

## The role of hysterosalpingography in the evaluation of infertile women without risk factors for tubal pathology

### Tubal patoloji için risk faktörü olmayan infertil kadınların değerlendirilmesinde hysterosalpingografinin rolü

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#### Abstract

**Purpose:** Assessment of tubal patency plays an important role in the diagnosis of female infertility. Hysterosalpingography (HSG) and conventional laparoscopy with chromopertubation is traditionally used in the assessment of tubal patency. We aimed to determine the necessity of HSG in evaluation of infertile women according to risk factors for tubal pathology.

**Materials and methods:** This prospective case-control study includes 174 infertile patients who were admitted infertility clinic. Age, duration of marriage, sexual relationship status, reproductive history were recorded. Patients were evaluated in terms of risk factors of tubal factors related to infertility and existing risk factors were recorded. The patients were divided into 2 groups; Group 1 composed of patients with risk factors and Group 2 composed of patients without risk factors.

**Results:** History of abdominal surgery was the most common risk factors (82.97%) in patients. Thirty five of 47 (74.46%) patients in Group 1 had patency in any tuba and while 118 of 127 (92.91%) patients in Group 2 had patency in any tuba (p=0.001). Bilateral tubal occlusions were identified in 12 of 47 (25.53%) patients in Group 1, and in 9 of 127 (7.08%) patients in Group 2. The difference between two groups was statistically significant (p=0.001).

**Conclusion:** Hysterosalpingography could be neglected in case of the evaluation of infertile women without risk factors for tubal pathology. Thus, the patients without risk of tubal factor will be protected from hysterosalpingography procedure which does not provide meaningful contribution has a radiation hazard and is painful procedure. Larger scaled studies on this subject are warranted to reach more precise conclusion.

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**Key words:** Hysterosalpingography, infertility, tubal pathology, risk factors.

#### Özet

**Amaç:** Kadın infertilite tanısında tubal açıklığın değerlendirilmesi önemli rol oynar. Hysterosalpingografi ve kromopertubasyonlu laparoskopisi, tubal açıklığın değerlendirilmesinde geleneksel olarak kullanılmaktadır. Risk faktörü değerlendirilmesine göre tubal faktör olabileceğini düşündüğümüz infertil kadınlarda doğrulama açısından hysterosalpingografinin gerekli olup olmadığını belirlemeyi amaçladık.

**Gereç ve yöntem:** Bu prospektif vaka-kontrol çalışmasına infertilite polikliniğine çocuk sahibi olamama şikayetiyle başvuran 174 infertil olgu dahil edildi. Hastaların yaşı, evlilik süresi, cinsel ilişki durumu, reproduktif öyküsü kaydedildi. Hastalar tubal faktör infertilitesine neden olabilecek risk faktörleri açısından sorgulandı ve mevcut risk faktörleri kaydedildi. Tubal risk faktörü taşıyıp taşıyamalarına göre hastalar 2 gruba ayrıldı. Grup 1 risk faktörü taşıyanlar, Grup 2 ise risk faktörü taşımayanlardı.

**Bulgular:** Olgularda abdominal cerrahi öyküsü en sık (%82.97) bulunan risk faktörüydü. Grup 1'de 47 olgunun 35 (%74.46)'inde herhangi bir tubada geçiş varken, Grup 2'de 127 olgunun 118 (%92.91)'inde herhangi bir tubada geçiş vardır. Grup 1'de 47 olgunun 12 (%25.53)'inde, Grup 2'de ise 127 olgunun 9 (%7.08)'unda bilateral tubal tıkanıklık tespit edildi. Her iki grup arasında bulunan fark anlamlıdır (p=0.001).

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**Sonuç:** Histerosalpingografi, tubal patoloji için risk faktörü taşımayan infertil kadın değerlendirmesinde yapılmayabilir. Böylece herhangi bir tubal risk faktörü taşımayan olgular, anlamlı katkısı sağlamayan, ağrılı ve radyasyon tehlikesi göz ardı edilemeyen histerosalpingografi işleminden korunmuş olacaktır. Bu veriyi doğrulayacak daha geniş ölçekli çalışmalara ihtiyaç vardır.

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**Anahtar sözcükler:** Histerosalpingografi, infertilite, tubal patoloji, risk faktörleri.

## Introduction

Infertility is defined as the inability to conceive for a year of regular unprotected sexual intercourse and affects approximately 15% of couples [1]. In the etiology of infertility, female factor rate 40-55%, male factor rate 25-40%, and unexplained infertility rate 10% [2]. The causes of female infertility are ovulatory dysfunction, tubal-peritoneal factors, cervico-uterine pathologies and some unexplained factors. Tubal-peritoneal factors account for 30-40% of them [3].

The next step of standard evaluation in infertile patients after taking medical history, physical examination, semen analysis, hormone profile, and determination of ovulation, is to evaluate tubal patency. Assessment of tubal patency plays an important role in the diagnosis of female infertility. Hysterosalpingography (HSG) and conventional laparoscopy with chromopertubation is traditionally used in the assessment of tubal patency. Recently, hysterosalpingosonography (sono-HSG) stands out as an alternative to the HSG in the evaluation of tubal patency. Maheux-Lacroix et al. [4]. Did not detect any statistically significant difference between the HSG and sono-HSG in their systematic review which included 30 studies about tubal occlusion for diagnostic verification. Sono-HSG seems to be more advantageous for evaluation of the uterine cavity [5,6], myometrium and ovaries. Furthermore, there is no exposure to ionized radiation [7]. Laparoscopy is still considered the gold standard method [8]. However it requires experience, general anesthesia, operating room environment and has serious potential risks. Therefore, HSG is the most widely used diagnostic method of tubal patency at initial evaluation due to non-invasive nature and low cost [9,10] despite being a low sensitivity imaging method. Fatnassi et al. [11]. Stated that laparoscopic examination revealed out pelvic abnormality in 45 of 100 infertile

patients with normal HSG. Sakar et al. [12]. Reported that HSG has a sensitivity of 63%, specificity of 89.3%, positive predictive value of 92%, negative predictive value and accuracy rate of 55% and 72% respectively.

The most important complaint experienced during HSG procedure is the pain. In the studies, the significant pain and discomfort during HSG procedure develops in 60% of the cases and persist even after 24 hours that may require analgesia [2]. In another study, the rate of significant pain was reported as 72% [13]. Patient and health staff are exposed to radiation during the procedure which has cancer and teratogenic risks [14,15]. It is also hard to standardize these risks due to differences of X-ray (fluoroscopy) devices used during procedure and the number of shots. However, HSG examination may still be able to take a pass in patients with certain risk factors that helps us to predict outcome.

In this study, we aimed to determine whether HSG requires verification in the evaluation of infertile women according to risk factors (RF) for tubal pathology.

## Materials and Methods

This prospective case-control study includes 174 infertile patients who were admitted infertility clinic and planned to undergo HSG between May 2011 and November 2011 at the School of Medicine, Dicle University, Diyarbakir, Turkey. Ethics committee approval was taken from Research Ethics Committee of Dicle University. HSG which were obtained for recurrent miscarriage, uterine anomaly, with diagnosis of Asherman's syndrome to evaluate the uterine cavity and fallopian tubal ligation or after tubal reanastomosis were excluded from the study. Patients having uterine pathology (endometrial polyps, submucous myoma and uterine anomalies) on transvaginal ultrasound (TvUS) were also excluded from the study. Age,

duration of marriage, duration of unprotected regular intercourse and reproductive history were recorded. Risk factors that may cause tubal problems including tuberculosis, pelvic inflammatory disease (PID), endometriosis, history of abdominal surgery and intra-uterine device (IUD) usage were questioned, and existing risk factors were recorded.

Patients were divided into 2 groups based on tubal risk factor. Group 1 had risk factor while Group 2 did not have risk factor. HSG was performed on day 7-12 of the menstrual cycle in the radiology department. The position of the uterus was assessed by pelvic examination. The cervix was cleaned with antiseptic (povidone-iodine), and the anterior lip was grasped with a tenaculum. Rubin cannula was placed in the cervical canal and 10-20 mL of radiopaque material (Sodium diatrizoate, Urografin® 76%, Bayer Pharma, Germany) was given into uterine cavity slowly under the fluoroscope, and 3 more films were obtained. The shape of the tubes and the absence of any hydrosalpinx with spillage of dye into the peritoneal cavity were used as indicators of patency of unilateral or bilateral fallopian tubes.

## Statistical Analysis

Descriptive analysis was performed for the identifier data in both cases of groups. Parametric and non-parametric data were examined respectively using analysis methods by Student's t-test data, and chi-square tests. Mean and standard deviation were used to define for continuous variables. Identification percent were used to to define categorical data.  $p < 0.05$  was considered statistically significant. Statistical Package for Social Sciences (SPSS) version 16.0 (SPSS Inc., Chicago, IL, USA) was used at all statistical analyzes.

## Results

The mean age of Group 1 and Group 2 patients were  $29.09 \pm 5.44$  and  $28.51 \pm 6.66$  respectively. The other group characteristics were shown on Table 1. The mean age, duration of marriage and duration of infertility of both groups did not show significant difference ( $p > 0.05$ ). The distribution of risk factors in Group 1 was presented in Table 2. The history of abdominal surgery was the most common risk factor (82.97%).

**Table 1.** The general characteristics of the patients with risk factors (Group 1) and without risk factors (Group 2).

Analized cases (n:174)	Grup 1 (RF+) (n:47)	Grup 2 (RF-) (n:127)	p-value
Age (years)	$29.09 \pm 5.44$	$28.51 \pm 6.66$	0.243
Duration of marriage (years)	$8.23 \pm 4.99$	$4.81 \pm 4.51$	0.339
Duration of infertility (years)	$4.80 \pm 4.09$	$3.27 \pm 3.41$	0.500
Primary infertility [n (%)]	15 (31.91)	84 (66.14)	0.00
Secondary infertility [n (%)]	32 (68.08)	43 (33.85)	

Data as presented mean $\pm$ SD, n: Number of cases  
Group1 (RF +): Patients with risk factors.  
Group2 (RF-): Patients without risk factors.  
 $p < 0.05$  was considered statistically significant.

Tubal passage results of Group 1 and Group 2 were compared in Table 3. There were significant differences between two groups in terms of bilateral tubal patency, any tubal patency and bilateral tubal occlusion ( $p < 0.05$ ). But there was no significant difference between two groups for unilateral tubal occlusion ( $p > 0.05$ ). Thirty five of 47 (74.46%) patients in Group 1 had patency

in any tuba while 118 of 127 (92.91%) patients in Group 2 had patency in any tuba ( $p = 0.001$ ). Bilateral tubal occlusion were identified in 12 (25.53%) patients with a risk factor in Group 1 (n=47), and in 9 (7.08%) patients that without risk factor Group 2 (n=127). The difference between two groups was statistically significant ( $p = 0.001$ ).

**Table 2.** The distribution of risk factors in Group 1.

Risk Factors	Group 1 (RF+)	
	(n:47)	(%)
Tuberculosis history	4	8.51
Pelvic inflammatory disease history	3	6.38
Abdominal surgery history	39	82.97
Endometriosis history	3	6.38
Intra-uterine device usage history	5	10.63

Group1 (RF +): Patients with risk factors. n: Number of cases

**Table 3.** Evaluation of tubal patency of the patients with and without risk factors by HSG.

State of tubal patency	Grup 1 (RF+) n:47 (%)	Grup 2 (RF-) n:127 (%)	p-value
Bilateral tubal patency	30 (63.82)	107 (84.25)	0.003
Any tubal patency (Bilateral tubal patency+unilateral tubal patency)	35 (74.46)	118 (92.91)	0.001
Unilateral tubal occlusion (Unilateral tubal patency)	5 (10.63)	11 (8.66)	0.769
Bilateral tubal occlusion	12 (25.53)	9 (7.08)	0.001

Chi-square tests were used for the analysis of the result of tubal patency.  
HSG: Hysterosalpingography, n: Number of cases  
Group1 (RF +): Patients with risk factors.  
Group2 (RF-): Patients without risk factors.  
p<0.05 was considered statistically significant.

## Discussion

In our study, secondary infertile cases (68.1%) in Group 1 and primary infertile cases (%66.1) in Group 2 formed the majority. The history of abdominal surgery (%82.97) was found to be the most frequent risk factor. Between the two groups, there was a statistically significant difference ( $p<0.05$ ) according to bilateral tubal patency, any tubal patency and bilateral tubal occlusion results. Thirty-five cases (74.46%) had patency in any tuba in Group 1 (n=47), while 118 cases (92.91%) had patency in any tuba in Group 2 (n=127) ( $p=0.001$ ). When the tubes were evaluated according to occlusion, bilateral tubal occlusion in 9 patients (7.08%) were detected and the difference between the two groups was statistically significant ( $p=0.001$ ).

Tubal factor has an important place in women infertility. Tubal patency is routinely evaluated by HSG, but this process has a risk

of radiation exposure to both performer and the patient [16,17], and has a painful nature.

In this study, we did not identify bilateral tubal occlusion, in the majority of patients who had not any risk factor for tubal patency. We recommend laparoscopic evaluation in a very small number of patients with bilateral tubal occlusion. The risk factors of tubal infertility are pelvic infection, tuberculosis, previous ectopic pregnancy, previous tubal surgery of the abdomen or pelvic infections associated with an increased risk of IUD use. These risk factors should be asked in the evaluation of infertile couples. In our study the risk factor in the majority of patients is a history of laparotomy (82.97%). In patients with risk factor, the incidence of tubal pathology was significantly higher than the one without risk factor. Therefore, laparoscopy may be considered for patients with risk factor with skipping HSG. In the literature, HSG is

recommended in the initial plan in the patients without risk factor for the evaluation of tubal patency. However laparoscopy is recommended instead of HSG for the initial evaluation of patients with risk factors [18]. Kahyaoglu et al. [19]. Suggested diagnostic laparoscopy procedure in patients with unexplained infertility in cases of secondary infertility with or without risk factors. In a study performed between 110 Nigerian women pelvic pathology was detected in 48 women by HSG and laparoscopy. HSG and laparoscopy findings were compared in 48 patients, and laparoscopy was detected significantly better ( $p < 0.002$ ) for diagnosis proximal tubal occlusion and non-tubal factors [20]. It has been argued that laparoscopy should be the first procedure for evaluation of tubal infertility [20]. Similarly, Ismajovich et al. found a high rate of false positive and negative results in HSG for the diagnosis of peritubal adhesions compared to laparoscopy [21].

In our study, the number of patients with primary and secondary infertility was different. In Group 1, the percentage of secondary infertile patients (68.08%) was significantly higher than Group 2 (33.85%). In Group 1, history of abdominal surgery was observed in 82.97% of patients ( $n=39$ ) which is considered as the most common risk factor of tubal occlusion. Previous cesarean section history constitutes an important part of these risk factors. We believe that significantly high rate of secondary infertility in Group 1 is related to cesarean delivery.

Bilateral tubal occlusion is one of the finding of HSG that provides the most important contribution to treatment of infertility after the initial standard assessment. In the present study, bilateral tubal occlusion was observed in 9 of 127 patients (7.08%). In other words, tubal patency was determined in 118 of 127 (92.91%) patients, and that does not lead to a change in the treatment procedure. However, bilateral tubal occlusion was detected in 12 of 47 (25.53%) patients carrying a risk factor in Group 1. The difference between the two groups was significant ( $p=0.001$ ). Briefly, HSG provided a contribution in treatment of one-quarter of patients carrying risk factor.

In accordance with our study, a recently published meta-analysis involving 4521 patients from seven studies [22] the results of HSG in

patients carrying risk factor were detected significantly different from the ones without risk factor. This meta-analysis calculated the sensitivity and specificity of HSG studies for evaluating the accuracy of the results of this examination. However, our goal is not to assess the accuracy of HSG in this study, but only to assess the effect of these results on our treatment options. Therefore, we did not evaluate the sensitivity and specificity of HSG and did not compare by laparoscopy.

In infertile patients, Mgbor [23] and Adinma et al. [24] reported that bilateral tubal occlusion rate detected by HSG were 23.3% and 17.5%, respectively. In a multi-center study, evaluation of tubal patency before laparoscopy was carried out to determine the value of HSG, and bilateral tubal occlusion rate was 15% [25]. In our study group, rate of bilateral tubal occlusion in patients carrying risk factor was 25.53%.

Except history of abdominal surgery the risk factor ratios of our study are similar to studies mentioned above. When tubal occlusion risk factors examined, HSG will contribute significantly to assessment of patients carrying risk factor.

According to recent data, a debate exists on the role of HSG in the initial evaluation of infertile women [26]. We hesitate to use HSG because of radiation exposure of both the patients and health staff and also its painful nature. In addition, we did not identify bilateral tubal occlusion in the majority of cases without risk factor, and these results did not give additional contribution to our treatment.

The major limitation of the study was limited sample size.

In conclusion, HSG may be neglected in the evaluation of infertile women without risk factor for tubal pathology. If we create high risk group for tubal pathology according to history of infertility, gynecological examination, and vaginal ultrasonography, hysterosalpingography may give meaningful results. Thus, patient without a risk factor will be protected from HSG procedure which is painful and has a radiation hazard. Larger scaled studies on this subject are warranted to reach more precise conclusion.

The authors report no declarations of interest.

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