Hysterosalpingographic Technique and Findings in Infertile Women

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Learning objectives

To review hysterosalpingography (HSG) examination technique and common findings in women investigated for infertility at the Human Reproduction Unit in our Hospital.

Background

HSG refers to the radiographic evaluation of the uterine cavity and fallopian tubes after injection of radio-opaque medium trough the cervical canal. Fluoroscopy is performed during the evaluation to help guide the procedure as well to improve the quality of the radiographic images\(^1\). Images of the endometrial canal and fallopian tube lumens can be obtained, with almost no evaluation of the external uterine contour\(^2\).

This technique is commonly use in the evaluation of infertility, is relatively easy procedure, requires no anaesthesia and has a low complication risk. We used it as a first line approach for uterine morphology and for determining tubal patency as part of the infertility work-up in our hospital\(^3\). A wide variety of uterine and tubal abnormalities that cause infertility and other reproductive disorders can be shown by this technique, and a normal HSG can obviate unnecessary procedures (like hysteroscopy or laparoscopy) \(^4\).

Findings and procedure details

Technique:

Often the procedure itself can be intimidating because of the associated pelvic examination and the discomfort that goes with it for the patient, this poster will draw on a thorough review of current knowledge on the subject as the considerable experience by the department radiologists to point out practical tips for making this examination as smooth and atraumatic as possible.

The scheduling of the procedure should be done between days 5 to 10 of the menstrual cycle. This allows performing the examination while the endometrium has not grown significantly, since endometrium from the secretory phase may have lumpy appearance, potentially leading to false-positive diagnosis of an endometrial mass\(^4\), also should be done during this time to minimize the chance of interfering with a possible early pregnancy.
We will address some psychological issues before turning to the technical aspects of the process. A calm, confident and empathetic doctor can significantly minimize patient apprehension during the procedure. Introduce yourself before staring the procedure, inform the patient of the procedure (the insertion of the speculum and catheter) and what sort of discomfort to expect. This is also a good moment to go over the inform consent with the patient and fully answer all questions that she might have.

Contrary to common belief, warning or sympathizing using language that refers to negative experiences increases patient pain and anxiety and its use is discourage. So for example instead of saying to the patient that she may feel pain during the procedure, speak of discomfort or fullness of the uterus.

**Preprocedure Medications: Thoughts on analgesia and antibiotics use**

Patients can be instructed to take a nonsteroidal antiinflammatory an hour before the procedure; however, there is not enough evidence that supports treatment with analgesics significantly reduce pain during or after the procedure. Some randomized trials have reported less procedure associated pain with use of topical anaesthetics. We routinely do not give analgesics before or during the procedure, but encourage patients to take what they normally take for menstrual cramps before the procedure and prescribe 600mg of ibuprofen after the procedure in case of pain.

The risk of infection is rare and has been reported to be less than 1%, antibiotic prophylaxis with 500mg of azithromycin can be given to all women during the procedure but is not warranted. If the study results are suggestive of previous pelvic inflammatory disease or HSG demonstrates dilated fallopian tubes, antibiotic treatment with doxycycline 100mg twice a day for 5 days is recommended.

**Examination Technique:**

Before the patient enters the room, the sterile instrument tray is prepared and checked (Fig. 1). Place equipment within reach and set it to your own standards. Use a 60cc syringe and attached to the balloon catheter or 8-French paediatric foley catheter, then between 5 to 10cc of contrast material is pour into the system. Second eliminate air bubbles remaining in the system before inserting it, since they may confuse interpretation and unnecessarily prolong the procedure. Also check with a 5cc syringe that the balloon system is working before using it (Fig. 2). The patient is placed supine at the end of the fluoroscopic table with her knees bent in a modified lithotomy position, and draped with a sheet. Support patients head with a pillow, this can help the patient feel more comfortable.
Sometimes the tables at some radiologic fluoroscopic suites are not adequate for putting the patient in this position, in such cases the frogleg position could allow for good access. We recommend elevation of the pelvis for ease out the insertion of the system. It can be done with a pillow or with having the patient put her hands under her hips.

A sterile disposable double-bladed plastic speculum is inserted into the vagina to provide clear view of the cervix. A gooseneck lamp can provide light during the procedure so proper visualization of the cervix external os can be achieve. You can ease down insertion and increase your efficiency by having the patient strain down (Vasalva maneuver) or gently pressing down on the lower abdomen. You can ask the patient or an assistant to help you with this maneuver or do it yourself with your free hand. Cervix is cleaned with a disinfectant. Clasp the catheter at 2cm from the tip with a surgical clamp (a curved Kelly clamp works best). The tubular end of the tip is inserted into the external cervical os using the Kelly to propel inward, and the attached syringes should be held together with the other hand. You should advance the catheter just past the internal cervical os; avoid touching the uterus fundus with the catheter tip this might not only cause pain, but provoke a vasovagal response. Once is in the endocervical canal the balloon should be inflated. This might cause pain to the patient, ask her to give you input on her discomfort so as not to overinflate the balloon. If placement of the system is correct, it should form a tight seal of the endocervical canal that prevents leakage into the vagina.

There are many catheter systems available now to perform the procedure. More and more, clinicians are using catheters typically reserved for sonohisterosalpingography (SHG) for HSG. Balloon catheters are advantageous in that they typically do not require tenaculum placement for cervical traction, which is better tolerated by the patient. A study that compares the characteristics of six different catheters for performing SHG to identify those that offer more reliability, tolerability and cost. They found that 93% of the procedure that were done correctly performed no differences were found between the catheter systems. Overall the choice of which catheter should be used can be the preference of the physician performing the procedure.

The contrast media should be injected slowly, using low steady pressure with constant fluoroscopic monitoring of uterine and tubal filling. A small amount of contrast is used early in the examination to best visualize subtle intrauterine abnormalities such as polyps or synechiae, which may be obscure when the uterine cavity is completely filled. Contrast injection is continued as the uterine tubes opacify, with the endpoint of the examination being demonstration of bilateral tubal spillage into the peritoneal cavity. Monitor the examination when possible by watching the patient´s face.
Fluoroscopic time and the number of films obtained should be minimize, to reduce the radiation dose to the patient. In our experience, we need around 3 to 5 minutes for most examinations. We routinely obtain 4 images, all collimated to the area of interest. The first exposure is before any contrast is injected into the uterus, the second one is done early in the examination, usually after the uterine cavity has opacified but before bilateral tubal spillage has occurred (Fig 3). The third exposure is obtained almost at the end of the procedure to show permeability or obstruction of fallopian tube (Fig 4). At this point the procedure is almost done and the catheter system and speculum is taken out slow and carefully. We then ask the patient to rotate on their own axis 360° degrees, then we take the fourth image to prove peritoneal spillage\(^3\) (Fig 5-6). In some cases when anatomical features are obscure we might take oblique projections, but are not routinely done (Fig 7).

Inform the patient of what to expect in the upcoming hours or days. Mild pain is common during the procedure, and may last for a few hours afterwards. Leaking of contrast and spotting can be expected after HSG. Usual activities may be resumed immediately and sexual intercourse is not ban, but should be avoid in the first day. Warn the patient that fever, increasing pain or heavy bleeding is not normal and requires evaluation.

We tell our patients of the examinations results if asked, especially if the results are normal. We believe that radiologists have a direct responsibility to their patients. Studies of radiologist-patient communication show that many patients wish to learn the results of imaging tests from the radiologist at the time of the examination, and that many referring physicians support the principle of radiologists disclosing results when patients ask for them\(^{19-24}\). For abnormal results use your best judgement, and if you do, make sure that the information conveyed is appropriate and does not extend to treatment\(^4\). If doubts still remain, explain to patient that full discussion should take place with clinician who orders the procedure.

**Radiologist Report:**

It should include a description of endocervical and uterine morphology (size, position, shape, filling defects, endometrial irregularities, etc.), tubal patency should be mention and whether there was or not spillage of contrast medium into the peritoneum. If fallopian tube is obstructed or dilated should not only be mention, but also specify at which section of the fallopian tube is localized. The ease of cervical cannulation or if there is a cervical stenosis should be noted. This is valuable information, particularly for women undergoing intrauterine insemination or in vitro fertilization\(^4\). We also recommend noting if antibiotic treatment was given or if any complications during the procedure occur.

**Findings:**
We review 417 HSG procedures done at our hospital from the last 4 years. The median age for the population was 32 years, of which 89% were part of fertility work-up and 6.5% for previous abortions. Sixty percent of the procedures were concluded as normal and 12.5% require additional studies which included ultrasound, MRI, hysteroscopy or laparoscopy, depending on the pathology that was suspected.

For the complete list of findings in HSG we refer you to Table 1. Similar results have been by epidemiological studies of findings during HSG in infertile women\textsuperscript{25, 26}.

\textbf{Table 1. Findings in HSG in 417 infertile women}

<table>
<thead>
<tr>
<th>Findings</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cervix</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal caliber</td>
<td>387</td>
<td>92.8</td>
</tr>
<tr>
<td>Narrowing</td>
<td>22</td>
<td>5.3</td>
</tr>
<tr>
<td>Dilatation</td>
<td>7</td>
<td>1.7</td>
</tr>
<tr>
<td>Septate</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Uterine size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>400</td>
<td>95.9</td>
</tr>
<tr>
<td>Small or hipoplastic</td>
<td>13</td>
<td>3.1</td>
</tr>
<tr>
<td>Enlarge</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td><strong>Uterine shape</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>383</td>
<td>91.8</td>
</tr>
<tr>
<td>Arcuate</td>
<td>9</td>
<td>2.2</td>
</tr>
<tr>
<td>Unicorneate</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Bicornuate</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>Didelfos</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>T-shape uterus</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>Leiomyomas</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>Synechiae</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Postoperative</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Uterine filling defects:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>330</td>
<td>79</td>
</tr>
<tr>
<td>Air bubbles</td>
<td>26</td>
<td>6.2</td>
</tr>
</tbody>
</table>
Endometrial polyps 23 5.5
Leiomyomas 13 3.1
Synechiae 8 1.9
Endometrial hyperplasia 4 1
Adenomas 2 0.5
Unknown 9 2.2

*Fallopian tube visualization*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not obstructed</td>
<td>328</td>
<td>78.7</td>
</tr>
<tr>
<td>Unilateral obstruction</td>
<td>53</td>
<td>12.7</td>
</tr>
<tr>
<td>Bilateral obstruction</td>
<td>16</td>
<td>3.8</td>
</tr>
<tr>
<td>Unilateral hidrosalpinx</td>
<td>14</td>
<td>3.4</td>
</tr>
<tr>
<td>Bilateral hidrosalpinx</td>
<td>6</td>
<td>1.4</td>
</tr>
</tbody>
</table>

We detected endocervical caliber changes in 7% (Fig 6), abnormal uterine shape in 8% and abnormal uterine size in 4% in the population. Congenital uterine abnormalities corresponded to a 5.3% and acquired abnormalities to a 2.8% of the population. Uterine filling defects were detected in 21% including the identification of air bubbles. The pathological filling defects correspond mostly to leiomyomas and endometrial polyps (Fig. 7). Synechiae was the third most common pathological finding. Absent tubal visualization, either unilateral or bilateral was found in 16.5% and dilated fallopian tubes in 5% of the population. The most common site for occlusion was the isthmic portion of the fallopian tubes, either unilateral or bilateral. In thirty three (8%) patients there were findings suggesting abdominal adherences.

Pregnancy reported in the following three months was 6.7%. In the past has been reported that a good percentage of patient become pregnant soon after the procedure\(^{27-30}\). This therapeutic effect was found with Lipiodol and Ethiodol with pregnancy rates of 30% and 75% after a year respectively\(^{28, 29}\). These high rates may relate to other form of concomitant therapy used. Pregnancy rates have been lower in more recent studies using water soluble media. In 1983 a study using Sinografin found only 10.9% rate of pregnancy after 4 months follow-up\(^{31}\) and a prospective randomized study evaluated subsequent fertility rates after HSG with either oil or aqueous contrast medium was use without resorting to any therapy than clomiphene citrate. No statistical difference where found except for a higher pregnancy rate with oil than water base media in the subgroup of infertility of unknown cause\(^{32}\). The actual mechanism of this therapeutic effect is not yet known.
Risk and complications of HSG can relate to the use of contrast material, instrument manipulation like tenaculum site bleeding or perforation of the uterus or fallopian tube; or previous medical history of the patient\textsuperscript{33}. Most common complications are: pain and discomfort; injury and bleeding; uterotubal perforation, vascular extravasation, contrast media reactions, post-procedure infection or pregnancy radiation. Rate of infection can be as high as 3\% in patients with prior history of pelvic infection and rupture of hydrosalpinx can occur during the contrast injection\textsuperscript{33}.

No infections happen during the time of the HSG review, although we routinely give prophylactic antibiotic, and 1\% of severe complications were reported. There was one vascular extravasation (Fig 8), two severe abdominal pains, one bleeding and one seizure during a procedure that required emergency care.

**Images for this section:**

![Fig. 1: Sterile tray with instruments use for and during HSG](image-url)
**Fig. 2:** System utilized for HDG compile out of 8-French paediatric foley catheter, 60cc syringe to hold the contrast media, and a 5cc syringe for balloon inflation.
Fig. 3: Opacification of uterine cavity with initial opacification of both fallopian tubes.
**Fig. 4:** Bilateral opacification of fallopian tubes that extents into the infundibular-fimbriae portion.
**Fig. 5:** Initial fallopian tube spillage into the peritoneum after contrast media injection.
Fig. 6: Peritoneal spillage of contrast media after patient rotate on their own axis 360° degrees.
**Fig. 7:** Left oblique projection during HSG to better delimitate right fallopian tube that was obscure on AP projection.
**Fig. 8:** Narrowing of endocervical canal with a diameter less than 2.5mm.
Fig. 9: Uterine replesion defects due to multiple submucosal myomas that obstructs the left fallopian tube.
Fig. 10: Left vascular extravasation of contrast media.
Conclusion

Proper technique can increase your technical efficiency and success rate, allowing the radiologist to obtain more diagnostic information, and make a thorough differential diagnostic to determine pathological findings from the normal morphologic ones.

Personal information

References