Interpretation of hysterosalpingography

RAD Magazine, 43, 507, 9-10

Professor Anne Hemingway
Consultant radiologist

Dr Katherine van Ree
Consultant radiologist
Hammersmith Hospital, Imperial College Healthcare
NHS Trust, London
anne.hemingway@nhs.net

Introduction

The advent of assisted reproduction techniques such as in vitro fertilisation (IVF) has led to a significant increase in the demand for hysterosalpingography (HSG), a fluoroscopic imaging procedure involving the introduction of iodinated water-soluble contrast medium into the female genital tract to delineate the endo-cervical canal, uterine cavity, fallopian tubes and pattern of intraperitoneal spill.1

NICE guidance for the investigation of subfertility2 and a common perception is that HSG is primarily recommended for the detection of tubal disease. Performed correctly it is also invaluable in detecting and monitoring uterine pathology.

The technique was first described in 1910 by Rindfleish3 using a bismuth solution; by the early 1920s the oily contrast medium lipiodol was being used when, amazingly, one of the indications for the technique was to diagnose pregnancy.4 By the 1990s water soluble contrast media had largely replaced lipiodol for HSGs.5 Current indications for the procedure are numerous6-8 (table 1).

HSG typically forms part of subfertility investigations that also include an ultrasound, hormonal profiles and semen analysis. Other imaging modalities are usually supplementary (such as MRI) but can be helpful to further delineate abnormalities detected at HSG. It is important to appreciate that findings considered abnormal at HSG may or may not be of significance in regards to the patient’s symptoms and subsequent management.

This article will focus on factors that influence the interpretation of hysterosalpingograms. A comprehensive description of the technique, contraindications and complications can be found elsewhere.1,5

A crucial factor upon which an accurate interpretation can be made is image quality; achieving the highest possible image quality is dependent on numerous other factors including clinical background, patient anxiety, imaging sequence, procedure, technique and the experience of the radiographer and operator (table 2).

The paper or electronic request form for HSG should provide the patient’s gynaecological and obstetric history, other significant medical history and results of investigations to date. Past history affects the conduct and interpretation of the study. For example, previous uterine instrumentation should alert the radiologist to the possibility of uterine scar tissue, Asherman’s syndrome. A history of ectopic pregnancy increases the index of suspicion for tubal pathology such as salpinitis isthmic nodosa (SIN).9

An empathetic, calm environment is essential; women who have researched HSGs on the internet or had a poor smear experience will be anxious. Anxiety predisposes to pain which in turn can cause vaginismus or tubal spasm and an erroneous diagnosis of tubal occlusion. A simple pre-procedural checklist allows the operator to confirm all relevant information, establish rapport, provide a full explanation of the procedure, record the result of the pregnancy test and any drugs given and obtain written informed consent. Confirmation of demographic details, date of last menstrual period together with the outcome of any previous pregnancy, ie live birth, miscarriage, termination or ectopic, is essential.

We recommend performing a urine pregnancy test in all women as well as ascertaining no intercourse in that menstrual cycle – positive tests can occur in women who have experienced apparently cyclical bleeding in an early pregnancy.

History of post-partum complications should be sought, eg manual removal of placenta or post-partum haemorrhage; pelvic inflammatory disease, which may indicate tubal disease; previous pelvic or abdominal surgery such as myomectomy, tubal surgery. C-section or evacuation retained products of conception, which can all affect interpretation.

Ideally the procedure is undertaken and supervised by experienced staff with an interest in gynaecology. The procedure must be conducted gently and slowly, as a rushed speculum insertion or forceful contrast medium injection will cause unnecessary pain and diminish image quality. A wide range of catheters must be available,5 because the external cervical os may range in size from pinpoint to large and patulous. A 5Fr balloon inflated gently in the upper cervical canal is our catheter of choice. Once the catheter is in place the pelvic cavity is examined fluoroscopically and a control image acquired if any radio-opaque lesions are observed. Infusing contrast gently, a minimum of four image exposures, early filling AP, RAO, LAO and AP to show spill, are acquired supplemented by frame grabs as desired. Frame grab, fluoroscopic images alone are insufficient for accurate image interpretation. A low dose programme must be used and screening kept to a minimum. Women will frequently voice concerns about dose to the ovaries and question the operator regarding potential harm to future pregnancies. The national diagnostic reference level (DRL) for HSG is 2Gycm²;9 our local DRL for HSG is 0.7Gycm ².

It is essential to obtain a true en-face view of the uterine cavity (figure 1), views that only show a foreshortened view down the long axis of the uterus are non-diagnostic. Oblique images are essential (figures 2a-b) and can be obtained using a C-arm, patient rotation or a combination of both. Air bubbles can be distinguished from polyps by use of patient rotation, and it should be noted that small air bubbles can lodge at the cornu and mimic cornual occlusion.

If a balloon catheter is used and is inflated in the lower uterine segment a view following deflation (figures 2c-d) must be obtained to avoid missing lower uterine segment pathology. The range of uterine and /or tubal abnormalities that can be identified are shown in tables 3 and 4.

Uterine abnormalities

Congenital abnormalities

Readers will choose to use either the American fertility association10 or ESHRE11 classification system for their description of any congenital uterine abnormality identified on

---

HSG. Whichever system is used there are key procedural and interpretation caveats. If a unicornuate cavity (figure 3a) is identified the radiologist must gently withdraw the catheter under fluoroscopic control infusing contrast in order to attempt to identify a rudimentary horn and be sure the catheter is not advanced past the point of division of a duplicate system. The vagina and cervix must be re-examined to ensure that a second cervix and or vagina does not exist as part of a didelphic system. All patients with a unicornuate cavity should have an MRI scan to exclude a rudimentary horn.

If a septate (figure 3b) or bicornuate system (figure 3c) is suspected, then the radiologist should remember that the distinction cannot reliably be made on HSG and again MRI is required. Contrast spill may arch over the fundus and the pattern will suggest either a septate of bicornuate configuration, but in our experience this rarely occurs.

If two cervices are present both should be cannulated (figure 3d) to delineate the nature of the duplicate system present.

Acquired uterine abnormalities

Fibroids typically have been diagnosed prior to HSG by ultrasound. The HSG is useful for assessing the impact fibroids may be having on the uterine cavity (figure 3d) and assessing if any previous treatment – myomectomy or embolisation – has had any adverse effect on the cavity such as scarring (figure 5c) (see below).

Polyps may or may not have been identified previously. The HSG can determine if they are single or multiple, their location and if they are pedunculated (figure 4). As a rule of thumb, a filling defect distorting the cavity is more likely to be a fibroid than a polyp, although this is not an absolute discriminator.

Any form of uterine instrumentation, and particularly one that occurs in the gravid uterus, can give rise to uterine scar tissue or synechiae, Asherman’s syndrome.1 HSG is the gold standard for identifying this condition. Painless amenorrhoea suggests complete obliteration of the cavity, painful cyclical amenorrhoea indicates a lower segment or cervical occlusion with functioning endometrium above, light short menses suggest patchy scar tissue.

It is vital to image all areas of scar tissue from the cervix upwards if adequate treatment is to be offered, the HSG provides the surgeon with a road map for the hysteroscopic removal of adhesions. The HSG invariably underestimates the full extent of the scar tissue and even the smallest patch of scar tissue is significant.

Scar tissue is characterised by irregular persistent filling defects that are not obscured by further filling of the cavity with contrast (figures 5a-c). If scar tissue is identified and there is tubal patency the patient should be advised to avoid conception until review by the referring clinician. The risk of conception followed by further miscarriage and instrumentation and worsening of the scar tissue is high. Follow-up HSGs after adhesiolyis are invaluable in further treatment planning.

Tubal disease

Techniques to enhance tubal filling include rotating the patient or tilting the head of the bed down, coughing, valsalva manoeuvre, delay and relaxation techniques.

Tubal occlusion can occur at any point along the length of the tube. Proximal or cornual occlusion needs to be differentiated from spasm. Localised proximal disease may be amenable to selective salpingography and tubal re- cannulation.

The diagnosis of hydrosalpinges (figure 6a) is important. If bilateral their presence prevents the passage of an ovum and therefore fertilisation and subsequent pregnancy, but if unilateral, or if IVF is undertaken, there is then strong evidence that the presence of a hydrosalpinx significantly reduces embryo implantation. The affected tube(s) should be isolated from the uterine cavity either by ligation or hysteroscopic sterilisation. If a hydrosalpinx is identified, then additional antibiotic prophylaxis must be provided as these women are at increased risk of reactivation of infection.

Assessment of patients after sterilisation remains part of the remit of the radiologist. The surgeon may ask for an HSG following laparoscopic sterilisation if there has been any difficulty in placing the clips and, with the advent of hysteroscopic sterilisation with devices such as the ESSURE stent, meticulous technique to exclude tubal patency is essential.13 SINS, first described by Chiari in 1887, is characterised by isthmic diverticulae that invade the surrounding muscularis and incite secondary smooth muscle hypertrophy. The condition is usually bilateral, may be associated with tubal obstruction and hydrosalpinx and has a strong association with ectopic pregnancy (figure 6b).

With global travel and migration, the radiologist investigating fertility and other disorders of conception must maintain a high index of suspicion for tuberculosis (TB). Fallopian tubes and/or the uterine cavity can be involved in TB (figure 6c).

Conclusion

Interpretation of HSG is dependent on numerous factors including image quality, conduct of the procedure, operator experience and awareness of the impact of current and past medical history on any potential abnormality that may be demonstrated.

References

• Infertility – primary and secondary
• Recurrent miscarriage
• Post-operative assessment
  ○ myomectomy, division of uterine adhesions, correction of congenital anomaly, Caesarean section, tubal surgery etc.
• Sterilisation assessment
  ○ Pre and post reversal, complicated procedures and ESSURE
• Pre new cycle assisted reproduction, eg IVF/frozen embryo replacement cycle
  ○ especially if previous C-section/post-partum haemorrhage/other complication
• Surrogate evaluation

**TABLE 1**
Indications for hysterosalpingography.

- Image quality
- Quality of referral information
  ○ IRMER – sufficient information to justify exposure
  ○ Past medical history and current question to be addressed
- Clinical history to give context
  ○ Gynaecological
  ○ Obstetric
  ○ Other
- Technique
  ○ Environment
  ○ History, explanation and consent
  ○ Procedure
  ○ Images
- Experience of staff involved
-Clinical liaison

**TABLE 2**
Factors affecting interpretation of hysterosalpingograms.

- Congenital
  ○ Mullerian duct anomalies
- Acquired
  ○ Fibroids
  ○ Polyps
  ○ Asherman’s syndrome (uterine synechiae)
  ○ Adenomyosis
  ○ Post-operative change

**TABLE 3**
Uterine abnormalities.

- Spasm
- Occlusion
- Salpingitis isthmica nodosa
- Hydrosalpinx
- Tuberculosis
- Sterilisation
- Polyps

**TABLE 4**
Tubal abnormalities.

**Figure 1**
Normal HSGs. (A) True en-face view. (B) Normal intraperitoneal spill over uterine fundus. (C) Normal uterine cavity, fallopian tubes and spill following C-section, typical C-section irregularity in lower uterine segment (LUS).

**Figure 2**
(A) AP and (B) angled oblique view showing clear narrowing in the left side of the cavity due to scar tissue obscured on the initial image. (C) Balloon catheter inflated in the lower uterine segment and deflated (D) to demonstrate LUS segment clearly.
Figure 3
(A) Left unicornuate uterus. (B) Septate uterine cavity. Calcified subserosal fibroid noted. (C) Bicornuate uterine cavity, polyp noted in left uterine horn. (D) Didelphys – catheters present in both cervical canals. Both uterine cavities distorted by fibroids.

Figure 4
Multiple endometrial polyps in the lower uterine segment.

Figure 5
Asherman’s syndrome. (A) A small central patch of scar tissue. (B) More extensive central scar tissue. (C) Scar tissue secondary to myomectomy, intravasation also noted.

Figure 6
Tubal disease. (A) Left hydrosalpinx. (B) Bilateral salpingitis isthmica nodosa. (C) Tuberculous salpingitis.