
GYNAECOLOGY

Abnormal Hysterosalpingographic Findings in Infertile Women

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ABSTRACT

Objectives: To determine the rate and patterns of hysterosalpingography (HSG) abnormality among infertile women at Srinagarind Hospital, Khon Kean University, Thailand.

Materials and Methods: The study patients were identified through the reports of the Infertile Clinic. In our hospital, HSG was routinely performed in all women undergoing an evaluation of infertility problems. Medical records were extracted for baseline characteristics, types of infertility, and details of HSG findings. A 95% confidence interval (CI) was calculated to demonstrate the precision of data. Logistic regression model was used to determine an independent impact of the type of infertility on abnormal HSG findings.

Results: Overall, 589 women were reviewed. The mean \pm SD age was 32.9 \pm 5.0 years. Secondary infertility was noted in 163 (27.7%) women. Abnormal HSG was noted in 227 (38.5%, 95% CI, 34.6%-42.6%) women. The most common abnormal HSG findings were tubal occlusion and hydrosalpinx. When adjusted with patients' age, women with secondary infertility carried a higher risk of having abnormal HSG finding compared to those with primary infertility (an adjusted odds ratio, 2.44; 95% CI, 1.68-3.54).

Conclusion: Rate of abnormal HSG findings among infertile women in our setting was approximately 40%. Type of infertility was independently associated with abnormal HSG findings.

Keywords: Hysterosalpingography, primary infertility, secondary infertility, tubal occlusion, hydrosalpinx

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ความผิดปกติที่พบจากการเอกซเรย์ร่วมกับการฉีดสารทึบรังสีเข้าโพรงมดลูกในหญิงที่มีภาวะมีบุตรยาก

ขวัญฤทัย นามภักดิ์อินันต์, ชำนาญ เกียรติพิรกุล, เยาวภา จงเป็นสุขเลิศ

วัตถุประสงค์: เพื่อประเมินอุบัติการณ์และรูปแบบของความผิดปกติที่พบจากการเอกซเรย์ร่วมกับการฉีดสารทึบรังสีเข้าโพรงมดลูกในหญิงที่มีภาวะมีบุตรยาก

วัสดุและวิธีการ: ทำการศึกษา ณ คณะแพทยศาสตร์โรงพยาบาลศรีนครินทร์ มหาวิทยาลัยขอนแก่น โดยการทบทวนเวชระเบียนของหญิงที่มาใช้บริการที่คลินิกผู้มีบุตรยากตั้งแต่เดือนมกราคม พ.ศ.2551 ถึง เดือนธันวาคม 2556 โดยเก็บข้อมูลทั่วไป ภาวะมีบุตรยากทั้งแบบปฐมภูมิและทุติยภูมิ ลักษณะของความผิดปกติที่พบจากการเอกซเรย์ร่วมกับการฉีดสารทึบรังสีเข้าโพรงมดลูก โดยใช้การวิเคราะห์ความถดถอยแบบโลจิสติกและความเชื่อมั่น 95 เปอร์เซ็นต์ เพื่อหาปัจจัยที่มีความเกี่ยวข้องกับภาวะมีบุตรยาก

ผลการศึกษา: จากการตรวจเอกซเรย์ร่วมกับการฉีดสารทึบรังสีเข้าโพรงมดลูกในหญิงที่มีภาวะมีบุตรยาก จำนวน 589 ราย โดยมีอายุเฉลี่ย 32.9 ปี เป็นภาวะมีบุตรยากแบบทุติยภูมิร้อยละ 27 ตรวจพบความผิดปกติจากการเอกซเรย์ร่วมกับการฉีดสารทึบรังสีเข้าโพรงมดลูก ร้อยละ 38 และความผิดปกติที่พบมากที่สุด คือ ภาวะท่อน้ำไข่อุดตัน และท่อน้ำไข่ม้วนน้ำ โดยตรวจพบความผิดปกติในหญิงที่มีภาวะมีบุตรยากแบบทุติยภูมิมากกว่าแบบปฐมภูมิ 2.4 เท่า

สรุป: การตรวจเอกซเรย์ร่วมกับการฉีดสารทึบรังสีเข้าโพรงมดลูกในหญิงที่มีภาวะมีบุตรยากพบความผิดปกติร้อยละ 40 และประเภทของภาวะมีบุตรยากเป็นปัจจัยที่เกี่ยวข้องกับความผิดปกติที่พบ

Introduction

Hysterosalpingography (HSG) is a radiologic procedure used to examine the inside of the endocervical canal, endometrial cavity, shape and patency of fallopian tubes, and surrounding areas⁽¹⁾. During HSG, a radio-opaque material is slowly injected into the endocervical canal and usually carries out under fluoroscopy with image intensification. The patterns of dye filling within the inside of uterus and fallopian tubes and spilling out reflect the surface contour of the inside of the organs and adjacent peritoneum⁽¹⁾.

Nowadays, HSG is used predominantly in the evaluation of couples with infertility problems. The other common indications for HSG are recurrent abortion and tubal patency evaluation following tubal reversal. The recent meta-analysis using individual patient data emphasized that HSG is a useful screening procedure for evaluating infertile couples. The accuracy of HSG especially for determining tubal patency was similar across all patients with different characteristics⁽²⁾.

Rate of HSG abnormality and specific abnormal HSG pattern among women presenting with infertility vary widely between the studies which may be secondary to the differences in patients' characteristics and associated risks⁽³⁻¹²⁾. Data regarding the rate and pattern of HSG abnormality for a particular area are thus mandatory for providing baseline information. This study was accordingly conducted to determine the rate, patterns of HSG abnormality, and associated risks among women presenting with infertility problem at Srinagarind Hospital, Khon Kean University, Thailand.

Material and Methods

The present descriptive study was retrospectively conducted among women who attended an Infertile Clinic at the Srinagarind Hospital, Khon Kaen University, Khon Kaen, Thailand, between January 2008 and December 2012. The study was approved by the Research Ethics Committee of the Faculty of Medicine, Khon Kaen University. Because it was a retrospective study and the data were reported anonymously, the need for informed consent was waived by the Research Ethics Committee.

The study patients were identified through the reports of the Infertile Clinic. In our hospital, HSG was routinely performed in all women undergoing an evaluation of infertility problems. Medical records were extracted for baseline characteristics, types of infertility, and details of HSG findings. The results were stratified by type of infertility and patients' age.

Data were summarized as number (percentage) or mean \pm standard deviation (SD) as appropriate. A 95% confidence interval (CI) was calculated to demonstrate the precision of data. Multivariable logistic regression was applied to estimate the effect of type of infertility (primary versus secondary infertility) on the primary outcome, while adjusting for patients' age. An odds ratio (OR) with a 95% CI that did not include unity was considered statistically significant. Statistical analysis was carried out via STATA (NY, USA).

Results

During the study period, 589 women met the inclusion criteria and were included in the analysis. The mean \pm SD age was 32.9 \pm 5.0 years. One hundred and sixty-three (27.7%) women had secondary infertility while the remaining 426 (72.3%) women experienced primary infertility. The mean age \pm SD among women with primary and secondary infertility was 32.5 \pm 5.0 years and 33.9 \pm 4.8 years, respectively. Abnormal HSG was noted in 227 women (38.5%; 95% CI, 43.6%-42.6%). The most common patterns of abnormal HSG findings were tubal occlusion and hydrosalpinx.

Table 1 displays patients' age and HSG findings stratified by the type of infertility. Women with secondary infertility carried a higher rate of abnormal HSG than women with primary infertility (54.0% versus 32.7%, respectively). When adjusted by patients' age, women with secondary infertility were approximately 2.4 times more likely to have abnormal HSG findings than those with primary infertility (adjusted OR, 2.44; 95% CI, 1.68-3.54).

Uterine cavity abnormality was more common among women with primary infertility when compared to women with secondary infertility (9.4% versus 4.3%, respectively). Tubal pathology detected on HSG among

women with secondary infertility was 48.5% which was higher than that observed among women who had primary infertility (21.4%). Abnormal cervical canal was rarely noted (2%).

Table 2 shows the rate and patterns of abnormal

HSG findings stratified by patients' age. The rate and patterns of HSG abnormalities was roughly similar across all three patients' age groups. Details of tubal stenosis classified by site are shown in Table 3.

Table 1. Baseline characteristics.

Variables	All women N=589 (%)	Type of infertility	
		Primary infertile N=426	Secondary infertile N=163
Age (years)			
15-24	24 (4.1)	21 (4.9)	3 (1.8)
25-34	340 (57.7)	255 (59.8)	85 (52.1)
35-50	225 (38.2)	150 (35.2)	75 (46.1)
HSG findings			
Normal	362 (61.4)	287 (67.3)	75 (46.0)
Cervix	12 (2.0)	10 (2.3)	2 (1.2)
Cervical polyp	4	3	1
Cervical stenosis	8	7	1
Uterus	57 (9.6)	47 (9.38)	10 (4.29)
a) Congenital anomalies			
Arcuate uterus	3	3	-
Septate uterus	1	1	-
Unicornuate uterus	1	1	-
Bicornuate uterus	1	1	-
b) Acquired anomalies			
Uterine synechiae	3	3	-
Myoma uteri			
- Subserous	1	1	-
- Intramural	4	4	-
- Submucous	33	26	7
- Unspecified site	10	7	3
Fallopian tubes	170 (28.9)	91 (21.4)	79 (48.5)
Unilateral tubal stenosis	78	52	26
Bilateral tubal stenosis	65	23	42
Unilateral tubal hydrosalpinges	16	7	9
Bilateral tubal hydrosalpinges	16	12	4

Data are present as number (percentage)

HSG, hysterosalpingography

Table 2. Details of abnormal HSG findings stratified by age group.

Abnormal HSG findings	Age group (years)		
	15-24 N=24	25-34 N=340	35-50 N=225
Cervix	-	8 (2.3)	4 (1.8)
Cervical polyp	-	5	3
Cervical stenosis	-	3	1
Uterus	2 (8.3)	30 (8.8)	25 (11.1)
a) Congenital anomalies			
Arcuate uterus	-	2	1
Septate uterus	-	1	-
Unicornuate uterus	-	1	-
Bicornuate uterus	1	-	-
b) Acquired anomalies			
Uterine synechiae	-	2	1
Myoma uteri			
- Subserous	-	-	1
- Intramural	-	2	2
- Submucous	1	16	16
- Unspecified site	-	6	4
Fallopian tubes	7 (29.2)	96 (28.2)	67 (29.8)
Unilateral tubal stenosis	4	36	38
Bilateral tubal stenosis	1	42	22
Unilateral tubal hydrosalpinges	2	9	5
Bilateral tubal hydrosalpinges	1	11	4

Data are present as number (percentage)

HSG, hysterosalpingography

Table 3. Details of sites of tubal stenosis.

Sites of tubal stenosis	Cornue	Proximal	Distal	Fimbria
Unilateral (N=78)				
Right tubal stenosis (N=30)	10	5	7	8
Left tubal stenosis (N=48)	20	11	8	9
Bilateral tubal stenosis (N=65)				
Bilateral tubal stenosis (same site) (N=57)	8	24	13	12
Bilateral tubal stenosis (different site) (N=8)				
Right tubal stenosis	2	2	0	4
Left tubal stenosis	3	3	2	0

Data are present as number

Discussion

In the present study, the frequency of abnormal HSG findings and the associated predictor among women undergoing infertility evaluation have been systematically evaluated. The frequency of abnormal HSG findings in the present study was notably high (38.5%; 95% CI, 43.6%-42.6%). Tubal abnormality was a major cause of female infertility. Significant independent variables correlated with abnormal HSG were type of infertility when controlling for commonly applied markers.

In the literature, rate of abnormal HSG varies from 26% to 80%⁽³⁻¹²⁾. As mentioned earlier, wide variation of the reported rate of HSG abnormality are expected due to the differences in patients' characteristics and associated risks of each setting. In the present study, approximately 40% of women undergoing HSG for infertility evaluation were found to have abnormal HSG results. The most common site of HSG abnormality in the present study was tubal pathology which was consistent with previously reported findings^(3, 7-10).

Several studies have attempted to identify specific sociodemographic risk factors associated with abnormal HSG findings among infertile women. In a study of Liberty et al⁽¹²⁾, patients' age was noted to have significant independent impact on the rate of abnormal HSG. Infertile women aged 35 years or older had almost 4-fold higher risk of abnormal HSG as compared with younger women (adjusted OR, 3.7; 95% CI, 2.2-6.2). The actual causes of a higher rate of abnormal HSG among older women in this study however remained inconclusive. In previous studies conducted among Nigerian women, HSG tubal abnormality which was the most common patterns of abnormal HSG has been note to be more prevalent in women infected with human immunodeficiency virus (HIV) which might be due to the higher risk of pelvic infection among HIV-infected women^(6, 11).

Type of infertility has been acknowledged as an important factor for predicting the risk of abnormal HSG findings. Abnormal HSG findings were noted to be associated with secondary infertility than primary infertility^(4, 5). The higher risk of abnormal HSG among

women with secondary infertility was consistently observed in the present study. Women with secondary infertility carried a higher risk of abnormal HSG. When adjusted by patients' age, women with secondary infertility had an approximately 2.5-fold higher risk of abnormal HSG when compared to women with primary infertility (adjusted OR, 2.44; 95% CI, 1.68-3.54). Infections following abortion and delivery have been suggested as one of the possible causes of infertility. In addition, secondary infertility has been proposed as a potential indicator for infection complication occurring in previous pregnancy. So, this may be a theoretical explanation for the higher rate of abnormal HSG among women with secondary infertility⁽¹³⁾.

The present study was able to demonstrate the difference in abnormal HSG patterns among women with primary and secondary infertility. Uterine cavity abnormality was more common among women with primary infertility (9.4% versus 4.3%, respectively). In contrast, tubal pathology detected on HSG was more prevalent among women with secondary infertility as compared with those who had primary infertility (48.5% versus 21.4%, respectively). This information should be taken into account during patients' counseling and treatment planning.

The present study has some limitations. First, this study was retrospective; some clinically important data therefore may not be available, such as detailed sexual behavior, patients' symptoms, duration of infertility, underlying disease, and previous history of sexually transmitted disease which might impact on to the rate of abnormal HSG. Second, the results of HSG findings reported herein obtained from the medical recoded. We did not review HSG imaging. A lack of data regarding to further investigations after abnormal HSG was another limitation resulting in the inability to differentiate about the high rate of abnormal HSG in the present study was due to a higher rate of underlying pathology in the genital tract or due to the high false positive rate on HSG.

In conclusion, abnormal HSG findings were not uncommon in our setting. Approximately 40% of women undergoing HSG for infertility evaluation were noted to

have abnormal results. The most common site of abnormal HSG was tubal pathology. Significant independent variables correlated with abnormal HSG were type of infertility when controlling for patients' age. Additional studies to evaluate the results of further investigations among infertile women with abnormal HSG findings are warranted.

Conflict of interest

The authors have no conflict of interest to declare.

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References

1. Simpson WL, Jr., Beitia LG, Mester J. Hysterosalpingography: a reemerging study. *Radiographics* 2006;26:419-31.
2. Broeze KA, Opmeer BC, Van Geloven N, Coppus SF, Collins JA, Den Hartog JE, et al. Are patient characteristics associated with the accuracy of hysterosalpingography in diagnosing tubal pathology? An individual patient data meta-analysis. *Hum Reprod Update* 2011;17:293-300.
3. Sinawat S, Pattamadilok J, Seejorn K. Tubal abnormalities in Thai infertile females. *J Med Assoc Thai* 2005;88:723-7.
4. Bello TO. Tubal abnormalities on hysterosalpingography in primary and secondary infertility. *West Afr J Med* 2006;25:130-3.
5. Lash MM, Yaghamee A, Strohsnitter W, Lalwani S. Association between secondary infertility and fallopian tube obstruction on hysterosalpingography. *J Reprod Med* 2008;53:677-80.
6. Adesiyun AG, Ameh CA, Eka A. Hysterosalpingographic tubal abnormalities and HIV infection among black women with tubal infertility in sub-Saharan Africa. *Gynecol Obstet Invest* 2008;66:119-22.
7. Shrivastava VR, Rijal B, Shrestha A, Shrestha HK, Tuladhar AS. Detection of tubal abnormalities by HSG in Nepalese subfertile women. *Nepal Med Coll J* 2009;11:42-5.
8. Ibekwe PC, Udensi AM, Imo AO. Hysterosalpingographic findings in patients with infertility in South eastern Nigeria. *Niger J Med*. 2010 Apr-Jun;19(2):165-7.
9. Okafor CO, Okafor CI, Okpala OC, Umeh E. The pattern of hysterosalpingographic findings in women being investigated for infertility in Nnewi, Nigeria. *Niger J Clin Pract* 2010;13:264-7.
10. Al Subhi T, Al Jashmi RN, Al Khaduri M, Gowri V. Prevalence of tubal obstruction in the hysterosalpingogram of women with primary and secondary infertility. *J Reprod Infertil* 2013;14:214-6.
11. Adegoke AA, Anthony E, Olumide AB, Folake O, Idowu AA. Hysterosalpingographic Tubal Abnormalities in Retroviral (HIV) Positive and Negative Infertile Females. *J Clin Diagn Res* 2013;7:35-8.
12. Liberty G, Hyman J, Friedler S, Anteby EY, Margalioth EJ. High rates of abnormalities in hysterosalpingography in couples with male factor infertility. *Clin Exp Obstet Gynecol* 2014;41:415-8.
13. Besley MA. WHO Report: The epidemiology of infertility. A review with particular reference to sub-Saharan Africa. *Bull WHO* 1976; 54:319-45.