



ΠΑΝΕΠΙΣΤΗΜΙΟ
ΔΥΤΙΚΗΣ ΑΤΤΙΚΗΣ
UNIVERSITY OF WEST ATTICA

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Anatomy of The Female Pelvis



Τμήμα Μαιευτικής

Πανεπιστήμιο Δυτικής Μακεδονίας

Φασουλάκης Ζαχαρίας

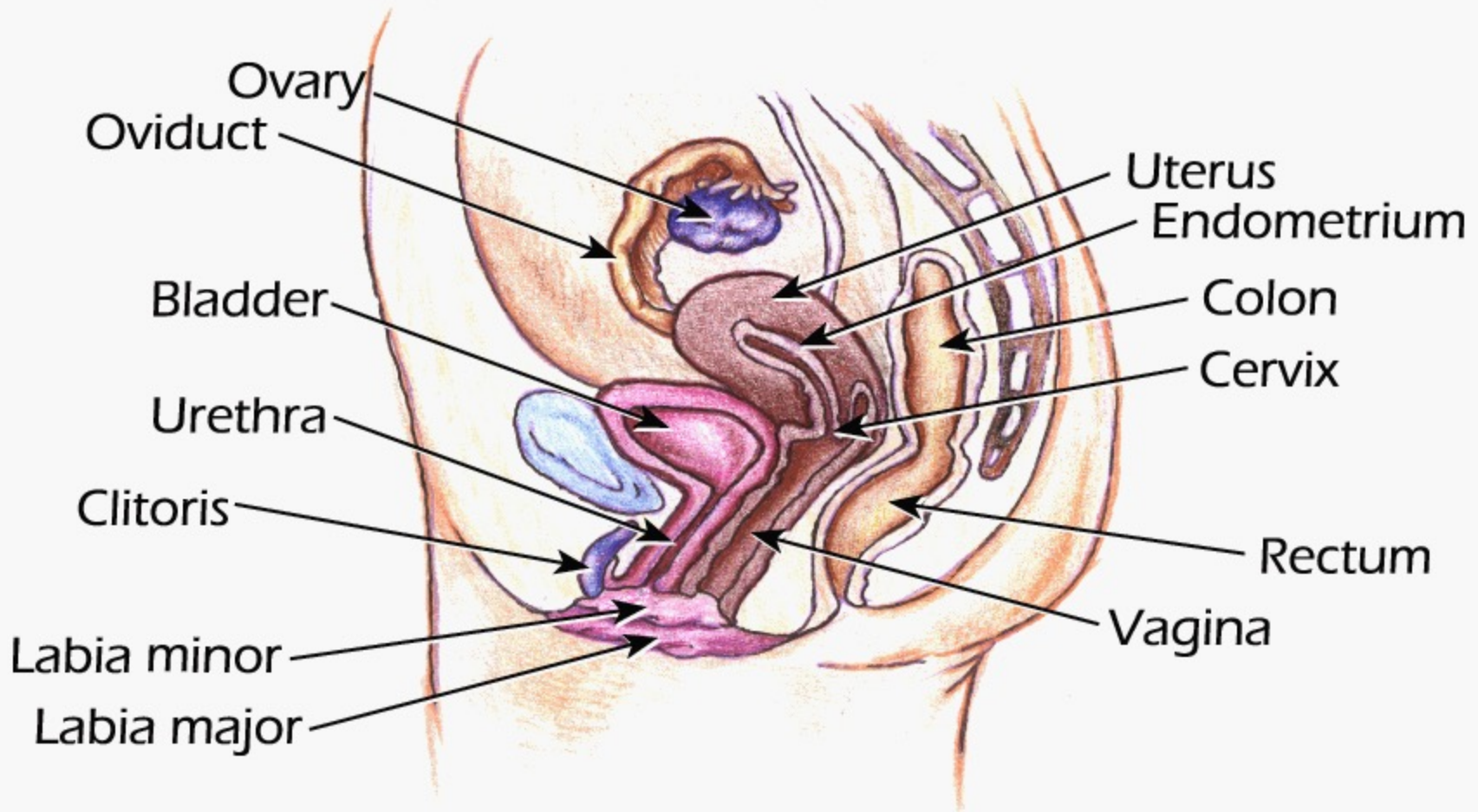
Μαιευτήρας Γυναικολόγος

Τμήμα Μαιευτικής Πανεπιστημίου Δυτικής Αττικής

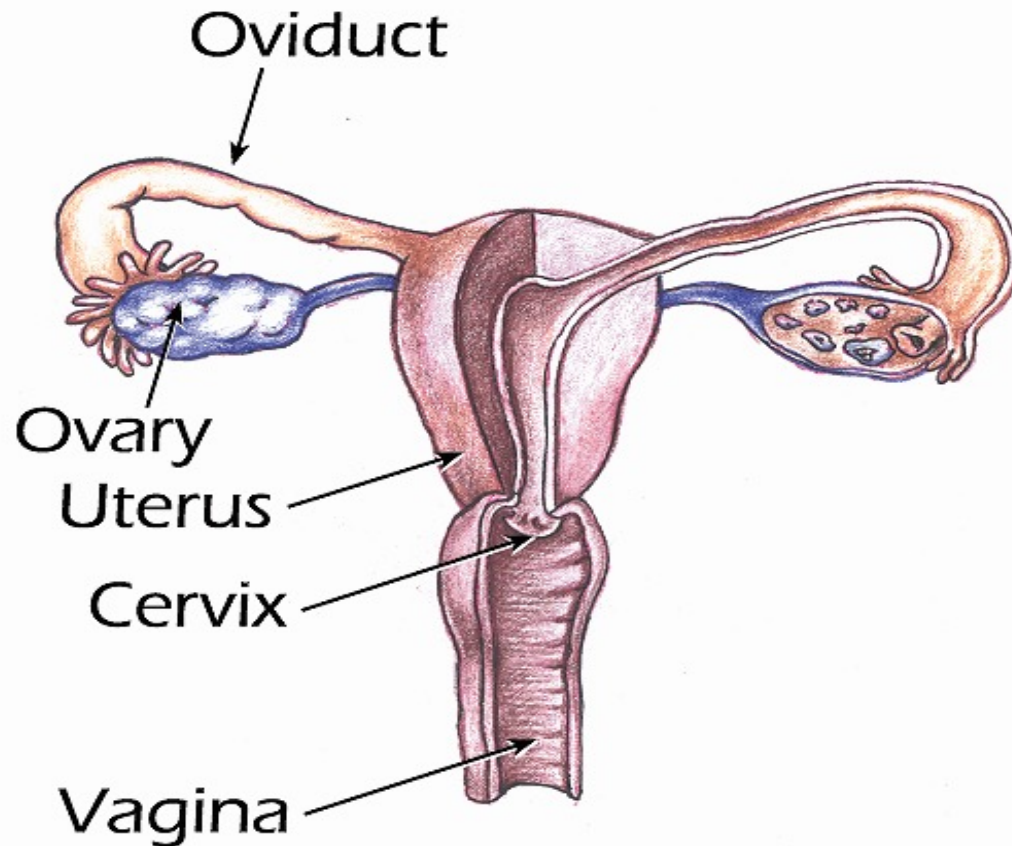
Pelvic Viscera

- Pelvic organs include:
 - Bladder
 - Uterus
 - Adnexae
 - Rectum
- Also have the sigmoid colon, cecum, and ileum are components of the pelvic anatomy

Female Genital Organs



Internal Genital Organs

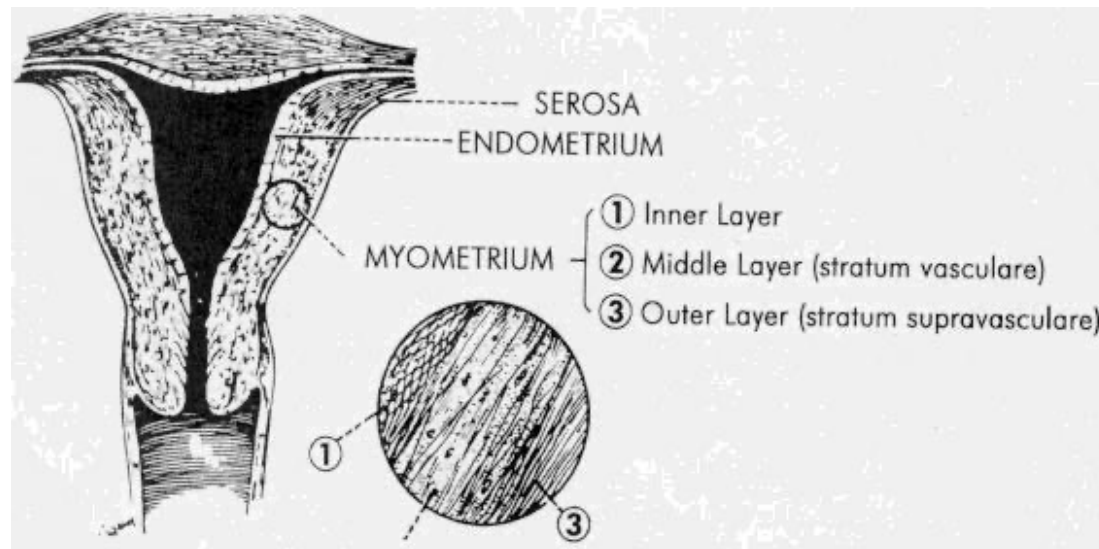


Uterus

- 7-8 cm long, 5-7 cm wide, 2-3 cm thick
- projects superior-anteriorly over urinary bladder
- two major parts
 - body (superior 2/3s) & fundus
 - cervix (inferior 1/3) has internal os, external os, anterior lip, & posterior lip
 - lined with columnar, mucus-secreting epithelium

– Wall of uterus consists of 3 layers:

- Perimetrium/serosa - outer serous coat, peritoneum supported by thin layer of connective tissue
- myometrium - 12-15 mm smooth muscle, main branches of blood vessels and nerves of uterus are in this layer
- endometrium - inner mucous coat



Uterine Tubes

- 10-12 cm long, 1 cm diameter
- Extend laterally from cornua of uterus
- Consists of 4 parts
 - Infundibulum or fimbrial end
 - distal end, abdominal ostium, about 2 mm in diameter
 - 20-30 fimbriae
 - Ampullary part
 - widest and longest part, over 1/2 its length
 - fertilization occurs here
 - most common site for ectopic

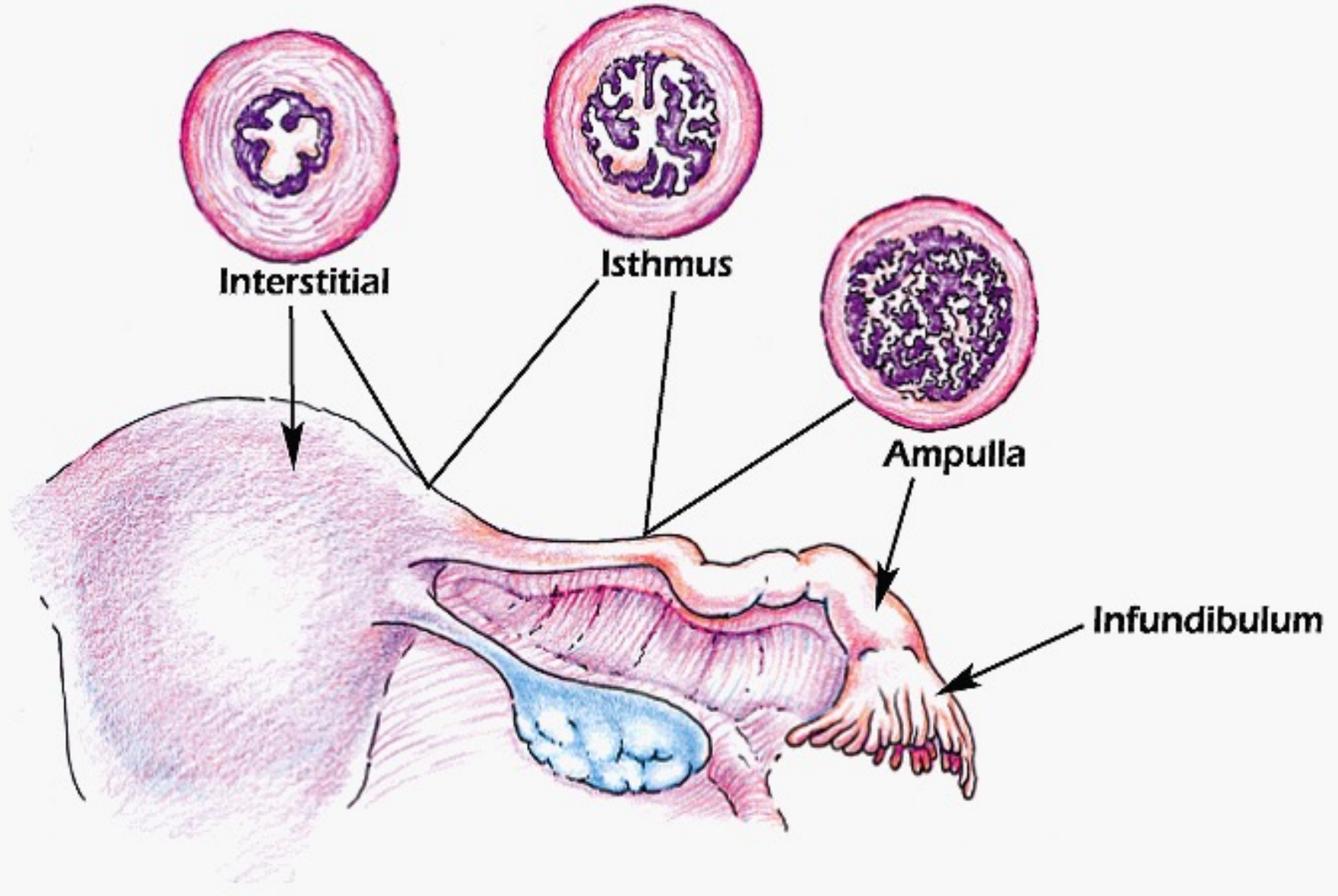
Uterine Tubes

– isthmus

- short 2.5 cm, narrow, thick-walled part of tube that enters the uterine cornu

– uterine part

- short segment that passes through thick myometrium of uterus
- uterine ostium (smaller than abdominal ostium)



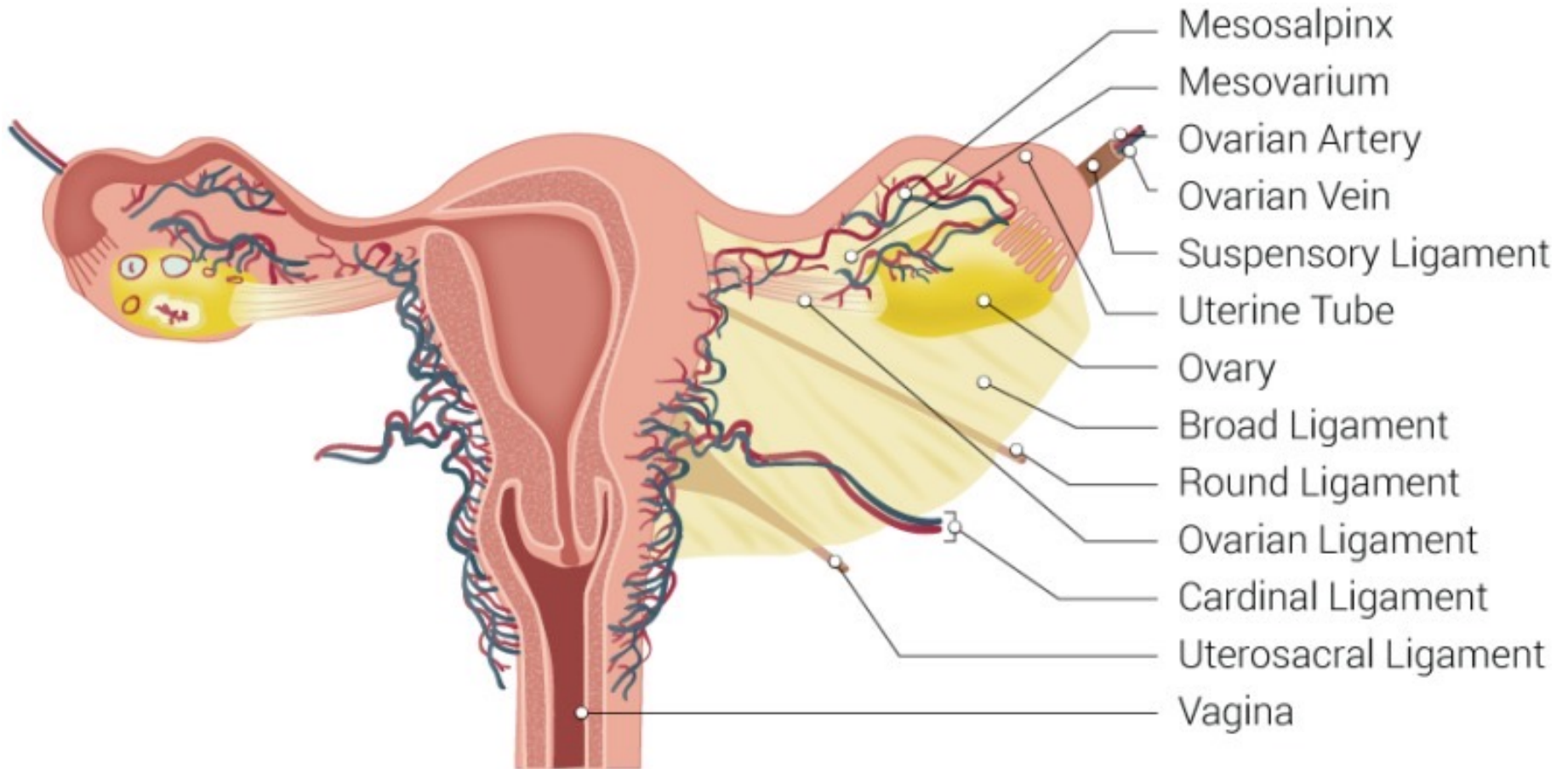
Ovaries

- oval, almond-shaped, 3 cm long, 1.5 cm wide, 1 cm thick
- ligaments
 - superior (tubal) end of ovary is connected to lateral wall of pelvis by suspensory ligament of the ovary. It contains ovarian vessels and nerves
 - ligament of ovary - connects inferior (uterine) end of ovary to lateral angle of uterus
- surface of ovary is not covered by peritoneum
 - oocyte expelled into peritoneal cavity

Vagina

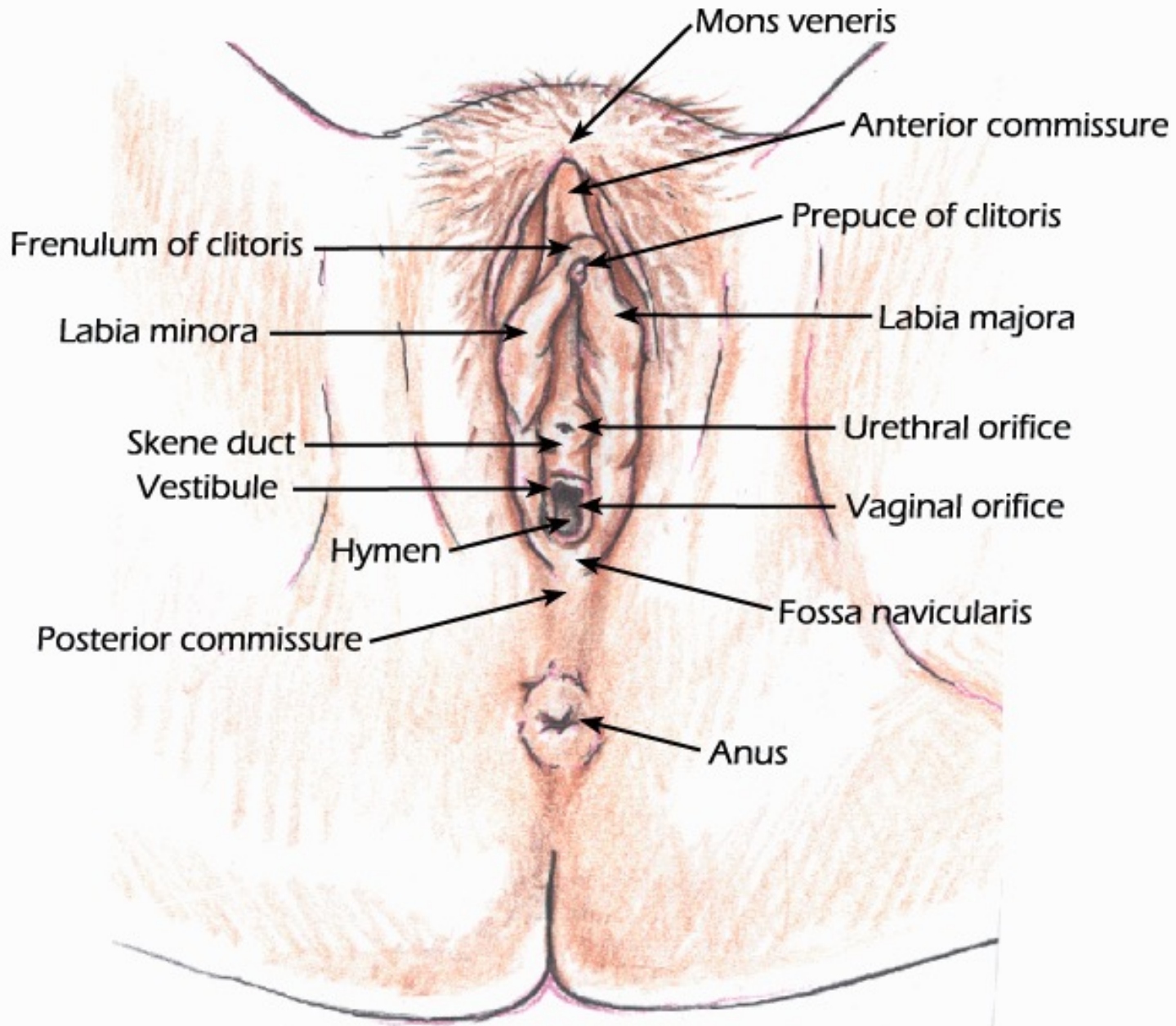
- Four fornices
- sphincters of vagina
 - pubovaginalis muscle
 - urogenital diaphragm
 - bulbospongiosus muscle
- lymphatic drainage
 - superior part into internal and external iliac lymph nodes
 - middle part into the internal iliac lymph nodes
 - vestibule into superficial inguinal lymph nodes

- Round ligaments
- Infundibulo-ligament
- Utero-ovarian ligament
- Broad ligament
- Cardinal ligament
- Uterosacral ligaments



External Genital Organs

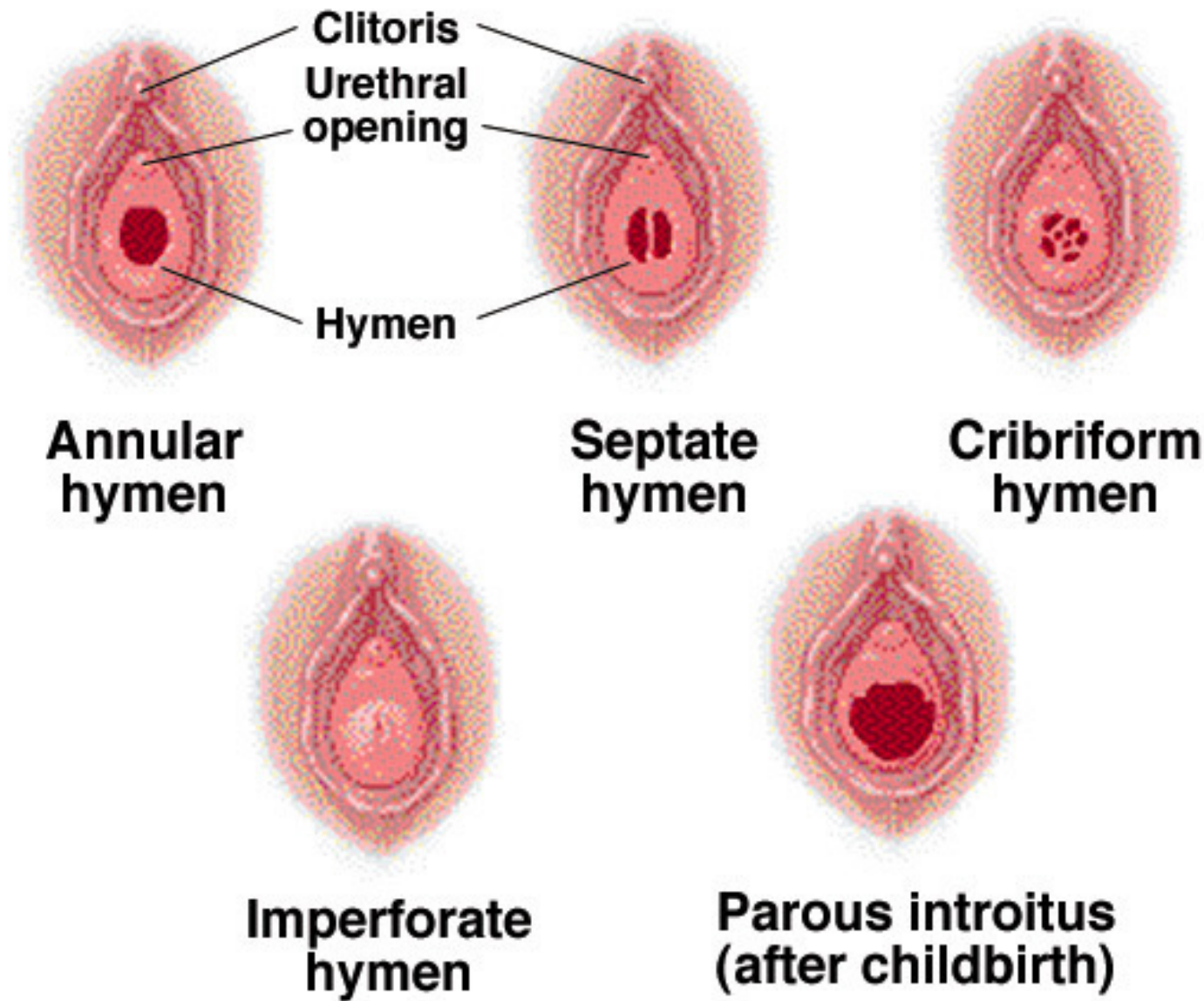
- mons pubis
- labia majora
- labia minora
 - prepuce (clitoral hood)
 - frenulum of the labia minora = fourchette
- vestibule of the vagina
 - external urethral orifice
 - paraurethral glands (Skene's glands)
 - Bartholin's gland



External Genital Organs

- vaginal orifice
 - hymen
- greater vestibular glands
 - Bartholin's glands [bulbourethral glands]
- arterial supply
 - two external pudendal arteries
 - one internal pudendal artery
- venous drainage: internal pudendal veins

Various Types of Hymens

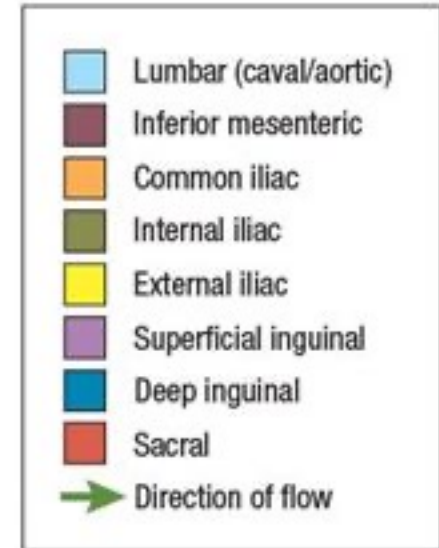
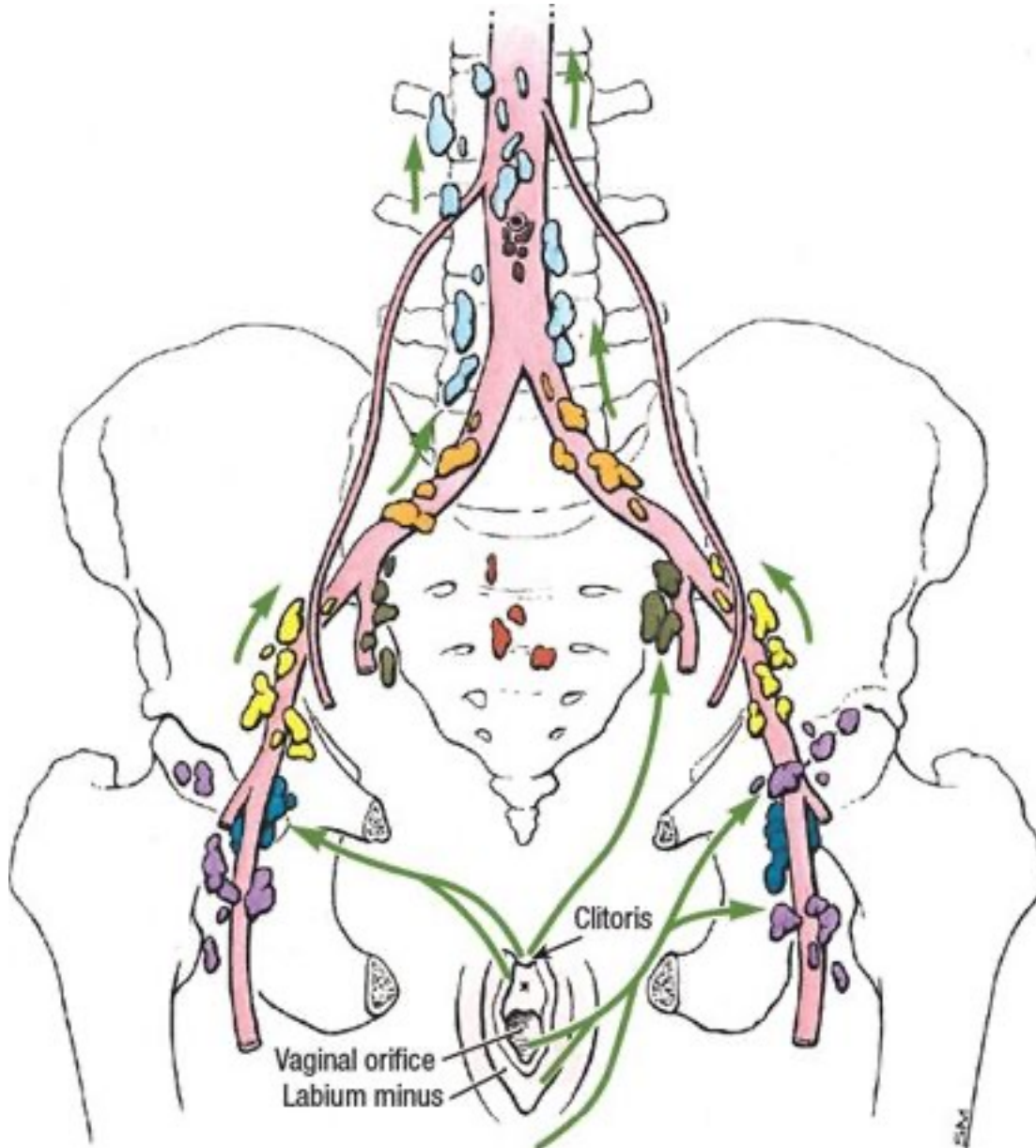


Lymph Drainage

- The external genitalia, anus, and anal canal drain to the superficial inguinal nodes
- The lower one third of the vagina drains to the sacral nodes and the internal and common iliac nodes
- The cervix drains to the external or internal iliac and sacral nodes

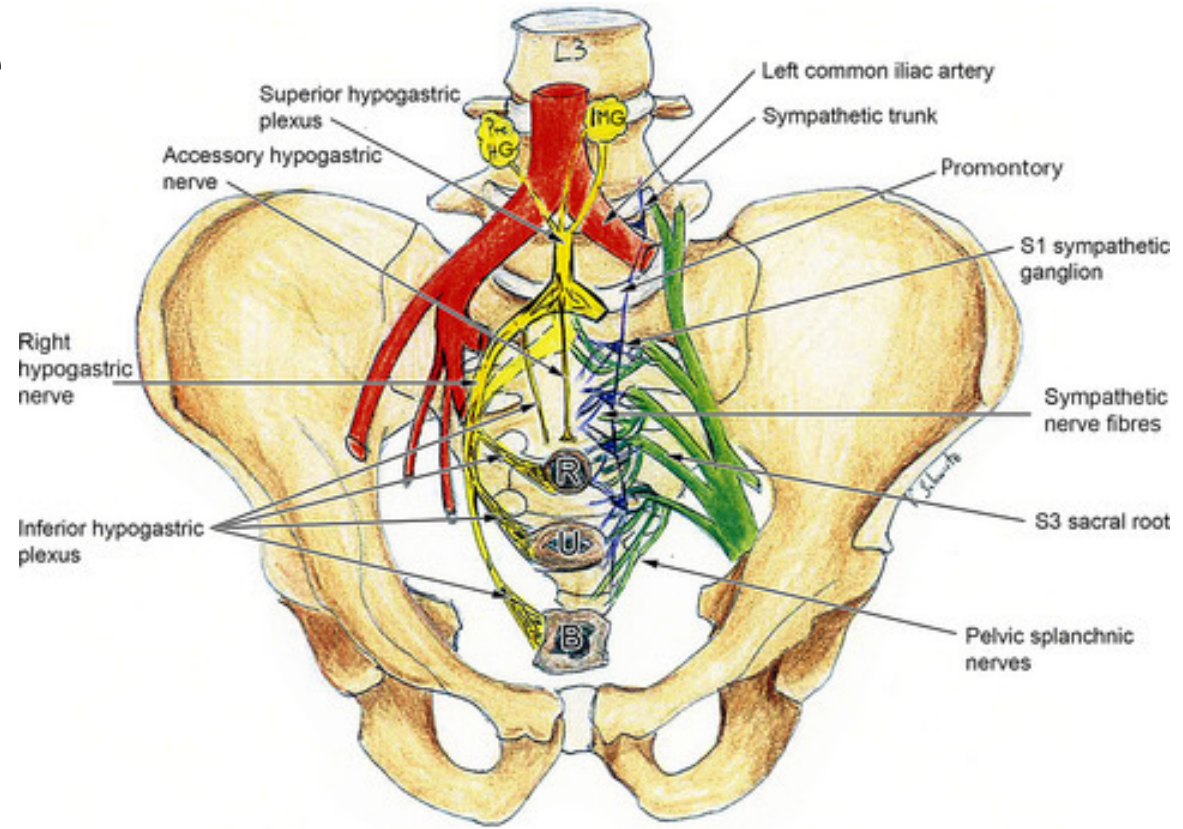
Lymph Drainage

- The lower uterus drains to the external iliac nodes
- The upper uterus drains into the ovarian lymphatics to the lumbar nodes. The lymphatics of the ovaries drain out of the pelvis to the lumbar nodes



Innervation of External Genital Tract

- ilioinguinal nerve
- genital branch of the genitofemoral nerve
- perineal branch of the femoral cutaneous nerve
- perineal nerve





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Basic Principles of Ultrasound



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HISTORY

- ◉ Ultrasound was 1st introduced by Ian Donald in 1950 from Glasgow, UK.
- ◉ **Father of ultrasonography - Ian Donald**
- ◉ Ultrasonography is commonly used diagnostic test due to high safety, more acceptance and low cost.

Christian Doppler (1803 – 1853)

Famous for what is called now the “Doppler effect”

- 1841** Professor of mathematics & physics
Prague polytechnic
- 1842** Published his famous book
“On the colored light of the binary stars
& some other stars of the heavens”
- 1850** Head of institute of experimental physics
Vienna University



Austrian physicist



Doppler had a trumpeter stand on a moving train for 2 days, playing the same note, while trained musicians recorded the difference in sound.

Doppler theorized that sound and light waves change if the **source of the wave** moves or if the **observer of the wave** moves.

It was during the years of his early teaching career that Doppler presented a brilliant paper entitled

On the colored light of the double stars and certain other stars of the heavens

to the Royal Bohemian Society in Prague.

- ⦿ 3.5 MHz frequency is used in abdominal ultrasound whereas 5-7.5 MHz is used in vaginal type.
- ⦿ Higher is the frequency more will be the resolution of the image but lower will be the depth of tissue penetration.

DIAGNOSTIC TOOL FOR...

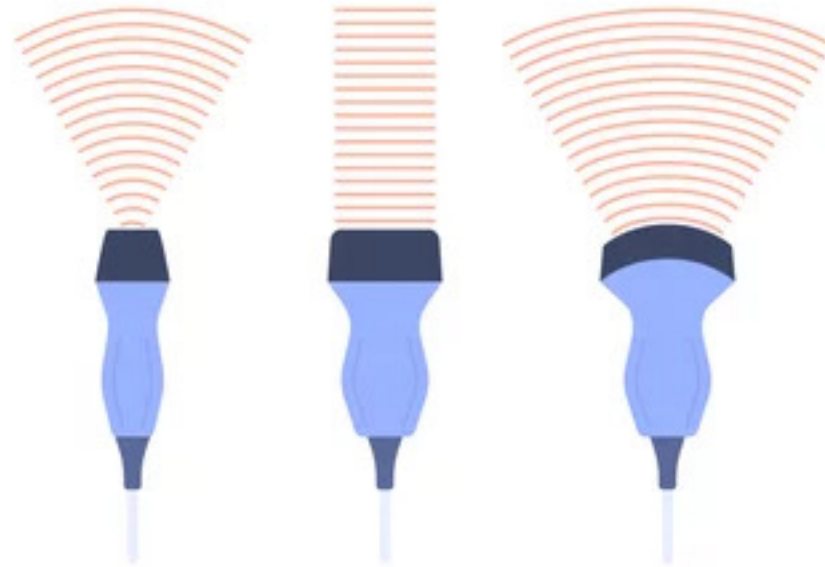
- ◉ Assessment of adnexal pelvic masses
- ◉ Diagnosis of polycystic ovaries
- ◉ Investigation of postmenopausal bleeding
 - ◉ Imaging and measure of endometrial thickness
- ◉ Investigation of menorrhagia
 - ◉ Fibroids and adenomyosis
- ◉ Monitoring of follicle number and growth for IVF
- ◉ Egg recovery for IVF and ICSI
- ◉ Evaluation of pelvic pain
 - ◉ A limited role
- ◉ Screening for ovarian cancer
 - ◉ Too many false positives

DIAGNOSTIC TOOL FOR...

- ⊙ IUCD and Implantation location
- ⊙ Treatment of ovarian cysts (aspiration) and ectopic pregnancy (methotrexate)
- ⊙ Saline hysteroigraphy for delineation of the uterine cavity
- ⊙ Tubal patency studies in infertility
- ⊙ Evaluation of primary amenorrhoea

ULTRASOUND COMPONENTS

- ⦿ Transducer Probe
- ⦿ Transducer Pulse Controls
- ⦿ CPU
- ⦿ Display
- ⦿ Keyboard/Cursor
- ⦿ Disk Storage Device
- ⦿ Printer



PHASED ARRAY

LINEAR

CURVILINEAR

ULTRASOUND PROBE TYPES





ABDOMINAL ULTRASOUND

- ◉ Bladder should be full [Full bladder will push bowel away from the field- **acoustic window**]
Explain
- ◉ Consent [verbal]
- ◉ Female attendant [**chaperone**]
- ◉ Privacy
- ◉ Gentle
- ◉ Brief Gynecological history
- ◉ Examination findings - abdominal and vaginal

TRANSVAGINAL ULTRASOUND

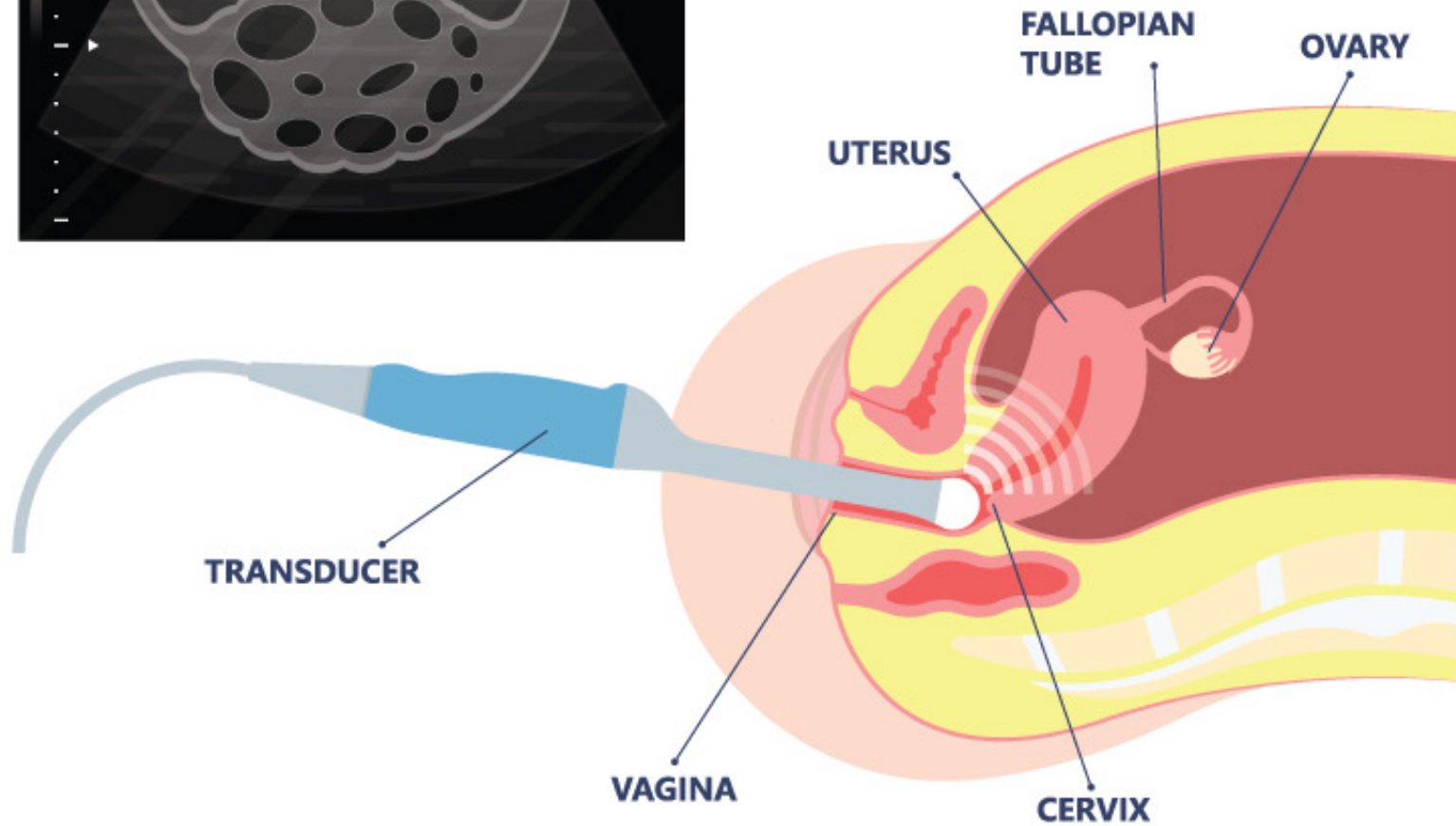
- ◉ Bladder full is not needed
- ◉ It has a range of about 8-10 cm.
- ◉ Wear a pair of Gloves

Trans-vaginal probe movements:

- a] **Penetrating** - introducing into vagina
- b] **Rocking** - antero-posterior movement
- c] **Sliding** - lateral movement
- d] **Roatating** - to 45 to 90 degrees
- ◉ **Drawbacks** -
 - ◉ 1. Virgins
 - ◉ 2. Elderly Postmenopausal women
 - ◉ 3. Post radiation stenosis
 - ◉ 4. Children
 - ◉ 5. Psycho-sexual disorder



TRANSVAGINAL ULTRASOUND



FINDINGS

- ◉ Identify bladder
- ◉ Uterus size - 6-8X5X4 cm
- ◉ Uterus position - anteverted or retroverted
- ◉ Myometrium
- ◉ Cervix - for growths like polyps or fibroids
- ◉ Endometrial lining
- ◉ Bilateral ovaries
- ◉ Any other adnexal masses - ovarian or fallopian tubal masses
- ◉ Color Doppler - flow of the blood in a vessel can be identified
- ◉ Fluid in the Pouch of Douglas

STEP BY STEP

◎ SCANNING TECHNIQUE

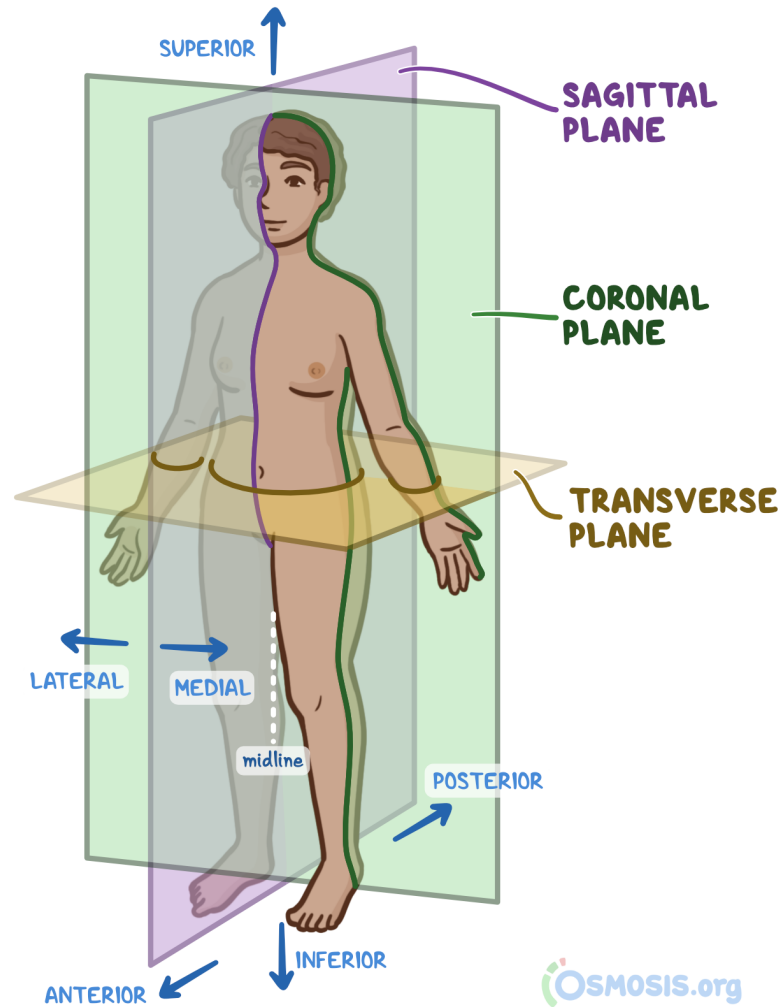
■ ORIENTATION

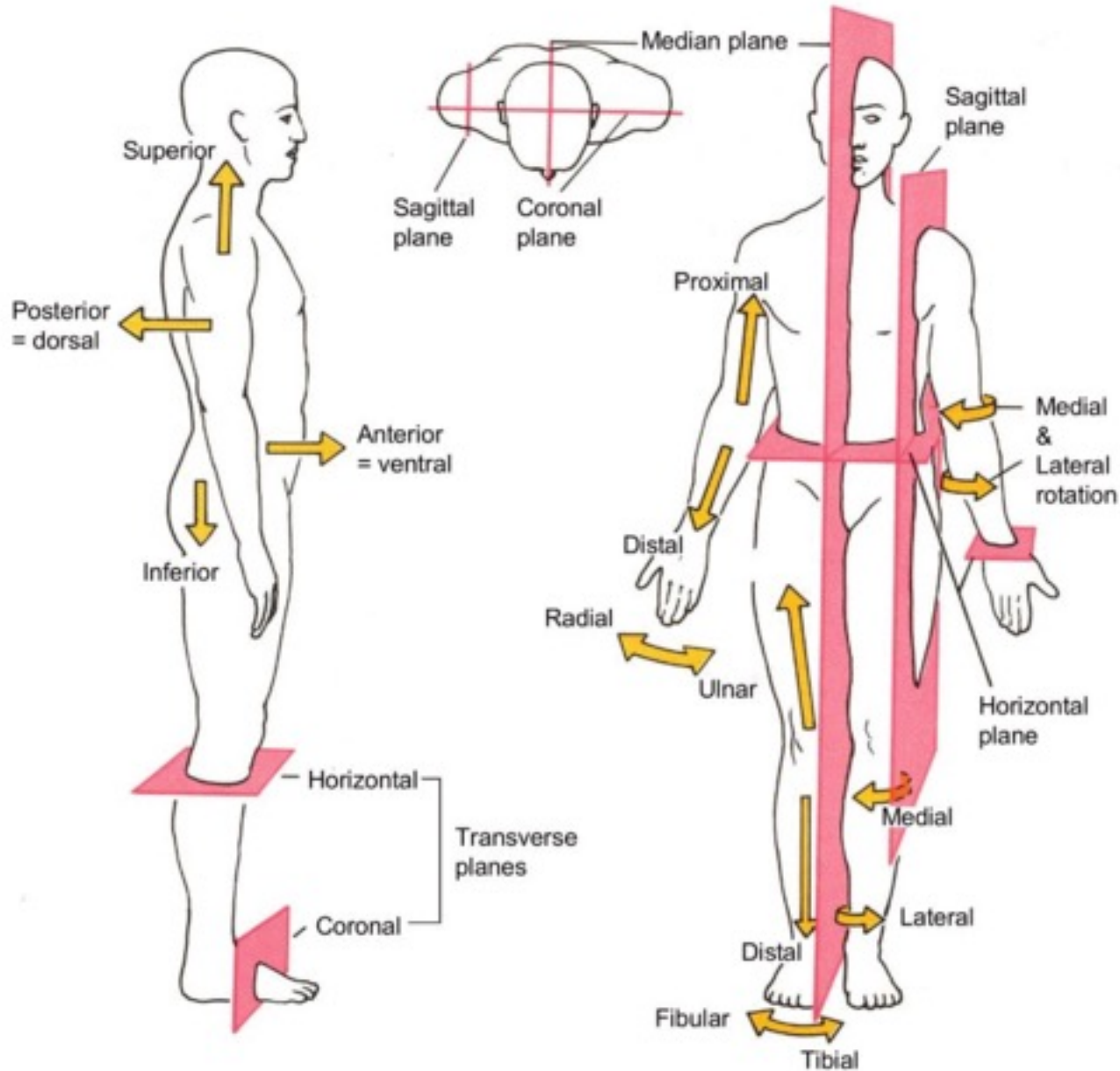
- FULL BLADDER (MARKER, ACCOUSTIC WINDOW)
- UTERUS
- TVS => INTERNAL ILIAC VESSELS, OVARY IN ANTEROMEDIAL

STEP BY STEP

⊙ SCANNING PLANES

- SAGITTAL (LONGITUDINAL, VERTICAL, ANTERO-POST)
- CORONAL (HORIZONTAL, TRANSVERSE, CS, TRANS-PELVIC)
- LEFT-RIGHT ORIENTATION
- TRANSDUCER
 - TRANS ABD => 3.5-5 MHz
 - TRANSV => 5-8 MHz
- BIG MASS => EMPTYING BLADDER





FINDINGS

- ◎ THE UTERUS & CERVIX
 - ANTEVERTED/RETRO
 - ENDOMETRIAL THICKNES
 - DECIDUAL REACTION
 - UTERINE CAVITY ABNORMALITY
 - CERVICAL ABNORMALITY

FINDINGS

- ⊙ THE ADNEXAE (TUBES & OVARIES)
 - HYDROSALPINX
 - OVARIAN CYST
 - PCO
- ⊙ POUCH OF DOUGLAS
 - FREE FLUID
 - SOLID MASSES
- ⊙ OTHER PATHOLOGY

FINDINGS

◎ THE UTERUS

- POSITION => NEXT TO BLADDER (ANTEVERTED), LOOPS BOWEL FILLING THE SPACE BETWEEN BLADDER & UTERUS.
- THE SIZE & SHAPE (AGE, PARITY)
 - PRE PUBERTAL 1.0-3.3 LENGTH, 0.5-1.0 WIDTH
 - NULLI 7X4X4 CM, MULTI + 1.2 CM
 - POST-MENOPAUSAL 3.5-6.5 LONG, 1.2-1.8 W

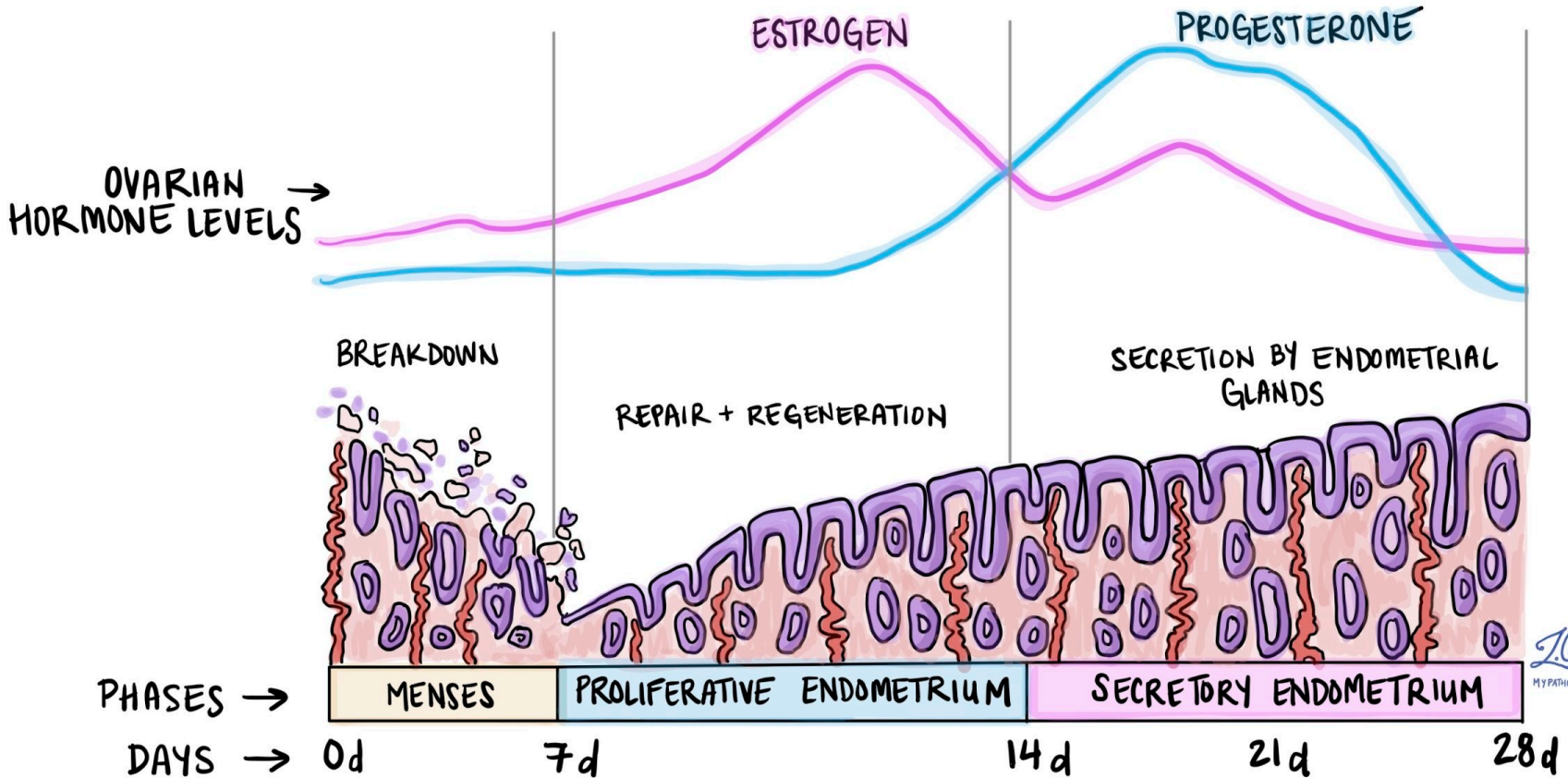
FINDINGS

- ◎ TEXTURE OF NORMAL=>
 - HOMOGENOUS
 - LOW-MEDIUM ECHOGENICITY
 - SMALL 1-2 mm BLOOD VESSELS

ENDOMETRIUM

- ⦿ THICKNES & TEXTURE AFTER MENARCHE
=> CYCLICAL CHANGES
- ⦿ EARLY MENSTRUAL PHASE => ANECHOIC =>
BLOOD
- ⦿ VERY THIN 1-4 mm (AP width)
- ⦿ PROLIFERATIVE; 4-8 mm, isoechoic or
slightly hyperechoic relative to the outer
- ⦿ LATE PROLIFERATIVE (PERIOVULATORY)=>
A MULTILAYERED ENDOMETRIUM

- ⊙ THE SECRETORY PHASE=> ECHOGENIC, 8-16 mm
- ⊙ Outline endomet cavity=> regular, except polyp, submucous fibroid.
- ⊙ Oligomenorrhoea, amenorrhoea => >16 mm, prolonged unopposed estrogen effect
- ⊙ Normal postmenopausal=> atropic, thin, < 4mm



- ⦿ Proliferative phase - 2-4 mm
- ⦿ Secretory phase - 5 - 14 mm
- ⦿ In post-menopausal women - more than 4 mm warrants or is an indication for biopsy

NORMAL, NON-PREGNANT UTERUS ON T/V U/S



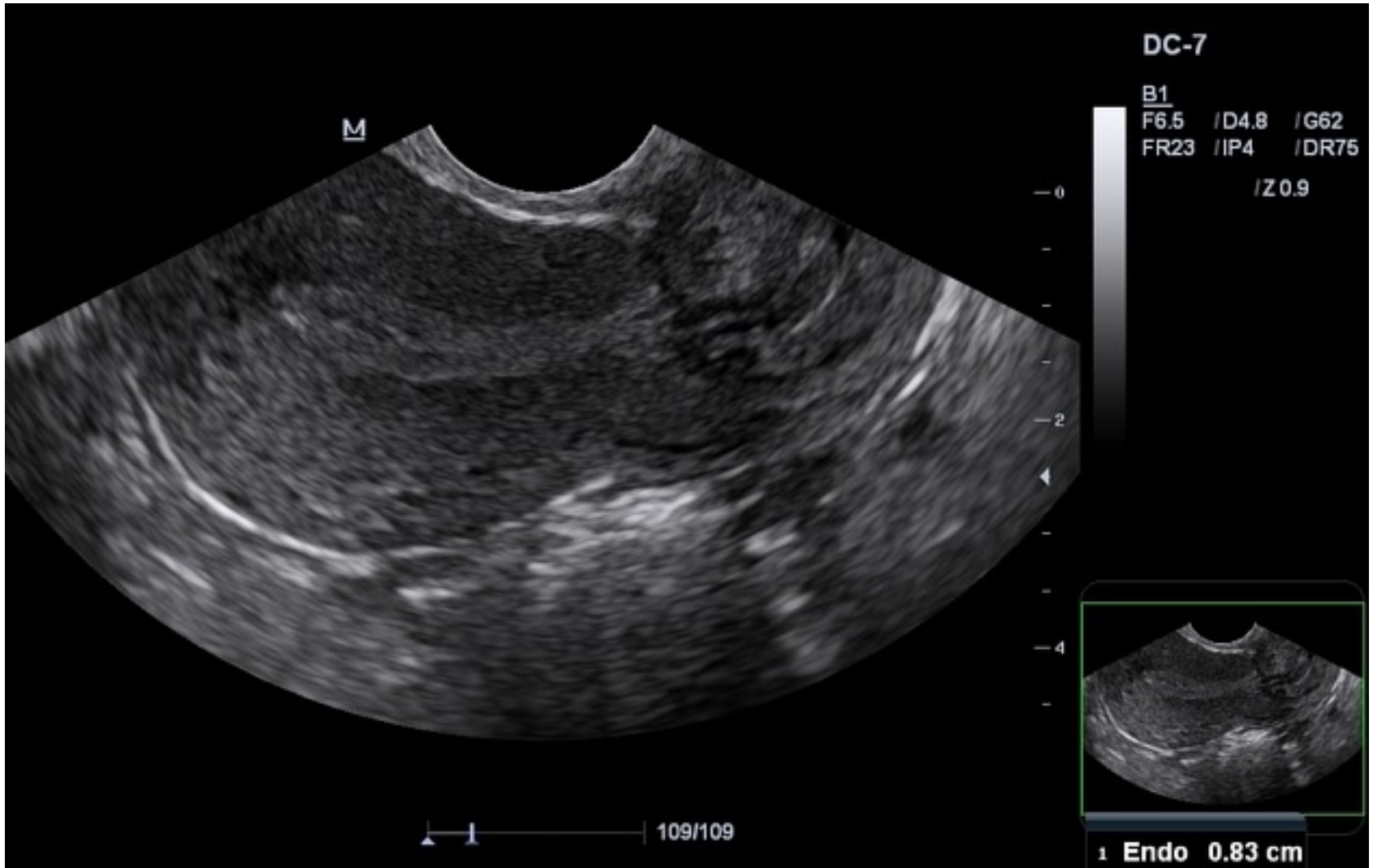
Source: Ma OJ, Mateer JR, Blaivas M: *Emergency Ultrasound*, 2nd Edition:
<http://www.accessemergencymedicine.com>

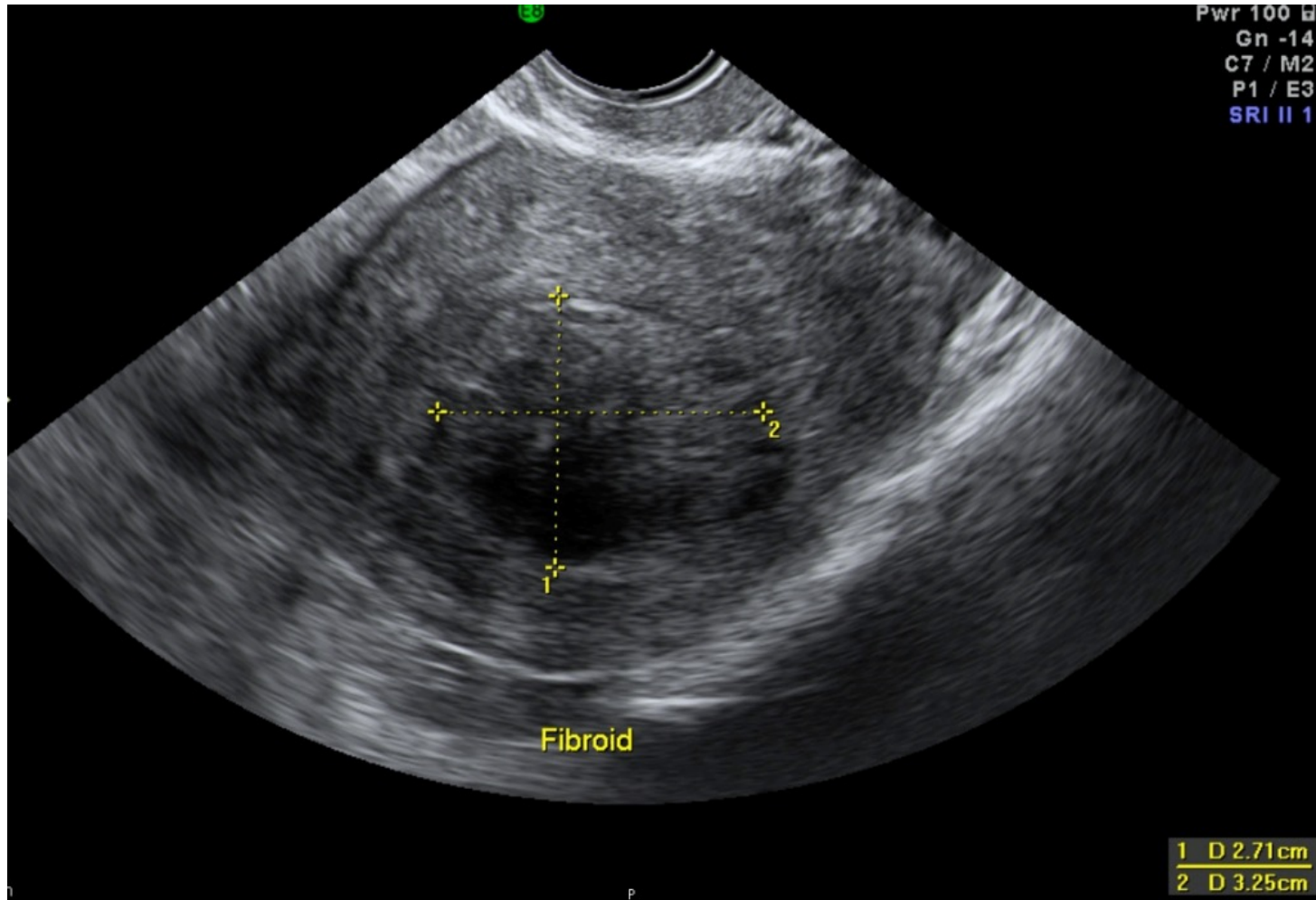
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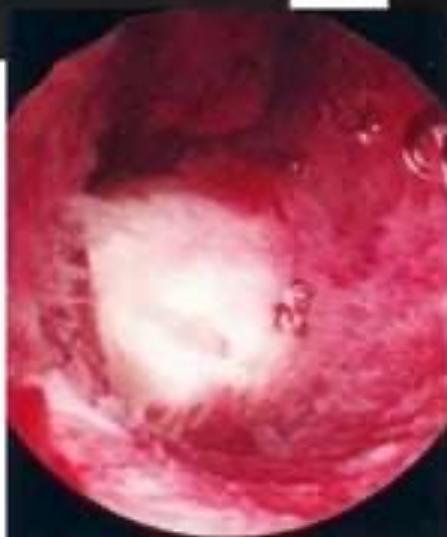
THE OVARIES

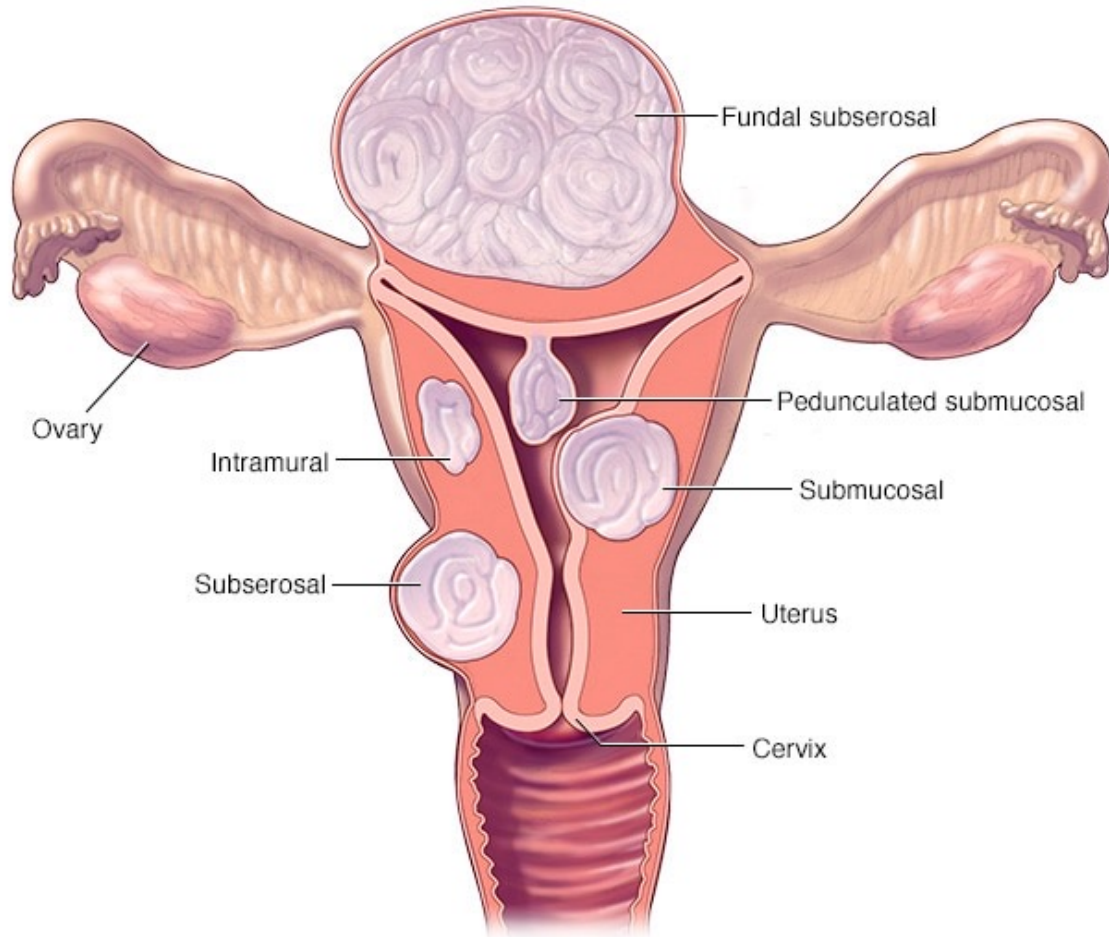
- ⊙ Not easily seen during trans-abd US
- ⊙ Ovoid structures antero-medial to the internal iliac vessels => TVS
- ⊙ Size varies => hormonal status
- ⊙ Adolescence=> 4.2 cm³
- ⊙ Premeno adult=> 9.8 cm³
- ⊙ Postmeno => 5.8 cm³

- ⊙ Small, rounded,
- ⊙ anechoic spaces=> follicles or corpus luteum in reproductive age
- ⊙ 60% postmenopausal ovaries can be identified.
- ⊙ Simple functional cysts are solitary and measure 4-7 cm in diameter.

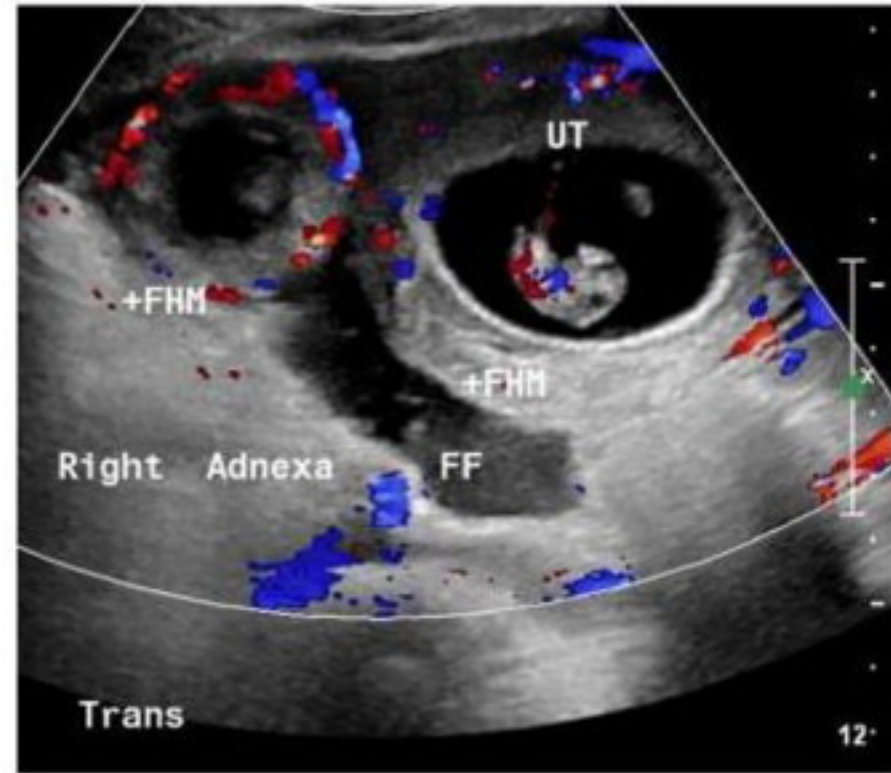
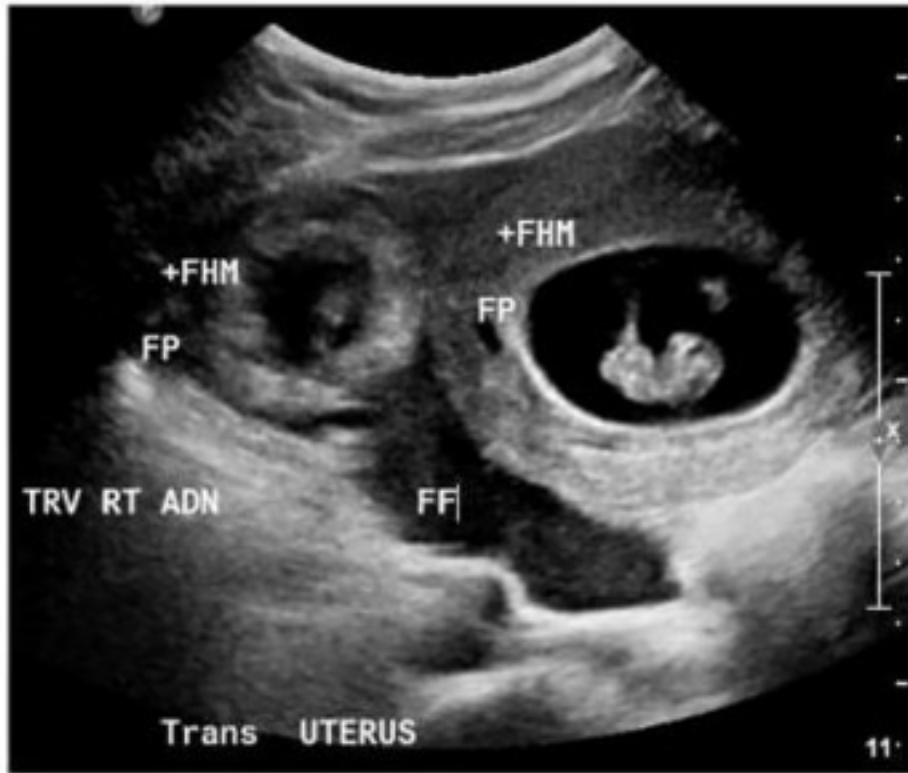








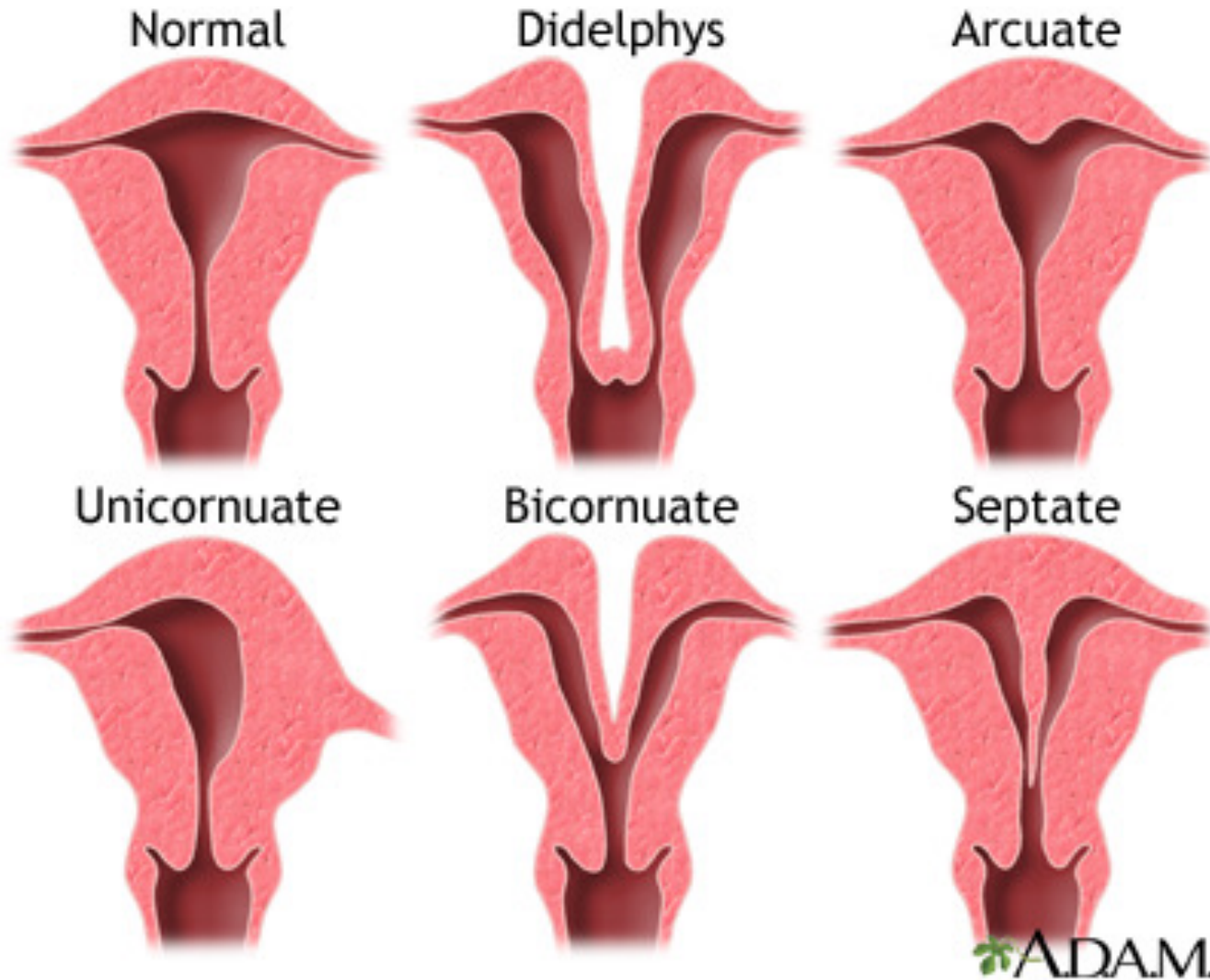
HETEROTOPIC PREGNANCIES





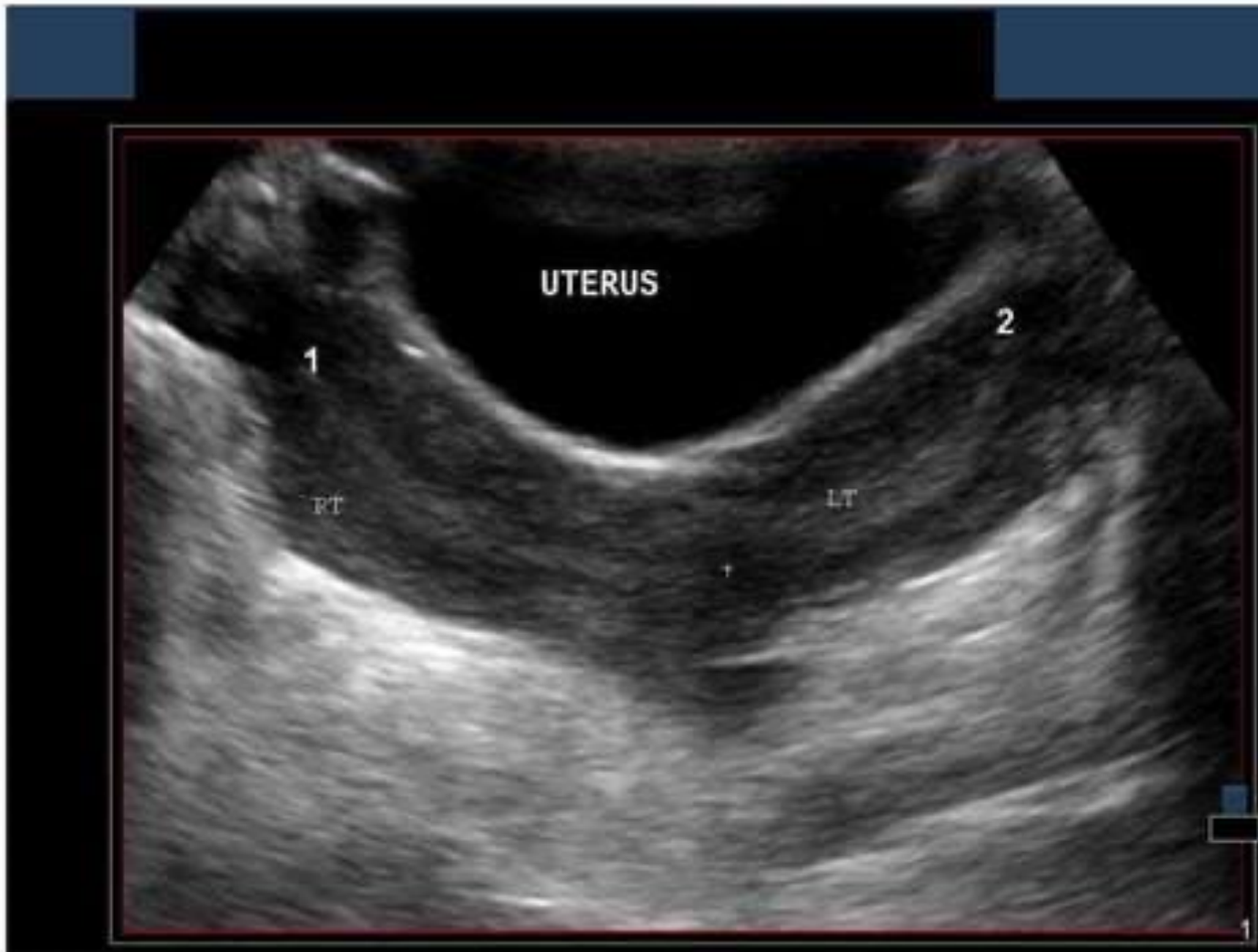




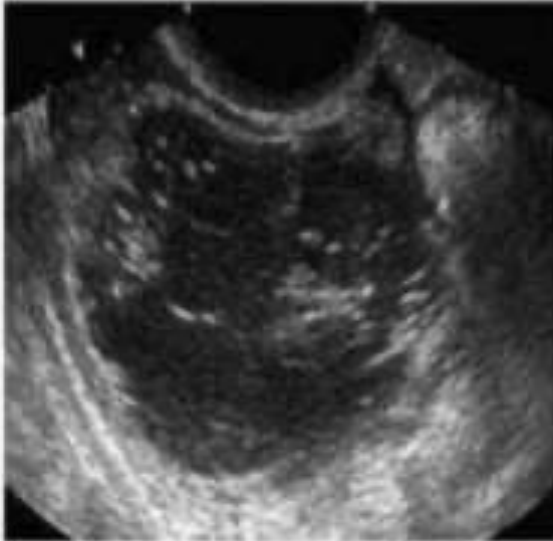




DIDELPHIS UTERUS



DERMOID CYST



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FOLLICULAR CYST

