



Original Article

Evaluation of time lapse for establishing distal tubal occlusion diagnosis during hysterosalpingography procedure performed by using water soluble contrast media

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Abstract

Background: Hysterosalpingography (HSG) is the most frequently used diagnostic measure for simultaneously determining uterine abnormalities and tubal status among subfertile women. Despite several broader advantages such as availability and increased experience, the subjectivity involved during administration of the HSG procedure itself, and necessary imaging review, decreases the reliability and accuracy of HSG. In this study, we evaluated the time intervals between X-ray imaging during HSG procedure to establish the presence of distal tubal occlusion.

Methods: Our study evaluated the HSG records of 89 women who underwent diagnostic laparoscopy for infertility work-up. Patients who were diagnosed with distal tubal occlusion upon receiving HSG and patients who demonstrated tubal patency on HSG were included in the study, to compare the time intervals in seconds from the tubal visualization view to the last fluoroscopic X-ray shot during the HSG procedure with tubal patency on diagnostic laparoscopy.

Results: A statistically significant correlation regarding tubal patency between HSG procedures and diagnostic laparoscopy chromopertubation procedures was demonstrated. Although nearly statistically significant, the interval in seconds between the first HSG imaging and distal tubal filling was shorter for patients with patent tubes on diagnostic laparoscopy than patients with bilateral tubal occlusion (8.4 ± 31.9 and 12.0 ± 19.7 , respectively; $p = 0.057$). Time period intervals between the first and the last HSG, and between distal tubal filling to the last HSG of patients with patent tubes on diagnostic laparoscopy and patients with bilateral distal tubal occlusion were found to be statistically similar.

Conclusion: Although a trend exists towards shorter time period intervals between the first uterine visualization and distal tubal filling graphy among patients with tubal patency, rather than patients with distal tubal occlusion confirmed by diagnostic laparoscopy, clinically reliable objective time period intervals for finalizing the HSG procedure and proceeding with diagnostic laparoscopy due to distal tubal occlusion diagnosis on HSG could not be detected.

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Keywords: diagnostic imaging; hysterosalpingography; reliability; tubal patency

1. Introduction

Despite the increasing availability of treatment options, infertility remains an important public health issue for almost 15% of couples. Congenital Müllerian abnormalities, fertilization and implantation defects, anovulation, male factor, and tubal occlusion are main etiological factors that are associated with infertility.¹ Uterine cavity abnormalities can be a

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contributing cause of subfertility in 10% of women. Abnormal uterine findings like endometrial polyps, fibroids or intra-uterine adhesions which potentially can interfere with implantation and result in pregnancy loss can be detected using hysterosalpingography (HSG).² Among all etiological factors impacting women's infertility, fallopian tube abnormalities account for up to 40% of female subfertility. Thus, during fertility evaluations, assessment of tubal patency has priority. HSG is the most commonly utilized first-line diagnostic test for evaluation of the tubal status. The discriminative feature of HSG as a diagnostic imaging study is its ability to evaluate the morphology and the patency of the fallopian tubes, which normally appear as thin, smooth lines that widen in the ampullary portion. Congenital abnormalities, tubal occlusion due to spasm or infection are tubal abnormalities which can be observed with HSG. An abrupt blockage of contrast media passage with nonopacification of the distal fallopian tube either unilateral or bilateral, and prevention of contrast media from freely spilling into the abdominal cavity by pelvic pathologies, are commonly seen tubal pathologies on HSG examination.^{3,4} Intrinsic (ascending salpingitis, including salpingitis isthmica nodosa) and extrinsic (peritonitis, endometriosis, and pelvic surgery) etiological factors can result in tubal damage and functional insufficiency. Serum chlamydia antibody immunoglobulin G titer has been found to be correlated with the severity of tubal damage found in infertile women.⁵ In the past, efforts to correct tubal occlusion have generally started with tubal surgery by infertility specialists. The success rates of *in vitro* fertilization-embryo transfer procedures resulted in a decline in tubal surgery attempts for tubal occlusion. When assisted reproduction techniques, particularly *in vitro* fertilization-embryo transfer, are not an option for a woman with tubal occlusion, diagnostic and operative surgery for tubal reconstruction becomes a primary treatment choice. HSG is the primary diagnostic measure to evaluate uterine cavity and tubal passage during a female infertility work-up. Unlike a high specificity rate, the relatively low sensitivity rate of HSG causes unnecessary surgeries for evaluation of tubal patency, which predisposes the women to risks of anesthesia and surgery itself. Increased awareness about the appropriate HSG technique will increase the sensitivity of the procedure and decrease unnecessary surgeries.

HSG is performed by the passage of a radio-opaque dye from the cervical canal into the uterine cavity under fluoroscopic guidance. HSG can be performed using water- or oil-soluble contrast medium (WSCM or OSCM). Potential complications of OSCM use are oil embolism and granulomatous inflammation in the presence of an obstructed or inflamed fallopian tube, despite an increase in spontaneous pregnancy rates following the HSG procedure. When compared with OSCM, superior radiographic images are captured with WSCM utilization during HSG that makes WSCM the preferred medium for an HSG procedure. However, an increased frequency and duration of bleeding after HSG, and higher post HSG miscarriage rates have been linked to WSCM usage during HSG. Technically, a subsequent plain X-ray imaging is undertaken 24 hours following the HSG procedure with OSCM

under fluoroscopic guidance to evaluate tubal patency. This is not an obligation for WSCM usage, because the contrast agent directly spreads to the abdominal cavity through the fallopian tubes, which is easily witnessed on fluoroscopy during the procedure. To the best of our knowledge, during HSG procedures performed by using WSCM, the time period necessary to finalize the procedure and decide tubal patency or distal tubal occlusion based on the passage of contrast media has not been previously determined by investigators. Determination of an "at least" time period for finalizing the HSG procedure with great reliability will decrease unnecessary laparoscopy procedures attributable to false positive HSG results. In this study, we investigated this objective to increase the accuracy and reliability of distal tubal occlusion diagnoses during HSG procedures, which will prevent infertile women from undergoing sham surgeries without any benefit to their future prognosis.

2. Methods

HSG examinations of the patients were scheduled within 7 days after cessation of their menstruation to ensure a thin endometrium and to avoid a concurrent pregnancy. A serum human chorionic gonadotropin test was also routinely performed before the HSG procedures, to exclude an early pregnancy. Pregnancy, active vaginal infection, acute pelvic inflammatory disease, and severe allergy against iodine contrast agents were considered as contraindications for the procedure. At our institution, HSG is not performed under intravenous sedation due to the potential risks for aspiration or allergic reaction. An oral nonsteroidal anti-inflammatory drug was appropriately administered to all patients 1 hour before the procedure. Prophylactically, a doxycycline 100 mg pill twice a day was routinely administered to all patients for 1 week, starting 1 hour before the procedure. HSG procedures were performed by the gynecologists with a Cohen catheter (manufactured by Storz, Tuttlingen, Germany) through cannulation of the cervical os. When the catheter was in place, water-soluble noniodinated contrast medium (Omnipaque 300 mg I/mL containing 647 mg iohexol/mL equivalent to 300 mg iodine/mL, GE Healthcare, Carrigtohill, Ireland) was applied under fluoroscopic control. A single X-ray shot was taken upon visualization of the uterine cavity during injection of the WSCM. A second shot was taken upon visualization of the fallopian tubes under fluoroscopy. The third and further shots were taken based on the spillage of contrast media into the pelvic cavity without any established time restriction to finalize the procedure. The HSG results of the patients were reviewed for the purpose of making a decision whether to proceed with further diagnostic laparoscopy, as indicated by the presence of septated uterus or tubal occlusion views on HSG. The HSG records of women who had undergone diagnostic laparoscopy for infertility work-up were evaluated on the Picture Archiving Communication System (PACS, SarusPACS, Ankara, Turkey) of a tertiary education and research hospital between February 2014 and October 2015. Based on the PACS records, 218 HSG views of the diagnostic laparoscopy patients were detected. Patients who underwent

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