

Agreement between hysterosalpingography and laparoscopic chromopertubation in assessment of tubal patency

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Summary

Background: To assess the agreement between tubal patency assessed by laparoscopy with chromopertubation and by hysterosalpingography using contrast media.

Setting: University Medical School.

Patients: 314 consecutive women subjected to laparoscopy and hysterosalpingography for an infertility study.

Design: Prospective study.

Methods: Chromopertubation using Methylene blue dye, performed on days 20-24. Hysterosalpingography performed on days 7-10 with water soluble contrast.

Main outcome measure: Kappa coefficient calculation.

Results: Kappa coefficient ranged from 0.40 to 0.36, depending on the categories analyzed, corresponding to a fair agreement.

Conclusion: The diagnosis of tubal factor requires that both tubal patency tests (Hysterosalpingography and laparoscopy) show an abnormal patency. When one of the aforementioned tests is normal, performing the second one has little clinical advantage. However, it is suggested that when there is a discordant patency the pregnancy rates could be somewhat reduced.

Key Words: Hysterosalpingography; Laparoscopy; Tubal patency; Agreement; Mild tubal factor; Discordant tubal factor; Pregnancy rates.

Introduction

In about 14% of cases of infertility there is a tubal factor [1]. Assessment of tubal patency is a fundamental part of the study of infertile couples. The standard diagnostic procedures for tubal patency investigation are hysterosalpingography with contrast media (HSG) and laparoscopic chromopertubation (LCP). A number of authors have reported a remarkable discrepancy between these two tests [2-8]. Various studies have reported the agreement rate between the two techniques, with results varying from 55 to 84% [2, 4, 5, 9-12]. However, only recently has the agreement been expressed by means of an adequate mathematic parameter (Kappa statistics) [5]. Besides, in the aforementioned studies, usually only two diagnostic categories have been analyzed. The relative tubal factor, whose role in infertility is not well known, has not been evaluated in the aforementioned studies.

The purpose of this study was to evaluate the agreement between tubal patency assessed by HSG and LCP in infertile women, considering different diagnostic categories.

Materials and Methods

We studied 314 women consecutively investigated by HSG and laparoscopy because of infertility ≥ 2 years at our Human Reproduction Unit. Mean age was 29.7 years (SD = 3.6) and mean infertility duration 4.1 years (SD = 2.7). Exclusion criteria were a history of previous salpingectomy or other forms of tubal surgery and a history of pelvic inflammatory disease.

Main infertility diagnoses (excluding tubal factor) were ovulatory disorders (17.8%), endometriosis (29.0%), male factor (20.1%), and unknown infertility (14.0%).

HSG was performed between the 7th and 10th day of the menstrual cycle. A saline contrast media (9.25% sodium amidotrizoate and 60.75% meglumine aminotrizoate) (Pielograf, Juste, Madrid, Spain) was employed under sterile conditions with the tenaculum cannula technique. Ten mg Diazepam (Valium, Roche, Madrid, Spain) were administered per os 60 minutes before the beginning of HSG. Routine spot films were performed under fluoroscopic guidance. The views obtained included a scout view of the pelvis as well as at least 3 anteroposterior views of the uterus and the tubes (underfilled, filled and delayed). Sometimes additional anteroposterior underfilled and oblique views were obtained.

Amoxicillin at the dose of 500 mg per os was given per os/8 hours for the 3 days following HSG.

Laparoscopy was performed under general anesthesia between the 20th and 24th day of the cycle. Tubal patency was assessed with the patient in the Trendelenburg position, injecting Methylene blue dye by means of the intrauterine cannula of Cohen (Richard Wolf, Reims, France). LCP was performed after obtaining HSG results. In cases of discrepancy, as well as in cases of non-patency, a number of trials of Methylene injection were repeated. When there were abnormal findings at HSG, laparoscopy was performed 1-2 months after HSG, whereas in normal HSG, laparoscopy was performed after 6 months of ovulation stimulation following our standard infertility work-up [13].

For the purpose of this study the following categories were considered both for HSG and LCP. Tubes were considered "normal" when the medium passed freely without causing tubal dilatation. A tube was considered "without flow" when the medium did not pass to the peritoneal cavity, either with or without producing tubal dilatation, in spite of repeated attempts.

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Cases with scarce passage or with passage with tubal dilatation as well as those with limited intraperitoneal spillage were diagnosed as "difficult flow" or "relative tubal factor". To facilitate the analysis, in cases with abnormal findings, agreement was analyzed considering the most severe findings (both by HSG and LCP) in the same tube.

Agreement was assessed by means of Kappa statistics. The Kappa coefficient has the important characteristic of correcting for the chance agreement which would be expected to occur if the two classifications were totally unrelated. Failure to take account of chance agreement can lead to erroneous conclusions about the quality of measurement which corresponds to the agreement above-the agreement due to chance [14]. $\text{Kappa} = \% \text{ agreement} / (1 - \% \text{ chance expected agreement})$. Weighted and non-weighted Kappa were employed. Complete agreement corresponds to a $\text{Kappa} = +1$, whereas complete disagreement to a $\text{Kappa} = 0$. Kappa values > 0.80 show very good agreement, between 0.61 and 0.80 good, between 0.41 and 0.60 moderate, between 0.21 and 0.40 fair and < 0.20 poor [15].

Patients were followed-up for a period of 2-7 years and were subjected to a number of therapies following different clinical criteria. Cases subjected to IVF were excluded from this follow-up. There were no case subjects of tubal surgery.

Pregnancy rates were recorded.

Results

Agreement (Table 1)

When only two diagnostic categories were considered (normal or abnormal tubal patency) (Table 1), there were 179 cases with normal HSG and LCP, from the 209 with normal LCP and from the 229 with normal HSG. Both HSG and LCP were abnormal in 52.38% (55/105) of abnormal LCP and in 64.70% of abnormal HSG (55/85). Kappa coefficient was 0.40 (agreement = 74.52%, agreement due to chance = 57.59%).

When three categories were considered ("normal", "relative tubal factor" and "without flow") the following results were obtained. From the 37 LCP "without flow", at HSG tubal passage was observed in 62.16% (14 cases with normal flow and 9 with difficult flow). Similarly, among the 27 HSG without flow, tubal drainage was

observed in 48.15% at LCP (9 with normal flow and 4 with difficult flow). Kappa coefficient was 0.36 (agreement = 70.38%, agreement due to chance = 53.55%).

If we consider a fourth category, separately analyzing the unilateral and bilateral relative tubal factor, a similar agreement was obtained. Kappa coefficient was 0.37 (agreement = 70.06%, agreement due to chance = 52.32%).

When only the presence or absence of tubal passage studied by HSG and LCP was considered, Kappa coefficient was 0.38 (agreement = 88.53%, agreement by chance = 81.64%).

There were 7 cases of diagnosed bilateral distal tubal occlusion by LCP: one had a normal HSG, 2 showed difficult passage and 4 no flow at HSG.

Follow-up

Pregnancy rate among patients with normal HSG and LCP was 42.7% (70/164) versus 31.0% in cases with a discrepancy between HSG and LCP (22/71) ($p = 0.12$, $\text{Chi}^2 = 2.38$, $\text{OR} = 1.66$, 95% confidence interval = 0.88 - 3.12). There was no case of ectopic pregnancy among pregnancies from patients with normal HSG and LCP (0/70) versus 2 cases (9.09%) (one after ovarian stimulation and the other after intrauterine insemination) in patients with a discrepancy between HSG and LCP (2/22) ($p = 0.055$, Fisher exact test). The intrauterine pregnancy rate was 41.46% (68/164) in the group with normal HSG and LCP versus 28.17% (20/71) in the discrepancy group ($p = 0.07$; $\text{Chi}^2 = 3.19$; $\text{OR} = 1.81$, confidence interval = 0.95 - 3.46).

Discussion

A number of tests for the study of tubal patency have been recently introduced [16-19]. However, the standard tests are still HSG and LCP although their usage shows large differences from one country to another [20]. It is well known that HSG is more useful in the study of intra-tubal conditions, whereas LCP is more useful in the study of peritubal conditions.

LCP is recommended by the World Health Organization as part of the routine investigation, whereas HSG is not recommended as a first-line approach [21]. On the other hand, the American Fertility Society recommends both [22]. However there are no randomized studies to establish which of these two methods is the most deserving of being incorporated into a standard fertility work-up [20].

There are a number of studies reporting a concordance between HSG and LCP ranging from 55% to 84% (2, 4, 5, 9-12); our results (69% - 81%) being in the reported range. However, Kappa statistics have only recently been analyzed.

We found a fair Kappa coefficient when analyzing the concordance of tubal patency assessed by HSG and LCP, ranging from 0.36 to 0.40 depending on the categories analyzed, which is similar to the 0.45 recently reported by Adelusi *et al.* in a more reduced population [5]. If the laparoscopic surgeon had been blinded to the results of the HSG, agreement would have been lower. On the other hand although the relative tubal factor is subjective and

Table 1. — Tubal patency assessed by hysterosalpingography and laparoscopic chromoperturbation

TUBAL PATENCY BY HYSTEOSALPINGOGRAPHY	TUBAL PATENCY BY LAPAROSCOPY				Total
	Normal Flow	Unilateral Difficult Flow	Bilateral Difficult Flow	Without Flow	
Normal	179	25	11	14	229
Unilateral difficult flow	21	26	1	1	49
Bilateral difficult flow	0	0	1	8	9
Without flow	9	2	2	14	27
Total	209	53	15	37	314

Comparisons made:

Normal vs abnormal (uni or bilateral difficult flow and without flow). Kappa = 0.40 (agreement = 74.52%)

Normal vs relative factor (uni or bilateral difficult flow) vs without flow. Kappa = 0.36 (agreement = 70.38%)

Normal vs unilateral difficult flow vs bilateral difficult flow vs without flow. Kappa = 0.37 (agreement = 70.06%)

Passage (Normal flow and uni or bilateral difficult flow) vs without flow. Kappa = 0.38 (agreement = 88.53%)

difficult to quantify, the different comparisons made either analyzing this category separately or including it in other groups (both in abnormal flow and in passage) resulted in similar Kappa values. Although Kappa values depend upon the prevalence in each category, thus the different clinical trials not being comparable, our results are similar to the 0.45 recently reported by Adelusi *et al.* in a more reduced population [5].

A number of different mechanisms could be responsible for the HSG-LCP discrepancy: anesthesia (inhibiting a tubal spasm or allowing higher intrauterine pressures), plugs of mucous or of amorphous debris in the tubes, air bubbles, technical difficulties (such as inadequate cervical seal), different endometrial phase (with a different endometrial and endosalpinx development as well as different tubal physiology), the beneficial or detrimental effect of the test performed in the first place (removal of plugs of mucous/debris, tubal distension, inflammation), interval between both tests or even the different nature of the liquids employed (when oil soluble contrast media were employed at the HSG). Sulak *et al.* showed that only 50% of tubes resected for alleged cornual occlusion had true histological occlusion [23]. It has been suggested that whereas a HSG with proximal tubal obstruction is often not confirmed, a HSG with distal tubal obstruction is generally accurate [24]. Probably the same is true for laparoscopy.

It is not known if the disagreement between tubal patency evaluated by HSG and LCP always corresponds to a methodological failure, or if in some instances it could have a clinical relevance in infertility.

Our study demonstrates that the diagnosis of tubal patency abnormality should require that both HSG and LCP be performed in order to avoid a number of false positive results. On the other hand, a trend to lower pregnancy rates with increased ectopic pregnancy rates was observed in cases with discordant tubal patency in regard to cases with concordant normality. Although a number of confounding factors were not ruled out, it is tempting to speculate that in some instances the discrepancy between HSG and LCP could reflect some mild tubal dysfunction which could result in lower intrauterine pregnancy rates.

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