IMAGING OF ADNEXAL LESION- BENIGN

PRESENTED BY,

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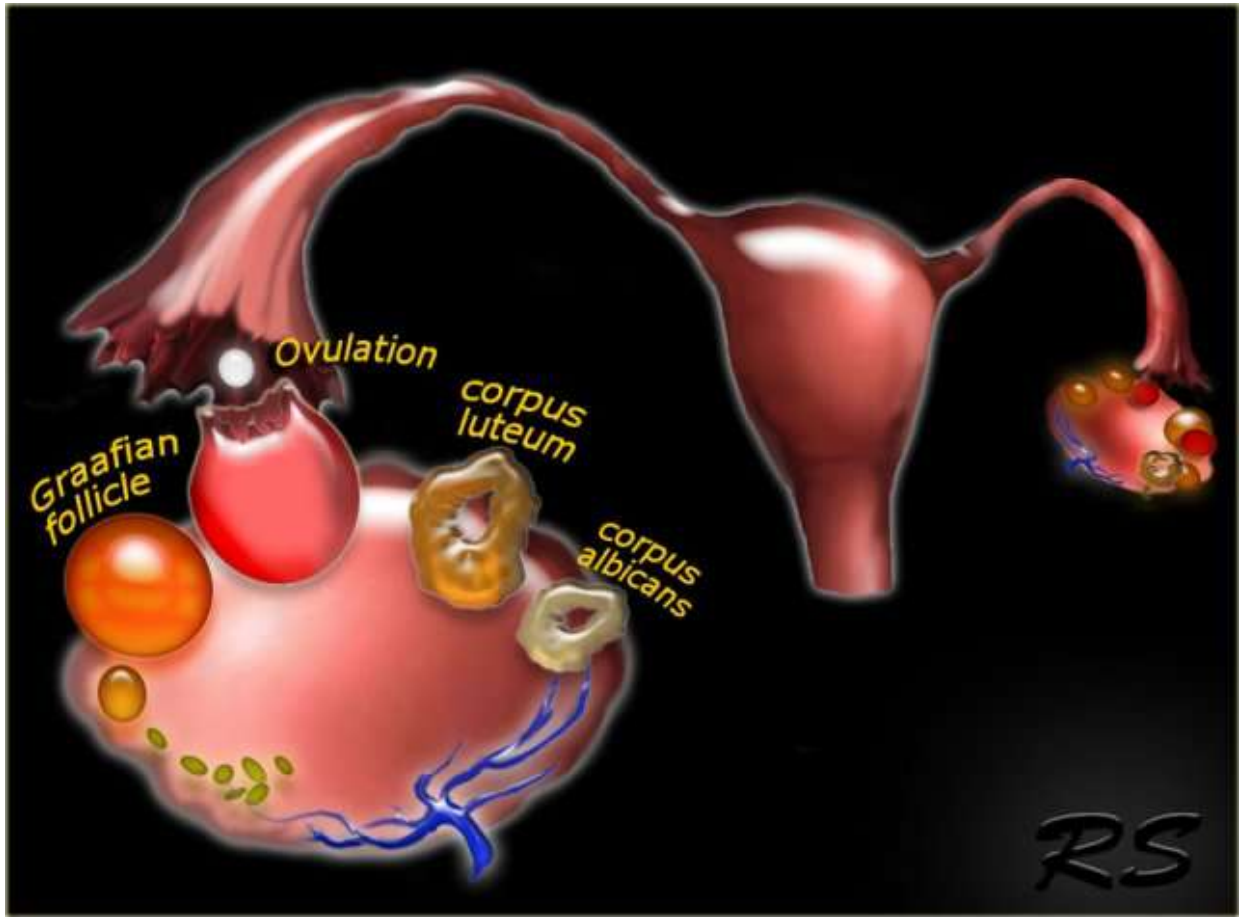

Ovulation
corpus luteum
Graafian follicle
corpus albicans
RS

ROLE OF IMAGING

USG:

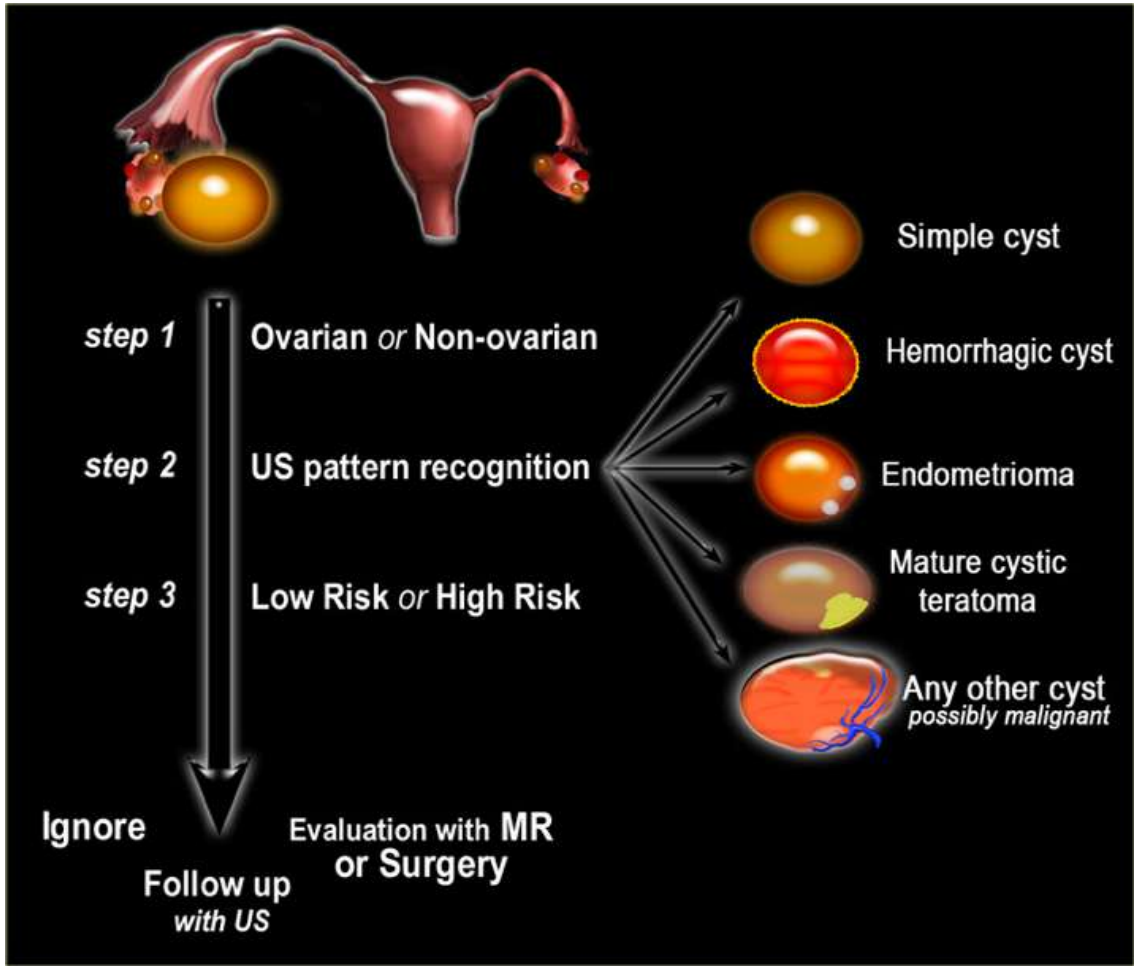
For characterization of ovarian masses, ultrasound is first line method of choice.

CT:

CT is useful for N- and M- staging of proven malignant lesions

MRI:

For complex lesions, 1° evaluation with ultrasound is followed by further evaluation with MRI.


step 1
Ovarian or Non-ovarian
step 2
US pattern recognition
step 3
Low Risk or High Risk
Simple cyst
Hemorrhagic cyst
Endometrioma
Mature cystic teratoma
Any other cyst
possibly malignant
Ignore
Follow up
with US
Evaluation with MR
or Surgery

OVARIAN AND NON-OVARIAN

- **Gonadal vessels lead to the lesion + No separately identifiable normal ovaries = ovarian lesion likely.**
- **Separate ovaries identified from the lesion = non-ovarian lesion likely.**
- **To identify the ovary, trace the**

Right ovarian vein which drains into IVC

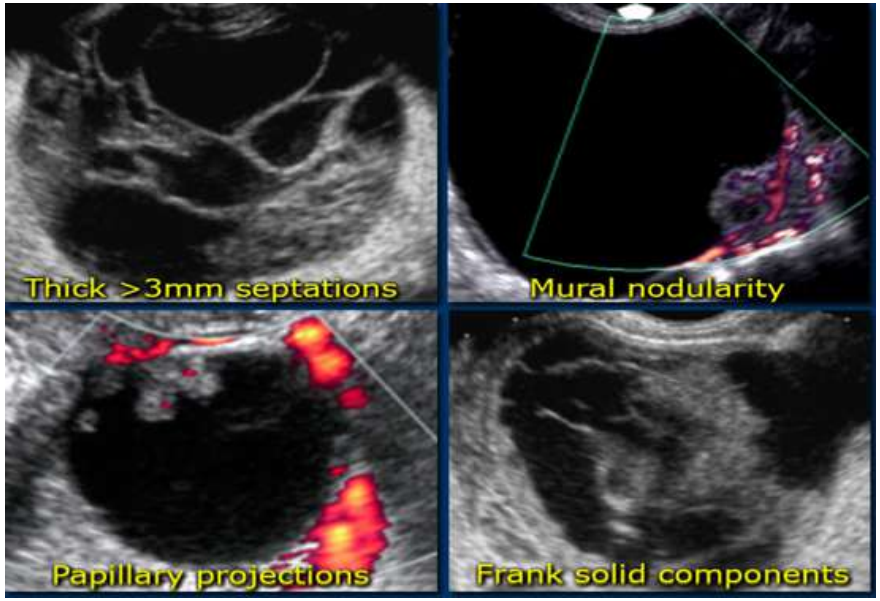
Left ovarian vein which drains into left renal vein

FEATURES OF BENIGN OVARIAN LESION

- Unilocular
- No internal vascularity
- Non enhancing thin septations <3 mm
- No ascites
- No enhancing solid components
- No peritoneal deposits

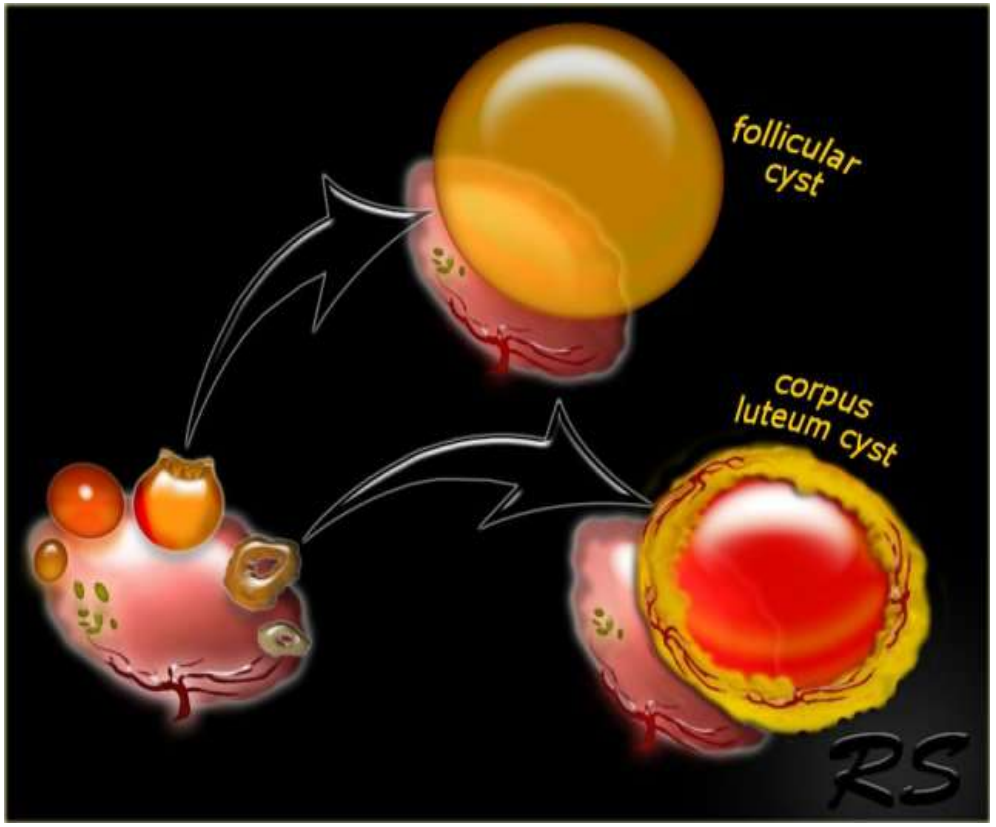
FEATURES OF MALIGNANT OVARIAN LESION

thick septations >3mm
mural nodularity
internal vascularity+
>=4 papillary projections >3 mm
frank solid components



OVARIAN	FALLOPIAN TUBES	UTERUS	OTHERS
Functional cyst	**Tubo-ovarian abscess**	**Pedunculated leiomyoma**	**Peritoneal inclusion cyst**
Neoplasms	**Hydrosalpinx**		**PCOD**
Endometriosis	**Para ovarian cyst**		**Diverticulitis**
	Ectopic pregnancy		

FUNCTIONAL/PHYSIOLOGICAL OVARIAN CYSTS



FOLLICULAR CYST

- **Dominant Graafian follicle >3 cm**

USG:

unilocular

anechoic cyst with thin smooth wall posterior acoustic enhancement

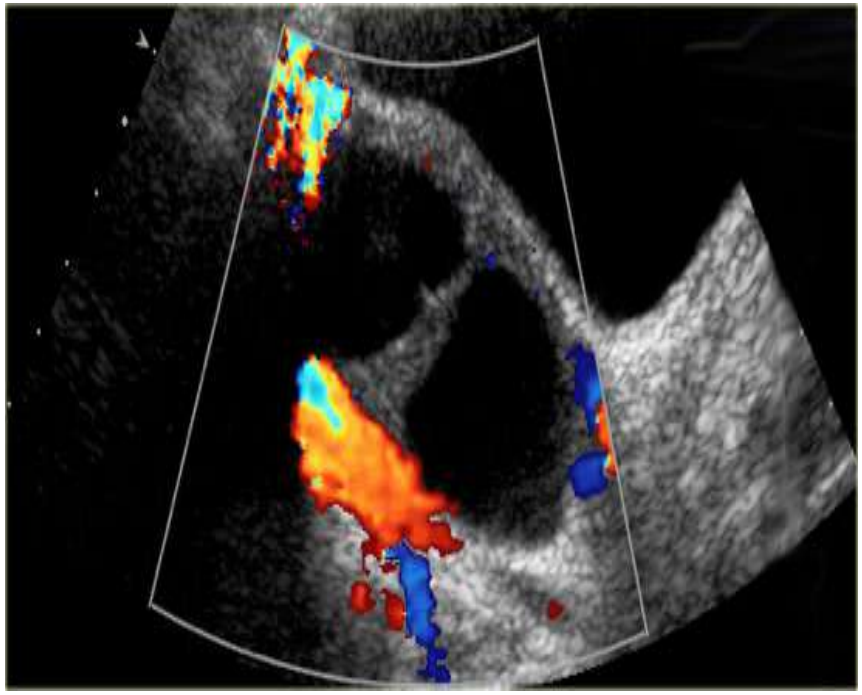
No solid components, internal septations or internal vascularity

MRI:

T2W: hyper intense

T1W, T1W post contrast: hypo intense

Will resolve spontaneously on follow up



- **Cysts >7 cm - needs further imaging with MR or surgical evaluation should be considered.**

CORPUS LUTEUM CYST

- A corpus luteum may seal and fill with fluid or blood, forming a corpus luteum cyst.

USG:

small (< 3cm) complex ovarian cyst with thick, crenulated wall with peripheral wall vascularity on color Doppler analysis.

Giving 'RING OF FIRE' appearance.

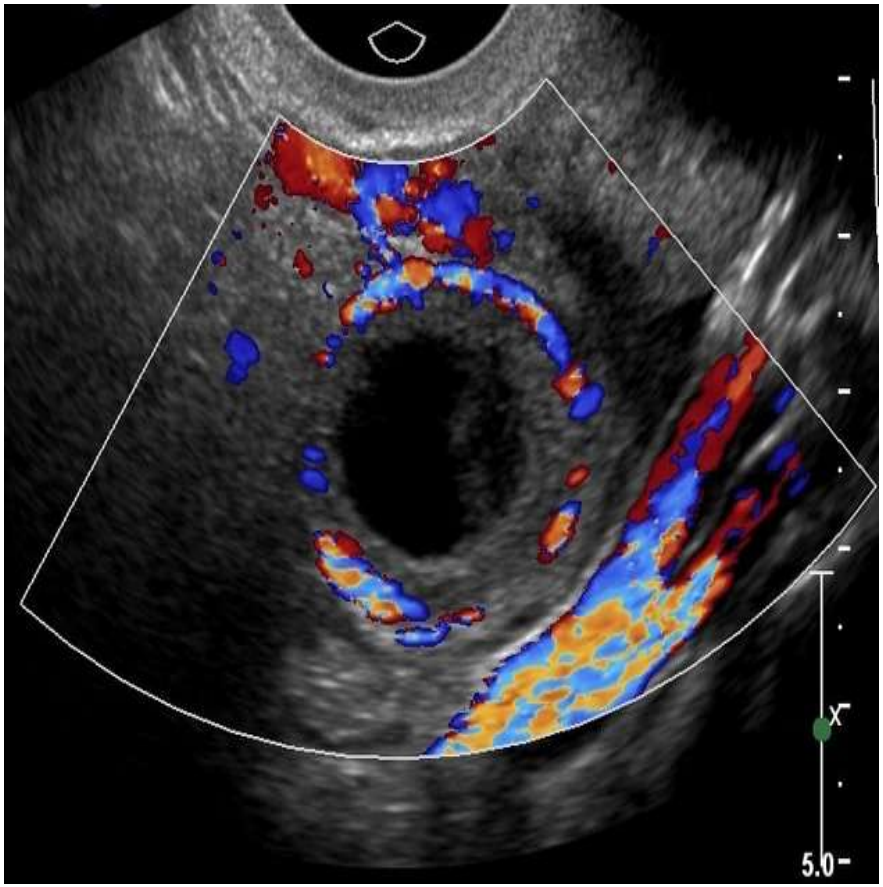
Good through-transmission and no internal vascularity.

MRI:

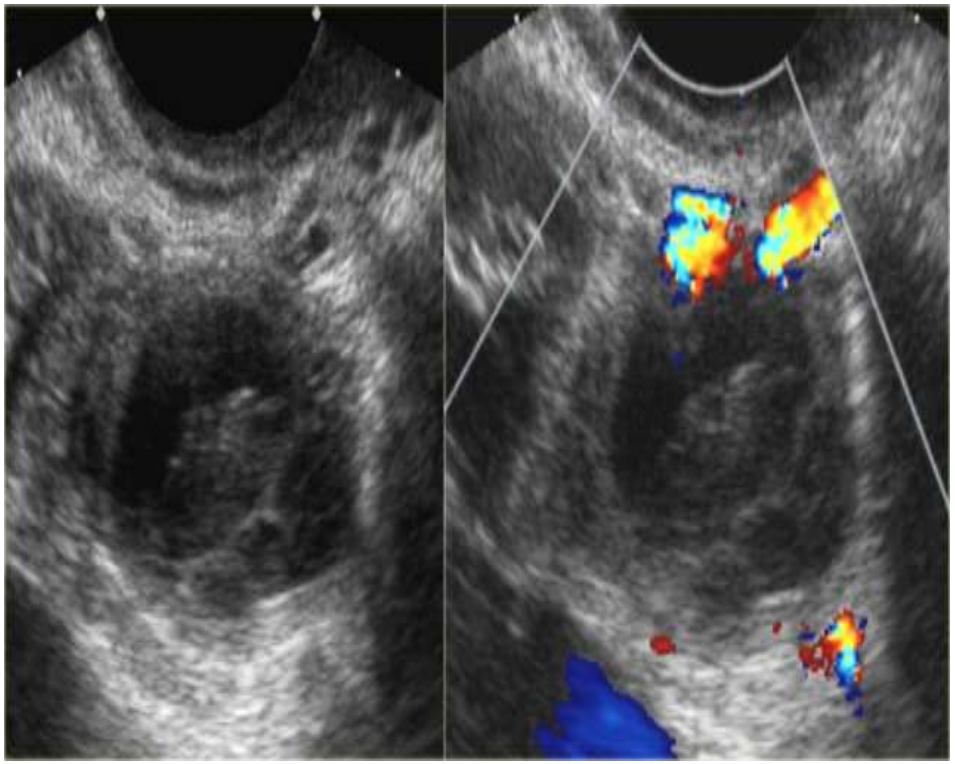
T1: homogeneously hypo intense

T2: hyper intense

T1 C+ (Gd): intense wall enhancement



HEMORRHAGIC CYST



- **Graafian follicle or follicular cyst bleeds forms complex hemorrhagic ovarian cyst.**

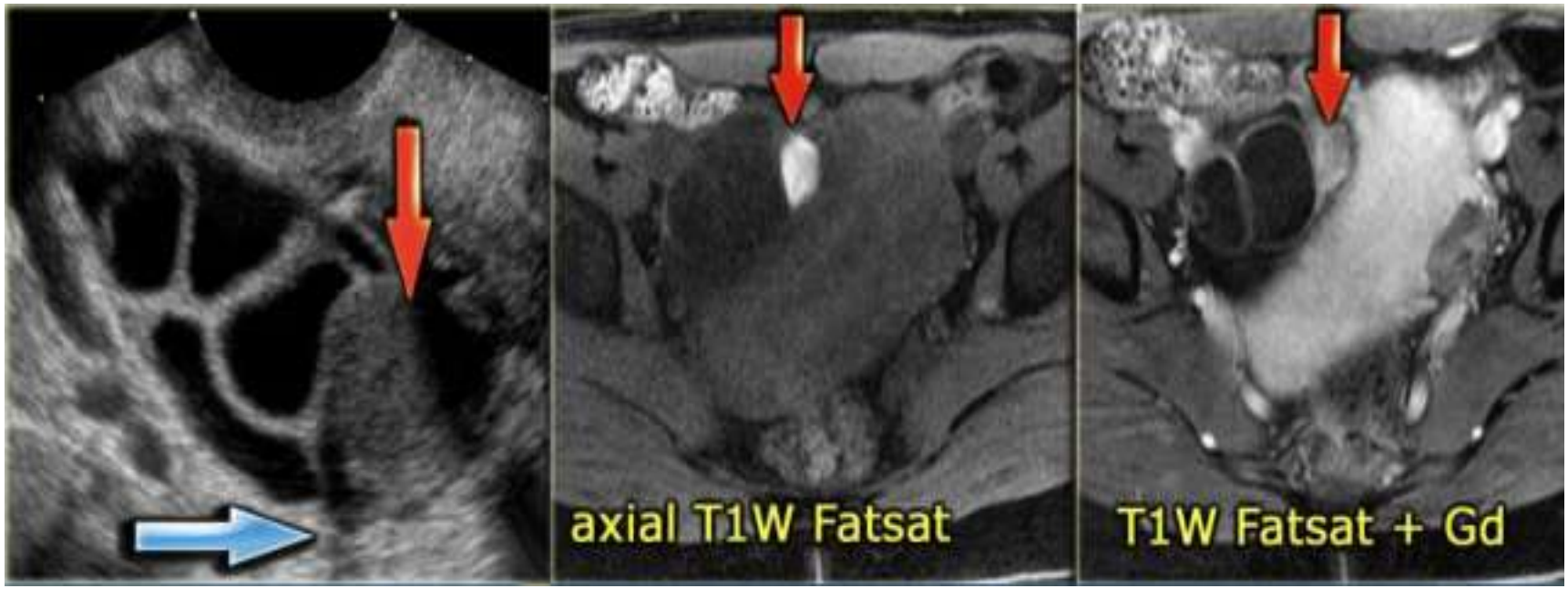
USG:

unilocular thin-walled cyst with fibrin-strands or low-level echoes and good through transmission.

no internal vascularity

Concave margins – consistent with blood clot

- **Gentle pressure on the cyst with the TVS transducer is helpful, as an Intra cystic clot may show jiggling or jelly-like motion with this maneuver.**



- **On the T1-weighted image without fat sat the complex cyst is bright, indicating either fat or blood content.**
- **On the T1-weighted image with fat sat the lesion remains bright, ruling out a fatty lesion.**
- **After the administration of Gd there is no enhancement, confirming that this is a hemorrhagic ovarian cyst.**

D/D may include Endometrioma

POLYCYSTIC OVARIAN MORPHOLOGY

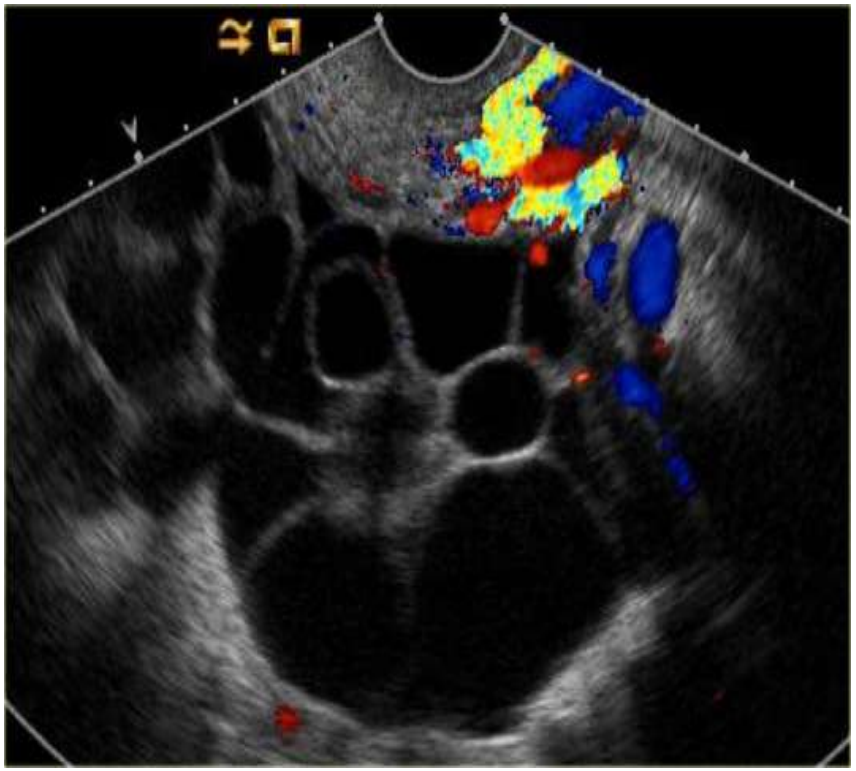
- **Increased follicle number per ovary (FNPO): ≥20**
- **ovarian enlargement (volume >10 mL) excluding dominant follicle >10 mm or corpus luteum**
- **30% have normal ovarian volume.**
- **10 antral follicles of 2-9 mm or more per slice (FNPS): ≥10**
- **individual follicles are similar in size with peripheral distribution gives a "string of pearls" appearance**
- **increased ovarian stromal area to total ovarian area (S/A) ratio)**

PREGNANCY ASSOCIATED OVARIAN ABNORMALITIES

- Ovarian hyper stimulation syndrome
- Hyper reactio luteinalis
- Theca leutein cysts
- Luteomas

THECA LUTEIN CYSTS

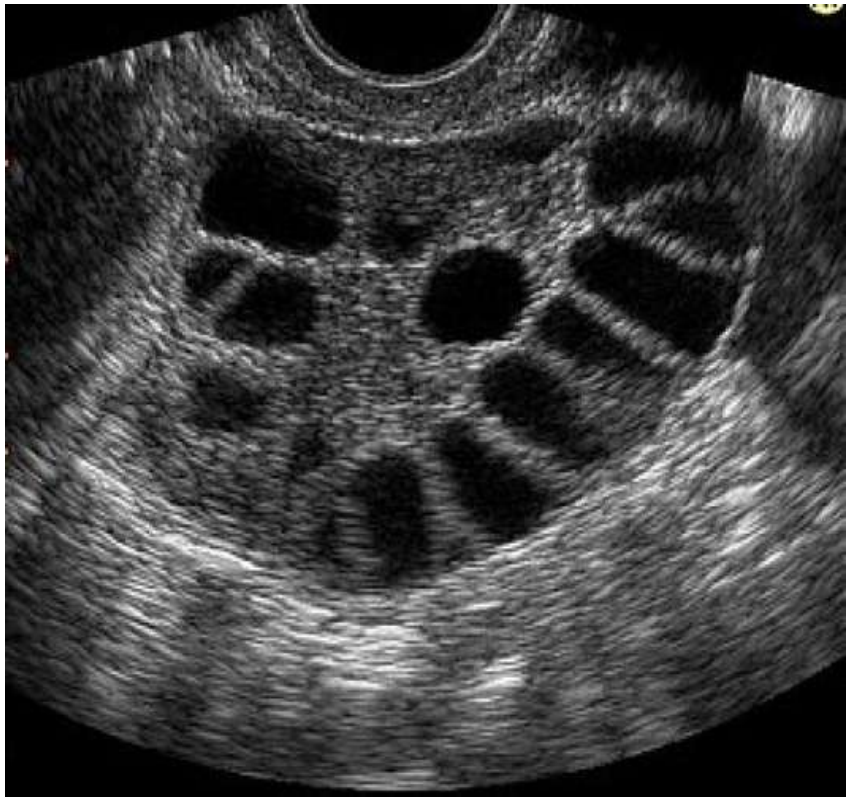
- High beta HCG levels
- History of gestational trophoblastic disease.
- With GTD, the cysts are uncommon in 1st trimester because exposure to elevated HCG has not been long enough to develop the cysts.



Ovarian hyper stimulation syndrome

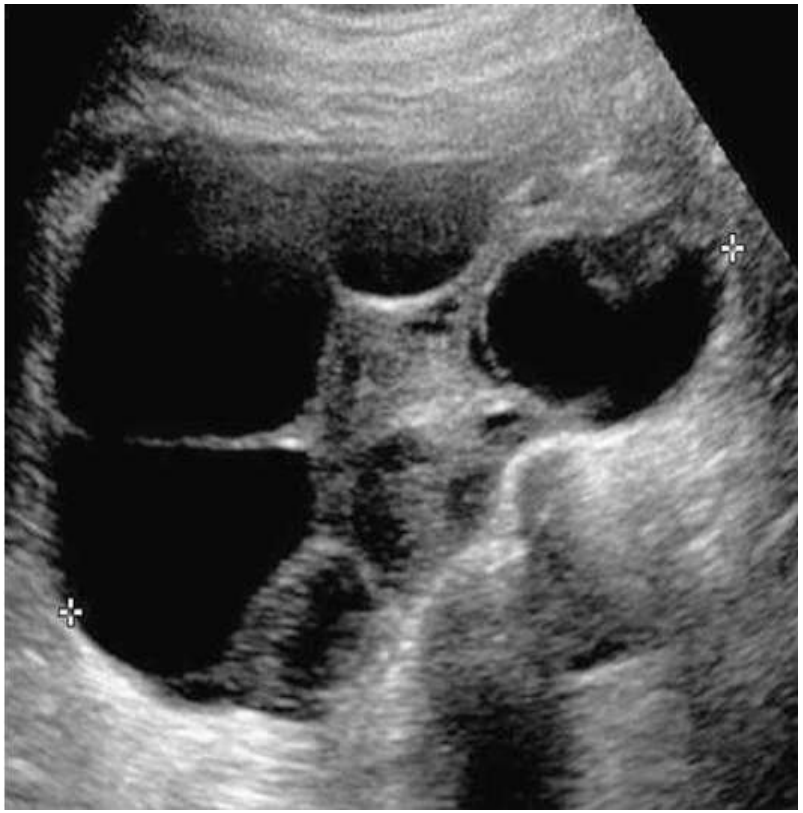
- Hormonal overstimulation by HCG.
- Usually bilateral
- History of IVF, PCOD with some fertility drugs like clomiphene citrate
- Associated with fluid shifts

- Mild: ovaries < 5 cm
- Moderate: ovaries 5-12 cm
- Severe: ovaries >12 cm in diameter



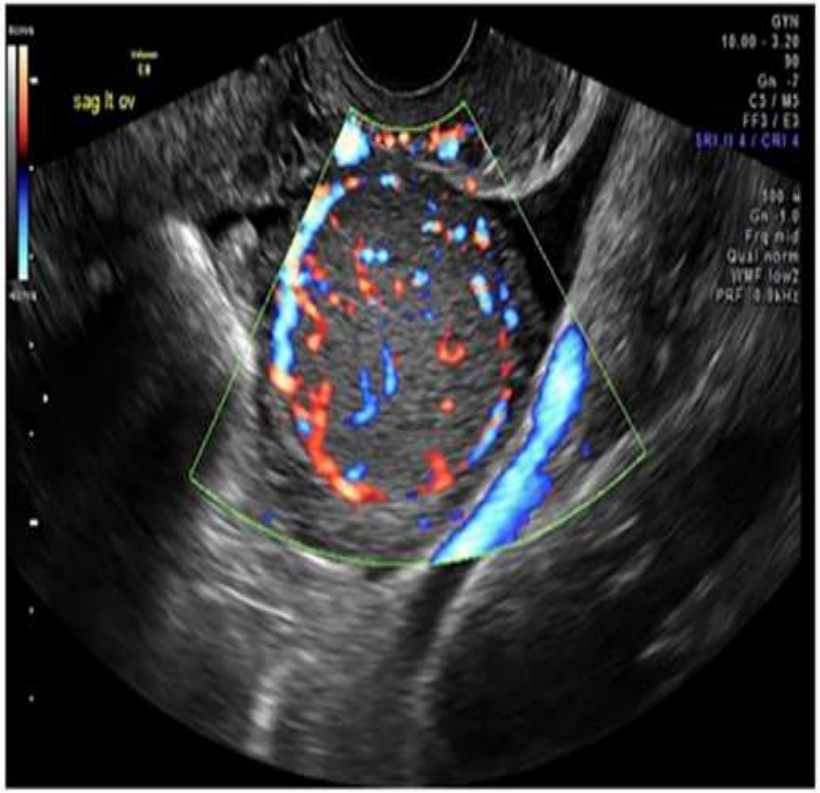
HYPERREACTIO LUTEINALIS

- **Beta HCG Normal Abnormal response to circulating HCG**
- **Theca lutein cysts in the absence of ovulation induction therapy and sometimes in the absence of GTD.**
- **Most commonly occur in 3rd trimester or in puerperium**
- **USG – bilateral enlarged ovaries with multiple cysts similar but smaller than those found in OHS.**
- **Self limiting condition**



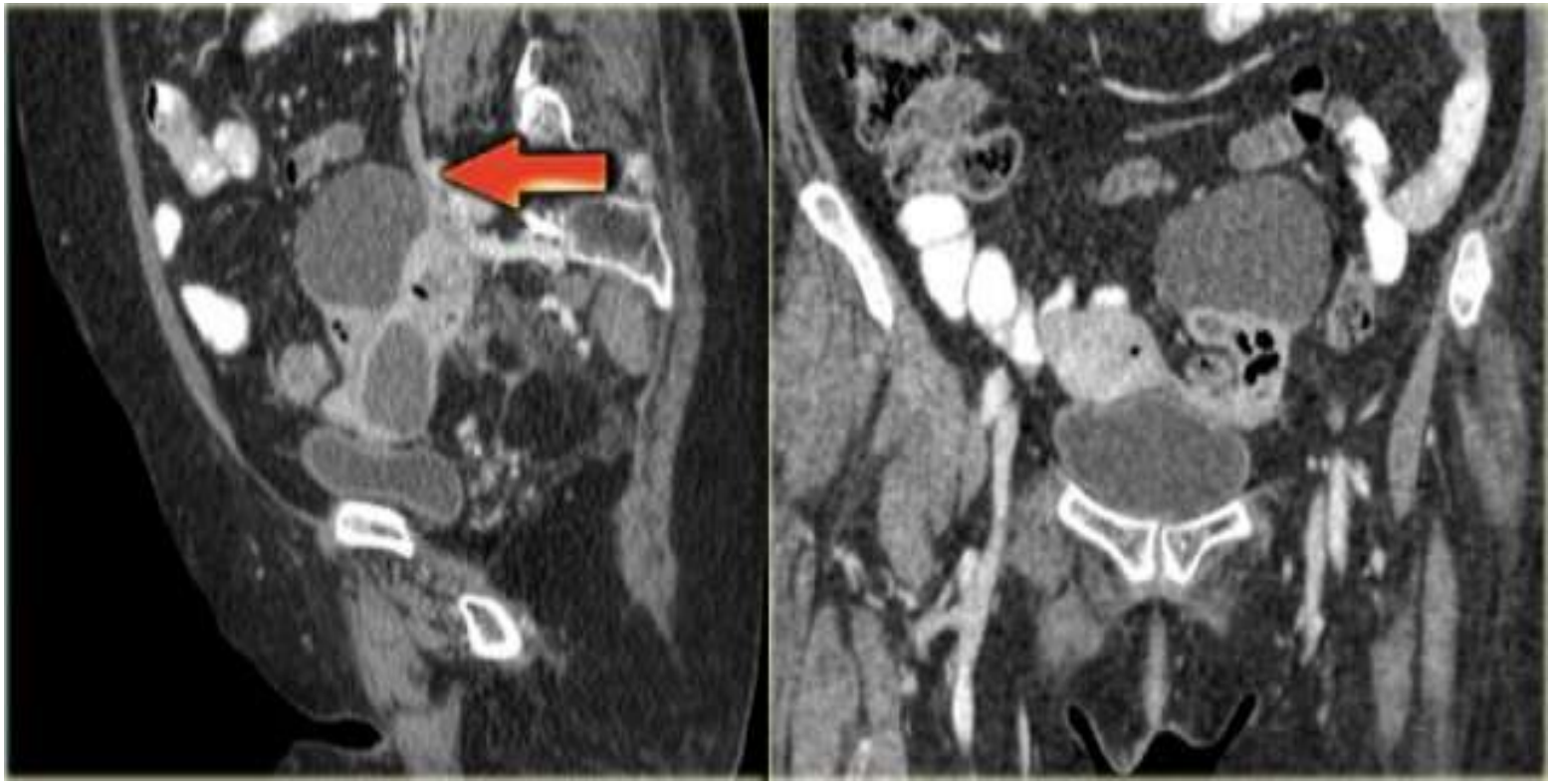
OVARIAN LUTEOMAS

- Incidental finding
- Discovered as small intraovarian mass in pregnant patients who undergo ovarian resection at delivery
- USG - an ovarian mass with solid component with variable cystic areas due to haemorrhage
- virilisation – gives diagnosis.
- m/c cause of maternal virilisation in pregnancy
- Resolves spontaneous after 8 weeks of delivery



TUBO-OVARIAN ABSCESS

- Tubo-ovarian abscess (TOA) usually arises as a complication of Chlamydia or Gonorrhoeae infection that rises from the vagina or cervix to the fallopian tubes.
- On imaging a thick-walled complex cystic ovarian lesion is seen with abundant flow.
- The presence of a thickened endometrium or hydrosalphinx makes the diagnosis of a PID more likelv.



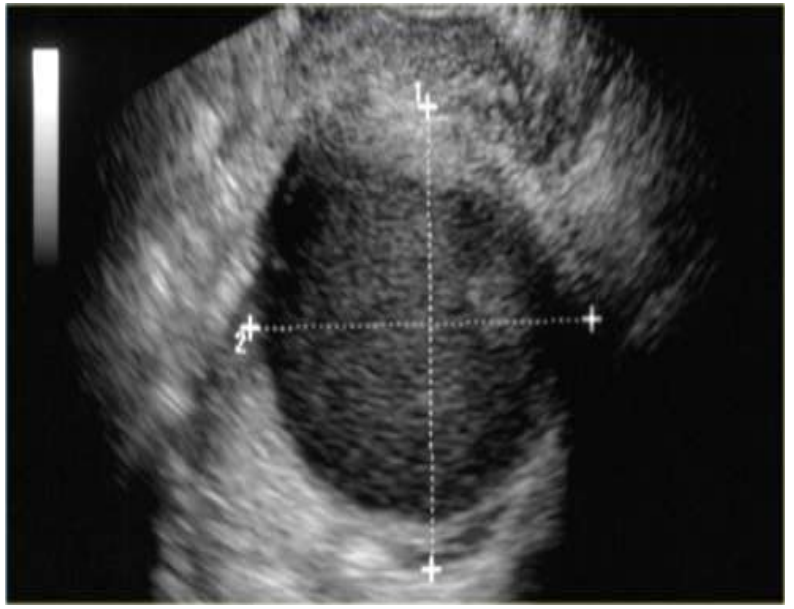
- On the sagittal image, the lesion is connected to the ovarian vein confirming that this is an ovarian lesion.
- The coronal image shows the anatomic connection to the uterus.
- There is a gas bubble in the uterine cavity, which confirms the suggestion of an infection rising from the uterine cavity via the salpinx to involve the ovary

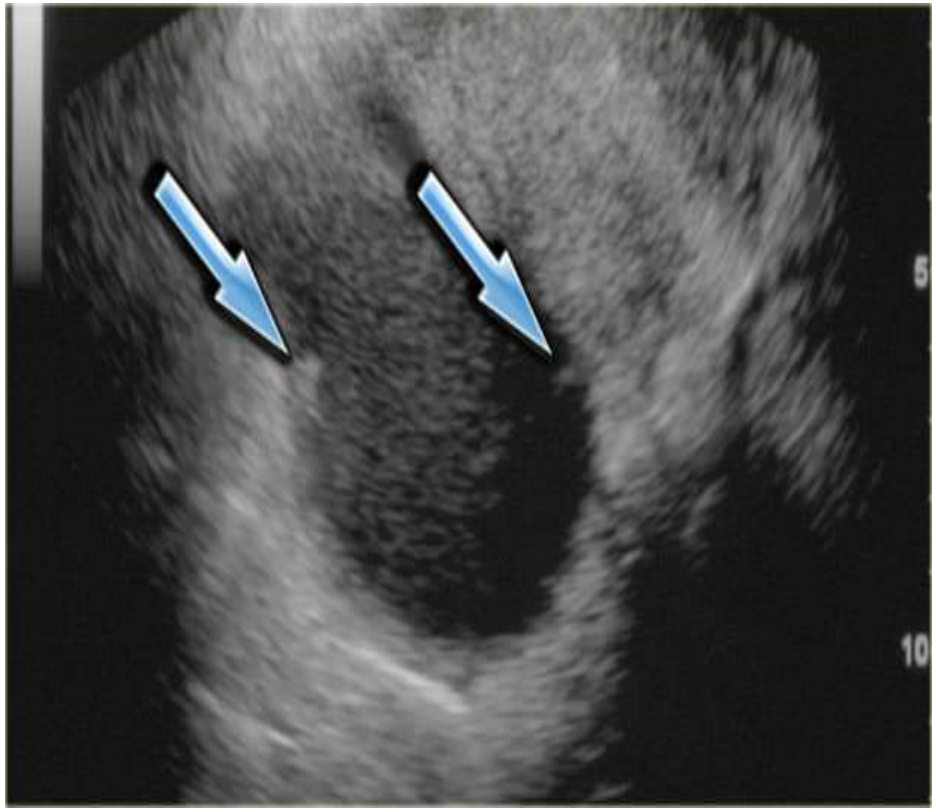
ENDOMETRIOMA

USG:

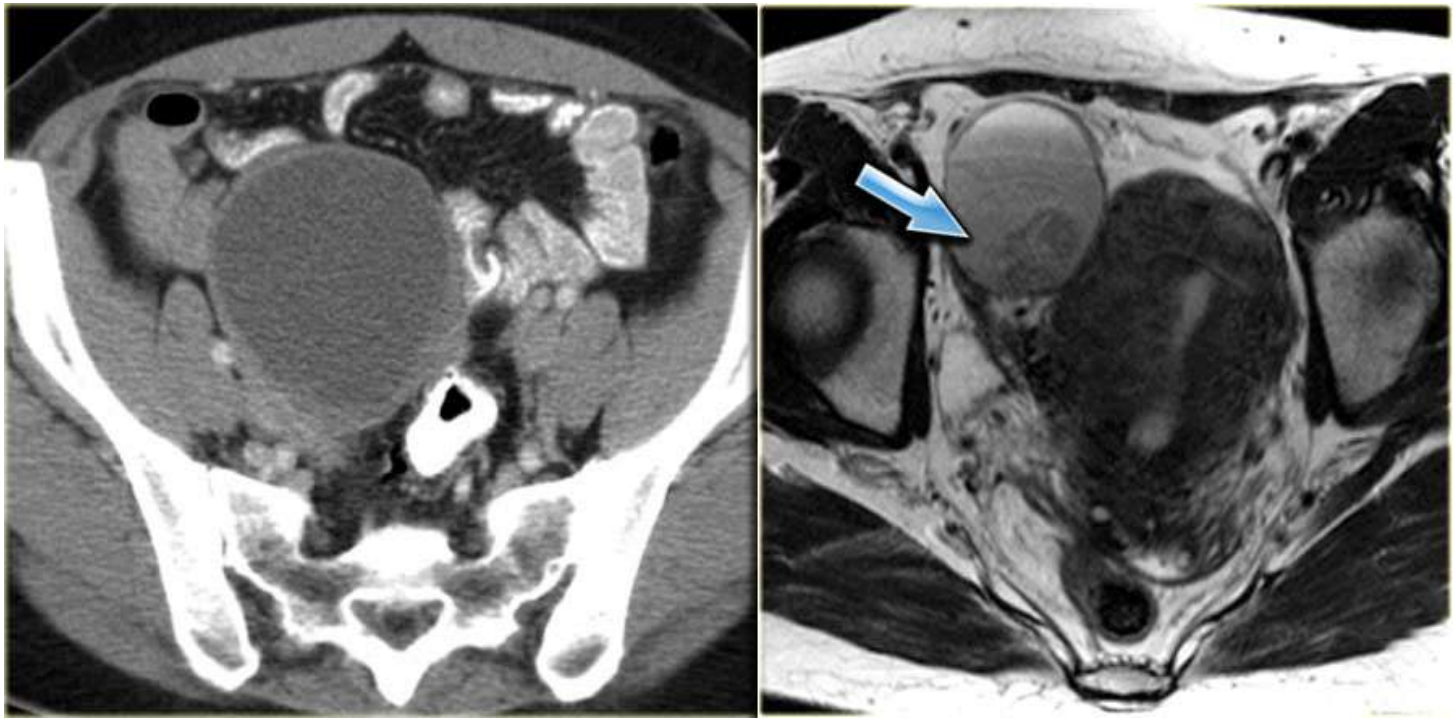
- **Homogeneous and hypoechoic mass**
- **Diffuse low-level echoes (ground-glass) and few echogenic foci in it's wall**
- **No internal flow at colour Doppler**
- **No enhancing nodules or solid masses**
- **In 30% echogenic foci are seen within cyst wall**

Require initial 6-12 week follow up to rule out hemorrhagic cyst.

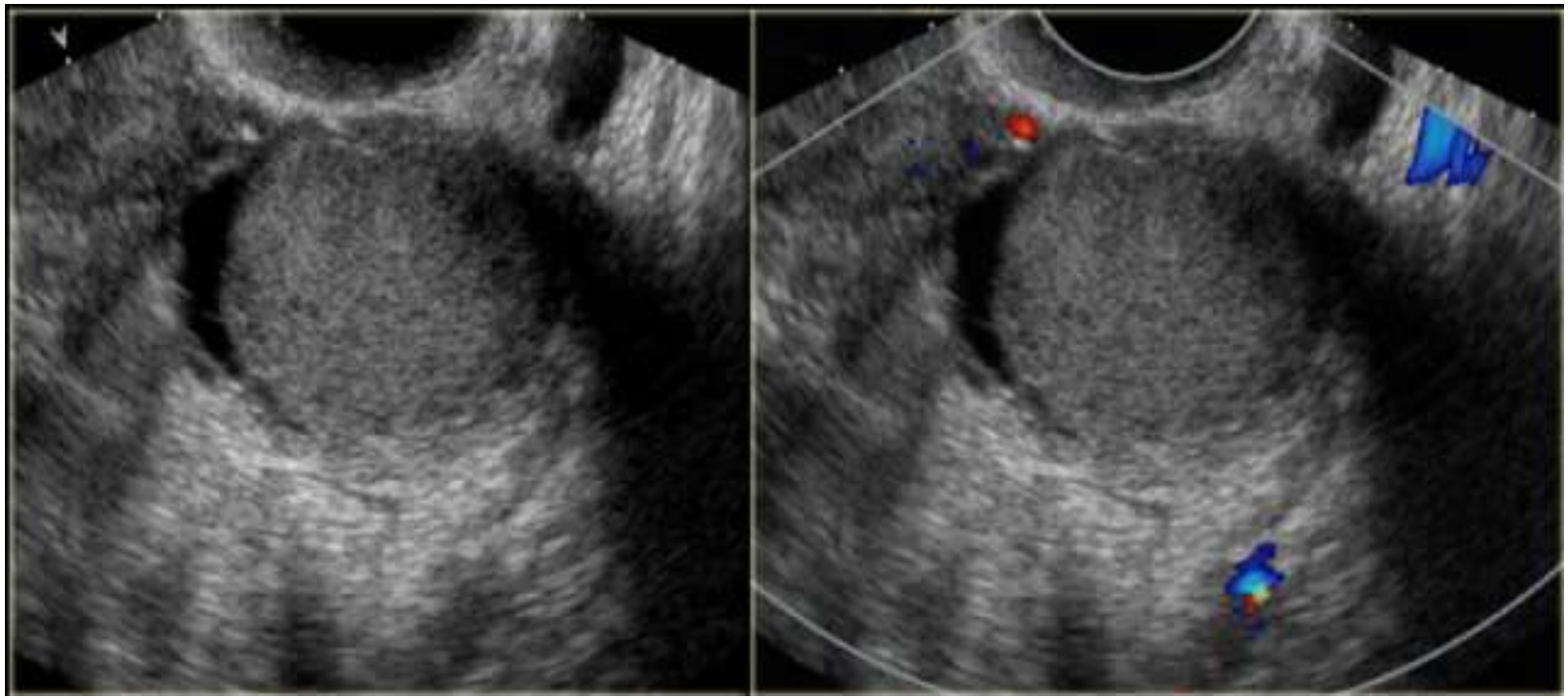




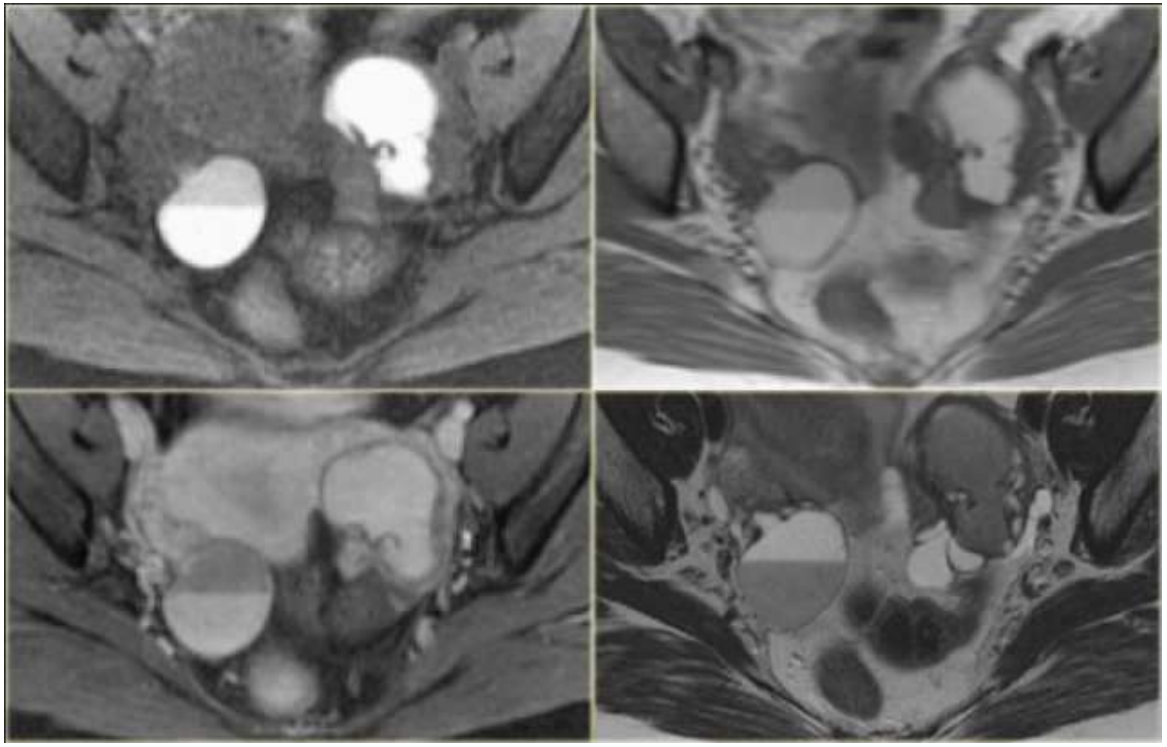
- **In 1/3rd of patients, small echogenic foci can be seen adhering to the wall – cholesterol deposits, but may also constitute small blood clots or debris.**



- CT shows the same, predominantly cystic lesion.
- If additional imaging is needed for cysts that are indeterminate at ultrasound, it is better to perform MRI.
- The T2-weighted image on the right correlates nicely with the ultrasound image.
- On T2-weighted images endometriomas typically show 'shading'.



- **unilocular, mildly hypoechoic ovarian lesion with through transmission.**
- **There is no internal or wall vascularity on Doppler.**
- **D/Ds: hemorrhagic cyst or endometrioma.**
- **Follow up MRI**



- T1W – hyper intense.
- The bright signal persists on fat saturation indicating the presence of blood.
- There is T2 shading consistent with a hemorrhagic lesion.
- There is no enhancement.
- The fluid-fluid level in the right ovarian lesion also confirms its cystic nature

OVARIAN NEOPLASMS

A] Epithelial cell tumours

- Serous cystadenoma and cystadenofibroma
- Serous borderline tumour
- High grade serous cystadenocarcinoma
- Mucinouscystadenoma and cystadenocarcinoma
- endometrioid and clear cell carcinoma
- Brenner's tumour

B] Germ cell tumours

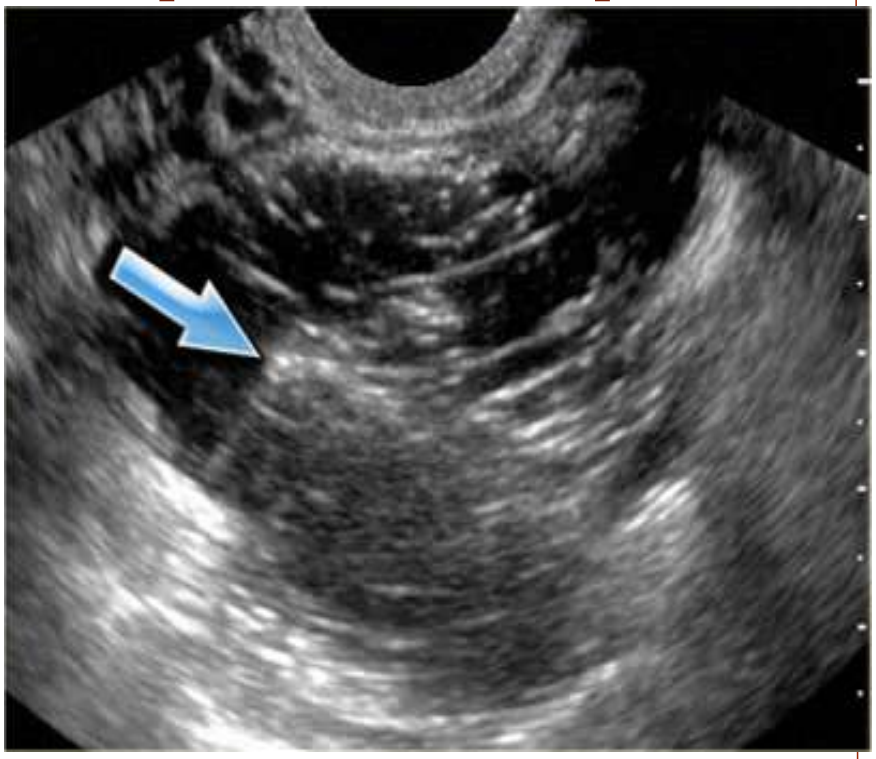
- Teratoma
- Dysgerminoma
- Yolk sac tumour

C] Sex cord stromal tumours

- Granulosa cell tumour
- Fibroma
- Sertoli-leyding cell

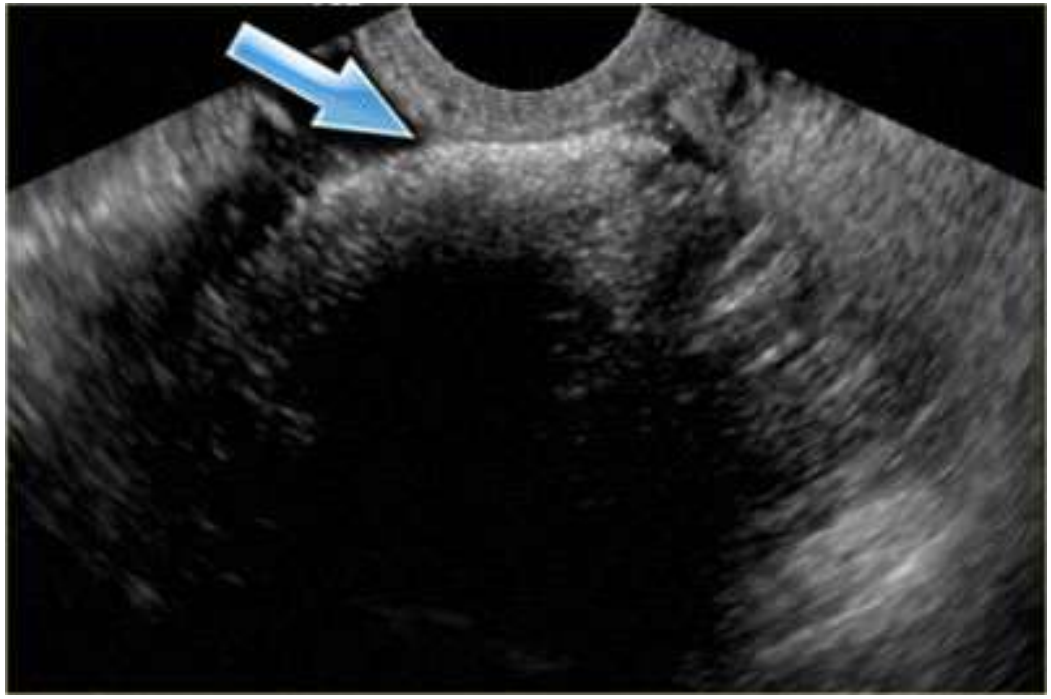
D] metastatic

MATURE CYSTIC TERATOMA [DERMOIDS]

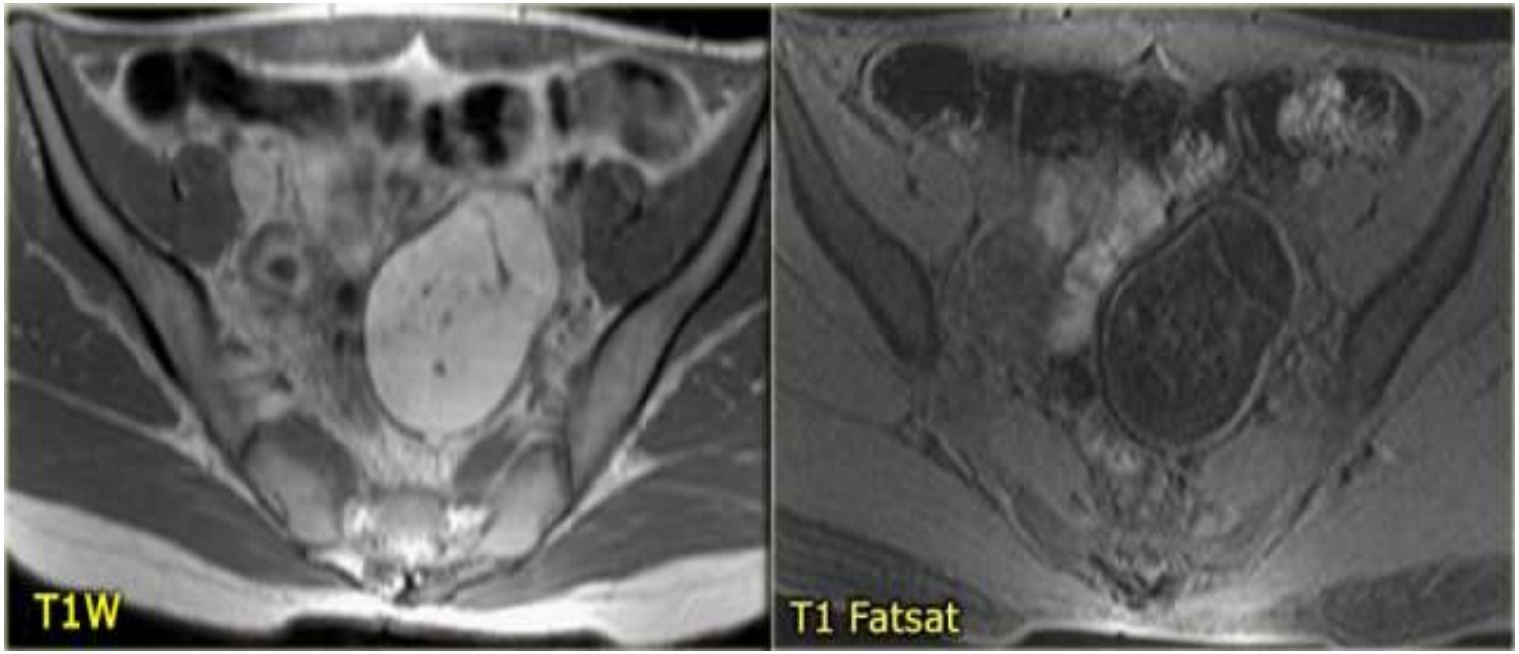


- young women of child-bearing age.
- unilocular (up to 90%) but can be multilocular, and are bilateral in ~15%.
- Up to 60% may contain calcifications.
- The cystic component is fluid, fat, produced by sebaceous glands in cyst lining and echogenic spherical structures.
- The presence of fat is diagnostic.
- USG:

cystic mass, with a hyperechoic solid mural nodule, which is called a Rokitansky nodule or dermoid plug.

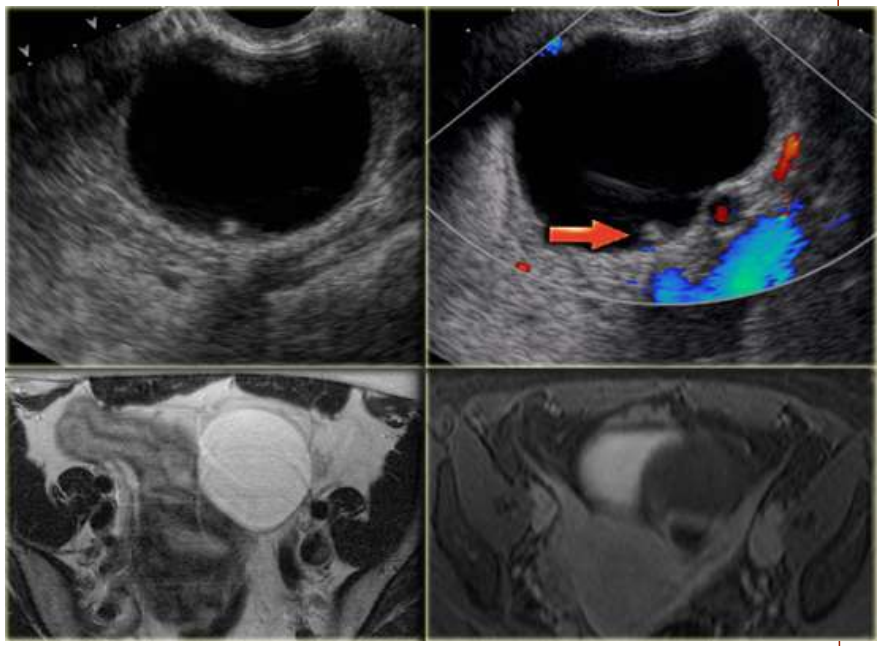


- **In another case the transvaginal ultrasound shows the 'tip-of-the-iceberg' sign: acoustic shadowing from the hyperechoic part of the dermoid cyst.**
- **A fat-fluid level may be present, caused by fat floating on more aqueous fluid.**
- **Multiple thin, echogenic lines or stripes may be seen, caused by hair floating in the cyst cavity.**



- **Axial T1-weighted image in the same patient shows a bright lesion with an internal septations.**
- **A septation is seen in about 10% of these lesions.**
- **On the T1-weighted image with fat suppression there is suppression of the signal.**
- **This confirms the fatty content and is diagnostic of a teratoma.**

CYSTADENOMA AND CYSTADENOFIBROMA



- At imaging a serous cystadenoma is most often unilocular and anechoic, and may look like a simple cyst.
- Mucinous cystadenomas are most often multilocular with thin (The locules may contain complex fluid, due to proteinaceous debris or hemorrhage, or both.
- The finding of papillary projections should raise the suspicion of a possible borderline malignancy or a cystadenocarcinoma.

TVS:

Anechoic left ovarian cyst with no septations.

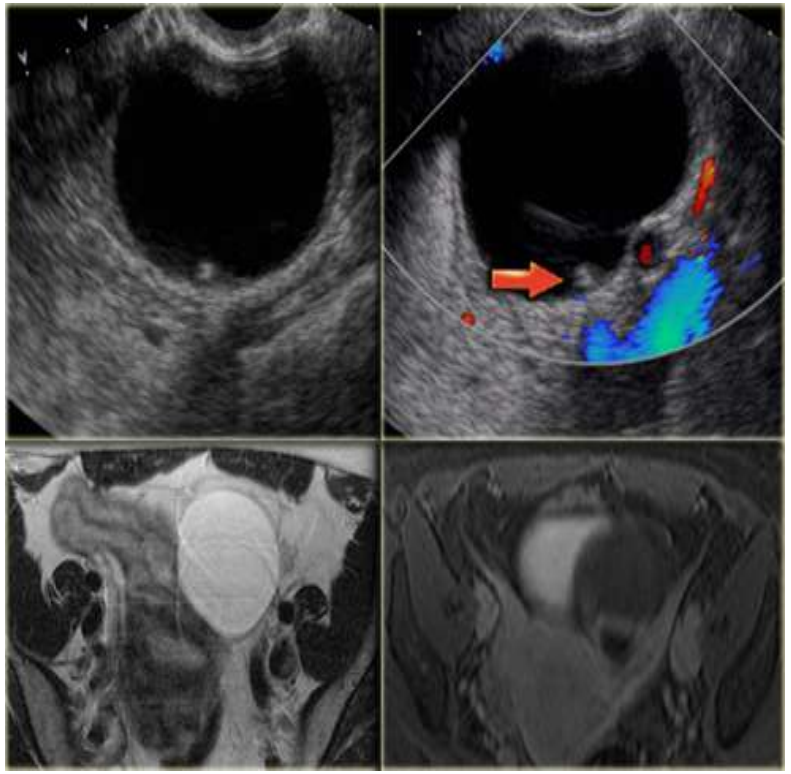
There is nodule on the posterior wall that shows no flow on Doppler.

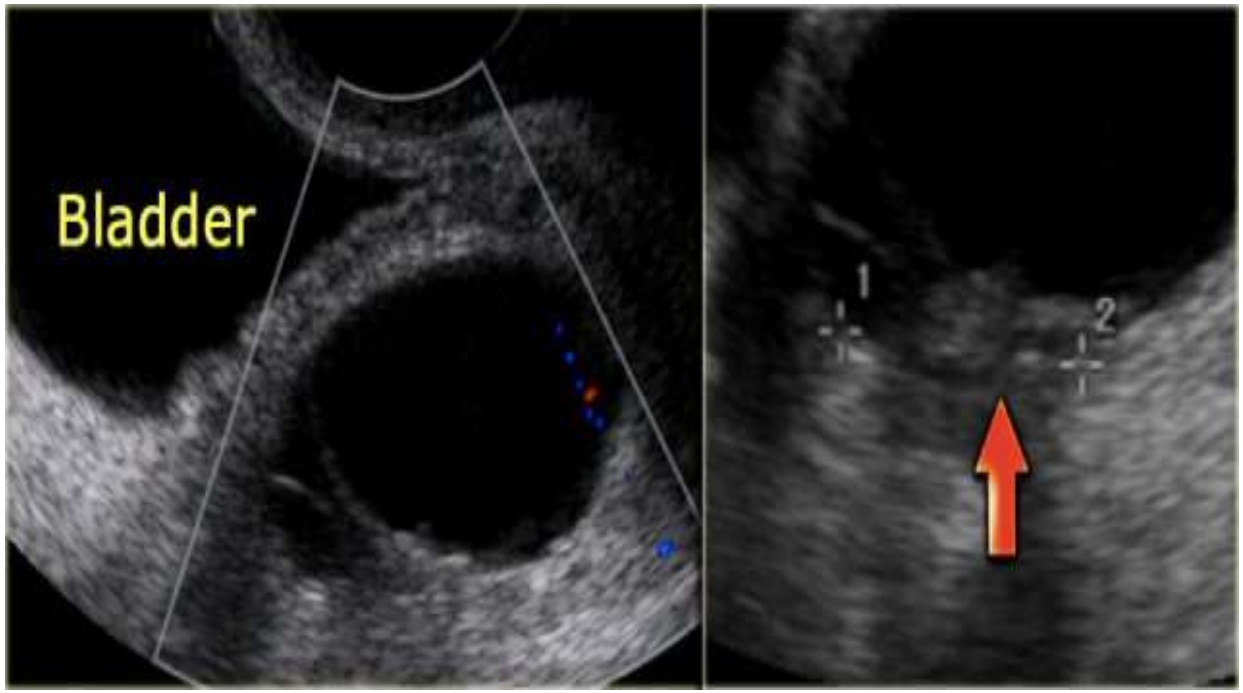
This may be a follicular cyst with some debris, but a cystic neoplasm cannot be excluded.

Work-up with MRI is recommended.

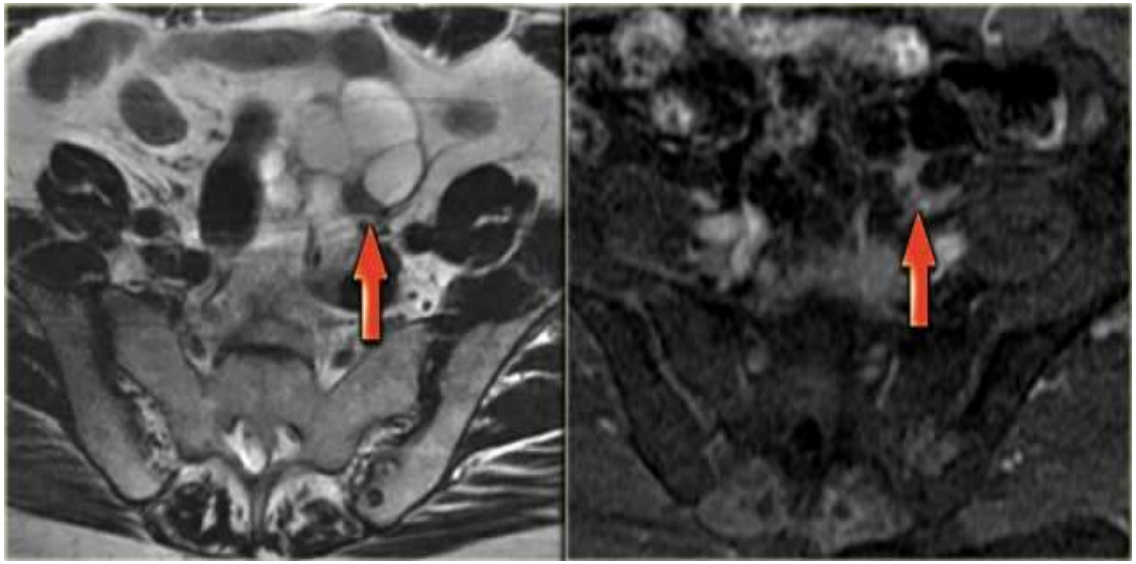
<u>MRI:</u>

- **T2-weighted image of the same patient shows thin enhancing septations.**
- **There are no tumor nodules and no adenopathy or peritoneal deposits.**
- **This proved to be a cystadenoma.**



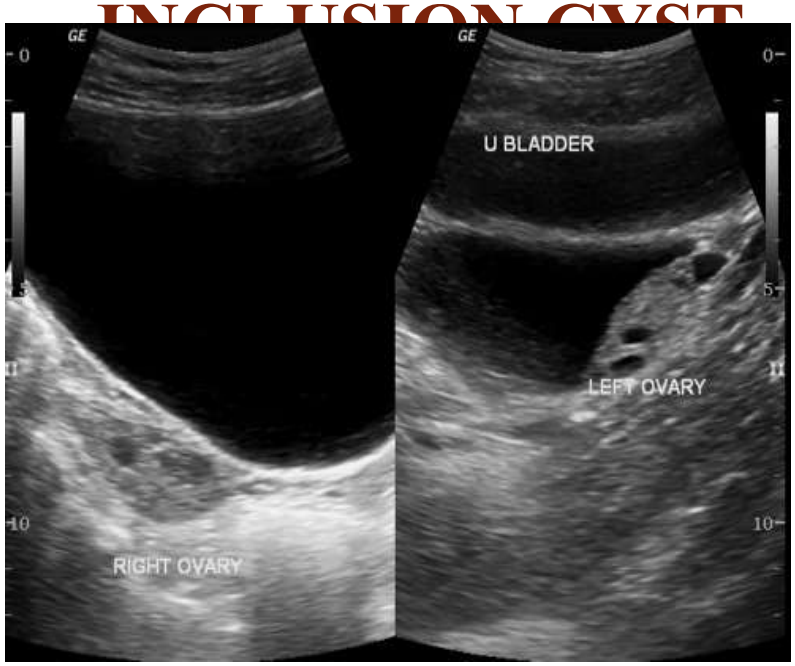


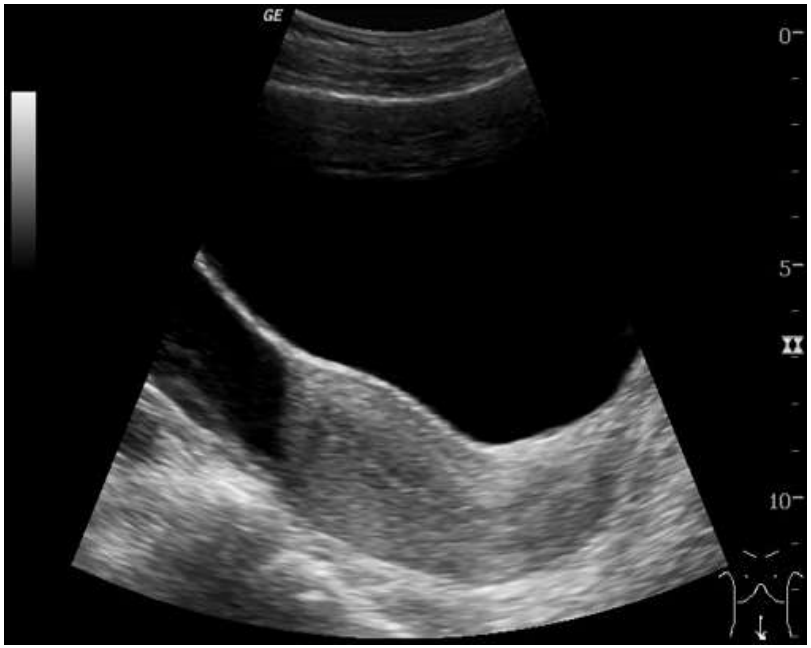
- On the posterior wall a solid mural nodule is found, which is avascular.
- No secondary signs of malignancy.
- Continue with the MRI.



- Axial T2 shows a complex cystic left ovarian lesion, with a solid nodule on the posterior wall.
- At post-contrast axial T1W-FatSat the thin septa and the mural nodule show slight enhancement.
- On the basis of these findings the distinction between a benign ovarian lesion such as a cystadenofibroma and a malignant lesion cannot be made.
- The lesion was resected and was found to be a cystadenofibroma.

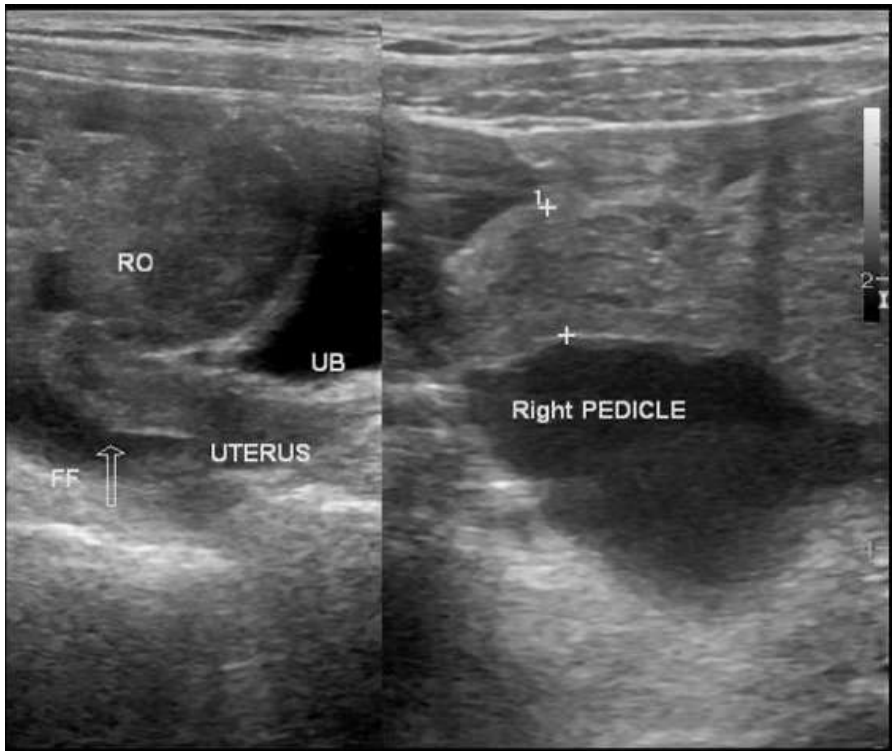
PERITONEAL INCLUSION CYST





An irregular fluid collection is seen within the left adnexa extending up to the lumbar region. It abuts the uterine fundus. The ovary is noted at the lower end of the fluid collection. Few septa radiating towards the ovary. Ovarian parenchyma is normal. History of some surgery would be there.

OVARIAN TORSION



- **USG:**

enlarged edematous globular ovary [>5 cm in diameter or >20 cc volume]

stromal hypo echogenicity (edema) or patchy hyperechogenicity (hemorrhage)

cystic or hemorrhagic degeneration (indicates established infarction)

peripheral follicles surrounded by a hyperechoic ring (follicular ring sign) most likely due to hemorrhage in the thecal layer

unusual ovarian location e.g. anterior or posterior to the uterus, or a change in position

tilted uterus (pulled by the twisted ligaments)

- **Doppler findings in torsion are variable:**

little or no ovarian venous flow (sensitivity of 100% and specificity of 97%)

asymmetrical flow compared to normal ovary

HYDRO SALPINX

- **Secondary due to pelvic inflammatory disease.**

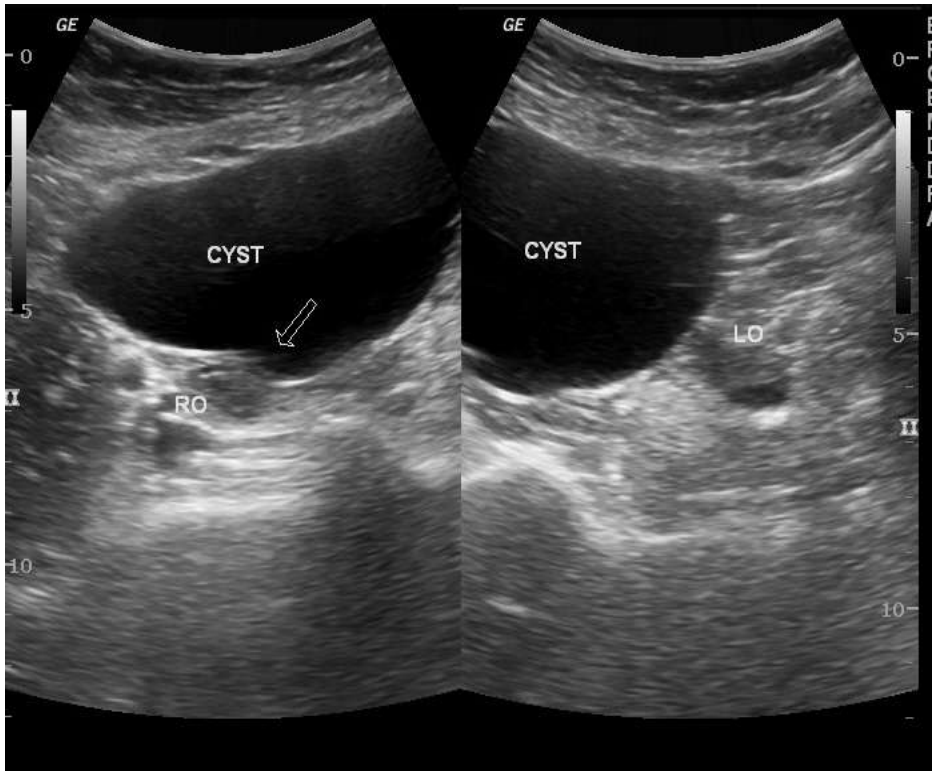
USG:

Cystic, elongated or folded anechoic tubular C or S-shaped fluid-filled structure in adnexa incomplete septations and lack of vascularity.

distinct from the uterus and ovary.

- **Longitudinal folds may produce a characteristic "cogwheel" appearance in cross-section.**
- **Indentations on the opposite sides of the wall are referred to as the waist sign. The waist sign, in combination with a tubular-shaped cystic mass, has been found to be pathognomonic of a hydrosalpinx.**

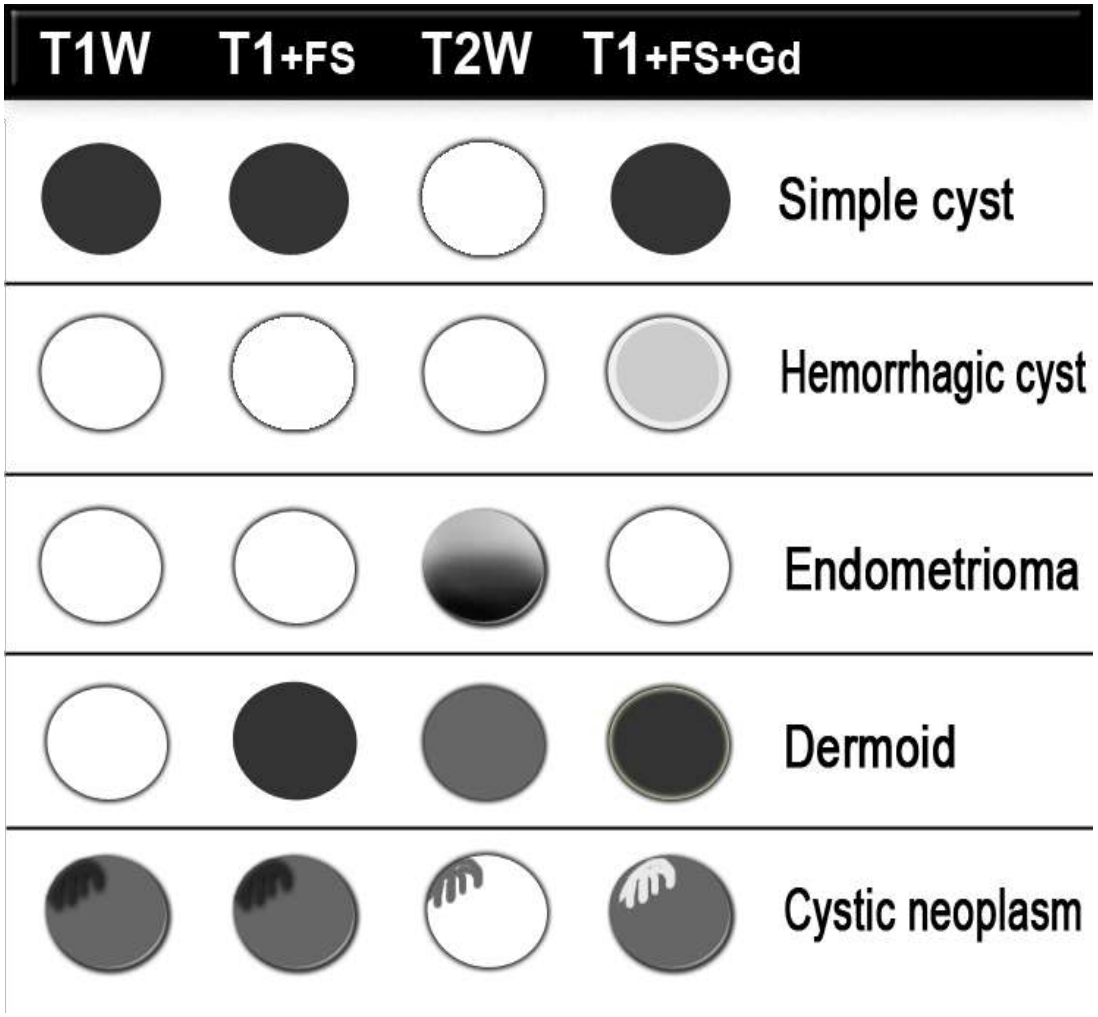
Para ovarian/tubal cyst



- well-defined, thin walled, anechoic cystic lesion abutting right ovary. There are no calcifications / thick septa / mural nodules in cyst. Right ovary shows normal follicular pattern.
- Left ovary is also normal.

- **MRI PROTOCOL**

T2W without fatsat
T1W with and without fatsat
T1W post contrast with fatsat subtraction images
T1W post contrast upper abdomen for screening
DWI – lymph nodes and detection of peritoneal deposits



THANK YOU