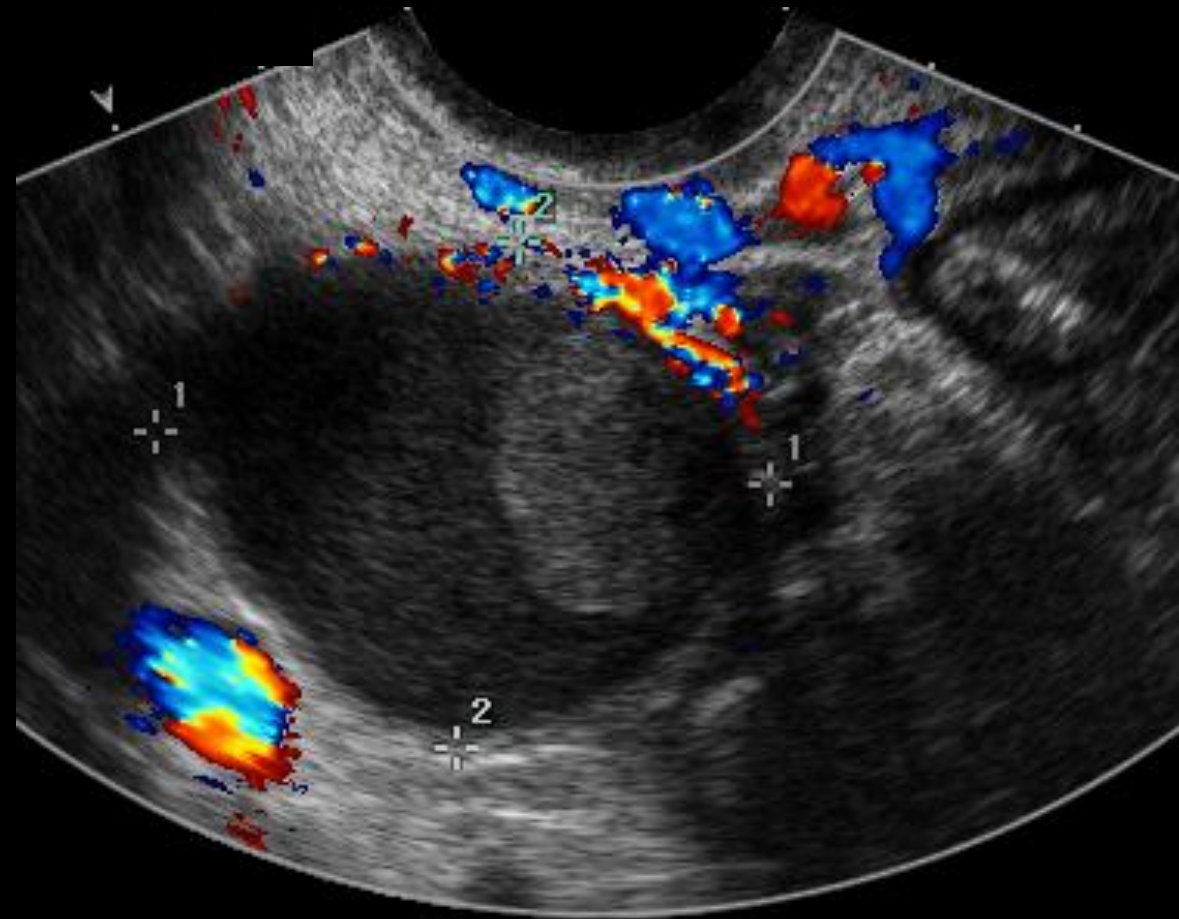
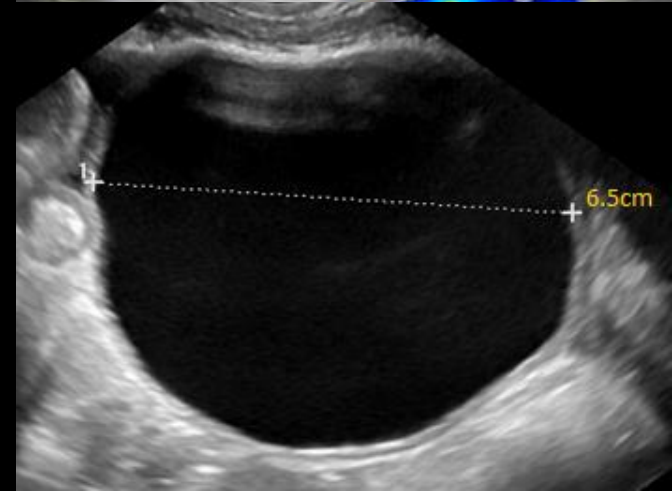
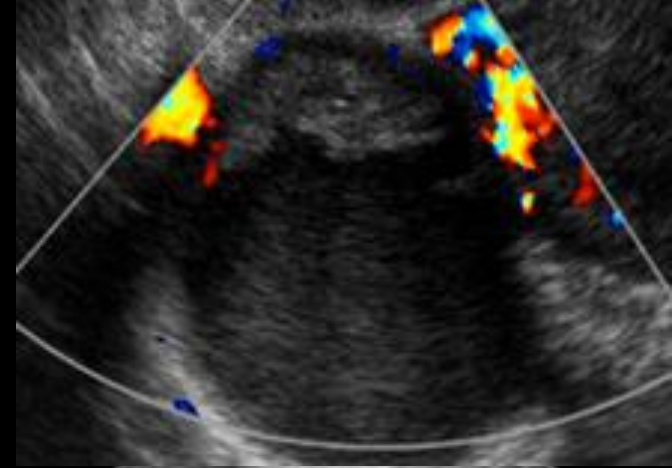


# Development of Ovarian Cancer in Ultrasound Indeterminate Ovarian Lesions: Incidence and Tumor Type

Ashley Cahoon, Elizabeth Maddox, Katherine Maturen, Jessica Robbins, Elizabeth Sadowski, Alexander Blaty, Ashish Wasnik, Lisa Barroilhet, Laura Huffman, Krupa Patel-Lippmann, Viktoriya Paroder

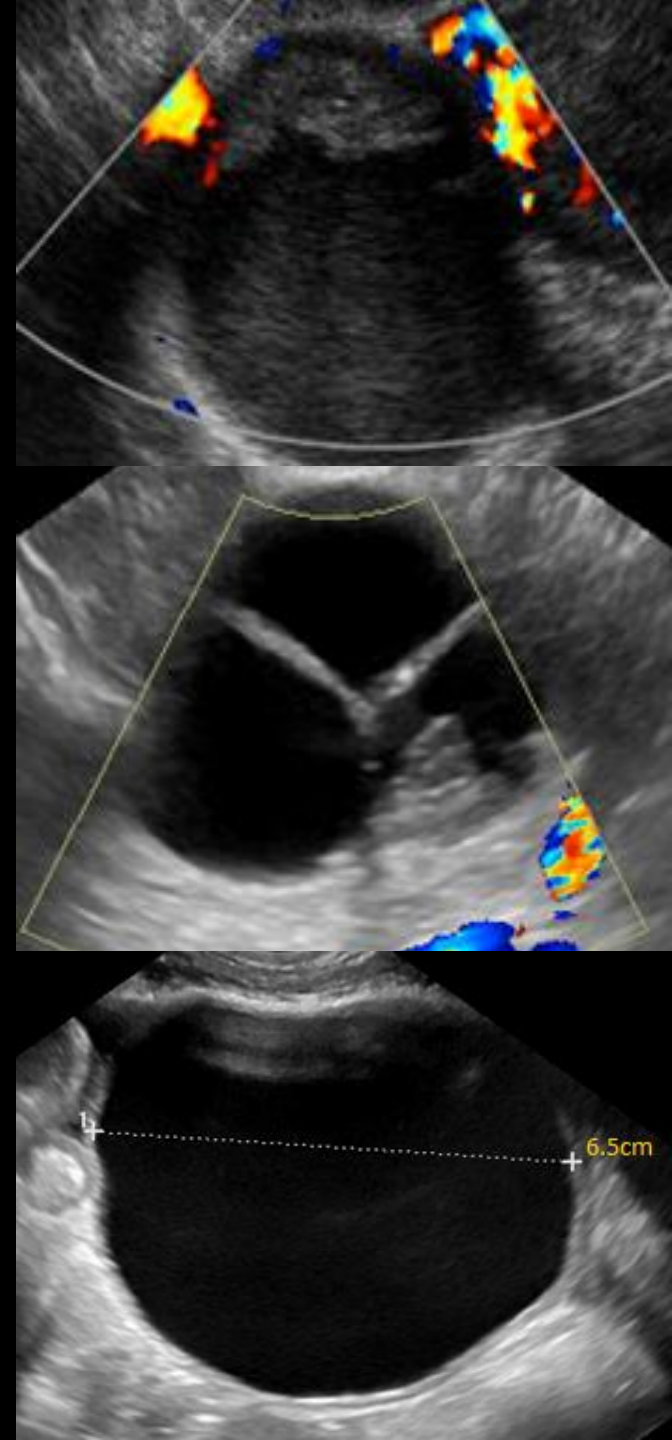


The authors have no disclosures



# Study Goal

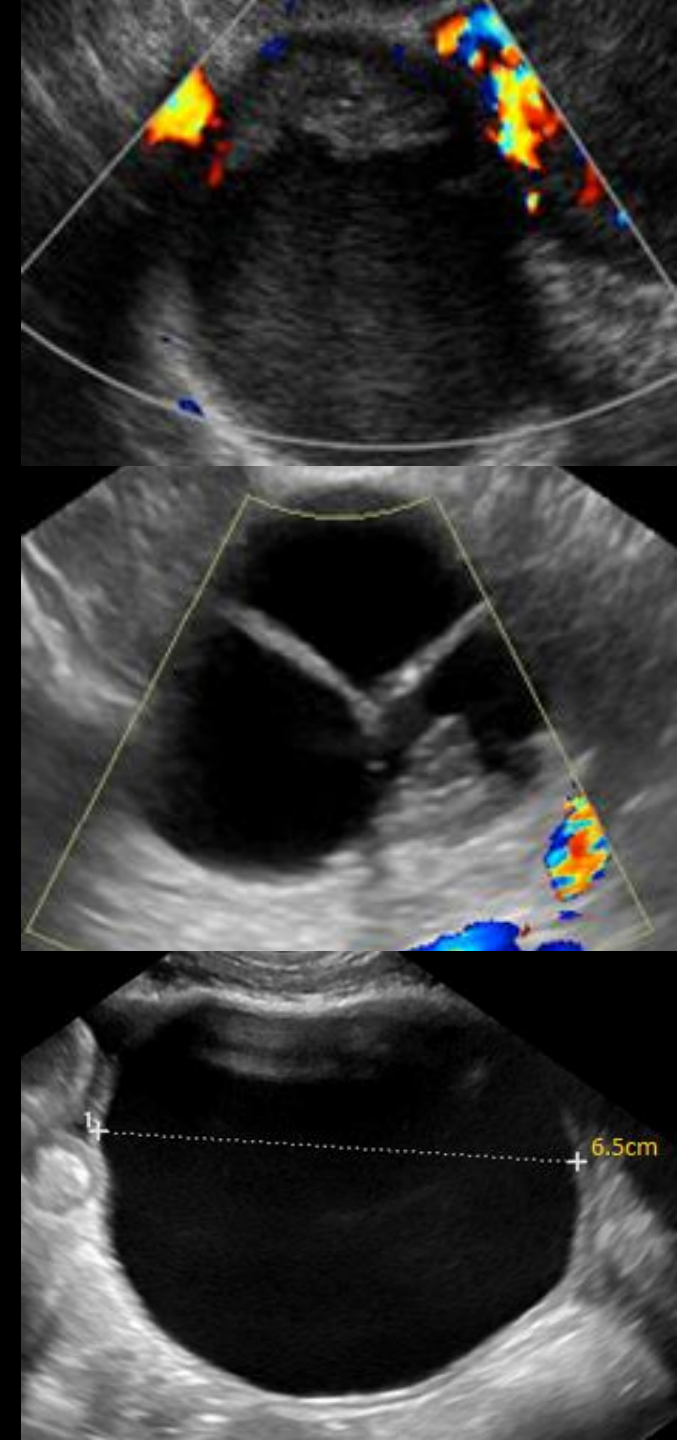
- The goal of this study is to determine the incidence of ovarian cancer in sonographically indeterminate cystic ovarian lesions



# Background

- Ovarian cancer has the highest mortality of any of the gynecologic malignancies with an overall 5 year survival rate of 47% (cancer.org)
- Early identification of ovarian cancer significantly improves patient outcomes
- The ability to identify potentially malignant ovarian lesions by imaging is critical in early detection
- Approximately 23% of incidentally found adnexal lesions cannot be classified as benign or malignant by a single ultrasound<sup>1</sup>

1. Timmerman, et al. Simple ultrasound rules to distinguish between benign and malignant adnexal masses before surgery: prospective validation by IOTA group. BMJ 2010;341:c6839

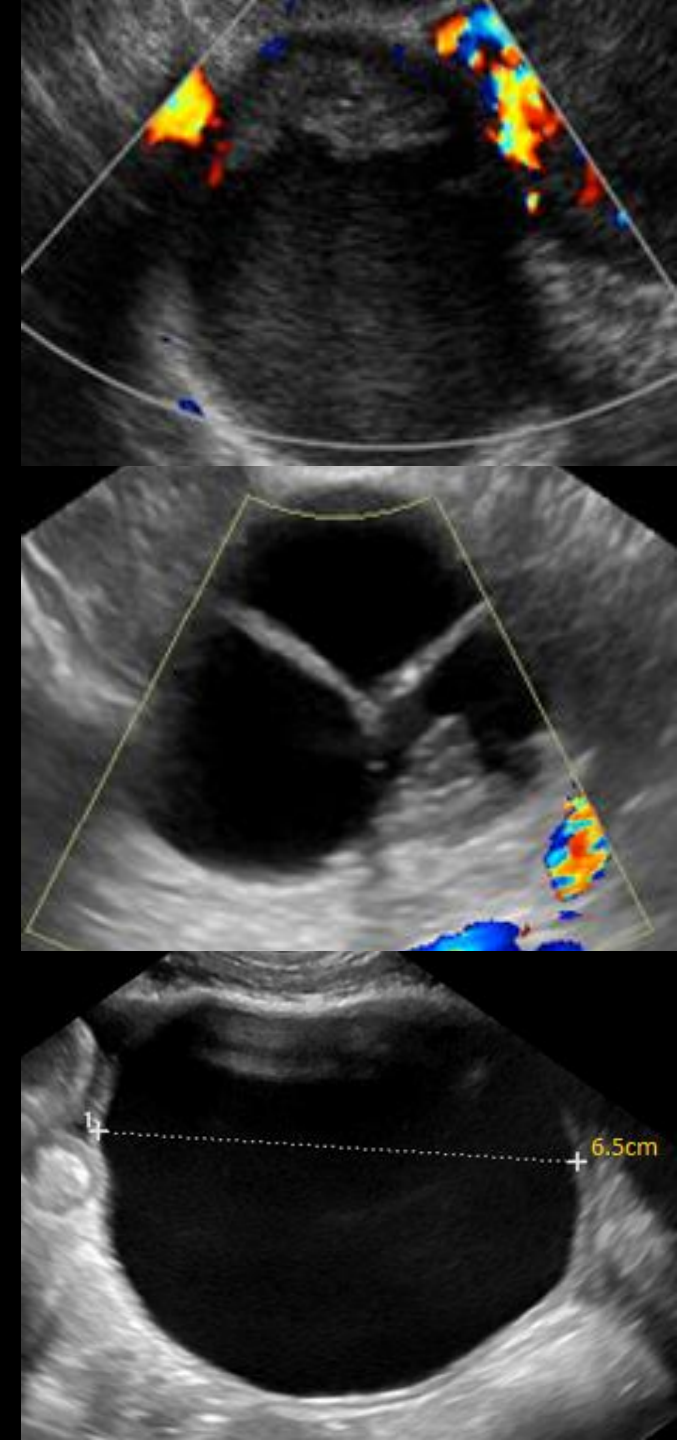




# Background

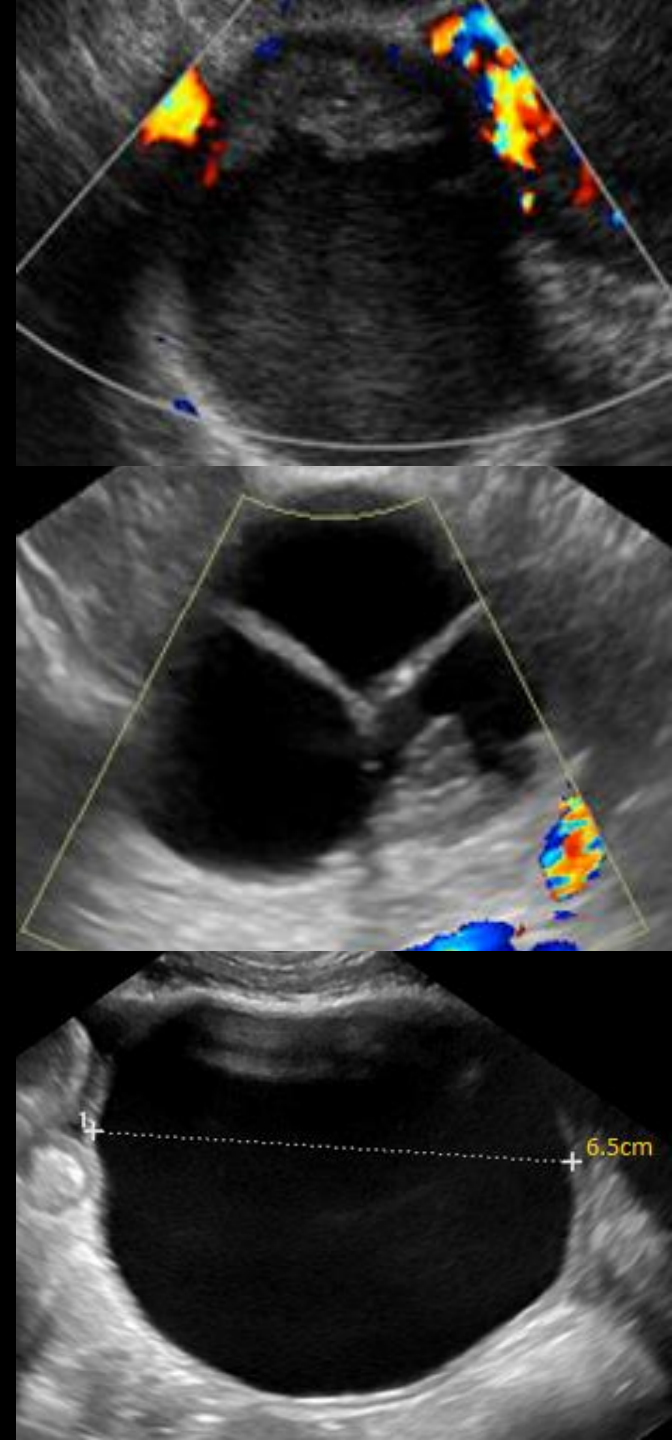
- Cystic ovarian lesions >5cm in size<sup>1</sup>, or with thick, avascular septations and/or soft tissue components are considered sonographically indeterminate<sup>2,3</sup>
- The incidence of ovarian cancer in ultrasound indeterminate lesions is not well documented

1. Ekerhovd E, et al. Preoperative assessment of unilocular adnexal cysts by transvaginal ultrasonography. Am J Obstet Gynecol 2001; 184:48-54.
2. Timmerman, et al. Simple ultrasound rules to distinguish between benign and malignant adnexal masses before surgery. BMJ 2010;341:c6839.
3. Levine D, Brown DL, Andreotti RF, et al. Management of asymptomatic ovarian and other adnexal cysts imaged at US SRU consensus conference statement. Ultrasound quarterly 2010; 26:121-131.



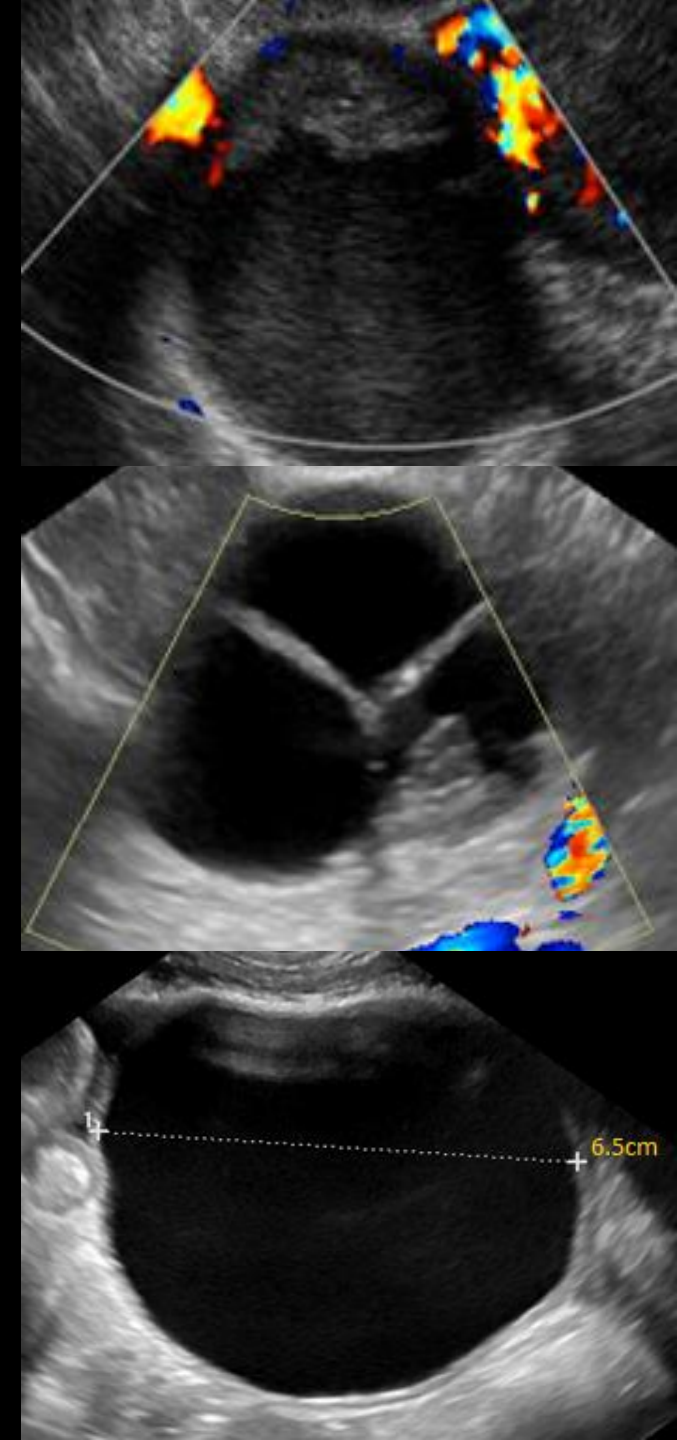
# Methods: Subjects

- IRB-approved, HIPAA compliant retrospective imaging review study
- General low-risk outpatients from multiple academic centers: UW, UM, Duke
  - Non-pregnant
  - Post-menarchal women of any age who underwent a transvaginal ultrasound exam between October 2010 and November 2011



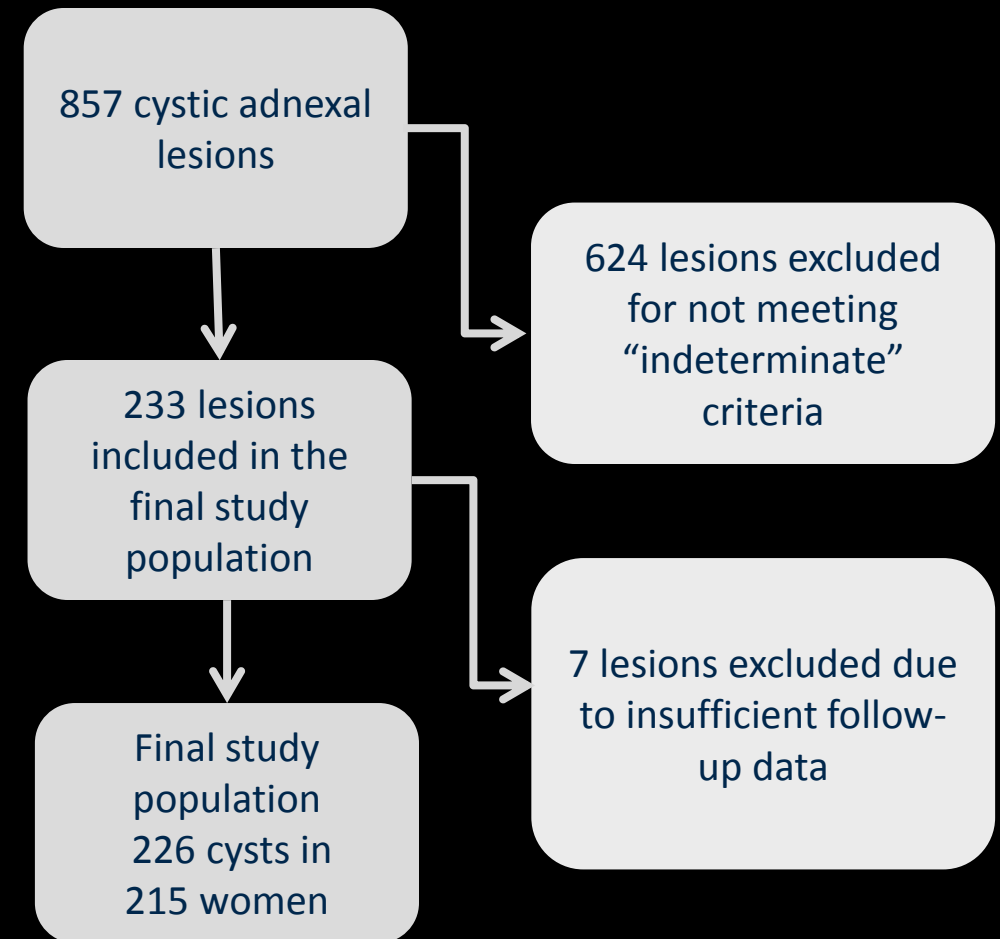
# Methods: Procedures

- Review of transvaginal US exams from October 2010 to June 2011:
  - Cystic ovarian lesions were identified and a fellowship-trained abdominal radiologist reviewed the US images, recording:
    - Cyst type
    - Number and thickness of septations
    - Number and greatest size of soft tissue nodules
    - Presence or absence of flow in any soft tissue component
- Clinical and imaging records were reviewed to document follow-up and outcome:
  - Patients were included if one of the following was true:
    - Resolution or decrease in lesion size on follow-up imaging
    - Surgical pathology was available
    - Normal pelvic exam  $\geq 2$  years from the baseline study was documented



# Methods: Inclusion/Exclusion

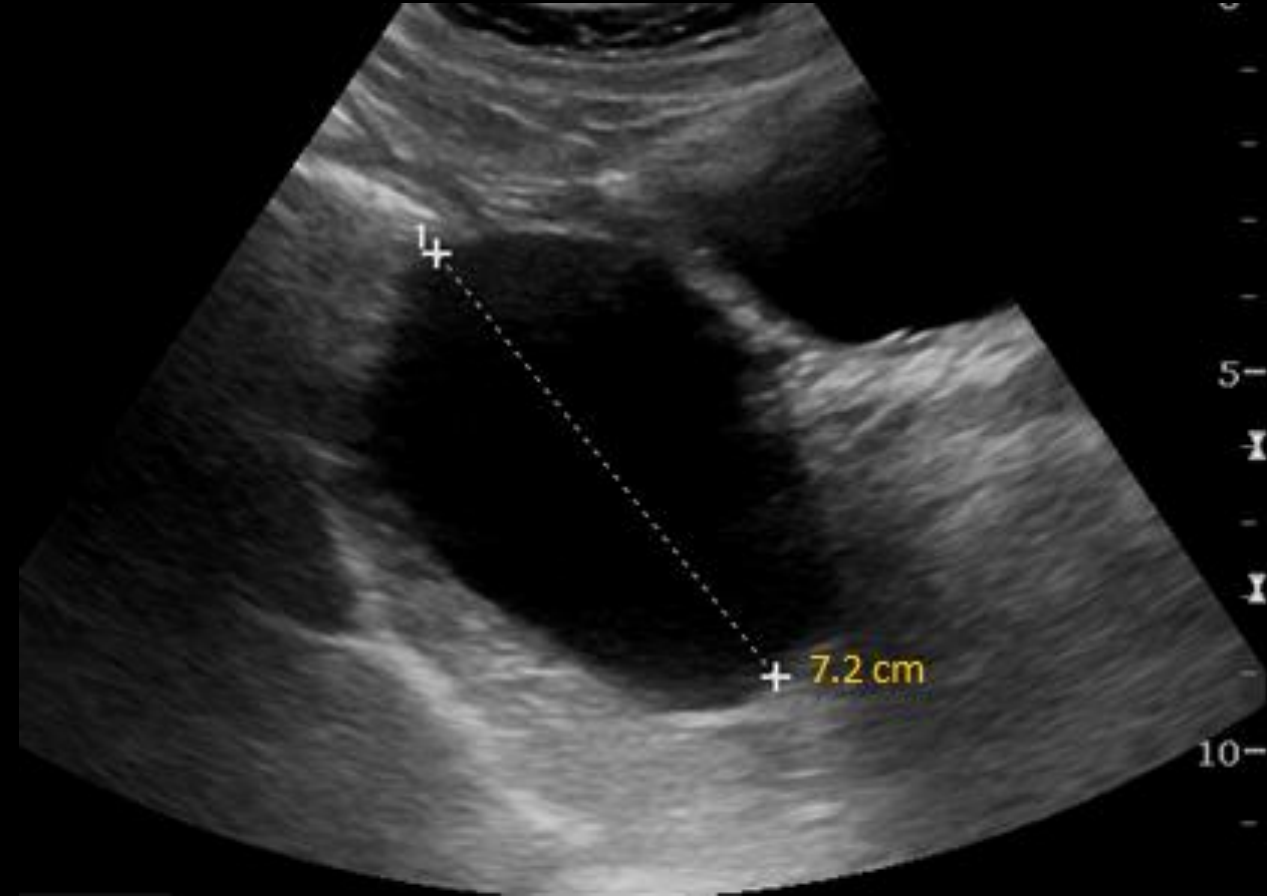
- Included cystic lesions:
  - $\geq 5$  cm
  - Thick, avascular septations
  - Avascular soft tissue components
  - Atypical hemorrhagic cysts, atypical dermoids, atypical endometriomas
- Excluded lesions:
  - Ovarian lesions with blood flow in the internal soft tissue components
  - Classic appearing lesions  $\leq 5$ cm in diameter
    - Simple cysts, endometriomas, hemorrhagic cysts, dermoids
  - Solid lesions





# Lesion selection: Size $\geq 5\text{cm}$

- A 7.2 cm simple left ovarian cyst in a 54 year-old, which enlarged slowly on follow-up imaging
- Pathology showed benign serous cystadenoma
- Lesions  $\geq 5\text{cm}$  are considered incompletely evaluated by ultrasound, and therefore indeterminate<sup>1</sup>

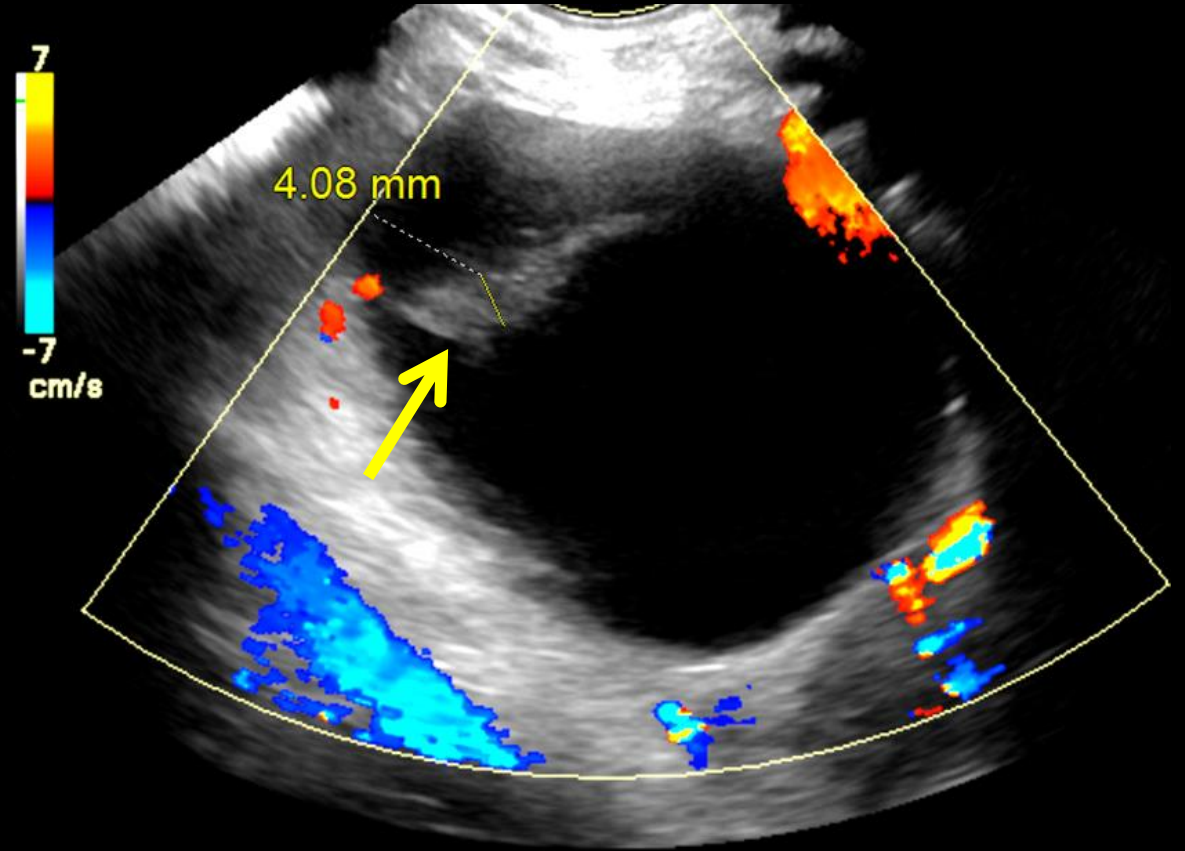


1. Ekerhovd E, et al. Preoperative assessment of unilocular adnexal cysts by transvaginal ultrasonography. Am J Obstet Gynecol 2001; 184:48-54.

# Lesion selection:

## Thick septation (>3mm) without blood flow

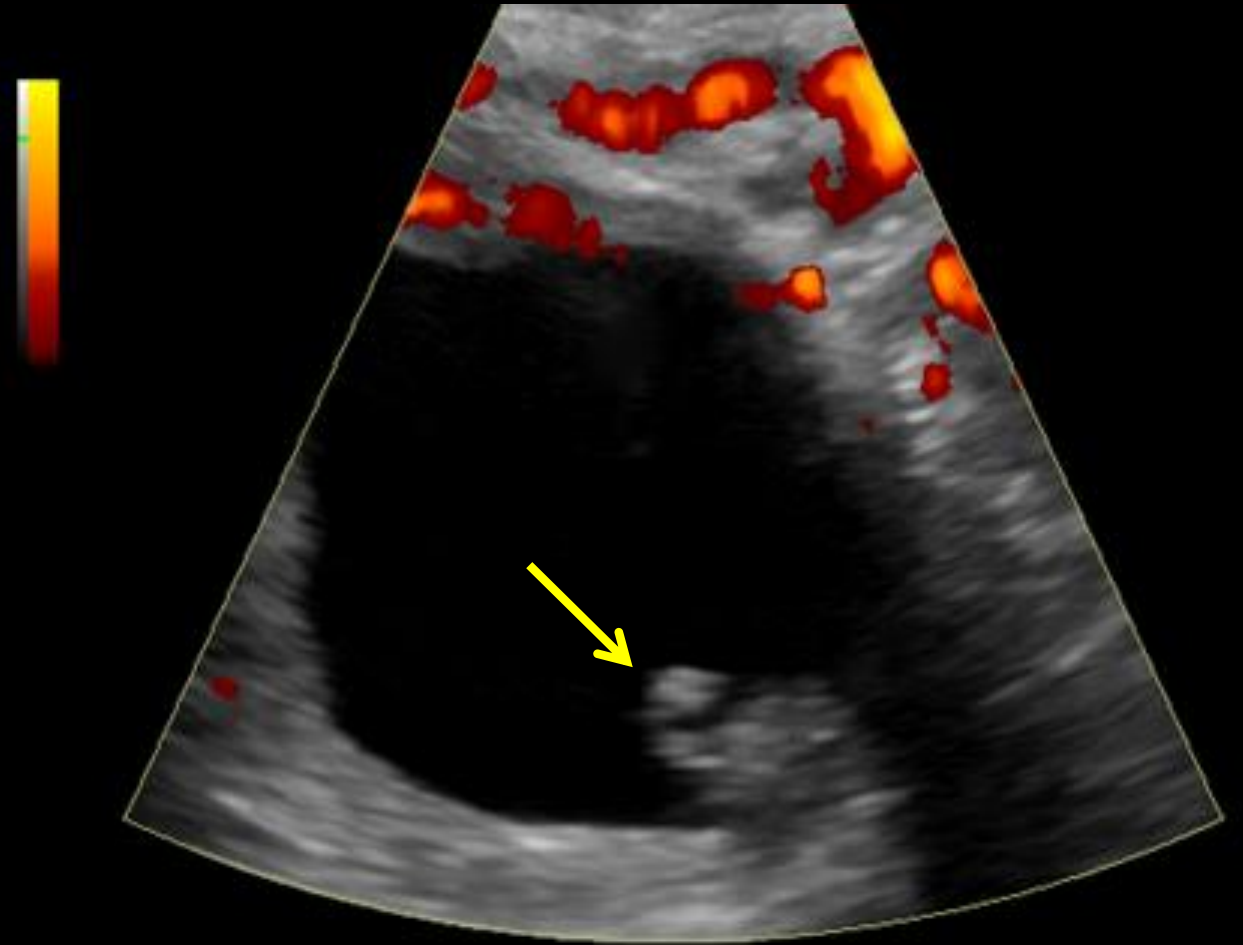
- A 38 year-old asymptomatic female with a 5cm complex adnexal lesion, with a single, avascular, thick septation (yellow arrow)
- Pathology showed mucinous cystadenoma



# Lesion selection:

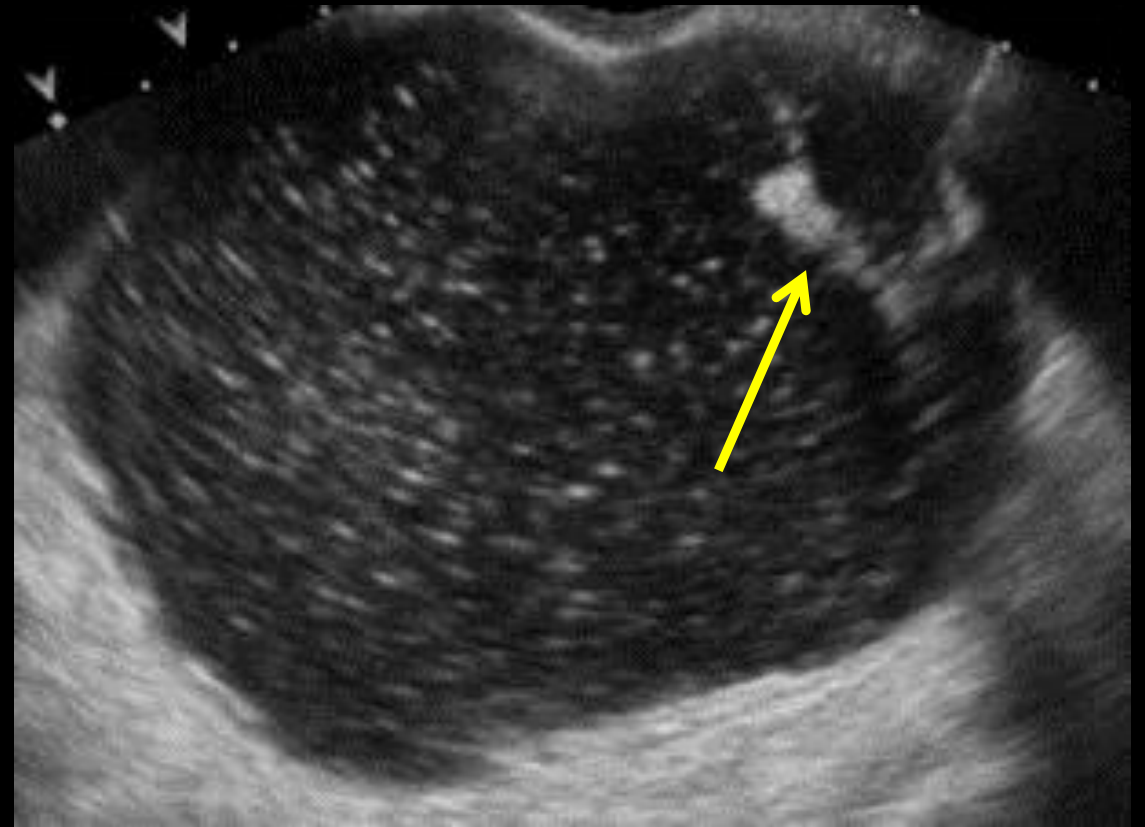
## Soft tissue nodule without blood flow

- A 2.4 cm complex left ovarian cyst with a 4 mm avascular soft tissue nodule (**yellow arrow**) in a 52 year-old
- Pathology showed serous cystadenofibroma



# Lesion selection: Atypical dermoid

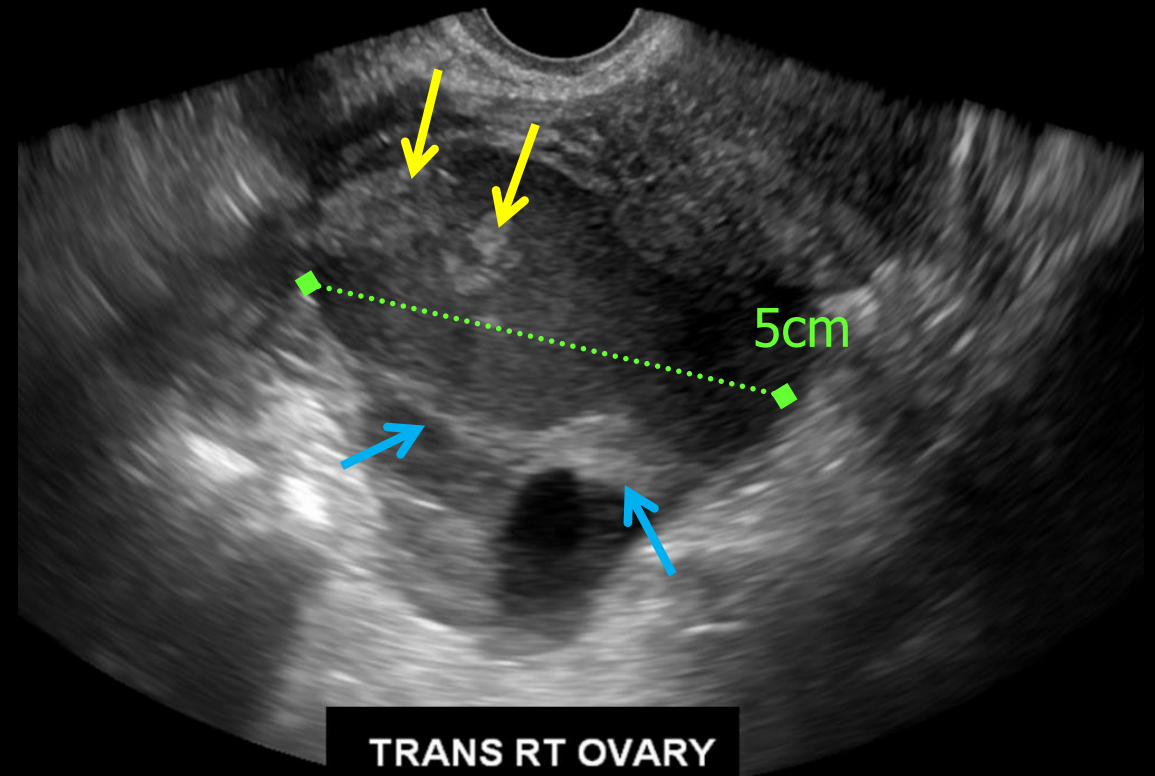
- A 31 year-old female with a 6 cm complex lesion, with atypical features for dermoid (dots, no dashes) and a septation (yellow arrow)
- Pathology showed mucinous cystadenocarcinoma





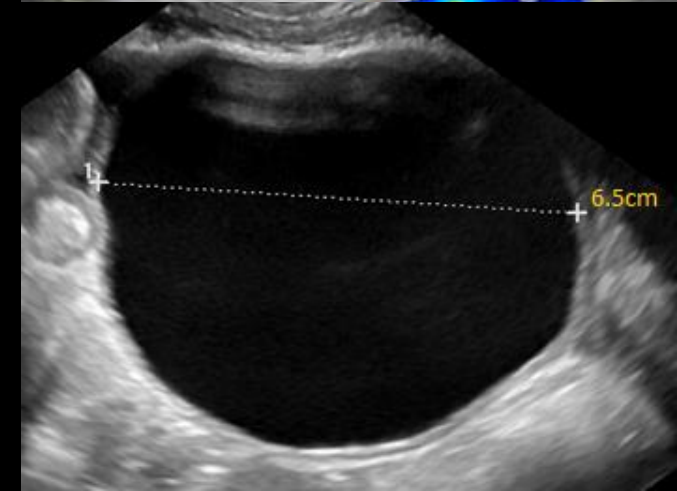
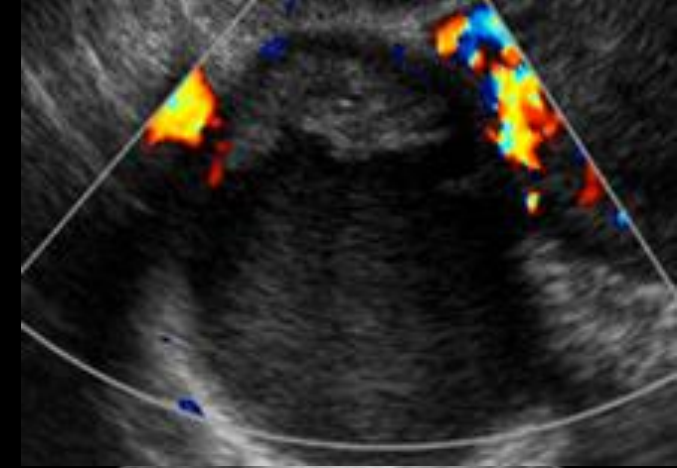
# Lesion selection: Atypical endometrioma

- 48 year-old asymptomatic perimenopausal female with a 5cm complex adnexal lesion: homogenous echoes, similar to an endometrioma, however, there is also a thick septation (blue arrows) and apparent soft tissue nodules (yellow arrows), with no internal blood flow
- Pathology showed endometroid adenocarcinoma



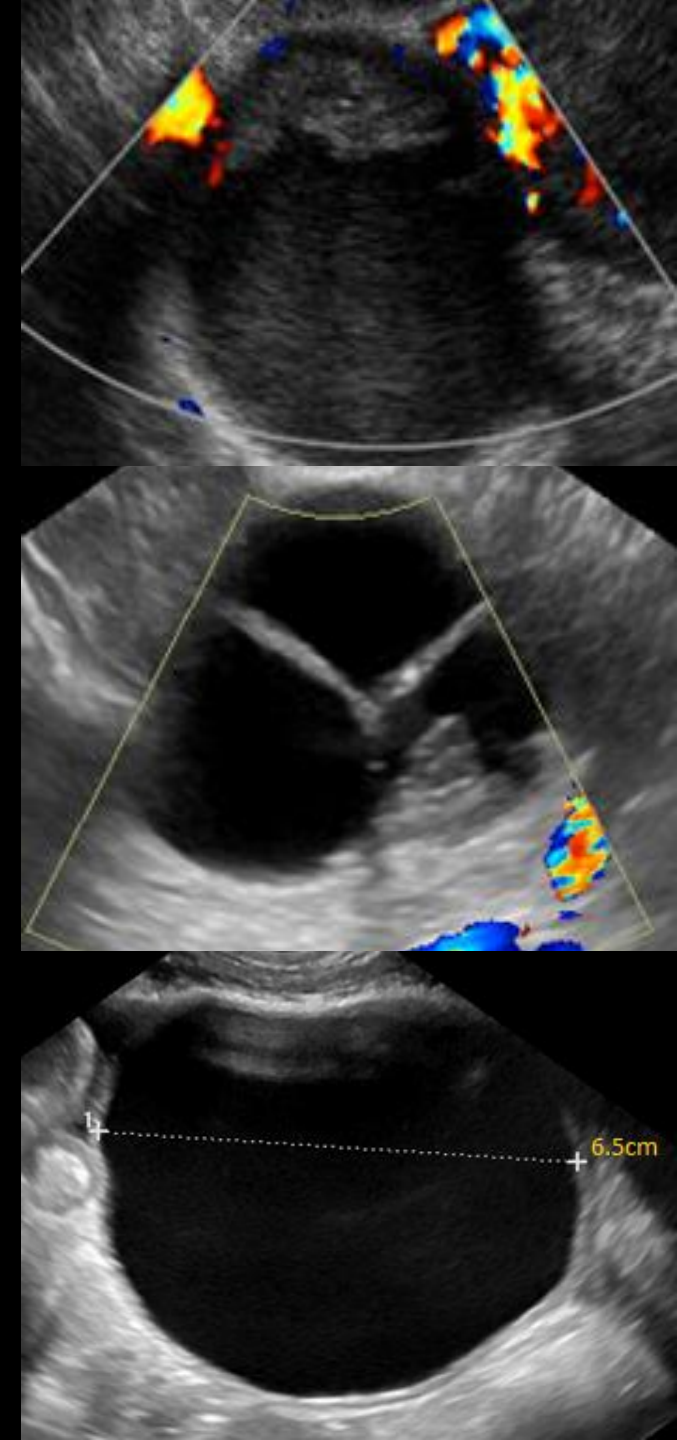
# Results: Patients

- Mean age of 41.3 +/- 14 years
  - Age range: 14-85 years
- Menstrual status:
  - 72.5% pre-menopausal
  - 23.2% post-menopausal
  - 4.3% unknown menstrual status
- Follow-up inclusion:
  - 50.4% by imaging
  - 47.4% by pathology
  - 2.2% by clinical follow-up

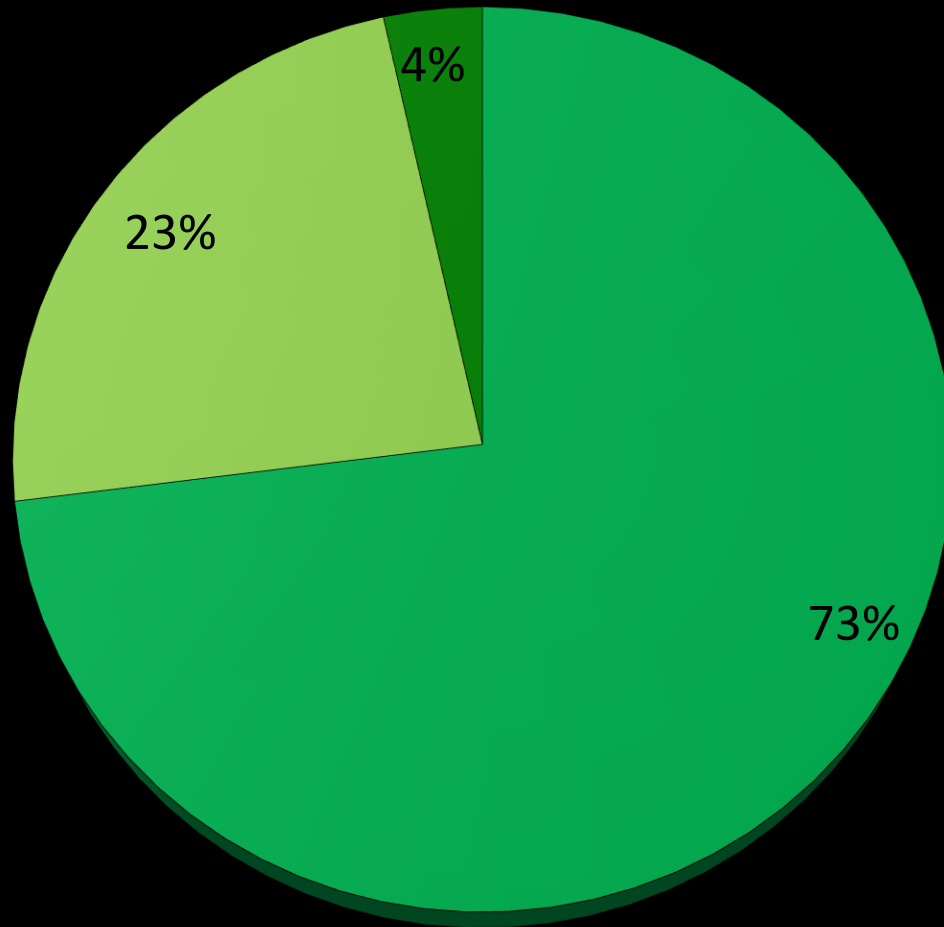


# Results: Lesion types by imaging

- 856 total cystic ovarian lesions
- 27.2% indeterminate lesions (n=233)
  - 39.9% complex cysts
  - 29.2% simple cysts
  - 11.6% classic hemorrhagic cyst  $\geq 5\text{cm}$
  - 11.2% atypical hemorrhagic cyst
  - 3.4% classic endometrioma  $\geq 5\text{cm}$
  - 1.7% classic dermoid  $\geq 5\text{cm}$
  - 1.7% atypical dermoid
  - 1.3% atypical endometrioma



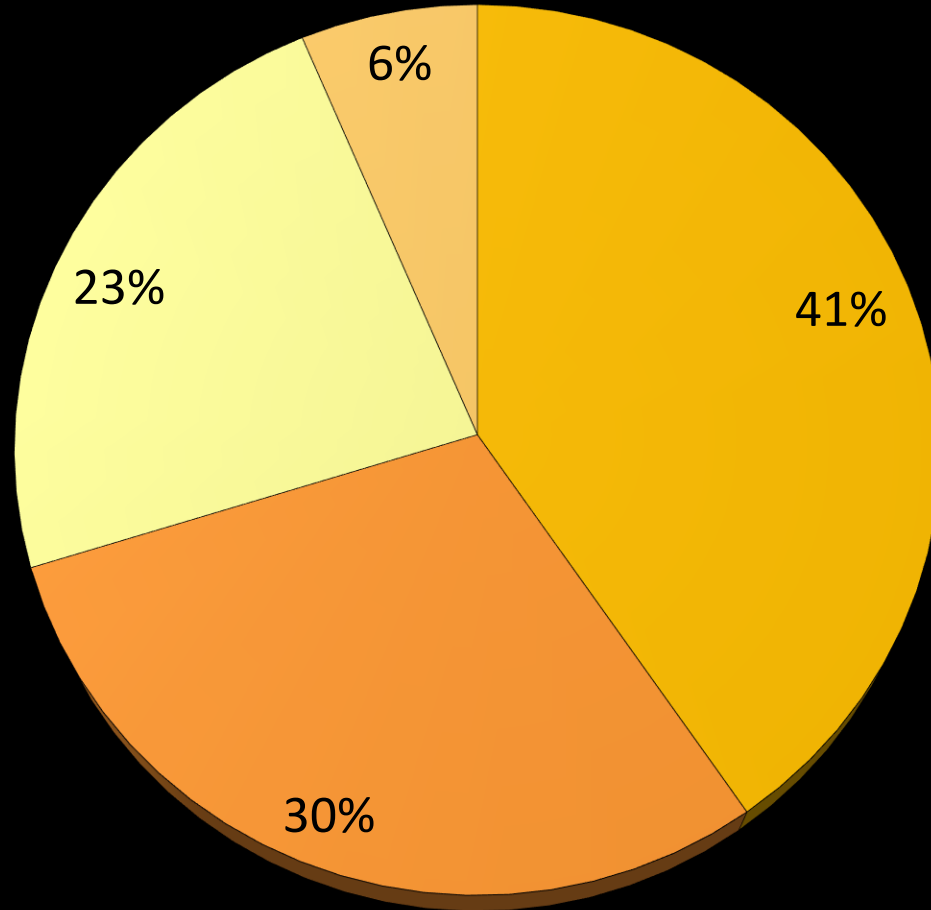
# Results: Lesions



- **Non-neoplastic, benign (n=165)**  
Endometriomas, follicular and hemorrhagic cysts
- **Neoplastic, benign (n=53)**  
Cystadenomas, cystadenofibromas, dermoids/mature teratomas
- **Malignant (n=8)**  
Borderline, low-grade and high-grade



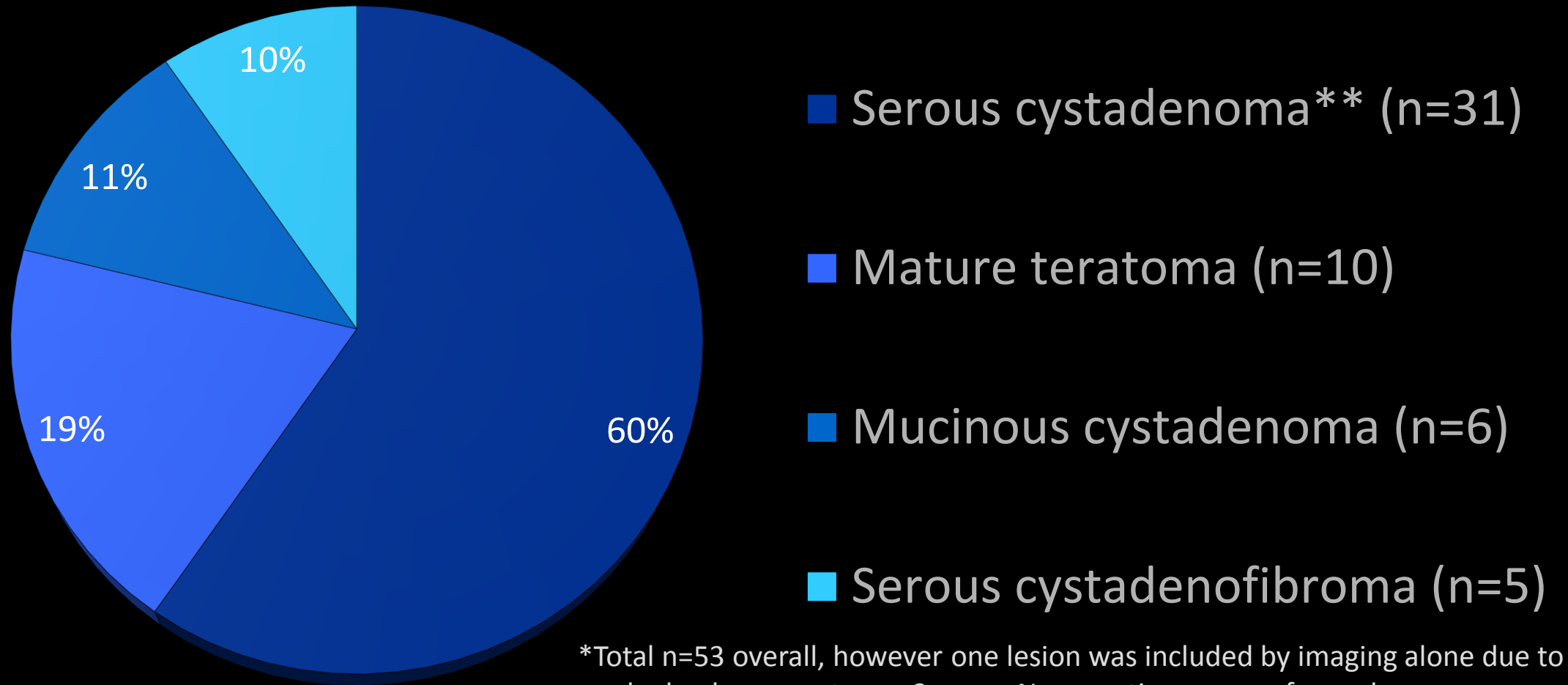
# Results: Benign Non-neoplastic Lesions



- Endometrioma (n=19)
- Follicular cyst (n=14)
- Hemorrhagic cyst (n=11)
- Other\* (n=4)

\*One each of stromal hyperplasia, peritoneal inclusion cyst, tubo-ovarian abscess, and xanthogranulomatous inflammation

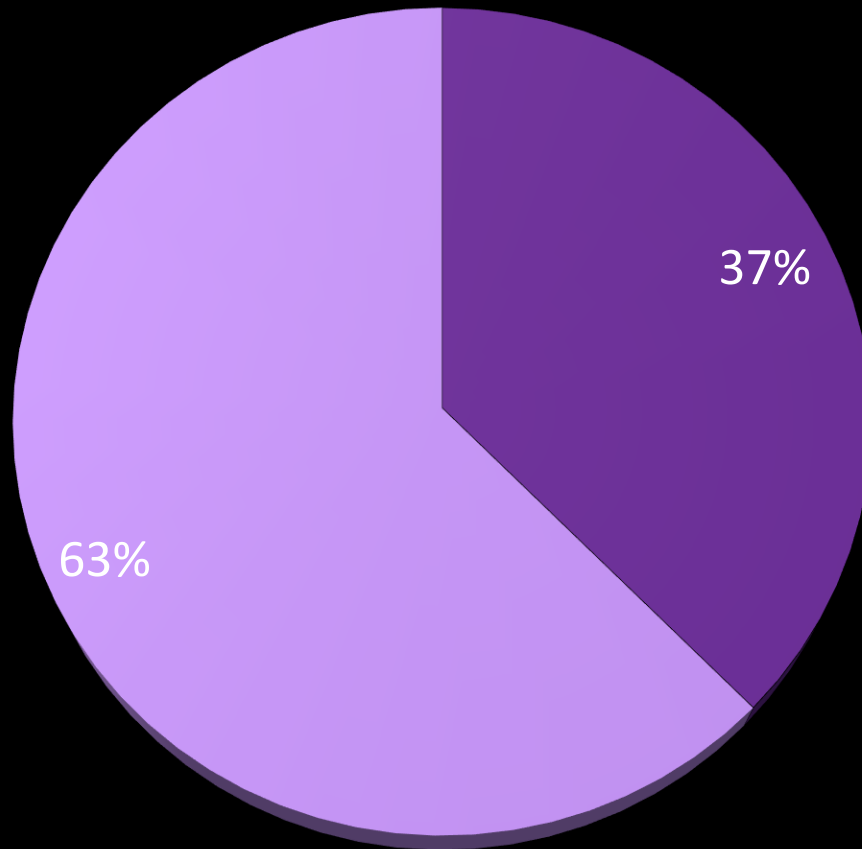
# Results: Benign Neoplastic Lesions\*



\*Total n=53 overall, however one lesion was included by imaging alone due to gradual enlargement over 2 years. No resection was performed

\*\*One serous cystadenoma lesion contained a synchronous Brenner tumor and one contained a focus of atypia

# Results: Malignant Lesions



## ■ Non-invasive tumors (n=3)

Borderline tumors: 2/3 were bilateral lesions in the same patient

## ■ Invasive tumor (n=5)

1 metastatic adenocarcinoma from colon primary

1 low grade mucinous adenocarcinoma

1 low grade serous carcinoma

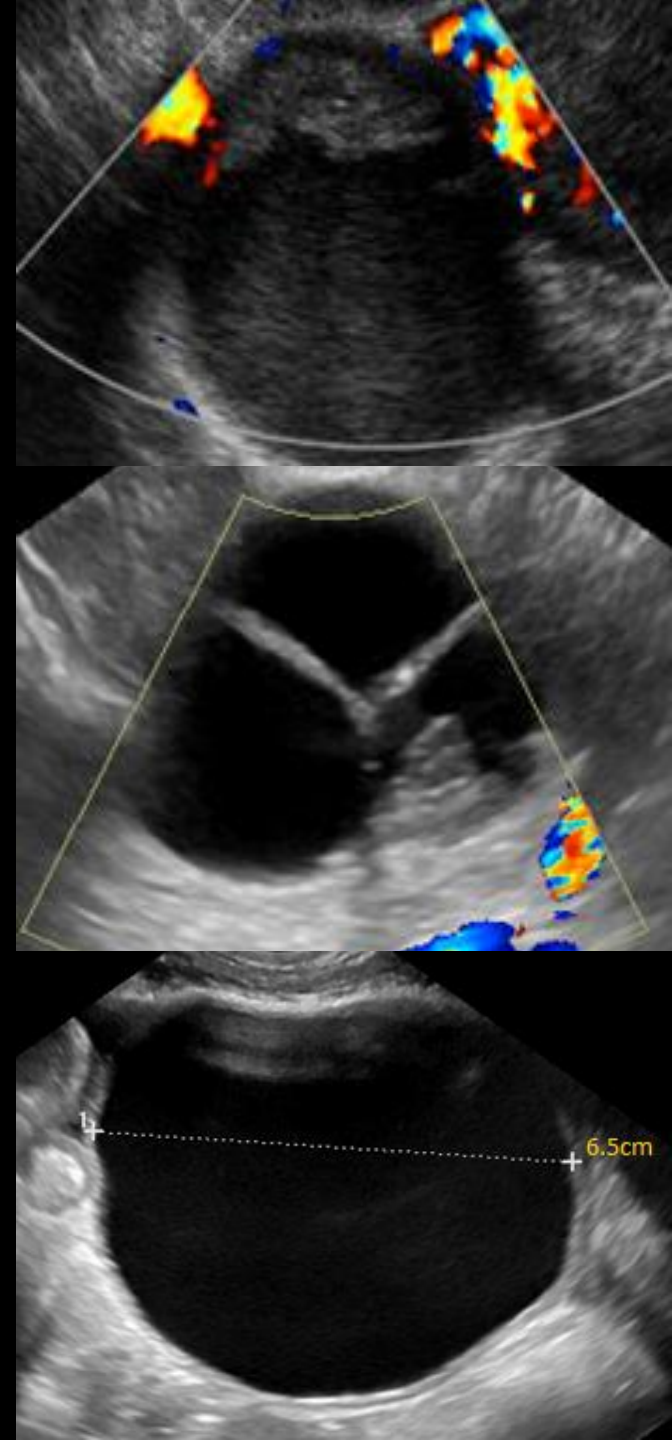
1 clear cell carcinoma

1 adenocarcinoma with both serous and clear cell features

- 5/8 (62.5%) patients with malignant lesions were pre-menopausal
- 3/8 (37.5%) patients with malignant lesions were post-menopausal

# Discussion

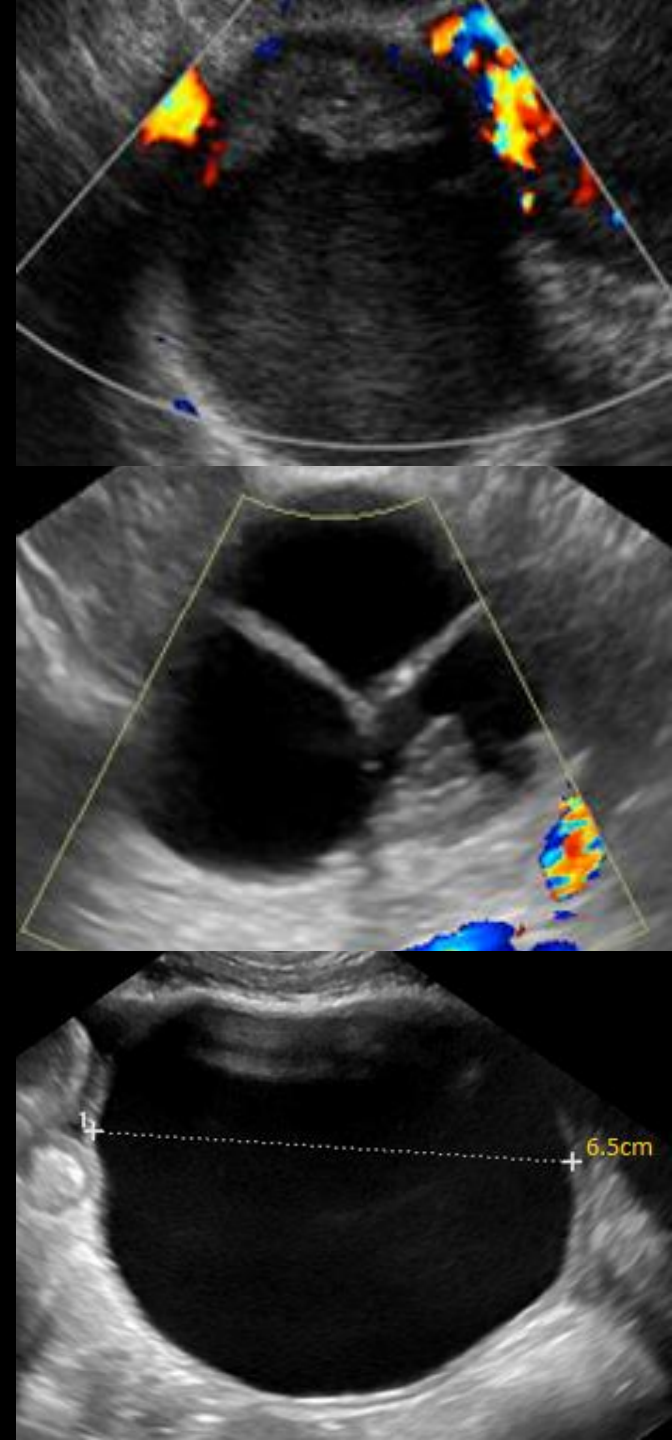
- Of the 226 included indeterminate adnexal lesions, 73% were non-neoplastic, 23.5% were benign ovarian neoplasms, and 3.5% were malignant ovarian neoplasms
  - There is a high percentage of pre-menopausal women in our study population (72.1%), which may account for the high incidence of non-neoplastic lesions





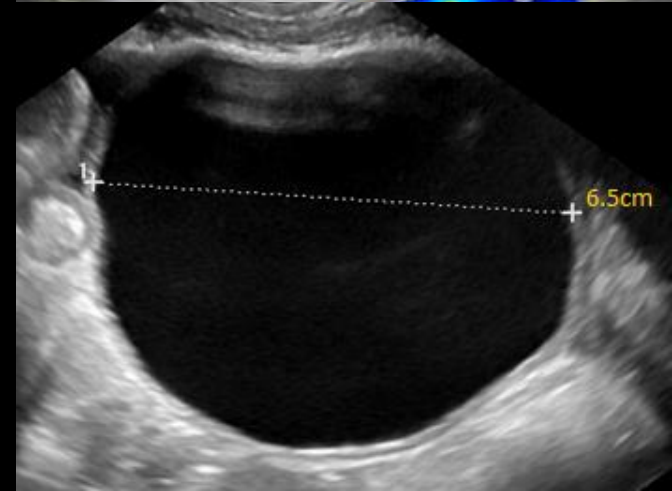
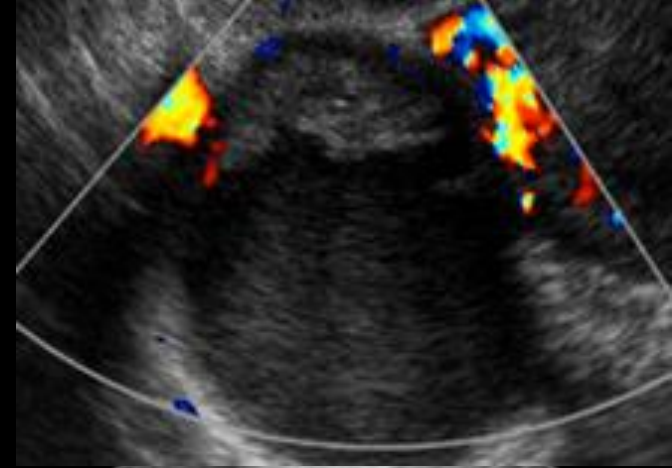
# Discussion

- Endometriomas were the most common benign, non-neoplastic lesions identified in this study
- Serous cystadenoma was the most common benign neoplasm, followed by mature teratoma
- Of the malignant lesions, 3 were borderline tumors and 4 lesions were invasive cancers of ovarian origin



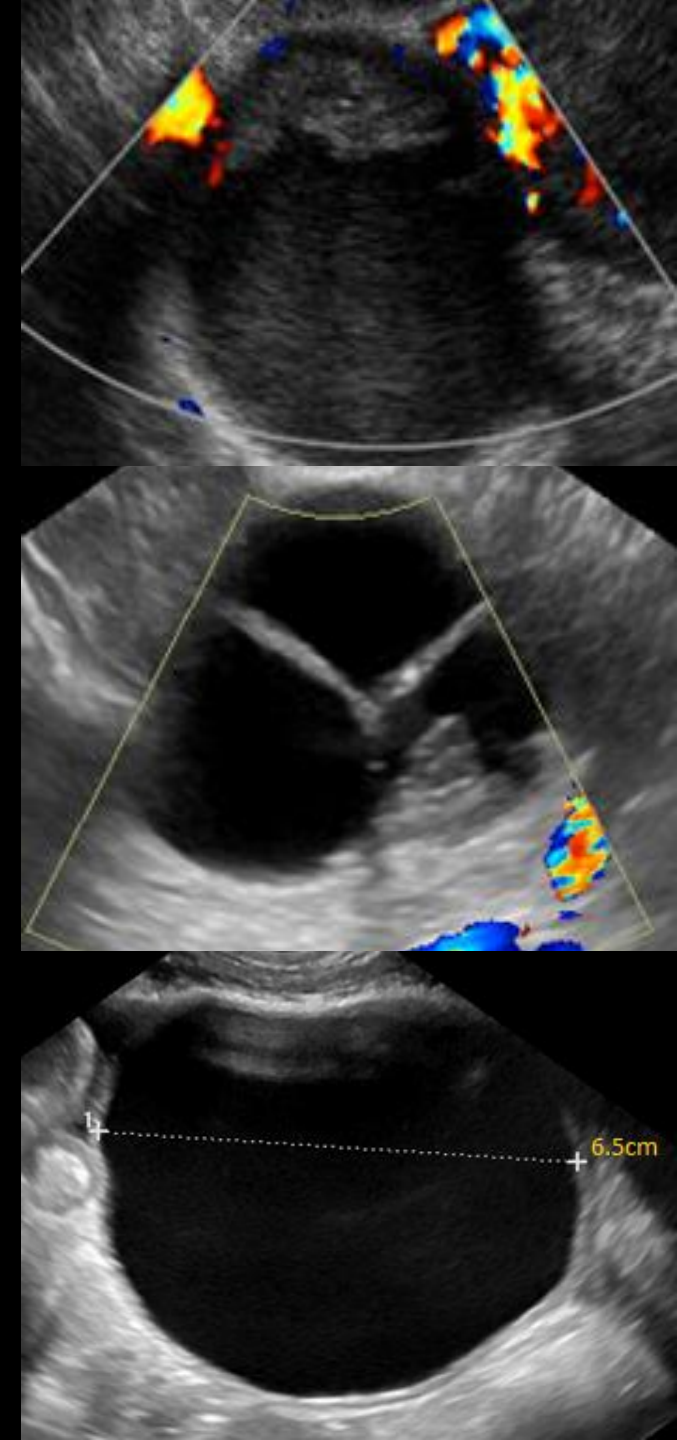
# Limitations

- Retrospective study
- Low-risk outpatient population with a high percentage of pre-menopausal patients
- Small number of malignancies



# Summary

- The incidence of **indeterminate ovarian lesions** in our population was 27%
- Benign lesions accounted for a significant proportion of these lesions (96%)
- Malignancy was identified in a small but significant proportion of patients (4%)
- Our findings highlight the **importance of follow-up** of sonographically indeterminate ovarian lesions
  - **Follow-up by US or MRI, or surgical consultation can be considered based on the clinical picture**
- Follow-up of these lesions is a future area of research, as currently there are no evidence-based guidelines to suggest which method of follow up is best



Thank you for your attention!

Questions or comments?

Please feel free to contact us at:

[acahoon@uwhealth.org](mailto:acahoon@uwhealth.org)

Or

[esadowski@uwhealth.org](mailto:esadowski@uwhealth.org)

