG and diagnostic laparoscopy findings revealed bilateral tubal patency on Sono HSG as well as laparoscopy in 78 cases, bilateral tubal patency on Sono HSG necessary but not on laparoscopic in 6 patients, bilateral tubal patency on laparoscopy but not on Sono HSG in 12 cases and bilateral tubal patency neither on Sono HSG nor on laparoscopy in 24 cases. On statistical analyses the results of two modalities in assessment of bilateral tubal patency were found to be comparable. As compared to DLH, Sono HSG has sensitivity of 86.6%, specificity of 80%, positive predictive value of 92% and negative predictive value of 66% (Table 5).

Comparison of Sono HSG with hysteroscopy revealed normal uterine cavity by both Sono HSG and diagnostic hysteroscopy (DH) in 70 cases (true negatives), uterine factors seen both by Sono HSG and DH (true positives) in 28 patients, pathology seen on Sono HSG but not on hysteroscopy (false positives) in 2 patients and pathology

seen on hysteroscopy but not on sono HSG (false negatives) in 20 patients. On statistical analysis Sono HSG found to be 58.33% sensitive, 97.22% specific, 93.33% positive predictive value and negative predictive value of 77.78% (Table 6).

Table 4: Comparison of various findings on Sono HSG and DLH.

Finding	Sono HSG		DLH	
	No. of patients	Percentage	No. of patients	Percentage
Cystic ovary	4	3.33	6	5
Endometriosis (mild to moderate)	4	3.33	14	11.67
T.O. mass	4	3.33	6	5
Hydro salpinx	4	3.33	6	5
Adhesion	2	1.67	4	3.33
Fibroid	8	6.67	6	8.33
PCOD	4	3.33	4	3.33
Tubercles	0	0	8	6.67
Congenital anomalies	2	1.67	6	5
Frozen pelvis	0	0	4	3.33
Hyper Proliferative endometrium	12	10	6	5
Irregular uterine cavity	4	3.33	4	3.33
Deep seated cornual opening	0	0	16	13.33
Congenital abnormal	2	1.67	6	5
Intra uterine adhesion	4	3.33	12	10
Polyp	4	3.33	6	5
Total	58	48.32	118	98.32

Table 5: Comparison of Sono HSG and diagnostic laparoscopy in assessing B/L tubal patency.

Criteria	No. of patients (%)
B/L tubal patency on Sono HSG and laparoscopy (true positive)	78 (65)
B/L tubal patency on Sono HSG but not on laparoscopy (false positive)	6 (5)
B/L tubal patency on laparoscopy but not on Sono HSG (false negative)	12 (10)
B/L tubal patency neither on laparoscopy nor on Sono HSG (true negative)	24 (20)

Table 6: Comparison of Sono HSG and hysteroscopy in diagnosing uterine factor of infertility and subfertility.

Criterion	No. of patients	Percentage (%)
Uterine pathology seen by both HSG and DH (true positive)	28	23.33
Pathology on Sono HSG but not on Hysteroscopy (false positive)	2	1.67
Pathology on hysteroscopy but not on Sono HSG (false negative)	20	16.67
Pathology neither on Sono HSG nor on hysteroscopy (true negative)	70	58.33

DISCUSSION

During infertility evaluation, tubal assessment is one of the most important element as it is major contributor for infertility. Traditionally tubal patency assessment has been made by CO₂ insufflation of the fallopian tube (Rubin test).⁶ Sono HSG is relatively less invasive technique in evaluation of uterotubal factors in infertile women. Present study was conducted on 120 infertile women. Uterotubal factors were evaluated by Sono HSG followed by

Diagnostic laparohysteroscopy (DLH). The results were then analyzed.

In our study maximum patients were between 20 to 30 years of age (90%) which is almost same as study done by Dawle et al (2014).⁷ In our study primary infertility were noted in 86 patients (71.67%) and secondary infertility in 34 patients (28.33%) which is in accordance with the study done by Arjumand Bano and Parvathapuram Sneha (2021).⁸ Out of 120 patients 102 patients had same findings regarding tubal factors on TVS Sono HSG and DLH. These included 78 true positives i.e. patent tubes on

both evaluations and 24 true negatives i.e. blocked tubes on both procedures. Thus the accuracy of Sono HSG with the laparoscopy as gold standard was 85% and this correlates with many studies like Nabil et al (2011), Suttipichate et al (2002).^{9,10} In evaluation of tubal patency with laparoscopy, sono HSG has sensitivity of 86.6%, specificity of 80%, positive predictive value of 92%, negative predictive value of 66% and diagnostic accuracy of 85%, which is also comparable with a study done by Saima et al (2018).¹¹ In the evaluation of uterine factors with hysteroscopy Sono HSG has sensitivity of 58.33%, specificity of 97.22%, positive predictive value of 93.33% and negative predictive value of 77.78 % which is again in accordance with the study done by Nayak et al (2020).¹² In our study no adverse event except mild pelvic pain during instillation of saline through uterine cavity in 20 (16.7%) patients were noted. No other immediate or remote complication was seen by either Sono HSG or DLH. Tanawattanacharoen et al (2000) noted pelvic pain in 36.66 % followed by nausea in 5% and vaginal bleeding in 3.33% of patients during Sono HSG.¹³ Sono HSG is not a substitute for DLH but it can be considered as non-invasive screening procedure in the evaluation of infertility, which is also supported by Luciano et al (2011).¹⁴

CONCLUSION

Sono HSG should be the first step procedure of choice in assessment of tubal patency and if it does not demonstrate patency, the next step should be the diagnostic laparoscopy hysteroscopy (DLH) evaluation. Our study demonstrated excellent agreement with the gold standard (laparohysteroscopy with chromopertubation). Thus TVS Sono HSG with its accuracy and safety, is a promising screening and diagnostic technique in evaluating tubal patency and uterine factors on an ambulatory basis.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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