

# AMSER Case of the Month

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73 yo female with sudden onset RLQ pain

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# Patient Presentation

- **HPI:** 73 year old female presents to the ED with sudden onset 8/10 RLQ pain. She reports it worsens with movement and is ameliorated with heat and oxycodone. She endorses loss of appetite, several bouts of emesis the day prior to presentation, no bowel movements for 3 days (a change from her baseline), and pelvic pain. ROS otherwise negative.
- **PMHx:** noncontributory
- **Vitals:** HR 81; RR 18; BP 153/70; SpO2 96%; T 98.7°F
- **PE:** Abdomen was flat and nondistended but tender to palpation over RLQ. Bimanual exam notable for small anteverted uterus and a large, moderately tender right adnexal mass. Full physical exam otherwise noncontributory.
- **Initial Labs:** Complete blood count and comprehensive metabolic panel were all within normal limits.

# ED Vitals

ED Triage Vitals [01/12/25 1701]

| Temp                       | Temp<br>Source | Heart<br>Rate | Heart<br>Rate<br>Source | Resp | BP            | Patient<br>Position | BP<br>Location | SpO2 | FiO2<br>(%) |
|----------------------------|----------------|---------------|-------------------------|------|---------------|---------------------|----------------|------|-------------|
| 37.1<br>°C<br>(98.7<br>°F) | Oral           | 81            | Pulse<br>Oximetry       | 18   | (!)<br>153/70 | Lying               | Left<br>arm    | 96 % | --          |

What Imaging Should We Order?

# Select the applicable ACR Appropriateness Criteria

## **Variant 1:** Right lower quadrant pain. Initial imaging.

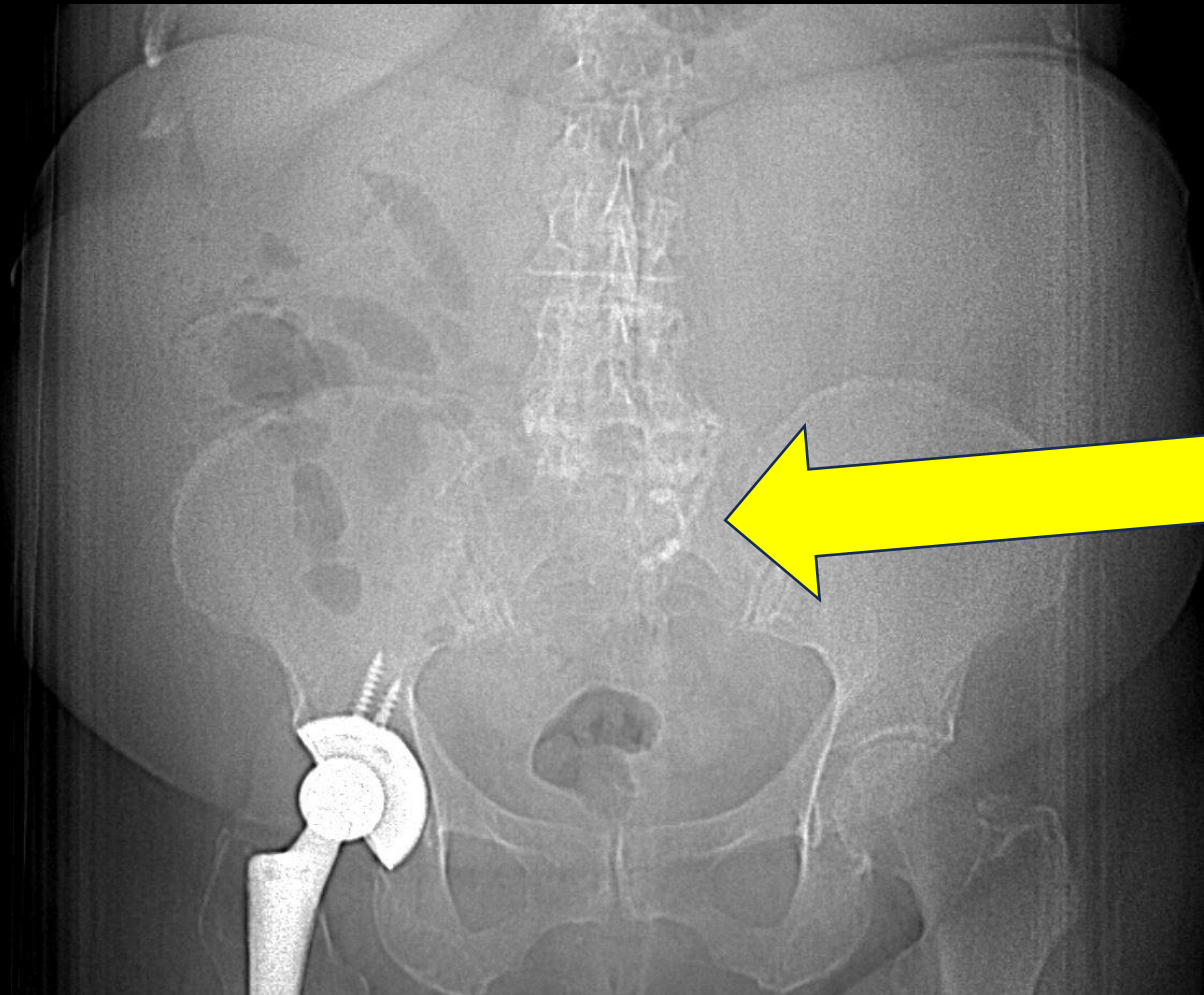
| Procedure   | Appropriateness Category | Relative Radiation Level |
|---|--------------------------|--------------------------|
| CT abdomen and pelvis with IV contrast              | Usually Appropriate      | ☢☢☢                      |
| US abdomen  | May Be Appropriate       | ○                        |
| US pelvis   | May Be Appropriate       | ○                        |
| MRI abdomen and pelvis without and with IV contrast | May Be Appropriate       | ○                        |
| MRI abdomen and pelvis without IV contrast          | May Be Appropriate       | ○                        |
| CT abdomen and pelvis without IV contrast           | May Be Appropriate       | ☢☢☢                      |
| Radiography abdomen                                 | Usually Not Appropriate  | ☢☢                       |
| Fluoroscopy contrast enema                          | Usually Not Appropriate  | ☢☢☢                      |
| CT abdomen and pelvis without and with IV contrast  | Usually Not Appropriate  | ☢☢☢☢                     |
| WBC scan abdomen and pelvis                         | Usually Not Appropriate  | ☢☢☢☢                     |

This imaging modality was ordered by the ER physician

# Findings (unlabeled)



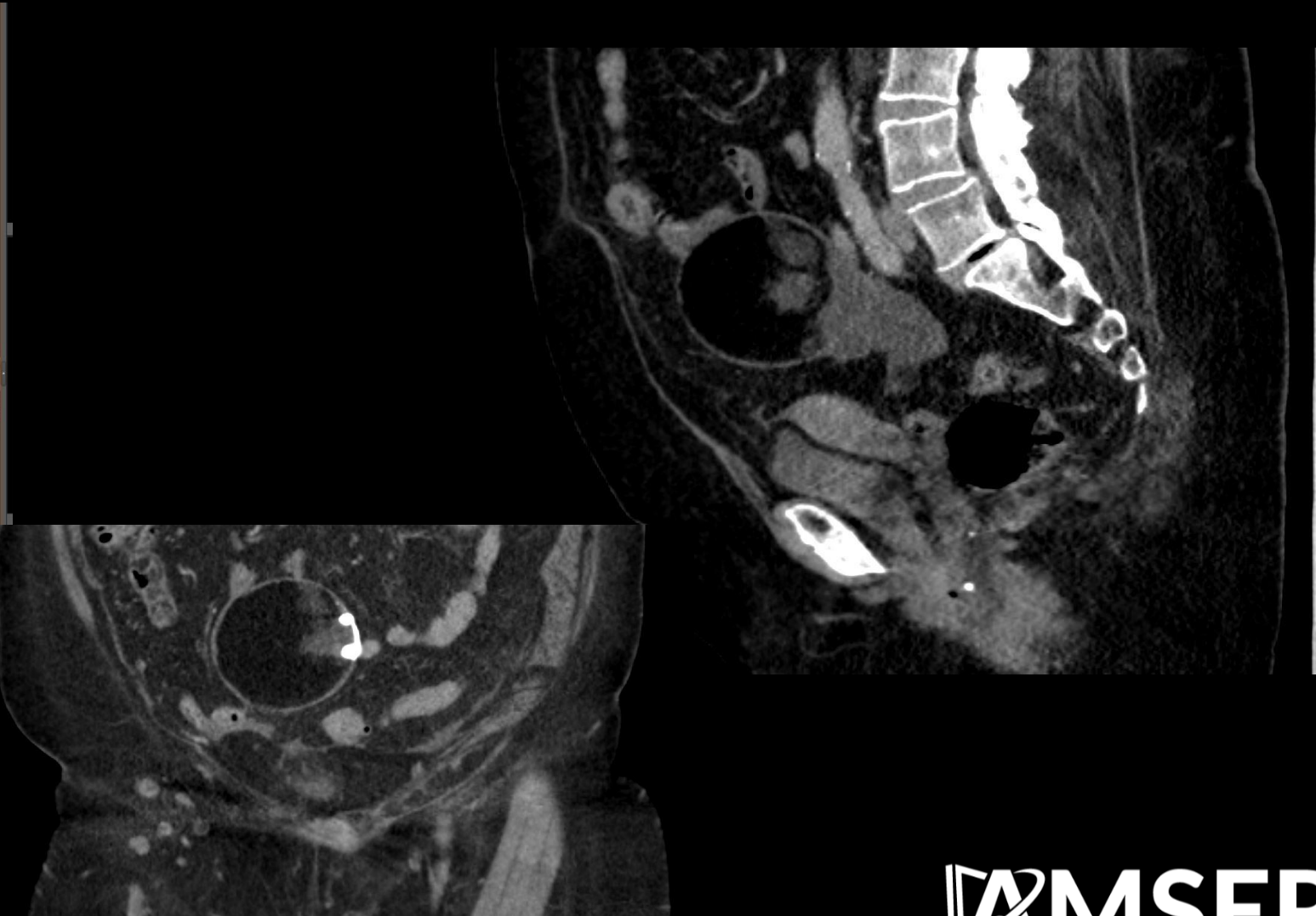
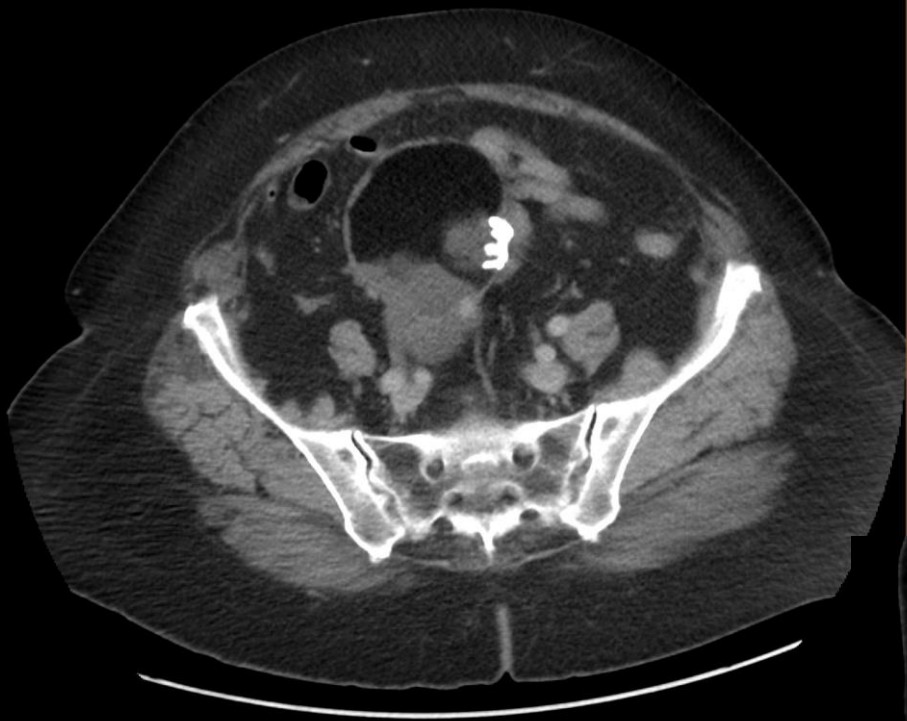
## Findings (labeled)



irregular, dense,  
dystrophic  
calcifications

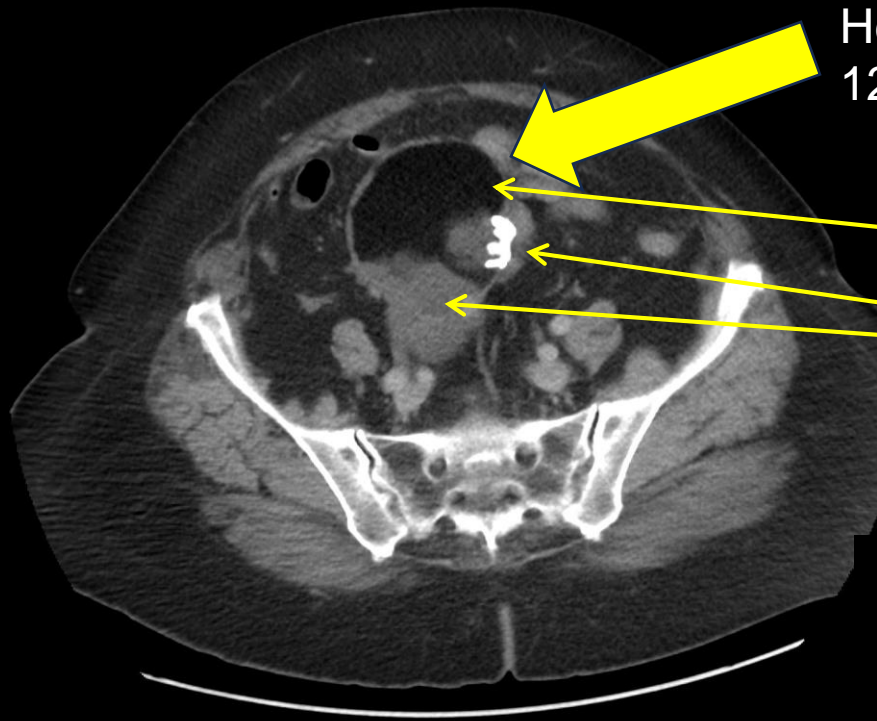


## Findings (unlabeled)





# Findings (labeled)

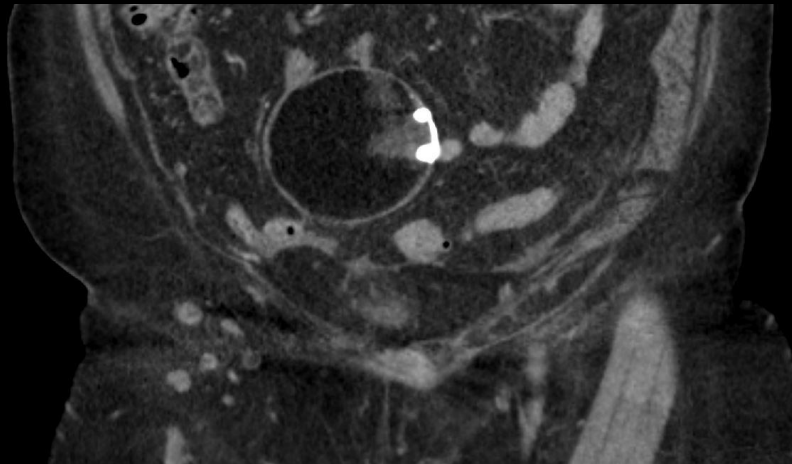
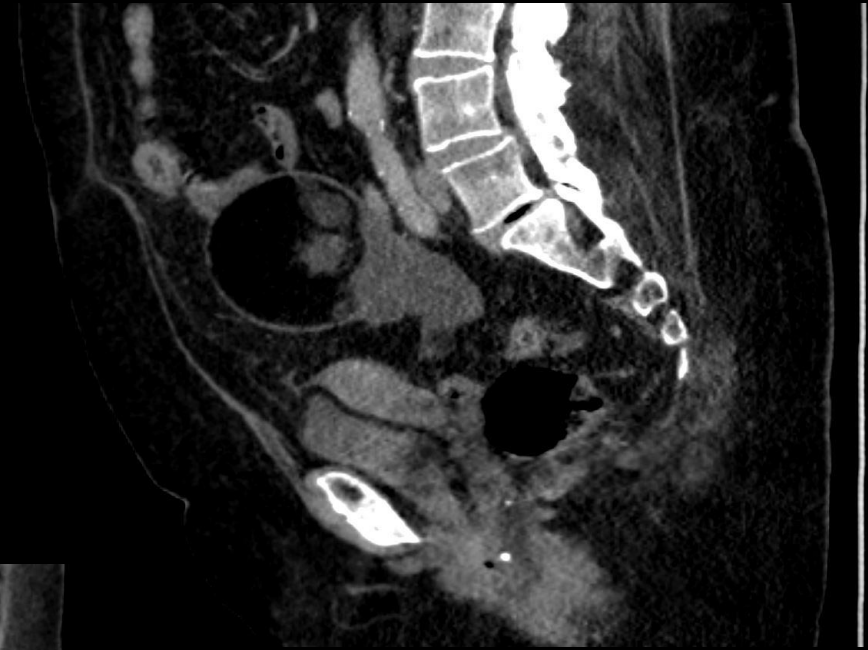


Heterogenous mass measuring  
12.3x7.9x8.1 cm

Fatty Portion: -127 HU

Calcified Portion: 960 HU

Cystic Portion: 8 HU



# Differential Based on Imaging

## Germ Cell Tumors (Most Likely Given Calcifications & Fat)

- **Mature Cystic Teratoma – Most Likely**
  - **Hallmark:** Presence of **fat, calcifications (teeth, bone), and soft tissue** on CT.
- **Immature Teratoma**
  - **Hallmark:** Heterogeneous solid-cystic mass with calcifications but lacks fat.
  - Malignant, often in adolescents/young adults.
  - Can have hemorrhage, necrosis, and rapid growth.

## Epithelial Ovarian Tumors

- **Serous Cystadenoma/Cystadenocarcinoma**
  - **Hallmark:** Multiloculated cystic mass with **thin septations**; papillary projections if malignant.
  - **No fat or calcifications** expected.
- **Mucinous Cystadenoma/Cystadenocarcinoma**
  - **Hallmark:** **Large, multiloculated cystic mass** filled with mucinous material.
  - More likely to cause **mass effect**, rarely calcifies.

## Sex Cord-Stromal Tumors

- **Fibroma / Thecoma**
  - **Hallmark:** Solid, hypodense mass without necrosis or cystic changes.
  - **May show calcifications**
- **Granulosa Cell Tumor**
  - **Hallmark:** Solid-cystic tumor, sometimes hemorrhagic.
  - Produces **estrogen**, leading to **endometrial thickening/hyperplasia**.

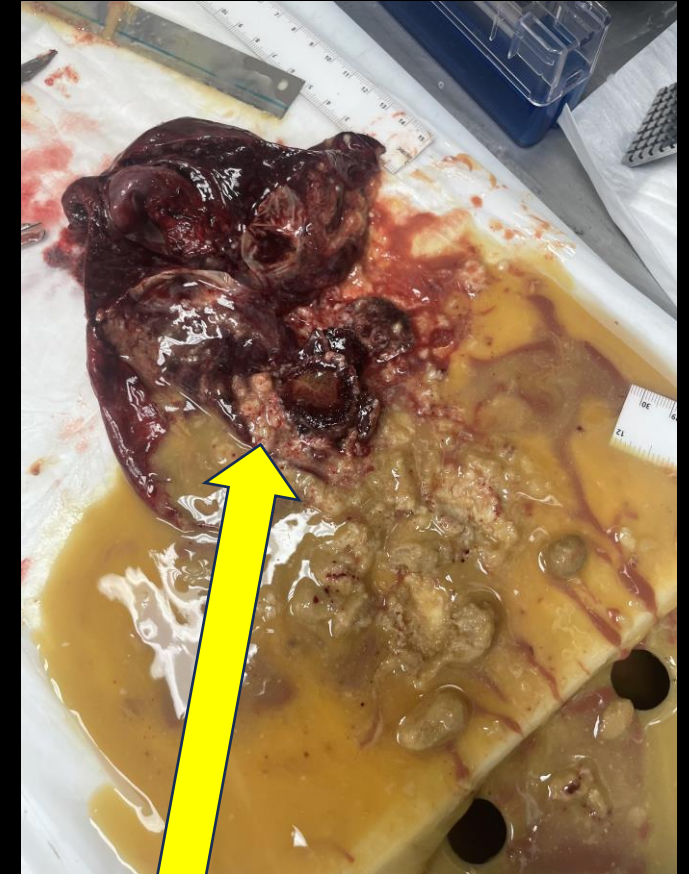


# Gross Findings (unlabeled)





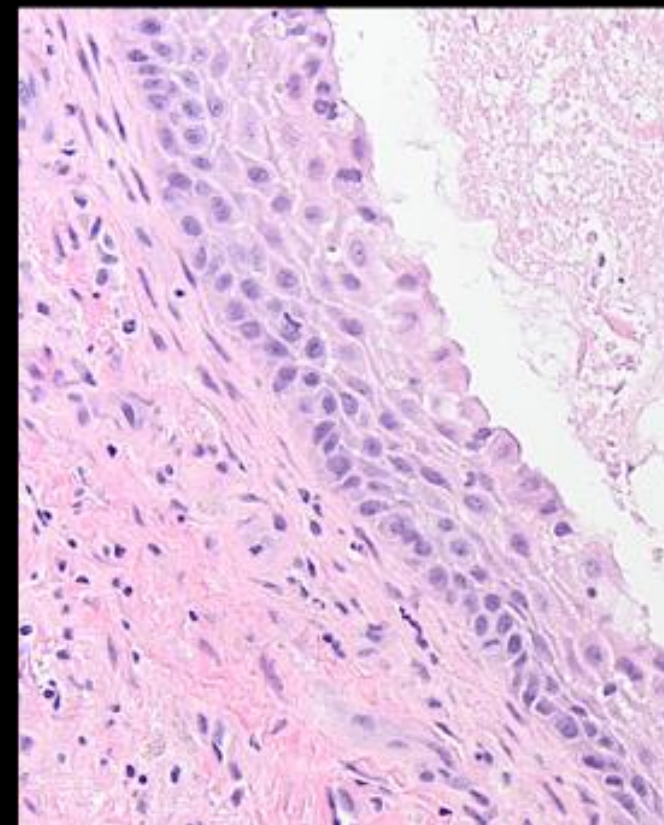
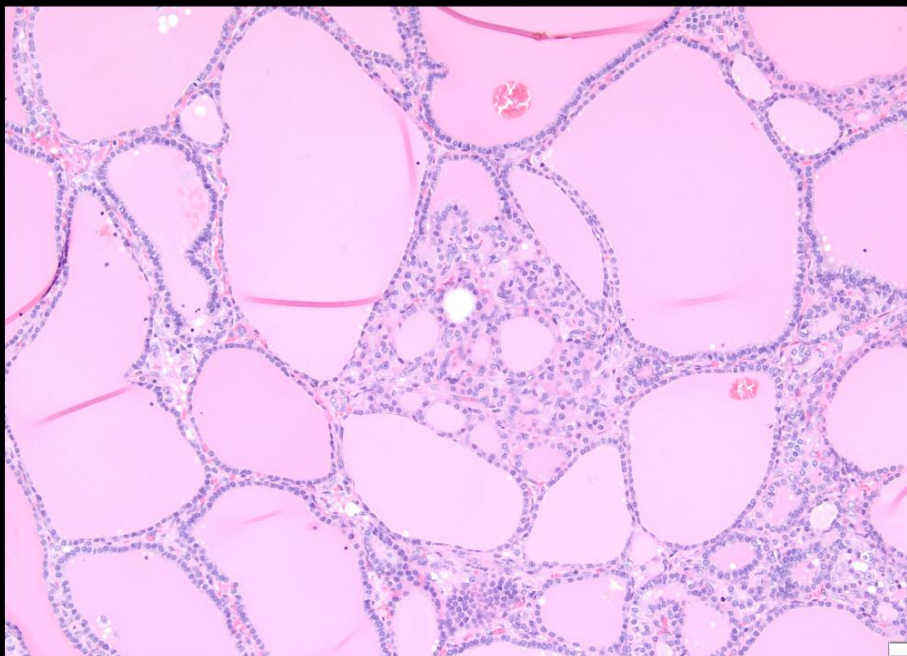
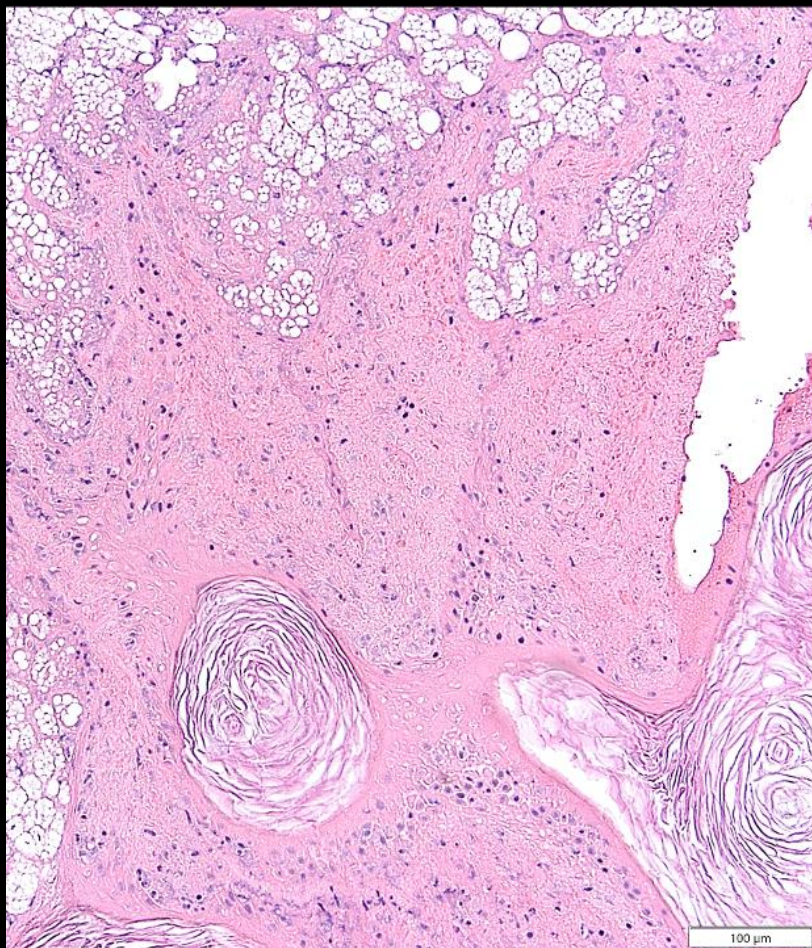
# Gross Findings (labeled)



Note teeth



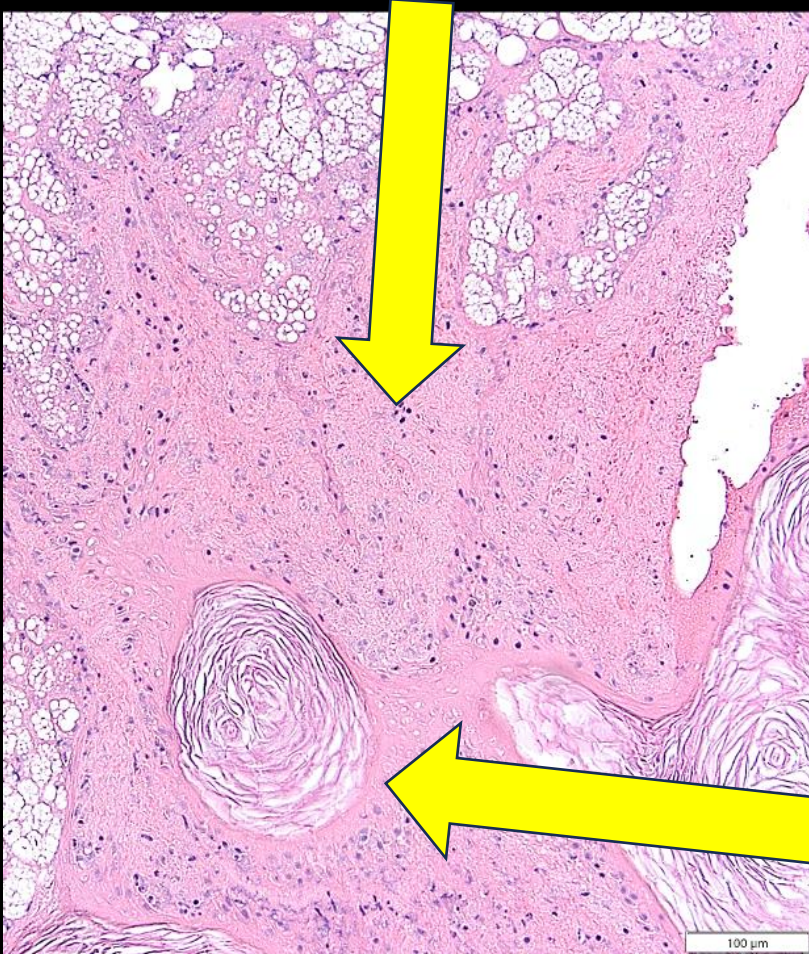
# Microscopy (unlabeled)



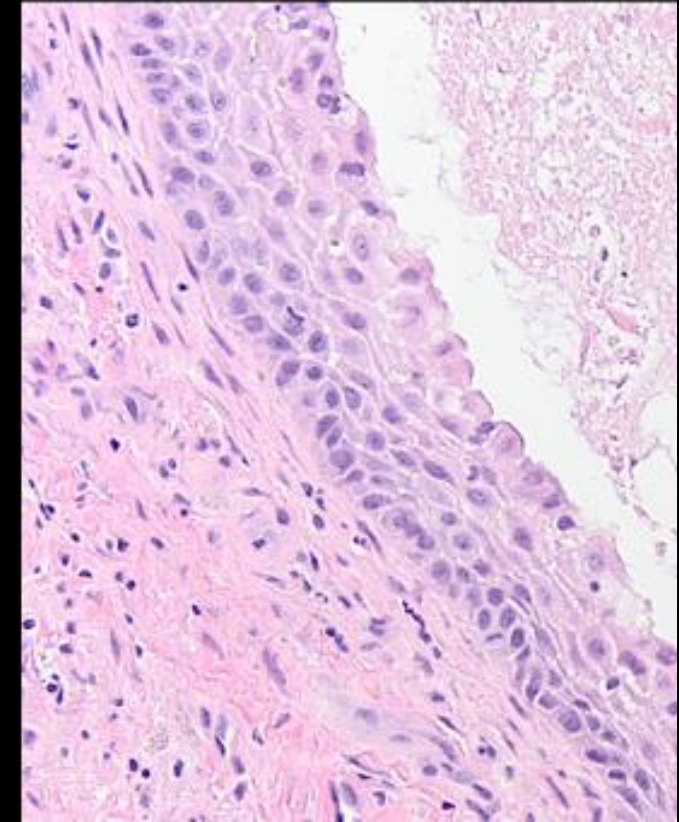
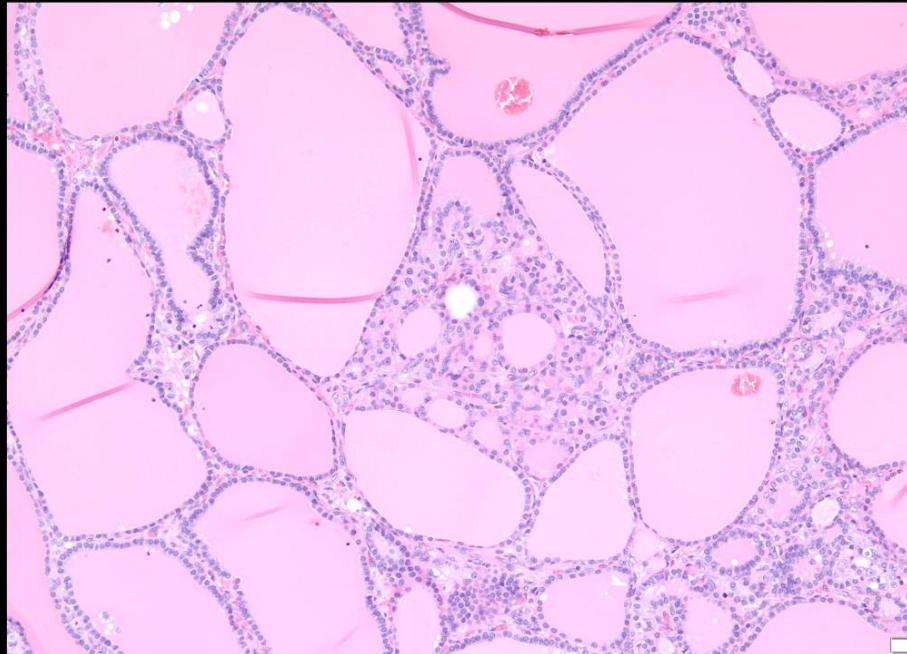


# Microscopy (labeled)

Necrosis, consistent with ovarian torsion



Thyroid Tissue (endoderm)



Stratified epithelium (ectoderm)

Keratin Pearl (ectoderm/ mesoderm) - A skin appendage derived from ectoderm but encased in mesodermal connective tissue. The presence of skin appendages implies mesoderm, despite being derived from ectoderm.



Final Dx:

Mature Cystic Teratoma

# Case Discussion

- **Clinical Presentation**

- Mature teratomas are the most common **benign ovarian neoplasm** (~10–20% of ovarian tumors).
- Typically, asymptomatic but can present with **pelvic pain, fullness, or pressure**.
  - In this case, the patient had **acute RLQ pain** and nausea due to torsion over the mass, which led to further imaging.

- **Radiologic Features**

- **Classic CT Findings:**
  - Well-defined **cystic mass** with **fat, calcifications (teeth, bone), and soft tissue**.
  - **Rokitansky nodule** (solid protuberance) may be present.
- **Ultrasound Findings:**
  - Heterogeneous echogenic mass with **posterior acoustic shadowing** (“tip of the iceberg” sign).
  - Possible **dermoid mesh** (floating echogenic bands from hair).

# Case Discussion

- **Torsion as a Complication (Confirmed in Surgery)**

- **Torsion is the most common complication of MCTs** (~15% risk, especially if >5 cm).
- Imaging clues to torsion:
  - Enlarged ovary with heterogeneous enhancement.
  - Peripherally displaced follicles ("string of pearls" sign).
  - Twisted vascular pedicle (**whirlpool sign**—best seen on Doppler US).
- **Surgical findings in this case:** The ovary was torted, confirming the radiologic suspicion.
- Microscopy Findings: Microscopic necrosis confirmed torsion

- **Histologic Composition**

- Derived from **all three germ layers**:
  - **Ectoderm:** Keratinized epithelium, sebaceous glands, hair follicles.
  - **Mesoderm:** Connective tissue, muscle, adipose.
  - **Endoderm:** Glandular structures, including occasional **thyroid tissue**.

# Case Discussion

- **Potential Complications**

- Ovarian torsion (as seen in this case).
- Rupture → chemical peritonitis.
- Malignant transformation (<1%, usually squamous cell carcinoma).

- **Differentiating Struma Ovarii vs. MCT with Thyroid Tissue**

- **Mature Teratoma with Thyroid Tissue:** Contains **some** thyroid elements but is **predominantly** other germ layers. No clinical thyroid dysfunction.
- **Struma Ovarii:** A monodermal teratoma where **>50% of the tumor is thyroid tissue**. May cause hyperthyroidism and has a small risk of malignant transformation to thyroid carcinoma.
- **Key distinction:** Struma ovarii is **mostly thyroid**, while teratomas have **mixed tissue types**.

# References:

- **Kutiyanawala M, Gaillard F.** Mature cystic ovarian teratoma. *Radiopaedia.org*. Published January 28, 2025. Available at: <https://radiopaedia.org/articles/mature-cystic-ovarian-teratoma-1>. Accessed January 31, 2025.
- **Singh P, Lath N, Shekhar S, et al.** Struma ovarii: A report of three cases and literature review. *J Mid-life Health*. 2018;9(4):225-229. doi:10.4103/jmh.JMH\_53\_18
- **Taylor EC, Irshaid L, Mathur M.** Multimodality imaging approach to ovarian neoplasms with pathologic correlation. *RadioGraphics*. 2021;41(1):289-315. doi:10.1148/rg.2021200086
- **Wolff EF, Hughes M, Merino MJ, et al.** Expression of benign and malignant thyroid tissue in ovarian teratomas and the importance of multimodal management as illustrated by a BRAF-positive follicular variant of papillary thyroid cancer. *Thyroid*. 2010;20(9):981-987. doi:10.1089/thy.2009.0458