ULTRASOUND
LECTURE SERIES

— Presented by —

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Benign Abnormalities of the Female Pelvis

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Cervix

- Can be scanned in sagittal or coronal plane
- Usually sagittal midline view gives most information
- Tip of probe almost touching anterior lip of cervix in transvaginal sonography (TVS)
- Sometimes see bladder above cervix even when bladder almost empty.
- Hard to discern entire cervical length, but measured from internal os to external os, usually more important in obstetric scanning

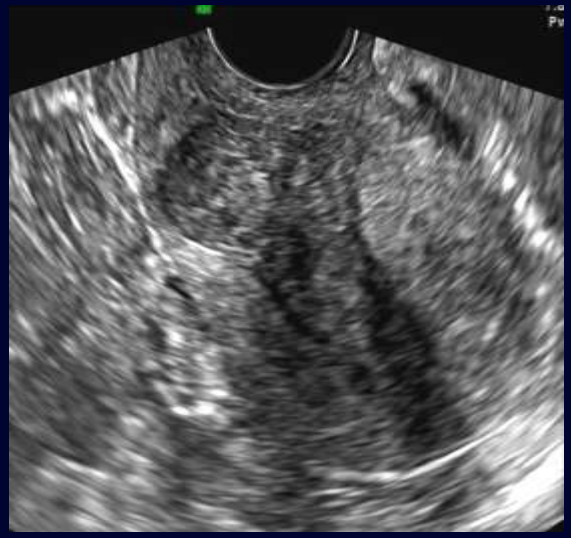
Cervix: Nabothian cysts

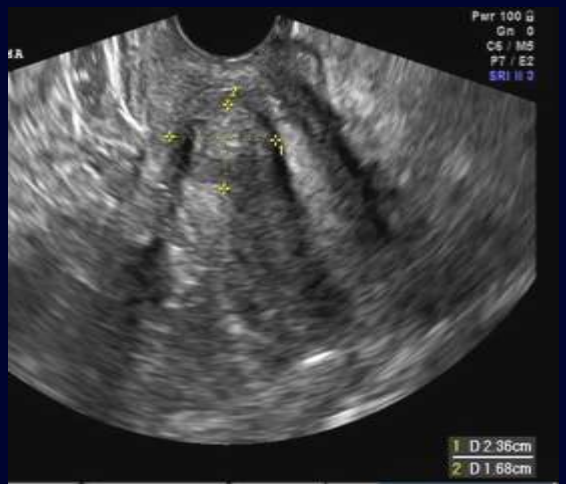
- Dilated thin walled anechoic inclusion cysts
- Various sizes
- Not pathologic
- Can grow quite large

Cervix: masses

- Usually related to pregnancy, may be complicated intrauterine pregnancy or rarely cervical pregnancy
- Cervical malignancy: Ultrasound usually not a first-line tool for the diagnosis of cervical malignancy
- Can see an unusually bulky and large cervix, may be barrel shaped

Cervical myomas



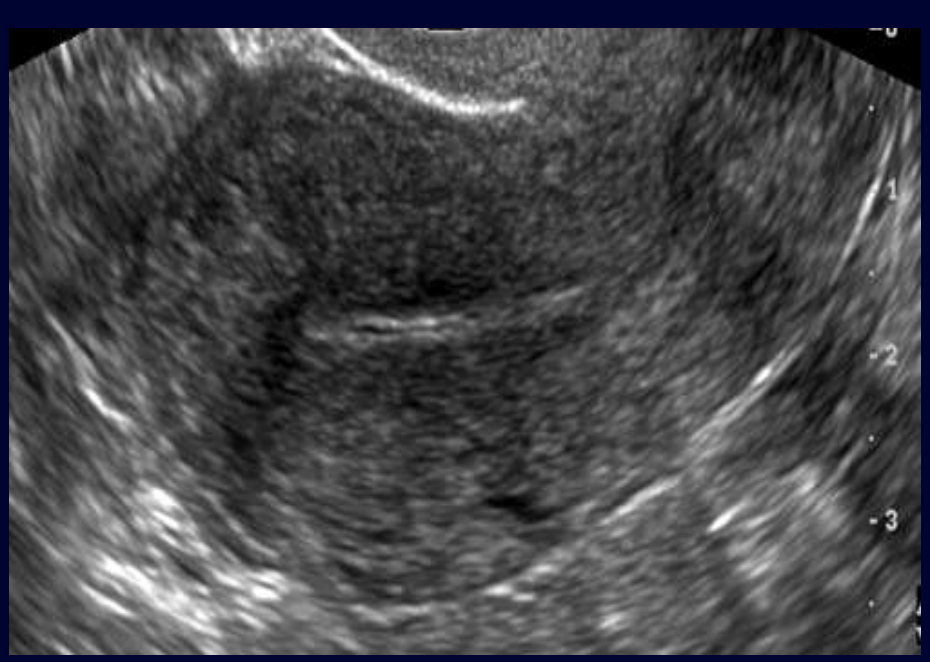


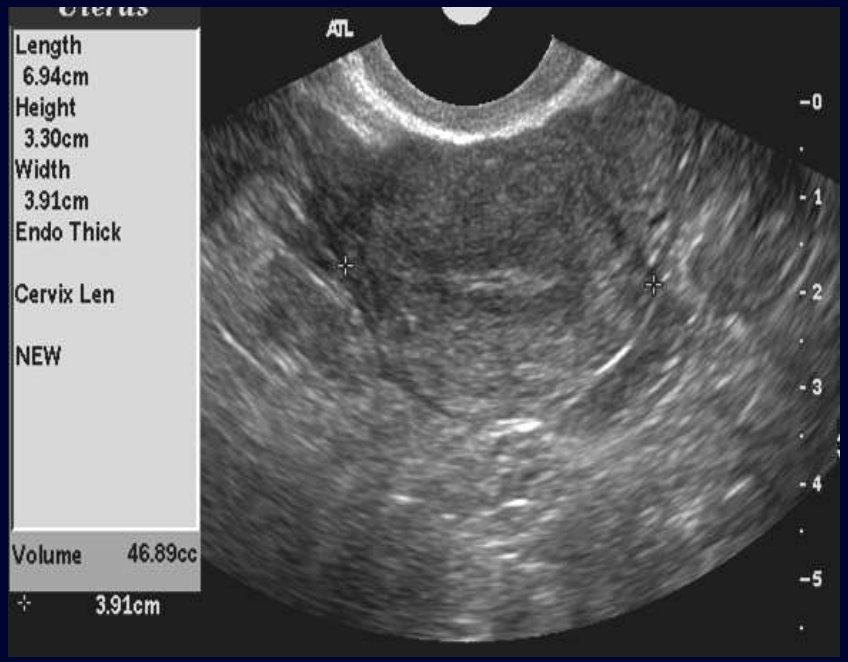
- May cause abnormal vaginal bleeding and/or dyspareunia
- May grow large
- Occasionally prolapse into canal or vagina

Uterus and Endometrium

- Two basic uterus views: sagittal and transverse
- Two basic uterus positions: anteverted and retroverted
- Endometrial measurements: single or double layer
- Premenopausal women: endometrial thickness depends on time of cycle
- Postmenopausal women: endometrial thickness depends on hormone replacement therapy (HRT) regimen if on HRT

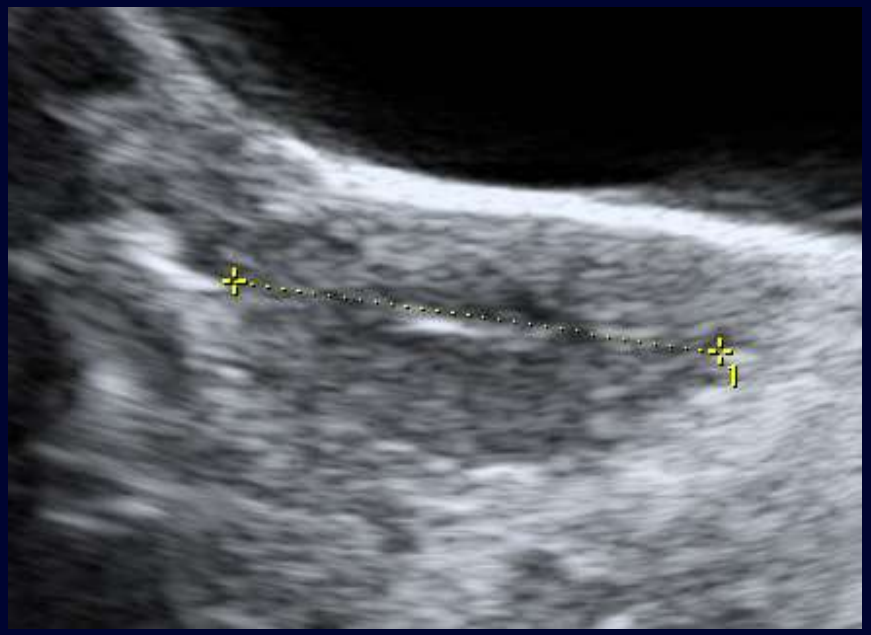
Anteverted uterus: sagittal and transverse





Retroverted uterus: both sagittal views; see uterine dimensions

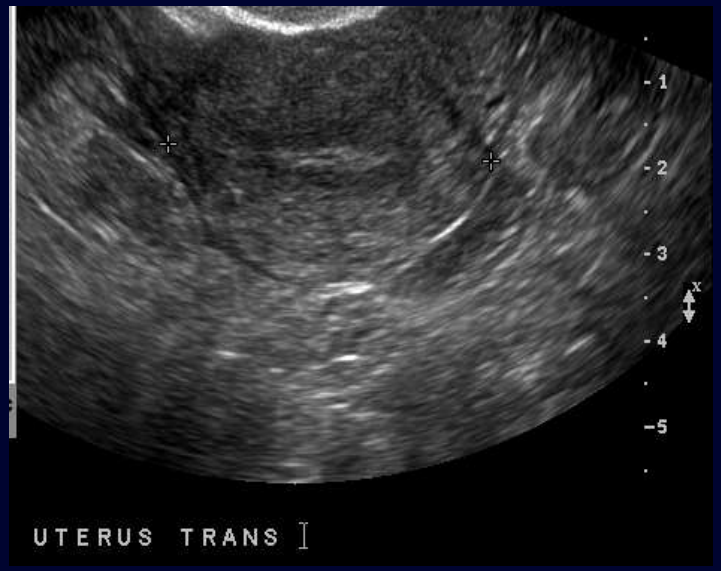
Transabdominal view of the uterus: sagittal (L) and transverse (R)



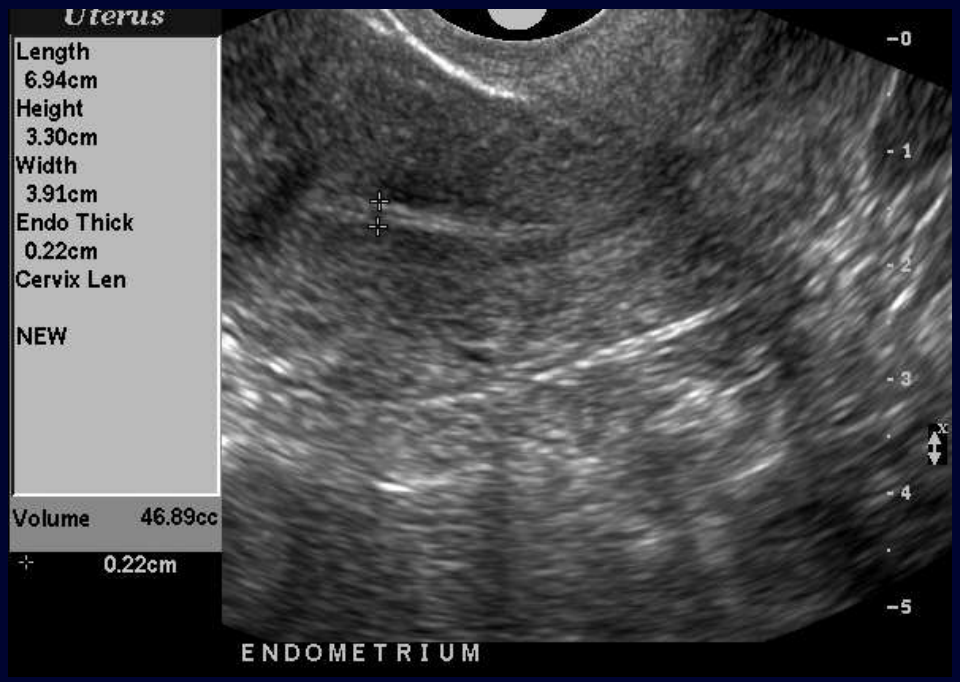
Endometrium

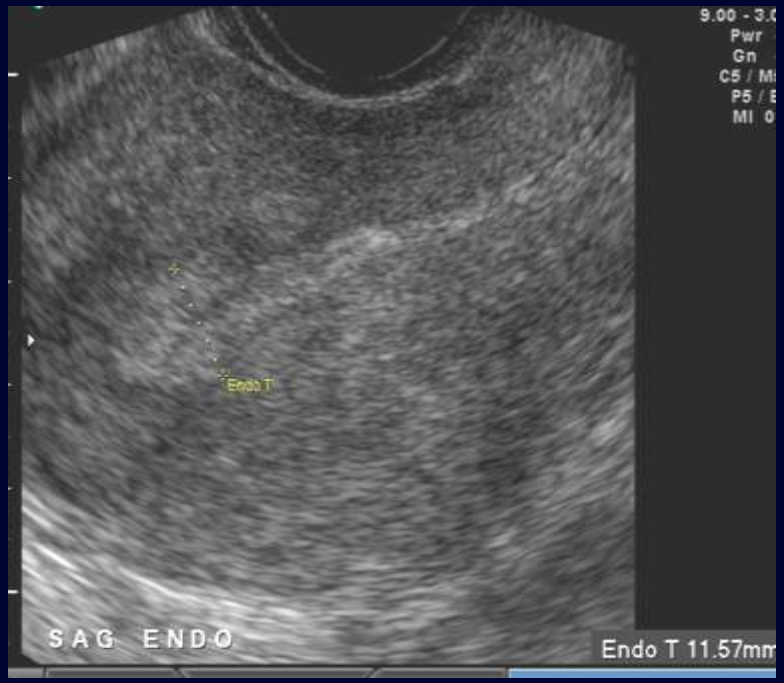
- Changes during the menstrual cycle
- During time of ovulation, often multilayered appearance
- In secretory phase, gains thickness (0.8-1.4 cm) and more echogenic
- Measured in sagittal plane and from anterior endometrial-myometrial interface to posterior endometrial-myometrial interface
- If fluid within, do not measure as one layer

Normal early phase (proliferative endometrium): sagittal and transverse



Endometrial measurements

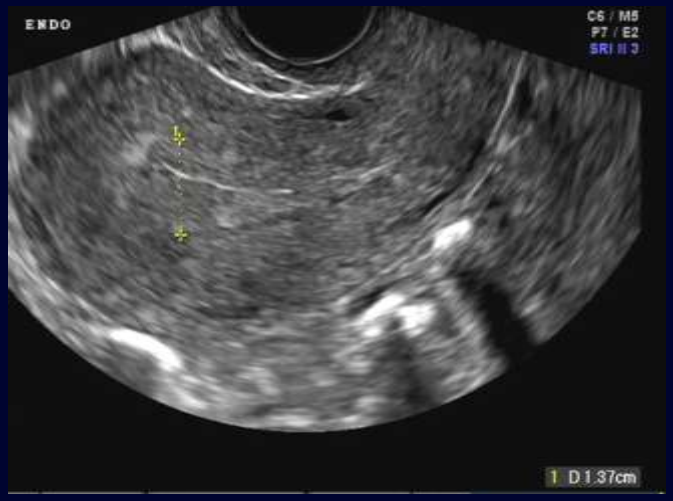




Endometrium: trilaminar

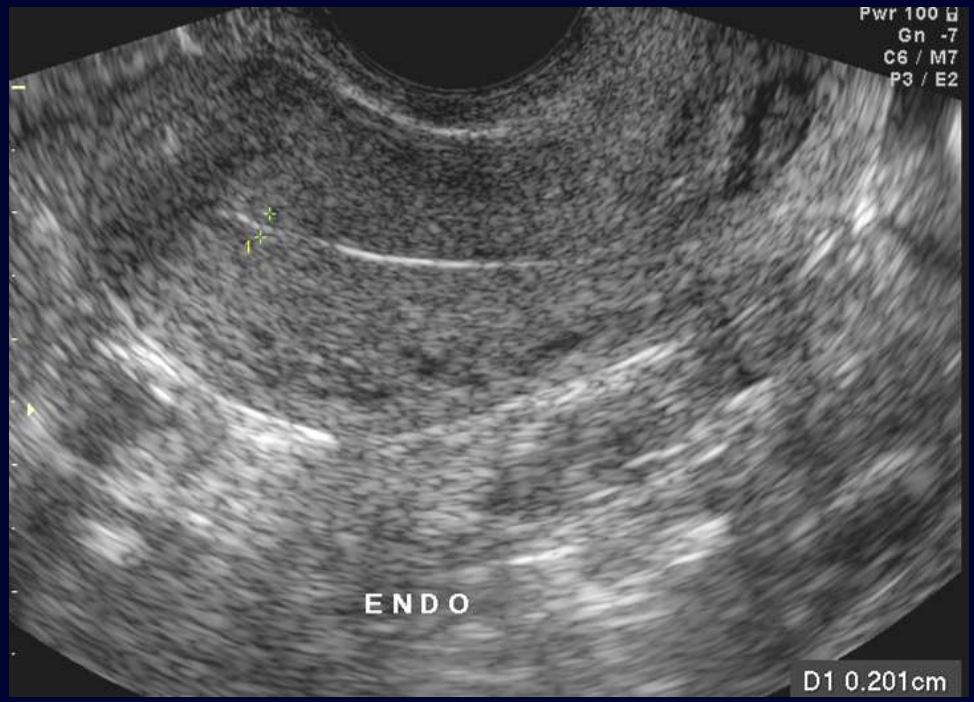
- Hyperechoic endometrial-myometrial interface
- Hypoechoic endometrium
- Mid hyperechoic line likely representing mid cycle mucus

Endometrium: secretory



- Usually thicker than proliferative
- Often hyperechoic
- Lose trilaminar features

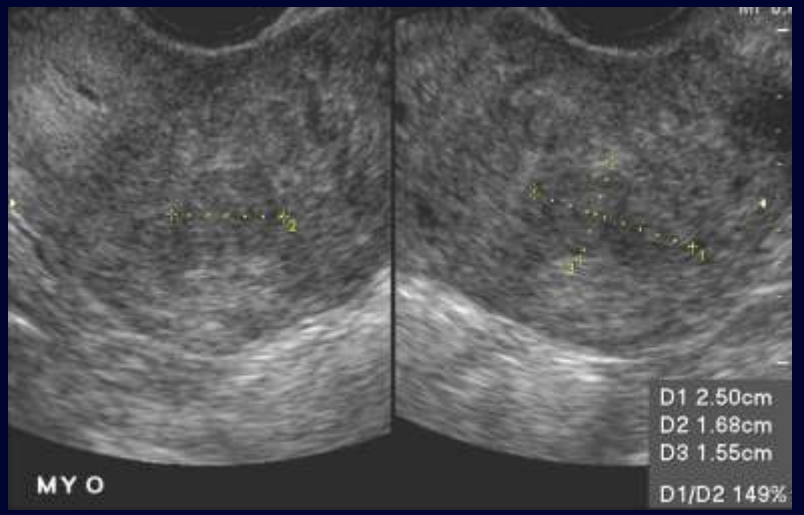
Postmenopausal endometrium: usually thin and measures less than 0.5 cm



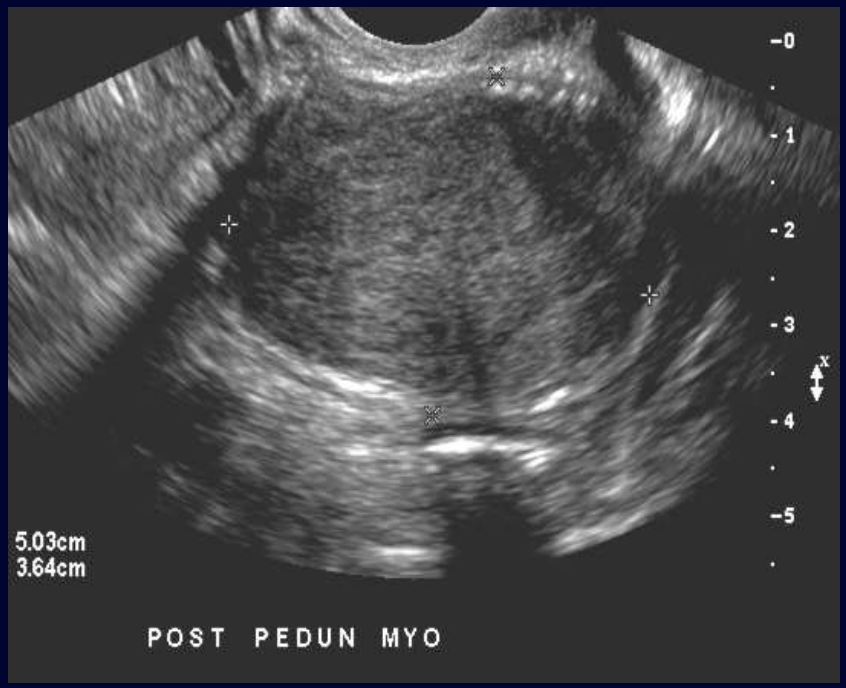
Uterine Abnormalities

- Uterine myomas: 3 locations: submucous, intramural, subserosal
- May also be pedunculated
- Endometrial pathology: polyps, thickening, hyperplasia, carcinoma
- Can use saline infusion sonohysterography (SIS) to help delineate

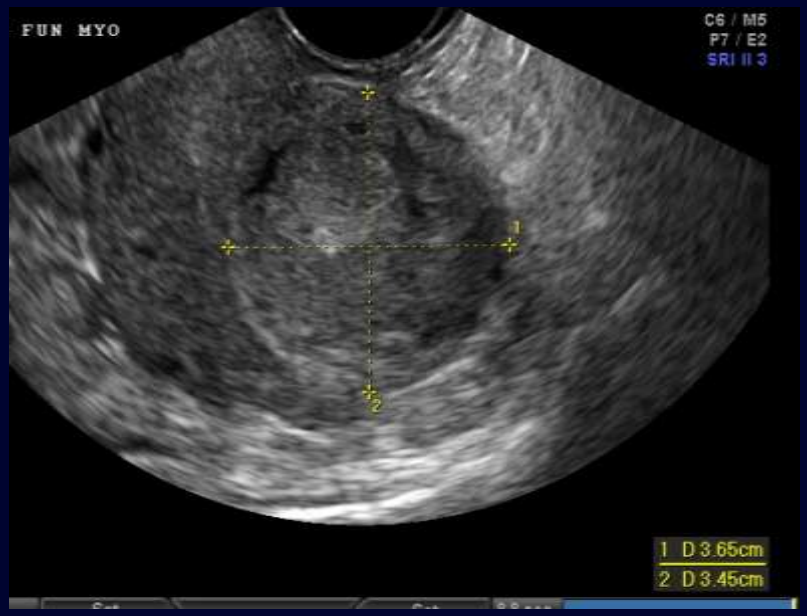
Intramural myomas



Posterior pedunculated myoma

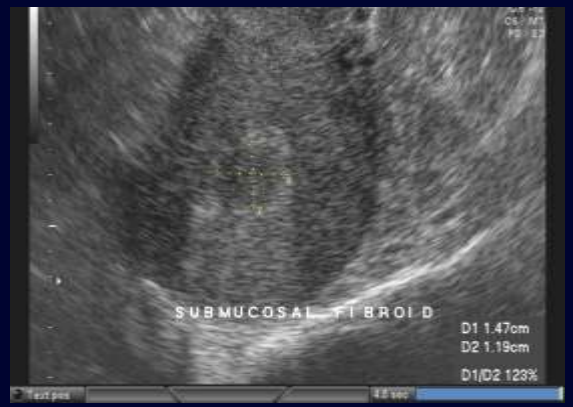


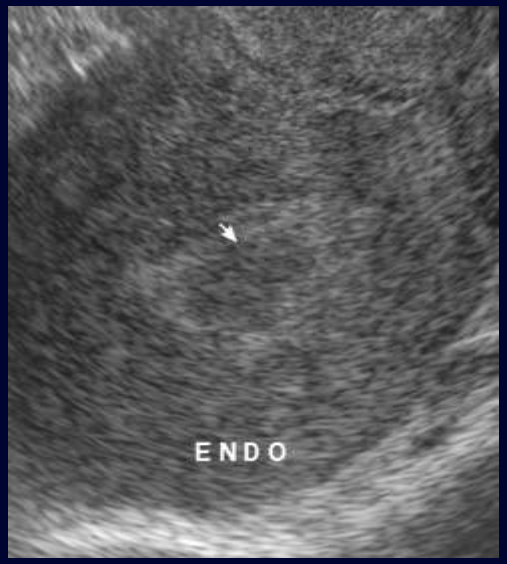
Myomas

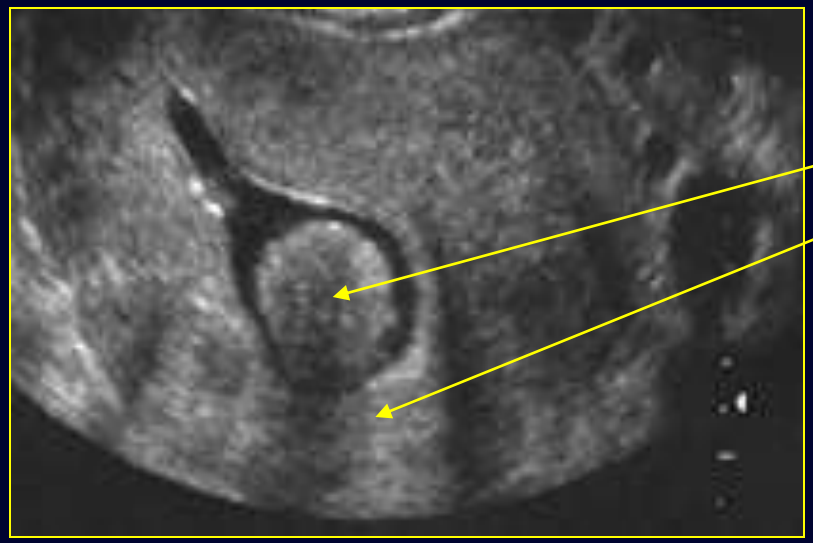

FUN MYO
C6 / M5
P7 / E2
SRI II 3
1 D 3.65cm
2 D 3.45cm


INTRA ANT CORPUS LT
1 D 1.89cm
2 D 1.27cm
3 D 1.32cm

Submucous myoma







Submucosal myoma with SIS

Submucous myoma myometrium

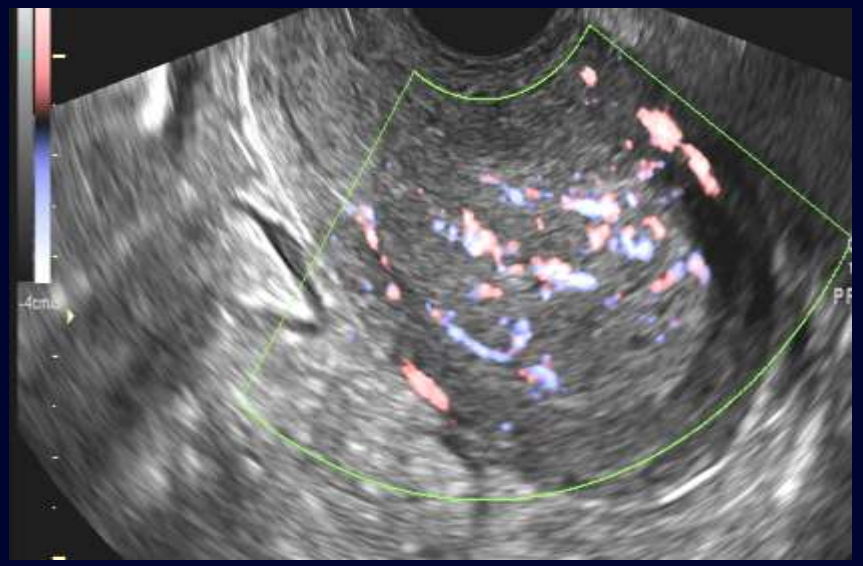
Endometrial Hyperplasia

- Normal postmenopausal endometrium: 5 mm or less associated with inactive endometrium
- Thick endometrium in a postmenopausal woman especially with bleeding may be suggestive of hyperplasia or carcinoma
- Cannot use sonographic measurement to differentiate
- Peak incidence in early postmenopausal years

Endometrial hyperplasia

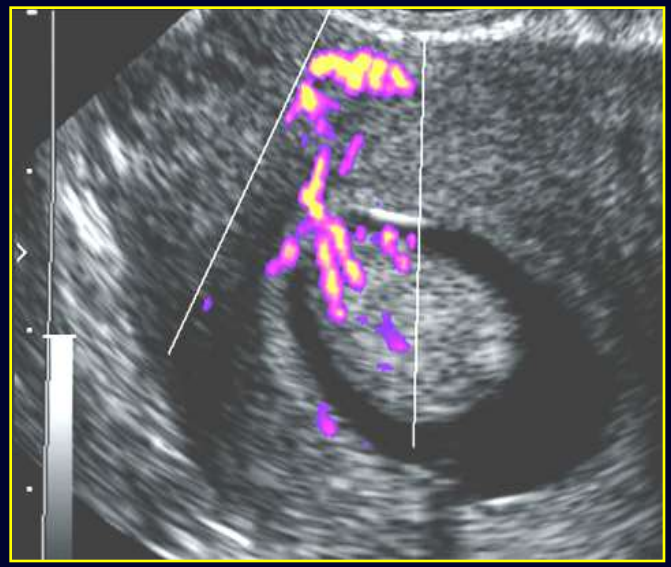
- May be focal or global thickening
- Can only be diagnosed by pipelle or histology
- Need to correlate patient's age and/or history

Endometrial carcinoma: often diagnosed in postmenopausal years, thick endometrium, may have increased Doppler flow, no sonographic diagnosis but thick endometrium should prompt further workup



Endometrial polyps

- Cause of postmenopausal bleeding in 2%-8% of patients.
- See thick endometrium with feeding vessel and possible internal cystic spaces.
- It is often difficult to differentiate hyperplasia from polyps on TVS alone: need SIS.



Endometrial polyps

- Often in perimenopausal or early postmenopausal women, with or without HRT
- 97%-99% benign
- Often cause of menorrhagia or menometrorrhagia
- Rx: hysteroscopic removal

Endometrial polyp with SIS: SIS is a useful adjunct to sonographically differentiate focal or global endometrial pathology from polyp and better tailor diagnostic and therapeutic options for patient

Concurrent submucous fibroid and endometrial polyp

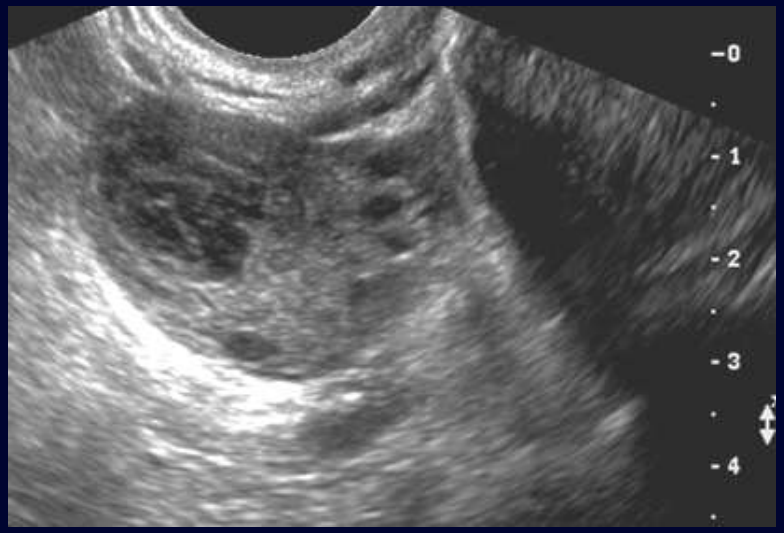
Uterine Neoplasms

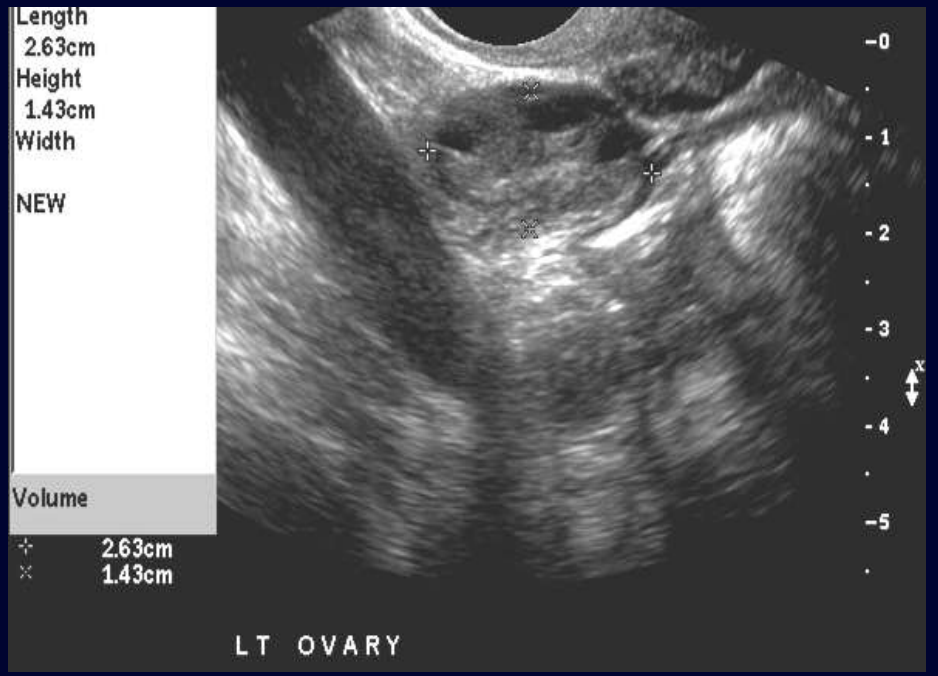
- Difficult to differentiate myomata from uterine malignancy by ultrasound: hint may be rapid growth or increased and aberrant blood flow, especially in a postmenopausal patient
- Examples: leiomyosarcoma, malignant mixed mesodermal tumor

Ovaries

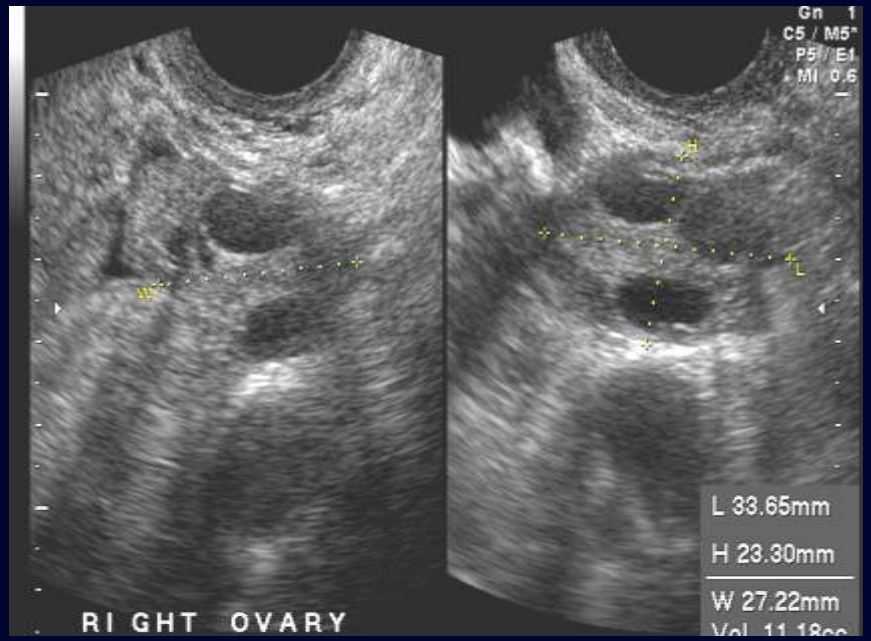
- Basic dimensions: 2 x 3 x 4 cm
- Depends on time of cycle and phase of life: premenopausal, perimenopausal, postmenopausal
- Many normal findings and variations
- Often located superior and medial to hypogastric vessels
- If any question, rescan in 6 weeks

Normal ovaries, menstruating years: see hypogastric vein and ovary on right



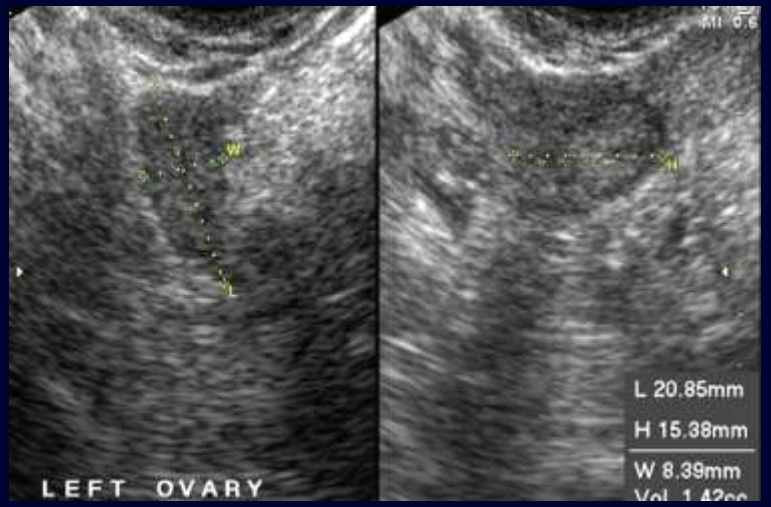


Normal ovaries: depending on time of cycle, premenopausal women may have follicles and/or functional cysts, or a corpus luteum

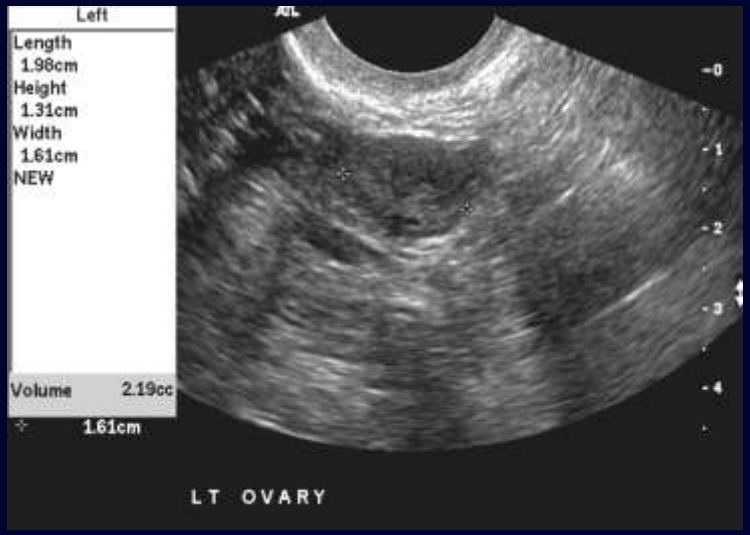


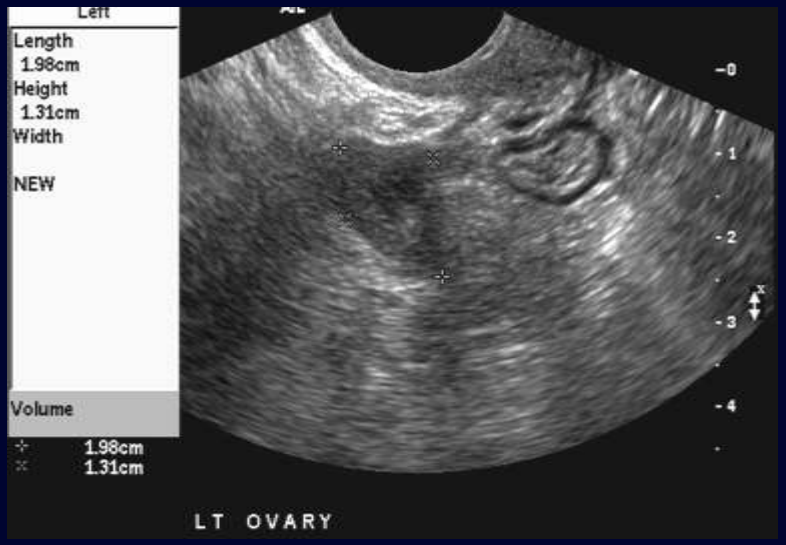
Normal ovaries on oral contraceptive pills: often have multiple small immature-appearing follicles

Postmenopausal ovaries: more difficult to image, smaller, no functional cysts, less pelvic fluid; may not image at all



Postmenopausal ovaries



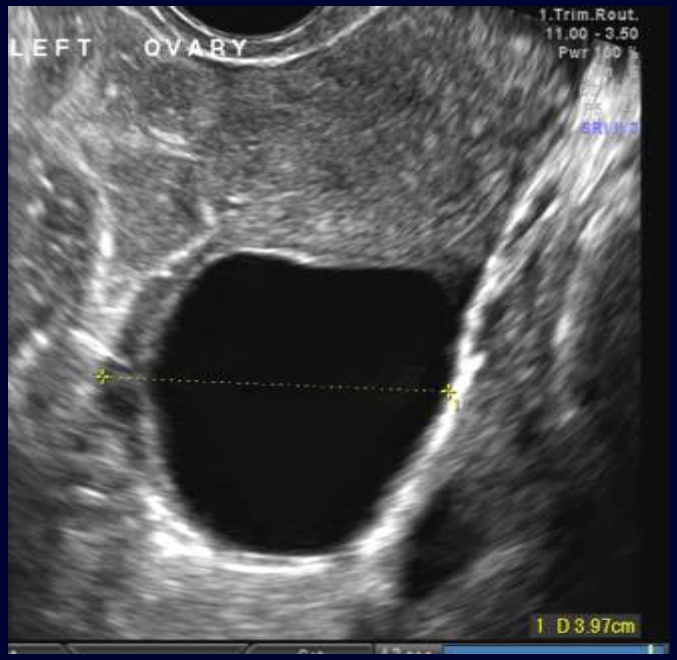


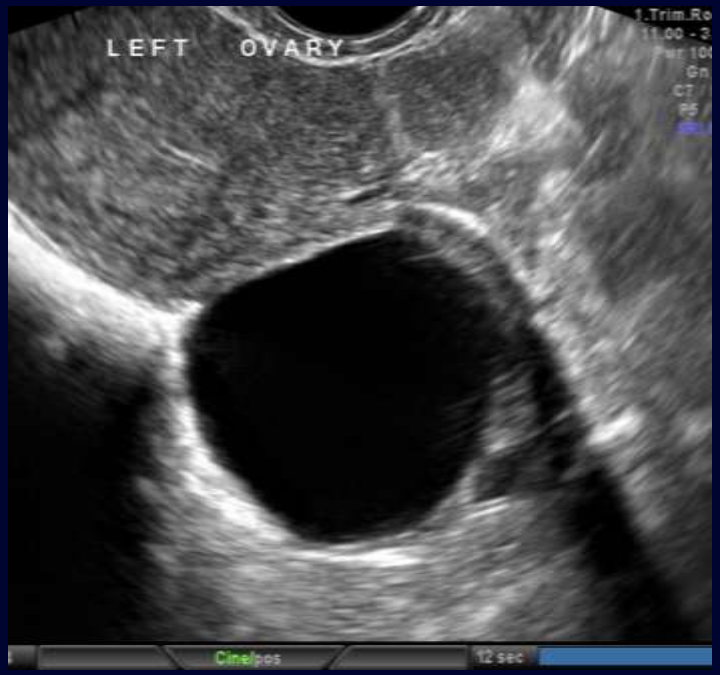
Ovarian follicle: normal functional-type ovarian cyst in menstruating female

Large Functional Cysts

- Usually solitary
- Usually smaller than 3 cm but can be larger
- Simple appearing: thin and smooth walled, sonolucent fluid filled
- Follow up in 6 weeks to 2-3 months for resolution

Functional cysts: unilocular, filled with sonolucent fluid, usually between 1-4 cm, occasionally can be larger

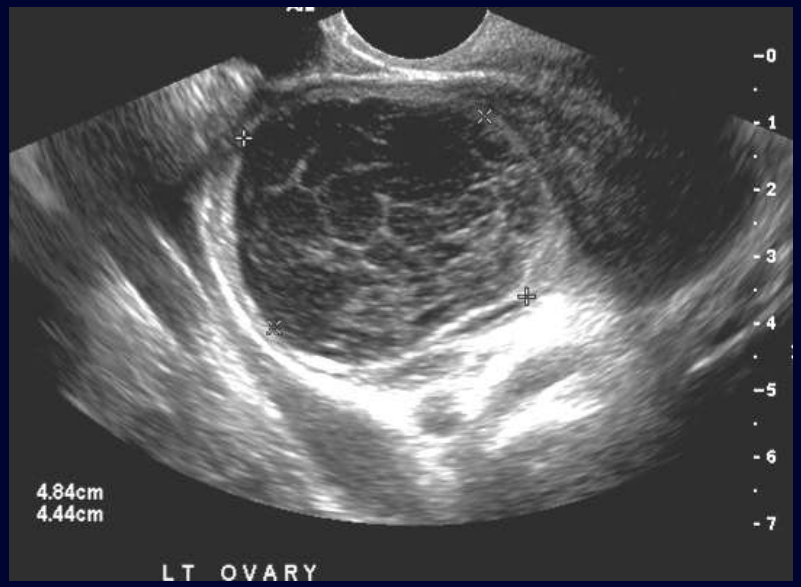


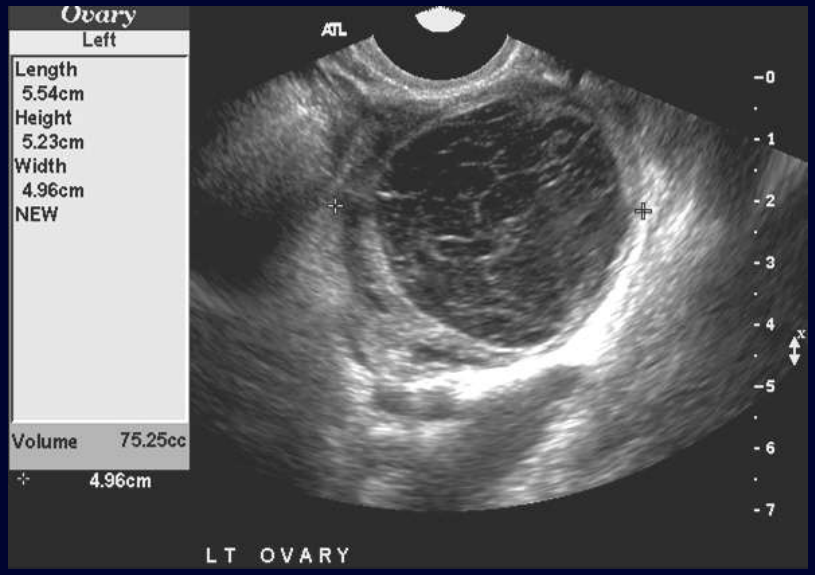


Corpus Luteum

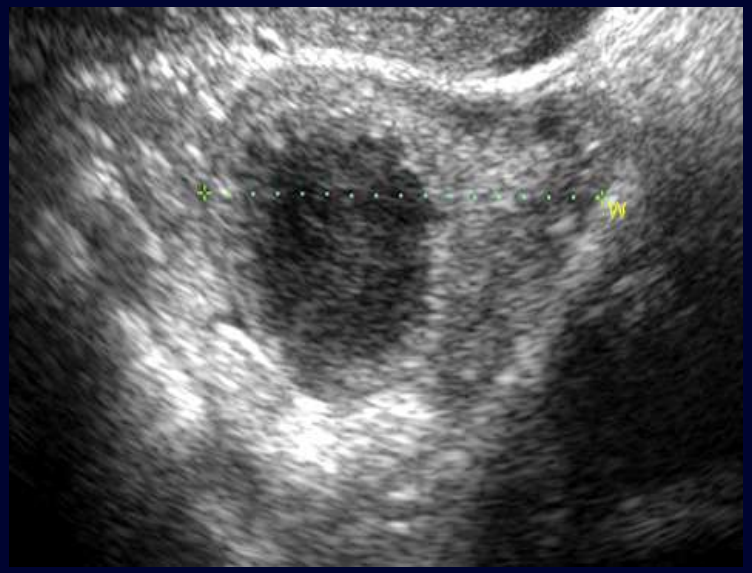
- Secretory phase of menstruating women
- The “great pretender” due to myriad of appearances, some complex appearing
- Usually low-level internal echoes, trabeculation
- “Ring of fire” on color Doppler studies
- Can rupture: see hemoperitoneum

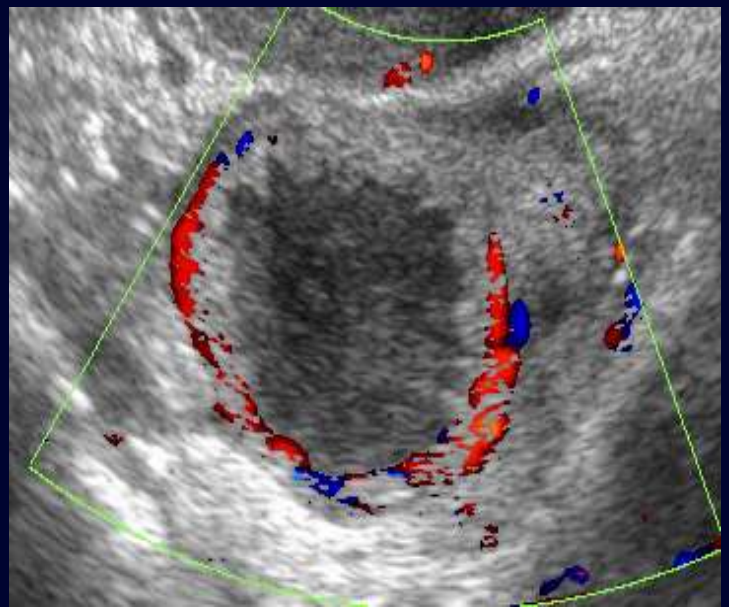
Corpus luteum: often lacy "reticular" internal echoes; key to diagnosis is time of cycle



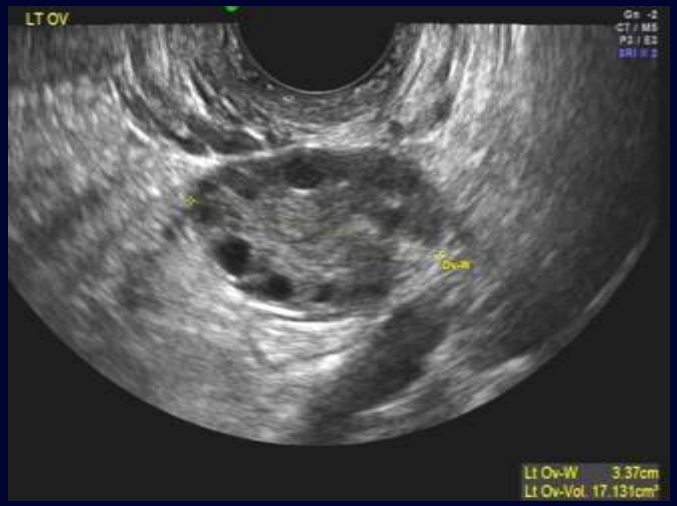


Corpus luteum: the "great pretender," may have myriad appearances; if any question, bring patient back in 6 weeks, should resolve if functional, can use Doppler "ring of fire" to assist in diagnosis





Polycystic ovaries



- Typical sonographic appearance of a polycystic ovary (PCO) is multiple small subcapsular immature follicles
- May have pronounced stroma or increased ovarian volume
- Syndrome not always present based on sonographic findings alone
- PCO diagnosis based on clinical and laboratory findings

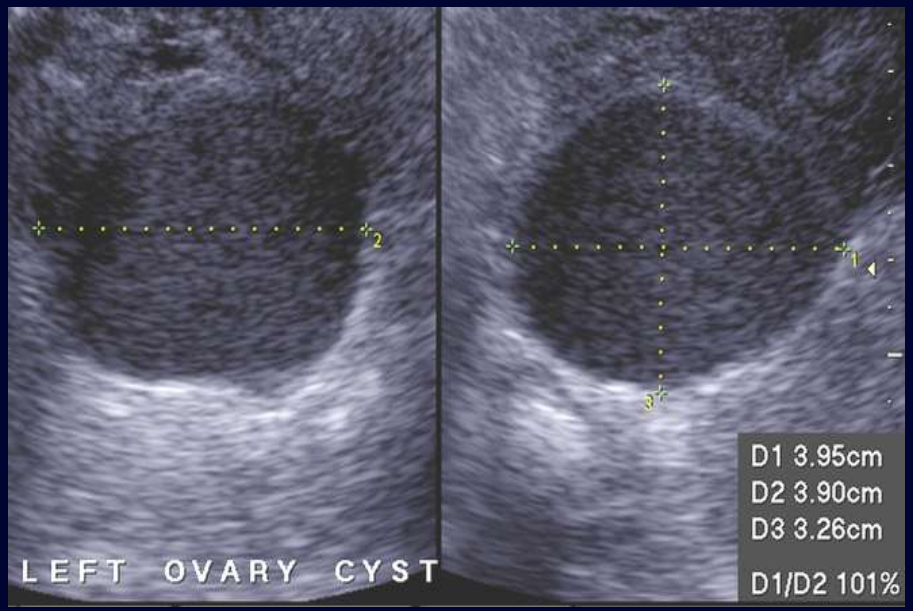
Benign Cystic Ovarian Masses

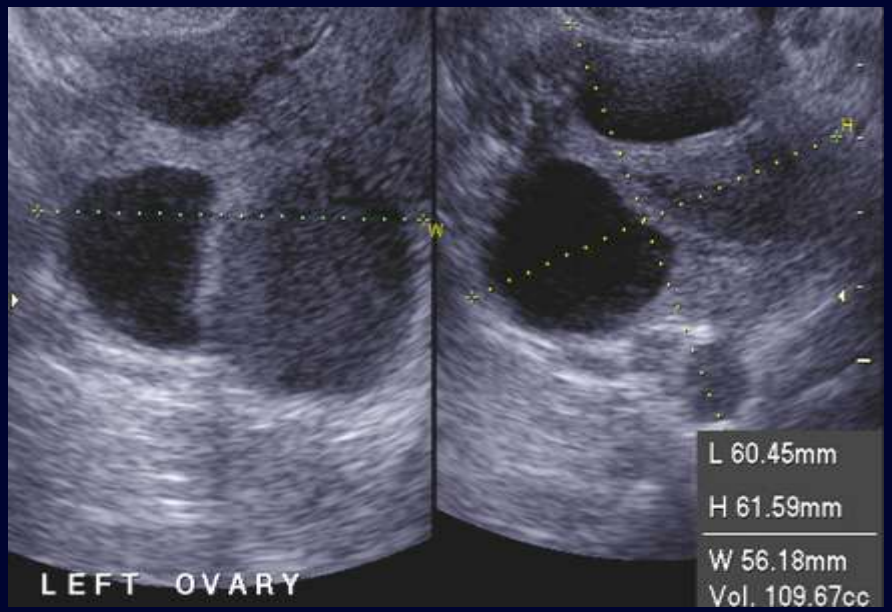
- Endometrioma
- Benign cystic teratoma
- Cystadenoma: serous and mucinous
- Cystic follicle (dysfunctional)
- Benign epithelial-lined cysts
- Paraovarian cysts

Endometrioma

- Endometriosis: endometrial tissue outside the endometrium, not always diagnosed sonographically
- Symptoms: dysmenorrhea, dyspareunia, infertility
- Sonographic hallmarks are ovarian cysts with homogeneous low-level echoes
- May be solitary, bilateral, multiple

Endometrioma: typical appearance is homogeneous low-level echoes, may be multiple and/or bilateral

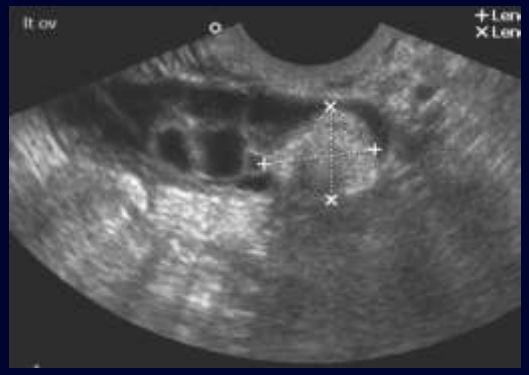




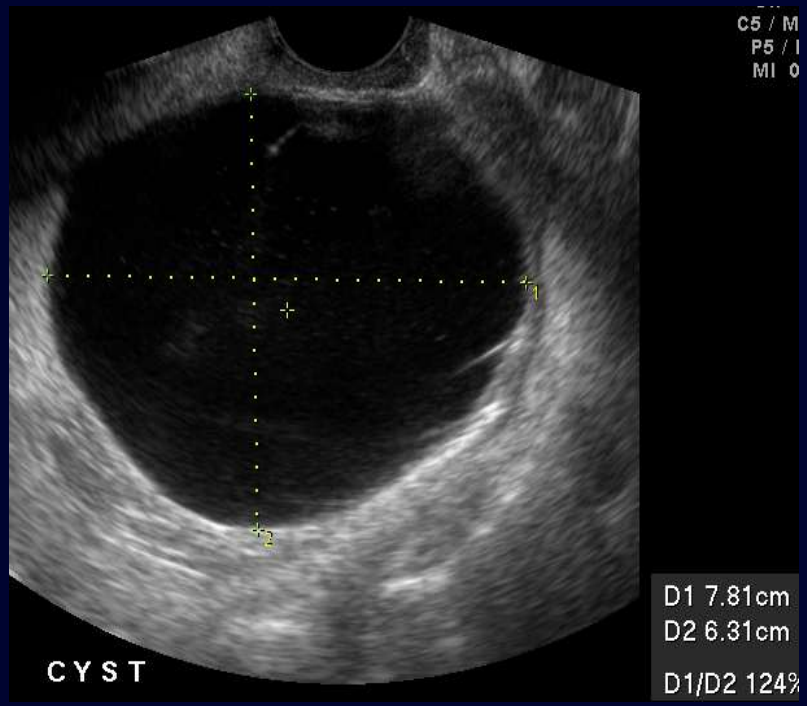
Benign Cystic Teratomas

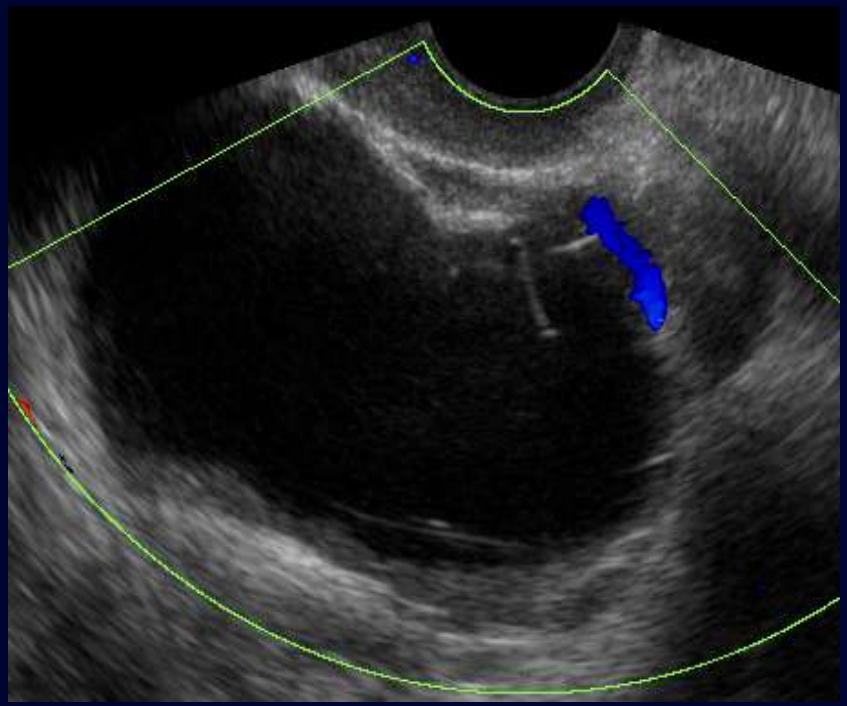
- Common in young/menstruating-age women
- Often incidental finding, many asymptomatic
- 15% bilateral or eventual recurrence
- Sonographic appearance: low-level echo fluid plus echogenic core that shadows
- Risk of ovarian torsion

Benign cystic teratoma (dermoid): often has echogenic “core” with posterior shadowing, may have coarse internal speckles, many appearances

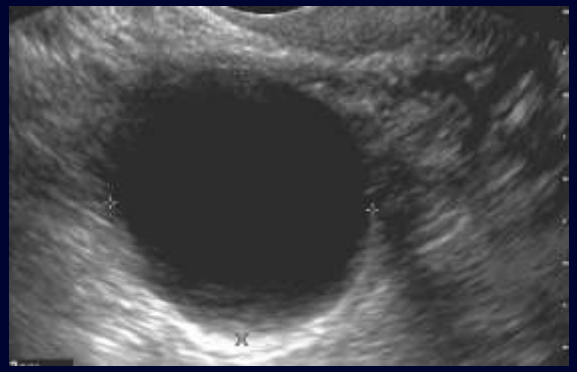


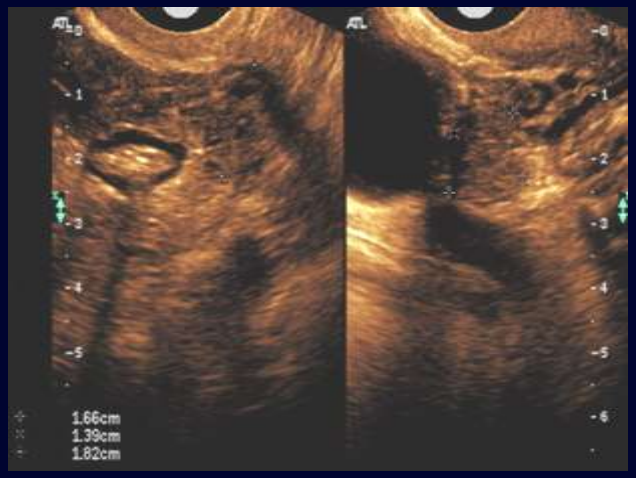
Large benign simple ovarian cyst: thin and smooth walled, sonolucent fluid filled

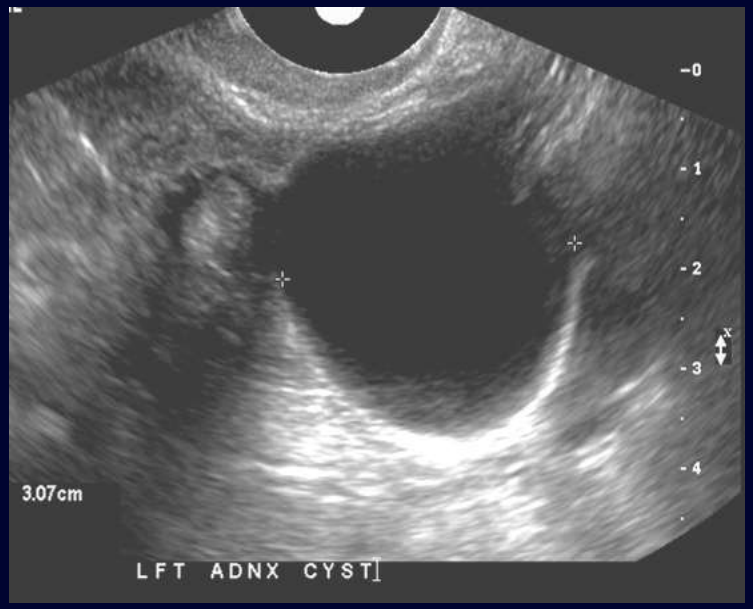




Paraovarian or paratubal cyst: when you see the ovaries separate from this cyst





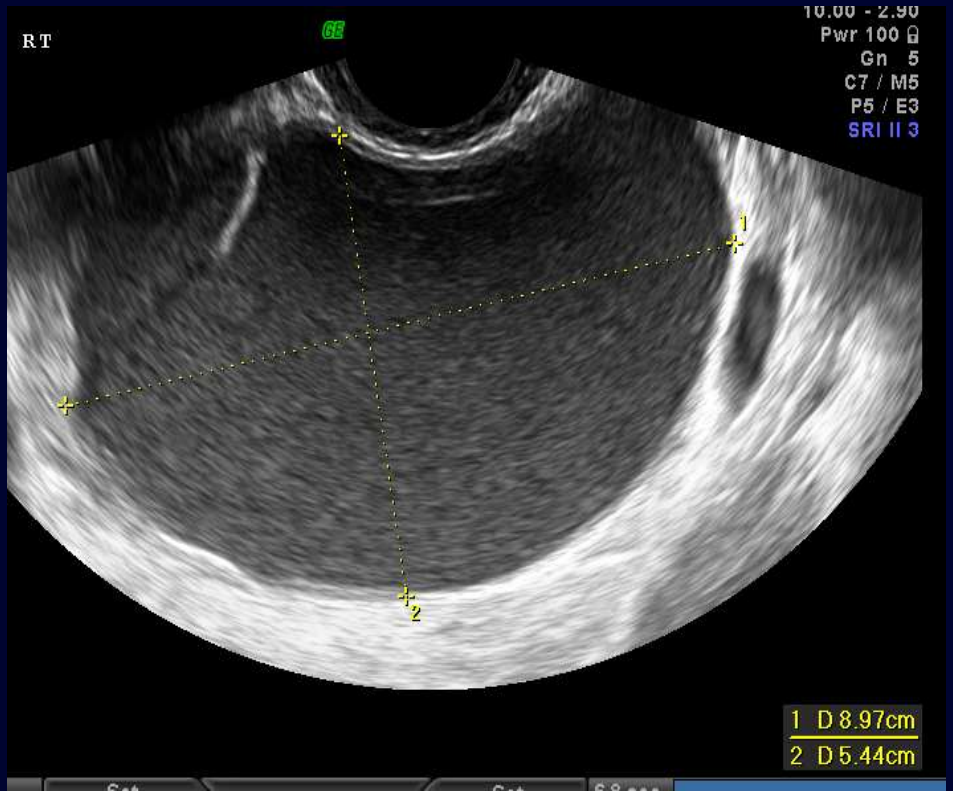


Cystadenomas

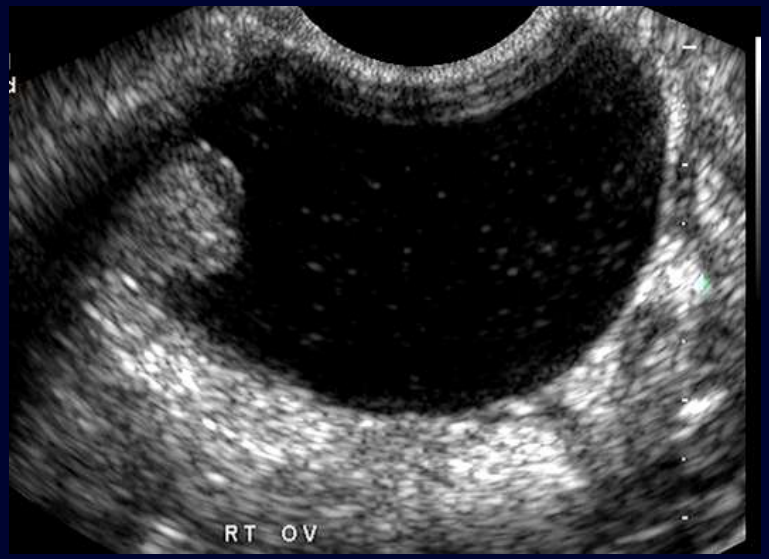
- May be serous or mucinous
- Serous: often postmenopausal, thin and smooth walled, sonolucent filled fluid
- Mucinous: can get very large, diffuse homogeneous low-level echoes
- Have low malignant potential (LMP) and carcinoma variants

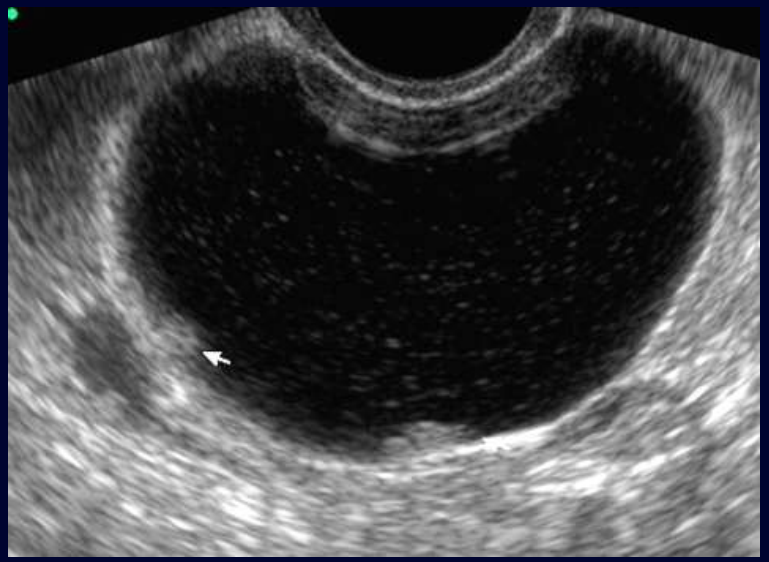
Cystadenoma: can be large, may have daughter cyst, serous usually with sonolucent fluid, mucinous with low-level echo fluid

Mucinous cystadenoma: can get quite large; see homogeneous low-level echo, filled fluid (can be confused with endometriomas but often larger)



Cystadenofibromas: primarily cystic masses with solid internal wall irregularities or projections/papillations

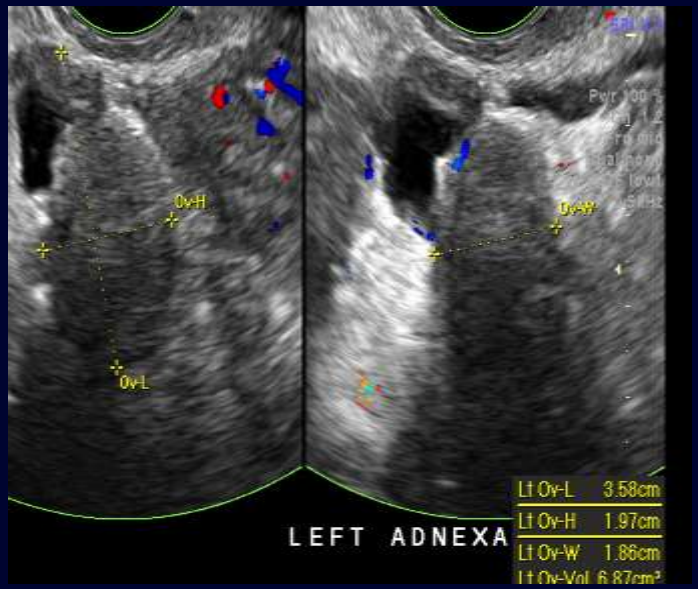


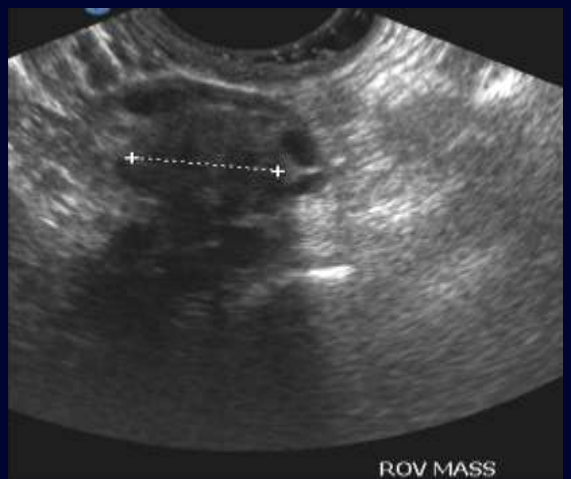


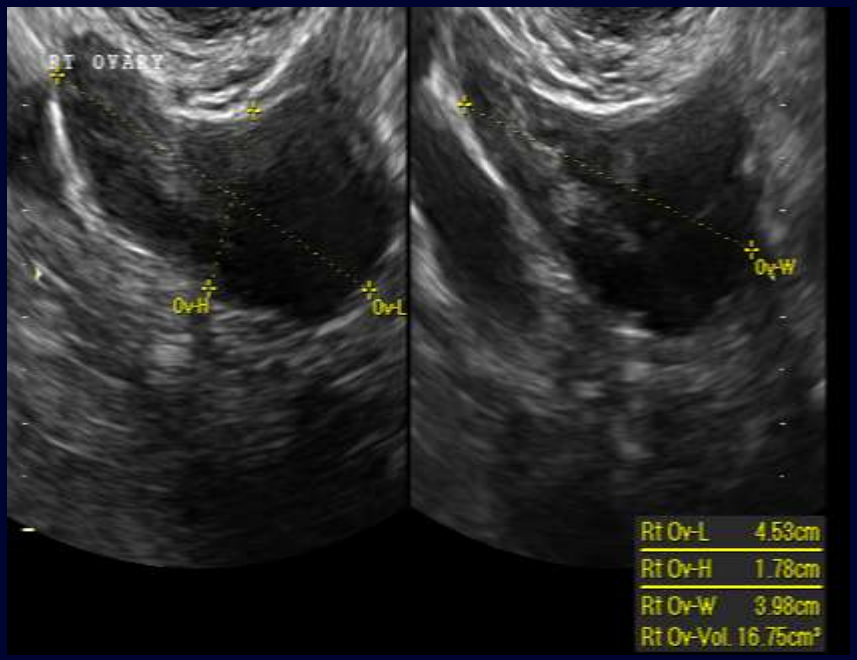
Benign Solid Ovarian Masses

- Fibroma thecoma: see posterior shadowing like myomas
- Brenner tumor
- Difficult to sonographically differentiate from malignant ovarian mass or metastasis from other organ system
- May be hormone producing

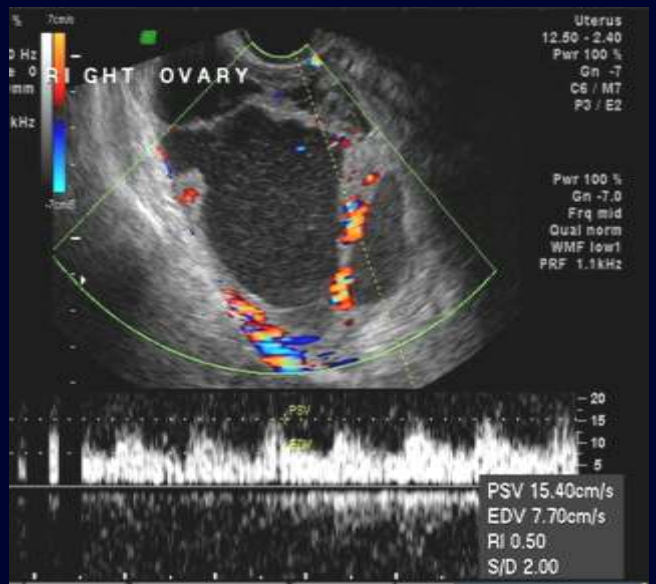
Benign solid ovarian masses



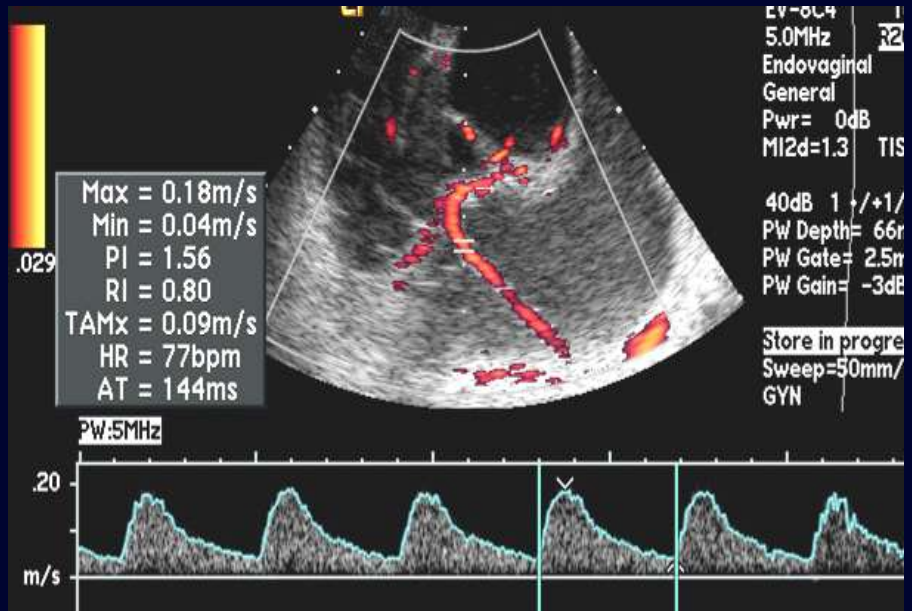




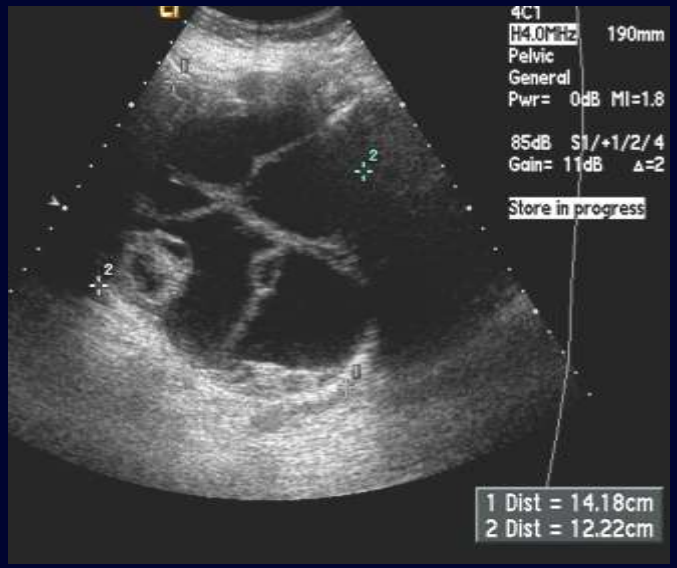
Ovarian tumor of LMP: cannot truly determine malignant potential by sonography, but appears complex



Ovarian cancer: sonographic picture similar to LMP, often large complex masses with cystic and solid components, may have increased blood flow; also see pelvic ascites



Ovarian cancer



Using sonography to differentiate benign vs malignant ovaries

- Scoring systems use morphologic characteristics of mass
- Some overlap between benign and malignant
- Sensitivity in the 90s%, specificity 95s%
- Positive predictive value usually low
- Negative predictive value high

Timmerman M and B rules (IOTA study: Europe)
M rules (predict malignancy)

Five rules to predict malignancy:

- **Irregular solid tumor**
- **Ascites**
- **At least 4 papillary structures**
- **Irregular multilocular solid tumor with largest diameter of at least 10 cm**
- **Very high color content on color Doppler examination**

Timmerman B rules (predict benignity)

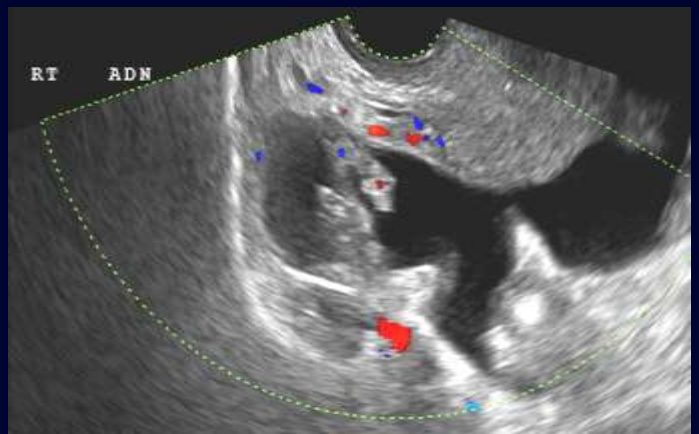
Five rules to predict benignity:

- Unilocular cyst
- Presence of solid components where the largest solid component is < 7mm in largest diameter
- Acoustic shadows
- Smooth multilocular tumor less than 10 cm in largest diameter
- No detectable blood flow on Doppler examination

Fallopian Tubes

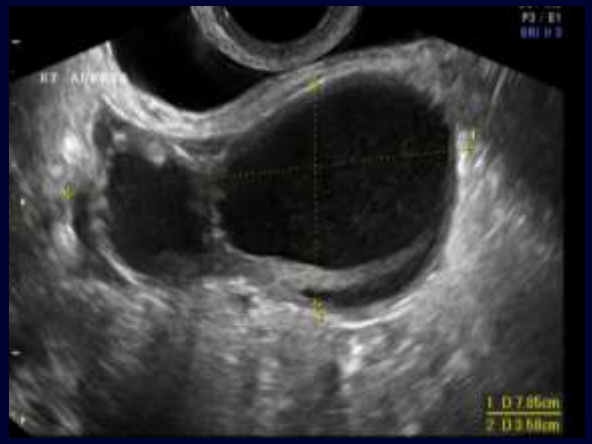
- If normal, usually do not see distal aspects; only first 2-3 cm seen on sonography.
- If pelvic fluid present, may see full delineation.
- If pathology, may see tubular structure with incomplete and/or complete septations separate from the ovary.
- May be acute or chronic processes.

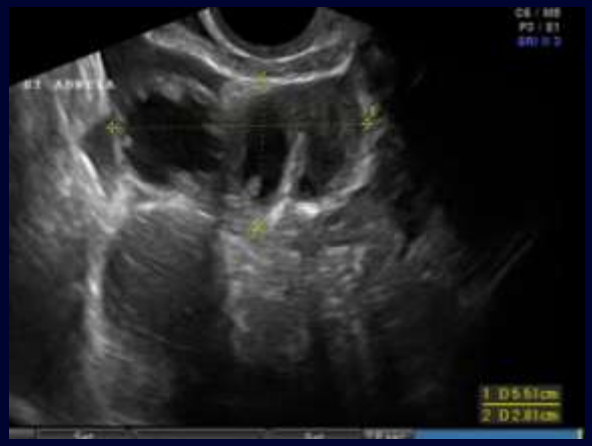
Normal fallopian tube



- In normal cases, only see first 2-3 cm of tube sonographically (upper scan).
- With fluid, blood, or ascites, can see length of tube and/or fimbria surrounded by fluid (lower scan).

Hydrosalpinx



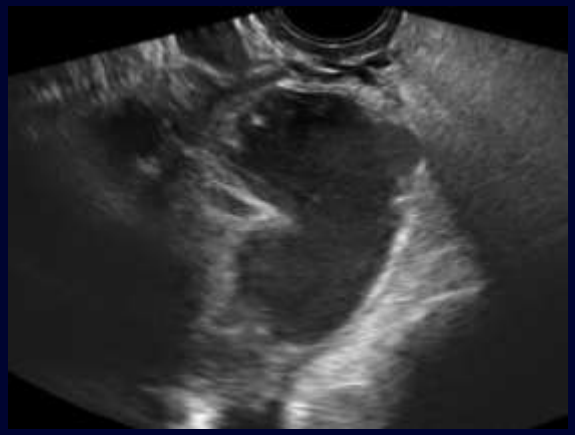


- May have thin or thick walls.
- Septa may be complete or incomplete.
- May have sonolucent or low-level echo filled fluid.
- See separate structure from ipsilateral ovary.
- May have flattened internal projections representing flattened tubal plicae.

Hydrosalpinx

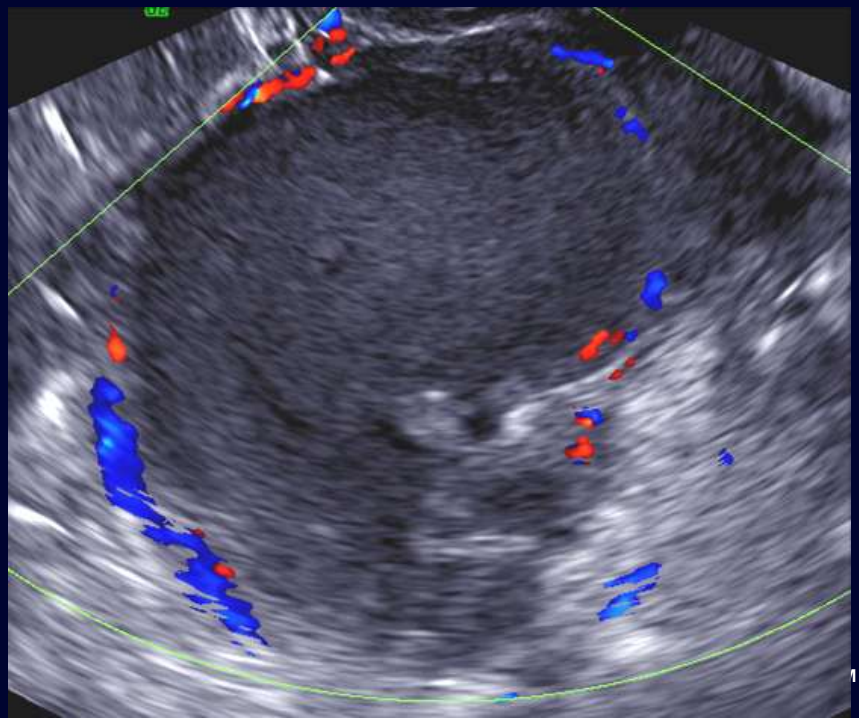
- May be mistaken for ovary if not also seen separately.
- May be tubular or round shaped.
- Implies chronic condition rather than acute setting.

Tubo-ovarian complex, acute



- Usually cannot separate ovary and tube.
- Tube is usually thick walled.
- May have low-level echo fluid within
- Incomplete septa.
- Correlate with clinical picture.

Tubo-ovarian complex, acute: no delineation between ovary and tube, often low-level echoes within (pus), incomplete septa, increased Doppler flow



Tubo-ovarian complex (TOC), chronic: tube part takes on more features of a chronic hydrosalpinx but ovary still adherent and part of the complex

- Ovary Tube TOC

Fallopian tube cancer

- Least common gynecologic cancer
- Similar in symptoms and ultrasound appearance to ovarian cancer
- Often late clinical presentation
- On sonography, can see suspicious looking mass adjacent to but separate from ovary
- Often misdiagnosed as ovarian cancer and true diagnosis made at surgery

Questions

1. The most common benign finding in the uterus is what? In what 3 locations can they be found?

2. If a thick endometrium is found in a postmenopausal woman (on no HRT) can sonography reliably differentiate benign from malignant pathology? What needs to be done?

Questions

3. Benign and malignant ovarian masses can generally be differentiated by ultrasound using what 3 features?

4. If a large simple ovarian cyst (suspected functional) is seen in a reproductive-age woman, what should be done?

Questions

5. Cystic inclusions of the cervix are called what? Are they normal?

6. The typical sonographic appearance of a benign cystic teratoma contains what?

Questions

- 7. Which ovarian cyst typically contains homogeneous low-level echoes?

8. Which benign ovarian mass may be mistaken for a pedunculated myoma?

Questions

9. Benign intracavitary pathologies that may cause menorrhagia or postmenopausal bleeding include what 2 entities?

10. Fallopian tubes are usually seen in their entirety sonographically when normal: true or false?