

## Salpingoscopy: An Adjuvant to Laparoscopy in Evaluation of Infertile Women

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### About the Author



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### Abstract

**Objective** To evaluate salpingoscopic tubal mucosal grading and to find out correlation between laparoscopic external tubal appearance and salpingoscopic mucosal appearance.

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**Design** Prospective observational study.

**Intervention** Salpingoscopy and laparoscopy.

**Materials and Methods** Thirty-seven infertile women between 21 and 40 years of age group who attended infertility clinic at IKDRC, Ahmedabad, from May 2015 to August 2015, were enrolled in the study. Laparoscopic tubal morphology was classified as regular, convoluted and hydrosalpinx. Salpingoscopic findings were graded (Grade I–Grade V) according to Brosens classification.

**Results** Laparoscopic appearance of tube was regular in 18 (48 %), convoluted in 17 (45.94 %), and hydrosalpinx in 2 (5.4 %) women. Salpingoscopic findings were graded as Grade I in 14 (37.83 %), Grade II in 10 (27.02 %), Grade III in 8 (21.62 %), Grade IV in 3 (8.10 %), and Grade V in 2 (5.4 %) women. Discordance between laparoscopic and salpingoscopic findings, i.e. regular appearance on laparoscopy and Grade III–Grade V appearance on salpingoscopy, was found in 38.88 % women.

**Conclusion** Laparoscopy alone might not be sufficient to predict tubal integrity and salpingoscopic endotubal grading may help in infertility treatment selection decisions. Early counselling towards IVF-ET can be encouraged in cases with higher grade.

**Keywords** Laparoscopy · Infertile · Salpingoscopy · Endotubal mucosa

## Introduction

Fallopian tube plays a vital role in oocyte retrieval and transport, sperm transport and capacitation, fertilization, and embryo storage [1]. It is estimated that 25–35 % of infertile women have tubal damage. This can be due to infection, inflammation, tuberculosis, endometriosis, and previous surgery (tubal or non-tubal surgery, appendicitis, others) [2].

Incidence of tubal factor infertility is underestimated as evaluation of tubal function is largely restricted to the assessment of tubal patency; it needs to be further assessed as infertility frequently persists in spite of successful restoration of patency in many cases and tubal pregnancy frequently occurs after infertility surgery which suggests undiagnosed underlying endotubal pathology [3].

While HSG remains the traditional method, laparoscopy is considered gold standard for evaluation of mechanical factors affecting fallopian tubes, but it cannot be used to directly observe the inner lumen of the fallopian tube [4]. Prediction of fertility by laparoscopy can be improved by concomitant performance of salpingoscopy that enables the visual inspection of ampullary and infundibular mucosa [2, 4].

Risk profile of salpingoscopy is comparable to laparoscopy, since both are performed simultaneously.

Primary aim of the present study was to examine correlation between laparoscopic external tubal and salpingoscopic mucosal findings in infertile women at our institute.

## Materials and Methods

The present study was a prospective observational study conducted at tertiary care hospital from May 2015 to August 2015. Thirty-seven infertile women between 21 and 40 years who attended infertility clinic were enrolled in the study, after detailed clinical history, physical examination, and investigations.

Informed written consent was obtained from all patients for the study and approved by local ethics committee.

Exclusion criteria for the procedure were same as for diagnostic laparoscopy which includes abnormal semen

parameters, contraindication to surgery, low ovarian reserve, infection, severe hydrosalpinx, and high-grade endometriosis.

Salpingoscopy was done in all infertile women who underwent diagnostic laparoscopy and showed at least one patent tube on chromopertubation test, during postmenstrual phase (day 5–day 9) under general anaesthesia. Laparoscopy was done by a transumbilical 5-mm port with two accessory 5-mm ports for ancillary instruments and salpingoscope. Laparoscopic external tubal morphology was classified for convenience as: regular (normal morphology), convoluted (any altered morphology, and hydrosalpinx (except severe degree). [4]. The entire laparoscopic procedure was completed before performing salpingoscopy as was adhesiolysis or endometrial tissue fulguration.

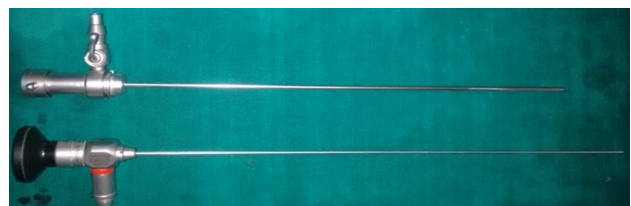
For salpingoscopy, a 2-mm, 30° rigid salpingoscope (Karl Storz, Germany Hopkins II) with an outer sheath of 2.8 mm diameter was used (Fig. 1).

After confirming tubal patency, an atraumatic grasping forceps were applied to hold the tubal wall against the sheath of salpingoscope, just behind the fimbrial end. Normal saline was used as distending medium with the aid of gravity to open up the intratubal space mainly the ampullary portion, up to ampulloisthmic region, to facilitate visualization of the mucosal folds which floats in the distending medium.

The mucosa of the ampullary segment in normal cases consisted of 3–5 major mucosal folds with secondary folds arising from them along with running vessels and several minor folds interspaced among them are seen around the whole circumference of the tubal lumen. The density of the mucosal folds increases towards the fimbrial end.

Salpingoscopic mucosal appearance was graded according to Brosens and Puttemans classification (1989) as follows: Grade I: normal mucosal folds (both major and minor); Grade II: the major folds are separated and flattened, but otherwise normal/dye staining of mucosa/minimal flattening; Grade III: focal adhesions between mucosal folds and variable flattening; Grade IV: extensive adhesions between mucosal folds and disseminated flat areas; and Grade V: complete loss of mucosal fold pattern.

All relevant information for follow-up was recorded on specially designed performa for the study.



**Fig. 1** Salpingoscope (2 mm) with its outer sheath (2.8 mm, Karl storz Germany Hopkins II)

All collected data was entered into the SPSS v20 and statistical analysis conducted. Chi-square test was used to calculate *P* value. '*P*' value < 0.05 was considered to be statistically significant. NS represents non-significant difference between the groups.

## Results

Baseline characteristics of the study population are given in Table 1. Mean age of the infertile women was  $27.89 \pm 3.20$  years. Mean duration of infertility was  $41.84 \pm 17.17$  months. Primary infertility was seen in 79.59 % women. Mean time for salpingoscopic procedure was  $9.35 \pm 2.07$  min. Salpingoscopy did not result in any intraoperative or delayed complication.

Distribution of infertile women according to laparoscopic appearance is given in Table 2. Regular external tubal morphology was found in 18 (48 %), convoluted in 17 (45.94 %), and hydrosalpinx in 2 (5.4 %) infertile women. Salpingostomy was also performed in fallopian tubes having hydrosalpinx. In few cases, pelvic adhesions were found which were released as far as possible.

Figure 2 shows grading distribution of salpingoscopic mucosal appearance among the same group of infertile women. Grade I was found in 14 (37.83 %), Grade II in 10 (27.02 %), Grade III in 8 (21.62 %), Grade IV in 3 (8.10 %), and Grade V in 2 (5.4 %) infertile women.

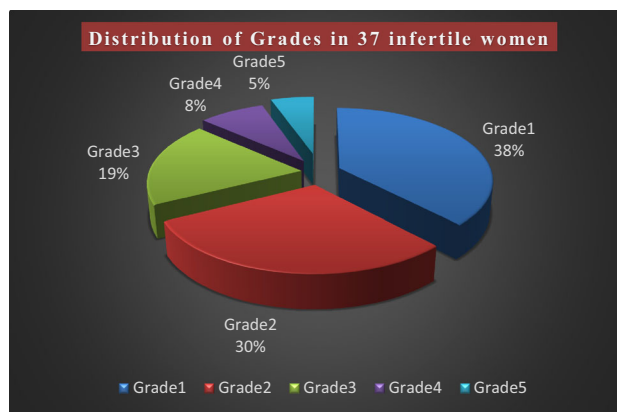
Table 3 and Fig. 3 show distribution of laparoscopic and salpingoscopic findings in total 74 fallopian tubes

**Table 1** Background of the infertile women underwent diagnostic hysterolaparoscopy with salpingoscopy

Summary of infertile women underwent diagnostic laparoscopy and salpingoscopy	
No. of patients	37
Mean age $\pm$ SD (years)	$27.89 \pm 3.20$ years
Mean $\pm$ SD duration of infertility (months)	$41.84 \pm 17.17$ months
Primary infertility (%)	81.08 %
Secondary infertility (%)	18.91 %

**Table 2** Distribution of laparoscopic external tubal appearance in infertile women

Laparoscopic external tubal appearance	No. of women ( <i>n</i> = 37)	Percentage (%) ( <i>n</i> = 37)
Regular	18	48
Convoluted	17	45.94
Hydrosalpinx	2	5.4



**Fig. 2** Distribution of endotubal mucosal grading in all infertile women

examined. As per Table 2, number of fallopian tubes with regular appearance was 36, convoluted appearance was 34 tubes, and hydrosalpinx was 4 tubes. Non-significant difference (*P* value 0.16) was found between the groups.

As shown in Fig. 3, Grade III–Grade V (Fig. 4c–e, respectively) endotubal appearance was found in seventeen fallopian tubes in spite of having regular external morphology, and in contrast, Grades I (Fig. 4a, b) and II were found in three fallopian tubes having hydrosalpinx appearance externally.

The study also showed lack of correlation between salpingoscopic and laparoscopic tubal findings with the value of correlation  $-0.10$  which shows negative correlation between variables.

Maximum infertile women were from 26 to 30 years of age group. Mild and moderate endometriosis (AFS classification) was found in 16 cases (43.24 %). We found low positive correlation (value  $-0.18$ ) between salpingoscopic findings and mild-to-moderate endometriosis.

## Limitations of the Study

Sample size is small, and these patients need to be followed up with respect to reproductive outcome. Limited number of infertile women with high salpingoscopic grade, i.e. Grade IV and Grade V, was found, and the procedure requires special instruments and expertise.

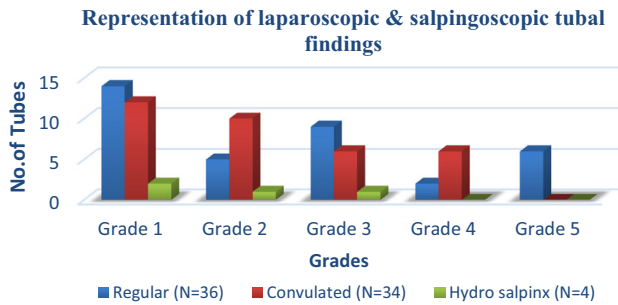
## Discussion

Tubal factor is reported to account for 25–35 % of subfertility in the Western medical literature, but the prevalence appears to be higher in India due to the higher rates

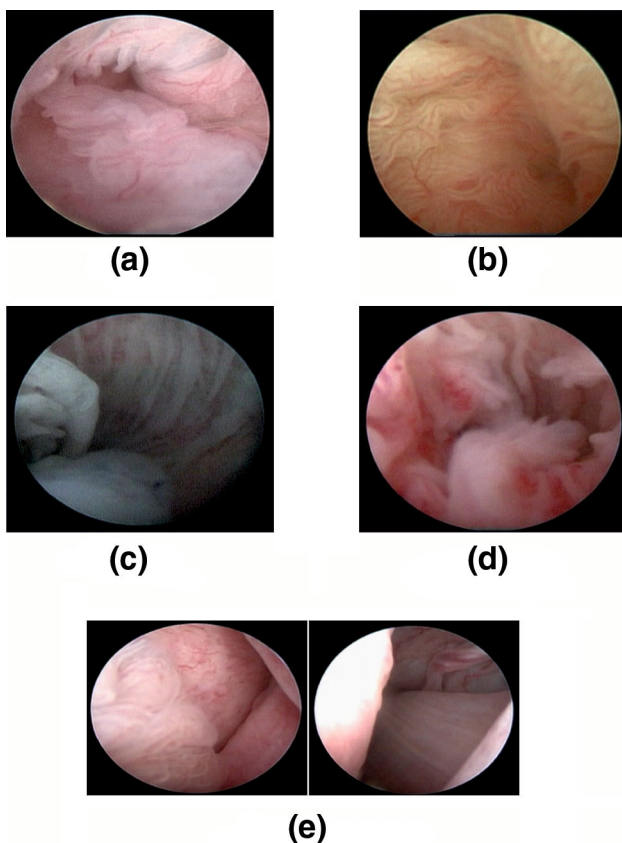
**Table 3** Laparoscopic and salpingoscopic findings in 74 fallopian tubes

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	<i>P</i> value
Regular ( <i>N</i> = 36)	14	5	9	2	6	0.16 (NS)
Convoluted ( <i>N</i> = 34)	12	10	6	6	0	
Hydrosalpinx ( <i>N</i> = 4)	2	1	1	0	0	

Non-significant difference between the groups (*P* value 0.16)



**Fig. 3** Representation of laparoscopic and salpingoscopic findings in all examined fallopian tubes



**Fig. 4** **a** Normal mucosal folds (major and minor) and **b** secondary folds. **c** Rounded edges of mucosal folds, i.e. disappearance of secondary folds/variable degree of flattening with dye staining of mucosa. **d** Abnormal vessels and adhesions between mucosal folds. **e** Complete loss of mucosal fold pattern in 28 years infertile woman with normal HSG (Grade 5)

of unrecognized pelvic inflammatory disease (PID) and tuberculosis [2].

With salpingoscopy, lesions of the infundibulum and ampullary region have been detected in patients for whom HSG and laparoscopy have shown apparently normal tubes [1]. Unless endotubal damage is severe, presence of ampullary mucosal adhesions is not incompatible with normal fertility, although it is reported to affect infertility negatively and increase risk of an ectopic pregnancy [5].

Salpingoscopy was originally performed during laparotomy for reconstructive tubal surgery to assess the mucosa of the infundibulum and ampullary region. A flexible bronchoscope was initially used before the introduction of rigid salpingoscope by Brosens et al. [6, 7].

Brosens et al. [6, 7] reported that tuboscopy in 7 of 27 subfertile women with normal HSG; they saw abnormalities of the folds such as adhesions, agglutination, and inflammatory vascular pattern. A control group of women with normal fertility had no abnormalities of tubal mucosa. Classification of the lesions identified has been proposed by Brosens and Puttmans [6, 7] and Kerin [8], Hershlag et al. [9]. We had limited the number of women with prior HSG done to get comparative result.

In our study, discordance between laparoscopic and salpingoscopic findings, i.e. regular appearance on laparoscopy and Grade III–Grade V appearance on salpingoscopy, was found in 38.88 % women. Surrey et al. [10] found high degree of correlation between laparoscopic and salpingoscopic findings in women with severe disease and no correlation in minimal or no fallopian tube damage. Our results also correspond nearly with the study. Number of infertile women with high salpingoscopic grade, i.e. Grade IV and Grade V, is small in the study, which would have been missed if laparoscopy alone was performed.

Various studies have been conducted to correlate laparoscopy and salpingoscopy and their association with fertility outcome.

Gian et al. [11] concluded that tubes that look normal externally can have lesions of the endosalpinx. Class III lesions are compatible with fertility, although the probability is reduced. With severe mucosal lesions, the chances of spontaneous pregnancy are very remote.

Similarly, Marchino et al. [4] found salpingoscopy a better predictor of future fertility than laparoscopy and chromopertubation alone, not only for negative but also for positive predictability of fertility outcome. Nakagawa et al. [1] concluded that the ability to evaluate inside the fallopian tube is informative for clinicians who deal with patients of infertility.

In women with endometriosis, Nezhat et al. [12] found no association with intratubal disease, while Shapiro et al. (1988) reported abnormal intratubal findings in 4 of 6 women studied. These studies used women undergoing sterilization or diagnostic laparoscopy as control group. Recently, Nakagawa et al. [13] evaluated salpingoscopic findings in women with and without ovarian endometriosis. They found that infertile patients with ovarian endometrioma are more likely to have normal intact fallopian tubes by comparison with infertile women who do not have ovarian endometrioma.

According to previous studies, laparoscopy and salpingoscopy probably complement rather than substitute for one another. It could direct the infertility investigations and treatment either towards reconstructive surgery or ART. In our experience too, given the low complication rate and rapidity of execution, salpingoscopy deserves a primary role in managing infertile women. This is in line with many studies.

## Conclusion

Although salpingoscopy requires expertise, mucosal grading might be useful for prediction of the prognosis and selection of infertility treatments, mainly in cases of minimal or no laparoscopic tubal damage findings, and use of tubal reconstructive surgeries could also be predicted before proceeding further. Early counselling towards IVF-ET can be encouraged in higher grade.

## Compliance with Ethical Standards

**Conflicts of interest** Vineet Mishra, Rajani Nawal, Rohina Aggarwal, Sumesh Choudhary, Tanvir Singh, Urmila Sharma, and Ritu Agarwal declare that they have no conflicts of interest.

**Informed Consent** All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Informed consent was obtained from all patients for being included in the study.

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