
بسم الله الرحمن الرحيم

HSG
TECHNIQUE & FINDING

For
6th year MEDICAL students

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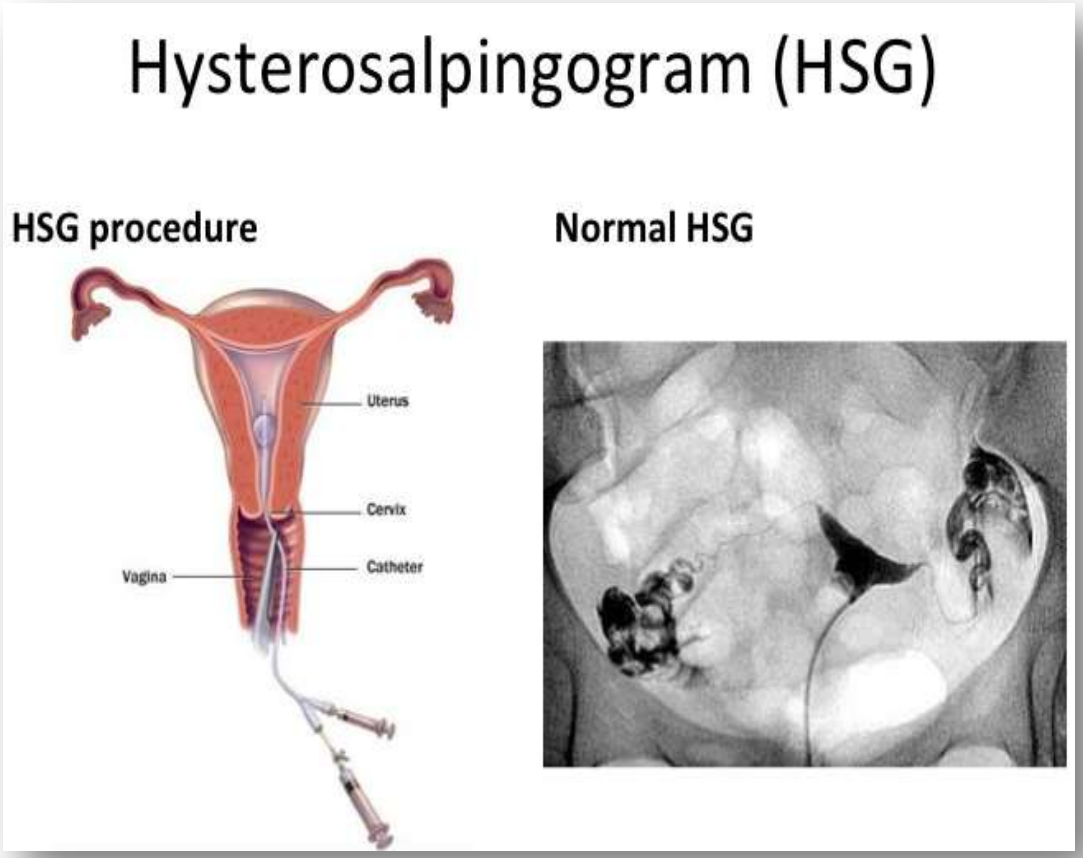
UPDATED



Radiographic evaluation

of *uterine cavity* and *fallopian tubes*

By administration of a radio-opaque medium through cervical canal.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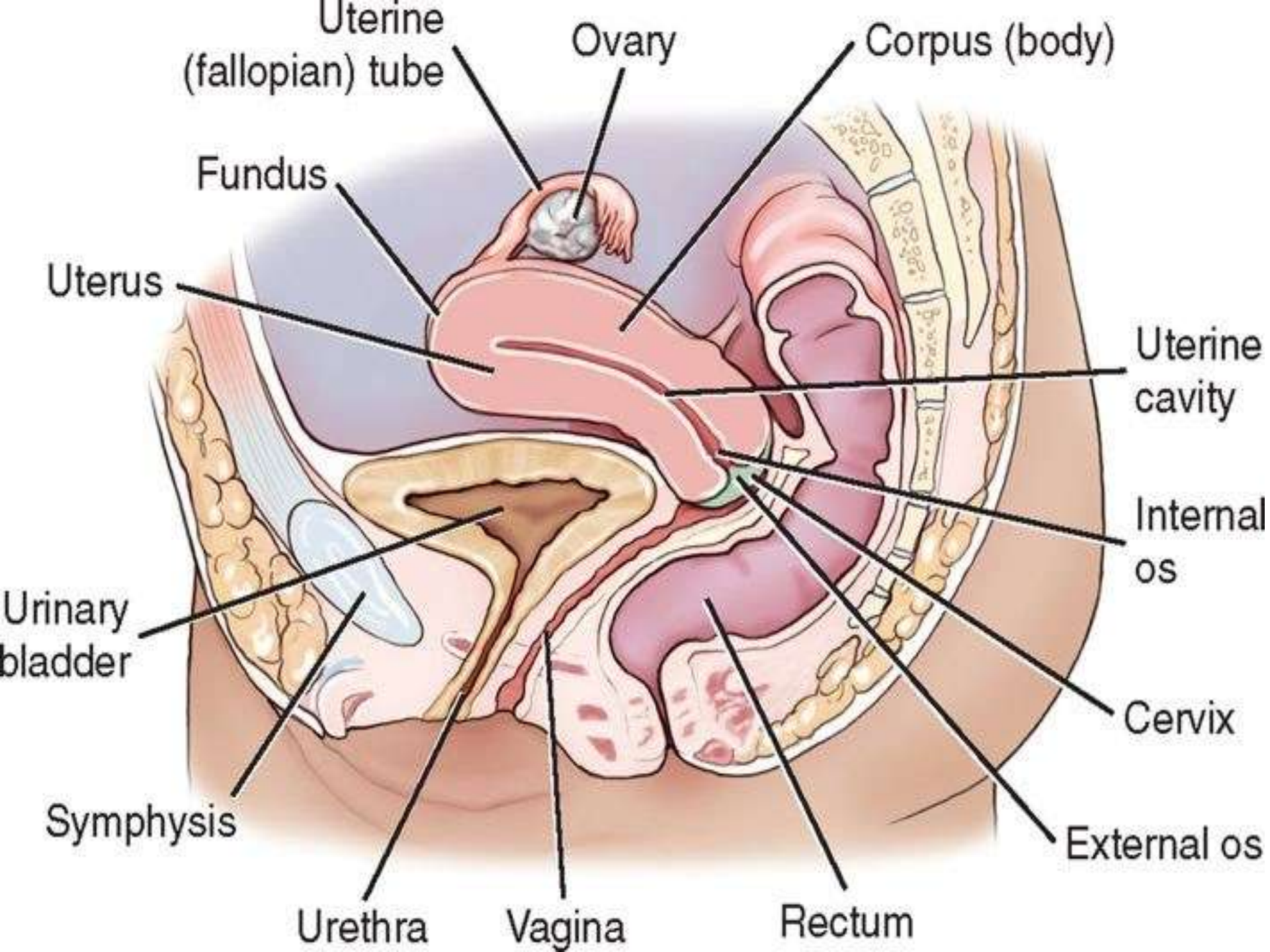
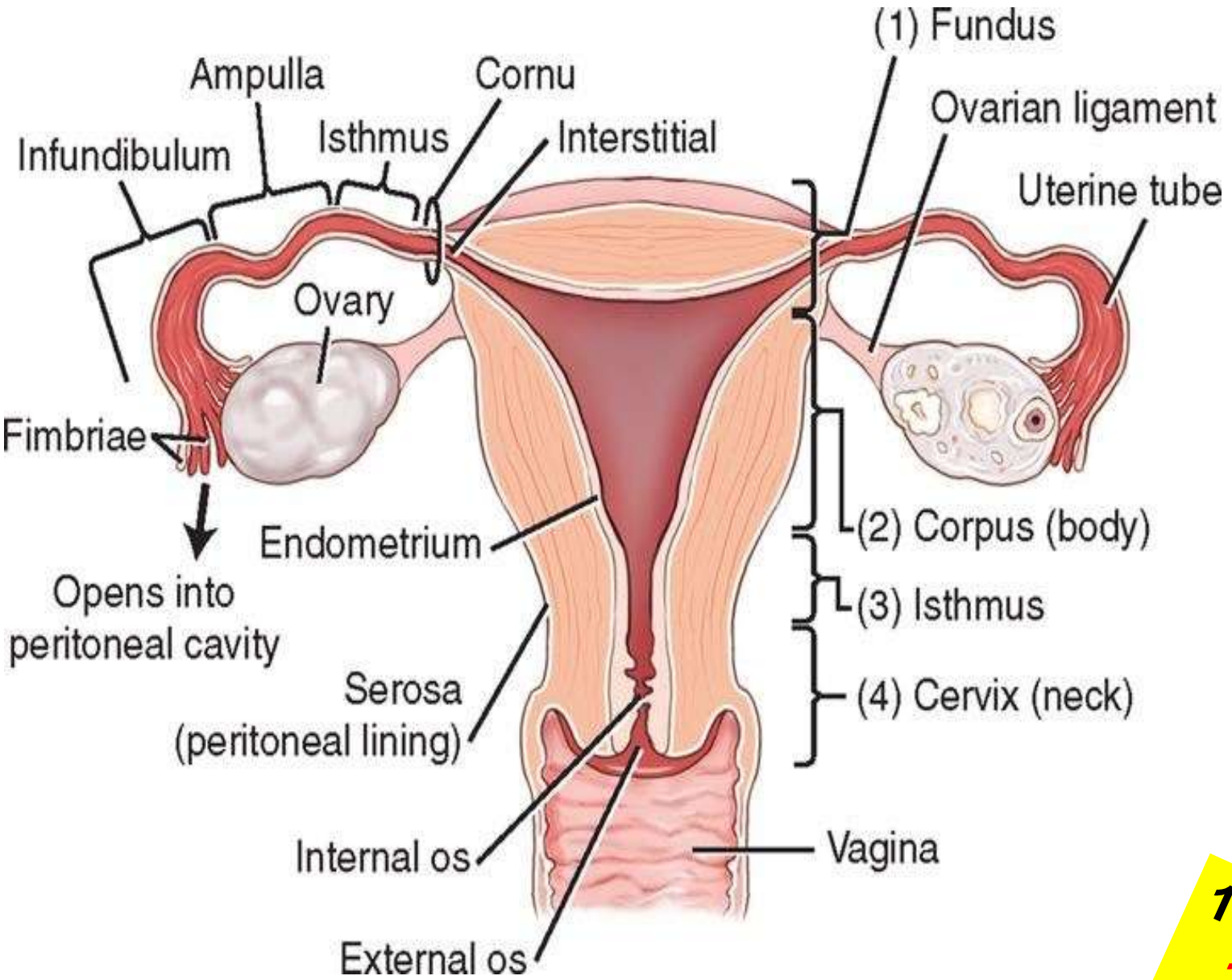
(HSG)

still an important radiologic procedure in investigating infertility .

- **It** demonstrates :
  - **Morphology** of uterine cavity,
  - **Patency** of fallopian tubes.

ANATOMY


Uterine (fallopian) tube
Ovary
Corpus (body)
Fundus
Uterus
Uterine cavity
Internal os
Urinary bladder
Cervix
Symphysis
External os
Urethra
Vagina
Rectum


(1) Fundus
Ampulla
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Isthmus
Interstitial
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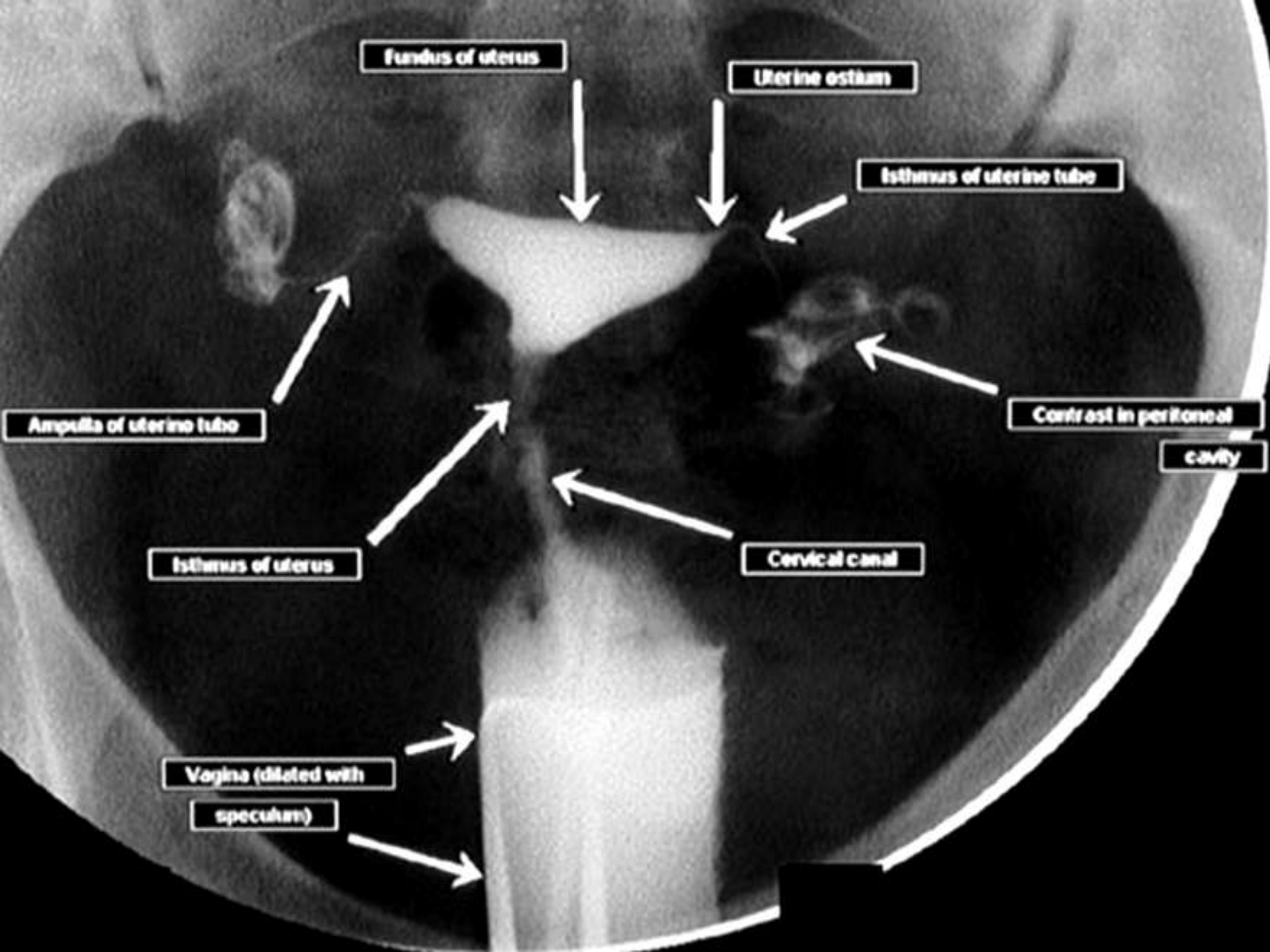
Ovary
Fimbriae
Endometrium
(2) Corpus (body)
Opens into
peritoneal cavity
(3) Isthmus
Serosa
(peritoneal lining)
(4) Cervix (neck)
Internal os
Vagina
External os

1st HSG
1910


Right Tube
Uterus
Left tube
Spill of dye
Spill of dye


Fundus of uterus
Uterine ostium
Isthmus of uterine tube
Ampulla of uterine tube
Contrast in peritoneal cavity
Isthmus of uterus
Cervical canal
Vagina (dilated with speculum)

Indications

1- Infertility assessment:

- Most common indications
- Diagnose **functional** or **structural defects.**

- **In some cases**, HSG can be a ***therapeutic tool*.**
- Injection of contrast media → dilate a narrowed, tortuous, or occluded uterine tube

2- F*requent miscarriages*

3- Uterine abnormalities

- *Congenital* / *masses /*Adhesions

4- Evaluate tubal patency

5- Abnormal menses

6- Preoperative control → uterine or tubal surgery.

Risks Vs Benefits

- ✓ **Minimally invasive**
- ✓ Rare complications
- ✓ *Valuable information*
- ✓ *Minimal exposure* to radiation
  - *Effective radiation dose ~ 1 mSv (comparable to average amount of background radiation over 4 mo)*

- **Must not** be performed if patient is query *pregnant*

- **Despite of newer imaging modalities,**

HSG

still *the best* to image the fallopian tubes.

Sensitivity

- ✓ **75%** → intrauterine adhesions.
- ✓ **58%** → polypoid lesions,
- ✓ **44.4%** → uterine malformations
- × ***0%*** → ***endometrial hyperplasia***.

Contraindications:

1- ***Possible Pregnancy : (main contraindication)***

Avoided by : performing HSG before the ovulation phase,

"between the 7th to 10th day of the menstrual cycle"

2- **Active** pelvic ***inflammation*** .

3- ***Bleeding :*** vaginal or uterine

4- ***Surgery*** Recent uterine or tubal

General contraindications :

severe cardiac or

renal deficiency,

Patient Preparation

✓Timing:

the **first half of the menstrual cycle** following cessation of bleeding. Due to

- **E**ndometrium is thin during this proliferative phase, → facilitates better image interpretation
- ***E***nsure that there is no pregnancy.

- **Second half** of the cycle **is avoided** because :

  - Possibility of pregnancy.
  - **Thickened secretory-phase** endometrium →

  increases risk of **venous intravasation** and may cause a false-positive diagnosis of cornual occlusion / Hazy outline.

Double uterine contour ←Improper imaging time

“Secretory Phase”

✓ *Bowel preparation* :

To avoid reproductive tract obscuring by bowel gas and/or feces.

→ By a mild laxative, suppositories, and/or a cleansing enema

✓ *Bladder Voiding* :

empting bladder immediately before the examination →

prevent displacement of the uterus and uterine tubes,.

+/-

- ***Antibiotics*** :
- ***Pain Killer***:
- ***Steroid (prednisolone)***
- ***Antispasmodics***

TECHNIQUE

Procedure

.....In a simple words

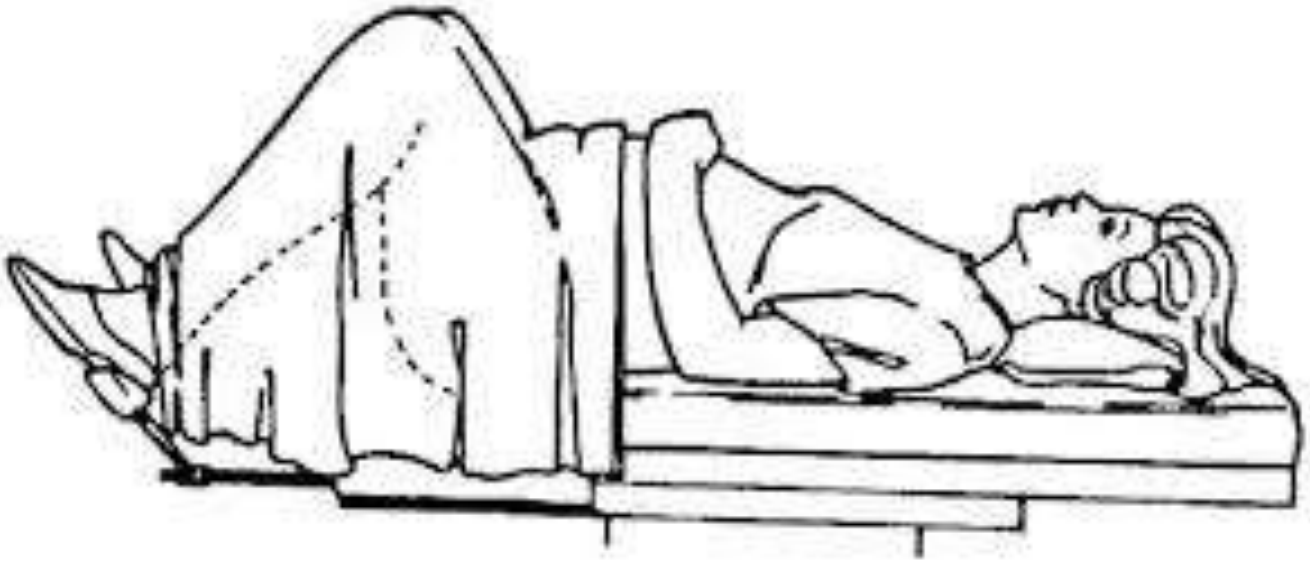
- A **speculum** is inserted into the vagina
- A **catheter** is then inserted into the cervix
- **Contrast** material is injected into the uterine cavity through the catheter
- **Fluoroscopic images** are then taken

Technique

- The patient is placed on the *fluoroscopic machine .*

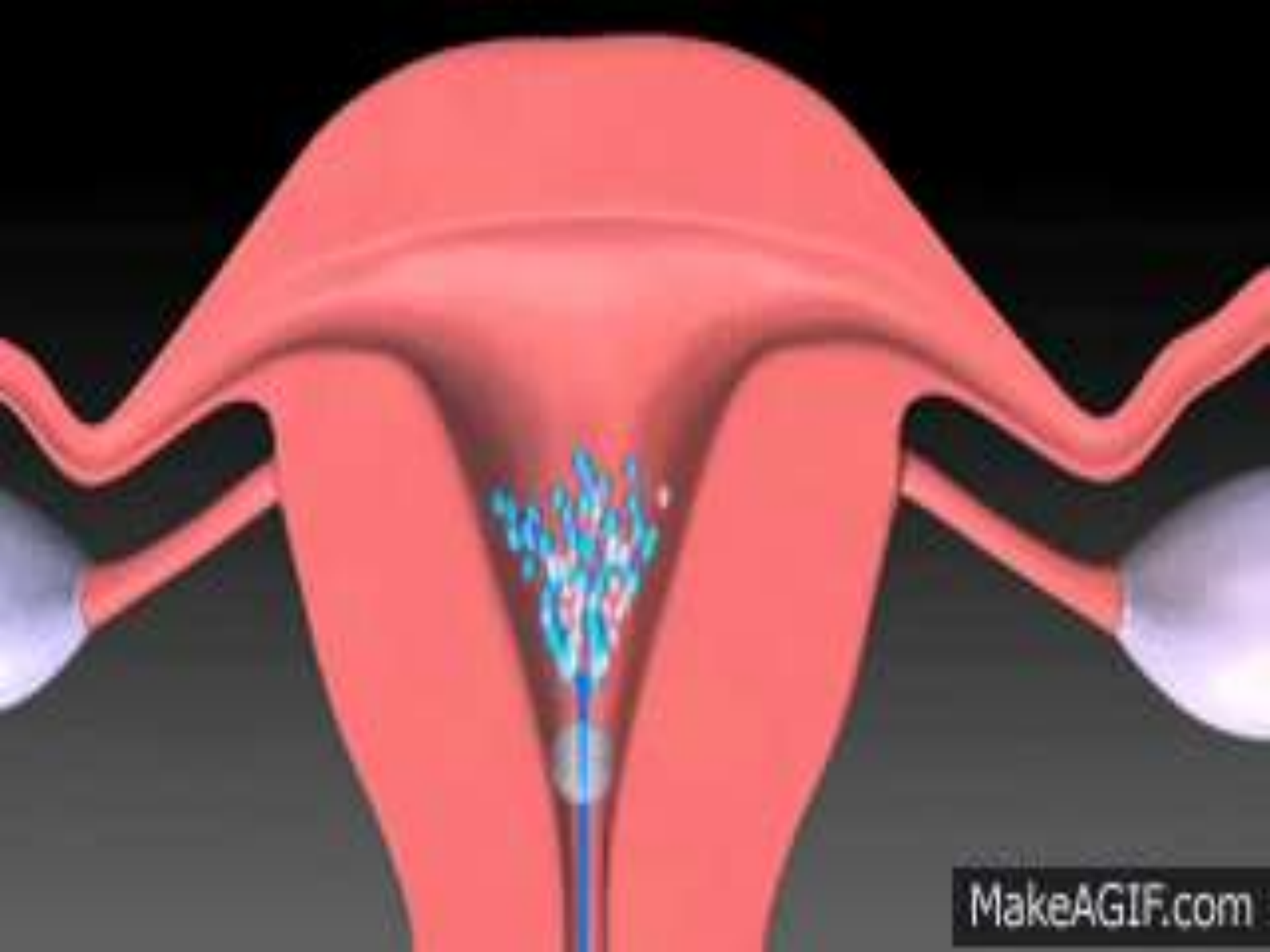
- **<u>Position</u>***:* Gynecologic examination

the patient bends her knees and places her feet at the end of the table.



Equipments

SOME FORMS OF CATHETERS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Contrast Media

iodinated media

Two categories

Water soluble

Oil Based

I- **Water-soluble**,

such as **Omnipaque** 300, is preferred.

- It is absorbed easily,
- Does not leave a residue, and provides adequate visualization.

II- oil-based contrast media

Allow maximal visualization of uterine structures.

- However, it has a very slow absorption rate

- persists in the body cavities for an extended time.

Risk of oil embolus that could reach the lungs.

→ AMOUNT OF CONTRAST

variable

"**About 5 : 15 mm**"

- ✓**About** **<u>5 ml</u>** → to fill the uterine cavity,
- ✓Additional **5 ml** → to demonstrate uterine tube patency.


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COMPLICATIONS

General or **Local**

Commonest

✓**PAIN**

✓**INFECTION**

1-Uterine contractions and discomfort

2- Infection

3- Vasovagal reaction

4- Endometrial Injury

5- Uterine perforation & tubal rupture: very rare.

6- Intra-vasation of contrast media: **Venous** or **lymphatic**

7- Allergic reaction to contrast media: **Very rare**

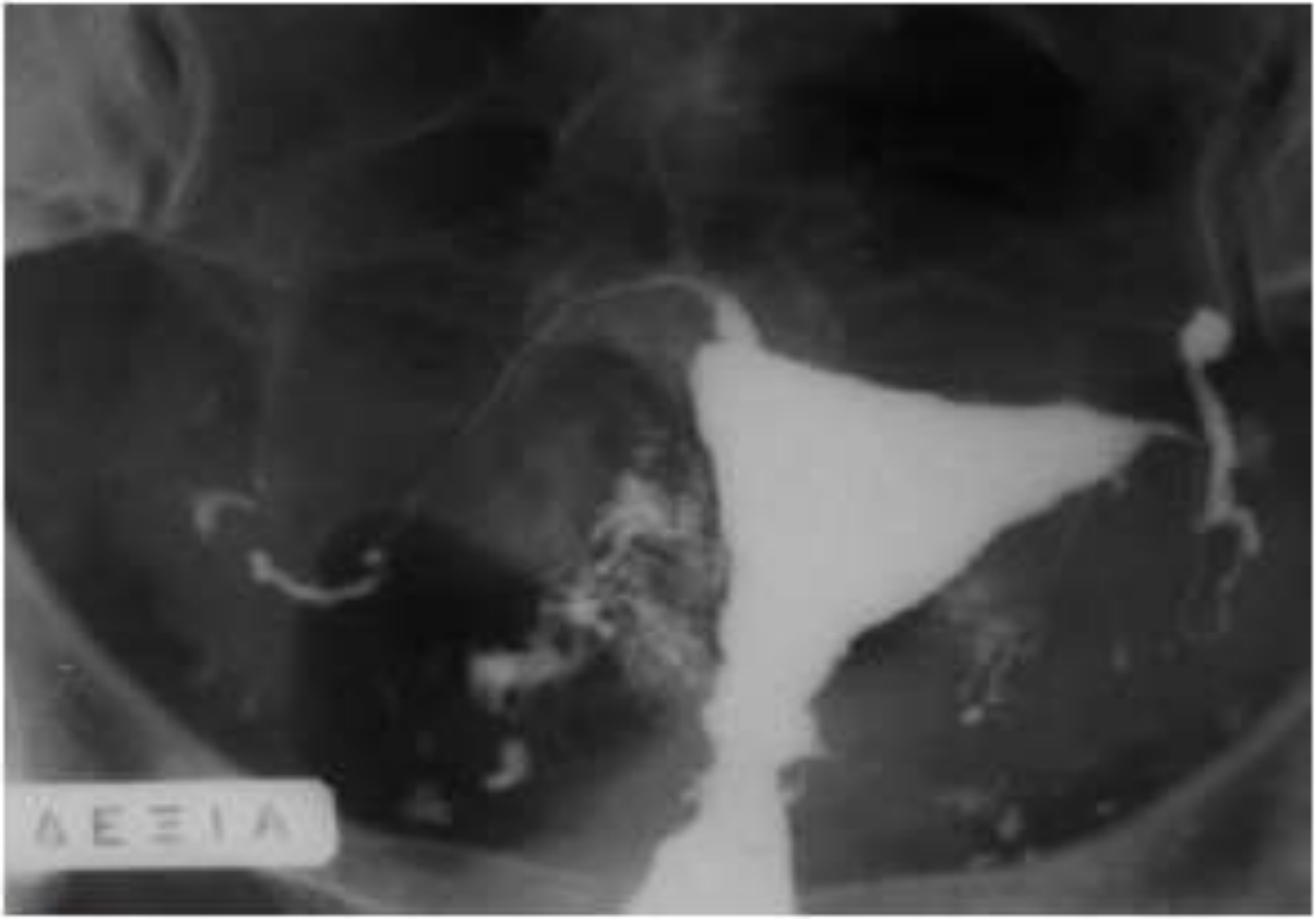
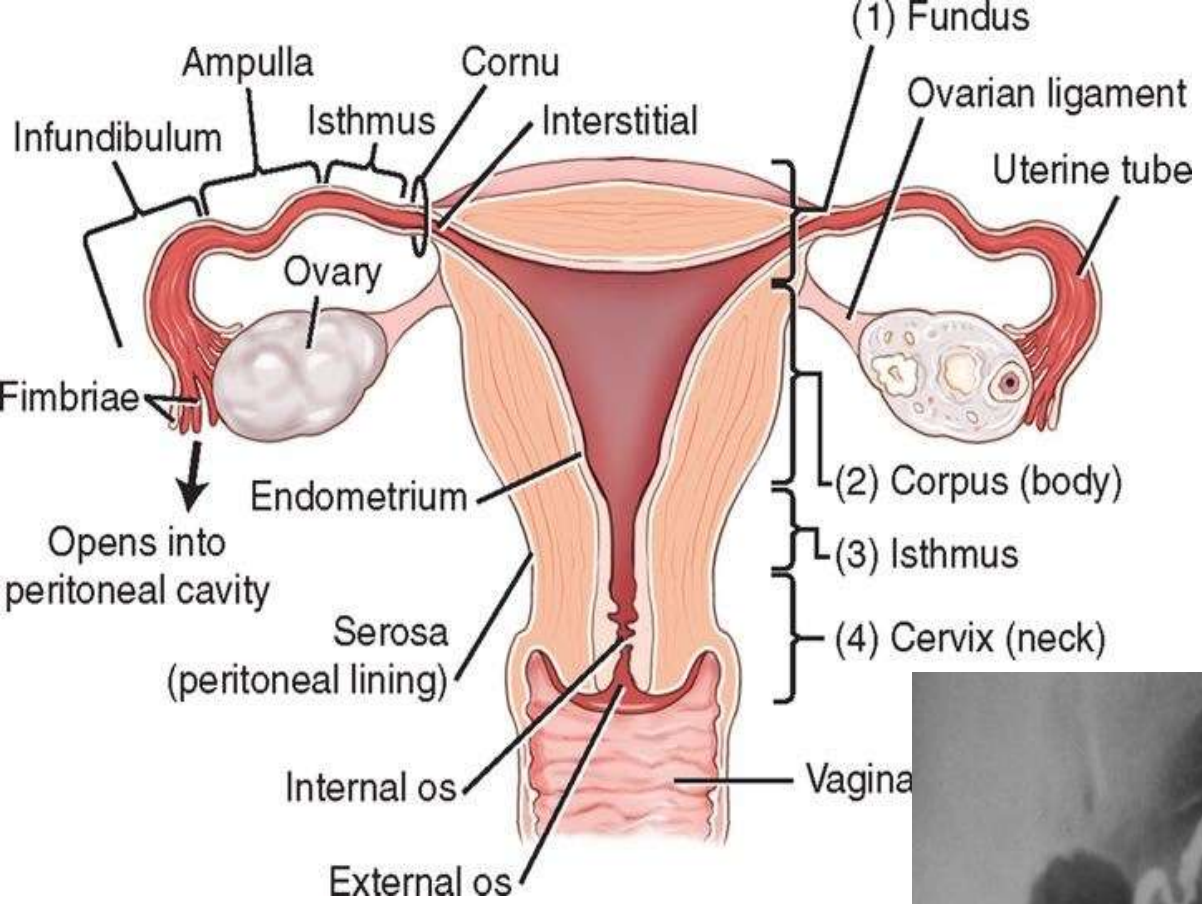


FIG 1. Extravasations of the contrast medium. Presence of contrast medium in the peritoneum.

Normal Findings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Internal os
Vagina
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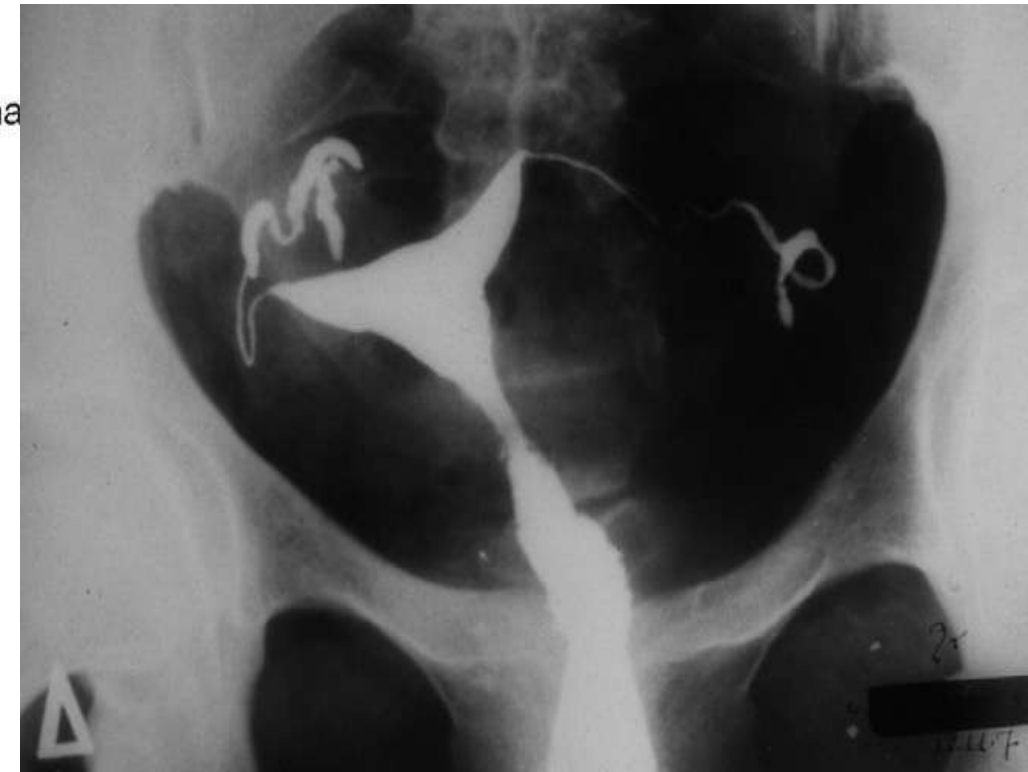

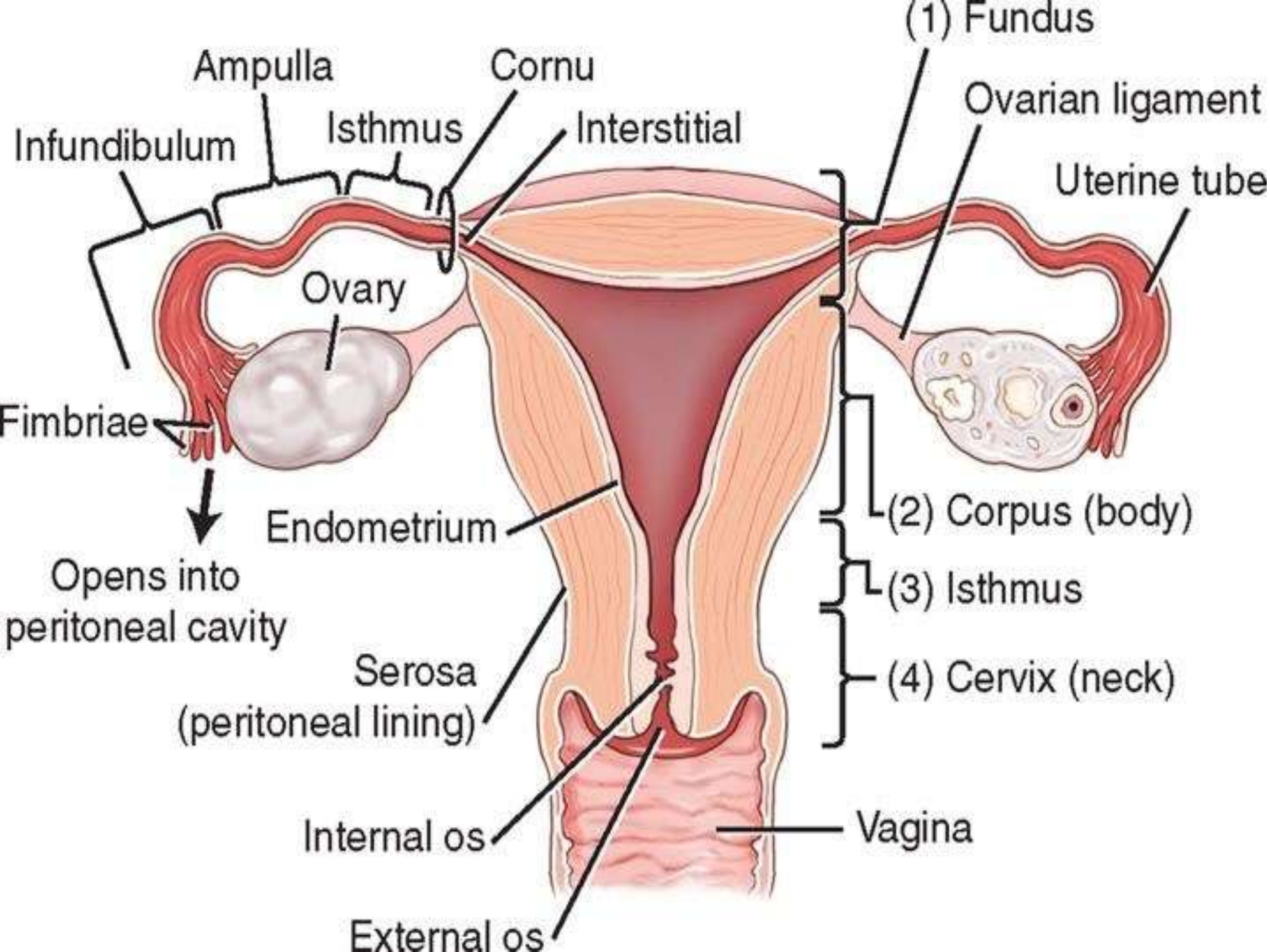
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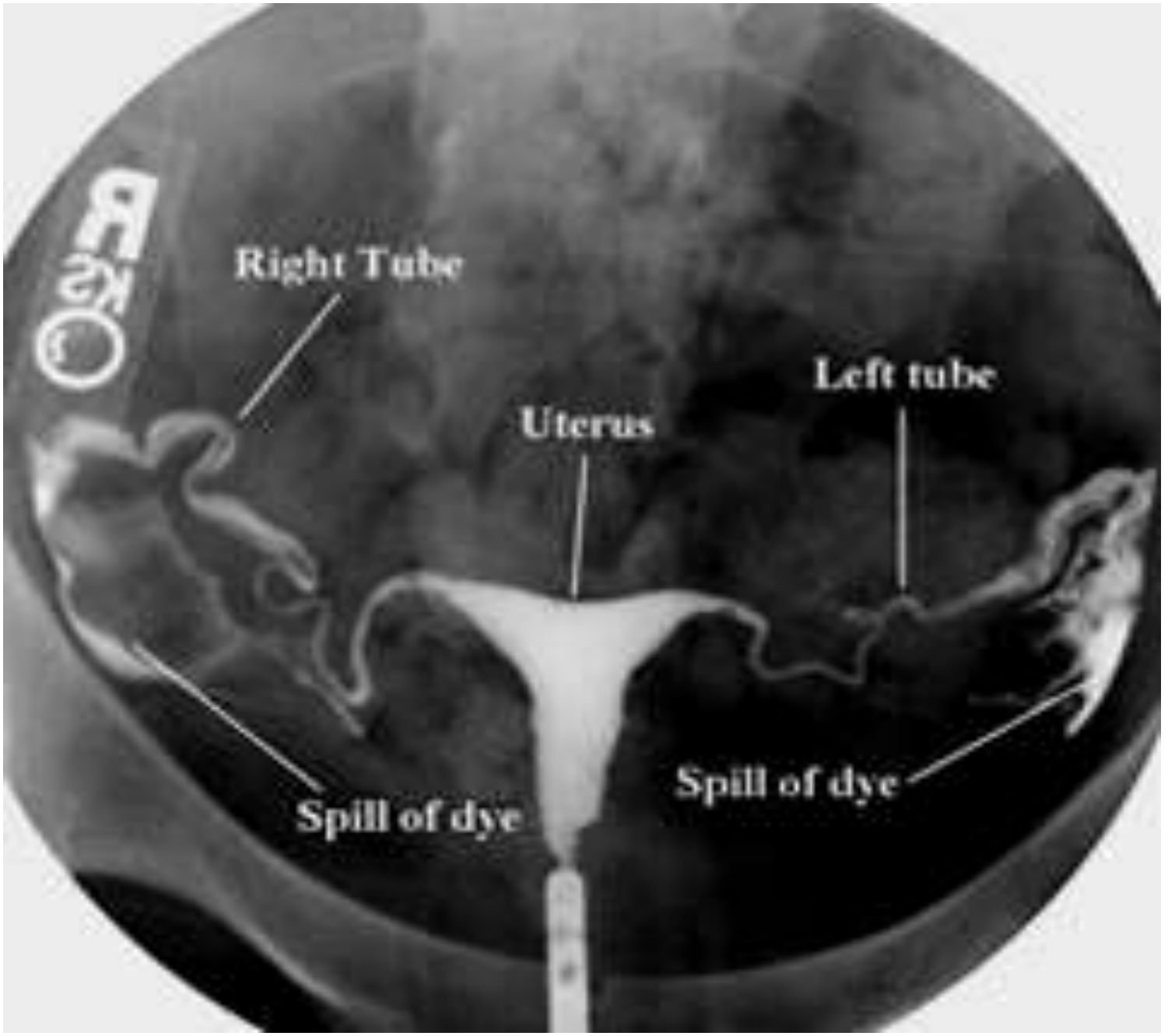
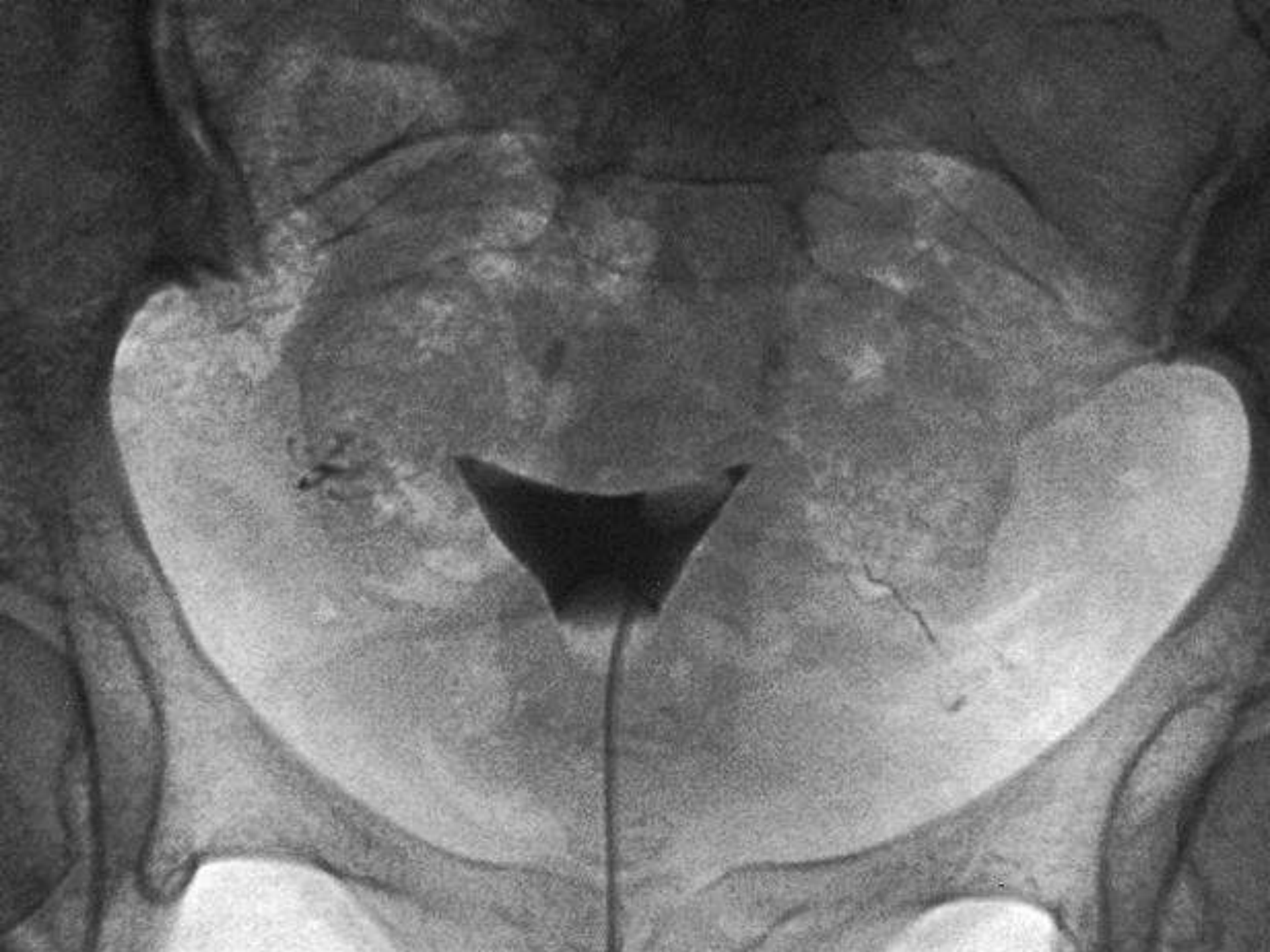
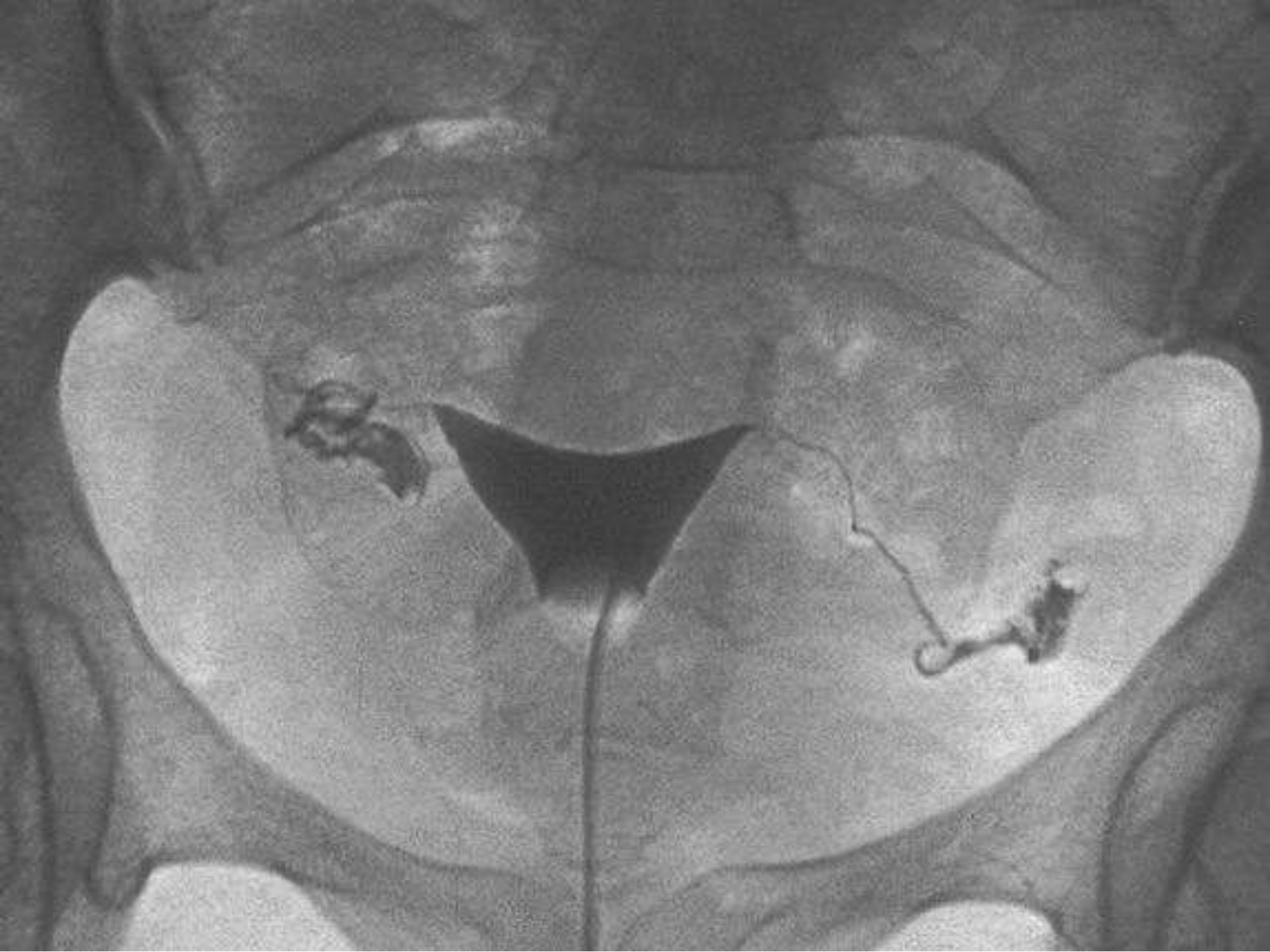
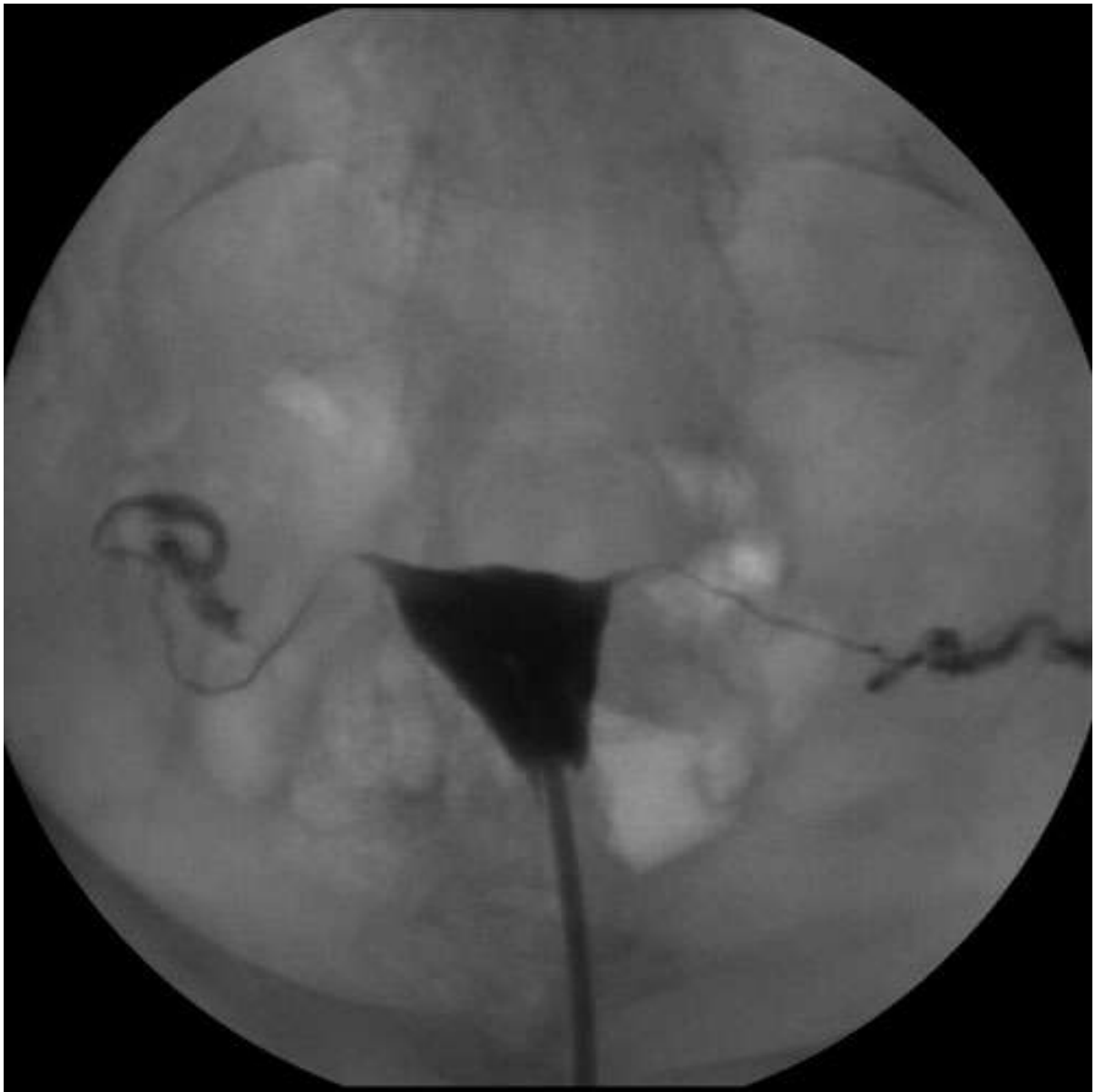

Right Tube
Uterus
Left tube
Spill of dye
Spill of dye

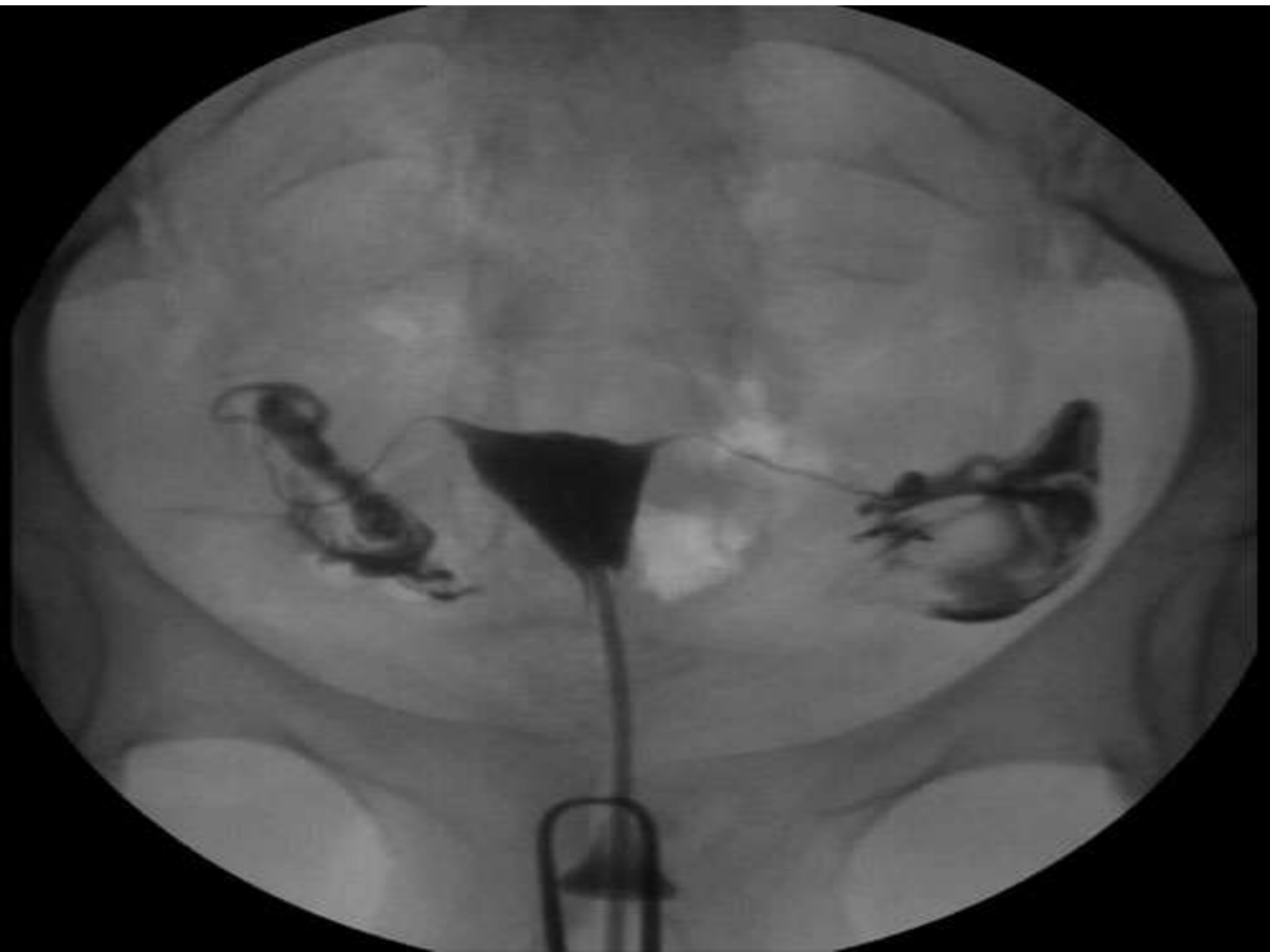
Scout





Normal Hysterosalpingograms





NORMAL

Comment on:

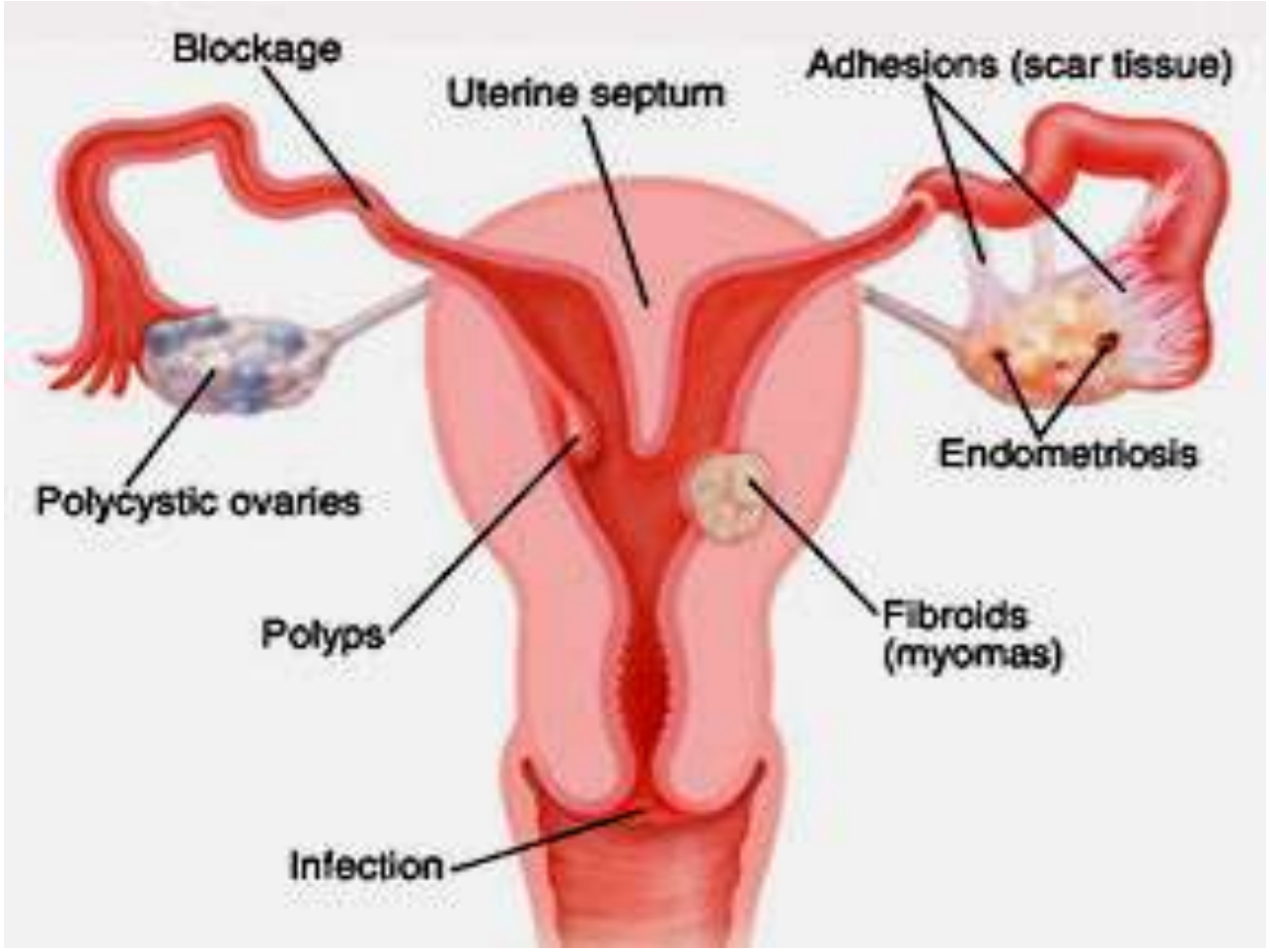
Uterine cavity: size &shape

Fallopian tubes: calibre, mucosa, patency

Free spill

Homogenous smearing

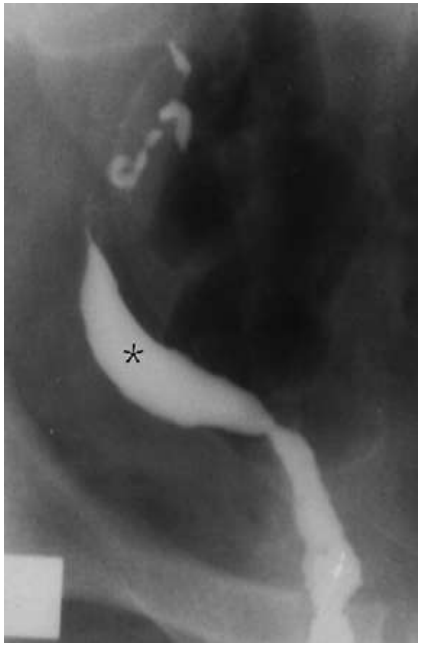
Abnormal Hysterosalpingogram



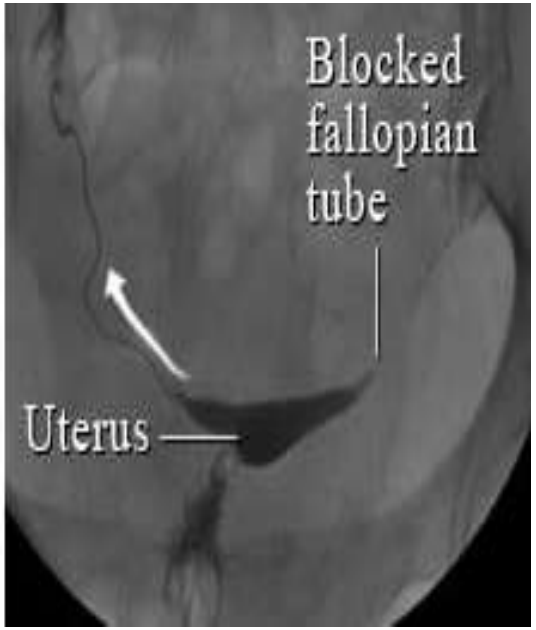
Abnormal HSG Findings

Filling Defect

Abnormal Configuration



Obstruction



Abnormal HSG Findings

Filling Defect

- ✓**Adhesions**
- ✓**Benign** : Fibroid
- ✓**Malignant** : Cancer

Abnormal Configuration

- ✓**Hypoplastic**
- ✓**Cong. Anomalies**

Obstruction

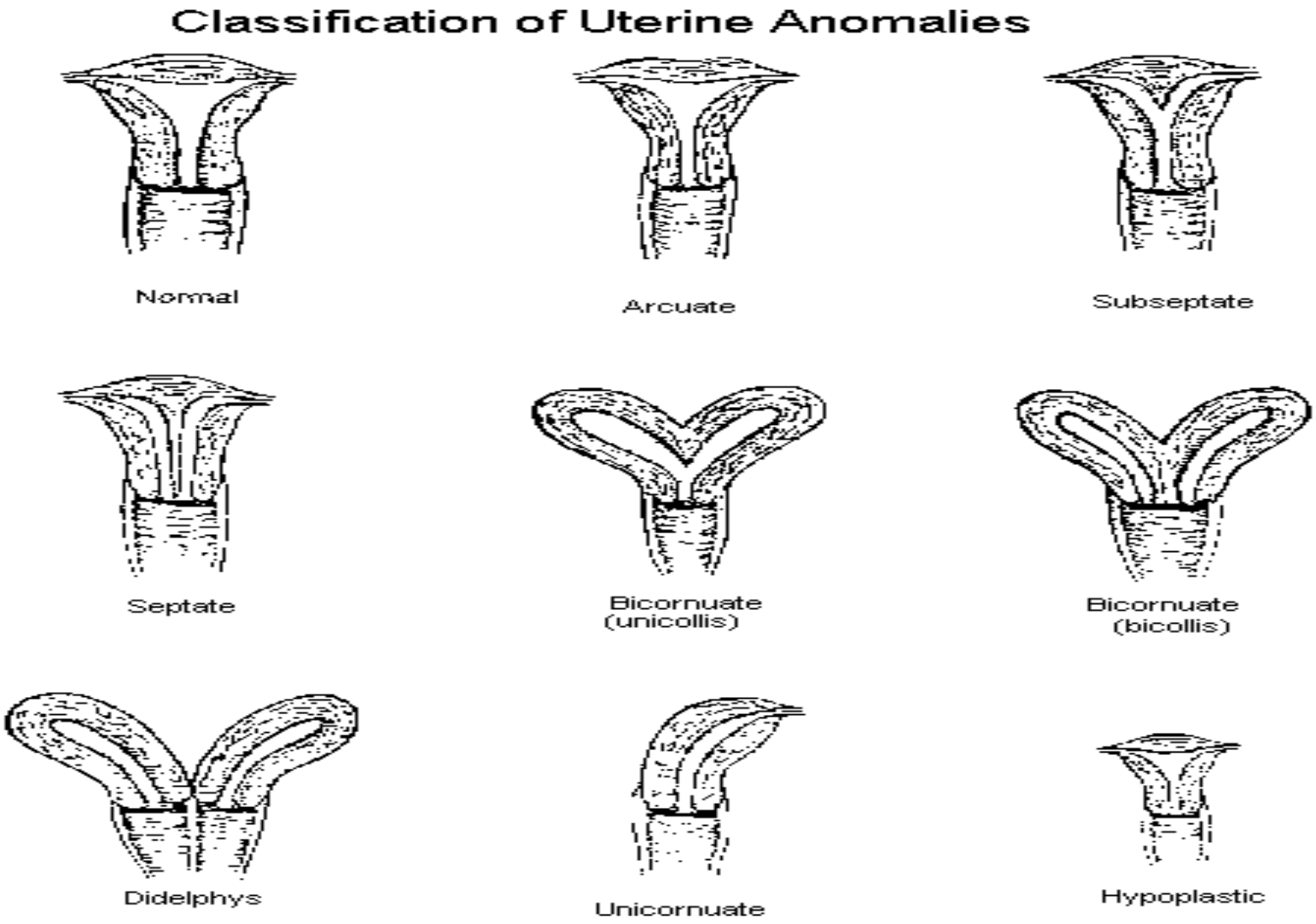
- ✓**Tube Block**
- ✓**HydroSalpinx**

"Hypoplastic Uterus "

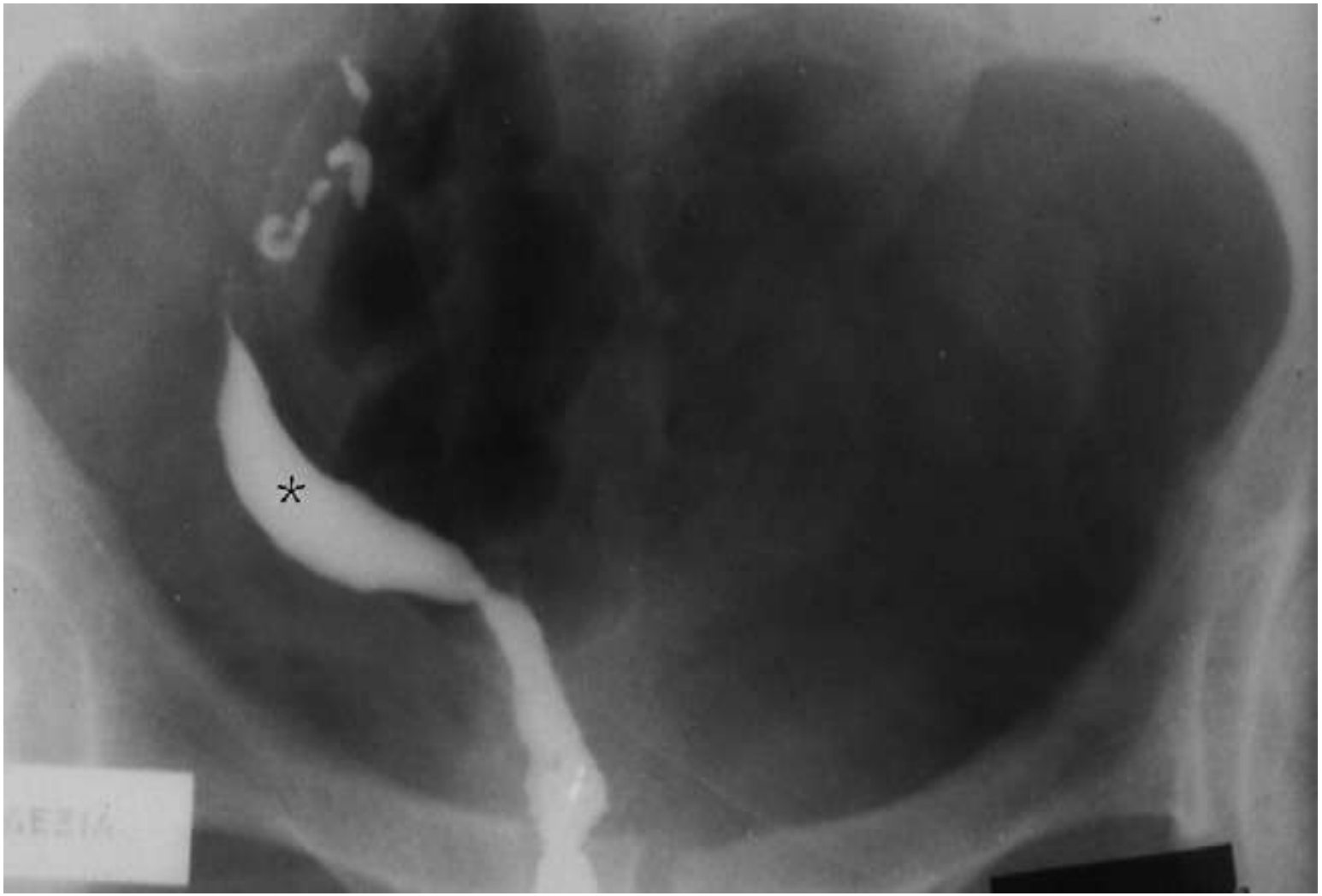
- ***➔ Small sized Uterus***
  - by *inadequate hormonic stimulation*,
  - Small uterine cavity size with normal vaginal length
  - A **common finding** in cases of female infertility.

- ***Small size*** of the uterus cavity with normal length of the vagina

Congenital Uterus Anomalies

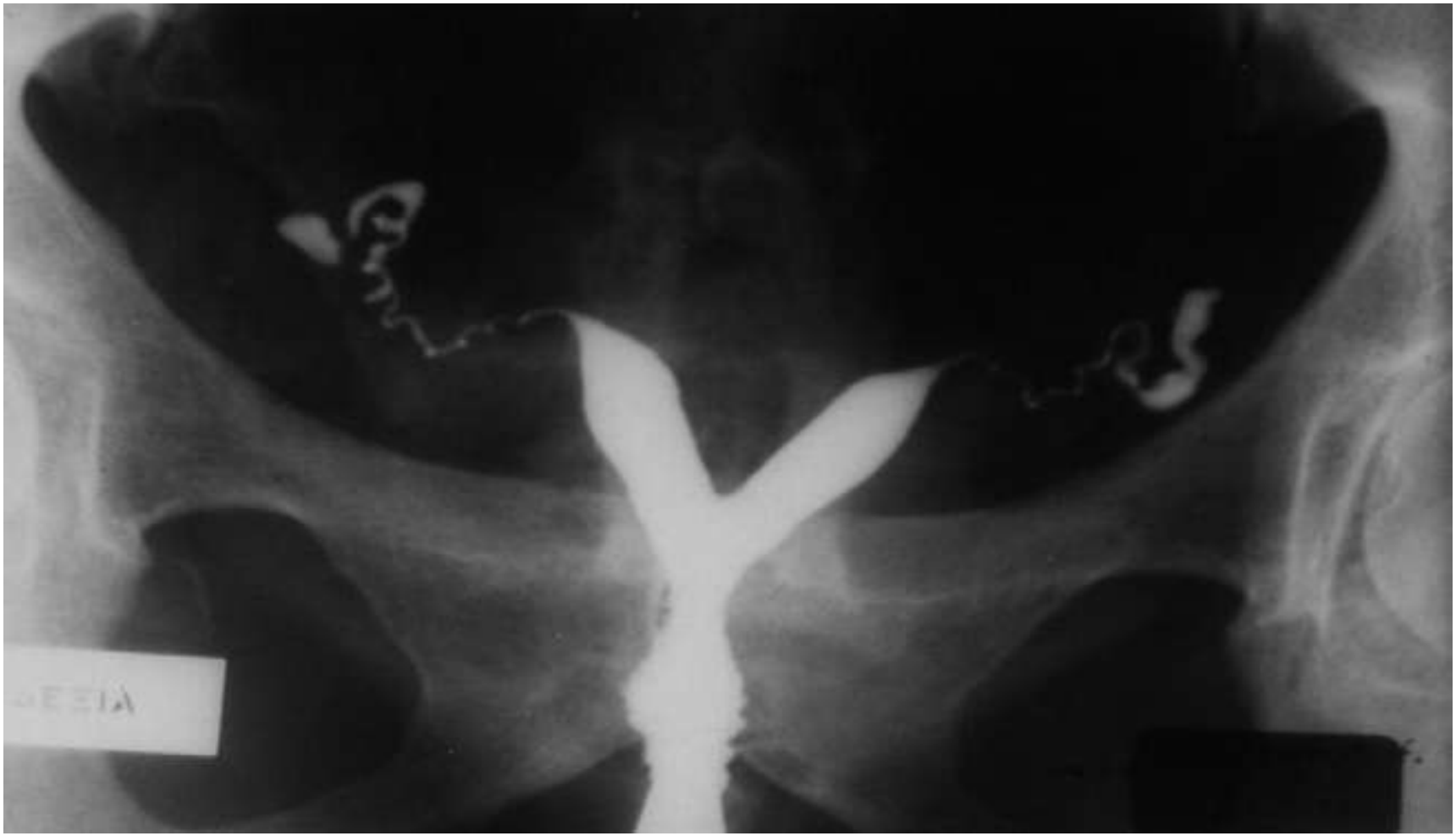


- Caused by ***incomplete junction*** of the paramesonephric ducts (Muller ducts),
- anomalies have *reproductive problems* :
  - ✓ little chance of conceiving,
  - ✓ higher rates of *spontaneous abortion*,
  - ✓ higher rates of *premature delivery*
  - ✓ Abnormal fetal position



- ***Unicornous uterus***.
  - Hysterosalpingography shows opacification of a single right uterine horn.
  - A single fallopian tube is also visualized.

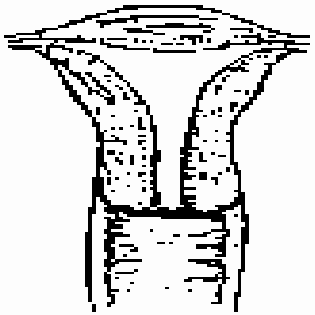
- Didelphys uterus.
  - Hysterosalpingography shows *two uterine cavities*, *two cervi*ces, and one single vagina.



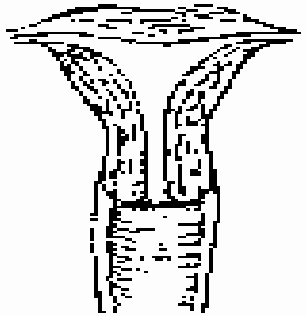
- Bicornate uterus.
  - Spot radiograph shows two uterine horns.
  - The fallopian tubes are also visualized at this imaging stage.

- Arcuate uterus. Hysterosalpingography demonstrates
  - a *depression of the uterine fundus*, compatible with an arcuate uterus.

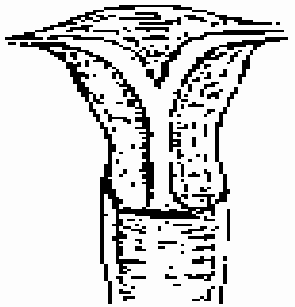
Classification of Uterine Anomalies



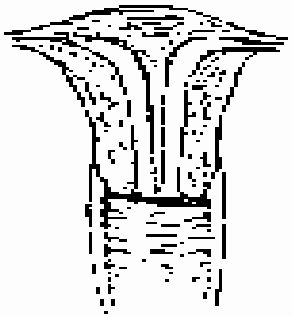
Normal



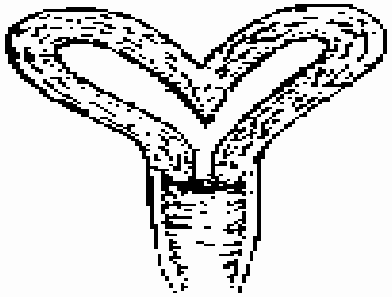
Arcuate



Subseptate

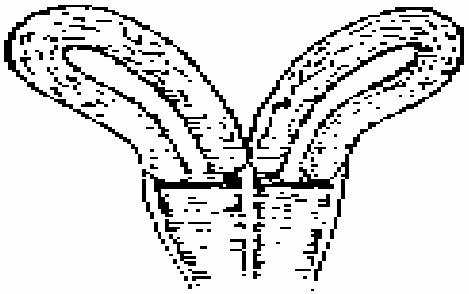


Septate

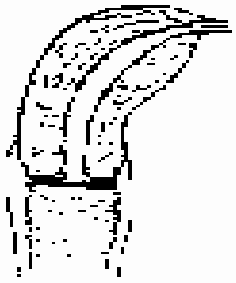


Bicornuate
(unicollis)

Bicornuate
(bicollis)



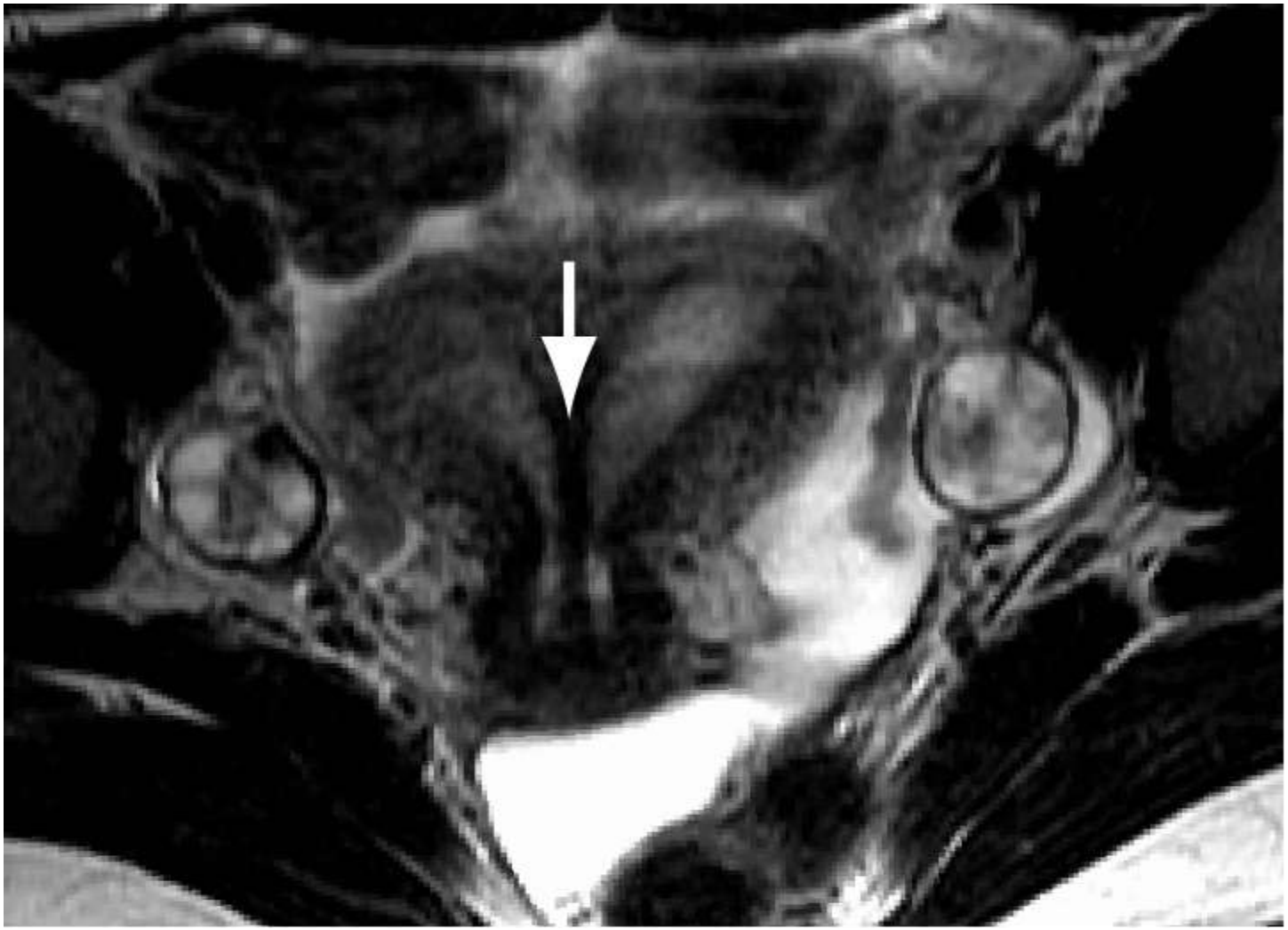
Didelphys



Unicornuate

Hypoplastic

N.B. MRI is important for further assessment of many cases especially "Double cavity " categories.



FILLING DEFECTS

Fibromyomas

- ***Submucosa fibromyomas*** →are imaged as smooth filling defects in the uterine cavity.
- DD:
  - endometrial polyps
  - possible pregnancy.
- ***Small intramural fibromyomas :***
  - Do not distort the endometrial cavity
  - Not visualized on HSG.
- ***Subserous fibromyomas :***
  - only if they are located in the lateral walls of the uterus. → smooth filling defects or smooth Depression of the fallopian tubes

- *Submucosa fibromyoma*.

Contrast deficiency “filling defect” with smooth border at the fundus of the uterus.

Endometrial Polyps

- focal overgrowths of the endometrium.
- usually manifest as well-defined filling defects and
- Best seen during the early filling stage.
- Small polyps may be obscured by contrast filling.

Internal Endometriosis (Adenomyosis)

- Ectopic islets of active endometrium in the muscularis wall of the uterus.
- It is usually imaged as a *pointed projection of 2 to 3* mm length, *perpendicular* to the uterine wall
- Rarely, this is imaged as a *sack-shaped projection* filled by contrast medium, 4 mm to 1 cm in length.

➔ ***Differential diagnosis :***

- **hyperplasia of the endometrium** and the entrance of the contrast medium in the myometrium or
- in the nutrient arteriole of submucosa fibromyomas.

- Endometriosis.

  Sack-shaped projection full of contrast medium

Uterine Cancer

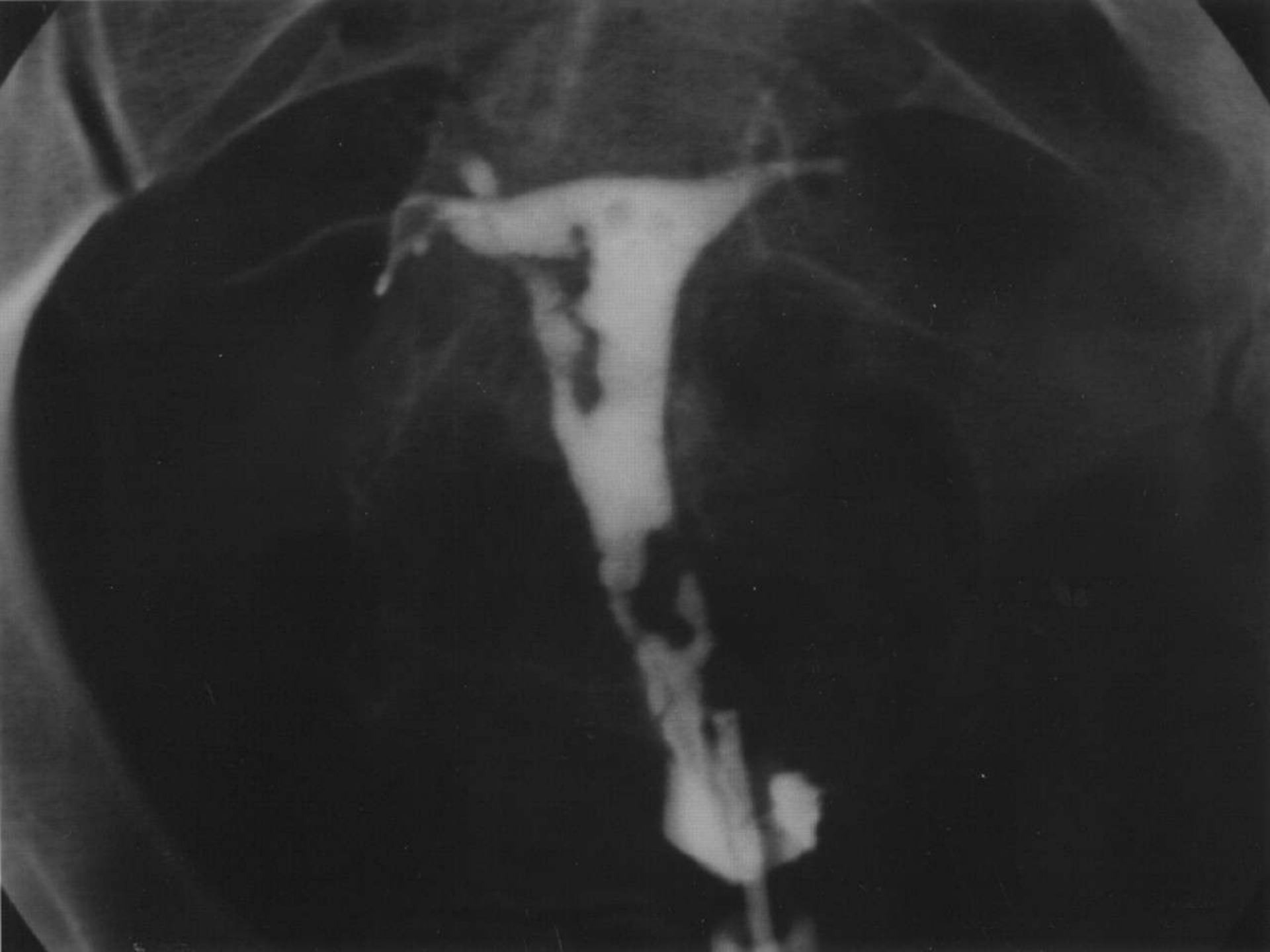
- manifests as an ***irregular filling defect*****,**
- rarely diagnosed by the HSG method.

Uterine cancer.
Large contrast deficiency "Filling defect" with abnormal border at the left lateral uterus wall, which is indicated.

Intrauterine Adhesions

- most commonly endometrial trauma of *curettage*.
- also in chronic *endometriosis due to tuberculosis*.
- Intrauterine adhesions manifest as ***irregular***

filling defects, → most commonly as **linear** filling defects arising from one of the uterine walls.



Asherman's syndrome

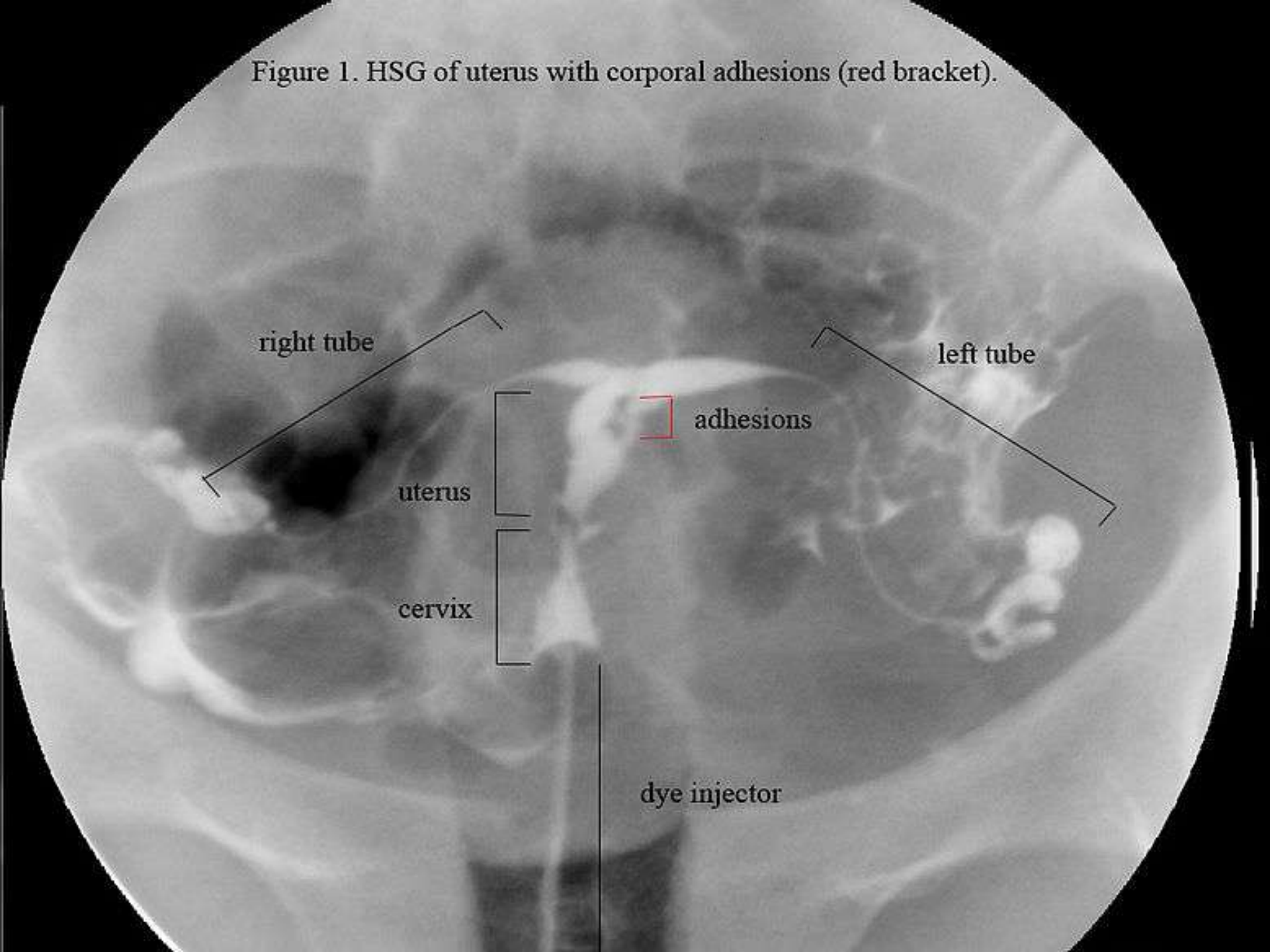
- is a condition characterized by:

adhesions and/or **fibrosis** of the endometrium most often associated with dilation and curettage of the intrauterine cavity.

- was first described in 1894 by Heinrich Fritsch (Fritsch, 1894)

& further characterized by Israeli gynecologist Joseph Asherman in 1948.

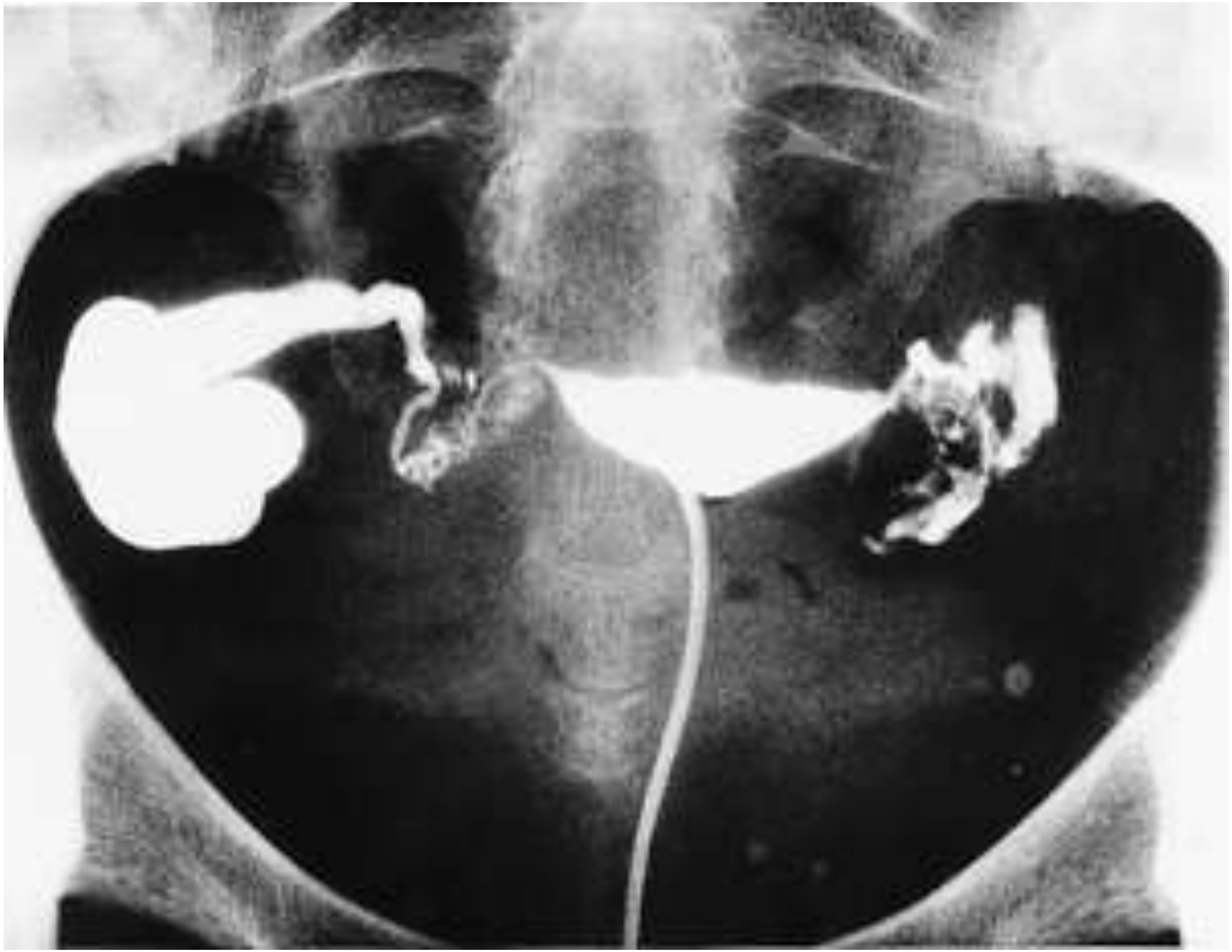
Figure 1. HSG of uterus with corporal adhesions (red bracket).

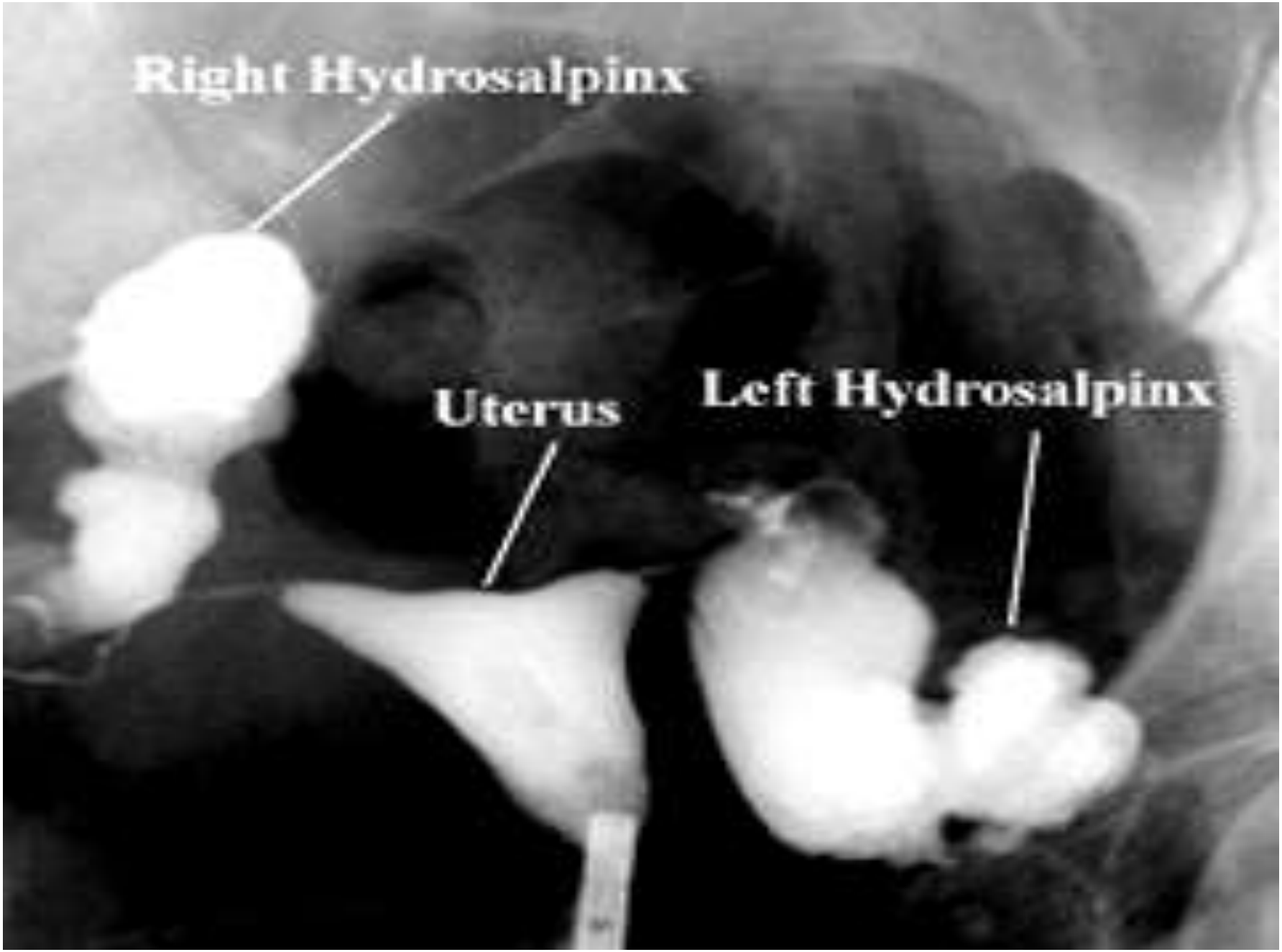


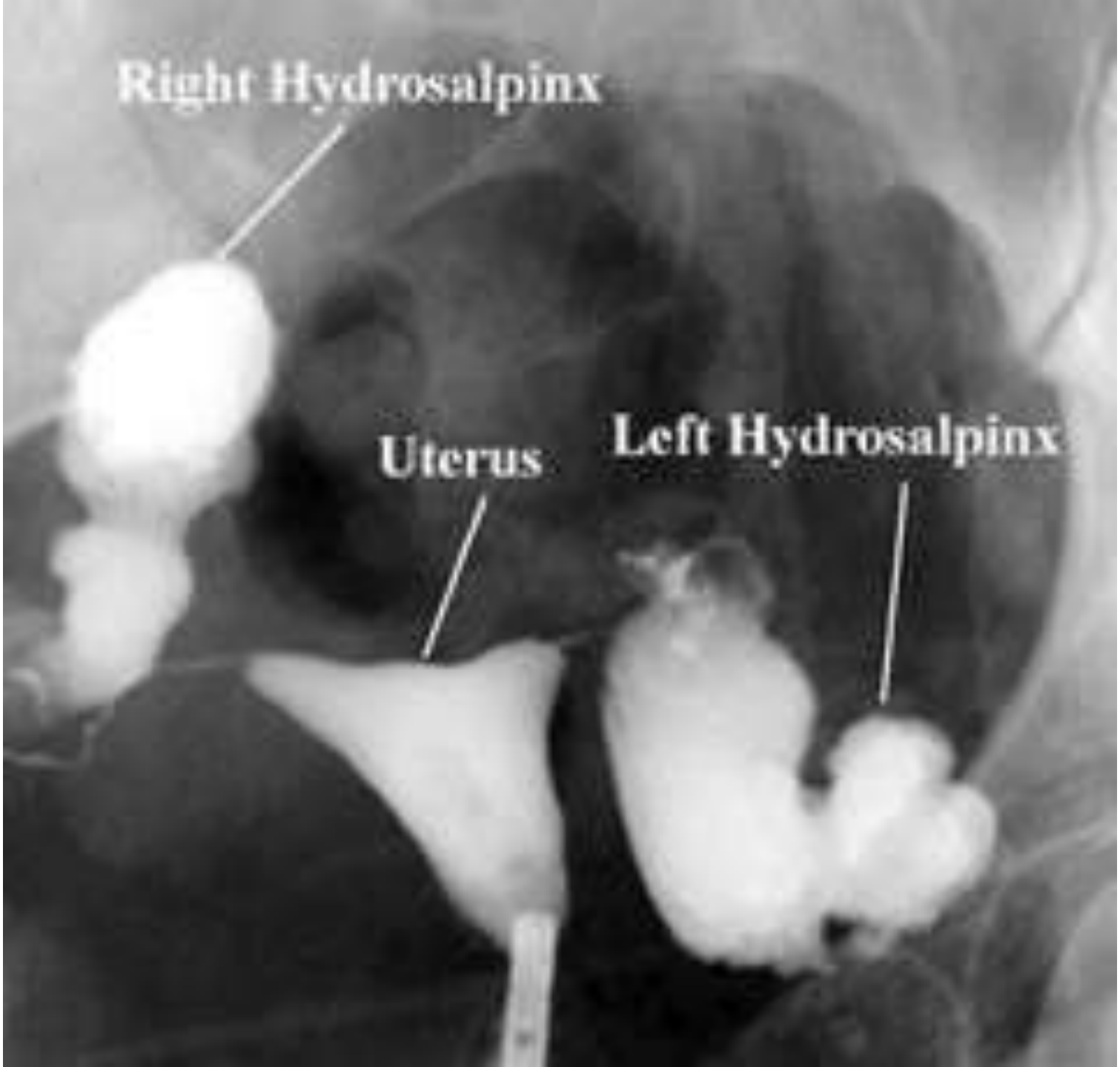
Hydrosalpinx

➔ *HSG is the best method for visualizing and evaluating the fallopian tubes*.

- Commonly results from a **previous inflammation** of the fallopian tubes (salpingitis).
- Distal tubal occlusion, → *dilation* of the proximal segment.
- The radiologic image shows a dilated lumen in one or more spots, →contrast will not pass to the peritoneal cavity




Right Hydrosalpinx
Uterus
Left Hydrosalpinx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Salpingitis Isthmica Nodosa

- a disease of ***unknown etiology,***
- ***characterized by :***
  - multiple small outpouchings or diverticula
  - Affecting one or both fallopian tubes.
- It is presumably caused by pelvic inflammatory disease or endometriosis .
- Is associated with ectopic pregnancy and infertility.9

Nodosa isthmic salpingitis.

Presence of small projected spots full of contrast medium, parallel to the fallopian tube.


©Behrang Amini, MD/PhD

Non Filling of the Fallopian Tubes

Non Filling of the Fallopian Tubes

- *This is the most common finding during the examination .*

➔ **Usually caused by:**

- poor technique,
- spasm, or
- obliteration of the fallopian tube.

➔ ***Poor technique includes:***

- imperfect straightening of the external cervical ostium
- Inadequate amount of contrast medium in the uterine cavity.

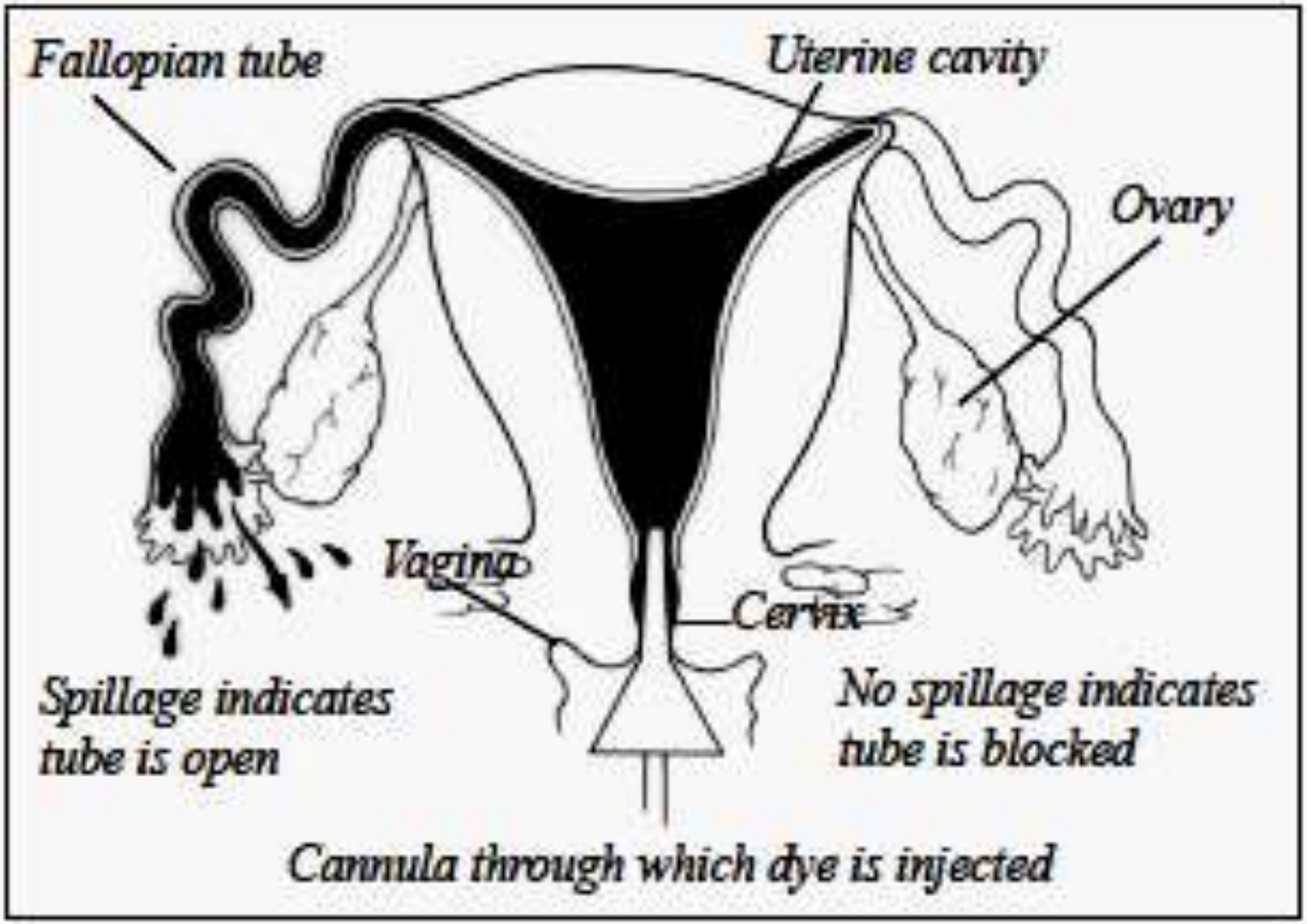
➔ ***Spasm Vs Obliteration :***

- The ***cornual portion*** of the fallopian tube is encased by the smooth muscle of the uterus
- If there is a ***spasm*** of the muscle during HSG, one or both tubes may not fill.
- **Tubal spasm Vs tubal occlusion** cannot be distinguished .

➔ ***This could be avoided by:***

- progressive administration of the contrast medium
- Administration of a ***spasmolytic agent*** to relieve spasm, → helping differentiate cornual spasm from true occlusion.

- **Obliteration** is usually caused by :
  - inflammation or
  - uterine surgery
- **manifests as** :
  - Non-opacification or
  - Abrupt cutoff of the fallopian tube → with ***no free intraperitoneal spillage.***


Fallopian tube
Uterine cavity
Ovary
Vagina
Cervix
Spillage indicates tube is open
No spillage indicates tube is blocked
Cannula through which dye is injected

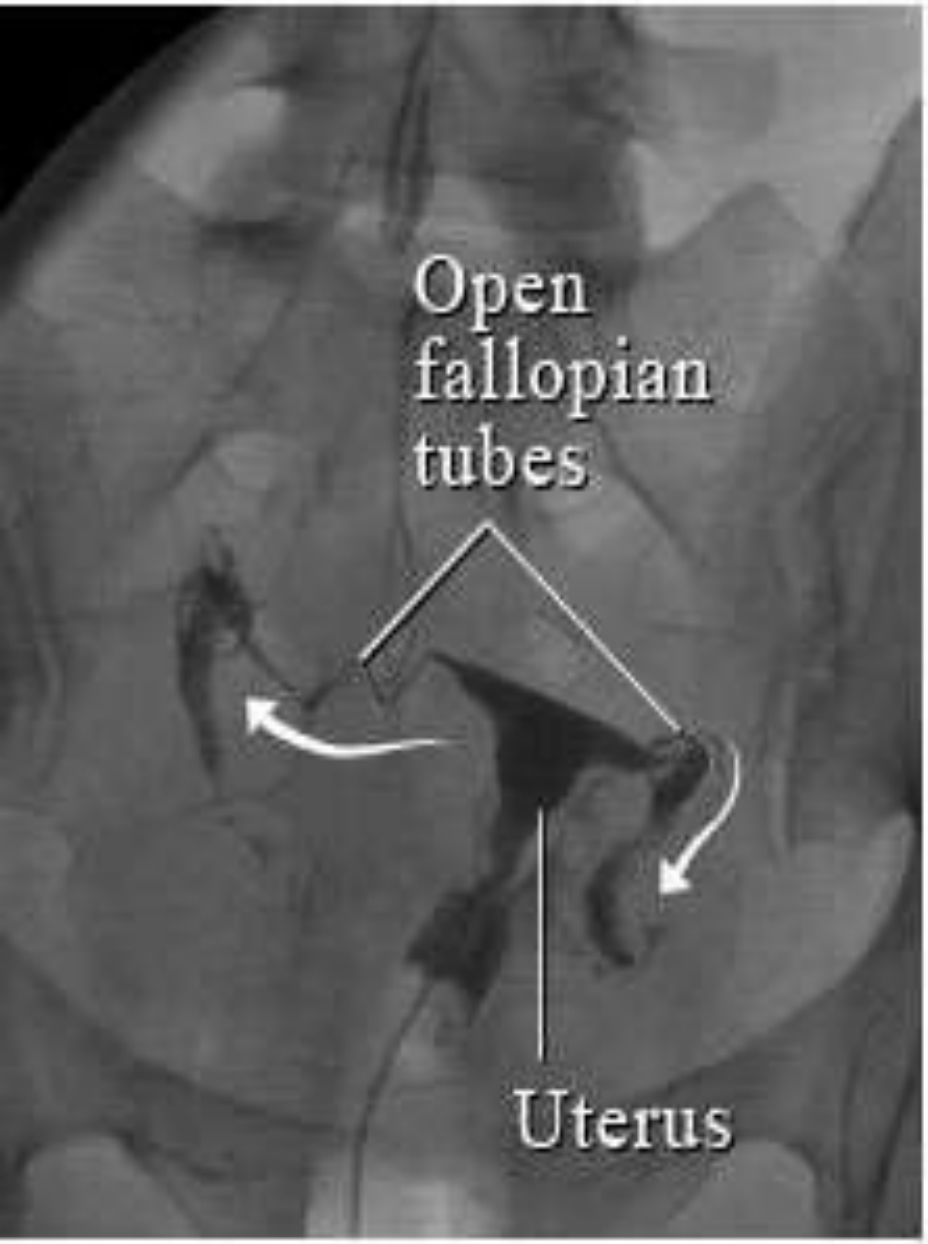


Figure 1

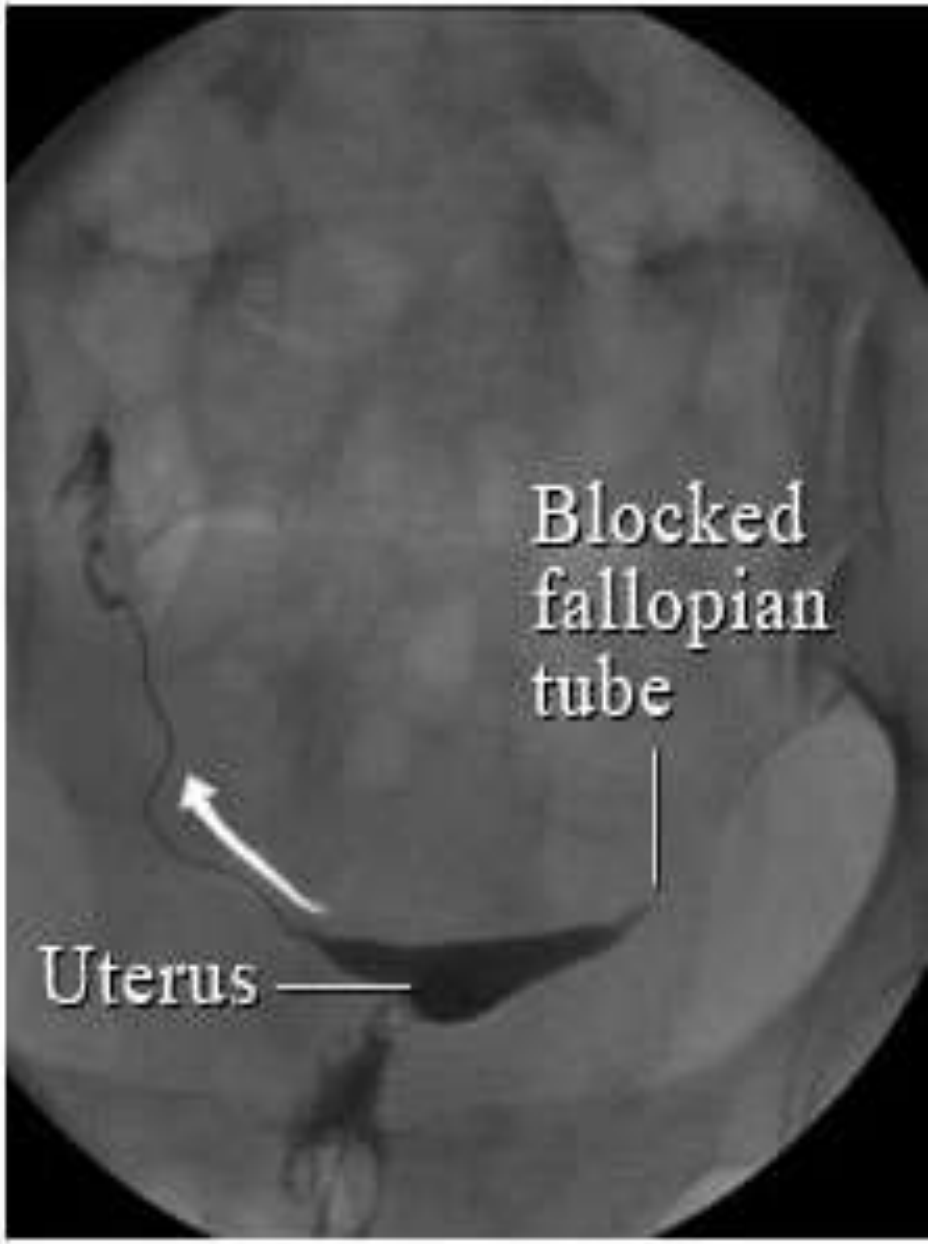


Figure 2

External Adhesions

- **occur secondary to : (***similar to the causes of tubal occlusion).*
  - previous inflammation or
  - surgery,

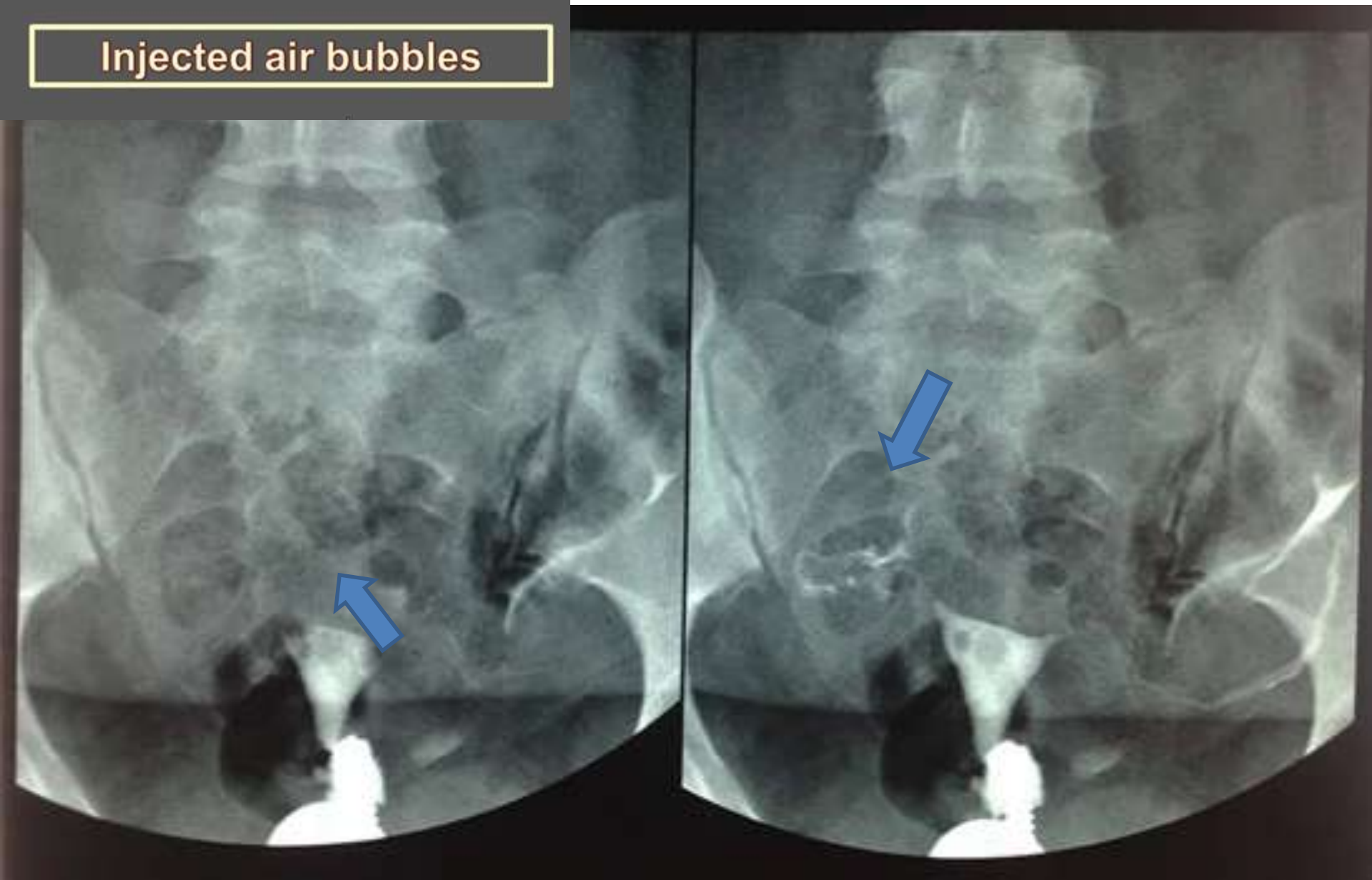
Peritubal adhesions → prevent contrast material from flowing freely around the bowel loops *"as seen in normal cases"*,

- **Most commonly manifest as** :
  - loculation of the contrast material around the ampullary portion of the tube.

CASES & Quiz

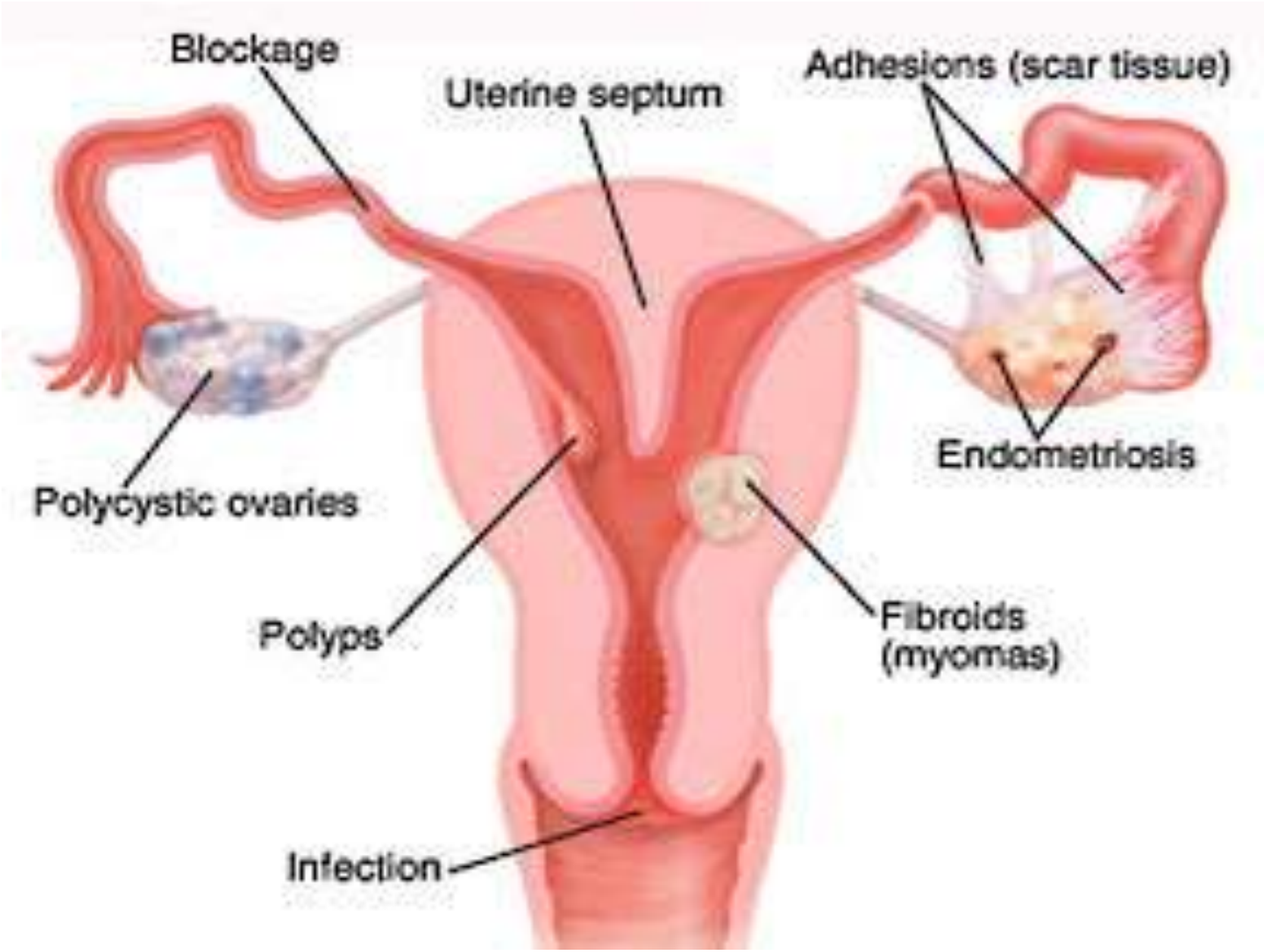
NORMAL HSG

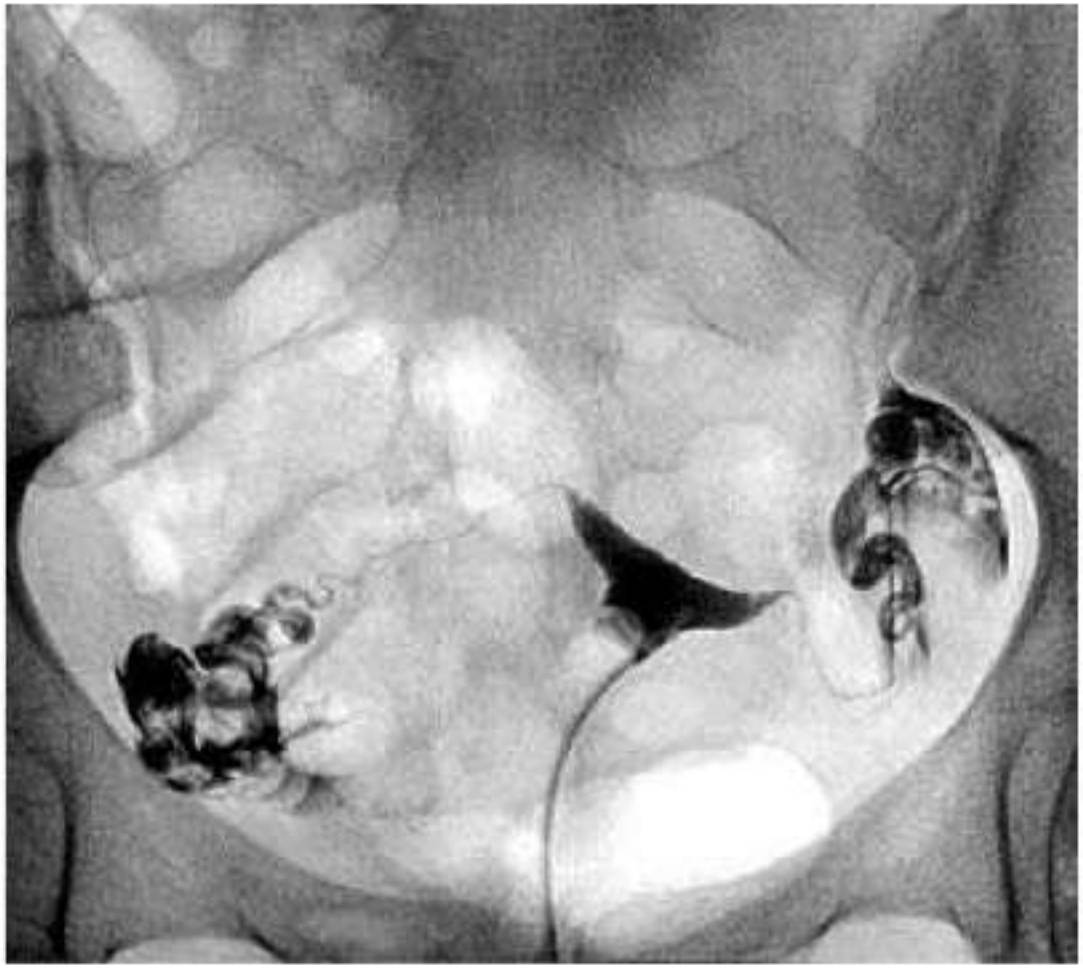
Injected air bubbles



IMPROPER IMAGING

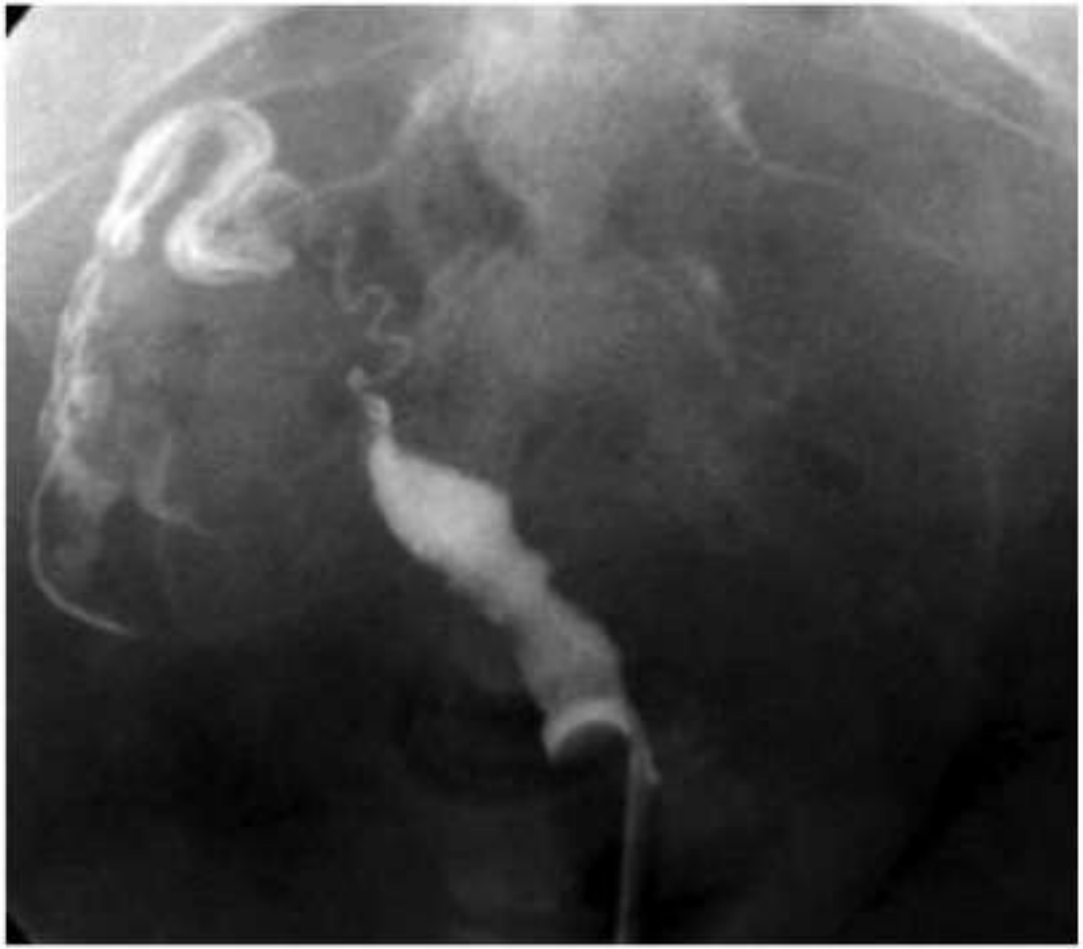
Inadequate cervical pulling
Uterus is markedly anti – flexed


Blockage
Uterine septum
Adhesions (scar tissue)
Endometriosis
Polycystic ovaries
Polyps
Fibroids
(myomas)
Infection




Normal Hysterosalpingogram
Open Fallopian Tubes
Normal Uterus


2:44:2
58
43

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Link of Video Lecture

- https://www.youtube.com/watch?v=O1eCAy34e3M

References:

- Hysterosalpingography: Technique and Applications ., Athanasios Chalazonitis, MD., et al , Curr Probl Diagn Radiol, September/October 2009.
- The WHO manualof diagnostic imaging, Radiographic Technique and Projections. Editors Harald Ostensen M.D.
- HSG film reading_Dr Rasha Kamal
- https://dallasivf.com/fertility-treatments/fertility-tests/female-fertility-testing/hsg/

THANK YOU

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June 2022