

Ultrasound of the Fallopian Tube

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No personal financial disclosures

Off- label use of US contrast for Hysterosalpingo-CONtrast-Sonography

Outline

1. General
 - a. Embryology and Anatomy
 - b. Sonographic signs of dilated tubes
2. Pelvic Inflammatory Disease
3. Hematosalpinx
 - a. Endometriosis
 - b. Ectopic pregnancy
4. Tumors
5. Torsion
6. Infertility
7. Look-a-likes

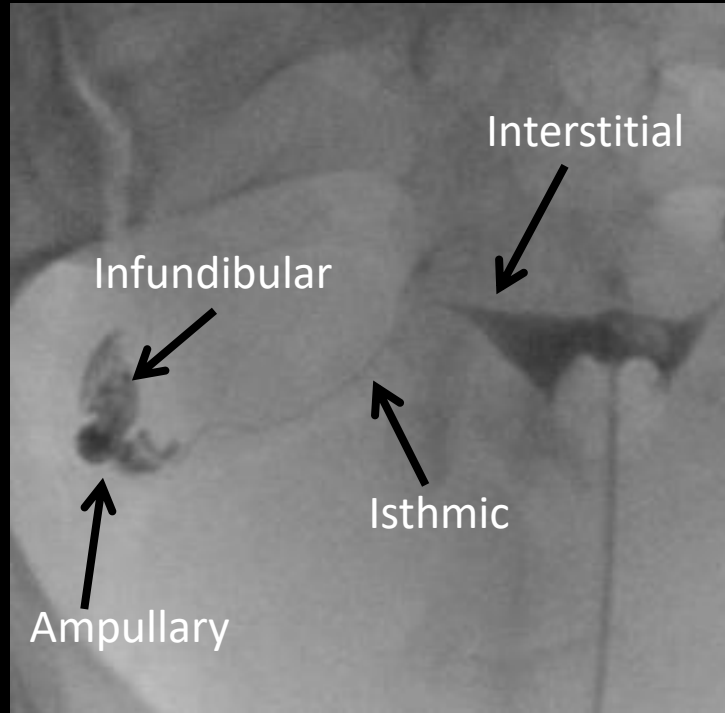
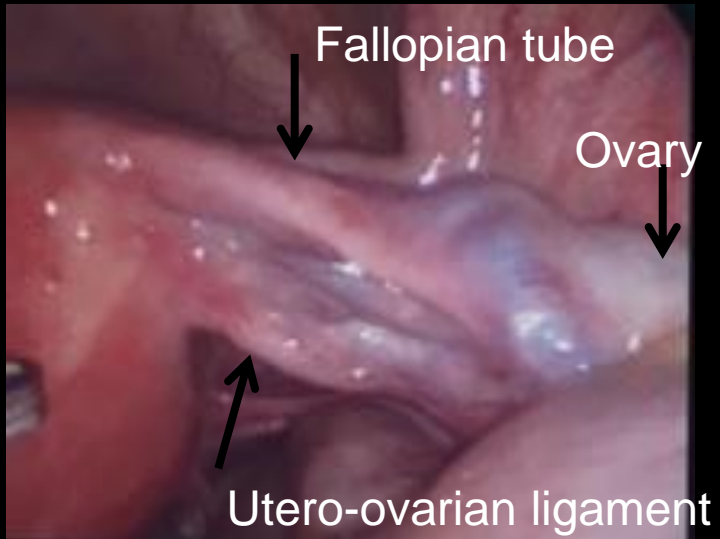
Embryology

- 5-6 weeks paired paramesonephric ducts form
- Cranial portions → fallopian tubes
 - Caudal portion fuses, forms uterus
 - Cranial end is funnel shaped and open to peritoneum
- Congenital Anomalies
 - Hydatid of Morgagni = Paratubal cyst
 - Part of paramesonephric duct that does not contribute to uterine tube may remain as a vesicular appendage
 - Other congenital anomalies: ectopic tube, tube in inguinal hernia (along with ovary)

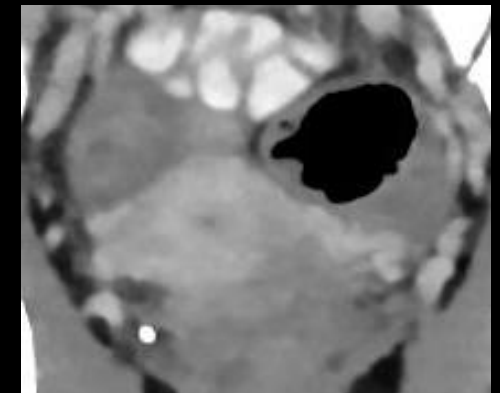
Normal Fallopian Tubes

- Extend from ovary to uterus within broad ligament
- 10-12 cm in length, 1-4 mm in diameter
- Open to peritoneal cavity with fimbria suspended over ovary to capture released ovum and transport it
- 4 anatomic segments
 - Interstitial- within myometrial cornua
 - Isthmic- narrowest portion of tube
 - Ampullary- closer to ovary, wider segment, ½ tube
 - Infundibulum with fimbria- funnel shaped
- Composition of wall
 - Mucosa- with fingerlike projections (plicae)
 - Epithelium- ciliated and non-ciliated columnar cells
 - Ciliated epithelium and plicae propel ovum towards uterine cavity, fluid is propelled out of tube into peritoneal cavity

Normal Fallopian Tube

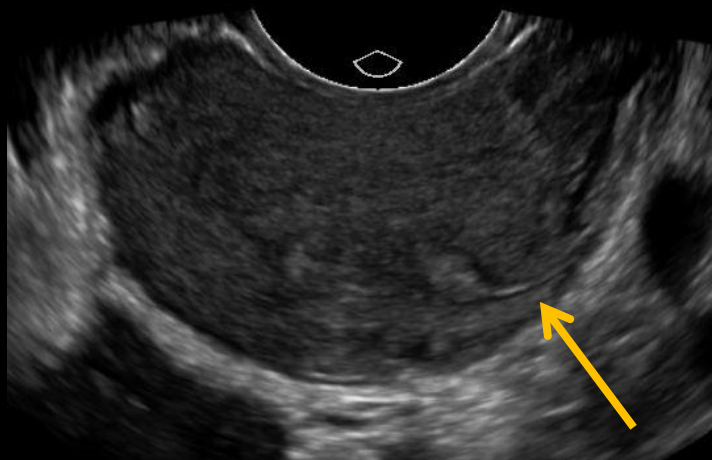


“Double contrast” after free spill

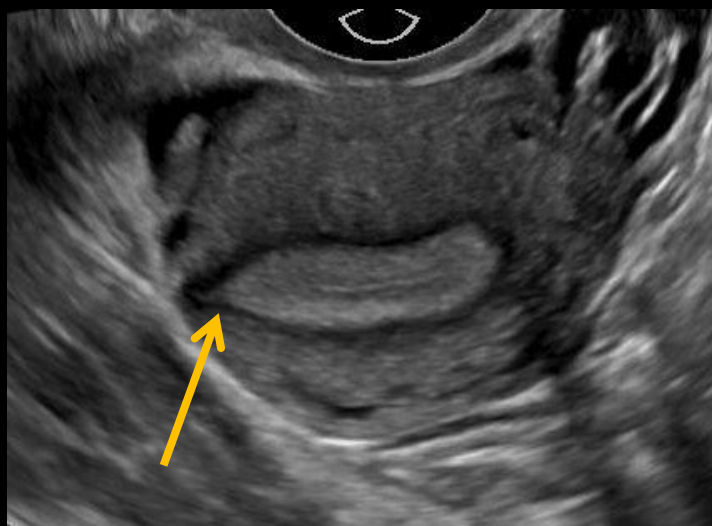
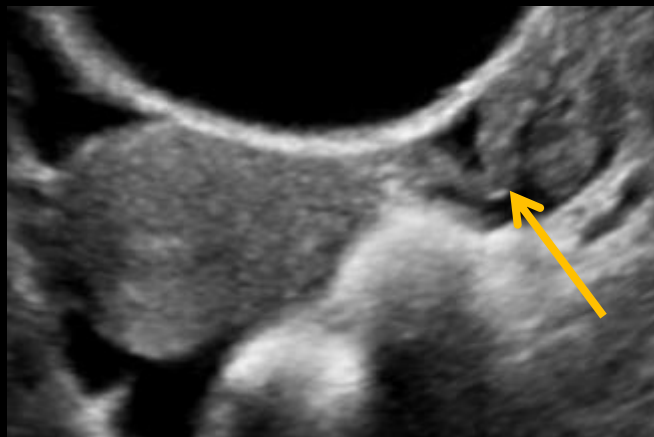


Normal Fallopian Tube

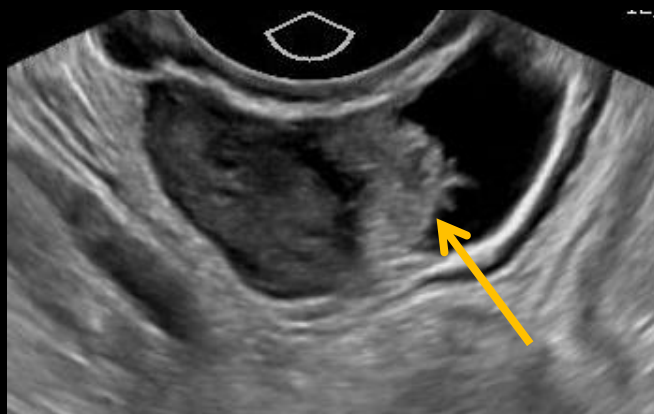
Interstitial



Isthmic and ampullary



Infundibular and fimbria



Normal Tube with paratubal cyst



C10-3v/OB I



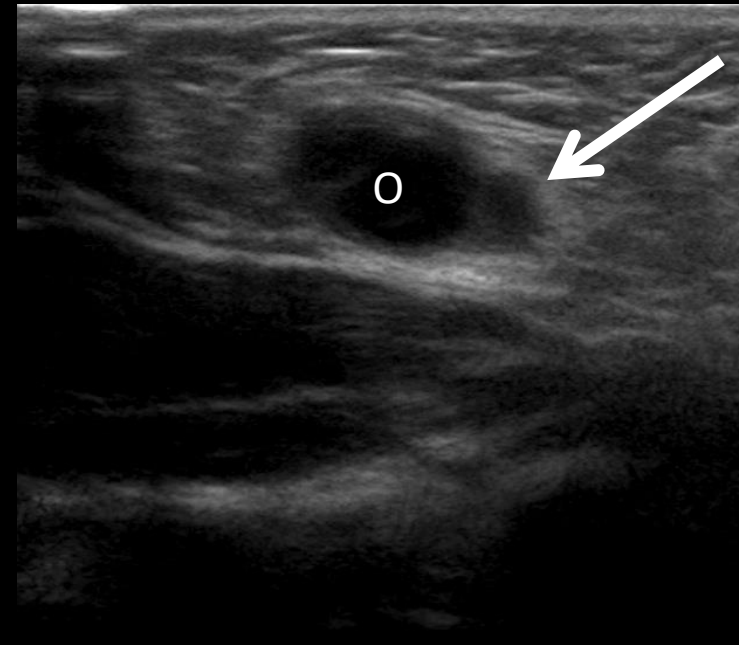
vary Right Trv
Page: 1 of 120

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Newborn with inguinal hernia containing ovary and tube



Sag Right



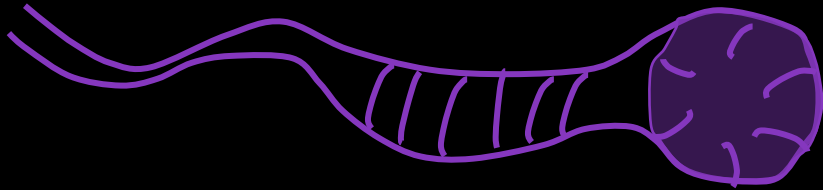
Trv Right

Abnormal Fallopian Tube

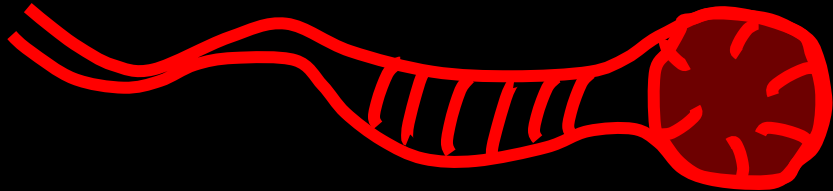
★ tubular structure SEPARATE from ovary ★

- Waist sign = diametrically opposed indentations in wall
 - Single best discriminator¹
- Incomplete septum = linear, echogenic protrusion arising from one wall but not reaching the opposite wall
- Thick wall ($\geq 5\text{mm}$) and cogwheel sign are best markers for acute disease
- Thin wall ($< 5\text{mm}$) and beads on string indicates chronic disease
- Other findings: tubular, “solid” structure, fluid/debris level, gas
- Cine clips, 3D inverted imaging

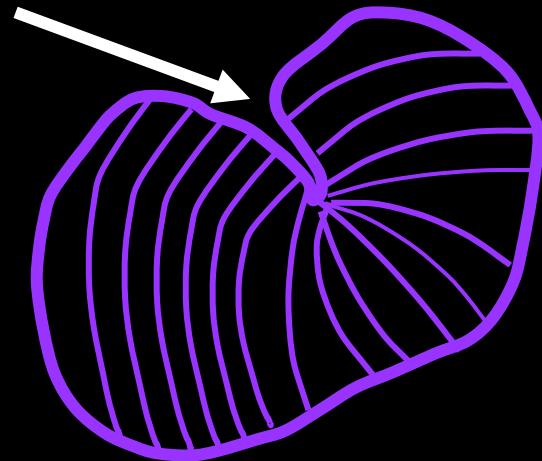
Normal tube



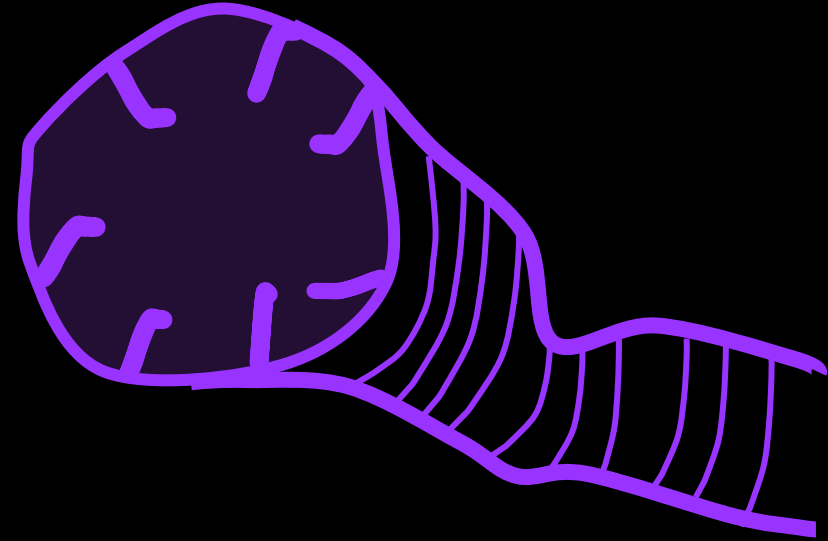
Salpingitis



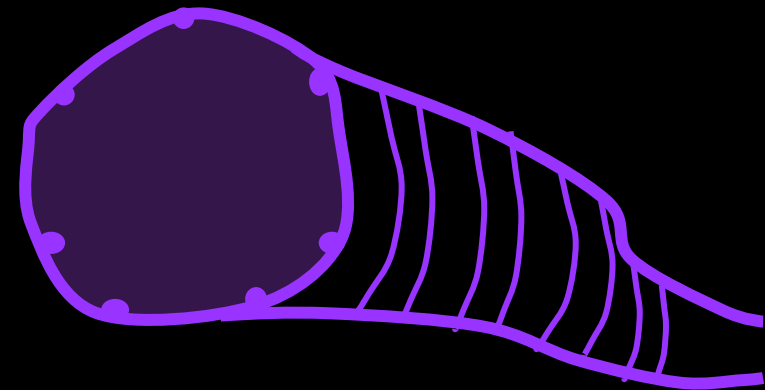
Waist sign
Incomplete septum



Cogwheel sign

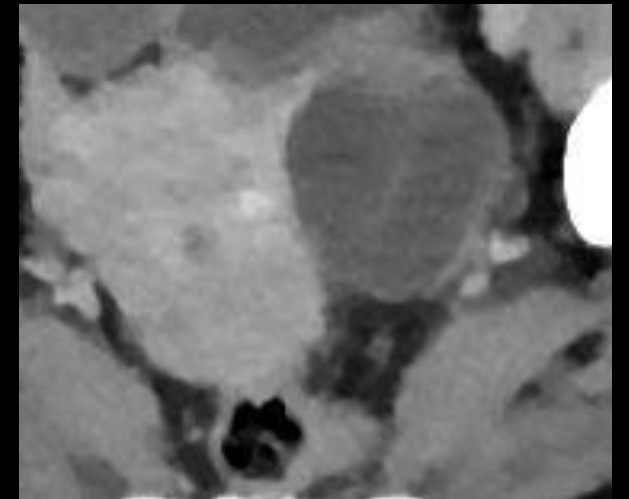


Beads on a string sign



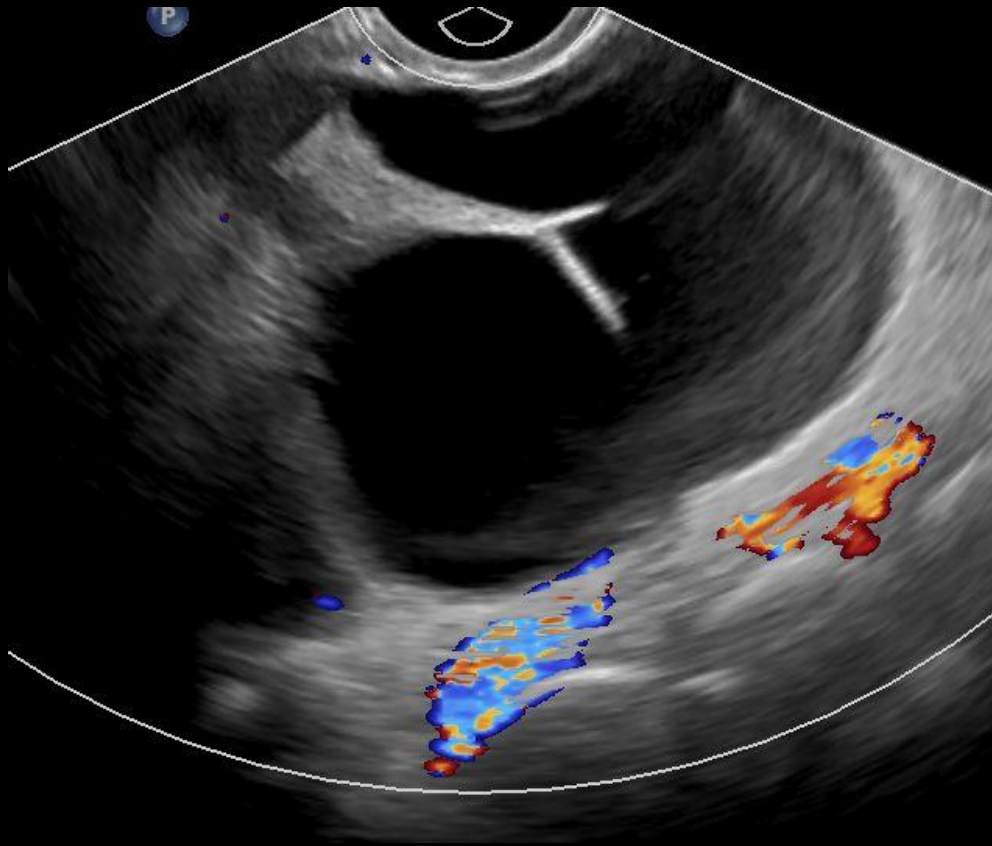
Hydrosalpinx

1. Occurs when FT secretions cannot drain into peritoneal and endometrial cavities
2. Causes: PID, endometriosis, paratubal adhesions
3. Patients often asymptomatic or recurrent pain
4. Large hydrosalpinx more difficult to differentiate from cystic adnexal mass

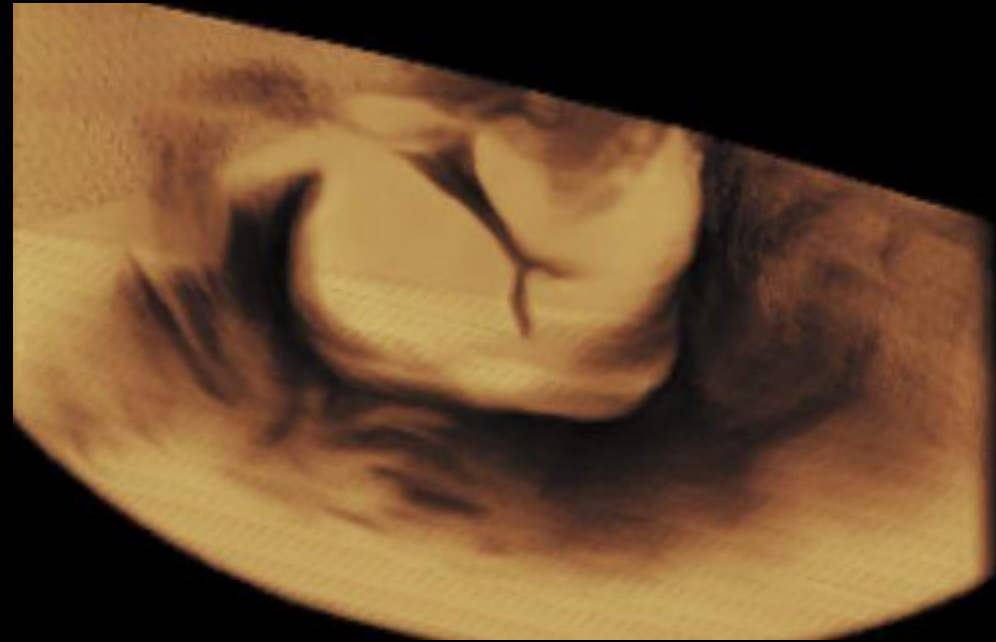


Hydrosalpinx

Waist and incomplete septum signs



3D helpful to appreciate tubal morphology



Hydrosalpinx during Sonohysterography

PRE



POST



Left Sag

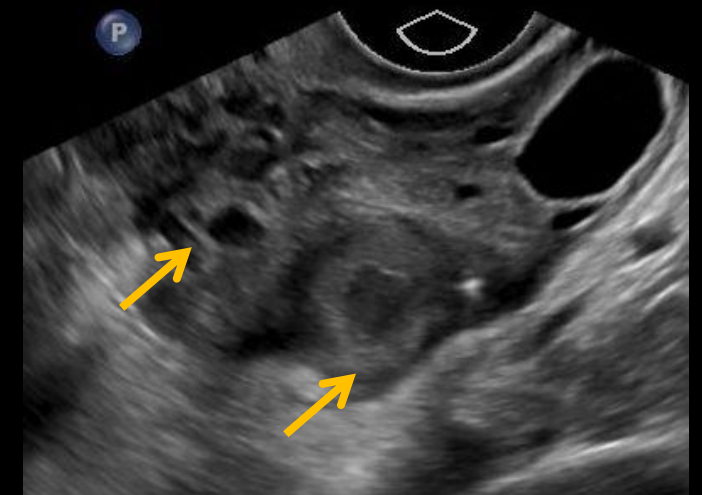
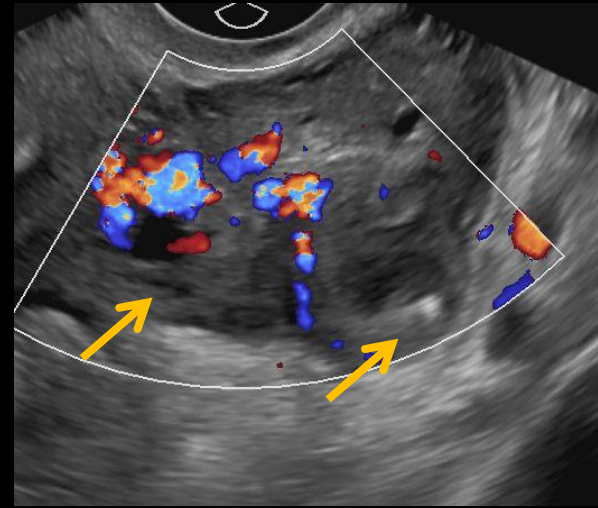
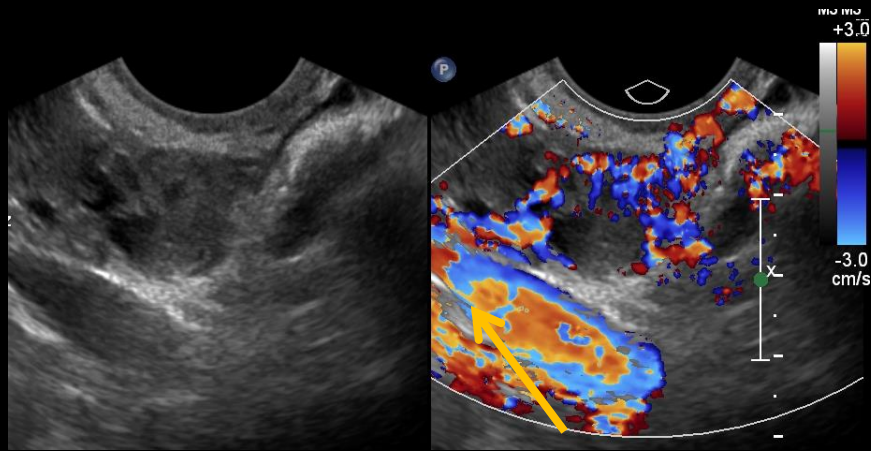
Pain and fever- PID

- Initial endometritis, leads to tubal inflammation, adhesions, obstruction, spread to peritoneum and ovary
- **US is 1° imaging modality, especially with non-specific sx**
 - TV- most useful to characterize tubal and ovarian abnormalities
 - TA- helpful for large abnormalities, extent of fluid
 - Useful to exclude other diagnoses
 - Abnormal fallopian tube is hallmark
 - Dilated thick walled FT, fluid debris level, hyperemia
- **2° CT for complications, guidance for treatment**
- **If 1° CT is diagnostic, 2° US should be used for follow up as needed after treatment**

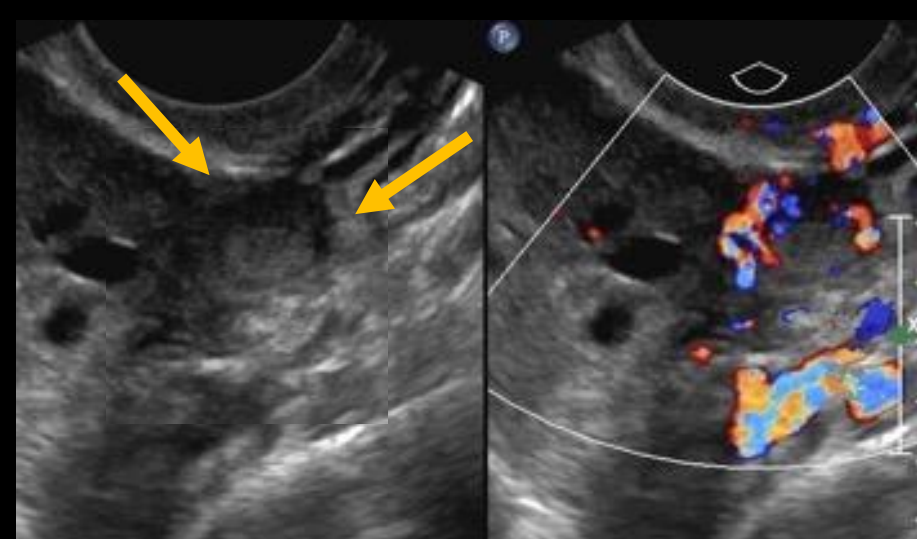
Salpingitis → Pyosalpinx → Tubo-ovarian complex → TOA

Salpingitis

Slightly thick, minimally dilated and hyperemic fallopian tube



Pyosalpinx- varying degrees of dilatation



Mildly dilated FT with hyperemia & debris level

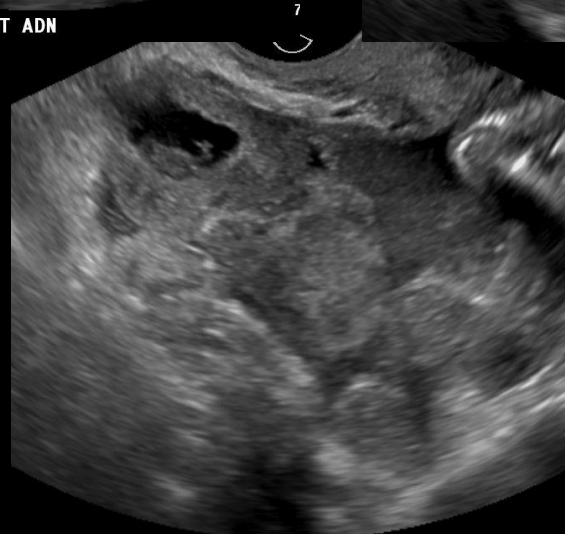
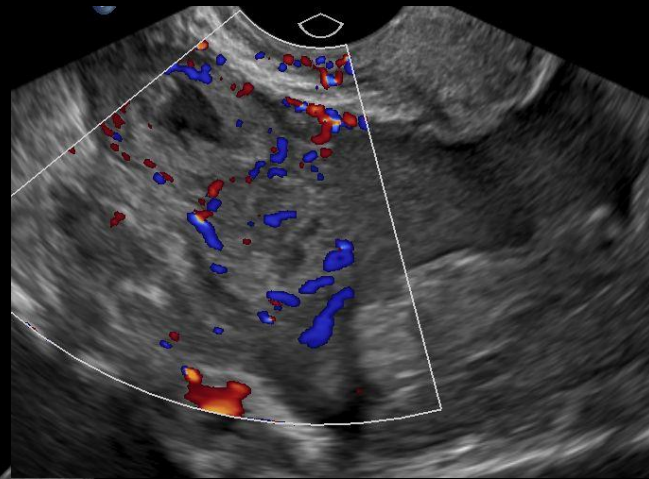


Moderately dilated debris filled FT, surrounding echogenic fat



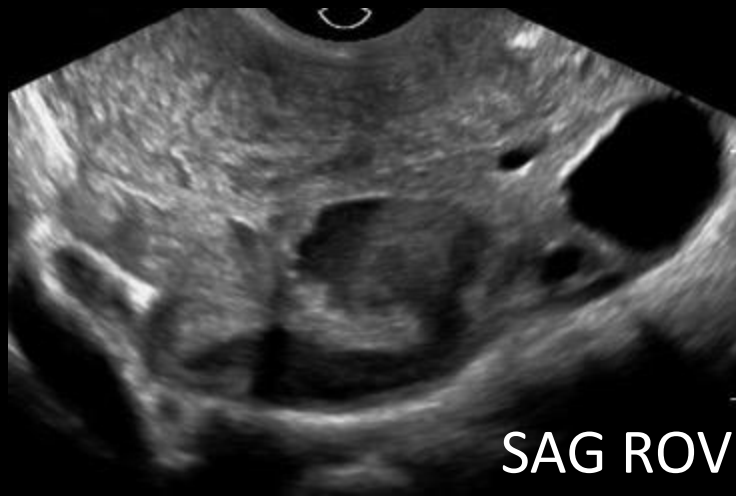
Markedly dilated FT with debris levels

Ruptured pyosalpinx in 56yo post menopausal patient



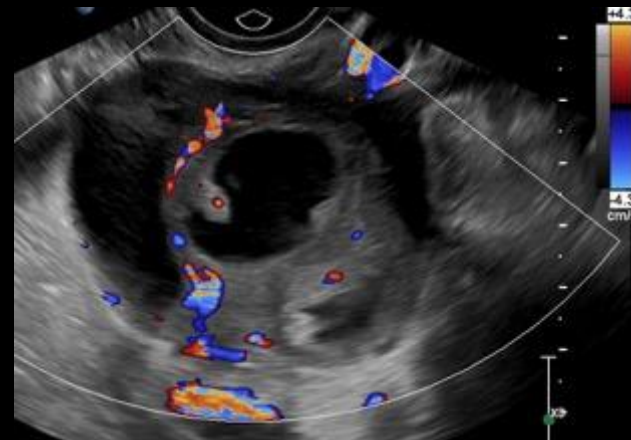
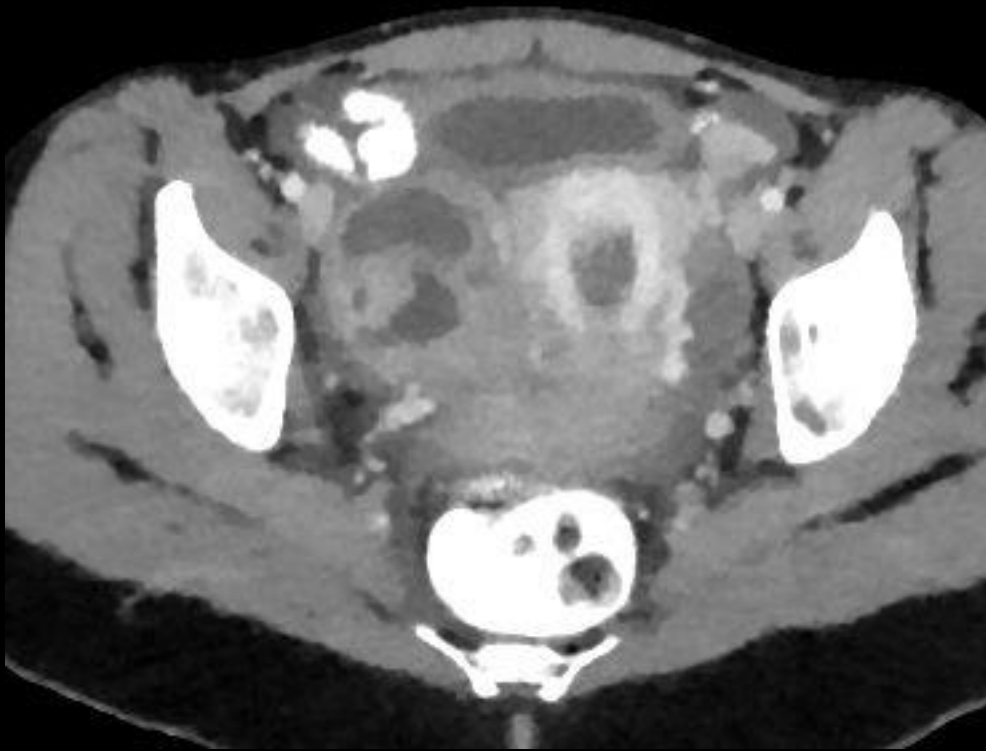
Tubo-ovarian complex

pyosalpinx stuck to normal appearing ovary



Use gentle push to show that pyosalpinx and ovary are “stuck” together and pus is mobile

Tubo-ovarian abscess

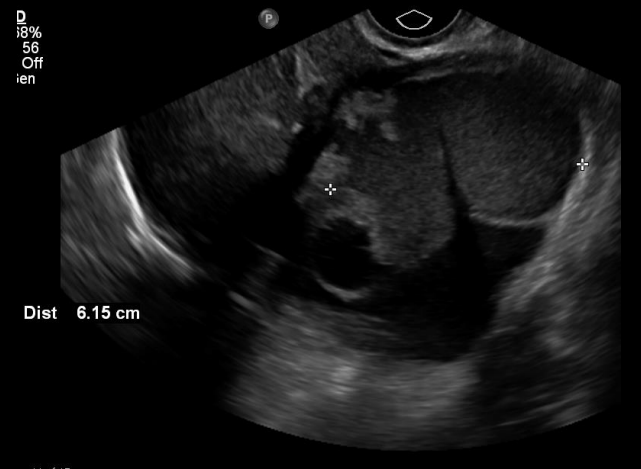
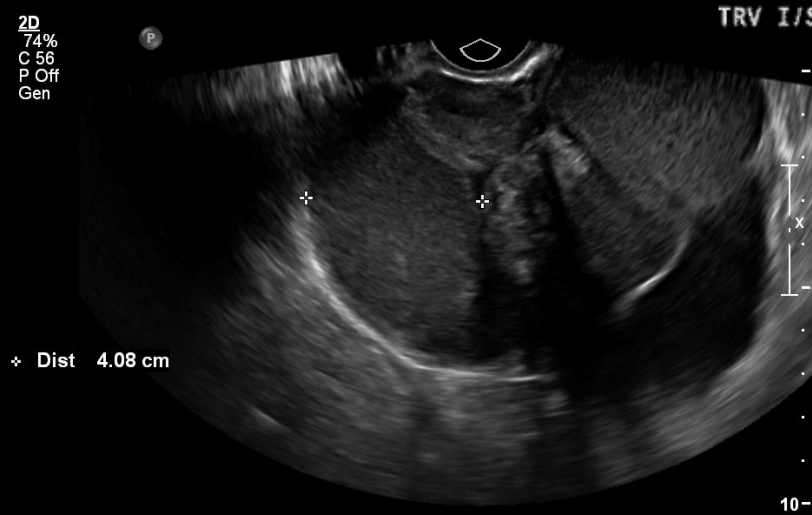
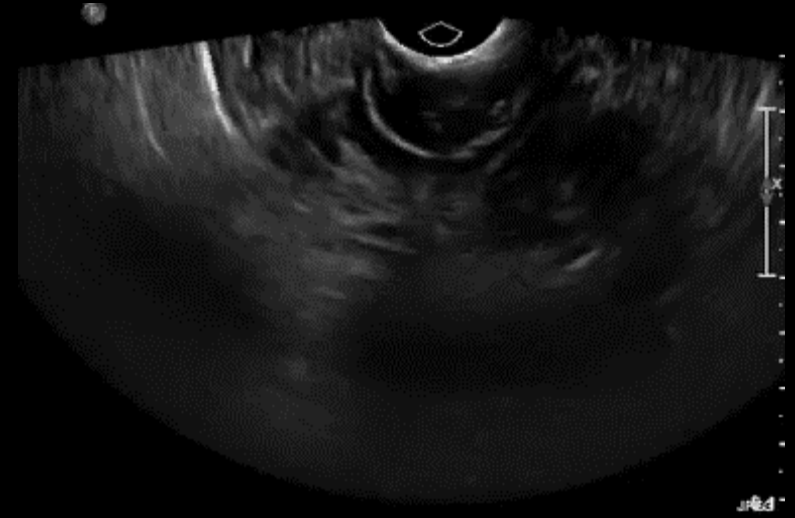


Hematosalpinx

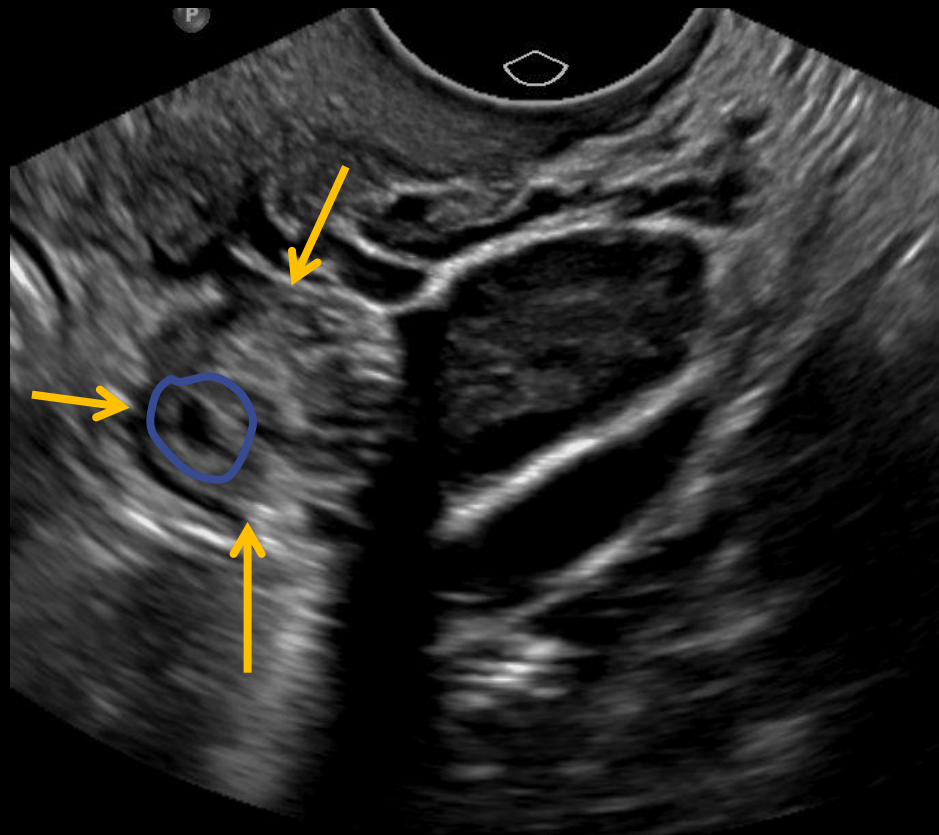
- Endometriosis
- Tubal ectopic pregnancy
- Endometrial Ablation
- Congenital uterine anomalies

Hematosalpinx: Endometriosis

1. Implants may be intra or extra luminal
2. Differentiate from pyosalpinx by thin wall without hyperemia, may have associated endometriomas and deep endometrial implants



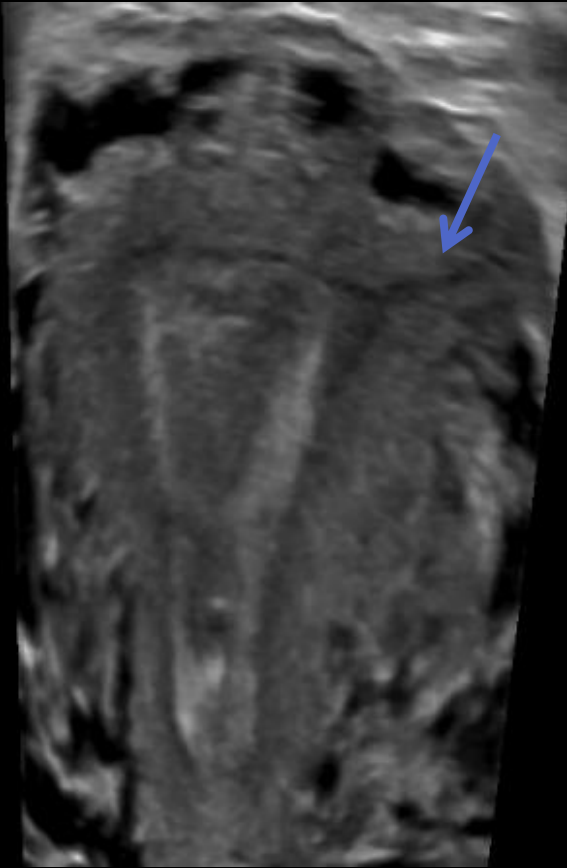
Hematosalpinx: Ectopic Pregnancy



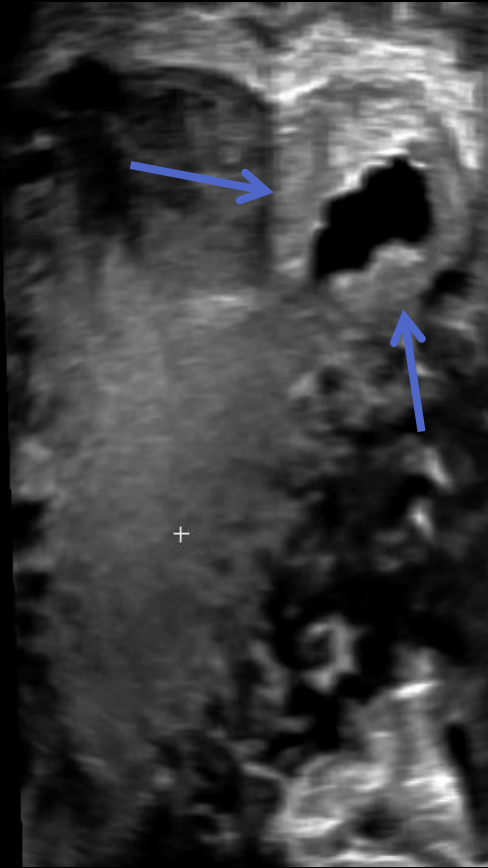
TRV LEFT OVARY <-->



Interstitial Ectopic Pregnancy



Normal Left
Interstitial FT



EP in
Interstitial FT



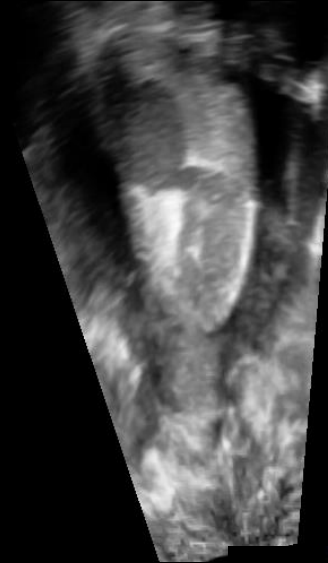
Endometrial Ablation

Cornual hydro or hematometra

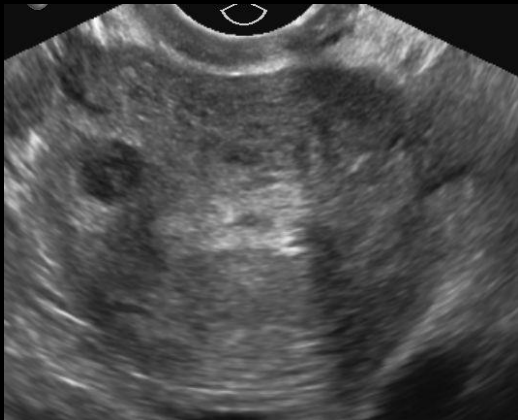
Bilateral cornual hydrometra



1. Persistent endometrium in interstitial FT bleeds
2. Obstructed by scarring and adhesions
3. Symptoms may be cyclic
4. Treatment often requires hysterectomy
5. Post ablation tubal sterilization syndrome occurs in pts who also have undergone tubal sterilization and blood dilates tubal stump



Unilateral cornual hematometra



Hematosalpinx: Müllerian Duct Anomaly

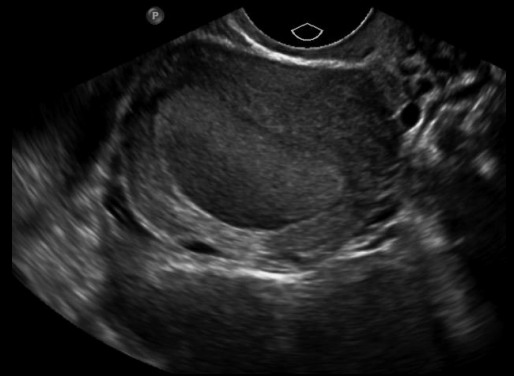
Early pregnancy
Palpable left adnexal mass



Uterus Trans

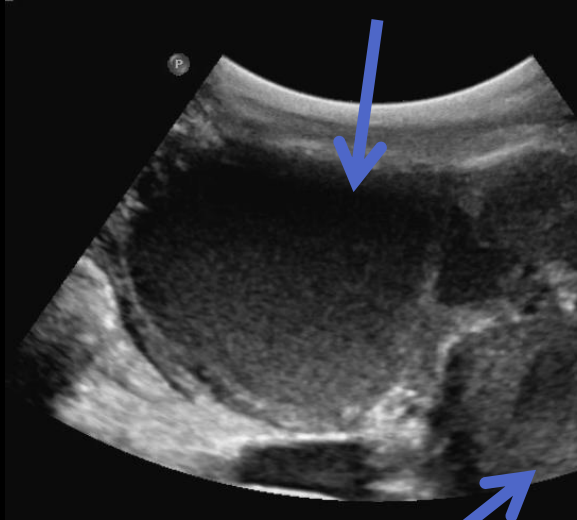


TV sag right



TV sag left

Hematosalpinx



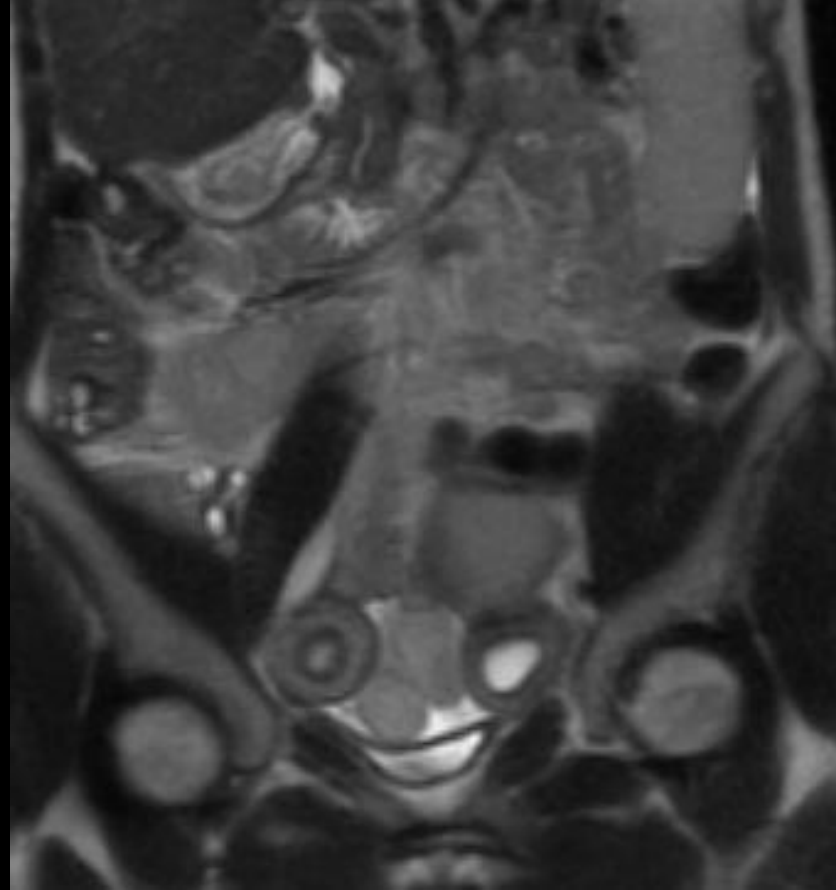
151 Left Adnexa Sag L/M

Atretic Left Horn



Left Adnexa Sag L/M

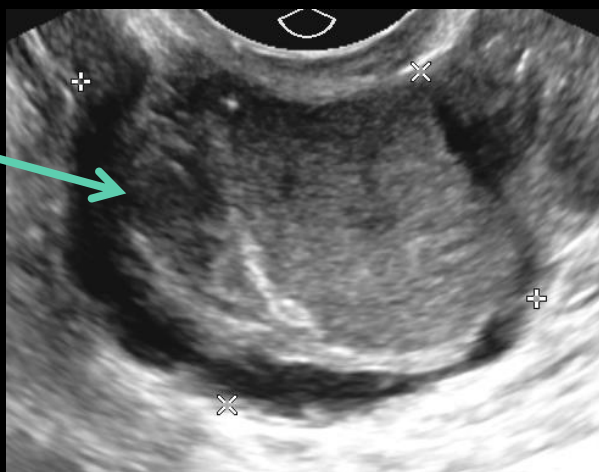
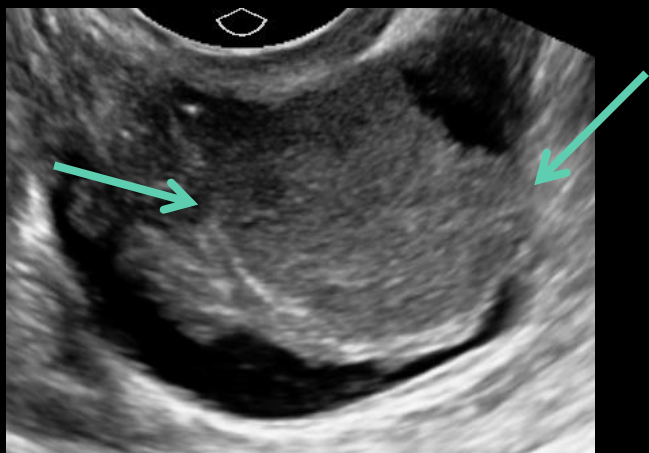
MR after pregnancy



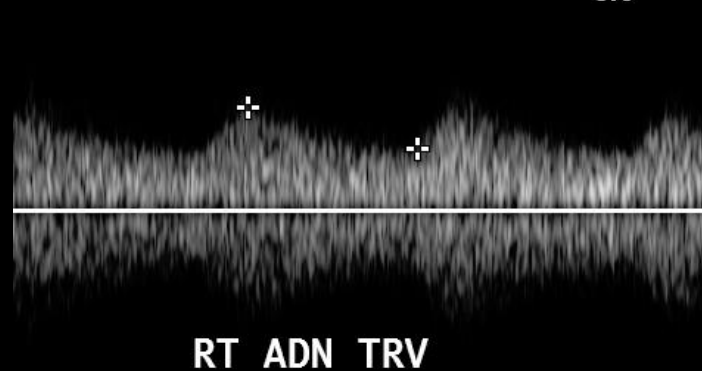
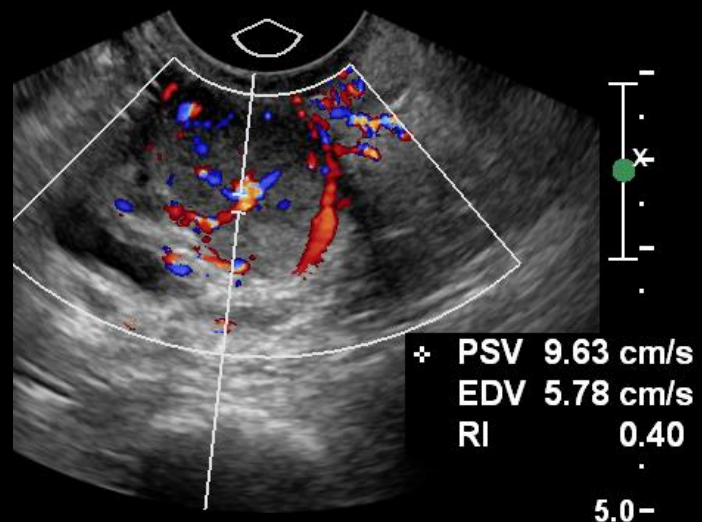
Unicornuate right uterus, atretic left horn
Left tube developed a **hematosalpinx** during pregnancy

New Right Adnexal Mass

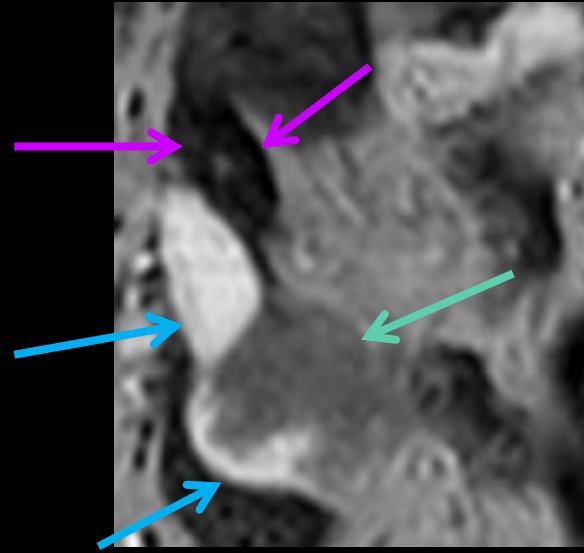
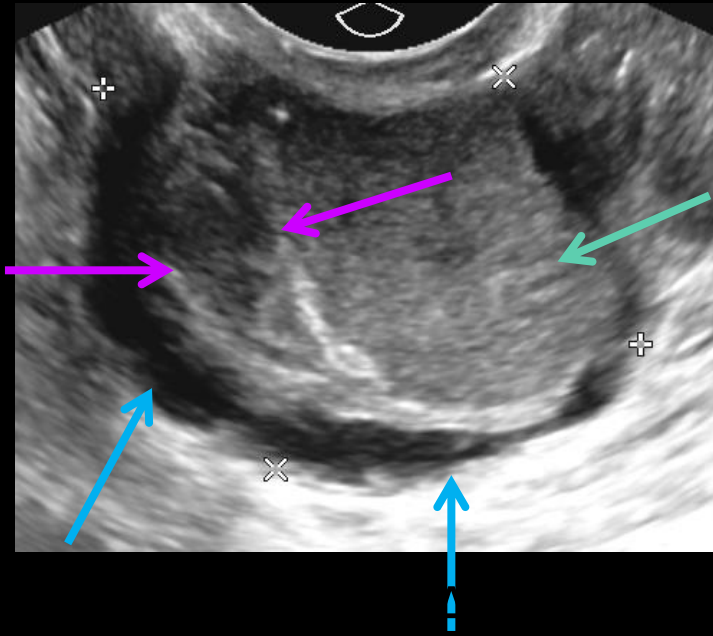
History: Postmenopausal patient with pelvic pain



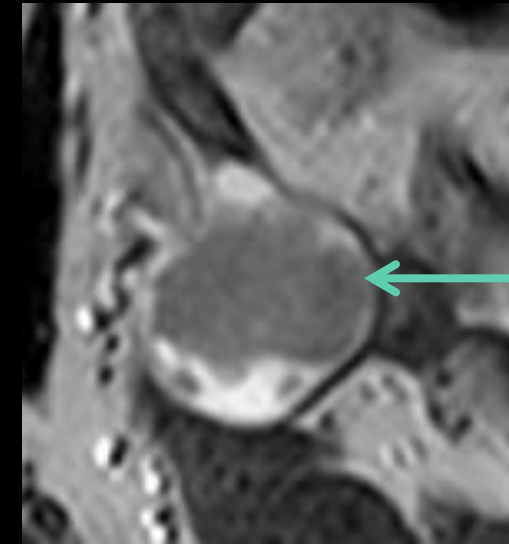
Ovary?



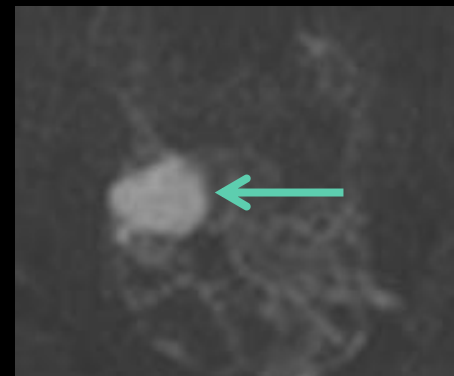
Primary Fallopian Tube Carcinoma



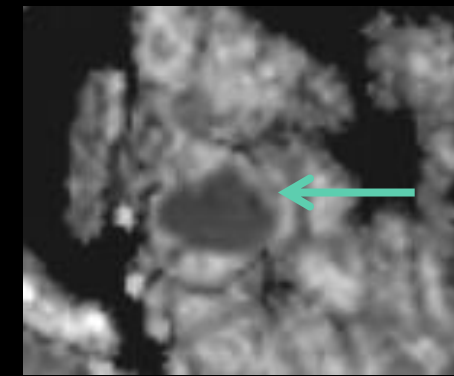
Axial T2W



Axial T2W



DWI b800



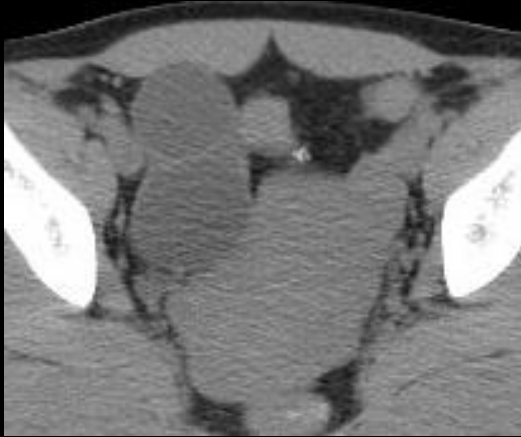
ADC map

Tubal Mass
Hydrosalpinx
Normal Right Ovary

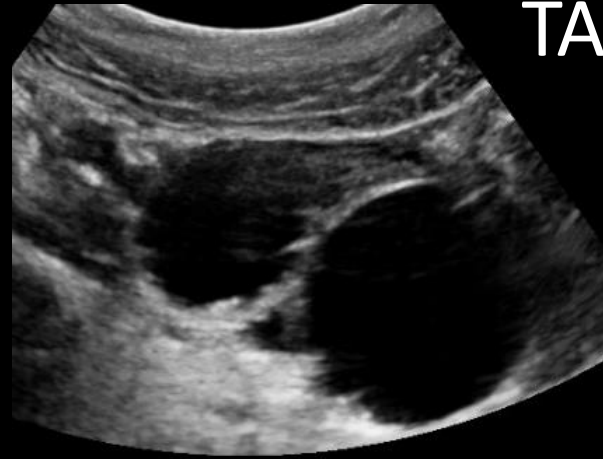
Primary Fallopian tube carcinoma

- Classified as 1°FT tumor if restricted to this site, otherwise significant overlap between ovarian and FT neoplasms
 - Serous carcinoma accounts for 70 – 90% FT tumors
- Serous tubal intraepithelial carcinoma (STIC) precursor of high grade ovarian and peritoneal carcinomas believed to arise in fimbriated end of FT
 - Often found occult in prophylactic salpingo-oophorectomy in high-risk women (BRCA mutations)
- Intermittent pelvic pain - tumor produces excessive serous fluid leading to hydrosalpinx and tubal distention that can decompress into peritoneal cavity
 - Latzko triad: intermittent vaginal discharge, colicky pain, adnexal mass

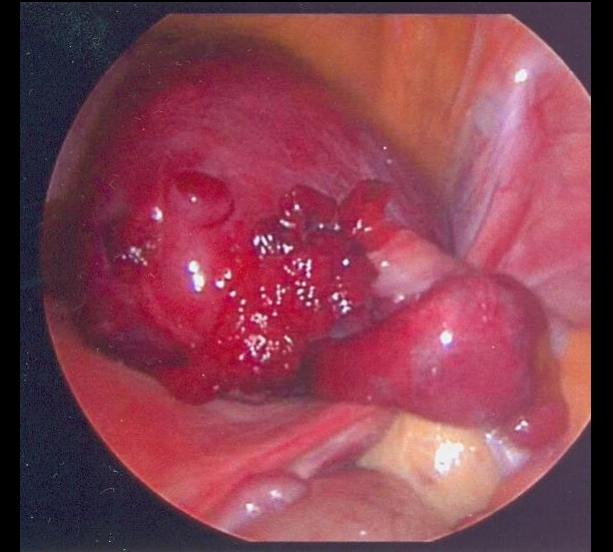
Isolated Fallopian Tube Torsion



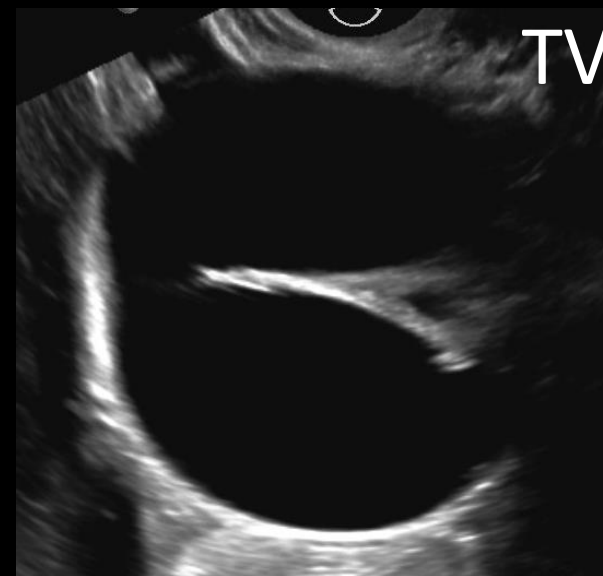
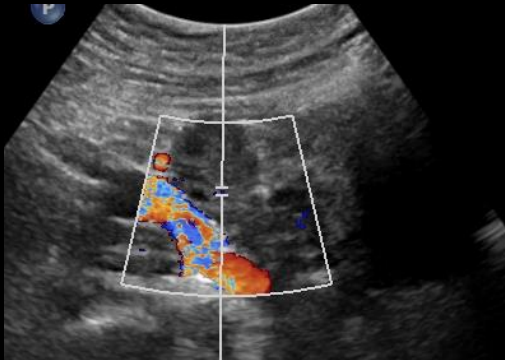
Stone search



TA



Normal ovaries



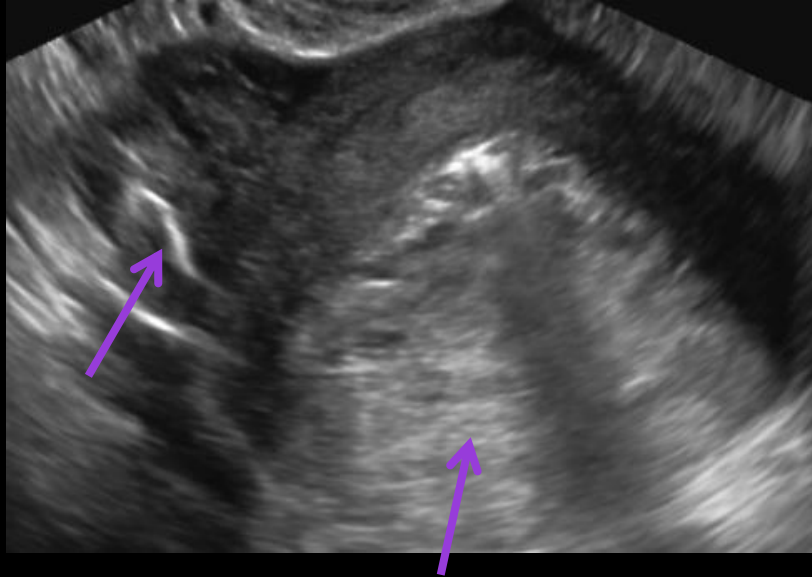
TV

Fallopian tube torsion

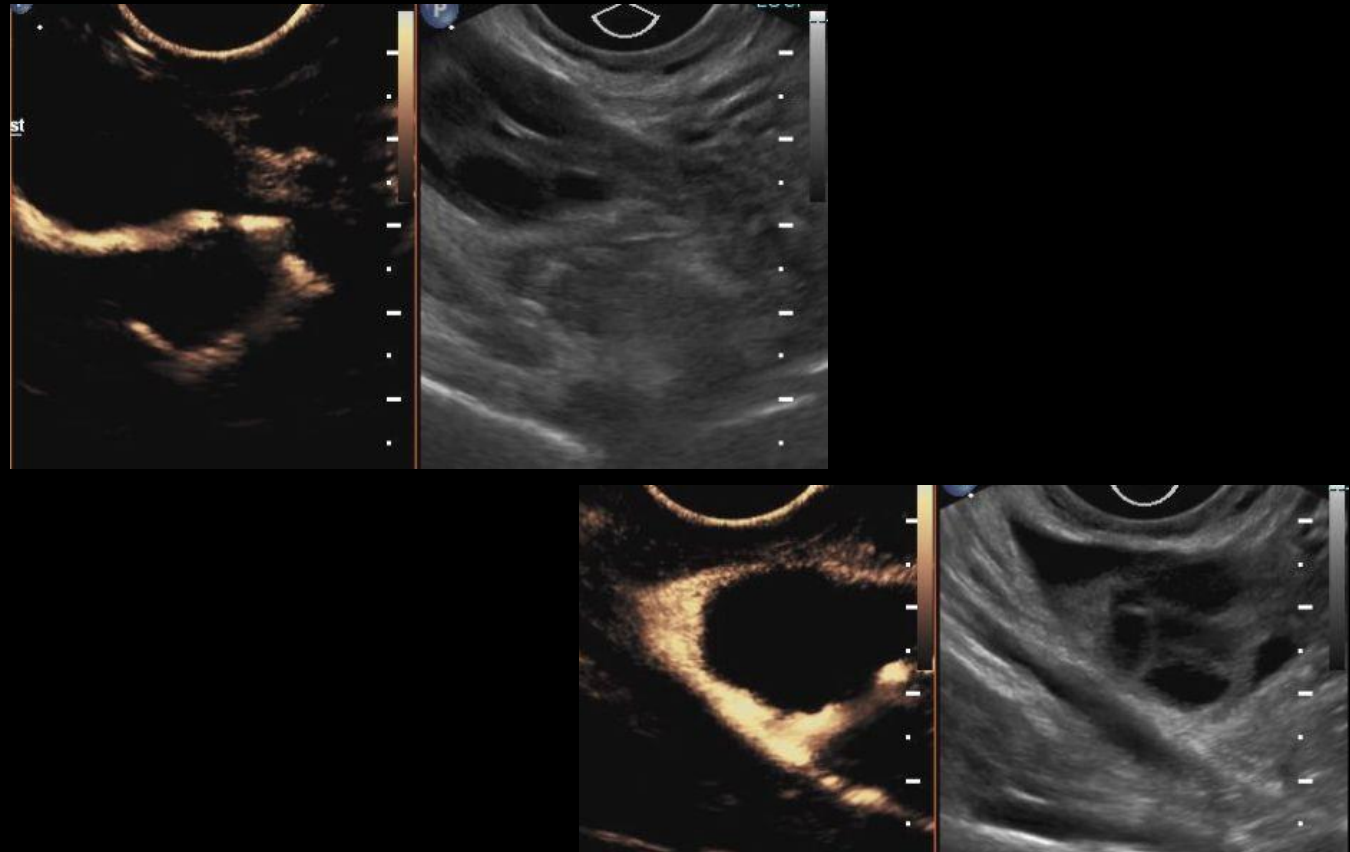
- Isolated FT torsion rare (1:1,500,00)
- Risk factors: tubal ligation, long mesosalpinx, hydatid cyst of Morgagni, hydrosalpinx
- Adolescent girls, premenopausal women
- Right FT > Left, secondary to fixation of left by sigmoid colon and mesentery
- Sx: acute onset pelvic pain, nausea, vomiting often after exercise
- Imaging: variable, may see thickened tubal wall with internal debris, twisting of tube and vessels

Tubal Patency: Air or US contrast

Air in endometrial cavity and right fallopian tube

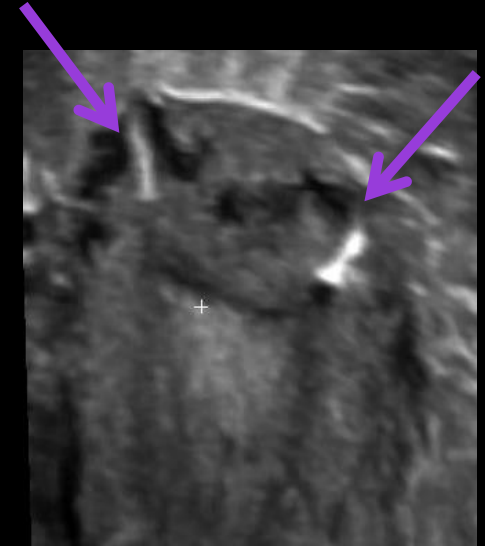
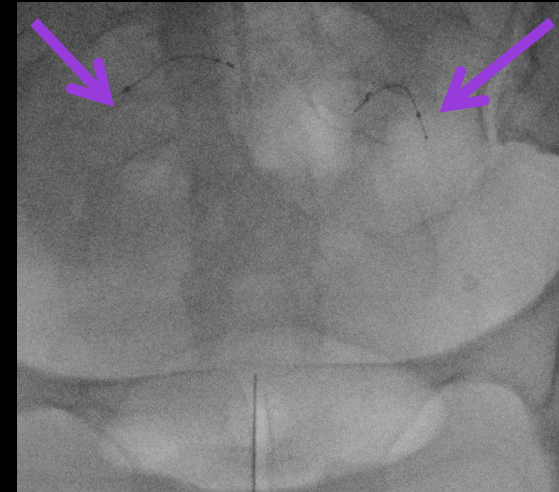


Lumason in Right FT, free spill around ovary



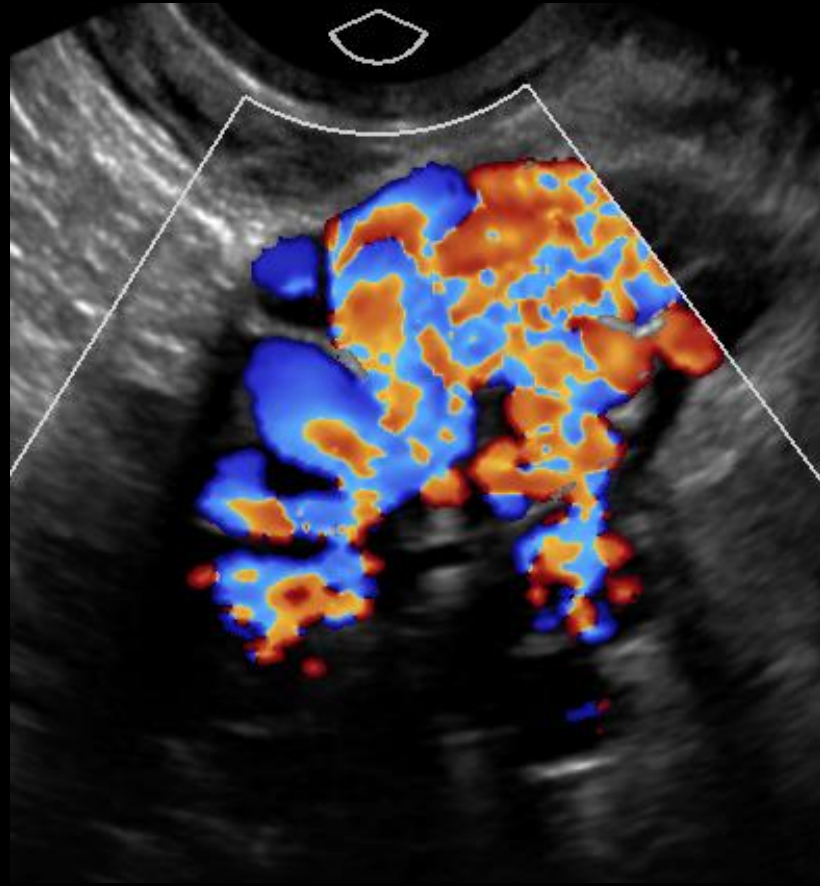
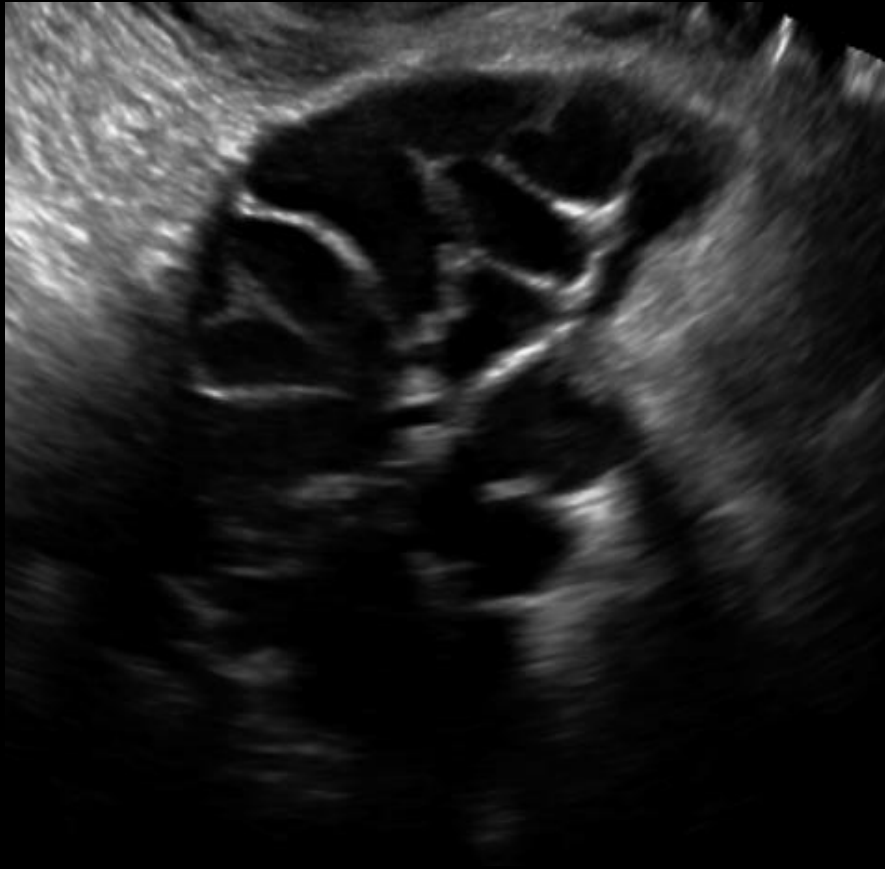
Fallopian Tube Occlusion Devices (no longer sold in U.S.)

- Devices placed into the fallopian tubes to prevent pregnancy
 - Metallic coils with end markers
 - Radiolucent silicone matrix
- Tubal perforation or migration
- Use of ultrasound
 - Verify correct position with 2D/3D
 - Locate a lost or misplaced device



Tubal Mimics

Pelvic Varices



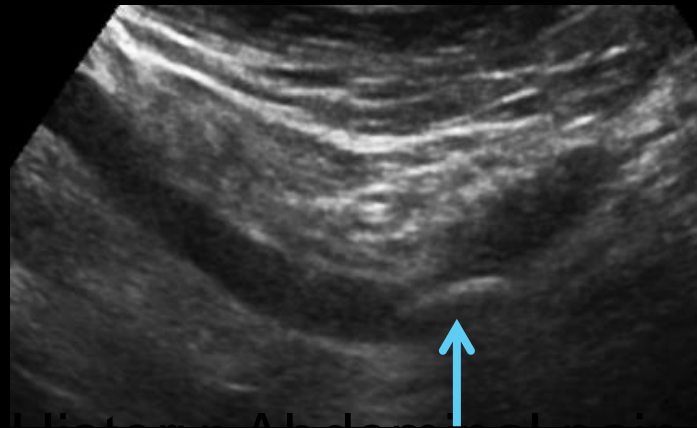
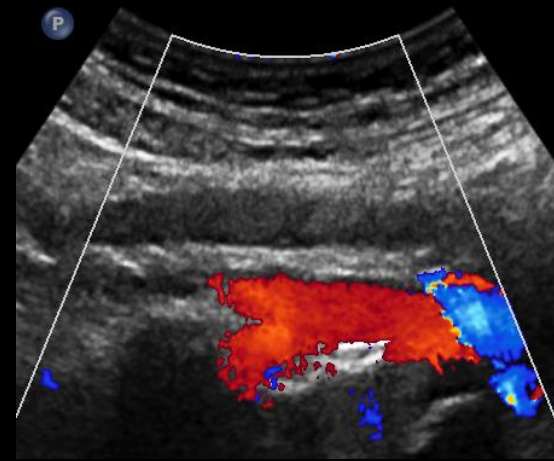
Cystic Ovarian Neoplasm



Peritoneal Inclusion Cyst encases FT and ovary

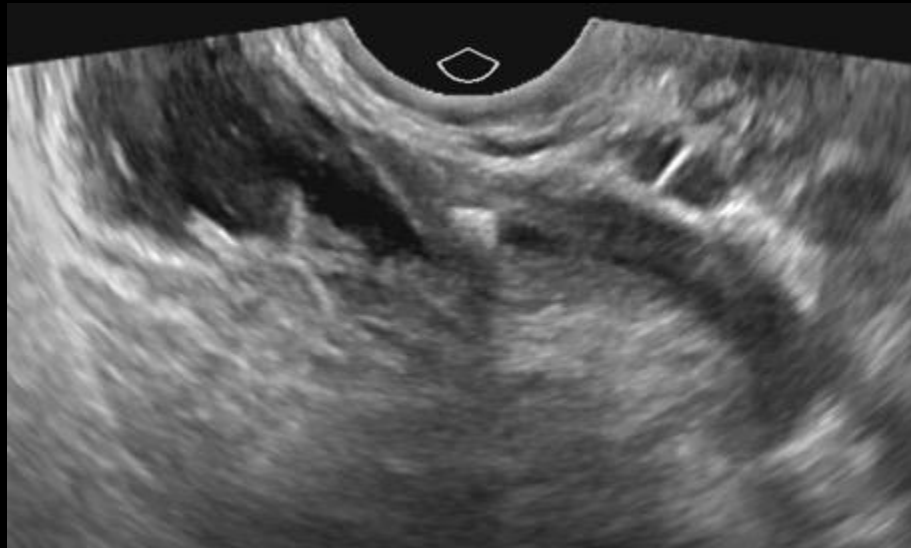


Hydroureter secondary to obstructing calculus (TA)



Hydroureter secondary to obstructing ureteral calculus (TV)

Acute right pelvic pain, normal right ovary



Markedly abnormal Terminal Ileum Crohns Disease



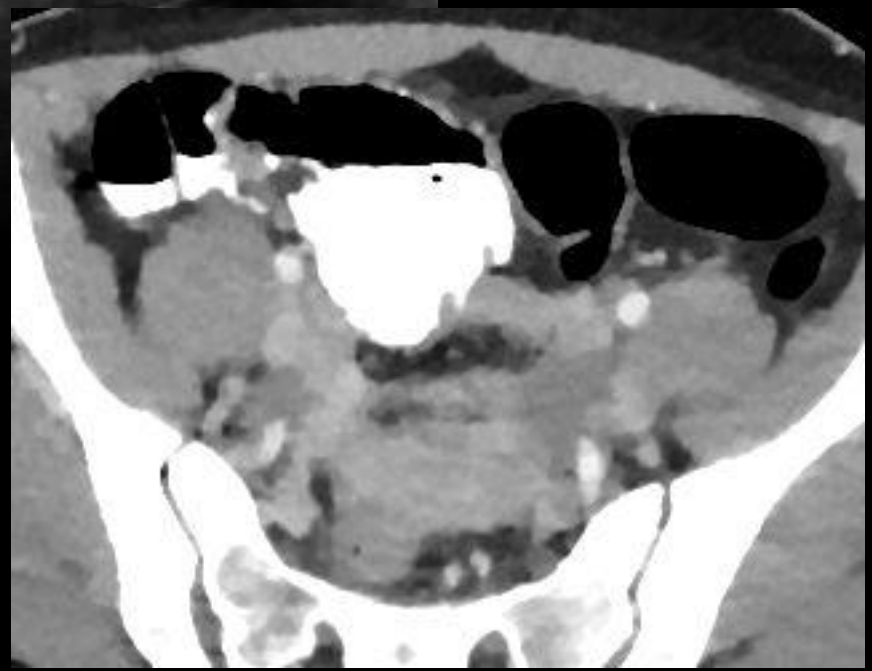
Acute appendicitis



Adnexa Right Sag



Right Ovary Trv



Summary

- Become familiar with appearance of normal fallopian tubes so that you can appreciate subtle abnormalities
- Remember signs of tubal origin of an adnexal “mass”
 - Waist, incomplete septum, cogwheel, beads on a string
- Distinguish between acute and chronic disease
- Distinguish tubal disease secondary to PID from other causes, including endometriosis, ectopic pregnancy and malignancy
- Beware of “look-a-likes”

The End

horrowm@Einstein.edu

Goodbye

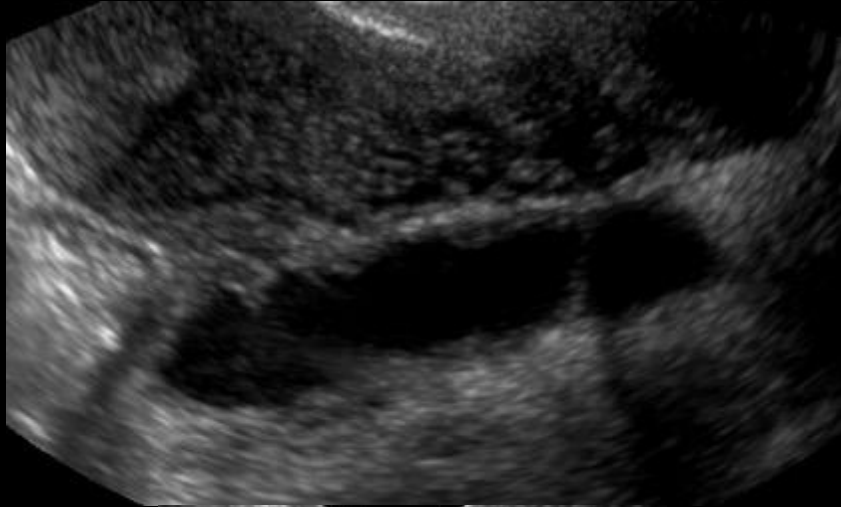


Peritoneal Inclusion Cyst

- Fluid from ovary encapsulated by adhesions
 - Impaired absorption of peritoneal fluid
- A cause of chronic and occasionally acute pain
- US: Cyst with thin walls and thin septations, often with ovary inside
 - Spider (ovary) in a web appearance
- Usually in pre-menopausal women with hx of abdominal or pelvic surgery, trauma, PID, , inflammatory bowel disease, endometriosis
- Treatment- biopsy if suspicion of malignancy, hormonal suppression of ovulation, aspiration, sclerotherapy, laser ablation, surgery

Peritoneal inclusion

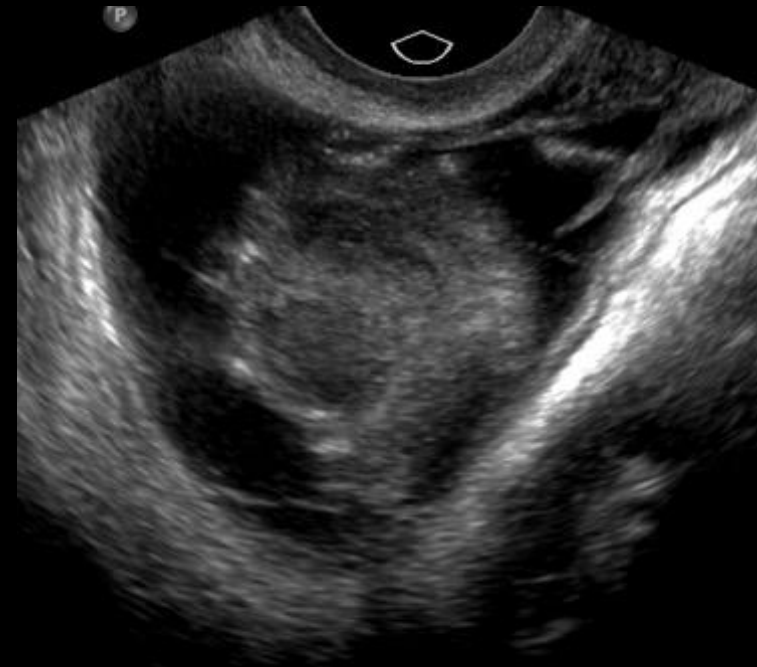
Hx PID and residual hydrosalpinx



SAG RT ADN

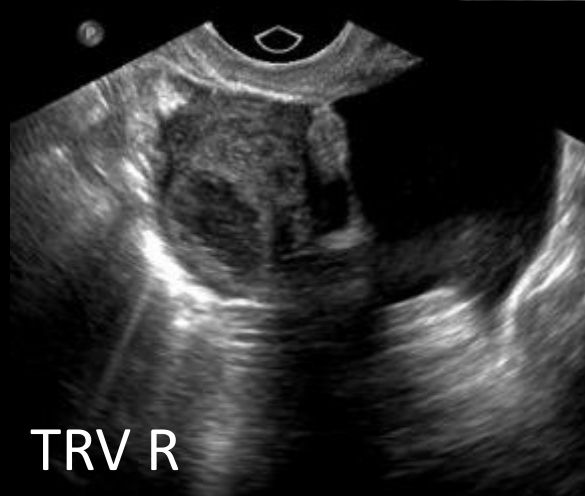
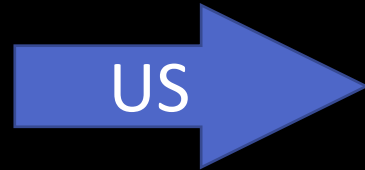
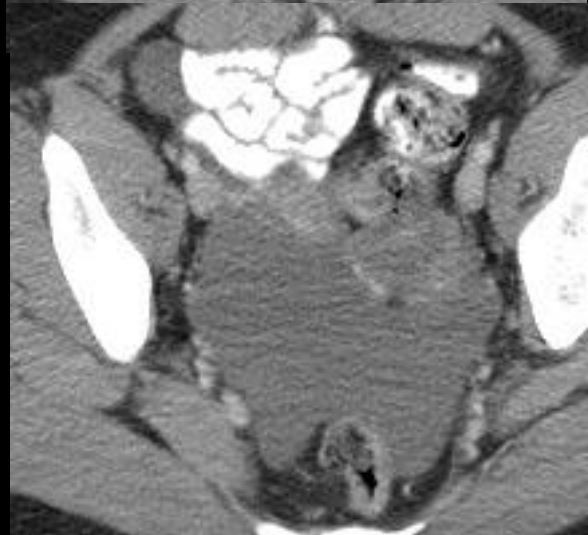
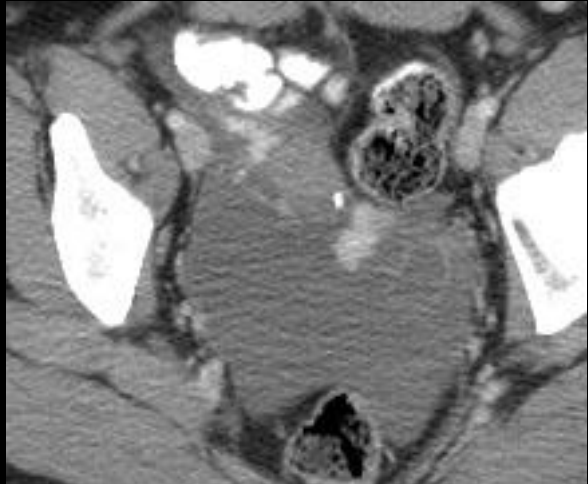
Worsening acute on chronic pain

1 year later



Peritoneal inclusion cysts encompassing ovaries and FTs

Prior hysterectomy



Collection, cystic mass, are ovaries normal?