

Original Research Article

# Comparative study of tubal patency by hysterosalpingography, transvaginal sonosalpingography and laparoscopy

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## Abstract

**Background:** Infertility is a global issue in reproductive health. In many cultures the ability to have children is important sign of an individual's worth.

**Aim and objective:** To compare hysterosalpingography, transvaginal sonosalpingography and laparoscopic chromotubation for evaluation of tubal factor in infertility.

**Materials and methods:** This consisted of 50 infertile women with either primary or secondary infertility. Including investigations for other factors, tubal factor was evaluated by hysterosalpingography, transvaginal sonosalpingography and laparoscopic chromotubation (in one or two cycles).

**Results:** The results of 50 cases of Infertility for Tubal patency by sonosalpingography, HSG, laparoscopy. 36 cases were of primary infertility and 14 cases of secondary infertility. Mean duration of primary and secondary infertility were  $5.79 \pm 3.19$  and  $5.97 \pm 3.36$  years respectively. Maximum number of cases had duration of infertility between 1 to 4 years (45.2 %). The average age in subjects of primary infertility were  $26.25 \pm 3.85$  years and in subjects of secondary infertility were  $29.73 \pm 4.87$  years. Up to 70% of cases had a high school or less than high school education and 92% of women were not employed. 29 patients had bilateral patency, in 14 patients had bilateral block, In 7 patients had unilateral block (either proximal or distal. findings in sonosalpingography, bilateral patency in 34 cases, findings at laparoscopy, bilateral patency number of cases 32 (64%), bilateral block no. of cases 12 (24%) and unilateral block no. of cases 6 (12%). In the group of Patients with Bilateral Patency there were 2 false Negative for HSG i.e. 22%, HSG and Laparoscopy are in agreement with 94%. There were 2 false positives for TVS i.e. 22%, between TVS and Laparoscopy

were in agreement with 94%. In the group of patients with bilateral block there was 100% agreement between TVS and Laparoscopy. There was 2 false positive for bilateral block, agreement between HSG and Laparoscopy being only 94%. In the group of patients with unilateral block there were 2 false negatives for TVS rate 22%, agreement between TVS and Laparoscopy being 67%, For HSG false positive rate 11%, agreement between HSG and Laparoscopy being 85.5%.

**Conclusion:** Low risk subjects for tubal factors in infertility, sonosalpingography can be employed as a screening procedure to pick up subjects needing HSG and laparoscopy. It is simple, in expensive, minimally invasive and one which would be complimentary to the armamentarium of infertility investigations already available.

## Key words

Tubal patency, Infertility laparoscopy, Sonosalpingography.

## Introduction

Infertility is a global issue in reproductive health. In many cultures the ability to have children is an important sign of an individual's worth. A women's status in the society of many developing countries are often identified with her fertility. It is estimated that 10–15 % of couples seek treatment for infertility [1]. It is generally considered appropriate to evaluate a couple for causes of infertility after 1 year of failed attempts at conception. However, given the inverse relationship of female fertility with age, it is often recommended that women over 35 years of age be evaluated after 6 months of failure to conceive, and women older than 40 are evaluated immediately.

Failure to have children can be seen as a social disgrace often a cause for divorce. Treatment for infertility is long, costly and often unsuccessful. Infertility implies apparent failure of a couple to conceive while 'Sterility' indicates absolute inability to conceive. If a couple fails to achieve pregnancy often one year of unprotected and regular intercourse it is an indication to investigate the couples. Infertility is termed Primary if conception has never occurred it Secondary if the patient fails to conceive often having produced a child of had an undoubted miscarriage (including ectopic pregnancy). Incidence of infertility is approximately 16.7%. Infertility forms 8-10% of cases seen in Gynaecology clinics of Indian hospitals. According to recent survey covering 27 countries

the incidence of infertility was 2-5% (primary) and 3-7% (secondary). MalPani, et al. [2] says that patients are much more willing to accept an examination done with a vaginal probe when this is performed by the gynaecologist himself.

A variety of factors may affect normal fertility including patient age, anatomy, ovulatory status, and sperm quality. Potential causes of infertility can be divided into male and female causes and include endocrine, anatomic, genetic, and behavioural conditions [3]. As a result, the evaluation of the infertile couple is multifactorial, necessitating physical examination, hormonal testing, and imaging. Because the infertility population is under a great deal of psychological and emotional stress, these patients benefit from a structured and streamlined evaluation. In particular, evaluation of the female partner attempting to conceive requires assessment of the uterus, endometrium, and fallopian tubes for anomalies or abnormalities potentially preventing normal conception. The best method for assessing these structures usually involves some combination of transvaginal sonography (TVS), hysterosalpingography (HSG), and hysteroscopy (HSC). Less often, pelvic magnetic resonance imaging (MRI) and saline infusion sonohysterography (SIS) are used.

The raised incidence of secondary infertility is due to infections- post abortal, puerperal and Sexually transmitted diseases although

population explosion in developing countries is a major problem demanding effective control of human fertility. Yet infertility remains one of the most difficult problems affecting married couples.

### **Materials and methods**

This study was conducted at the Department of obstetrics and gynaecology, Government Maternity Hospital, petlaburj, Hyderabad. This consisted of 50 infertile women with either primary or secondary infertility. Including investigations for other factors, the tubal factor was evaluated by: Hysterosalpingography - Transvaginal sonosalpingography and Laparoscopic chromotubation (in one or two cycles).

### **Inclusion criteria**

History of both wife and husband. Clinical examination. Ovulation factor - By BBT, endometrial biopsy and ultrasound. Cervical factor - by quantity and quality of cervical mucus and post coital test. Hormonal factor. Male factor - semen analysis.

### **Exclusion criteria**

Impotence, premature ejaculation, retrograde ejaculation. Emotional status, habits, addictions. History of mumps, measles, smallpox, tuberculosis. History of exposure to STD. History of diabetes, hypertension. History of radiation, chemotherapy. History of surgery for hernia, varicocele, spinal cord injury etc. evaluation of the infertile male:- history: Name, age, occupation, previous marriage, issues. Sexual history general examination: Build, height, weight. Secondary sexual characteristics. Vital data.

The procedure was performed between days 6 and 12 of the menstrual cycle at least 48 hours after menses had ceased. The women were advised to avoid unprotected intercourse in this period. HSG was performed using a sterile technique. The patients were placed in a lithotomy position, and a vaginal speculum was

inserted. The balloon catheter was inflated within the endocervical canal or lower uterine cavity. Approximately 10–15 mL of a water-soluble contrast was injected manually through the cannula. Fluoroscopic examination was performed during the injection. Three x-ray films were taken; images of early and maximal opacification of the uterine cavity, fallopian tubes, and peritoneal contrast spillage were obtained. Prophylactic antibiotics were prescribed. The patients were routinely pre-medicated prior to the procedure with oral mefenamic acid 500 mg three times per day until 48 hours after the procedure. The results of HSG were evaluated by radiologists.

Laparoscopy was performed under a general anaesthesia by an infertility specialist (the first researcher). A one cm incision was made within or just below the lower edge of the umbilicus. Through this incision the abdominal cavity is inflated with carbon dioxide gas and pneumoperitoneum being obtained. A trocar was inserted in the same region. The cannula of the trocar was left, and the trocar was pulled out. Then a laparoscope was introduced through the cannula. The abdominal cavity and pelvic were examined in the trendlenburg position. Atraumatic grasper forceps were used by the assistance of a second trocar for better visualization. A third trocar was applied if required. To assess tubal patency, methylene blue was injected through another uterine manipulator and results of laparoscopy were recorded by the infertility specialist as well. Demographic characteristics were collected through the interview using a structured questionnaire. Results of HSG and laparoscopy were also recorded in a check list by a trained midwife. Variables were age, primary and secondary infertility, duration of infertility, job, education, tubal patency (yes or no), bilateral no tubal patency and unilateral no tubal patency. Primary infertility describes couples who have never been able to become pregnant after at least one year of unprotected sexual cohabitation. Secondary infertility describes couples who have been pregnant at least once, but have not been

able to become pregnant again. The Laparoscopy findings were used as a reference standard to calculate sensitivity, specificity, positive and negative predictive values for bilateral tubal no patency and unilateral or bilateral tubal no patency. Data was analyzed by SPSS software (version 16).

The study protocol was approved by the local research ethics committee. Patients were enrolled after having provided their informed written consent. Participants were assured that their information would be kept confidential and provisions of the Helsinki Convention were considered.

## Results

The results of 50 cases of infertility for Tubal patency by Sonosalpingography, HSG, Laparoscopy. 36 cases were of primary infertility and 14 cases of secondary infertility.

Mean duration of primary and secondary infertility were  $5.79 \pm 3.19$  and  $5.97 \pm 3.36$  years respectively. Maximum number of cases had duration of infertility between 1 to 4 years (45.2%).

The average age in subjects of primary infertility were  $26.25 \pm 3.85$  years and in subjects of secondary infertility were  $29.73 \pm 4.87$  years. Up to 70% of cases had a high school or less than high school education and 92% of women were not employed.

In 50 patients studied 29 patients had bilateral patency, 14 patients had bilateral block. 7 patients had unilateral Block (either proximal or distal).

There was bilateral spillage and fluid in POD showing Bilateral Patency in 34 cases. There was distension of uterus without spillage and no collection in the POD Showing Bilateral Tubal block in 12 cases. There was collection in POD and unilateral spillage in 4 Cases (**Table – 1 to Table – 7**).

**Table - 1:** Demographic distributions.

Age in years	No. of cases	%
20-25	17	34
26-30	26	52
31-35	6	12
36-40	1	2
<b>Duration of infertility</b>		
1-2	0	0
2-3	6	12
4-5	16	32
6-10	22	44
11-15	5	10
15	1	2
<b>Menstrual cycle</b>		
Regular cycles	38	76
Oligomenorrhoea	11	22
Polymenorrhoea	1	2
<b>Cause associated</b>		
Post abortal/ Delivery	8	55.6
History of PID	4	28.5
Unknown	2	14.2

**Table - 2:** On examination of patient.

Per speculum examination	No. of cases	%
Vulvitis	Nil	Nil
Cervicitis	10	20
Vaginitis	2	4
Pinhole Os	2	4
T.O. Mass	2	4
<b>Bimanual examination</b>		
Uterus-AV	36	72
Uterus-RV	6	12
Hypoplastic uterus	2	4
PCOD	4	8

## Additional findings

Hydrosalpinx - 2  
 PCOD - 4  
 Pelvic Adhesions - 4  
 Frozen Pelvis - 1  
 Ovarian Cysts - 2  
 (Video Assisted Laparoscopic Cystectomy Done)

**Table - 3:** Male factor associated and also endometrial biopsy.

Semen Analysis	No. of cases	%
Normal Semen Analysis	38	76
Oligospermia	10	20
Azoospermia	2	4
Endometrial Biopsy-Histopathology		
Secretary Phase	32	64
Proliferative Phase	10	20
Luteal Phase Detect	1	2
Cystic Glandular Hyperplasia	7	14

**Table - 4:** Finding at Hysterosalpingography.

Findings	No. of cases	Percentage
Bilateral Patency	29	58
Bilateral Block	14	28
Unilateral	7	14

**Table - 5:** Findings in Sonosalpingography.

Findings	No. of cases	Percentage
Bilateral Patency	34	72
Bilateral Block	12	24
Unilateral Patency	4	8

**Table - 6:** Findings at laparoscopy.

Bilateral Patency	No. of cases	Percentage
Bilateral Patency	32	64
Bilateral Block	12	24
Unilateral Block	6	12

**In the group of Patients with Bilateral Patency**

- There were 2 false Negative for HSG.
- Agreement between HSG and Laparoscopy being 94%.
- False Negative rate being 22%.
- There were 2 false positives for TVS.
- False positive rate being 22%.
- Agreement between TVS and Laparoscopy being 94%.

**In the group of patients with bilateral block**

- There was 100% agreement between TVS and Laparoscopy.
- There was 2 false positive for bilateral block.
- Agreement between HSG and Laparoscopy being only 94%.

**In the group of patients with unilateral block**

- There were 2 false negatives for TVS. False negative rate 22%.
- Agreement between TVS and Laparoscopy being 67%.
- For HSG — there was 1 false positive case false positive rate 11%.
- Agreement between HSG and Laparoscopy being 85.5%.

**Discussion**

Diagnostic imaging plays an important role in the assessment of women with infertility. Although no consensus protocol for work up of these patients exists, the majority of infertility patients undergo a baseline TVS and HSG. TVS is used for evaluating ovaries, fallopian tubes, and the adnexa and is a favoured imaging modality in the infertility population because it is readily available, relatively low cost, and does not use ionizing radiation. TVS is the test of choice for diagnosing polycystic ovary syndrome [4], and is helpful for identifying endometriosis and the sequelae of PID. In addition, TVS is invaluable for monitoring ovarian folliculogenesis during treatment with ART [5, 6]. In contrast, HSG provides information about tubal patency and uterine cavity abnormalities such as anomalies, polyps, synechiae, and adhesions, any of which could interfere with embryo implantation [7]. However, HSG offers limited evaluation of the cervix and myometrium and does carry the small risks of contrast reaction and of ionizing radiation exposure [8]. Besides TVS and HSG, supplemental evaluation with SIS and hysterosalpingo-contrast sonography (HyCoSy) is sometimes performed. These imaging procedures are becoming more popular because of their ability to combine TVS adnexal evaluation with HSG-like assessment of the

uterine cavity, without the risks of contrast reactions and radiation exposure [9-11], but are not yet universally available.

**Table - 7:** Comparisons in groups.

<b>Comparative Study of TVS and HSG</b>			
<b>Observation</b>	<b>TVS</b>	<b>HSG</b>	<b>Correlation</b>
Bilateral Patency	<b>34</b>	<b>32</b>	<b>94</b>
Bilateral Block	<b>12</b>	<b>12</b>	<b>100</b>
<b>Unilateral Block</b>	<b>4</b>	<b>6</b>	<b>67</b>
<b>Comparative Study of TVS and Laparoscopy</b>			
	<b>TVS</b>	<b>Laparoscopy</b>	<b>Correlation</b>
Bilateral Patency	<b>29</b>	<b>32</b>	<b>90.6</b>
Bilateral Block	<b>14</b>	<b>12</b>	<b>85.5</b>
<b>Unilateral Block</b>	<b>7</b>	<b>6</b>	<b>85.5</b>
<b>Comparative Study of HSG and Laparoscopy</b>			
	<b>HSG</b>	<b>Laparoscopy</b>	<b>Correlation</b>
Bilateral Patency	<b>29</b>	<b>34</b>	<b>32</b>
Bilateral Block	<b>14</b>	<b>12</b>	<b>12</b>
<b>Unilateral Block</b>	<b>7</b>	<b>4</b>	<b>6</b>

Laparoscopy, sonosalpingography and hysterosalpingography play complementary roles in the investigation of the infertile female and are not competitive investigative procedures. Sonosalpingography: It is an inexpensive, minimally invasive, simple screening procedure which can be performed in the gynaecologist's office in ten to fifteen minutes only. It fulfills the requirements of a screening test for tubal patency with a low false positive rate. MalPani, et al. [2] said that patients are much more willing to accept an examination done with a vaginal probe when this is performed by the gynaecologist himself. The training and experience for the use of the vaginal transducer can be easily acquired by gynaecologists who are very familiar with pelvic anatomy. The usual record of the ultrasound study can give instant co-relation to the traditional bimanual examination. Sonosalpingography if complemented with the Sion procedure (or hydrofloatation technique) gives us additional information about the mobility and milieu exterior of the tube as well. The important points to be considered are that transvaginal sonography provides information on tubal factors, uterine factors, pelvic factors, and

endocrine factors. Thus one could combine the benefits of laparoscopy, HSG, hysteroscopy and endocrine evaluation in one simple noninvasive test, namely a carefully planned and executed sonographic study. By employing transvaginal ultrasonography for tubal patency and evaluation of the pelvic organs at the first visit of the couple, a quick decision can be taken for the early sorting out of problems and institution of the optimal treatment schedule. The earlier dictum has been that no infertility evaluation is complete without recourse to laparoscopy Pitkin, et al. [12]. Without doubt laparoscopy is the most popular and definitive method for investigating tubal patency and pelvic factors. According to, Rajan, et al. [13] negative laparoscopies can be avoided, whenever pelvic organs are certified normal by the transvaginal ultrasound. There by laparoscopy may be more logically used for patients with pelvic pathology or unexplained infertility and to confirm tubal block. According to Allahabadia, et al. [14], transvaginal ultrasound will be used in every laboratory or office performing obstetrical or gynaecological ultrasound. it will complement many of our traditional transabdominal studies, it will open

new horizons in imaging the cervix, the endometrium and the ovary; it will allow a whole new set of possibilities for ultrasonically guided procedures through the vagina. Ranaweera AKP, et al. [15] the value of sonographic hydrotubation using agitated saline as a screening test for tubal patency.

Suttipichate J, et al. [16] transvaginal saline sonosalpingography for the assessment of tubal patency. Volpi E, et al. [17] the role of transvaginal sonosalpingography in the evaluation of tubal patency. It is a new technique to test tubal patency under transvaginal sonosalpingography control. Lachlan deCrespigny RK [18] infertility investigation through saline infusion sonohysterosalpingography.

## Conclusion

Transvaginal ultrasound has the potential to affect the way we practice medicine on many different levels. The more one uses and explores transvaginal ultrasound, the more one sees that certain of its applications will be far more advantageous than previously available techniques. Sonosalpingography is offered not as a substitute for HSG, laparoscopy, hysteroscopy or salpingoscopy but as an office screening technique for tubal patency; which is simple, inexpensive, minimally invasive and one which would be complimentary to the armamentarium of infertility investigations already available. It can be done at the same time as the pelvic examination in the gynaecologist's office and gives additional information about pelvic pathology. For low risk subjects for tubal factors in infertility, sonosalpingography can be employed as a screening procedure to pick up subjects needing HSG and laparoscopy.

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