

## *Hysterosalpingography and investigation of female infertility*

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### **ABSTRACT**

Despite the arrival of newer imaging modalities, the increase of laparoscopic surgical techniques and the application of subservient reproductive techniques, hysterosalpingography remains one of the main radiological methods for the investigation of female infertility. The purpose of this article is to pictorially present the spectrum of pathological findings revealed with hysterosalpingography.

*Keywords:* Hysterosalpingography, infertility.

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### **INTRODUCTION**

Infertility is grouped into two categories: primary infertility refers to couples who have not become pregnant after at least 1 year of intercourse without contraception and secondary infertility refers to couples who have been pregnant at least once, but never again [1-3].

Female infertility may be caused by several factors including autoimmune disorders such as antiphospholipid syndrome (APS), cancer, clotting disorders, diabetes, tumors such as fibroids or polyps in the uterus and cervix, birth defects that affect the reproductive tract, excessive exercising, eating disorders or poor nutrition, use of certain medications including chemotherapy drugs, alcohol abuse, obesity, old age, anatomical causes [4], ovarian cysts and polycystic ovary syndrome (PCOS), pelvic infection or pelvic

inflammatory disease (PID), scarring from sexually transmitted infection or endometriosis, tubal ligation or failure of tubal ligation reversal, thyroid disease and too little or too much of certain hormones [5].

Infertility testing involves a complete medical history and physical examination of both partners. Blood and imaging tests should be done. In women, this may include: blood tests to check the hormone levels including progesterone and follicle stimulating hormone, body temperature measurement in the morning, FSH and clomid challenge test, luteinizing hormone urine test (ovulation prediction), thyroid function tests, hysterosalpingography (HSG), pelvic ultrasound and laparoscopy.

## PATIENT'S PREPARATION

Antibiotics should be prescribed one day before and a few days after hysterosalpingography, especially if there was an inflammatory process in the past. In addition, antibiotics must be prescribed after hysterosalpingography when the operation is bloody or when the fallopian tubes delineates with severe dilatation [6].

## TECHNIQUE OF CATHETERIZATION

The patient is placed on the fluoroscopic table on a gynecological examination position. After cleaning the area of the external genitalia with antiseptic solution, the vagina is dilated by a gynecologic dilator. Afterwards the cervix uteri is straightened by one (at the 12 o'clock position) or two (at the 9 and 3 o'clock position correlatively) surgical forceps exercising a degree of pulling. Then the outside cervix uteri ostium is catheterized. The catheterization can be performed in two ways. In our department, a salpingographer with a bell-shaped end of various sizes is used. The salpingographer is pushed through the vagina and fitted to the external cervix uteri ostium. In the second technique, the salpingographer has a plastic cup-shaped end which is also fitted to the external cervix uteri ostium by creating void phenomenon. In both techniques, at the other end of the salpingographer there is a syringe filled with iodinated hydrosoluble contrast medium. After the catheterization of the external cervix uteri ostium and before the administration of the contrast medium, the vagina-dilator is taken off [2, 6, 7].

## CONTRAST MEDIA

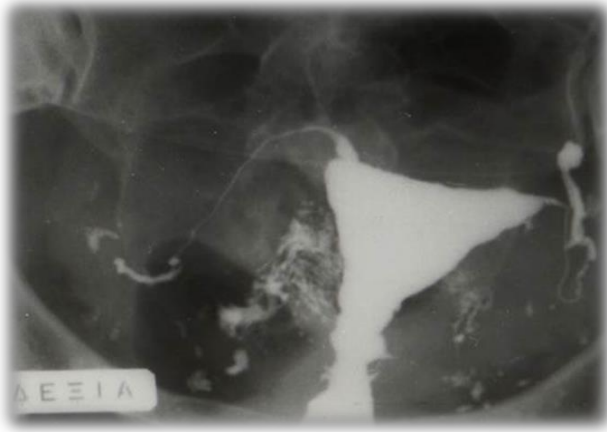
In the past the contrast media were primarily fat soluble [1]. Today, mainly iodinated contrast media are used. The contribution of the water soluble contrast media in the decrease of the conception time after the salpingography is mentioned in the literature.

## RADIOLOGICAL VIEWS

One simple radiograph of the pelvis (on a 24x30 cm radiological film) is necessary before the administration of the contrast medium into the uterine cavity. By this way, possible intrapyelic masses or calcifications will not lead to diagnostic problems during the study of the films. After that, the examination is operated under fluoroscopic control, so that we can acquire radiographs during the filling of the uterine cavity (usually 2-3 cc of contrast medium are enough), then during the filling of the Fallopian tubes (Figure 1) and finally, after the removal of the salpingographer, we acquire a radiograph in order to check the presence of contrast medium into the peritoneal cavity (Figure 2). The whole amount of the injected contrast medium should not be more than 10 cc. Before the first radiograph, the reflux of the contrast medium is checked fluoroscopically [2, 6, 8].



**Figure 1.** Normal uterus.



**Figure 2.** Extravasation of contrast medium.

**PATHOLOGICAL IMAGING FINDINGS**

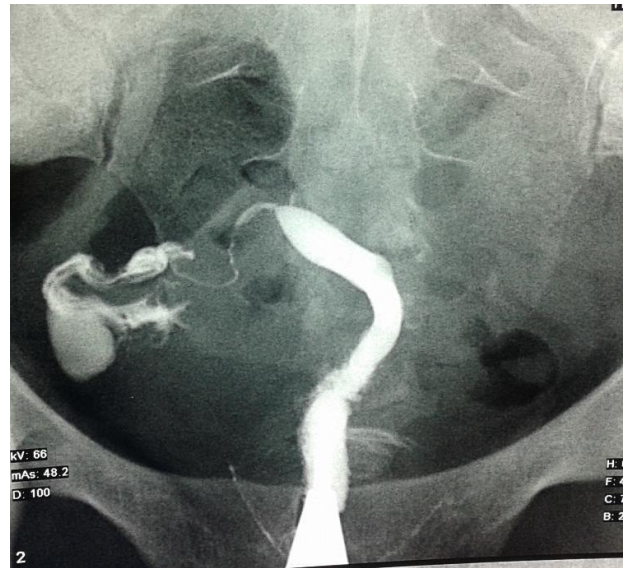
**Congenital uterus anomalies**

Congenital uterus anomalies are caused by incomplete junction of the Muller tubes or by non-absorption of the diaphragm which is located between the tubes during uterus growth at the 18th gestational week. These congenital anomalies occur at 9% of women with infertility problems and repeated abortions. According to the American Fertility Society there are the following categories: *Type I. Agenesis or aplasia of the uterus* (Figure 3). This anomaly is detected at early age.

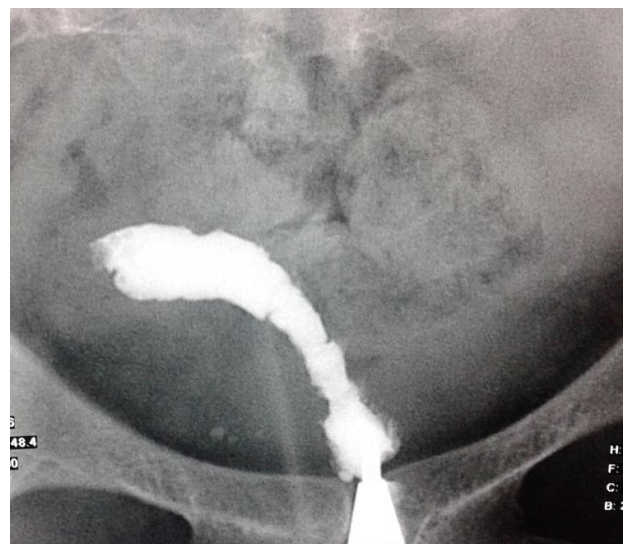


**Figure 3.** Hypoplasia of the uterus

*Type II. Unicorn uterus.* (Figures 4, 5). Rarely, one of the Muller tubes degenerates and the uterus cavity appears single, at the left or the right of the midline. The unicorn uterus communicates only with the ipsilateral oviduct.



**Figure 4.** Unicorn uterus. Unicorn uterus that communicates with the ipsilateral oviduct.



**Figure 5.** Unicorn uterus with obstruction of the ipsilateral oviduct.

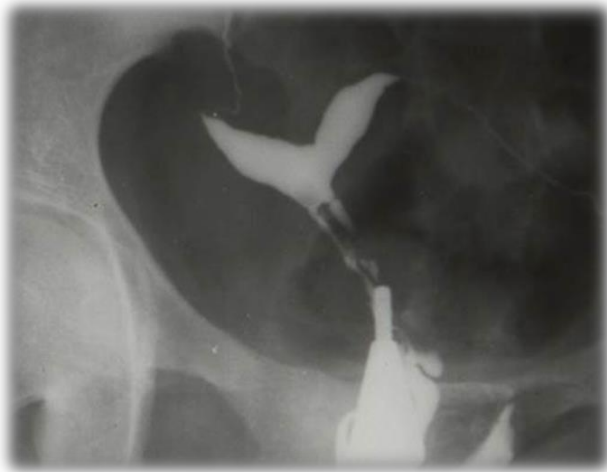
**Type III. Didelphys uterus.** It is a rare congenital anomaly that regards to the duplication of the uterus, the cervix and the vagina. Rarely didelphys uterus has only one vagina.

**Type IV. Bicornous uterus.** (Figure 6) The uterus cavity is divided into two cavities. Each cavity has an oblong shape and is separated from the other.



**Figure 6.** Bicornous uterus. The uterus cavity is divided into two cavities. Each cavity has an oblong shape and is separated from the other.

**Type V. Bicameral uterus.** (Figure 7) Uterus with an internal sagittal septum.



**Figure 7.** Bicameral uterus. Uterus with an internal sagittal septum.

**Type VI. Sagittate uterus.** (Figure 8) Sagittate and bicameral uteri are the most common congenital anomalies (50%). [2, 9, 10]



**Figure 8.** Sagittate uterus.

### Fibroids

The suprapubic ultrasonography is the method of choice for the diagnosis of fibroids. Types of fibroids:

**Submucosal fibroids** (Figure 9). They appear as smooth filling deficits in the uterus cavity. The differential diagnosis includes mucosal polyps (Figure 10), presence of air bubbles (Figure 11) and pregnancy.



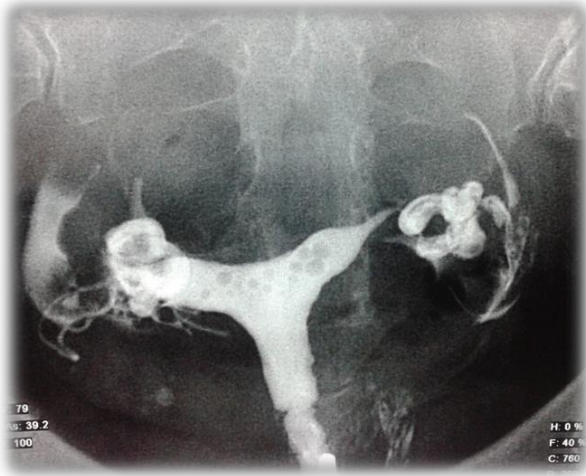
**Figure 9.** Submucosal fibroid depicted as a smooth filling deficit located at the fundus of uterus.



**Figure 10.** Mucosal polyp. A small smooth filling deficit in the endometrial cavity.



**Figure 12.** Subserous fibroid. A smooth filling deficit in the uterus is depicted. The fibroid is located at the lateral wall of the uterus.



**Figure 11.** Presence of air bubbles within the endometrial cavity. Small round-shaped filling deficits into the endometrial cavity.

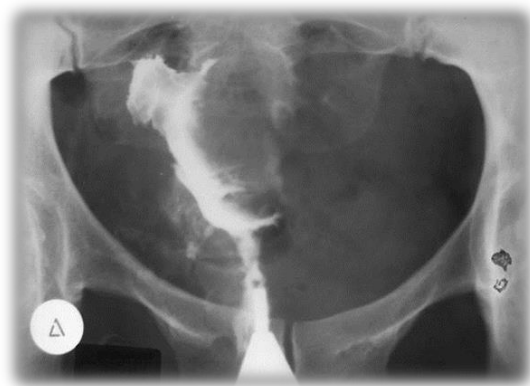
**Subserous fibroids** (Figure 12). The subserous fibroids appear as smooth filling deficits in the uterus cavity or as a mild repulsion of the oviducts, only when they are located at the lateral walls of the uterus [2].

**Adenomyosis**

Adenomyosis concerns to ectopic functional endometrium into the myometrium. It appears as a spiky protrusion, 2-3 mm long, vertical to the uterus wall after the injection of the contrast medium. The differential diagnosis includes hyperplasia of the endometrium and entrance of the contrast medium into the myometrium or into the feeding arterioles of the submucosal fibroids. [2]

**Uterus cancer**

The hysterosalpingography is not the method of choice (Figure 13). [2, 9]



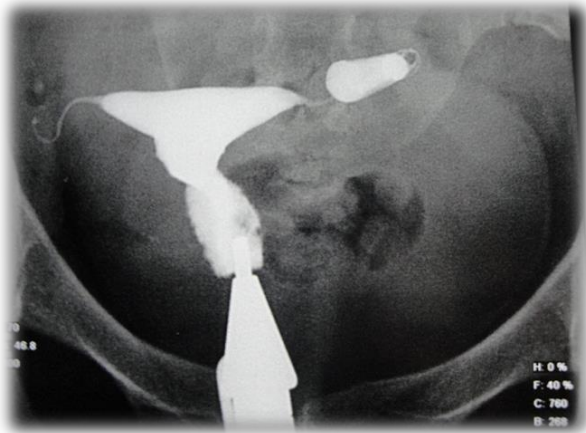
**Figure 13.** Uterus cancer. The hysterosalpingography revealed a filling deficit with rough margins.

### Anomalies of the vagina

Abnormal contour commonly seen in cervicitis or tuberculosis, reduction of the range of the tube or repulsion due to external pressure from a fibroid and filling deficit in the tube due to polyp or cancer, are some of the findings revealed during hysterosalpingography. [2]

### Anomalies of the oviducts

*Hydrosalpinx* (Figure 14). It is a common finding in hysterosalpingography and is usually the result of previous inflammation of the oviducts (salpingitis) with incomplete obstruction. A dilated tube in one or more segments and inability of the contrast medium to enter the peritoneal cavity are the main radiological findings.



**Figure 14.** Hydrosalpinx. A dilated tube and inability of the contrast medium to enter the peritoneal cavity are depicted.

*Tuberculous salpingitis.* It is usually caused by the obstruction of the distal end of the oviducts. If the inflammation is extensive there are areas of dilatation and narrowing. In generalized inflammation the contour of the uterus appears abnormal.

*Follicular salpingitis of the isthmus.* The aetiology remains unknown and is possibly caused by diverticula of the oviducts or it is associated with endometriosis. [2, 5]

*Non enhancement of the oviducts.* It constitutes the most common finding and the causes are the followings:

- Bad technique: This is due to incomplete straightening of the external cervical orifice or to insufficient propulsion of the contrast medium into the uterus cavity.
- Spasm: It takes place at the proximal segment of the oviducts and is avoided with the progressive injection of the contrast medium.
- Obstruction: It is the result of previous inflammations or surgeries at the area.
- External adhesions: These adhesions are the result of a previous salpingitis or peritonitis. The adhesions obstruct the exit of the contrast medium to the peritoneal cavity.

### CONCLUSION

Hysterosalpingography (HSG) has become a commonly performed and popular examination due to recent advances in reproductive medicine. HSG is considered to be the imaging modality of choice for the evaluation of the anatomy of the uterus and the salpinges. Congenital abnormalities, adenomyosis, leiomyomas, tubal occlusion and hydrosalpinx, can be detected with HSG. Although nowadays new diagnostic procedures such as ultrasonography, MRI and sonohysterography have developed, neither of these methods reduces the popularity and the efficiency of hysterosalpingography [11, 12].

The capacity of HSG to evaluate the patency of the fallopian tubes with free spill of

contrast into the peritoneal cavity remains the main advantage of the method. Ultrasonography and MRI can't evaluate tubal patency and sonohysterography has less satisfactory results than HSG. HSG can easily and safely diagnose tubal occlusion. Multiple adhesions inside the endometrial cavity caused by trauma, infections or surgical procedures such as leiomyomatectomy, are a usual cause of infertility. Hysterosalpingography is the only method that can depict endometrial adhesions and ultrasonography is only used for follow up after surgical removal of endometrial adhesions. (Figure 15)



**Figure 15.** Scar tissue after Caesarian section depicted as a filling deficit.

MRI and ultrasonography have higher sensitivity than HSG and play an important role in the evaluation of leiomyomas. Leiomyomas though, are rarely the main and only cause of infertility and other causes of infertility should be excluded before performing leiomyomatectomy. [12, 13]

There is a number of published studies that mention the potential therapeutic role of HSG. In some cases, unblocking of the occluded salpinx during the injection of the contrast medium was reported, but the utility and the efficacy of the method isn't yet proved [14].

Hysterosalpingography is a low cost, easily performed and efficient imaging method for the investigation of female infertility. Today it still remains the imaging method of choice. Radiologists should become familiar with the HSG technique, the interpretation of HSG findings and the possible complications of the procedure.

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## Υστεροσαλπιγγογραφία και διερεύνηση γυναικείας υπογονιμότητας

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### ΠΕΡΙΛΗΨΗ

Παρά την τεχνολογική εξέλιξη των απεικονιστικών μεθόδων, την αύξηση των λαπαροσκοπικών χειρουργικών τεχνικών και την εφαρμογή υποβοηθούμενης αναπαραγωγής, η υστεροσαλπιγγογραφία αποτελεί την απεικονιστική μέθοδο εκλογής για την διερεύνηση της γυναικείας υπογονιμότητας. Σκοπός του άρθρου αυτού είναι η παρουσίαση του φάσματος των απεικονιστικών παθολογικών ευρημάτων που αναδεικνύονται με την υστεροσαλπιγγογραφία.

*Λέξεις ευρετηρίου:* Υστεροσαλπιγγογραφία, Υπογονιμότητα.

### Παραπομπή

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