

## Female Pelvis – The art of ultrasound –

Beryl Benacerraf M.D  
*Harvard Medical School*



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## Financial disclosures

- I have nothing to disclose.
- No conflicts of interest

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## Why does quality of pelvic ultrasound vary so much in the US?

- Ultrasound is unique and is in a different category from other X-sectional imaging.
- Unlike CT and MR (static images), ultrasound offers the integration of realtime dynamic imaging, physical examination while taking a history.
- This renders GYN ultrasound operator-dependent compared to CT or MR, but there is so much added benefit!

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- Unfortunately ultrasound training does not appear to have kept up in many programs and is variable depending on teachers available.
- Trend in Radiology programs: GYN ultrasound increasingly involves a remote encounter with images read out of context by someone who did not speak to or examine the patient and possesses scant case-specific clinical information on a requisition.
- Interpreting images in isolation from the patient limits the effectiveness of ultrasound

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## How to do the most effective GYN ultrasound

- Talk to the patient – ask the patient to describe her symptoms
- Realtime: combine imaging and phys. exam
- 3D Volume imaging – use reconstructed views such as coronal view
- Color Doppler - combine vascular and morphologic imaging
- Consider non-gynecologic diagnoses – appendix, bowel etc...

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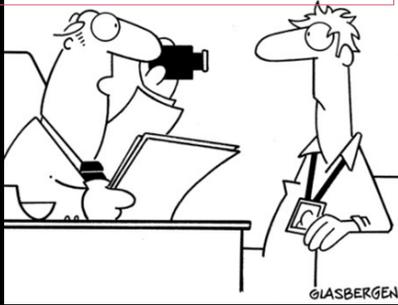
## Talk to the patient! Get a history during the exam

- Acute or chronic
- Diffuse or focal
- Cyclical or constant
- Sharp or dull or cramping
- ? Prior surgery
- Menopausal and hormonal status
- Could she be pregnant?

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Talk to the patients – where is pain, how long, cyclical, sharp, crampy, bleeding, when, how long, how much?

*It is a mistake to remove the radiologist from interacting directly with the patient.*



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## Ultrasound allows us to combine imaging with physical exam

- The ability to examine and image patients simultaneously offers considerable often neglected value, unique to ultrasound as a cross sectional imaging technique.
- Tenderness-guided ultrasound is an effective way of detecting implants of painful deep penetrating endometriosis.
- Testing the movement of lesions while scanning is essential to make the correct dx

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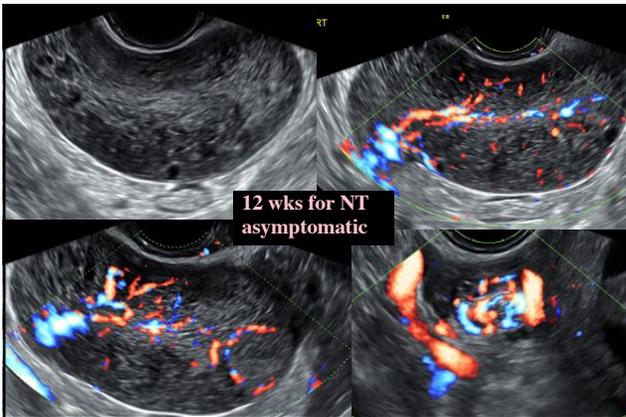
## During the scan

- How tender is the patient?
- Where is the tenderness? Focal?
- Do organs slide past each other?
- Push deliberately on each part of the pelvis with the probe and other hand to determine where the pain comes from.
- Does the cyst jiggle?

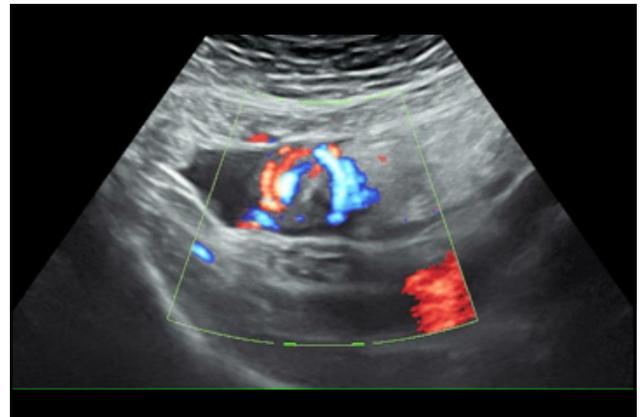
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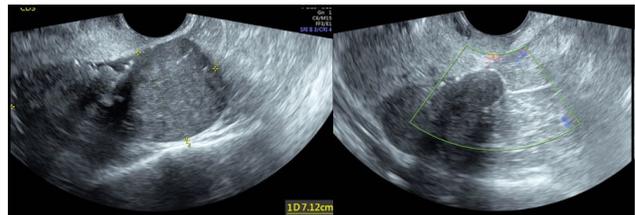


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**2<sup>nd</sup> opinion 70 yo after MRI for pelvic mass. ? whether ovarian or uterine**

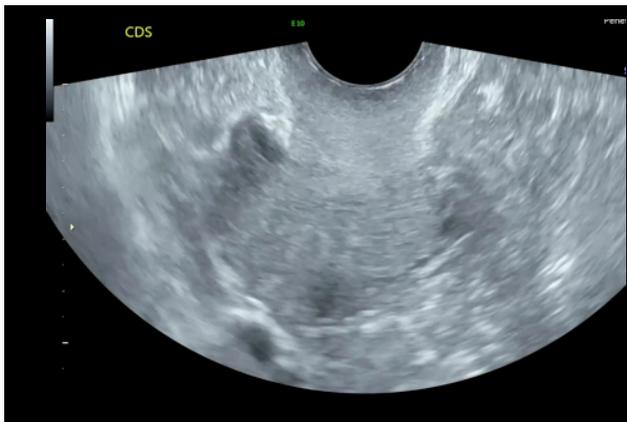


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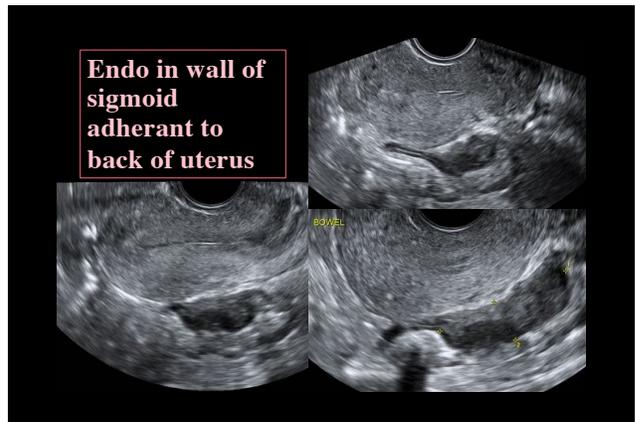


**Conclusion:**  
 1. A 3.7 cm above-described enhancing, left adnexal mass contiguous with uterine cervix with restricted diffusion does not have typical MRI characteristics of a fibroid or cystic ovarian lesion and should be considered an indeterminate solid mass of benign or malignant etiology (ovarian origin more likely). Recommend gynecologic consultation and tissue sampling/exploration laparotomy for definitive diagnosis.

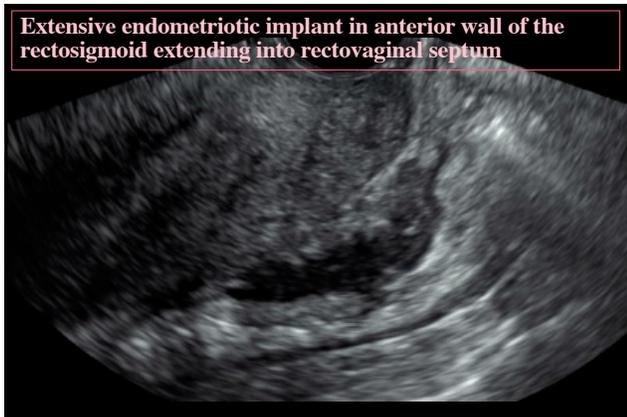
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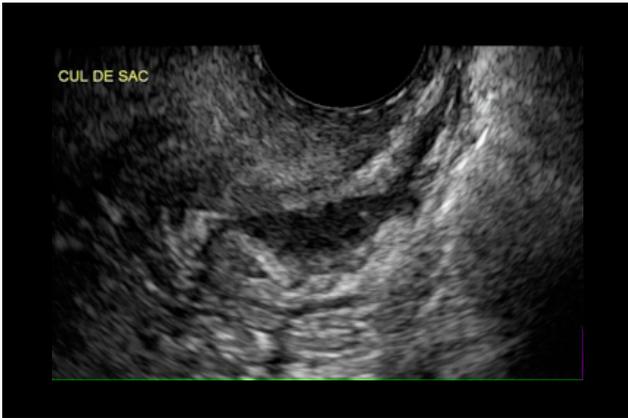
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**Ultrasound vs. MR for detecting endometriosis**

The sensitivity and specificity for detecting deep endometriosis by *tenderness guided* ultrasound was - 86% and 73% respectively while for MR it was - 90% and 73% respectively.

Saba et al. J Magn Reson Imaging. 2012 35:352-60.

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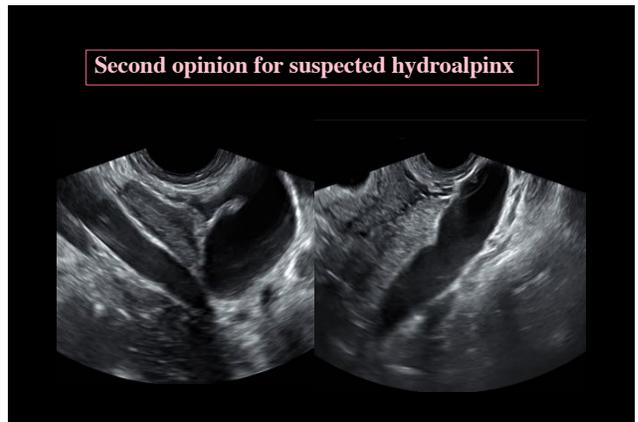
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**Ultrasound vs. MR**  
**198 pts with surgically confirmed rectosigmoid endometriosis**

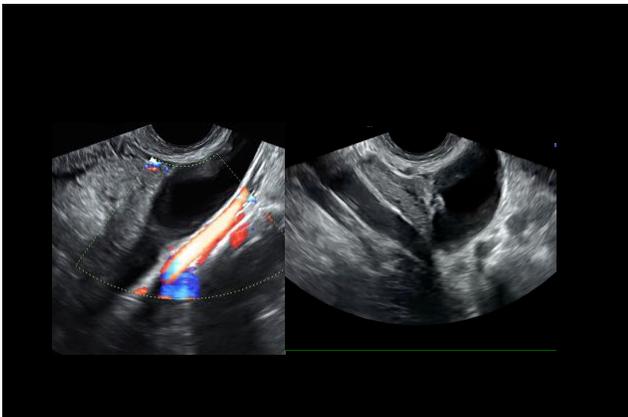
	Sensitivity	Specificity	Accuracy
<b>Ultrasound</b>	<b>98%</b>	<b>100%</b>	<b>99%</b>
<b>MR</b>	<b>83%</b>	<b>98%</b>	<b>98%</b>

Abrao et al. Hum Reprod. 2007;22:3092-7

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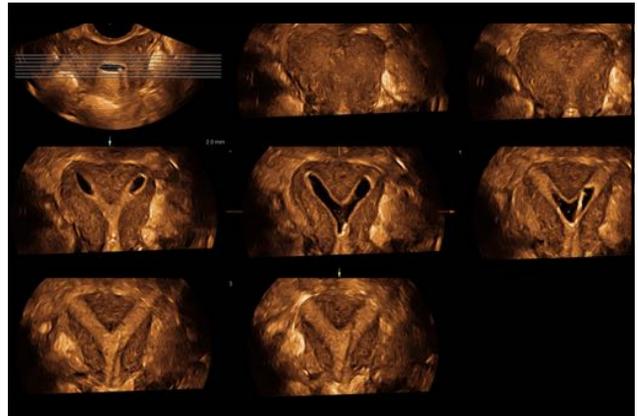


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### 3D Volume imaging – use reconstructed views such as coronal view

- There are now many indications for imaging of the pelvis which would previously have only been possible with MR but are now part of 3D ultrasound capabilities.
  - Uterine shape
  - IUCD
  - Localization of fibroids/polyps
  - Adnexal or tubal masses.

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### Three Right Angled Planes

- Volume acquisition is done to obtain an image in 3 planes. A dot representing a single point in space can be seen in all 3 images.
- This technology provides the ability to see anatomic sections in an orientation different from the acquisition section.

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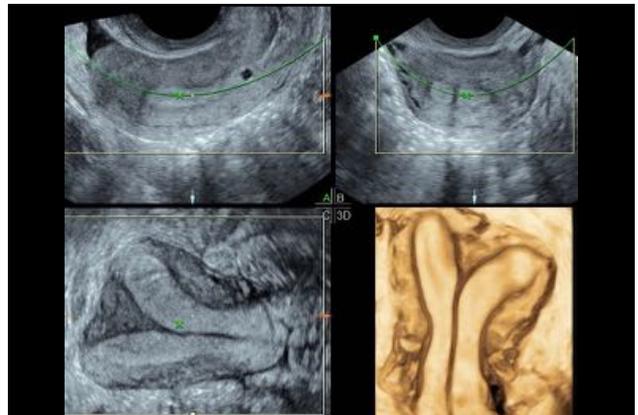


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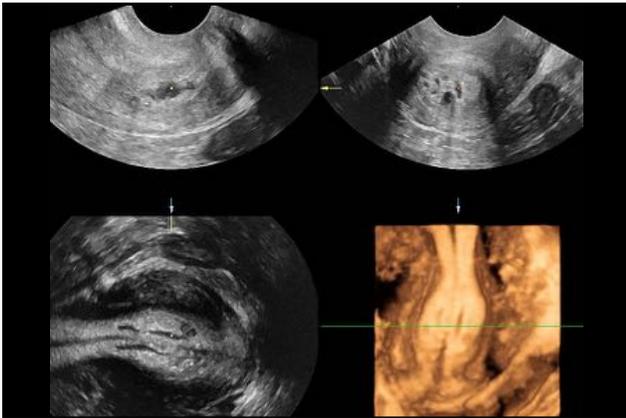
### The value of having a volume rather than a slice: *It is in the display*

- Three Right Angled Planes (MPR)
- The coronal view (rendered)
- Inverse mode
- Tomographic parallel cuts (TUI)

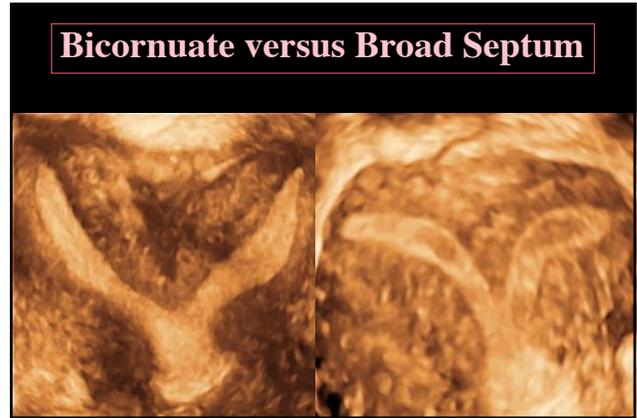
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**Bicornuate versus Broad Septum**

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**3D Ultrasound and Uterine anomalies**

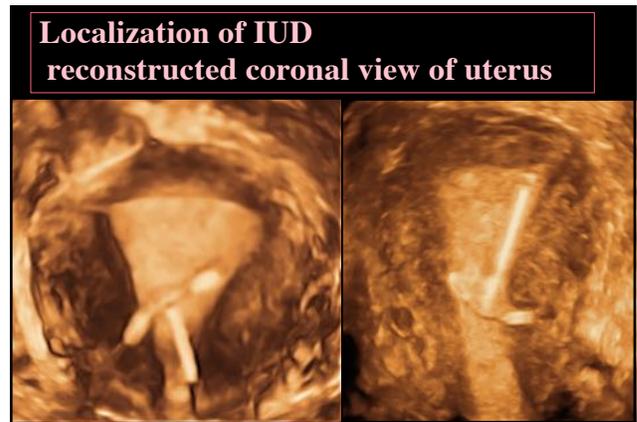
PubMed search found the articles on MR vs 3DUS for the dx of uterine anomalies.

	Sensitivity	Specificity
Ultrasound 3D	98-100%	100%
MR	28.6-100%	66-100%

We believe that 3DUS will emerge as the standard for the diagnosis of uterine anomalies.

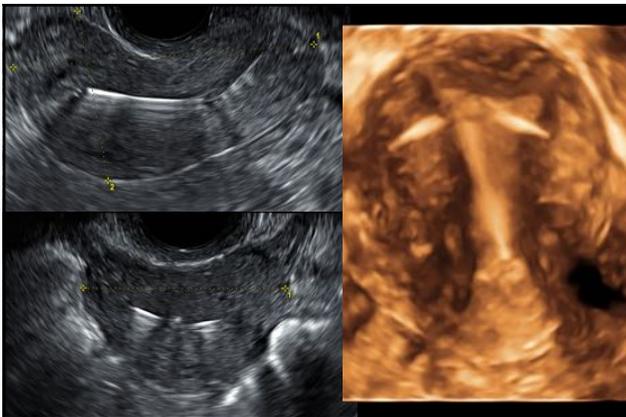
Deutch TD, Abuhamad AZ. JUltrasound Med. 2008;27:413-23.

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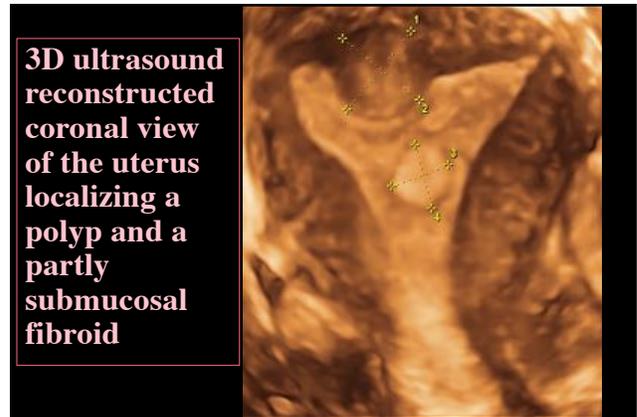


**Localization of IUD  
reconstructed coronal view of uterus**

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**3D ultrasound  
reconstructed  
coronal view  
of the uterus  
localizing a  
polyp and a  
partly  
submucosal  
fibroid**

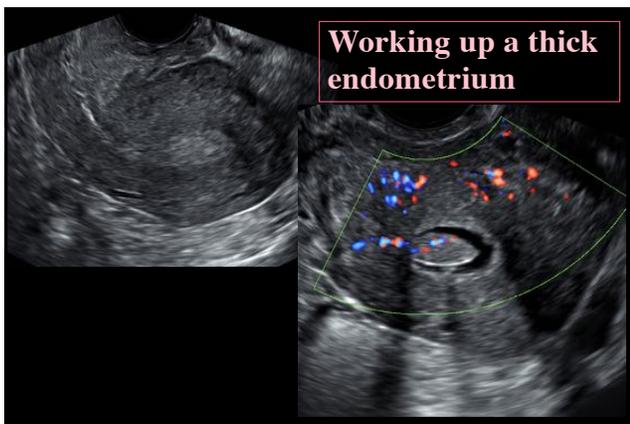
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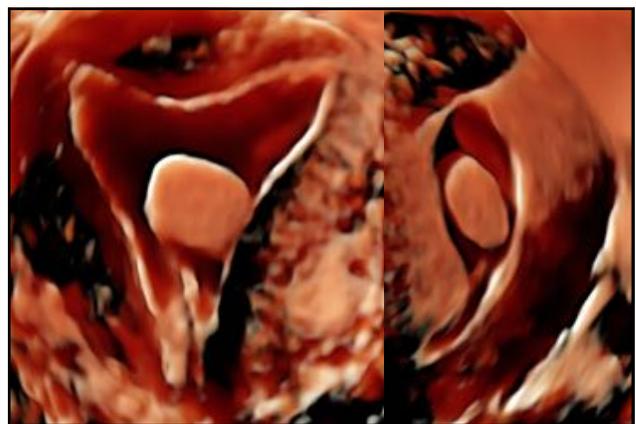
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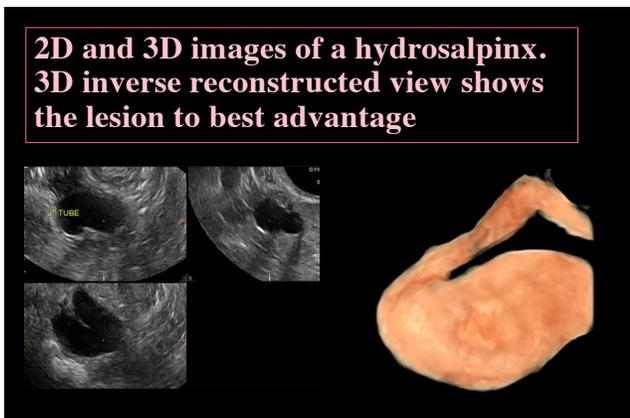
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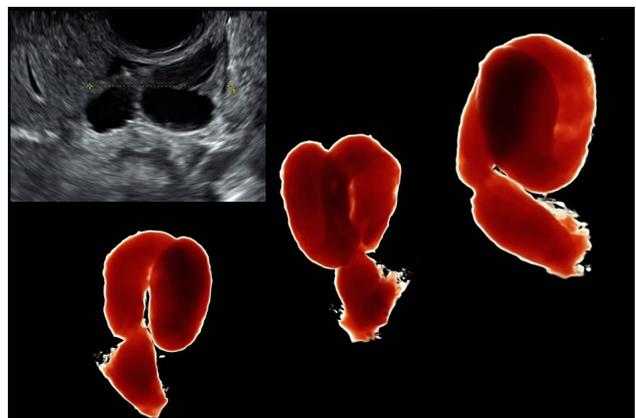
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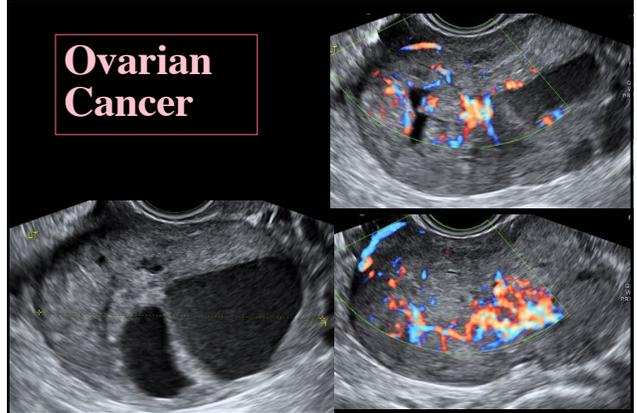
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**Doppler color flow provides crucial information about the lesion**

- Color Doppler combines vascular and morphologic imaging
- Color Doppler mapping can be the key to evaluating adnexal masses without the need for contrast.
- Cancers have abundant blood flow, benign lesions have limited flow
- The corpus luteum has characteristic circumferential flow.

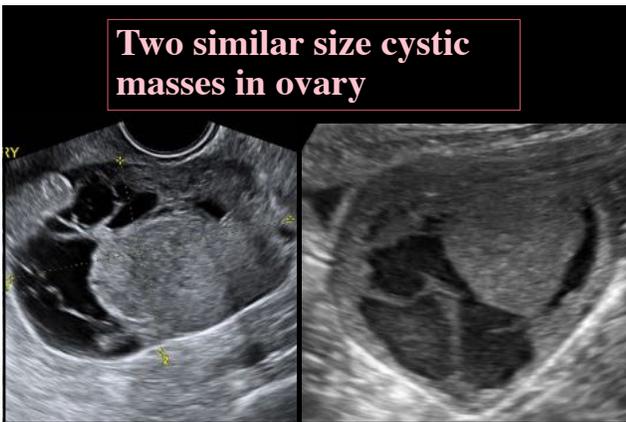
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**Ovarian Cancer**



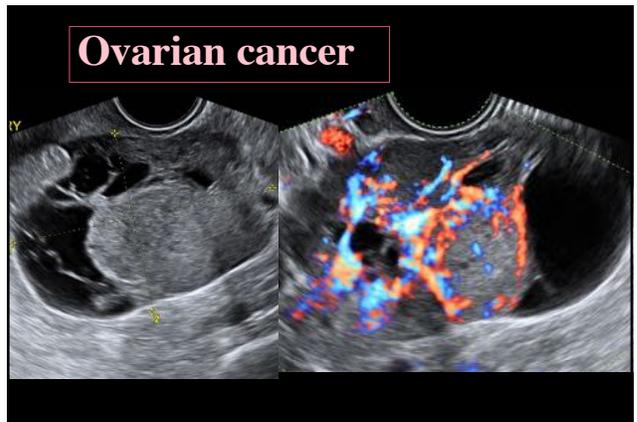
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**Two similar size cystic masses in ovary**



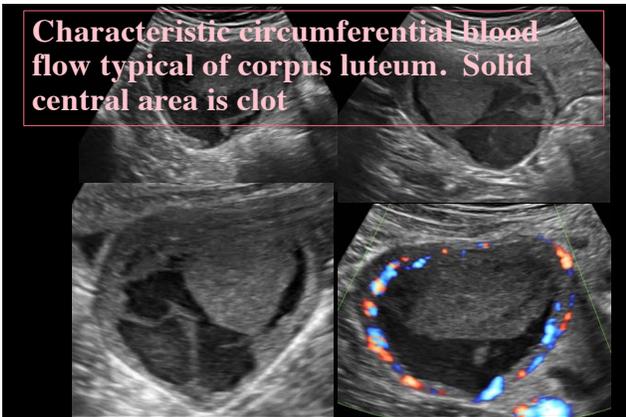
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**Ovarian cancer**



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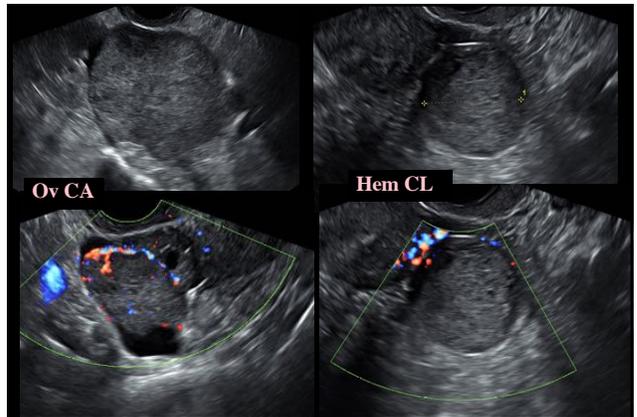
**Characteristic circumferential blood flow typical of corpus luteum. Solid central area is clot**



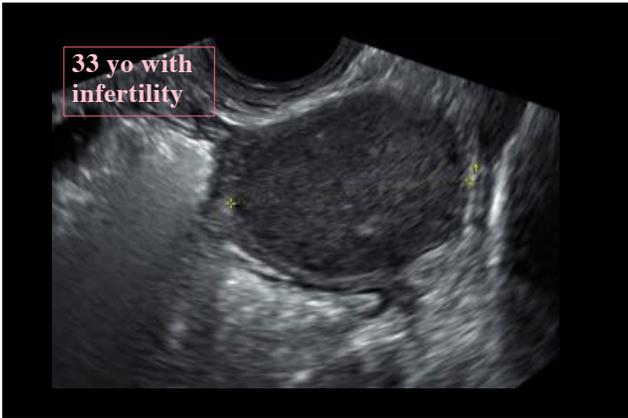
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Ov CA

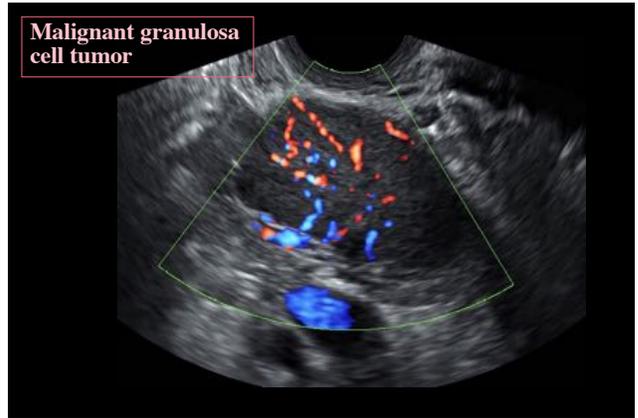
Hem CL



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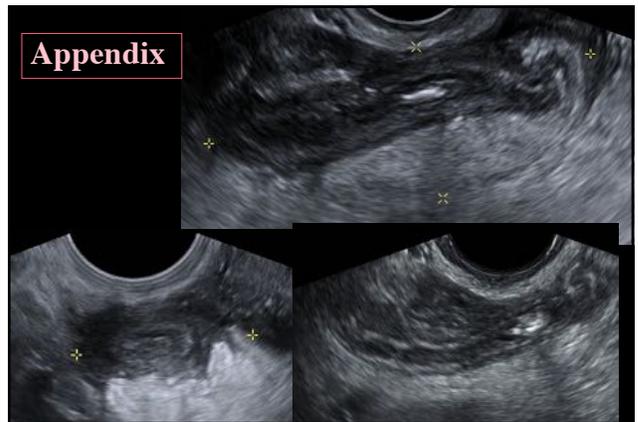
**Consider non-gynecologic diagnoses**

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*Broad ligament fibroid*  
*Peritoneal inclusion cyst*  
*Appendix*  
*Non-Gyn tumor (Gist)*

- If the lesion is separate/adjacent to ovary or uterus, does it move independently?

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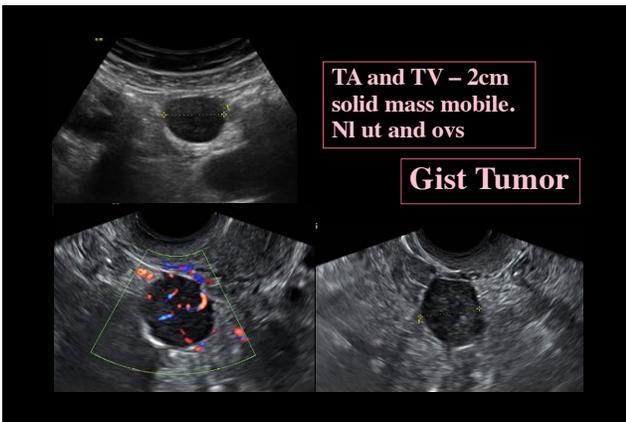
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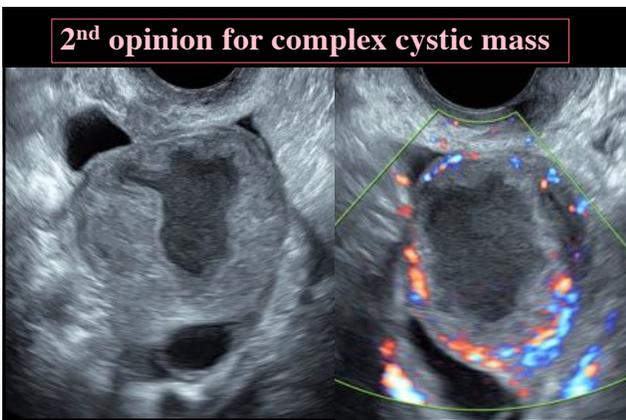


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- As residency programs in radiology have had to add more breadth of training in their curricula, the time spent learning ultrasound has diminished.
- As # of cases acquired by the PGY1s increased, the quality improved.
- But even after 200 cases, anatomic landmarks were detectable in only 56 % of cases. The residents missed > 40% of anatomic landmarks, and only 16% of their cases met the criteria to pass.

Hertzberg BS. AJR 2000;174:1221.

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**Dx adenomyoma**

IMPRESSION:  
 1. Redemonstrated 3.3 cm heterogenous T2 hyperintense intramural lesion within the right posterolateral uterus. Despite reassuring stability over 6 months, its appearance is atypical for fibroid, and hysterectomy should be considered.

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## Lost opportunities in GYN ultrasound

- CT and MRI may be easier to perform than ultrasound because they require less personnel and time and due to standardization.
- Most practicing radiologists don't do 3D ultrasound, don't necessarily go into the room when sonographer is scanning and rarely turn on Doppler.

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## Conclusion

- Incomplete training in ultrasound is not an indication for an MR or CT
- Pelvic ultrasound should be a realtime exam to reap the benefit of scanning the pt with the vaginal probe, Doppler and 3D when needed.
- Ultrasound techniques have progressed to improve the performance of US in GYN but only if they are applied by the practitioner.

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## Conclusion

- The trend to read ultrasound remotely prevents the proper use of the technique.
- GYN ultrasound in Europe is performed by MDs.
- The decline in quality of GYN ultrasound leading to more MR and CT is not conducive to good and cost-effective medical care.

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## Thank You For Your Attention!!



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