

# BENIGN OVARIAN TUMOURS

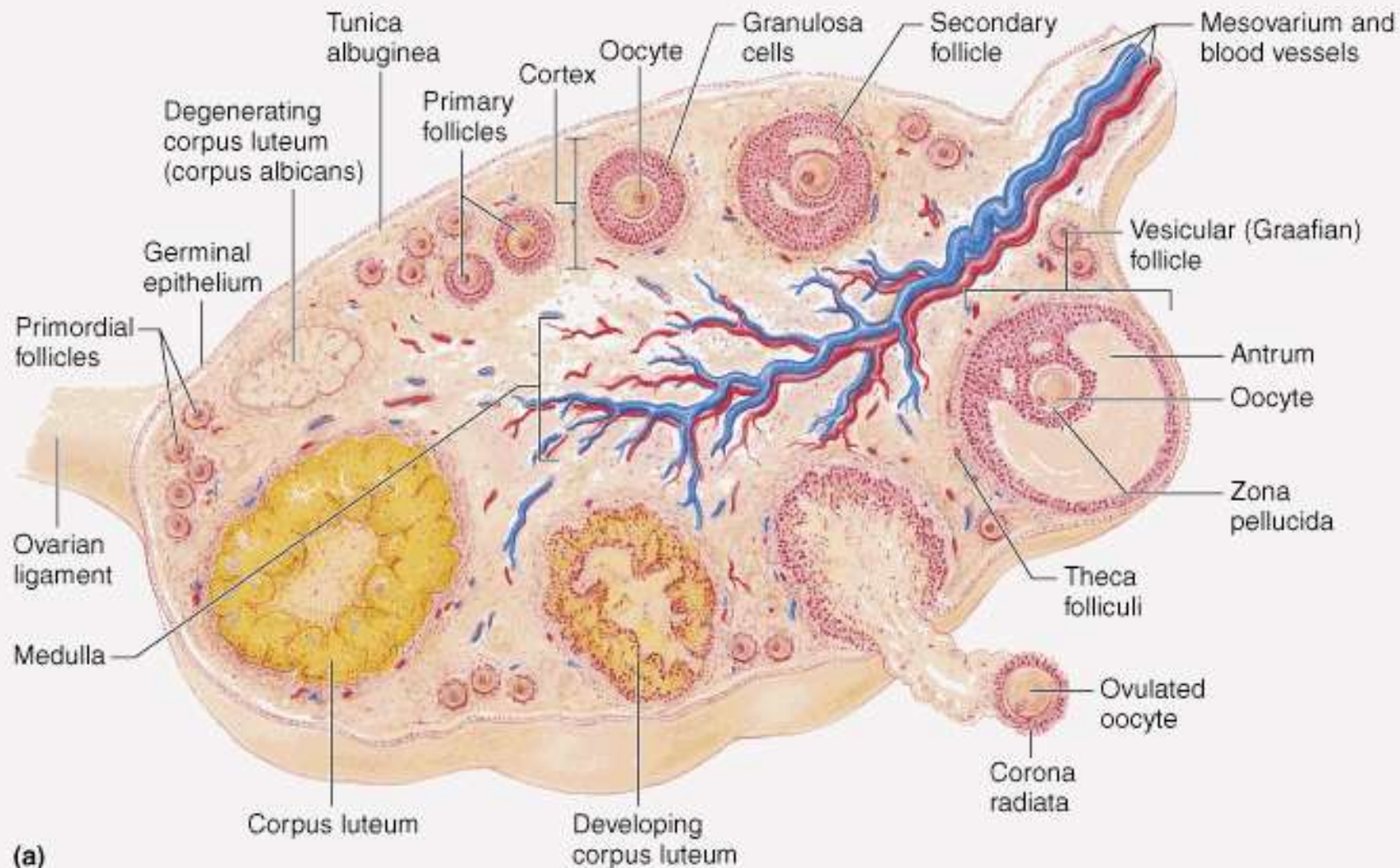
**Dr Omar aldabbas**

Associate professor

faculty of medicine, Mutah University

## NORMAL OVARIES

- Normal size 5 x 3 x 3cm
- Variation in dimensions can result from
  - *Endogenous hormonal* production (varies with age and menstrual cycle)
  - *Exogenous substances*, including OCs, GnRH agonists, or ovulation-inducing medication, may affect size.



# BENIGN OVARIAN TUMOURS

- Epidemiology
- Embryology
- Etiology
- Risk factors
- WHO classification
- Pathology of ovarian tumours
- Management  
(diagnosis & management)
- Surgery

# BENIGN OVARIAN TUMOURS

## FUNCTIONAL

- ▶ FOLLICULAR CYST
- ▶ CORPUS LUTEUM CYST
- ▶ THECA LUTEIN CYST

## INFLAMMATORY

- ▶ TUBO OVARIAN ABSCESS

## NEOPLASTIC

- ▶ BENIGN
- ▶ BORDERLINE
- ▶ MALIGNANT

## OTHERS

- ▶ ENDOMETRIOMA
- ▶ ENLARGED PCO
- ▶ PAROVARIAN CYST

# CAUSES OF BENIGN OVARIAN CYSTS

|                          |  |
|--------------------------|--|
| <b>(I) Functional</b>    | (a) Follicular cyst<br>(b) Corpus Luteal cyst<br>(c) Theca Luteal cyst                                   |
| <b>(II) Inflammatory</b> | (a) Tubo-ovarian abscess   |
| <b>(III) Others</b>      | (a) Endometrioma Ovary   |
| <b>(IV) Neoplastic</b>   |  |
| (1) Germ cell            | (a) Benign teratoma/ Dermoid Cyst  |
| (2) Epithelial           | (a) Serous cyst adenoma<br>(b) Mucinous cyst adenoma<br>(c) Brenner tumour<br>(d) Fibroma<br>(e) Thecoma |
| (3) Sex cord stromal     | (a) Granulosa cell , Sertoli- leydig cell  |

## CLASSIFICATION OF OVARIAN MASS

1. Simple cyst
2. Hemorrhagic cyst
3. Hyperstimulation in women who have undergone fertility treatment
4. Luteoma of Pregnancy
5. Endometrioma
6. Brenners tumour
7. Epithelial tumours
  - Serous and mucinous, endometrioid and clear cell tumours.
8. Sex cord and Mesenchymal tumours
  - Fibrothecomas, granulosa cell , sclerosing stromal and sertoli-leydig cell tumours.
9. Germ cell tumours
  - Mature and immature teratomas, dysgerminomas, endodermal sinus tumours, embryonal carcinomas.

# FUNCTIONAL OVARIAN CYSTS

- Follicular cysts
  - Corpus luteum cysts
  - Theca lutein cysts
  - Luteomas of pregnancy
- By far the most common clinically detectable enlargements of the ovary in the reproductive years.
- All are benign and usually asymptomatic.



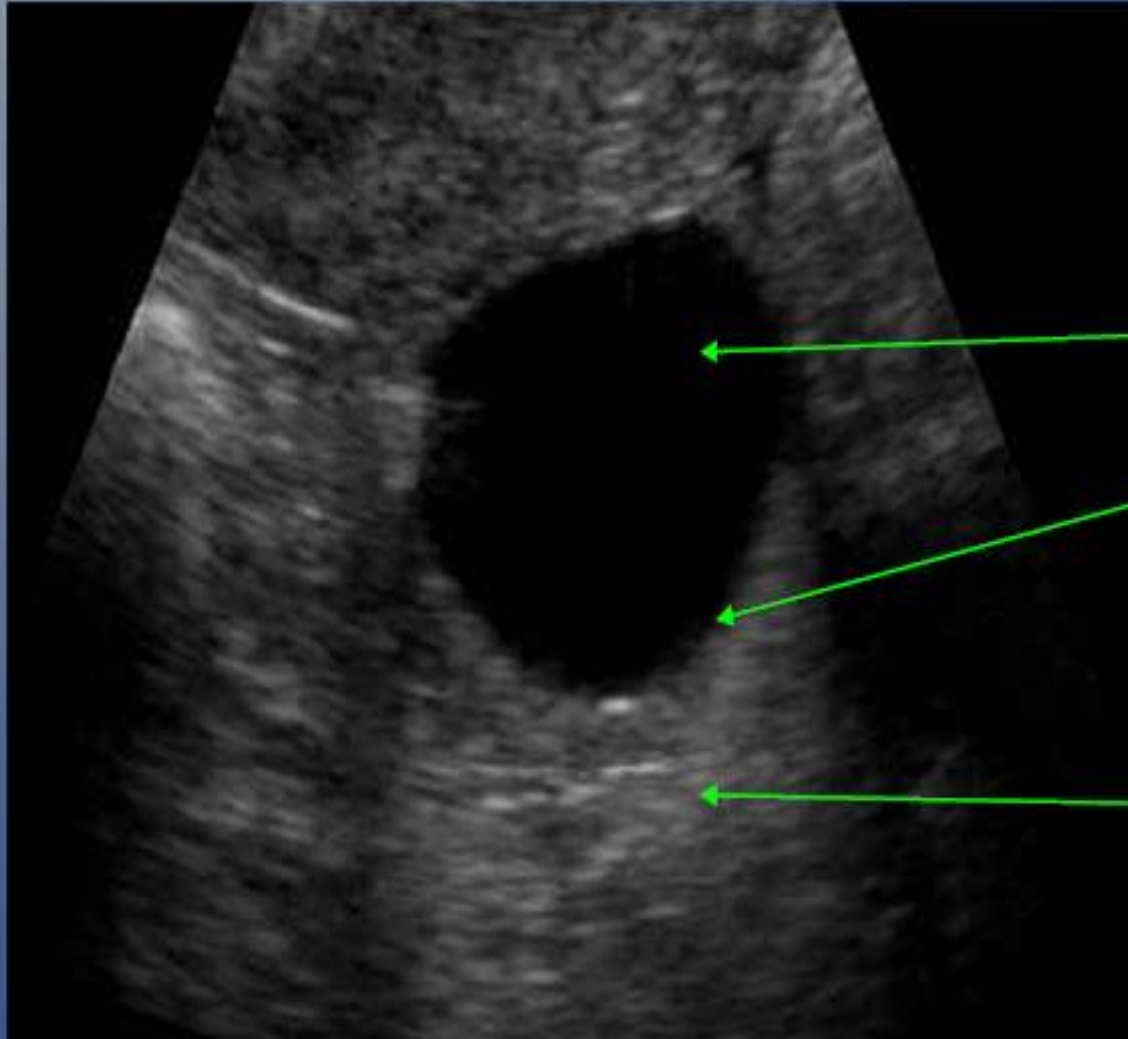
# FOLLICULAR CYSTS

- Cystic follicle is defined as Follicular cyst of diameter  $> 3\text{cm}$
- *Most common* functional cysts.
- Rarely larger than 8cm.
- Lined by granulosa cells
- Found incidentally on pelvic examination
- *Usually resolve within 4 – 8 weeks with expectant management*
- May rupture or torse occasionally causing pain and peritoneal symptoms.



# Benign findings: Simple cyst

Below is an example of a simple cyst. These are usually follicular cysts that have not ruptured and are filled with fluid. These are rarely malignant, and most will resolve on their own in 1-2 months.



## Characteristics of simple cysts:

-Anechoic

-Smooth, thin walls

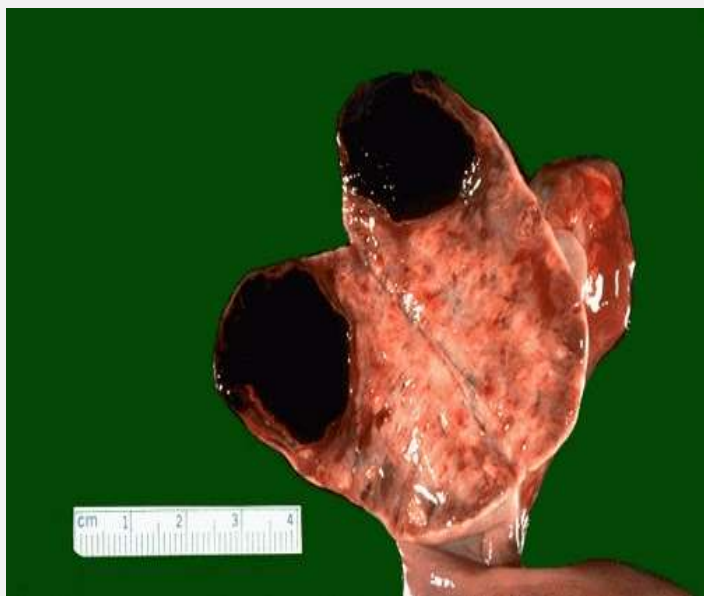
-No internal flow on Doppler

-Posterior acoustic enhancement

## CORPUS LUTEAL CYST

- Less common than follicular cyst.
- May rupture leading to hemoperitoneum and requiring surgical management( more in patients taking anti coagulants or with bleeding diathesis)
- Unruptured cysts may cause pain because of bleeding into enclosed ovarian cyst cavity.

# CORPUS LUTEAL CYST



# Ultrasound: Normal corpus luteum

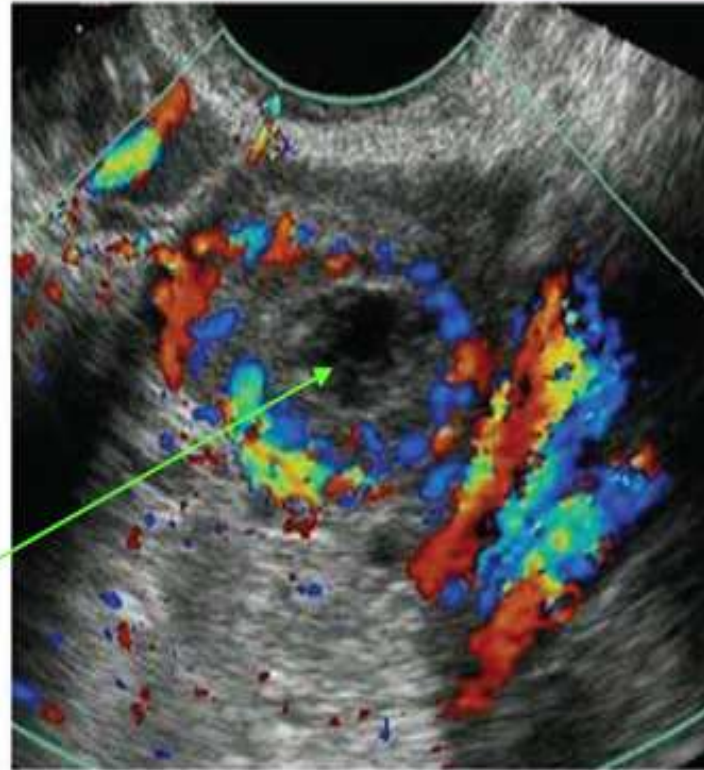
A normal corpus luteum appears as a cystic mass with a thick, crenulated wall and peripheral blood flow, or “ring of fire”.

Normal ovary appearance:

Reproductive age

Corpus luteum

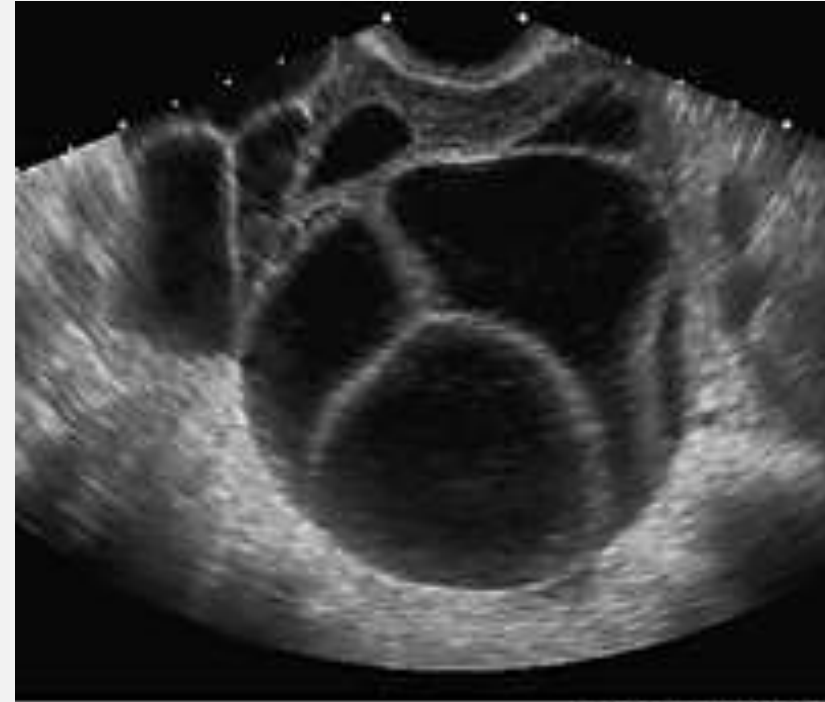
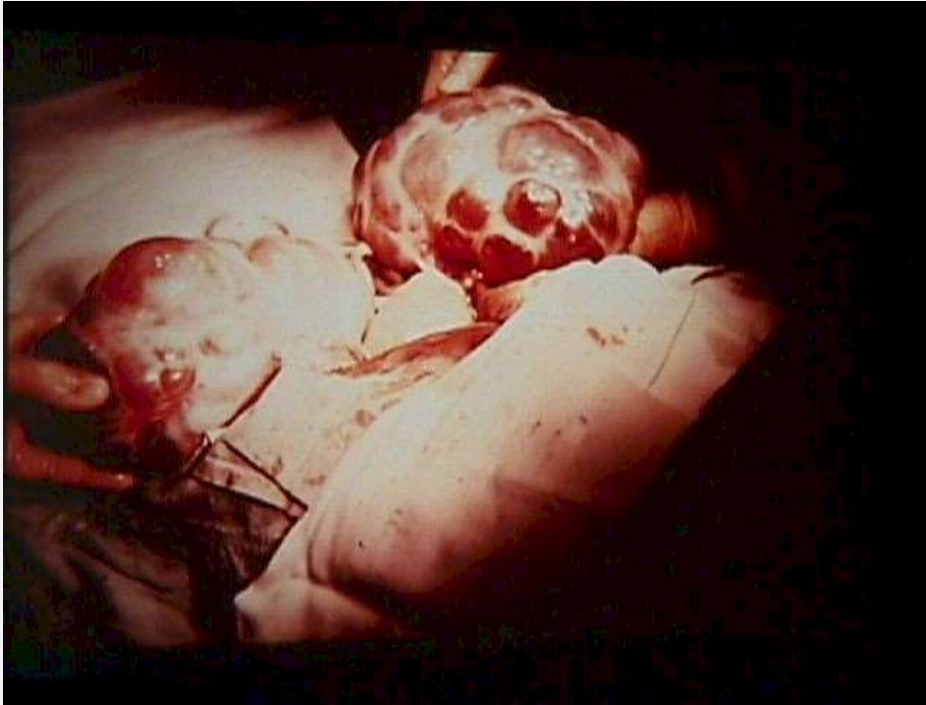
- Diffusely thick wall
- Peripheral blood flow
- Size  $\leq 3$  cm
- +/- internal echoes
- +/- crenulated appearance



## THECA LUTEIN CYSTS

- Least common
- **Usually *bilateral***
- Result from ***overstimulation of the ovary by  $\beta$ -hCG***
- Do not commonly occur in normal pregnancy
- Often associated with hydatidiform moles, choriocarcinoma, multiple gestations, use of clomiphene and GnRH analogues.
- *May be quite large (up to 30 cm) , multicystic, and regress spontaneously.*

# THECA LUTEIN CYSTS



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## MANAGEMENT OF FUNCTIONAL CYSTS

- Expectant
- Watchful waiting for two or three cycles is appropriate.
- Combined oral contraceptives appear to be of no benefit.
- Should cysts persist, surgical management is often indicated.

*Oral contraceptives for functional ovarian cysts (Review)*

*Cochrane Database of Systematic Reviews 2011*





## ASYMPTOMATIC SIMPLE CYSTS

|                  |   |
|------------------|---|
| <b>&lt;5cms</b>  | <b>Likely physiological<br/>(do not require follow up)</b>    |
| <b>5-7 cms</b>   | <b>Yearly USG</b>   |
| <b>&gt;7cm</b>   | <b>Require further<br/>imaging/surgical<br/>intervention.</b> |
| <b>RCOG 2011</b> |   |

# CAUSES OF BENIGN OVARIAN CYSTS

## (I) Functional

(a) Follicular cyst

(b) Corpus Luteal cyst

(c) Theca Luteal cyst

## ✓ (II) Inflammatory

✓ (a) Tubo-ovarian abscess

## (III) Others

(a) Endometrioma Ovary

## (IV) Neoplastic

(1) Germ cell

(a) Benign teratoma/ Dermoid Cyst

(2) Epithelial

(a) Serous cyst adenoma

(b) Mucinous cyst adenoma

(c) Brenner tumour

(d) Fibroma

(e) Thecoma

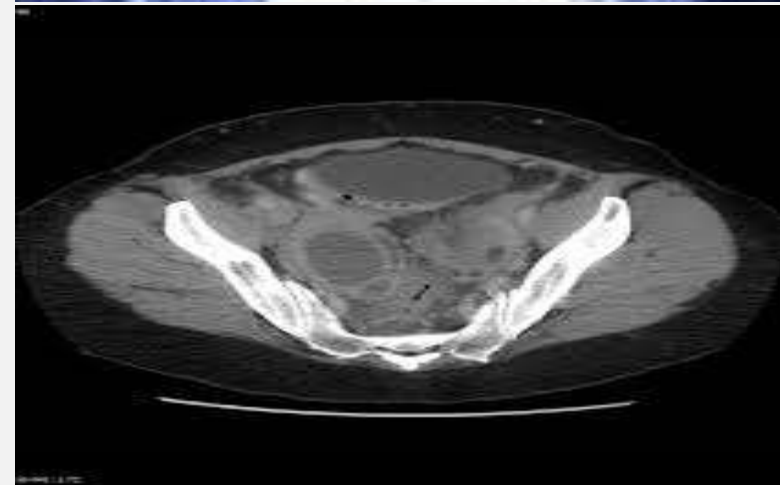
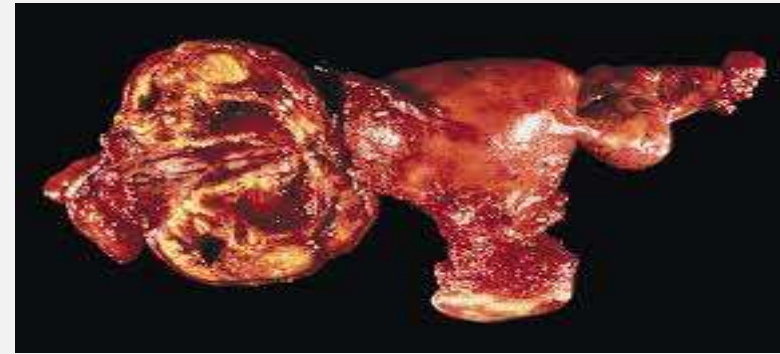
(3) Sex cord stromal

(a) Granulosa cell , Sertoli- leydig cell

## **(A) INFLAMMATORY OVARIAN CYSTS TUBO- OVARIAN ABSCESS**

Are present in 14-38% of patients hospitalized with pelvic inflammatory disease (PID) .

Commonly seen in patients with poor access to routine gynecologic care.



The traditional criteria for the diagnosis of PID include subjective bilateral abdominal pain per patient report and positive physical examination findings for bilateral adnexal tenderness at palpation and cervical motion tenderness. A hydrosalpinx is generally anechoic, whereas a pyosalpinx may have increased echoes within the fluid.



# CAUSES OF BENIGN OVARIAN CYSTS

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(3) Sex cord stromal

(a) Granulosa cell , Sertoli- leydig cell

## (A) ENDOMETRIOMA OF OVARY

- Most common site of involvement is the ovary.
- Endometriomas are pseudocysts formed by invagination of the ovarian cortex, sealed off by adhesions.
- They may completely replace normal ovarian tissue. Cyst walls are usually thick and fibrotic.



- **USG:** anechoic cysts to cysts with diffuse low-level echoes to solid-appearing masses.

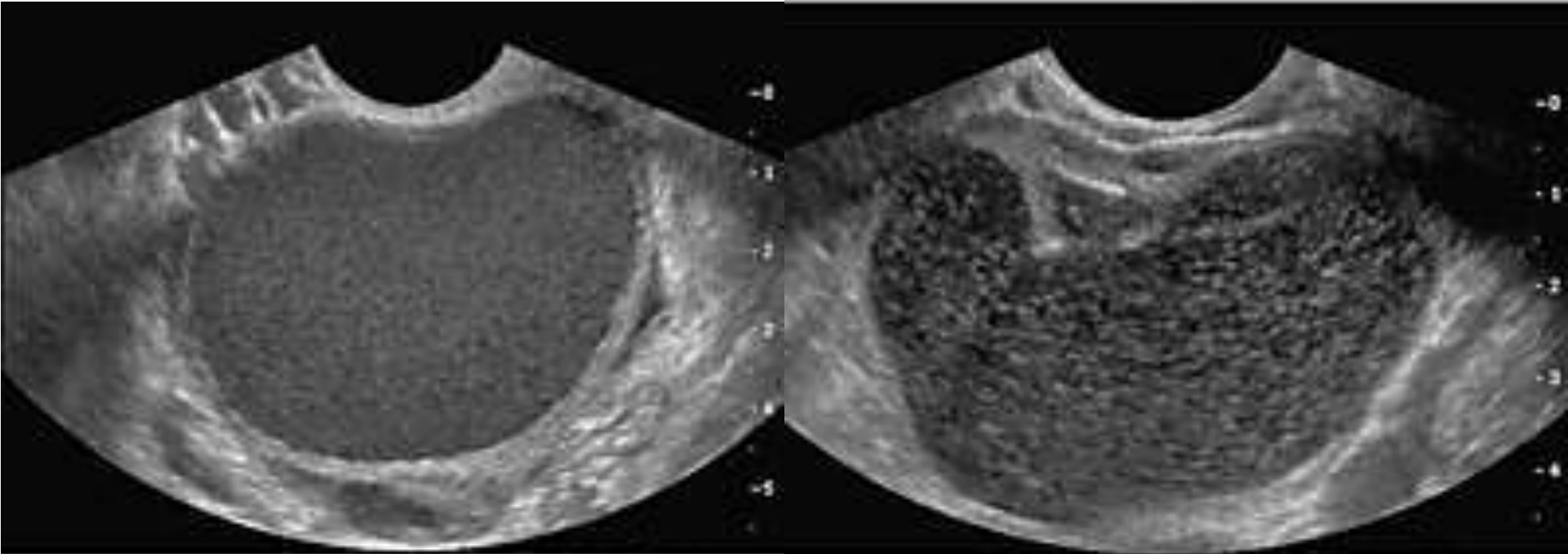
Fluid–fluid or debris–fluid levels may also be seen.

- They may be unilocular or multilocular with thin or thick septations
- Malignant transformation: 0.3% to 0.8%
- Management: medical and/ or surgical

# Ovarian Endometrioma



**Chocolate cyst  
of Ovary on  
cut section**





# CAUSES OF BENIGN OVARIAN CYSTS

|   |   |
|---|---|
| <p><b>(I) Functional</b></p>  | <p>(a) Follicular cyst<br/>(b) Corpus Luteal cyst<br/>(c) Theca Luteal cyst</p>   |
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# **BENIGN OVARIAN TUMORS**

- **Serous cystadenoma**
- **Mucinous cystadenoma**
- **Dermoid cyst**
- **Fibroma**
- **Thecoma**
- **Brenner's tumor**

## (A) SEROUS CYSTADENOMA

- Generally benign
- *Bilateral – 10%*
- **Risk of malignancy : 5 – 10 % borderline malignant, 20 -25% malignant**
- **GROSS** : multilocular with papillary components.
- **MICRO** : low columnar epithelium with cilia.

Characteristic psammoma bodies

(end products of degeneration of papillary implants)are found.

- Associated fibrosis may lead to “*cystadenofibroma*”



Gross appearance



Cut section appearance



Gross appearance

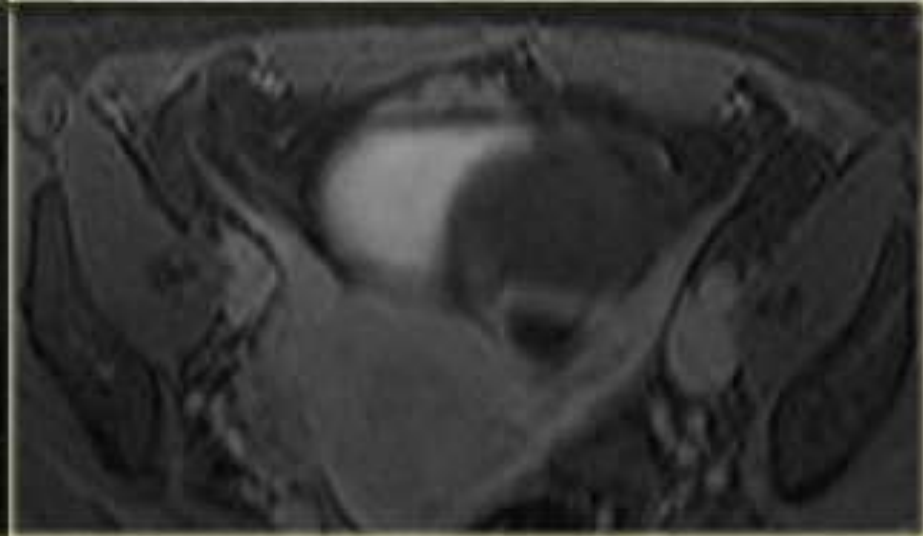
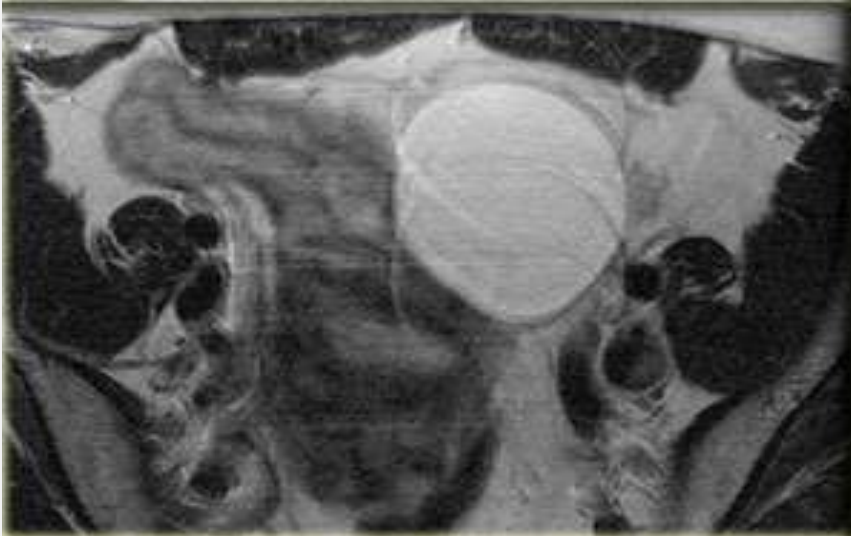
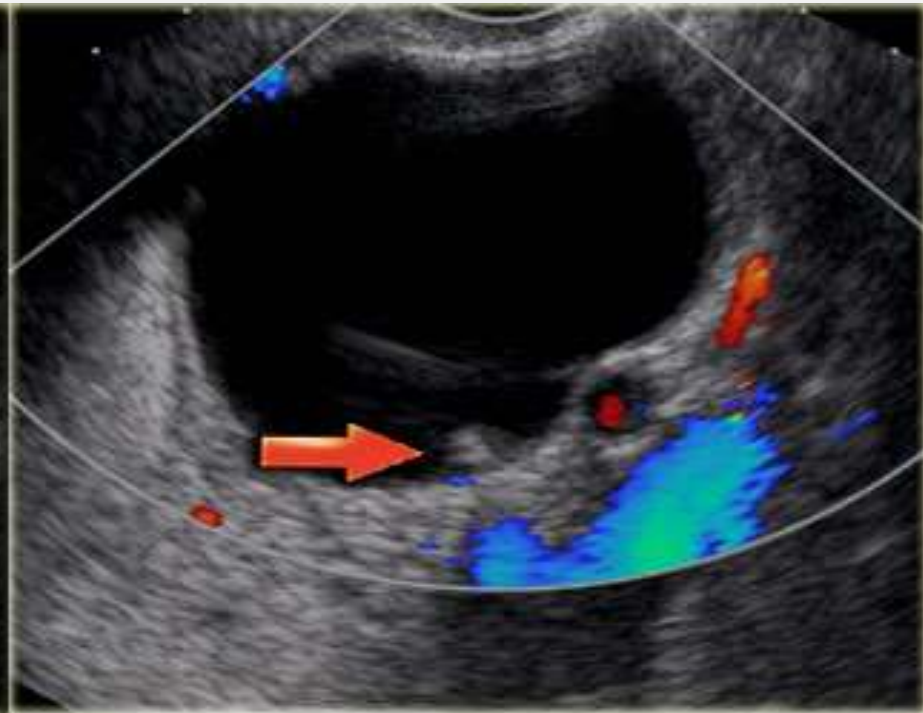


On USG Serous Cystadenoma



Cut section appearance

***On USG  
Serous  
Cystadenoma***

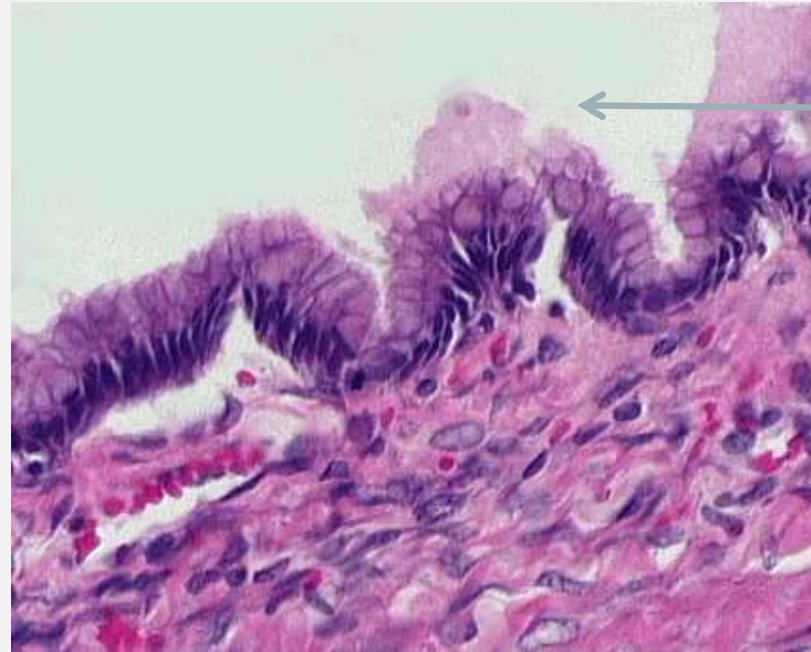


***On MRI Serous Cystadenoma***

## (B) MUCINOUS CYSTADENOMA

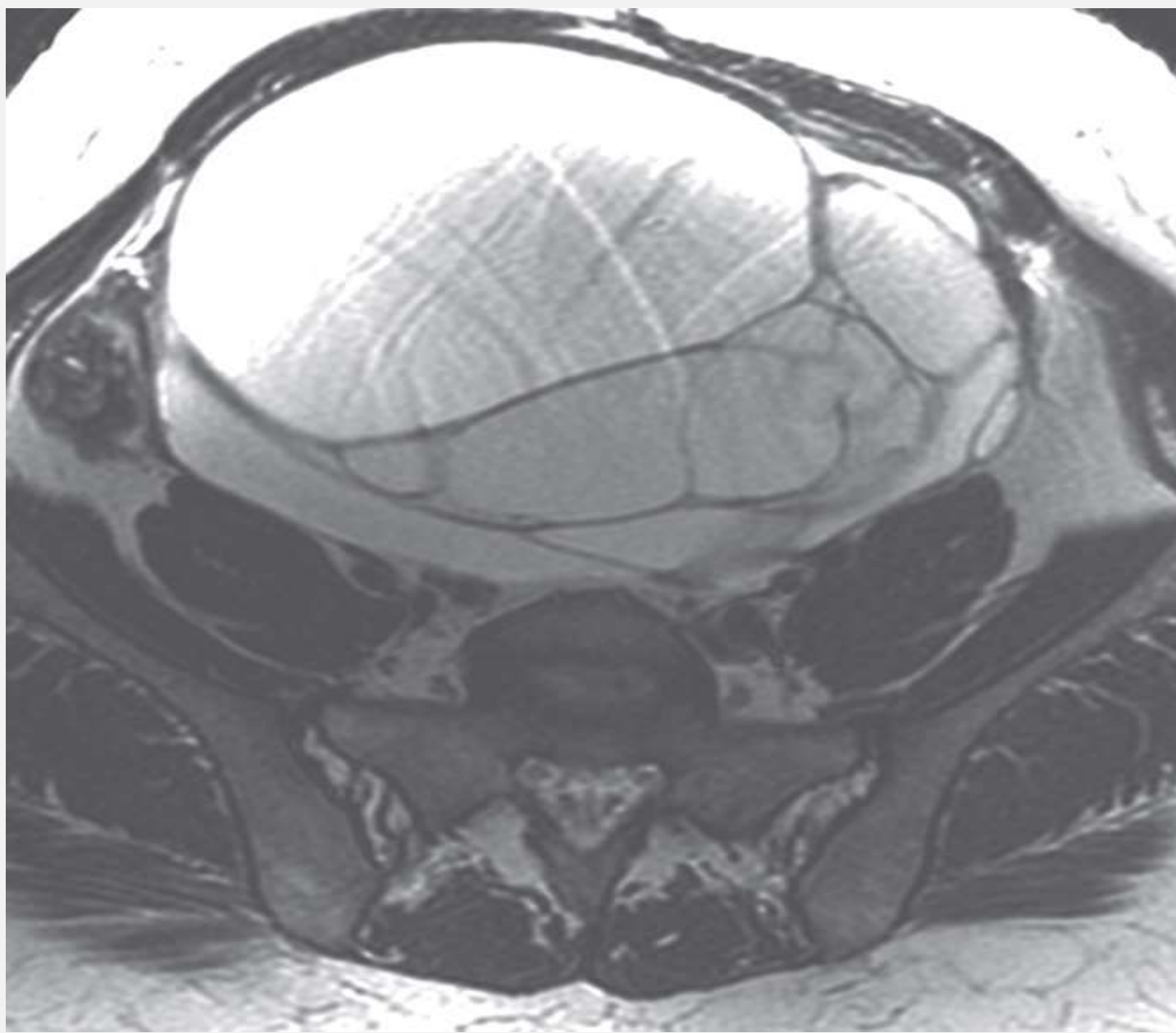
- Have tendency *to become huge masses*
- **Gross** : Round to ovoid masses with smooth capsules that are usually translucent or bluish to whitish gray
- Interior divided by discrete septa into loculi containing clear , viscid fluid.
- **Microscopy** : Epithelium – tall, pale staining, secretory with basal nuclei and goblet cells
- **5 – 10% are malignant**





Epithelium – tall, pale staining, secretory with basal nuclei and goblet cells





***On MRI Mucinous cystadenoma.***



## DERMOID CYST/ BENIGN CYSTIC TERATOMA

- Often ***bilateral (15 -25%)***
- **GROSS:** thick, opaque , whitish wall.
- **CONTENTS:** hair, bone, cartilage, and a large amount of greasy sebaceous material.
- **MICROSCOPICALLY :** all the three germ layers (ectoderm, mesoderm and endoderm)
- ***Malignant change occurs in 1-3%. Usually of a squamous type.***
- **Risk of torsion is 15%**
- An ovarian cystectomy is almost always possible, even if it appears that only a small amount of ovarian tissue remains

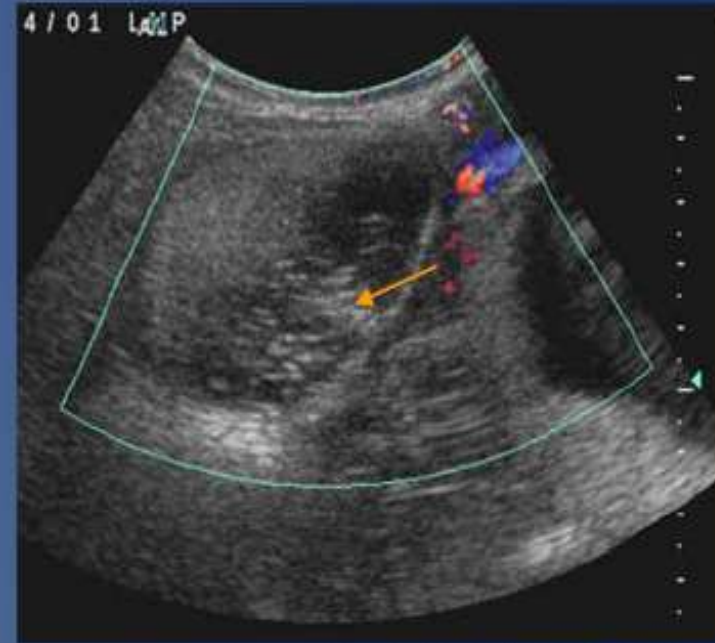


**Dermoid Cyst ( Benign Cystic Teratoma)**

# Benign findings: Dermoid cyst



Companion patient 11; PACS, BIDMC

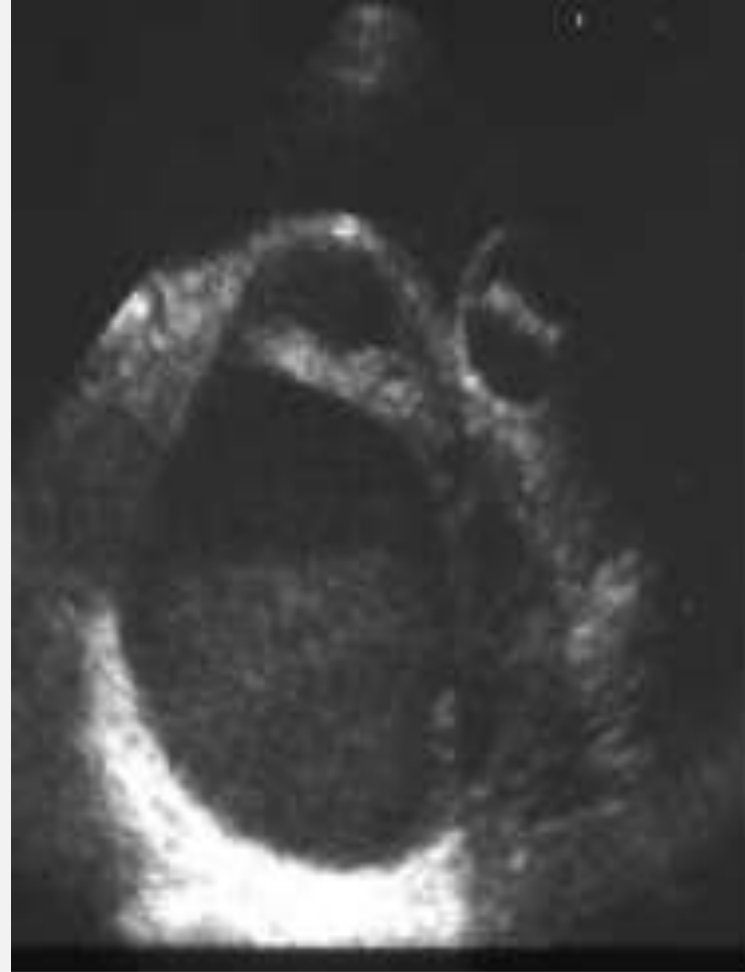


Companion patient 12; PACS, BIDMC

The above are examples of dermoid cysts, or mature cystic teratomas.

## Characteristics of dermoid cysts:

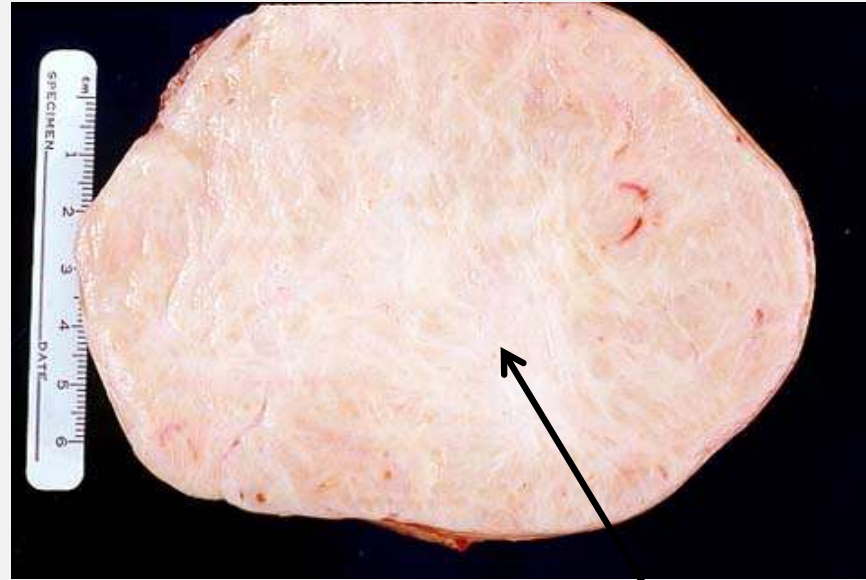
- Focal or diffuse **hyperechoic component (green arrow)** with distal acoustic shadowing (may represent fat; highly predictive of dermoid cysts)
- Hyperechoic lines and dots, called **dermoid mesh (orange arrow)**; may represent different tissues within teratoma, for example hair
- No internal flow on Doppler
- May see a fluid-fluid level, with the echogenic component layering nondependently (floating fat)



Varying sonographic appearance of ovarian teratomas.  
*Right:* predominantly cystic with fluid/fluid level.  
*Left:* solid, complex mass with "tip of iceberg" sign

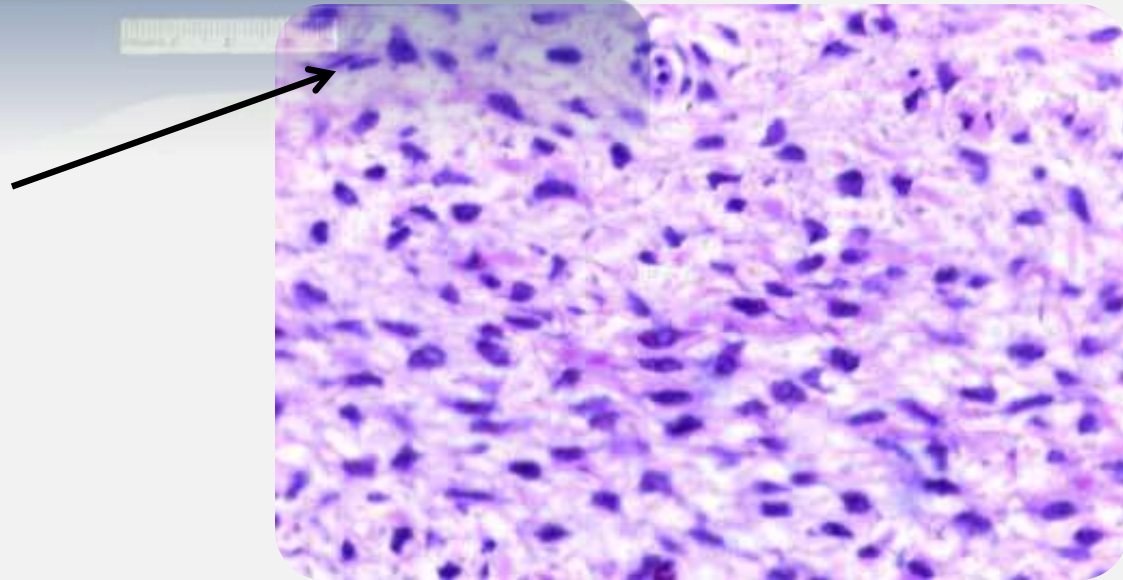
# FIBROMA

- *Most common benign, solid neoplasms* of the ovary.
- Compose approx 5% of benign ovarian neoplasms and 20% of all solid tumors of the ovary.
- Frequently seen in middle-aged women.
- Characterized by their firmness and resemblance to myomas
- Misdiagnosed as exophytic fibroids or primary ovarian malignancy
- Not hormonally active
- Fibromas may be associated with ascites or hydrothorax as a result of increased capillary permeability thought to be a result of VEGF
- *Mieg's syndrome (ovarian fibromas, ascites and hydrothorax) is uncommon and usually resolves after surgical excision.*

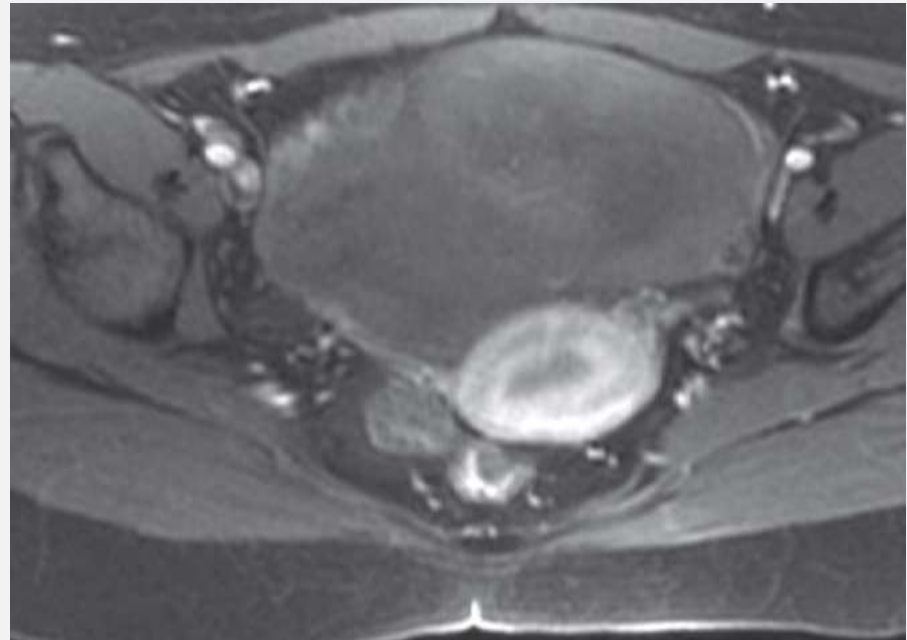
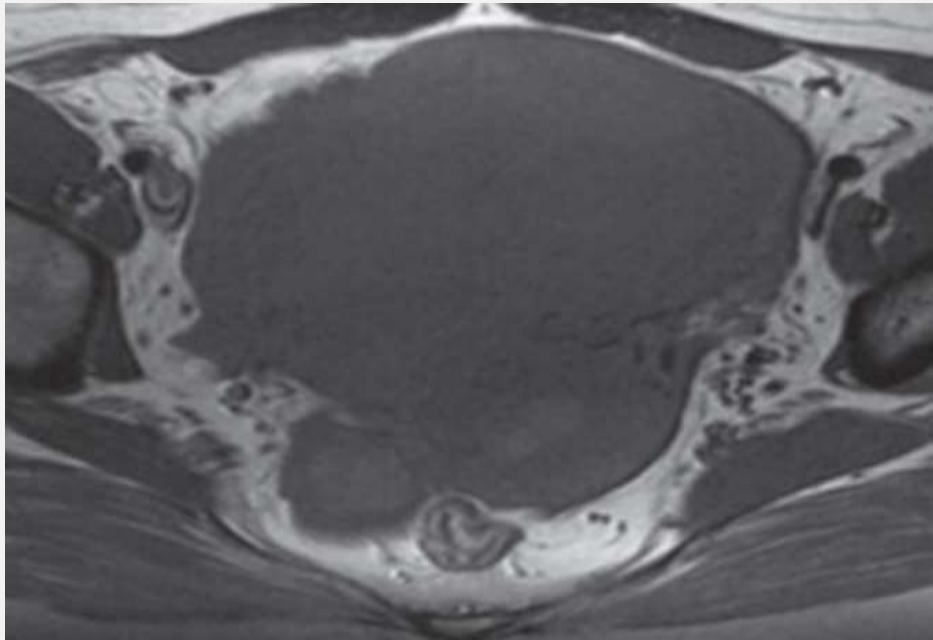
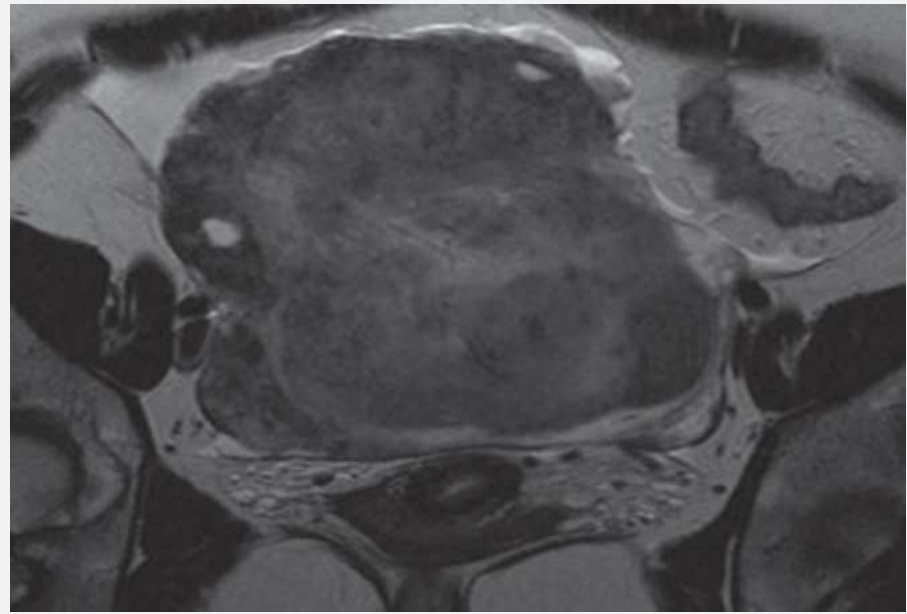
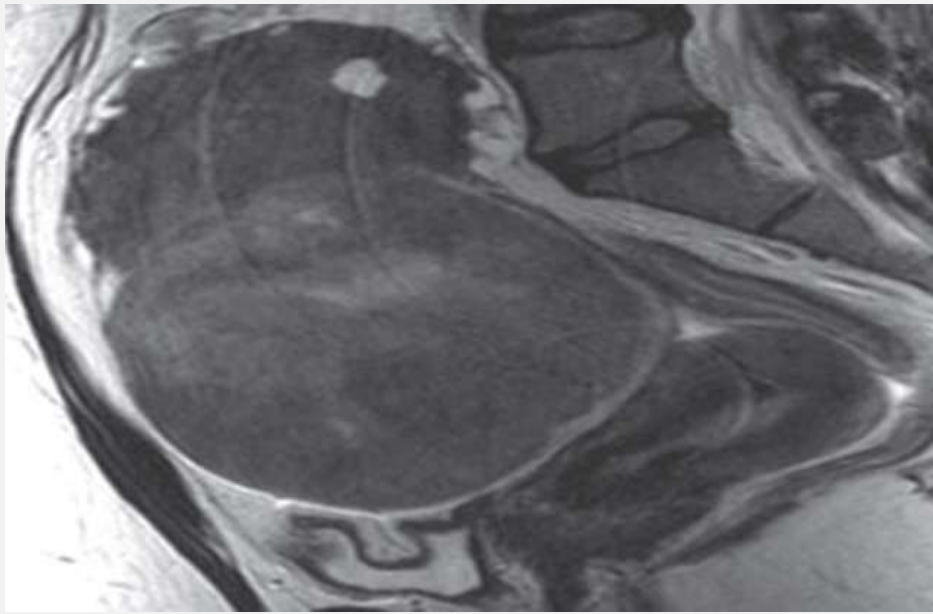


Gross appearance

Microscopy..



# OVARIAN FIBROMA



***On MRI Ovarian Fibroma.***

# THECOMA

- Solid fibromatous lesions that show varying degrees of yellowish discoloration
- Almost always confined to one ovary
- Usually >40 years, 65% after menopause
- May be hormonally active and hence associated with estrogenic or occasionally androgenic effects.
- Rarely malignant





# Ovarian Gonadal Sex Cord Stromal Tumours

- Granulosa theca cell tumours
- Sertoli-Leydig cell tumours

## Granulosa stromal Sex cord tumours

Found in all age groups and associated with the pseudo precocious puberty.

Early breast development , menstrual disorders, postmenopausal vaginal bleeding make up the characteristic symptom.

### **Microscopy :**

The characteristic cell is the round or slightly ovoid granulosa cell with its dark nucleus.

Mitosis are common and the ovumlike “Call Exner bodies “ are classic.



# Sertoli Leydig cell Tumours

Also called as Androblastoma

Often affect females beneath the ages of 40yrs

Usually be luteinised, simulating the classic pattern of the testes and producing steroids

Generally benign, may produce the masculinisation.





# TREATMENT OF NEOPLASTIC TUMOURS

In most instances, simple excision of the solid tumors is adequate therapy, particularly for women of reproductive age.

## CLINICAL PRESENTATION OF BENIGN TUMORS

- Asymptomatic – accidentally discovered on USG
- Chronic pattern of pain, increasing abdominal girth over months or weeks.
- Associated with secondary symptoms of anorexia, nausea, vomiting, urinary frequency.
- Could be associated with primary or secondary amenorrhea, menstrual irregularities, virilization, precocious puberty
- Become acutely symptomatic if undergoes torsion, rupture or haemorrhage.

***Benign ovarian neoplasms are indistinguishable clinically from malignant counterparts***

## COMPLICATIONS OF BENIGN OVARIAN TUMOURS

- **Torsion** : Commonly seen in Dermoid cyst, serous cystadenoma.
- **Intracystic hemorrhage** : serous Cystadenoma, venous congestion.
- **Infection** : Following torsion.
- **Rupture** : Big and tense type, following trauma.
- **Pseudomyxoma peritonei** : Seen in Mucinous Cystadenoma
- **Intestinal Obstruction**
- **Malignancy** : Rare .

**MANAGEMENT**

# INVESTIGATIONS



## Routine

- ✦ CBC
- ✦ ESR
- ✦ CXR
- ✦ ECG
- ✦ Urine R.M/C.S.
- ✦ Liver function test
- ✦ Renal function test

## Specific

- ✦ Ultrasound
  - Transabdominal / Transvaginal
  - ✦ Doppler colour flow
- ✦ C T scan and MRI
- ✦ Tumour markers
  - CA125, CEA, CA 19-9, HE4
- ✦ Genetic Analysis
- ✦ Endoscopy and Laparoscopy



## • Ultrasound

- This is the first line test for detecting, localizing, and characterizing adnexal masses.
- 90% of adnexal masses are correctly classified as benign vs. malignant on ultrasound.
- Many types of adnexal masses have typical characteristics on ultrasound, and are reliably recognized.
- No ionizing radiation, widely available, and low cost
- There are two forms of pelvic ultrasound:
  - Transabdominal – better tolerated, can evaluate abdominal processes; performed with distended bladder
  - Transvaginal – better resolution of pelvic structures, less artifact



# TRANSVAGINAL ULTRASOUND

- Pattern recognition is superior to all other scores.
- Subjective evaluation of ovarian masses based on pattern recognition can achieve sensitivity of 88% to 100% and specificity of 62% to 96%.
- Adding doppler does not seem to yield much improvement in the diagnostic precision, but *increases the confidence with which a correct diagnosis of benignity or malignancy is made.*



**Table 2.** IOTA Group ultrasound 'rules' to classify masses as benign (B-rules) or malignant (M-rules)<sup>38,51</sup>





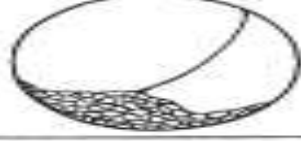

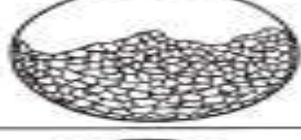
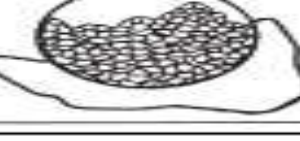
| B-rules  | M-rules   |
|--|---|
| Unilocular cysts   | Irregular solid tumour  |
| Presence of solid components where the largest solid component <7 mm | Ascites   |
| Presence of acoustic shadowing                                       | At least four papillary structures                                |
| Smooth multilocular tumour with a largest diameter <100 mm           | Irregular multilocular solid tumour with largest diameter ≥100 mm |
| No blood flow  | Very strong blood flow  |

simple ultrasound-based rules for the diagnosis of ovarian cancer. ultrasound  
obstetgynecol2008 RCOG 2011

# MORPHOLOGY INDEX

TUMOR VOLUME

TUMOR STRUCTURE

|   |                          |  |
|---|--------------------------|--|
| 0 | <10 cm <sup>3</sup>      |   |
| 1 | 10-50 cm <sup>3</sup>    |   |
| 2 | >50-100 cm <sup>3</sup>  |   |
| 3 | >100-200 cm <sup>3</sup> |   |
| 4 | >200-500 cm <sup>3</sup> |   |
| 5 | >500 cm <sup>3</sup>     |  |

| Score     | 0                            | 1                                 | 2  | 3  | 4                                    | 5   |
|-----------|------------------------------|-----------------------------------|--|--|--------------------------------------|---|
| Volume    | Less than 10 cm <sup>3</sup> | 10-50 cm <sup>3</sup>             | Greater than 50-100 cm <sup>3</sup>        | Greater than 100-200 cm <sup>3</sup>                     | Greater than 200-500 cm <sup>3</sup> | Greater than 500 cm <sup>3</sup>                        |
| Structure | Smooth wall, sonolucent      | Smooth wall, diffuse echogenicity | Wall thickening, less than 3 mm fine septa | Papillary projection equal to or greater than 3 mm thick | Complex, predominantly solid         | Complex, solid and cystic areas with extratumoral fluid |



## OTHER IMAGING MODALITIES



- CT, MRI, PET not recommended in the initial evaluation
- CT scan: evaluating
  - LN involvement,
  - Omental mets, peritoneal deposits, hepatic mets,
  - obstructive uropathy
  - or a probable ***alternate primary site*** when cancer is suspected based upon TVS
- MRI : differentiating non adnexal pelvic masses (like leiomyomata), expensive and inconvenient.

- ACOG GUIDELINES 2007

# TUMOR MARKERS

✓ CA125

✓ CEA

✓ CA 19-9

✓ HE4



# CA125

| SENSITIVITY | SPECIFICITY | PPV    | NPV    |
|-------------|-------------|--------|--------|
| 61-90%      | 71-93%      | 35-91% | 67-90% |



Most useful when **non-mucinous epithelial cancers** are present

Elevated in **80%** of patients with epithelial ovarian Ca but only in **50%** of patients with stage I disease

**Increased sensitivity in post menopausal women** esp. when associated with relevant clinical and USG findings

Cut-off of 30 u/ml, sensitivity of 81% and specificity of 75%



## CEA

Levels higher than 5 mg/L are seen in 85-90% of mucinous tumours but only in 30% of other epithelial cancers.

## CA 19.9

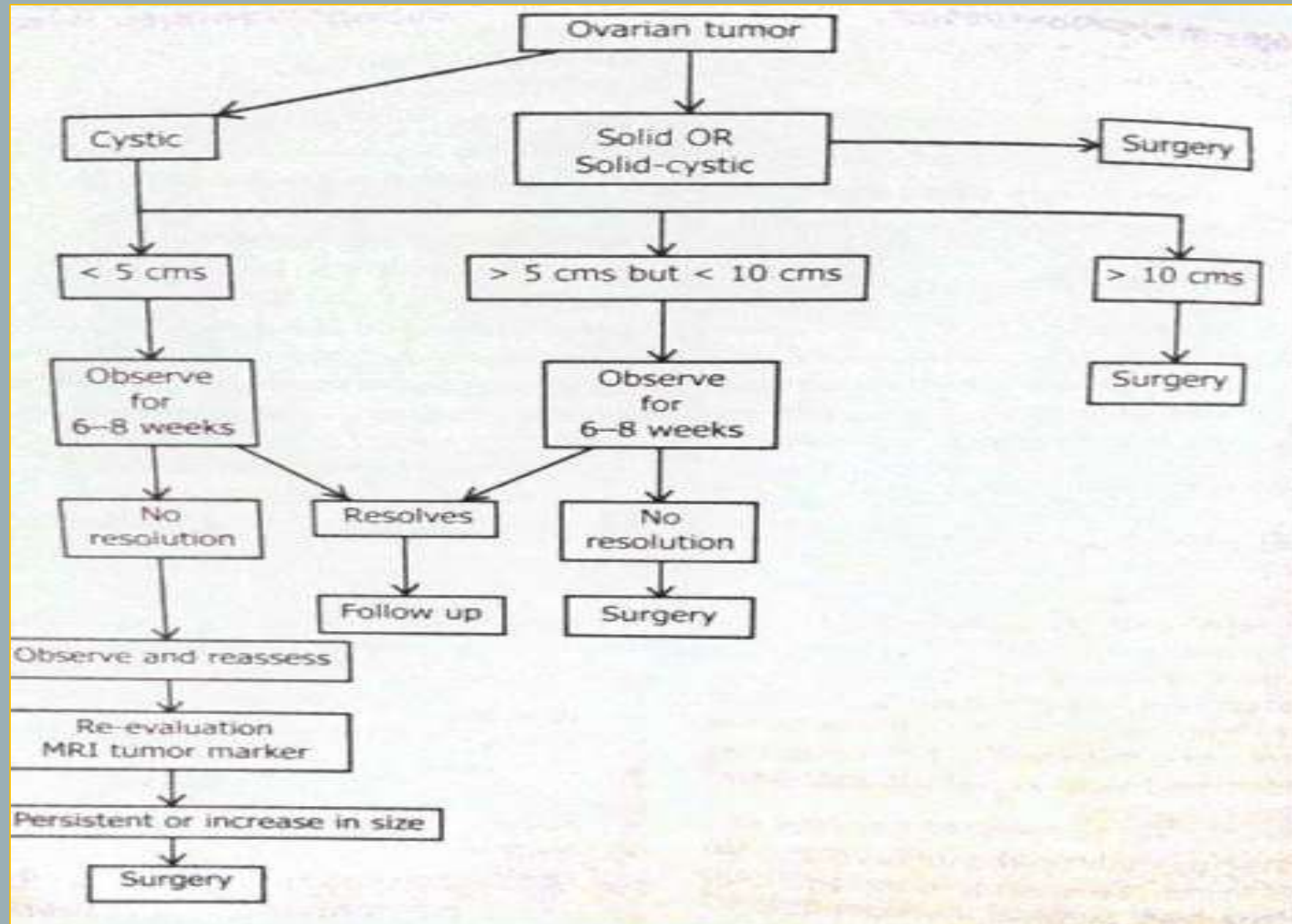
It is elevated in mucinous ovarian malignancy.



| Benign Ovarian tumour   | Malignant Ovarian tumour   |
|---|--|
| <p>Common in middle age group</p> <p>Painless unless complicated</p> <p>No edema</p> <p>No varicosities</p> <p>Generally unilateral</p> <p>Unilocular</p> <p>Thin walled</p> <p>Thin septae if present</p> <p>No papillae or solid contents</p> <p>Normal or decreased vascularity on doppler</p> <p>No metastasis</p> <p>Slow growing</p> <p>Smooth, cystic</p> <p>Freely mobile</p> <p>No ascites or if present clear fluid on paracentesis</p> | <p>Seen at extremes of ages</p> <p>May be painful</p> <p>Edema maybe present</p> <p>Varicosities may be present</p> <p>May be bilateral</p> <p>Multilocular</p> <p>Thick walled</p> <p>Thick septae</p> <p>Mixed echogenicity</p> <p>High vascularity, low pulsatility index and low resistance index</p> <p>Metastasis in advanced disease</p> <p>Rapidly growing</p> <p>Solid, nodular, irregularly shaped</p> <p>Fixed</p> <p>Ascites present and on paracentesis the fluid may be blood stained.</p> |



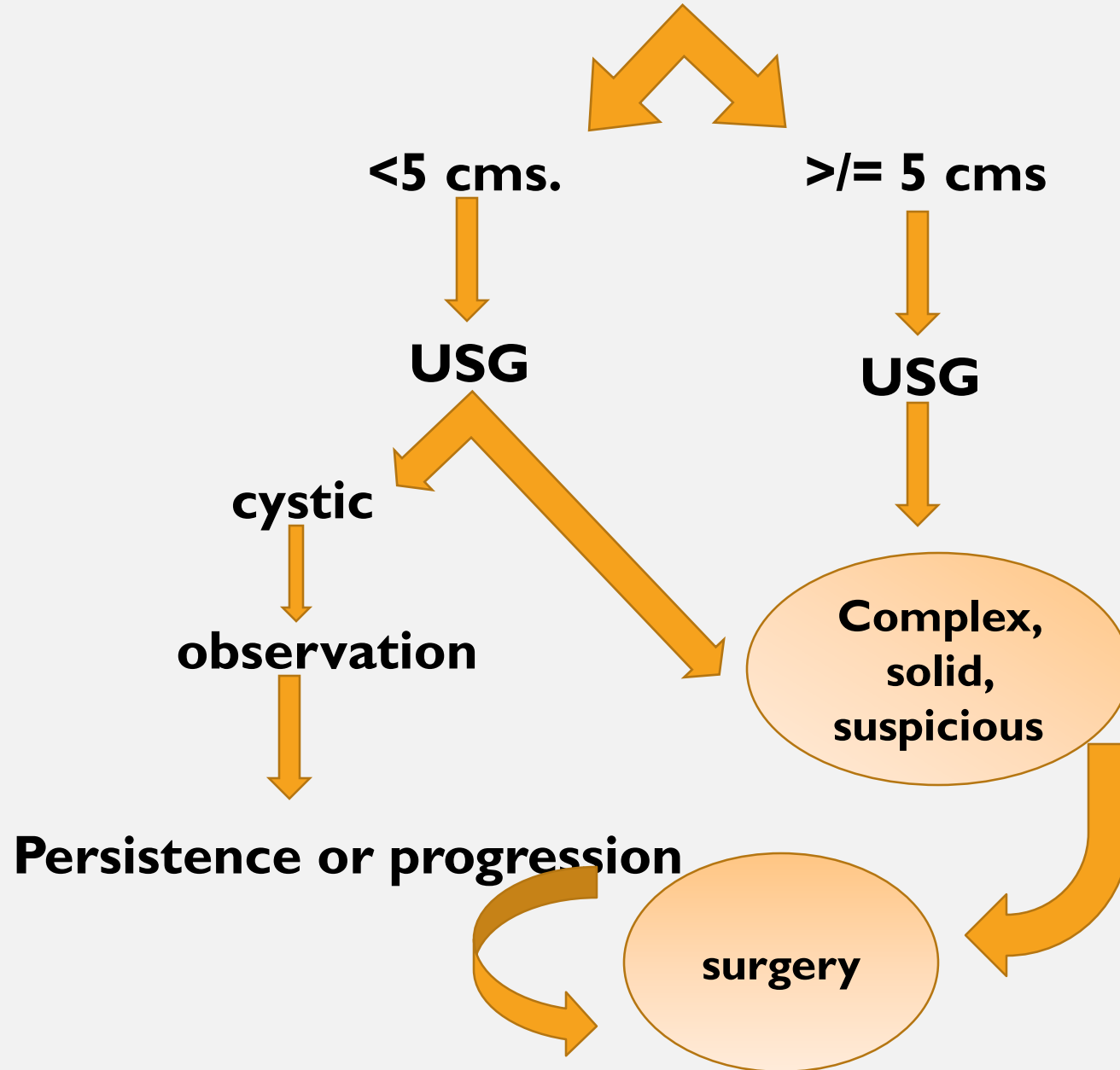
# TREATMENT



## INDICATIONS FOR SURGERY

- Any *solid* ovarian lesion
- Any ovarian lesion with *papillary vegetation* on the cyst wall
- Any *adnexal mass* >10cm in diameter
- Palpable adnexal mass in a *premenarchal or postmenopausal women*
- *Torsion or rupture* suspected

# Ovarian mass in reproductive age group



## CYST ASPIRATION

- ✓ Diagnostic cytology has poor sensitivity to detect malignancy, ranging from 25% to 82%
- ✓ Not therapeutic, even when a benign mass is aspirated
- ✓ Approx. 25% of cysts will recur within 1 year
- ✓ Aspiration of a malignant mass may induce spillage and seeding of cancer cells into the peritoneal cavity.

## OPERATIVE MODALITIES

- Laparoscopy vs laparotomy – decision based on suspicion of malignancy and technical expertise
- No RCTs comparing recurrence rates following laparoscopy or laparotomy.
- The objective is to try cystectomy if possible.
- Laparoscopic surgery for benign ovarian tumours is associated with less pain, shorter hospital stay, and fewer adverse events than with laparotomy.

Thank you!

