

## Original Research Article

# The assessment of endometrial pathology and tubal patency of infertile patients: MR-HSG and X-ray HSG

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## ABSTRACT

**Background:** Infertility is an important disorder for the pairs. Genetic, endocrine disorders or structural genital abnormalities can be cause. The cause of infertility can be determined with careful.

**Methods:** Although it can be reported that ultrasound with saline solution or contrast enhanced hystero salpingo-sonography is the best method to evaluate the uterine cavity and Fallopian tube patency, conventional hysterosalpingography (X-ray-HSG) remains the most commonly used procedure for imaging the uterine cavity and the fallopian tube patency in the evaluation of female infertility. But ionizing radiation to genital organs is the most important problem for X-ray-HSG.

**Results:** For this reason, they are still working on new methods to investigate female infertility as an alternative to X-ray HSGMRI is a favorite method because of excellent image characterization for the female genitals.

**Conclusions:** In this study, the diagnostic performance of MR-HSG was compared with X-ray-HSG which was accepted as a gold standard for detection of tubal patency and pathology of the endometrial cavity.

**Keywords:** Infertility, MR-HSG, X-Ray HSG

## INTRODUCTION

Infertility is an important disorder that affects approximately 10-15% of the pairs.<sup>1</sup> Although it has been reported that ultrasound with saline solution or contrast enhanced hystero-salpingo-sonography is the best method to evaluate the uterine cavity and fallopian tube patency, conventional hysterosalpingography (X-ray-HSG) The uterine cavity and the fallopian tube patency in the evaluation of female infertility.<sup>2</sup>

(MR-HSG) was used as a new method in which tubal patency is assessed and thought to have several advantages over X-Ray HSG and hysterosalpingography

(MR-HSG).<sup>3,4</sup> In this study, the diagnostic performance of MR-HSG was compared with X-ray-HSG which was accepted as a gold standard for detection of tubal patency and pathology of the endometrial cavity.

## METHODS

44 cases of infertile women were included in this study. Ages ranged from 19 to 39 years (mean age  $29 \pm 10$  years). After investigation of allergic history, a previous reaction to iodinated contrast media and obtaining informed consent. All cases were examined with MR-HSG and X-ray-HSG within 1 hour by the same radiologist. We had preferred to carry out the procedures

between 7-10 days of menstrual cycle and moderate filled bladder for both examinations.

MR-imaging was performed in a 1.5 Tesla MR (Symphony, Siemens, Germany). For imaging; Axial True-FISP (TE / TR: 2.1 / 4.3 ms, FOV 310-330 mm, thickness 4 mm), axial HASTE (TE / TR: 119/1100 ms, FOV 330-350 mm, thickness 4 mm) and sagittal TSE (TE / TR: 98/5190 ms, FOV 250 mm, slice thickness 4 mm) were acquired. For 3D MR-HSG, a fat-saturated 3D GRE sequence (3D FLASH: TE / TR, 1.1 / 4.3 ms, FOV 280 mm, thickness 1 mm) was acquired with a phased array body coil. No intravenous or oral contrast agent was given. Paramagnetic agent was diluted 1:20 with saline and 10-15 ml of this solution was slowly injected into the uterine cavity and patients were asked to breath quietly during the axial-coronal 3D FLASH MR -HSG sequences.

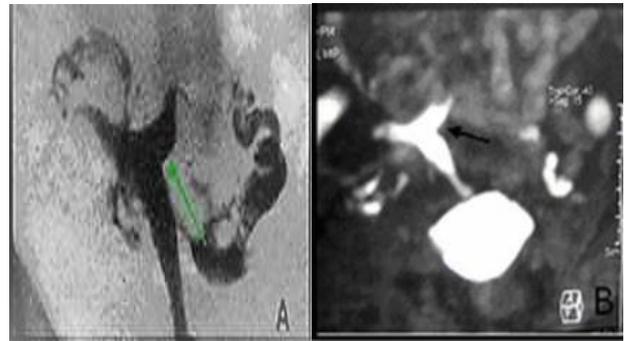
The patients were taken from the X-ray room and X-ray-HSG were carried out with digital imaging system (Siemens Axiom, Iconos 200, Germany) immediately following MR-HSG. Under fluoroscopic guidance, the uterine canal was filled with free intraperitoneal spillage of contrast was visualized from both fallopian tubes. 8-10 ml non-ionic contrast agent (Iohexsol, 300 / 50ml) was used during X-ray-HSG examination. The cervix is cleaned in the usual sterile fashion and the cervix is cannulated while a tenaculum is used to fixate the cervix in a standard fashion. Uterine cannulation was performed using a balloon catheter (Charriere 12, Rusch, and Kern, Germany) which was placed in the uterine cavity and inflated with air (4-6 cc) and blocked at its position.

All patients who did not receive any anesthesia or analgesia for HSG were interrogated regarding their experiences during both procedures such as abdominal discomfort and pain. MR-HSG images obtained from 3D FLASH sequences were processed with the maximum intensity projection (MIP), which has been applied to contrast images from the workstation (LEONARDO, Siemens, Erlangen, Germany). MR-HSG images were generated in different views. X-ray-HSG and MR-HSG images were printed for evaluation. Uterine cavity, tubal disease including blockage, both peritubal adhesions, and hydrosalpinx and peritoneal transition agents were evaluated in both methods. The results were compared with the Chi-square test.

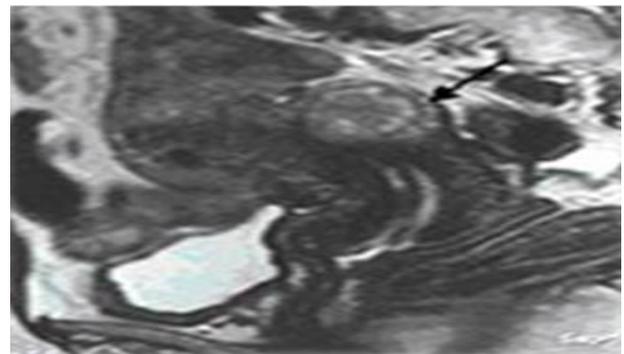
## RESULTS

MR-HSG was accomplished and well tolerated in all cases and MR-HSG caused patient discomfort than X-Ray HSG. Positioning of the catheter was feasible in most of the patients (88 %). The balloon was seen as hypointense signal in cavum uteri on all MR sequences. Endometrial cavity of all patients was evaluated in MR-HSG. Four bicornus uteri (Figure 1a-b), 1 septate uteri, 2 arcuate uteri, 2 irregular cavities, 1 indentation to cavity (Figure 2), 1 hypoplasia and 1 polypoid defect were seen

in MR-HSG of 44 cases which were correlated with X-ray-HSG. Bilateral tubal patency was determined in 28 of 44 cases by MR-HSG (79.4%) and in 22 of 44 by X-ray-HSG (70.5%).



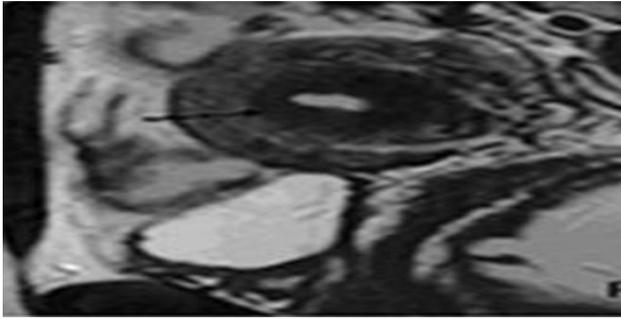
**Figure 1: (a) X-ray-hsg shows bilateral tubal patency, bicornuate uterus and left sided indentation on the uterine cavity (green arrow). (b), 3D GRE MR-HSG with overview MIP: right anterior oblique projection, shows bicornus uterus and left sided indentation on the uterine cavity (black arrow).**



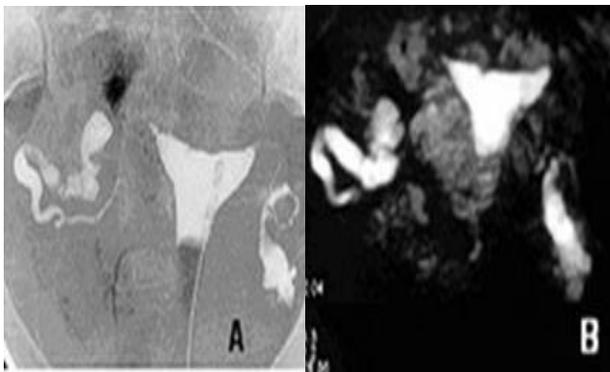
**Figure 2: Sagittal T2-W TSE MR image shows fibroid with mixed signal intensity on the posterior wall (black arrow).**

Unilateral occlusion of fallopian tube was seen in 6 of MR-HSG (12.5%) and 7 of X-ray HSG (12.5%) patients while bilateral occlusion was seen in 4 patients in each modality. Tubal patency was determined in 4 cases by MR-HSG which were not confirmed by X-ray-HSG due to spasm (4.5%). There were unilateral hydrosalpinx in 4 cases and bilateral in 1 in the both of the method (Figure 4a-b) (6.8%). Peritubal adhesions characterized as a loculation of contrast medium, convoluted tube and laterodeviation of the uterus were diagnosed in the late image of the both methods in 1 case. But second case with similar findings which was diagnosed with X-ray-HSG was not evaluated by MR-HSG due to no available late images. In addition, uterine fibroids were found in 3 cases (15.9%), adenomyosis in 2 (4.5%), ovarian cyst in 5 (8.8%), polycystic ovary syndrome in 9 (15.8%) and hemorrhagic cyst in 5 (11.4%) were seen in MR-HSG which could not be evaluated with X-ray HSG. Correlation and significance was measured using chi-square test and

confidence intervals were calculated using the method of proportions. The accuracy of MR-HSG was 100%, 86% and 97%, respectively. We could not detect significant differences between the two techniques ( $p > 0.05$ ).



**Figure 3: Sagittal T2-W TSE MR image shows adenomyosis (black arrow).**



**Figure 4: (a), X-Ray-HSG shows bilateral distal hydrosalpinx. (b), 3D GRE MR-HSG with overview MIP shows bilateral distal hydrosalpinx in harmony with X-Ray-HSG.**

## DISCUSSION

Routinely; fallopian tube patency is diagnosed by conventional X-ray-HSG, a method which is often painful due to osmotic irritation of endometrial and peritoneal tissue by iodinated contrast agents which also causes exposure of the genital organs of young and potentially fertile women to ionizing radiation. Systemic reactions to iodinated contrast material, however, also follow the vascular intravasation, are a potential occurrence, and a few cases are reported in the literature. Different iodinated contrast media can be used for X-Ray HSG: water-soluble, low osmolality nonionic contrast media are now the ones that are more commonly employed.<sup>5,6</sup> We used a non-ionic contrast agent for X-Ray HSG examination. Other screening modality for assessment of endometrial pathology and tubal patency is hysterosalpingo sonography which has a high negative predictive value. It is also subjective and operator depending test. For these reasons, it is used as a gold standard method, but it could have a role as a first-line screening test for pelvic pathology, including patency.<sup>7</sup> MRI is the most accurate method for noninvasive

diagnosis of various pelvic pathologies. Due to an excellent resolution, direct visualization of the reproductive organs, multiplanar imaging and avoidance of radiation, MRI is therefore used in the evaluation of female pelvis. But MRI could not evaluate tubal pathologies such as occlusion and peritubal adhesions. These pathologies are very important in female infertility. For these reasons, MR-HSG as a new method (combined with standard pelvic MRI) represents a possible one-step imaging approach to female infertility.<sup>8-10</sup> In our study, we could evaluate endometrial and tubal patency in addition to other pelvic pathologies in all cases with MR-HSG.

Limitations; First limitation dislocation of the catheter. It is possible during the transfer to the MR system, where catheter repositioning was not possible anymore due to the narrow MR tube. The catheter slipped back into the vagina during the examination in five of our patients and we excluded these patients from the study. Second limitation is that all evaluation was performed with the same radiologist. Third limitation is that each pathology was too few in each group for the statistical comparison, although the number of patients was enough. Appearance of the bowel lumen was sometime another occasional problem. Bright lumen can be confused with contrast enhanced adnexes. As, a result, we could not detect significantly differences in the diagnostic performance between the two techniques in evaluation of the tubal patency and endometrial pathology. Uterine cavity and tubal patency could be evaluated similarly with MR-HSG compared with X-Ray HSG.

## CONCLUSION

In order to enable a one-step imaging procedure for evaluation of all pelvic pathology including endometrial cavity and tubal patency, MR-HSG can be used as a first and sole modality without examining with X-Ray HSG in infertile females.

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