

## Role of Combined Hysteroscopy and Trans-Vaginal Ultrasound in Evaluation of Tubal Patency in Infertile Women

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### ABSTRACT

**Background:** Infertility is the failure to adequately have a healthy child. Tubal dysfunction is considered to be the cause of around 30% of all infertility cases. Examinations such as hysteroscopy and trans-vaginal ultrasound in evaluation of tubal patency in infertile women.

**Aim of the work:** To determine the diagnostic utility of TVS done immediately after diagnostic hysteroscopy in measuring tubal patency among infertile ladies, also evaluate the results with those obtained following chromopertubation laparoscopically.

**Patients and methods:** The endoscopic unit at our hospital saw a total of 60 infertile patients for laparoscopic chromopertubation over the three-month period between March 2018 and March 2019. Prior to laparoscopic chromopertubation, a diagnostic hysteroscopy was performed, which was followed by a TVS procedure. Pouch of Douglas was considered proof of tubal patency since it contained free fluid. On the basis of the outcome of TVS and laparoscopic chromopertubation, conclusions were drawn. It was determined if the mix of hysteroscopy and TVS improved the sensitivity, specificity, accuracy, and positive and negative predictive value in verifying unilateral or bilateral tubal patency.

**Results:** The existence of fluid in the pouch of Douglas was identified in 49 out of the 60 instances studied in this study. In all 49 instances, laparoscopic chromopertubation was used to certify the patency of either the unilateral or bilateral tubules. The presence of bilateral tubal blockage was established by laparoscopic chromopertubation in 8 of the last 11 instances (in which there was no fluid in the pouch of Douglas during ultrasonography). TVS is used after diagnostic hysteroscopy for the evaluation of tubal patency and has been shown to have great sensitivity and specificity.

**Conclusion:** In infertile women, TVS done immediately after diagnostic hysteroscopy offers extra information about tubal patency.

**Keywords:** Tubal patency; Laparoscopy; Hysteroscopy; Ultrasound; Gynecology.

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**Authorship:** All authors have a substantial contribution to the article.

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### INTRODUCTION

After one year of frequent unshielded sexual activity, infertility is described as the failure to adequately have a healthy child. Tubal dysfunction is considered to be the cause of around 30 percent of all infertility cases. Examinations to establish whether or not the tubes are patent and unharmed are a crucial element of the infertility evaluation process. <sup>1</sup>

Hysterosalpingography can be used to assess the fallopian tube's patency, laparoscopy chromotubation, and salinohystrography, among other methods of testing (HyCoSy). Falloposcopy per vaginam and salpingoscopy done at laparoscopy were used to create the desired mucosal look. <sup>2</sup>

The use of hysteroscopy as part of a standard infertility evaluation has sparked controversy; yet HSG has been the most widely utilized diagnostic procedure for tubal patency testing for the past many years now. When comparing HSG with hysteroscopy (HSC), a lack of agreement occurred in 30% of the instances, according to the study. <sup>3</sup>

Using hysteroscopy to visualize the uterine chamber from all angles and take direct biopsies of lesions, doctors can make more precise and accurate diagnoses of intrauterine diseases. <sup>4</sup>

Hysteroscopy, on the other hand, is not a reliable means of determining tubal patency or anatomy. Hysteroscopy, on the other hand, can be useful in the

examination of tubal patency when paired with ultrasonography.<sup>5</sup>

It has been recommended in recent years that sonosalpingography should be utilized as the initial step for determining tubal patency.<sup>6</sup>

Tubal patency was assessed using both negative and positive contrasts. When the turbulence of the contrast may be seen on the side or in the Douglas pouch, the tube is deemed patent.<sup>7,8</sup>

In 2009, Yildizhan et al. proposed that utilizing saline distension medium during hysteroscopic examination was useful for measuring accumulated fluid in the peritoneal cavity and confirming at least one patent tube.<sup>9</sup>

Fallopian tube morphological abnormalities can be seen immediately during laparoscopy, which is considered the perfect standard for diagnosing tubal disease and other intra-abdominal reasons of infertility.<sup>10</sup>

Diagnostic laparoscopic has emerged as the ideal technique in many clinics' infertility workups, functioning as the last step before recommending a partner for infertility treatment.<sup>11</sup>

Surgical treatment is possible with diagnostic laparoscopic, but it also puts the patient at risk for operational and anaesthetic complications.

In this study, we compared the findings obtained with laparoscopic chromopertubation to the diagnostic usefulness of TVS, which is performed shortly after diagnostic hysteroscopy to determine fallopian tubal patency in sexually active women.

#### PATIENTS AND METHODS

60 infertile ladies who came to our endoscopic department for laparoscopy chromopertubation had diagnostic hysteroscopy and TVS as part of their treatment plan between March 2018 and March 2019. The research group's average age was  $27.4 \pm 5.1$  years (range 20–35 years), with 40 women being nulligravida. Infertility lasted  $4 \pm 1.6$  years on average (range 1–12 years). All of the participants signed a written consent form, were of reproductive age, and had Ultrasonic folliculometry that indicated ovulation.

**Exclusion criteria** included suspicion of pregnancy, other causes of infertility (endocrinal cause and unexplained cause of fertile couples), symptoms suggestive of pelvic or lower genital tract infection, intractable cervical stenosis which would make insertion of hysteroscopy difficult and uncomfortable, patients with advanced or uncontrolled medical disease and patients with bad general condition, sever obesity and obvious organic pelvic pathology on clinical examination.

HSG was done in another day prior to the procedure using 2.5 ml of urographin dye injected in the cannula and HSG-1 film was taken, then another 2.5 ml of urographin dye was injected and HSG-2 film was taken, later film after 30 min was taken while the patient was in prone position for spill.

All patients received general anesthesia, in this study, an ultrasound instrument Madison Sono ACE R.(Medison, Seoul, South Korea) was used to perform a

basic TVS evaluation of the female pelvis with 5.5 mhz trans-vaginal transducer to evaluate the uterus, identifying the visibility of the Fallopian tubes and evaluating the presence of fluid in the cul de sac and quantifying its amount if present

All hysteroscopic examinations were performed by means of vaginoscopic approach, the process is carried done without using a speculum or tenaculum. Hysteroscopic examination was conducted with a firm 30o hysteroscopy equipped with a 6mm lens and an 8-mm diameter diagnostic sheath that included an operating channel, (KARL STORZ GmbH & Co., Tuttlingen, Germany). Iv-tubing was linked to the inflow channel on the sheath with distilled water for uterine distension. At a fluid delivery system pressure of seventy to one hundred cm H<sub>2</sub>O, each hysteroscopic surgery used an average of 2 hundred ml of fluid. [It was possible to produce this pressure because the fluid bag was one m over the uterine cavity]. The uterine cavity was illuminated with a high-intensity cold light source and fibre optic wire. All of the procedures were videotaped.

TVS was re-performed immediately after finishing the hysteroscopy to detect free fluid in cul de sac and measure its volume by taking 3 dimensions in 2 different planes if present as shown in fig.1. The presence of liquid in the Douglas pouch was taken as a sign of unilateral or bilateral tubal patency.

Chromopertubation is then done through laparoscopy in the same sitting, using a verus needle to create pneumoperitoneum

3 port laparoscopy was used, primary trocher through the sub umbilical incision, two secondary 5mm trochers, through which an instruments are inserted, then navigation through the abdomen and pelvis to assess the uterus, ovaries and search for other lesion that may be significant like peri-hepatic filmy adhesion (Fitz-Hugh-Curtis syndrome) which donates PID, therapeutic reproductive surgery, like coagulation of stage I or II endometriosis, adhesiolysis, or cystectomy, was done during laparoscopy when necessary, followed by a methylene blue test to determine tubal patency, and the incisions were fixed with vicryl suture.

TVS results were compared to laparoscopic chromopertubation and HSG results the sensitivity, specificity, accuracy, and positive, negative predictive values of diagnostic hysteroscopy accompanied by TVS were calculated to assess tubal patency. **Fig. 1**

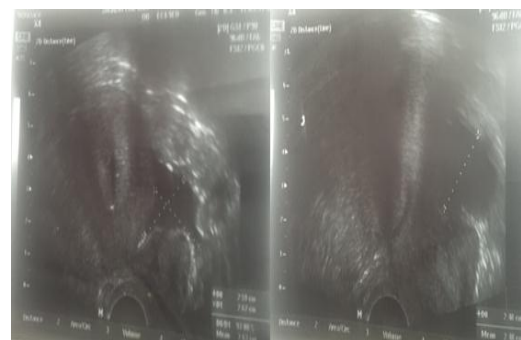


Fig. 1: Showing free fluid in the Douglas pouch and its three-dimension measurement

## RESULTS

The study comprised 60 female with a mean age of 27.4 yrs  $\pm$  5.1(20-35) and the mean was BMI (kg/m<sup>2</sup>) 26.3 $\pm$ 3.7(20.4-34.9) with 40 patients (66.7%) with 1<sup>st</sup> infertility and 20 patients (33.3%) with 2<sup>nd</sup> infertility

In 44 (73.3 percent) of the 60 instances, hysteroscopy was normal. The most prevalent finding (7 instances) among women with aberrant findings was an endometrial polyp, as indicated in table 1. Sub mucous myoma (4 instances) and intra-uterine adhesions were also discovered (3 cases), tubal ostial abnormalities (4 cases), and unicornuate uterus (2 cases) Cervical stenosis (2 cases). the overall count of discovered abnormalities surpasses the real number of patients with such abnormalities since several lesions were found in various individuals; hence, the total number of detected abnormalities above the real percentage of participants with these abnormalities (16 patients).

When comparing HSG to hysteroscopy in uterine assessment, HSG showed normal cavity in 49 case. In 44 of these cases, normal cavity was confirmed by hysteroscopy. Of the 11 cases with abnormal cavity, intra-uterine lesion was confirmed in all 11 cases, giving the HSG a positive-predictive value of 87.5%, a negative-predictive value of 71.4%, an accuracy of 73.4%, a sensitivity of 92.8%, and a specificity of 97.1%.

In 49 cases, an ultrasound reported the existence of fluid in the Douglas pouch. In all 49 of these cases, tubal patency was established by laparoscopic chromopertubation. Laparoscopic chromopertubation verified bilateral tubal blockage in 8 of the 11 negative instances (no fluid in the Douglas pouch). In three of the negative instances, patent tubes were verified laparoscopically, providing diagnostic hysteroscopy supported by TVS a positive predictive value of 100%, a negative predictive value of 72.7 percent, an accuracy of 96 percent, a sensitivity of 94.9 percent, and a specificity of 94.4 percent.

The study showed that the best cut off point of the fluid volume in Douglas pouch after hysteroscopy at which 1 or 2 tubes are patent is six ml with sensitivity of 91.9% and specificity of 66.7percent. The area under the curve is 0.86

In 49 patients, HSG revealed one or two patent tubes. Tubal patency was established in 46 of these instances by laparoscopic chromopertubation. Of the 11 negative cases (with bilateral tubal block), laparoscopic chromopertubation verified bilateral tubal blockage in 5 instances. Patent tubes were verified by laparoscopic chromopertubation in 6 of the negative instances, giving the HSG a positive-predictive value of 92.8%, a negative-predictive value of 50%, an accuracy of 87.5%, a sensitivity of 92.8%, and a specificity of 50%.

Intrauterine abnormalities	No
1- Adhesions:	
• Uterine	3
• Cervical	1
2- Polyps	2
3- Fibroids	4
4- Unicornuate uterus	2
5- Polypoid appearance of the:	
• endometrium	7
• cervical lining	1
6- Tubal ostial abnormalities:	
• Polyp	1
• polyposis	1
• hyperemia	2
7- Cervical stenosis	2
<b>Total</b>	<b>26*</b>

**Table 1:** Hysteroscopically detected intrauterine abnormalities

HSC shedding		Laparoscopy		Total
		Bilateral tubal block	1 or 2 patent tube	
	No	8 (13.33%)	3 (5%)	11(18.33%)
	Yes	0 (0%)	49 (81.66%)	49 (81.66%)
	Total	8 (13.33%)	52 (86.66%)	60 (100%)

**Table 2:** Comparison between the tubal patency results of laparoscopy and the hysteroscopy fluid.

		Laparoscopy		Total	
		BTB*	1 or 2 patent tube		
HSG	BTB	5 (8.33%)	6 (10%)	11	(18.33%)
	1 or 2 patent tube	3 (5%)	46 (76.66%)	49	(81.66%)
	Total	8 (13.33%)	52 (86.66%)	60	(100%)

**Table 3:** Comparison between the results of HSG and laparoscopy regarding tubal patency

## DISCUSSION

In this cross-sectional study, we collected data about 60 sub-fertile females managed at Al-Hussein university hospital and Al-Ahrar teaching hospital to try to find an alternative to HSG.

Our study revealed that the hysteroscopic fluid shedding had a sensitivity of 94.9%, specificity of one hundred percent, PPV of one hundred percent, and NPV of 72.7%, while HSG had a sensitivity of 92.8 percent, specificity of fifty percent, PPV of 92.8 percent, and NPV of 50%. The total validity and Kappa agreement of hysteroscopic fluid shedding and HSG with laparoscopy were (95%, 0.815 vs. 87.5%, 0.43, respectively).

Few studies have offered the notion of identifying fluid in a cul-de-sac as a measure of tubal patency. Apart from Begum et al., none of these studies were identical to ours in terms of how the saline was passed from the uterus to the peritoneal cavity. Saline was administered by hysteroscopic procedure while the uterine cavity was explored in both experiments, whereas saline was given using a Foley or Nelaton catheter in the other trials.

Richman demonstrated the capacity of ultrasonography to identify the patency of at least one fallopian tube in 35 infertile women by displaying free fluid in the cul-de-sac. HSG was utilised to compare the findings. With a sensitivity of 100 percent, ultrasound revealed bilateral occlusion and tubal patency with a specificity of ninety-six percent.<sup>13</sup>

In contrast to laparoscopy, Randolph found that U/S was equally perfect (sensitivity one hundred percent, specificity ninety one percent) in proving the presence of tubal patency as HSG (sensitivity ninety six percent, specificity ninety four percent), but less effective in measuring which tubes were patent<sup>14-15</sup>

Our study's lower sensitivity was due to the inclusion of three instances with adhesions (Laparoscopy revealed two pelvic and hysteroscopy revealed one intrauterine adhesion.) that might inhibit saline from accumulating in DP.

Sonosalpingography utilizing either a mixture of air and saline or Echovist as a contrast medium has been used for determining tubal patency. In recent years, sonosalpingography has been proposed as a perfect approach for determining tubal patency.<sup>16</sup>

Unlike sonosalpingography, our investigation was unable to show which side of the fallopian tubes the fluid had travelled through, making it impossible to determine the side of tubal block. Our work

compensated for the absence of turbulence visualization in sonosalpingography by measuring the amount of fluid in the DP upon and following hysteroscopy to evaluate hysteroscopic shedding. Then the cutoff value was estimated at/up which both tubes would be considered patentable.

In order to calculate the fluid volume (cut-off point) at which uni/bilateral tubal patency could be estimated, the sensitivity and specificity for the variety of probable cut-off points (volumes of hysteroscopic shedding) was graphically represented by ROC curve. A 6ml cutoff limit for fluid volume at which both tubes are patent was discovered to be the most sensitive and specific (91.9 percent) and to have the highest sensitivity and specificity (91.9 percent) (66.7 percent).

The accuracy of this test could be detected from the nearer the curve matches the left-hand border and then the top border of the ROC space and the area under the curve being 0.899.

Unlike sonosalpingography, our investigation was unable to show which side of the fallopian tubes the fluid had travelled through, making it impossible to determine the side of tubal block. Our work compensated for the absence of turbulence visualization in sonosalpingography by measuring the volume of fluid in the DP upon and following hysteroscopy to evaluate hysteroscopic shedding. Then the cutoff value was estimated at/above which both tubes would be considered patentable<sup>17</sup>

## CONCLUSION

Adding TVS to hysteroscopy enables assessment of the tubal patency, myometrium, and adnexa, adding valuable information to that gathered by hysteroscopy. This method is an outpatient and well tolerated procedure that can be utilized as a preliminary diagnostic procedure in determining infertility. Hysteroscopy is recommended whenever laparoscopy is planned, as it allows complete identification of all contributory factors.

Conflict of interest : none

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