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# Learning objectives

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To be aware of the clinical presentation and ultrasound characteristics of clinically significant adnexal masses in pregnancy.

To understand the limitations of investigations in pregnancy and the importance of a multidisciplinary approach in the management of complex adnexal masses.

To be aware of the indications for surgery and evaluate the appropriateness, mode and timing of surgery in pregnancy.

## Tumors Unique to Pregnancy

### 1. Luteomas:

may be virilizing

### 2. Theca-lutein cysts:

- can be large and appear complex.
- seen in: pregnancies with inordinately high hCG secretion e.g.

gestational trophoblastic disease

Twins

other situations with increased placental mass.

### 3. OHSS:

caused by:

- ovulation-induction therapy
- spontaneously {mutation in the FSH receptor}

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<b>Histopathologic type,</b>	<b>%</b>
Dermoid cyst	%22,2
Serous cystadenom	%14.8
Mucinosi cyst	%14.8
Endometrioma	%11.1
Morgagni cyst	%11.1
Follicle cyst	%11.1
Siderophagic cyst	%7.4
Fibroma	%3.7
Thecomata	%3.7

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## 3 Characters

### 1. Nearly all are benign

Ovarian cancer:

0.004–0.04%.

Most are borderline with a low malignant potential

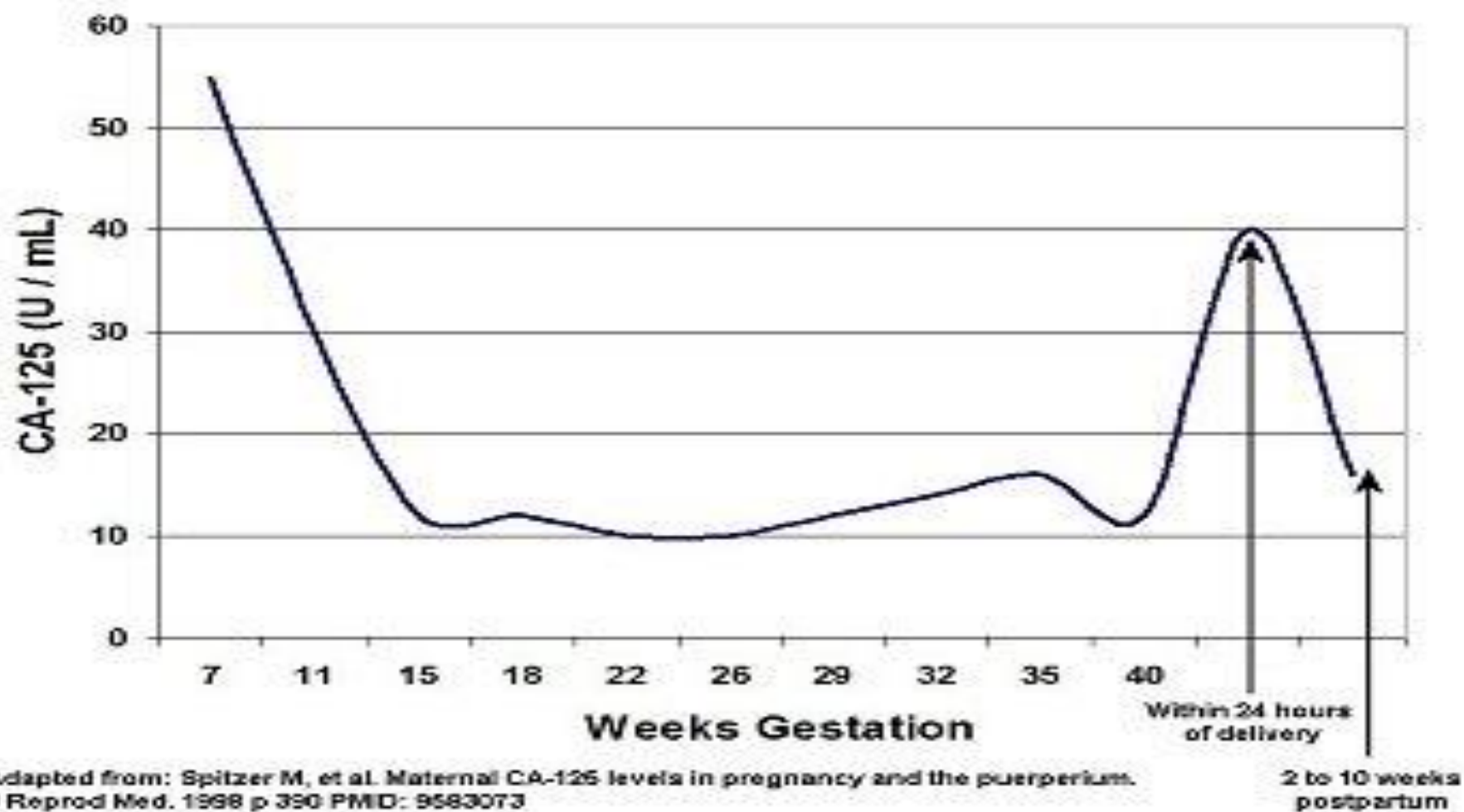
# Tumour markers

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The reliability of tumour markers in the diagnosis and characterization of tumours during pregnancy is often debated. During pregnancy elevations of tumour markers are mostly associated with the normal physiologic changes of pregnancy and presence of obstetric complications(miscarriage,preeclampsia,HELLP)

(Han et al., 2012)

### Mean CA-125 Levels Throughout Pregnancy



## During pregnancy:

### a. Serum AFP, BhCG& inhibin levels:

all raised {placental synthesis}: its use is limited.

### b. Serum CA125 levels:

elevated during pregnancy {decidual cell production, with levels rising as pregnancy progresses}.

Some researchers have suggested using a cut-off level of 112 U/ml as the upper limit of normal, compared with 35 U/ml in the non-pregnant state.

The usefulness of this marker in pregnancy is still **restricted** and if an ovarian mass is thought to look suspicious, further evaluation with MRI may be preferable.



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## **Human epididymis protein 4 (HE4)**

the HE4 level is approved for monitoring women with ovarian cancer for disease recurrence or progression, but not for screening.

t HE4 serum biomarkers are unaffected by pregnancy , and therefore may be helpful in the evaluation of pelvic masses in pregnancy.

# Management

## I. Surgery: Resection

1. suspected of rupture or torsion
2. capable of obstructing labor
3. >10 cm {increased risk of cancer in large cysts}.
4. contain septae, nodules, papillary excrescences, or solid components

## II. Observation:

Cysts 10 cm or less and simple

N.B. 5- to 10-cm cysts who are observed have been reported to require emergency exploration for rupture, torsion, or infarction in some studies

## 2. High possibility of regression

-Ovarian cysts:

Most are undetectable at 14 w (mostly C.Luteum)

Simple (<5 cm), hemorrhagic, OHSS: 90-100%

-Ovarian mass: < 6cm: 95%

>6cm: 60%

-Persistent: 75% are complex

### 3. Complications

Depend on size, gest age

1. Rupture
2. Haemorrhage
3. Torsion (up to 5%)
4. Obstructed labour
5. Fetal malpresentation

# Diagnosis

1. **Bimanual examination**
2. **US**
3. **MRI**
4. **Color Doppler**
5. **CT**
6. **Tumor markers**

## 2.US:

- Abd & TV
- Diagnostic in most cases (> 90%)
- Types:
  - I. Simple cyst
  - II. Low level echo cyst
  - III. Complex cyst
  - IV. Solid
- *Complex (Solid–cystic): more likely to be malignant.*
- *Purely solid or purely cystic: more likely to be benign.*

IOTA (International Ovarian Tumor Analysis) simple rules. Adjusted from Timmerman et al., 2010.

### Ultrasonic features

For predicting a malignant tumor (M features)

M1 – Irregular solid tumor

M2 – Presence of ascites

M3 – At least four papillary structures

M4 – Irregular multilocular solid tumor with largest diameter  $\geq 100$  mm

M5 – Very strong blood flow (colour score 4)

For predicting a benign tumor (B features)

B1 – Unilocular

B2 – Presence of solid components, of which largest solid component has largest diameter  $< 7$  mm

B3 – Presence of acoustic shadows

B4 – Smooth multilocular tumor with largest diameter  $< 100$  mm

B5 – No blood flow (colour score 1)

Rule 1: If one or more M features are present in absence of B feature, mass is classified as malignant.

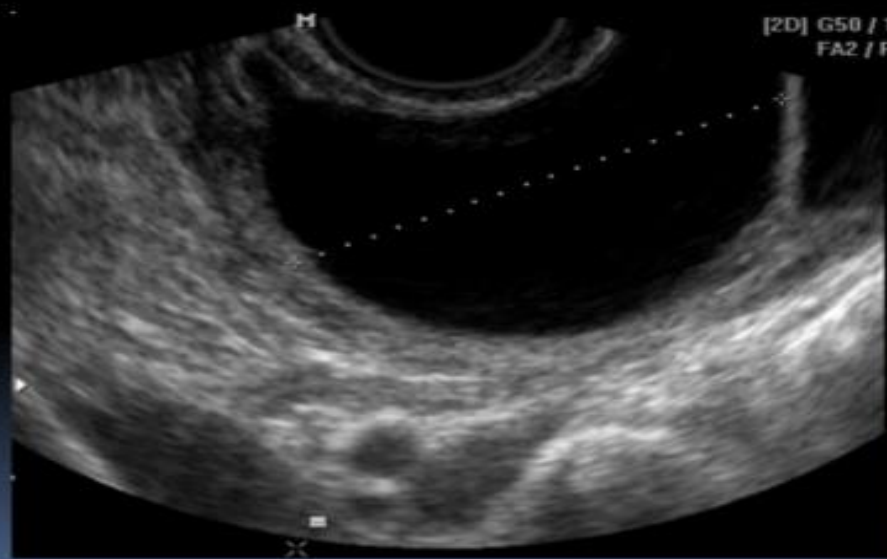
Rule 2: If one or more B features are present in absence of M feature, mass is classified as benign.

Rule 3: If both M features and B features are present, or if no B or M features are present, result is inconclusive and second stage test is recommended.

- Unilocular
- Thin-walled
- Anechoic



Follicular cyst



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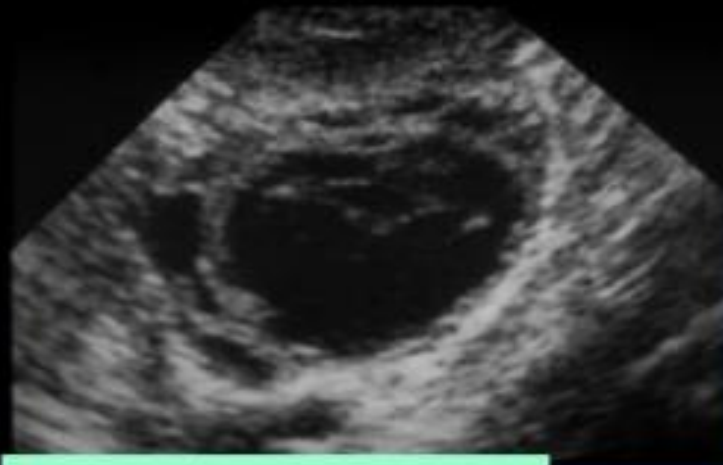


# Simple cysts

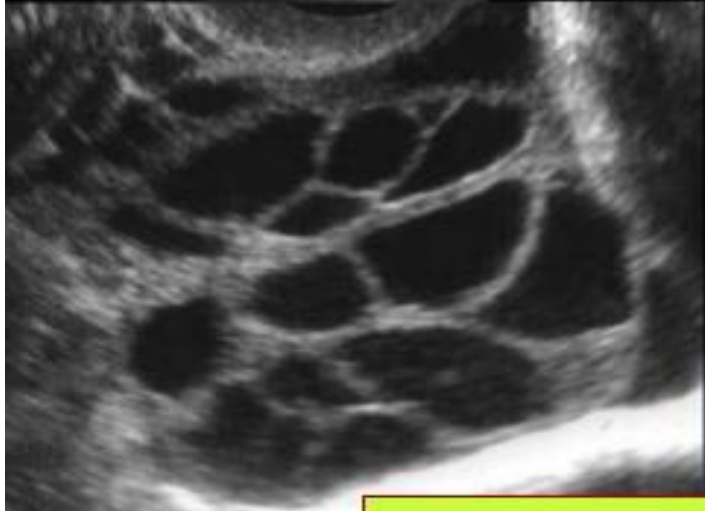


OVARIAN CYST

Corpus luteal or follicular cyst



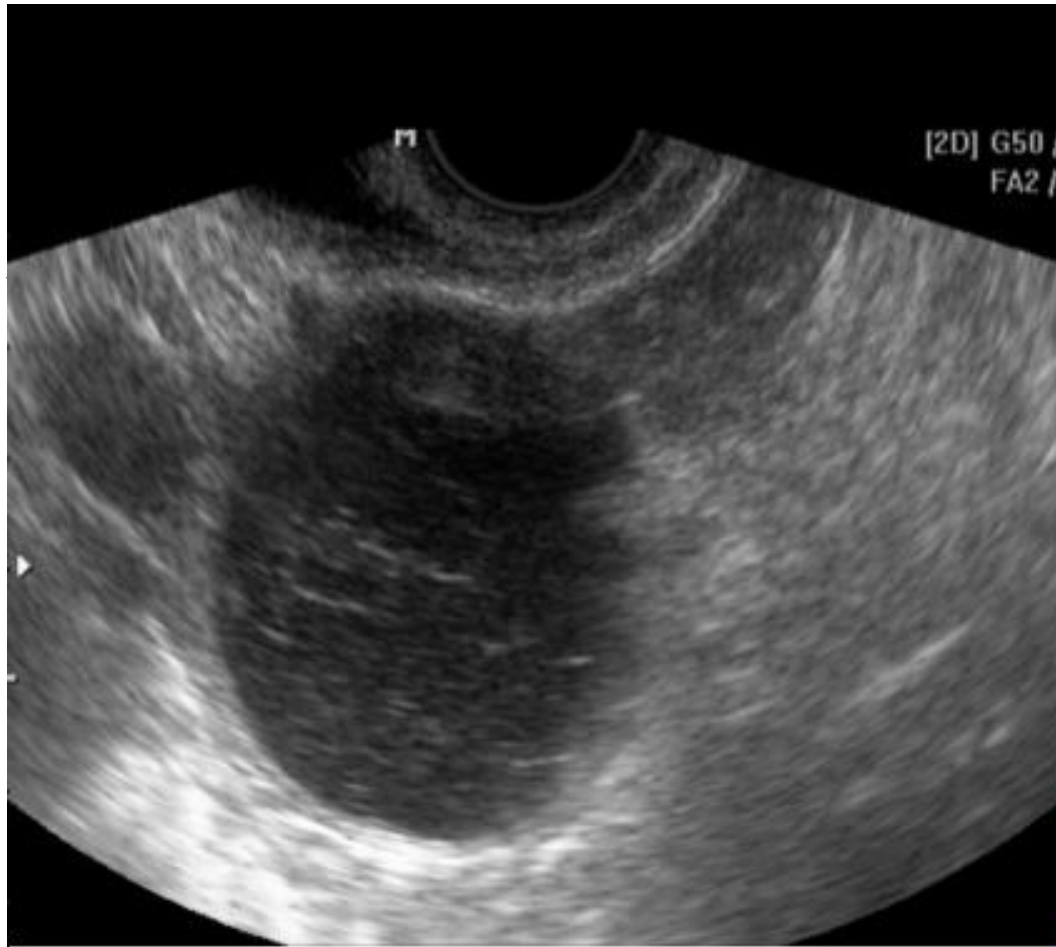
Haemorrhagic cysts



## OHSS

- Massively enlarged ovaries
- Thin-walled septation
- Ascites may be present

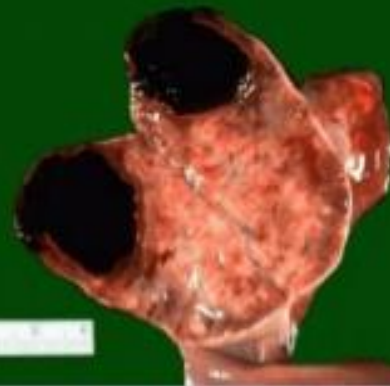




Hemorrhagic C.  
Corpus Luteum



Anechoic with lacelike internal  
echoes within cyst



## Low-level echo cysts + Characteristic Features

### Endometrioma

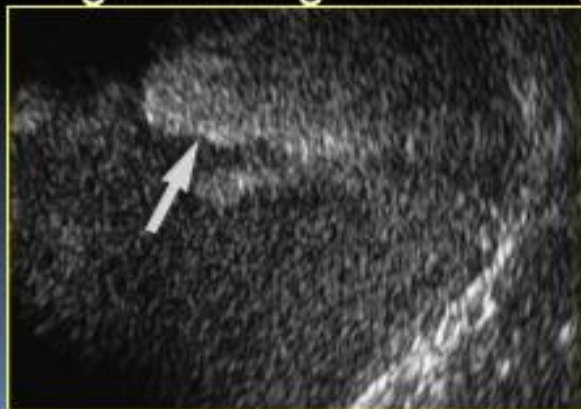
Hyperechoic wall foci (in 35%)

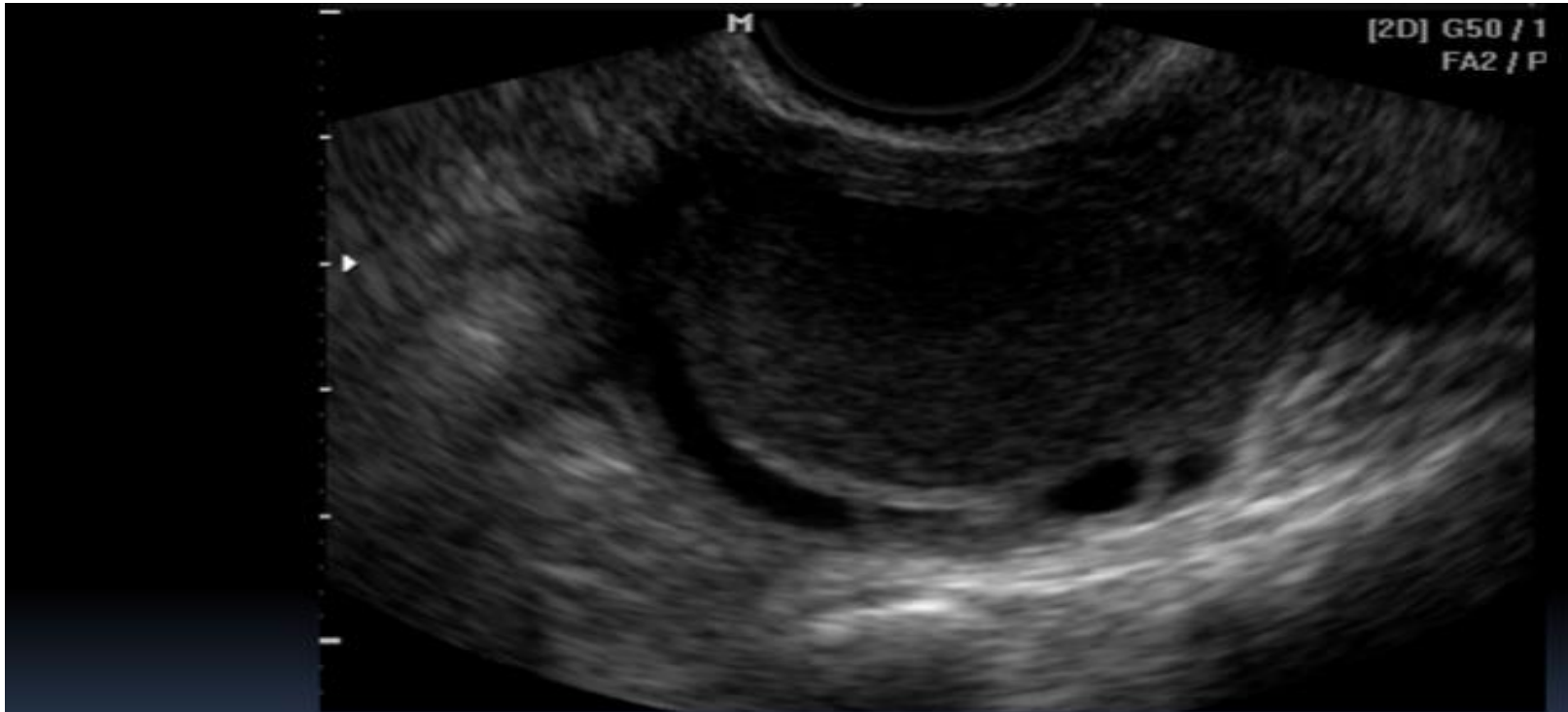
### Hemorrhagic cyst :

Lacelike internal echoes (in 40%)

### Teratoma

Regional bright echoes ( in 97% )





Endometrioma

Diffuse 'ground glass' pattern due to presence of old blood

## Malignant cyst

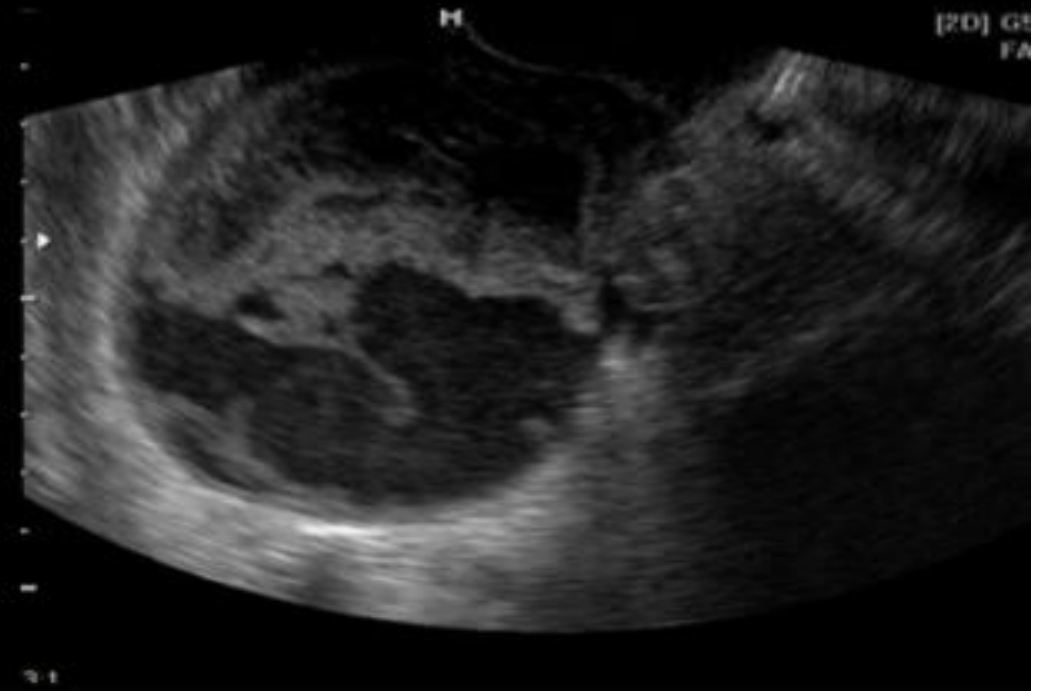
- Wall thickening
- Wall nodularity
- Septations > 3 mm
- Papillary projections
- **Solid component:**

the most significant predictor of malignancy

- **Ascites:**

positive predictive value of 95% for malignancy

*(Brown et al , 1998)*



# Surgery should be considered in 3 general groups

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1. Acute symptomatic with signs and symptoms of ovarian torsion or hemodynamically unstable due to cyst rupture.
2. Suspicious for malignancy
3. Larger adnexal masses that are at higher risk of the above complications.

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2. Important to consider is the **position** of the patient to avoid **hypovolemia, hypotension and hypoxemia** by the slowly change to Trendelenburg allowing only mild inclination, and from 20 weeks of gestation onwards, using the left lateral tilt position.



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**A midline laparotomy** with minimal uterine manipulation is preferred in case of an open approach.

# SURGERY

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If there is a low risk of malignancy, a minimally invasive approach is reasonable and can be performed at all stages of pregnancy.

However, as with other types of surgery performed during pregnancy, the optimal time to operate is the early second trimester.

# Surgery during pregnancy (open vs laparoscopy)

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4. Trochars should be placed at least 6cm above the fundus or in the left upper quadrant.
5. Intraoperativ CO2 monitoring by capnography should be used.
6. Intraoperative abdominal pressure should be maintained less than 15mm/hg while in trendelenburg position to ensure adequate venous return and uteroplacental sufficiency.

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Immediately after entry into the peritoneal cavity, peritoneal washings should be obtained for staging purposes in case the mass is malignant.

Contralateral ovarian biopsy is recommended if the ovary appears to be involved, but routine biopsy or wedge resection of a normal-appearing contralateral ovary is unwarranted

## Steps in staging ovarian cancer

1. Obtain any free fluid for cytologic evaluation
2. If no free fluid is present, obtain washings by instilling saline and recovering the fluid. The fluid should irrigate the cul de sac, paracolic gutters, and area beneath each diaphragm.
3. Systematically explore all intraabdominal organs and surfaces: bowel, liver, gallbladder, diaphragms, mesentery, omentum, and the entire peritoneum should be visualized and palpated, as indicated
4. Suspicious areas or adhesions should be biopsied. If there are no suspicious areas, multiple biopsies should be obtained from the peritoneum of the cul-de-sac, paracolic gutters, bladder, and intestinal mesentery when the disease appears confined to the ovary. These biopsies are not needed if the patient has advanced disease.
5. The diaphragm should be biopsied or scraped for cytology. A laparoscope and biopsy instrument may be used.
6. The omentum should be resected from the transverse colon.
7. The retroperitoneum should be explored to evaluate pelvic nodes. Suspicious nodes should be removed and sent for frozen section examination.
8. The paraaortic nodes should be exposed and enlarged nodes removed. Nodes superior to the inferior mesenteric artery should also be resected.
9. In the absence of suspicious nodes, pelvic and paraaortic nodes should still be sampled to exclude the possibility of microscopic stage III disease.
10. A total abdominal hysterectomy and bilateral salpingo-oophorectomy is performed. (Fertility-conserving surgery may be an option for some women).

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In certain malignant germ cell tumors of the ovary (eg, endodermal sinus tumors), lymph node dissection may be omitted, as the patient will require chemotherapy based on the histopathology alone

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Adequate surgical staging is of particular importance for stage I cancers (ie, those that are limited to the ovary , as many, but not all, of these neoplasms are adequately treated with surgery alone.

# Early stage ovarian cancer (borderline and invasive)

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**For early stage ovarian cancer, stage I and II** according to the International Federation of Gynecology and Obstetrics (FIGO), standard surgical procedure consisting of hysterectomy, bilateral adnexectomy, omentectomy, cytology, biopsies and lymphadenectomy should be aimed for. (Prat J and FIGO Committee on Gynecologic Oncology, 2014).

**For early stage disease, fertility- and pregnancy preserving treatment may be considered.** In these selected cases surgery includes removal of the adnex and surgical staging (cytology, peritoneal biopsies, omentectomy and appendectomy in mucinous tumours). (Prat J and FIGO Committee on Gynecologic Oncology, 2014).



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Removal of the corpus luteum should be avoided prior to eight weeks of gestation because the corpus luteum is primarily responsible for progesterone production and maintenance of the pregnancy at this time

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If the corpus luteum is removed prior to eight weeks, progesterone supplementation should be given as a 50 to 100 mg vaginal suppository every 8 to 12 hours

or as a daily intramuscular injection of 1 mL (50 mg) progesterone in oil

. After eight weeks, the ovary gradually shifts progesterone production to the placenta (called the luteal-placental shift).

As of 10 weeks of gestation, the placenta is the primary provider of progesterone, so progesterone supplementation is no long

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**Adnexal mass at cesarean delivery** — At cesarean delivery, any adnexal mass that appears suspicious for malignancy should be removed and sent for frozen section.

Complete surgical removal is preferred to aspiration and cytologic evaluation of cystic fluid, since malignancy could be missed with the latter.

If the mass is an incidental finding at cesarean delivery, the patient typically will not have an appropriate incision for surgical staging.

In these cases, if frozen section indicates malignancy, salpingo-oophorectomy is performed and postpartum possible hysterectomy within the next one to two weeks,( gynecologic oncologist for counseling)

# Conclusion

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Ovarian cysts or masses during pregnancy should be accurately evaluated to decide the most appropriate treatment option.

Ultrasound and MRI are safe and allow distinguishing between benign and malignant lesions.

A wait-and-see strategy is advised for an ovarian cyst with benign features.

Masses with **septa, solid components, papillary or nodules**, or **when persisting after 16 weeks** of pregnancy should be further investigated.

# Conclusion

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Laparoscopy is safe and feasible, and both maternal and perinatal outcomes are favorable.

If corpus luteum is removed before 8 weeks, then progesterone supplement should be given.

# Conclusion

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When advanced stage invasive ovarian cancer is diagnosed, termination of pregnancy may be considered in early pregnancy, otherwise chemotherapy can be administered during second and third trimester.

**Treatment options should be discussed for each patient individually.**

When there is high suspicion of malignancy, a multidisciplinary approach is necessary, and preferably patients should be referred to centres with specialized experience.

