

# **FIRST TRIMESTER COMPLICATIONS**

**Chapter 50**

# FIRST TRIMESTER BLEEDING

- × Approximately 15% of clinically recognized pregnancies spontaneously miscarried; loss rate may be even higher for early, clinically unrecognized pregnancies
- × Most common presentation for complications is vaginal spotting or frank bleeding
  - + Nearly 25% of patients during early stage of pregnancy

# FIRST TRIMESTER BLEEDING

- × Bleeding may be inconsequential; results from implantation
- × If bleeding accompanied by severe pain, uterine contractions, or dilated cervix, pregnancy unlikely to progress
- × TV examination to examine for presence of embryo, fetal heartbeat, yolk sac, or retained products

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# **PLACENTAL HEMATOMAS AND SUBCHORIONIC HEMORRHAGE**

# PLACENTAL HEMATOMA

- × Embryonic placenta may become detached, resulting in the formation of a hematoma
  - + Typically does not cause vaginal bleeding
    - × Most of these hemorrhages are continuous with a placental edge
    - × Although no risk factors have been associated with first trimester placental separation, it has been reported to have upward of a 50% fetal loss rate

# PLACENTAL HEMATOMA

- × Sonographically, placental hematomas may be difficult to distinguish from subchorionic hemorrhages
- × Placental hematomas do not cause bleeding, spotting, or other symptoms because they are within the chorionic sac without communicating with the endometrium

# SUBCHORIONIC HEMORRHAGE

- × Most common occurrence of bleeding in the first trimester
- × These low-pressure bleeds result from the implantation of the fertilized ovum into the uterine myometrial wall
- × Hemorrhage is found between the uterine wall and membranes of the fetus and is not associated with the placenta

# SUBCHORIONIC HEMORRHAGE

- × Clinical findings besides bleeding or spotting
  - + May include uterine contractions
- × If the hemorrhage becomes large enough
  - + May lead to a spontaneous abortion

# SONOGRAPHIC FINDINGS

- × Early bleed may appear echogenic as the red blood cells actively fill the area of hemorrhage
- × With time, the hemorrhage becomes more anechoic and may be seen between the uterine wall and the fetal membrane
- × Color flow Doppler demonstrates the avascular nature of the hemorrhage



LONG UT LT



C

# INTRAUTERINE SAC

- × If patient presents with positive pregnancy test, uterus appears normal and endometrial complex shows no sign of gestational sac consider:
  - + Very early intrauterine pregnancy
  - + Non-developing pregnancy
  - + Possible ectopic pregnancy

# INTRAUTERINE SAC

- × Sac grows approximately 1 mm/day
- × Yolk sac should be visualized when GS reaches 8 mm
- × Embryo should be visualized with MSD >16 mm (must be visualized with MSD of 25 mm)
- × Normal embryo grows at rate of 1 mm/day
- × Cardiac activity visible by 5.5 - 6.5 weeks

# COMPLETE ABORTION

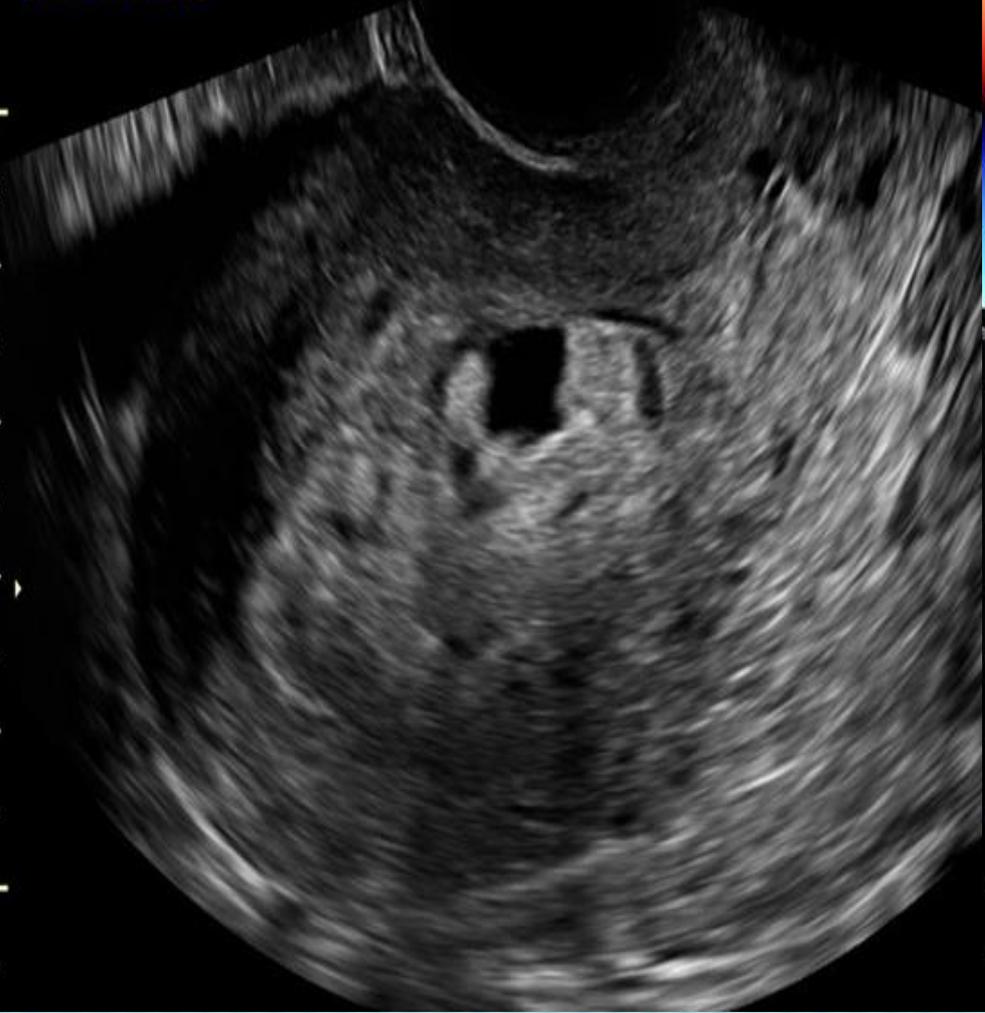
- × Characteristics for the sonographic diagnosis
  - + Empty uterus with no adnexal masses
  - + Free fluid and positive hCG levels
- × Serial hCG levels demonstrate rapid decline
- × Caution should be taken when a positive pregnancy test and an empty uterus are seen
  - + Possibility that an early normal intrauterine pregnancy between 3 and 5 weeks may be present

# INCOMPLETE ABORTION

- × May show several sonographic findings
  - + Ranging from an intact gestational sac with a nonliving embryo to a collapsed gestational sac
- × Retained products may be subtle
  - + Thickened endometrium greater than 8 mm may be the only sonographic evidence
- × Obvious embryonic parts
  - + May or may not cause acoustic shadowing
  - + Are obvious evidence of retained products of conception

SAG UTERUS

Voluson  
E8



COR UTERUS ML

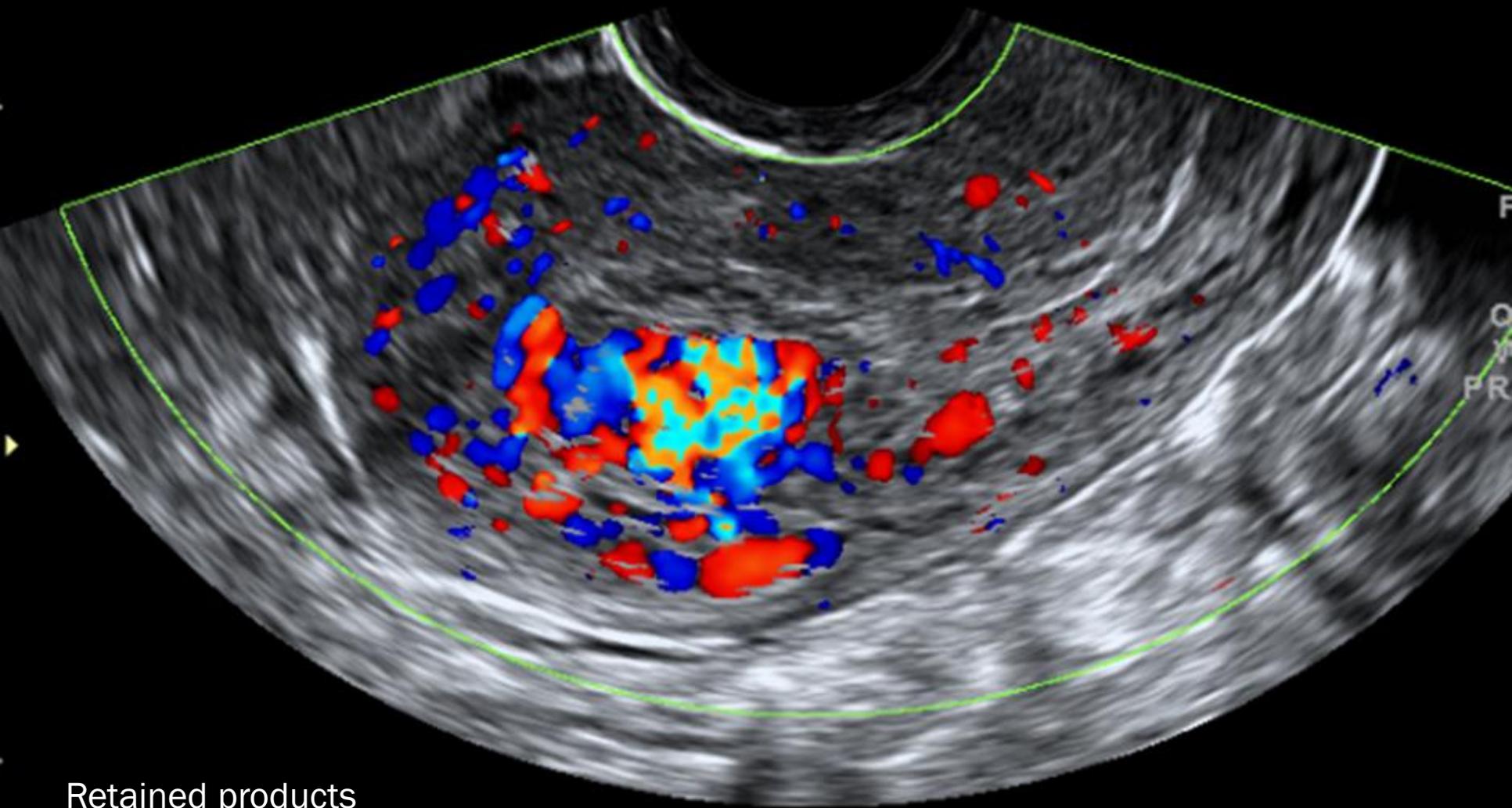
Voluson  
E8



SAG ENDO

GE

10

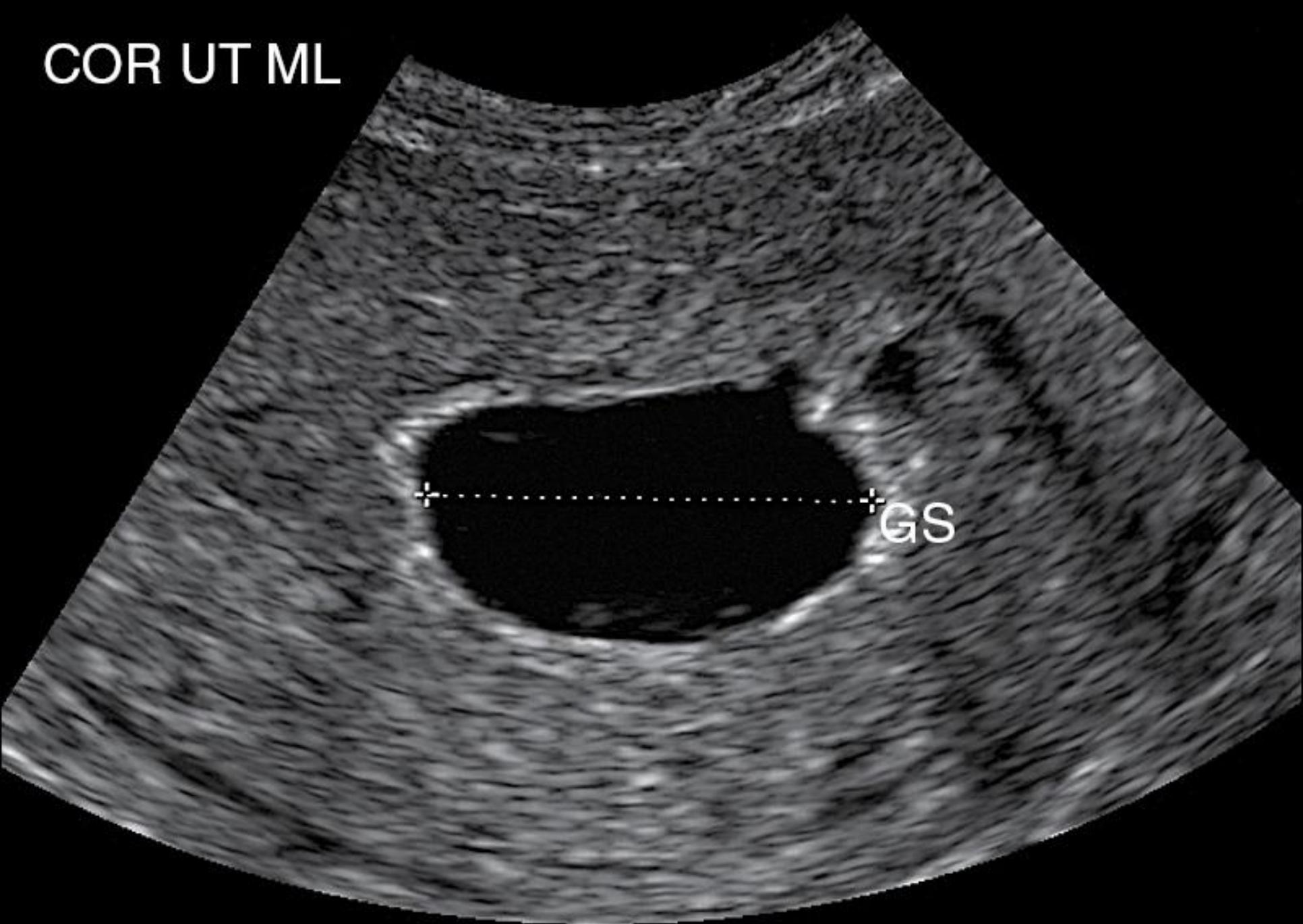


Retained products  
demonstrating high vascularity  
within endometrium

# ANEMBRYONIC PREGNANCY (BLIGHTED OVUM)

- × Gestational sac in which the embryo fails to develop
- × Typical sonographic appearance
  - + Large empty gestational sac that does not demonstrate yolk sac, amnion, or embryo
- × hCG levels may continue to rise but not at rapid rate

COR UT ML



GS

# GESTATIONAL TROPHOBLASTIC DISEASE

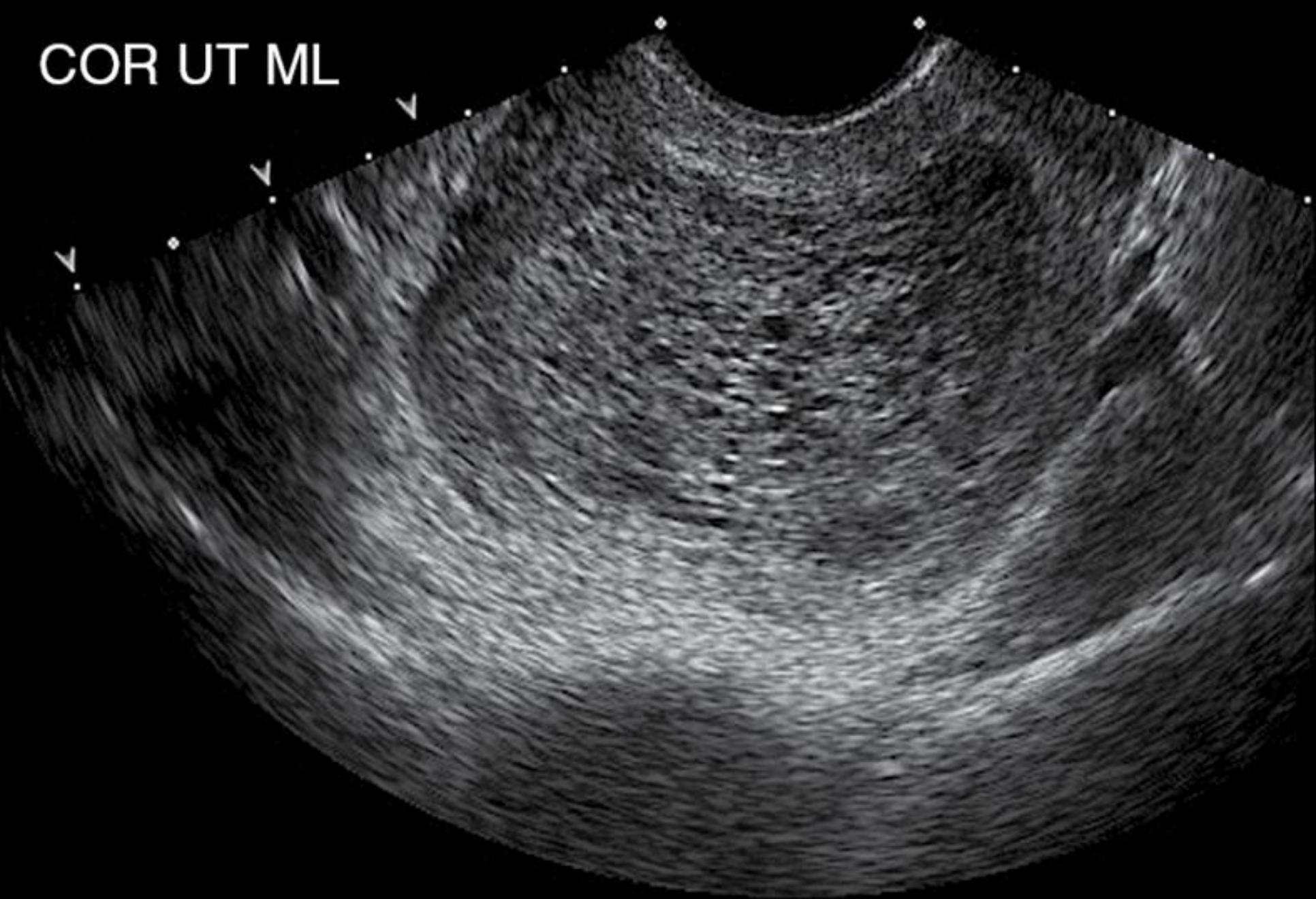
- × A proliferative disease of the trophoblast after a pregnancy
- × It represents a spectrum of disease from
  - + A relatively benign form,
    - × Hydatidiform mole
  - + To a more malignant form
    - × Invasive mole, or choriocarcinoma

- 
- × Clinical hallmark of gestational trophoblastic disease is vaginal bleeding in the first or early second trimester
    - + Serum levels of beta-hCG are dramatically elevated
      - × Often greater than 100,000 IU/ml
  - × Patient also may experience symptoms of:
    - + Hyperemesis gravidarum
    - + Preeclampsia

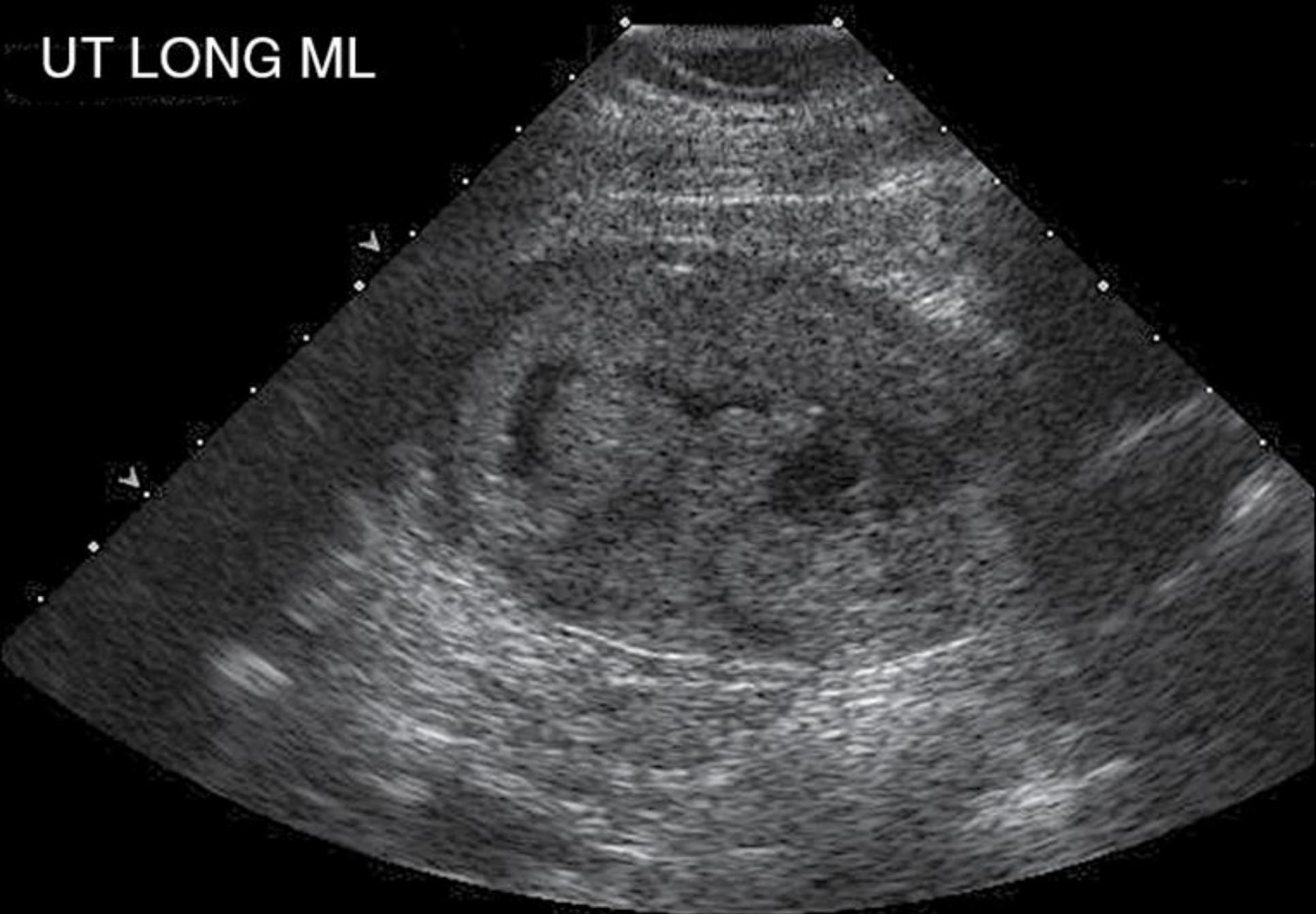
# SONOGRAPHIC FINDINGS

- × Varies with gestational age
- × The characteristic “snowstorm” appearance of hydatidiform mole
  - + Includes a moderately echogenic soft tissue mass filling the uterine cavity and studded with small cystic spaces representing hydropic chorionic villi
    - × May only be specific for a second trimester mole

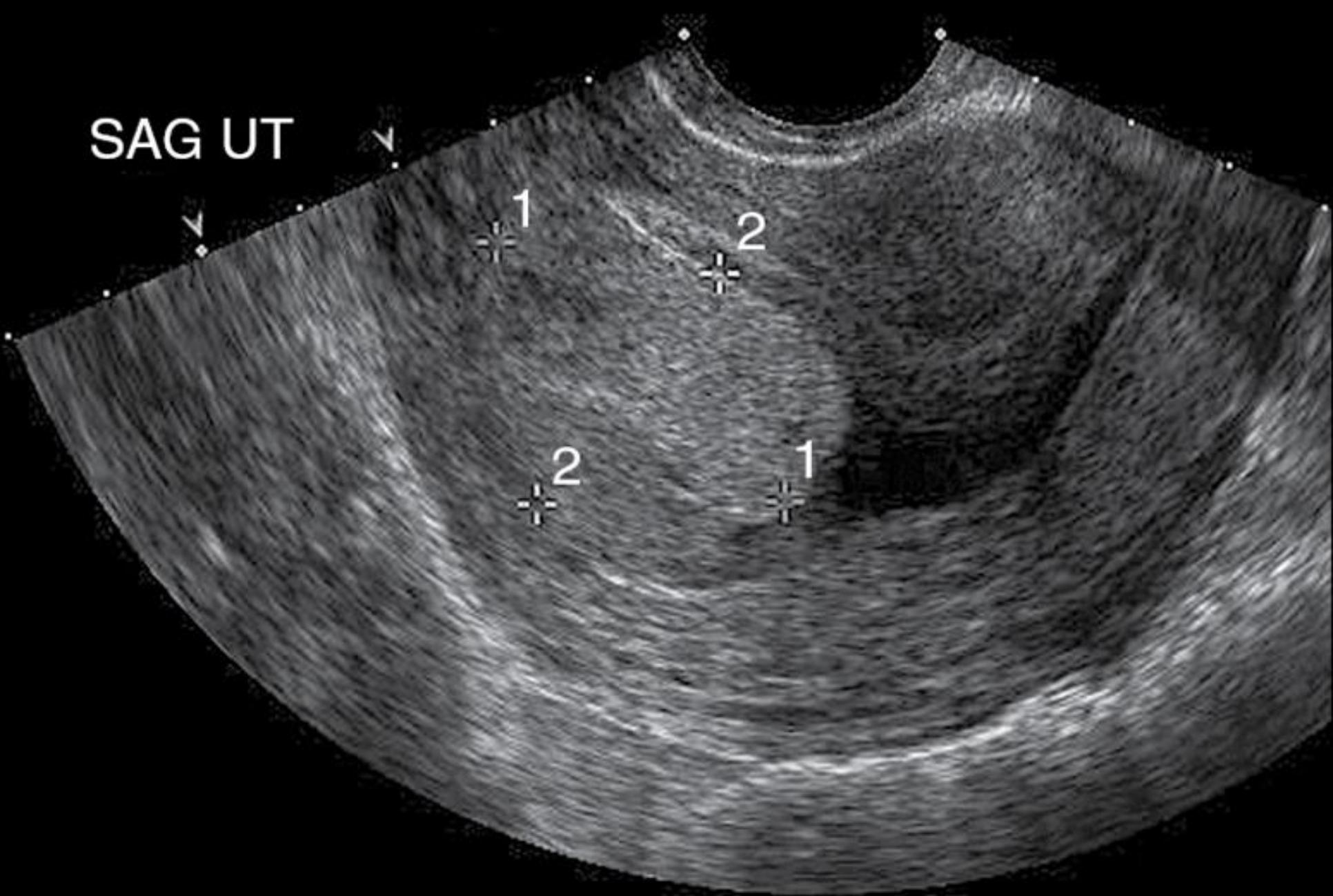
COR UT ML



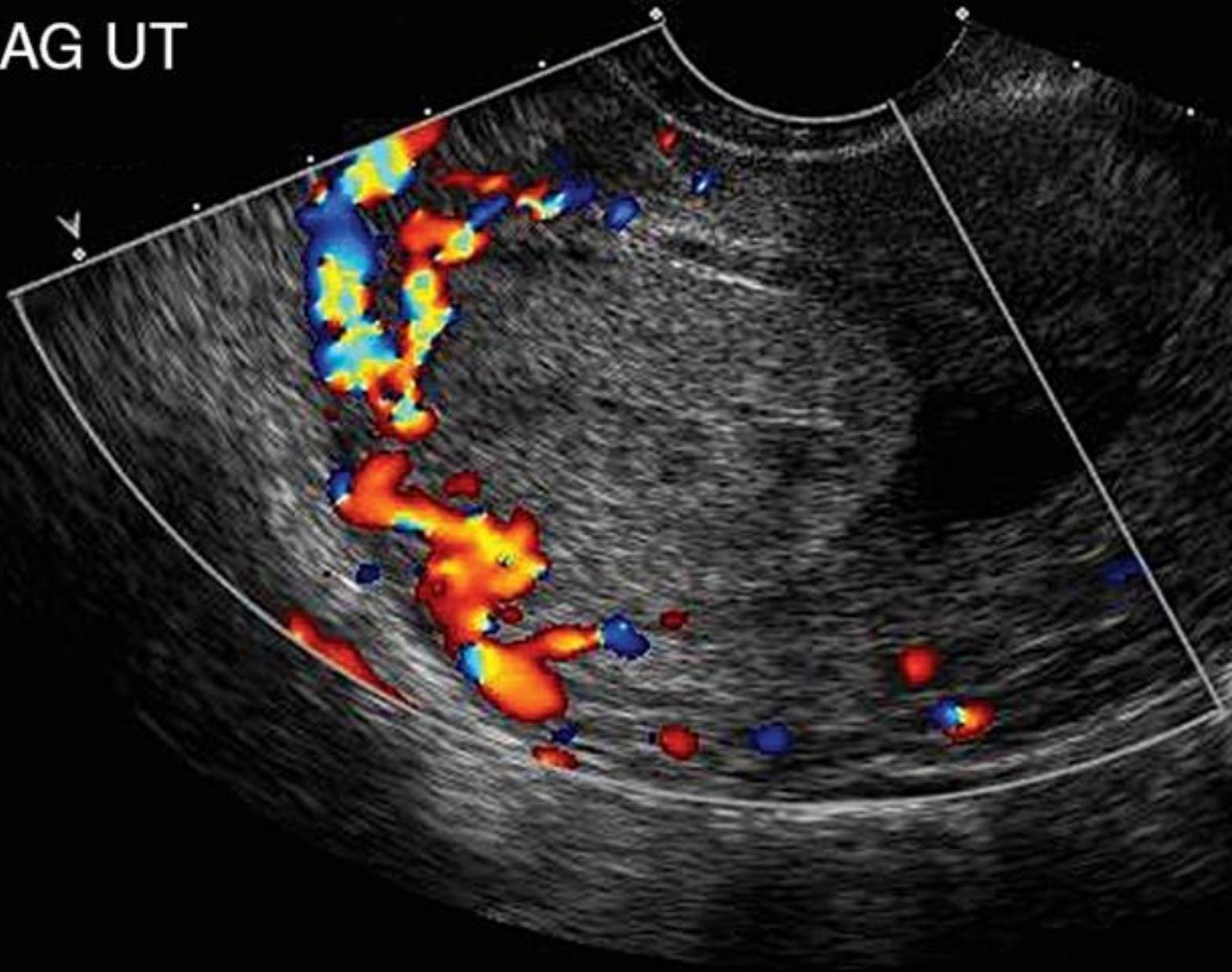
UT LONG ML



SAG UT



SAG UT



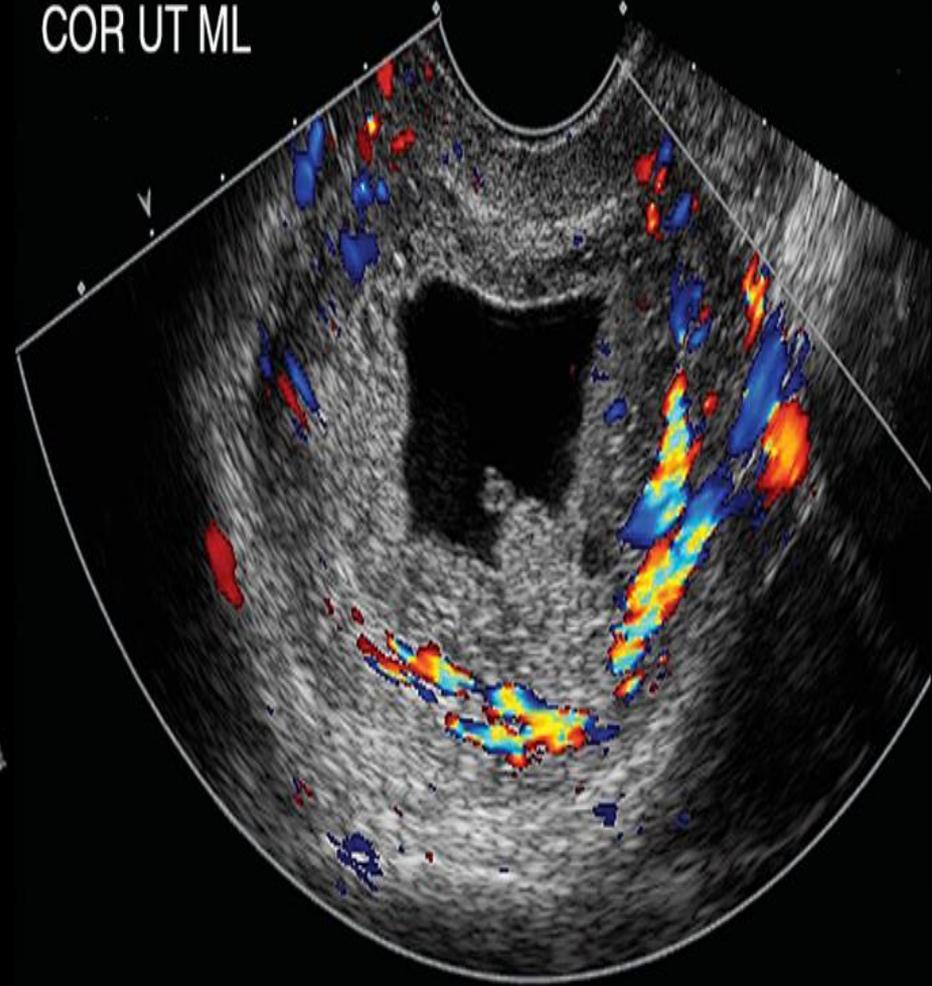
# SONOGRAPHIC FINDINGS

- × Appearance of first trimester molar pregnancy
  - + May simulate
    - × Missed abortion
    - × Incomplete abortion
    - × Blighted ovum
    - × Hydropic degeneration of the placenta associated with missed abortion
- × Also may be seen as a small echogenic mass filling the uterine cavity

AMNION/YS



COR UT ML



A

B

# GESTATIONAL TROPHOBLASTIC DISEASE

- × Usually no sign of viable embryo and early developing placenta exhibits multiple abnormal trophoblastic changes
- × Sonographic examination may reveal:
  - + Uterus larger in size than dates
  - + Filled with heterogeneous complex pattern
  - + Bilateral adnexal fullness
  - + May represent ovarian enlargement of theca lutein cysts

# GESTATIONAL TROPHOBLASTIC DISEASE

- × Partial mole on sonography has identifiable placenta
- × Placental tissue grossly enlarged and engorged with cystic spaces
- × Embryo or embryonic tissue may be identified
  - + Often abnormal and aborted in 1<sup>st</sup> trimester
  - + Later stages of pregnancy (>12 wks), careful analysis should be made to look for structural defects

# GESTATIONAL TROPHOBLASTIC DISEASE

- × Malignant forms of trophoblastic disease include invasive mole and choriocarcinoma
  - + Invasive hydatidiform mole - villi of partial or complete mole invades uterine myometrium and may further penetrate uterine wall
  - + Choriocarcinoma – fast growing tumor that metastasizes to lungs, liver, and brain

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# **CARDIAC ANOMALIES**

- 
- × **Sonographic differentiation of normal and abnormal appearances of the first trimester pregnancy may be subtle**
  - × **Distinguishing living from nonliving gestations is crucial, but recent studies have shown that demonstration of a living embryo does not necessarily mean a normal outcome**

- × Identifying an intrauterine pregnancy with or without cardiac activity is the first conclusive sonographic sign of normality or abnormality
- × Using endovaginal sonography, a living embryo should be detected when MSD reaches 25 mm
- × To conclusively demonstrate normal or abnormal findings, more than one sonogram may be needed

# ABSENT CARDIAC ACTIVITY

- × Absence of cardiac activity in first trimester is most critical sign for viability of pregnancy
- × Endovaginally, when CRL measure 4 mm, embryo should demonstrate cardiac function
- × SRU criteria states that pregnancy failure is diagnosed at CRL of 7 mm without cardiac function

# EMBRYONIC BRADYCARDIA & TACHYCARDIA

- × Embryonic cardiac rates of  $<90$  bpm at any gestational age within the first trimester have been shown to be a poor prognostic finding
- × Fetus with heart rate  $>170$  bpm shows signs of tachycardia, which may lead to heart failure and fetal hydrops

# **EMBRYONIC OLIGOHYDRAMNIOS AND GROWTH RESTRICTION**

- 
- × Growth delay and oligohydramnios within the first trimester have poor outcomes
    - + If gestational sac is 5 mm less than the crown-rump length
      - × Embryonic oligohydramnios may be suspected
    - + Universal demise was reported in embryos with this characteristic

- 
- × Embryonic growth restriction can only be determined by
    - + Relative sonographic dating by reliable menstrual history
    - + Growth delay of the embryo or gestational sac in relation to serial sonograms
  - × Chromosome abnormalities
    - + Are associated with embryonic growth restriction and embryonic oligohydramnios

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# **YOLK SAC EVALUATION**

# YOLK SAC

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- × Enlarged yolk sac  $\geq 5.6$  mm or greater, has increased risk for spontaneous pregnancy loss.
- × If abnormal in appearance, misshapen or highly echogenic; should follow for early pregnancy failure



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# **ECTOPIC PREGNANCY**

# ECTOPIC PREGNANCY

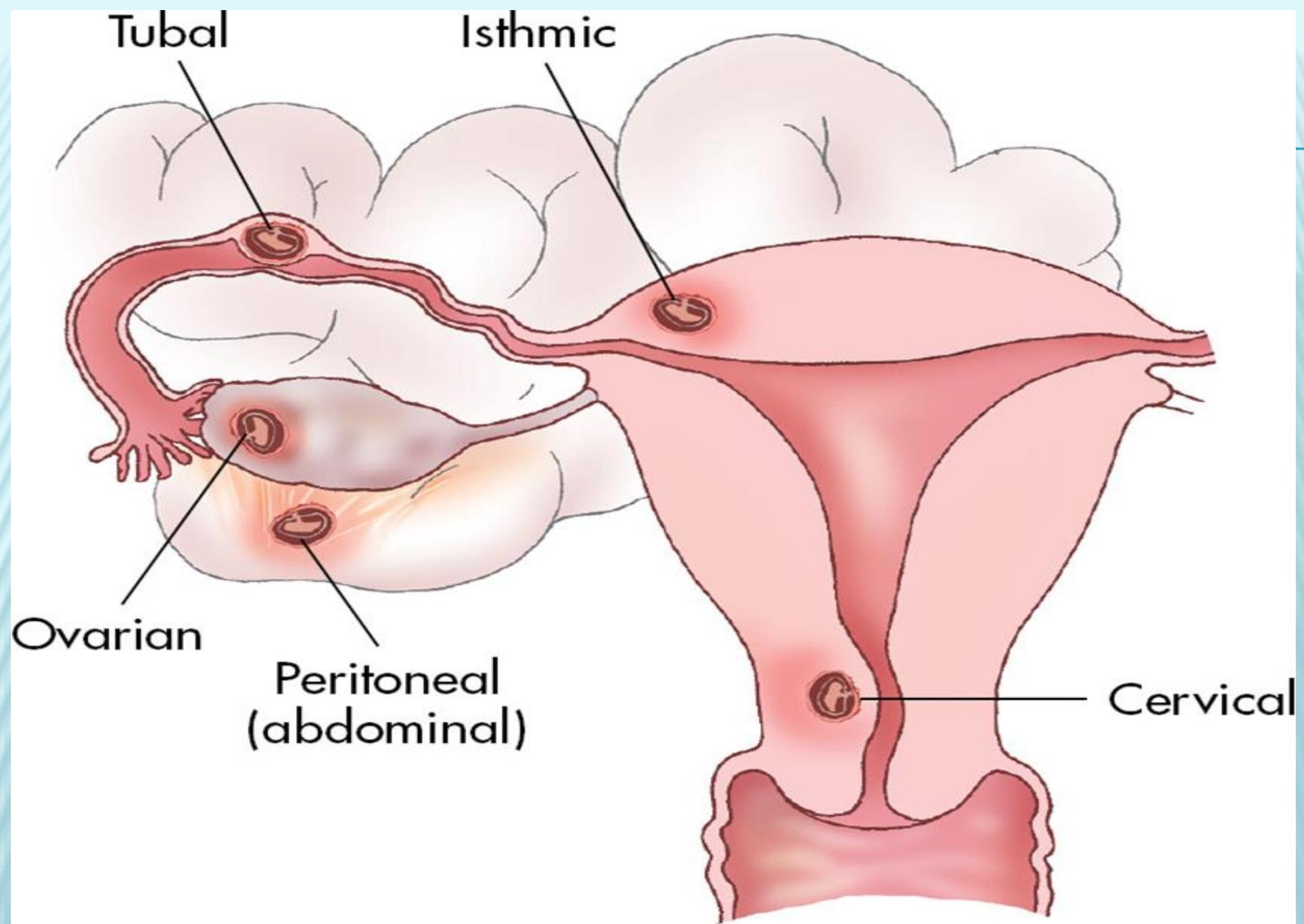
- × One of the most crucial diagnoses made
- × Approximately 10% of maternal deaths are related to ectopic pregnancy
- × Clinical findings may vary and are nonspecific
  - + Pelvic pain has been reported in 97% of patients, although pain may be consistent with other pathologic processes, such as appendicitis or pelvic inflammatory disease.
  - + Vaginal bleeding (75%) and a palpable adnexal mass (50%)

# ECTOPIC PREGNANCY

- × Associated risk factors include:
  - + Previous pelvic infections
  - + Use of intrauterine contraceptive devices (IUDs)
  - + Fallopian tube surgeries
  - + Infertility treatments
  - + History of ectopic pregnancies

# ECTOPIC PREGNANCY

- × Occurs within the fallopian tube in approximately 95% of cases
  - + Accounting for the remaining cases
    - × Ovary
    - × Broad ligament
    - × Peritoneum
    - × Cervix



- × **Correlating clinical tests with sonographic findings in ectopic pregnancy is imperative for diagnosis**
  - + Quantification of hCG is directly correlated with gestational age throughout the first trimester
  - + Discriminatory level of hCG in pregnancy should be thought of as a minimum level of hCG in normal IUP or ectopic pregnancy
  - + Using endovaginal techniques, the hCG discriminatory level in detecting an IUP has been shown to be 800 to 1000 IU/L (2IS) and 1000 to 2000 IU/L (IRP)

- 
- × If discriminatory levels of beta-hCG are met or surpassed and no intrauterine gestational sac is seen
    - + Ectopic pregnancy should be suspected
  - × Caution should be taken if beta-hCG levels are below discriminatory levels
  - × Early IUP may have an intrauterine appearance similar to ectopic pregnancy

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× In non-emergent cases

- + serial beta-hCG levels are preferred because trending of these levels would demonstrate a continuing pregnancy if hCG levels rise normally or slowly or plateau
- + whereas falling hCG levels may indicate missed or incomplete abortion

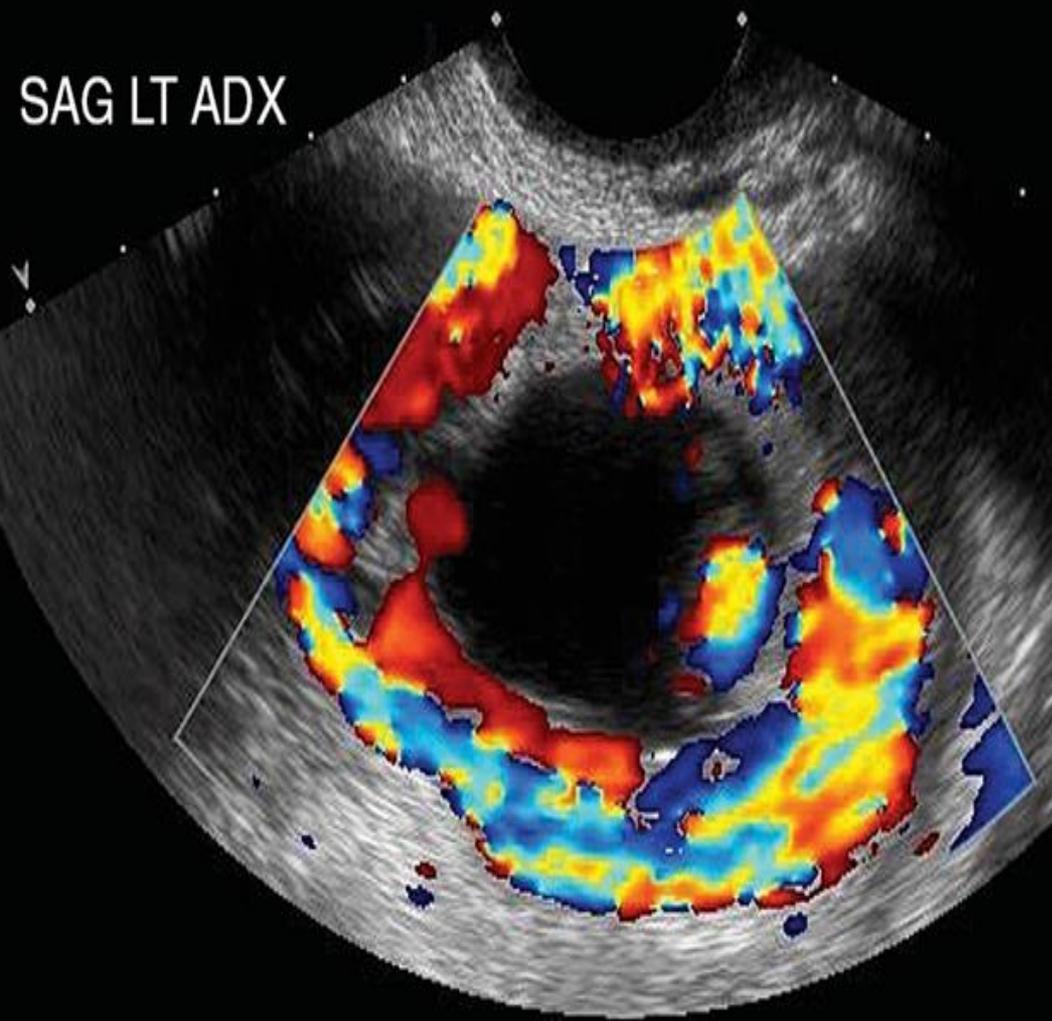
**SONOGRAPHIC  
FINDINGS  
IN  
ECTOPIC  
PREGNANCY**

- × Most important finding when scanning for ectopic pregnancy:

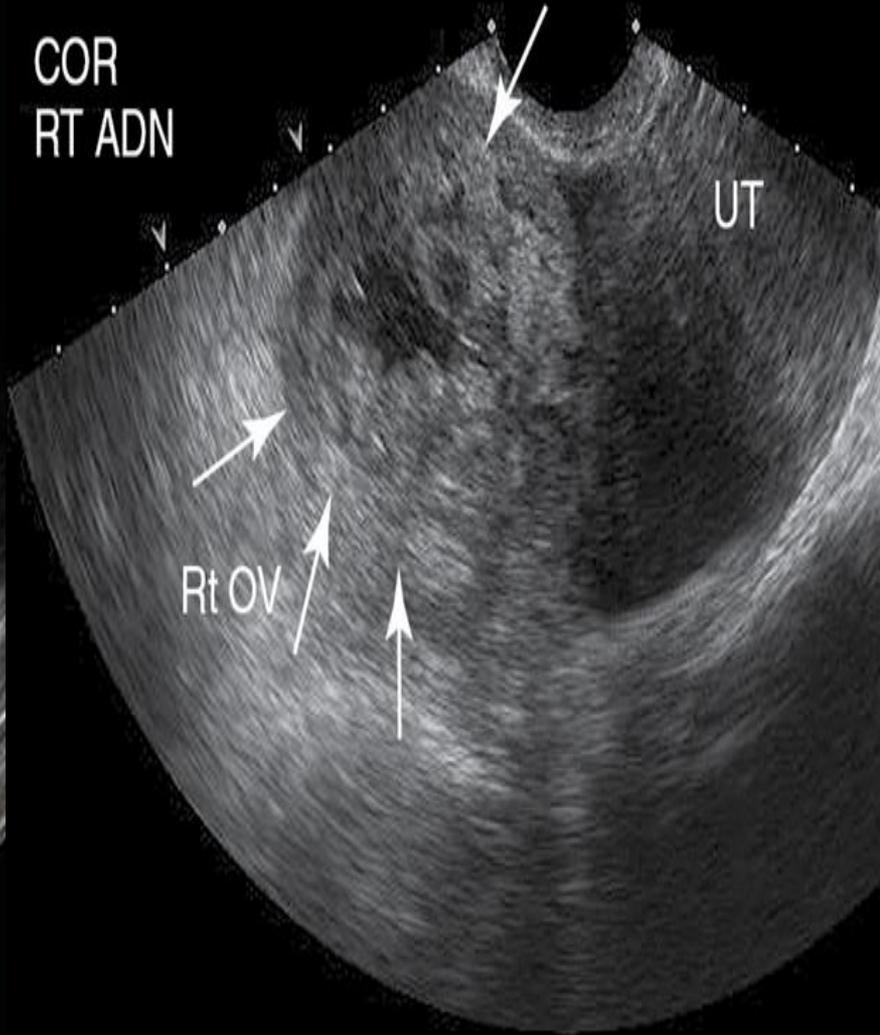
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  - + Identification of a normal intrauterine gestation
  - + If uterine cavity is empty, look for adnexal mass
- × Although the visualization of an intrauterine gestational sac that includes embryonic heart motion firmly makes the diagnosis of intrauterine pregnancy, earlier gestations (5 to 6 weeks) may normally not demonstrate these findings

SAG LT ADX



COR  
RT ADN

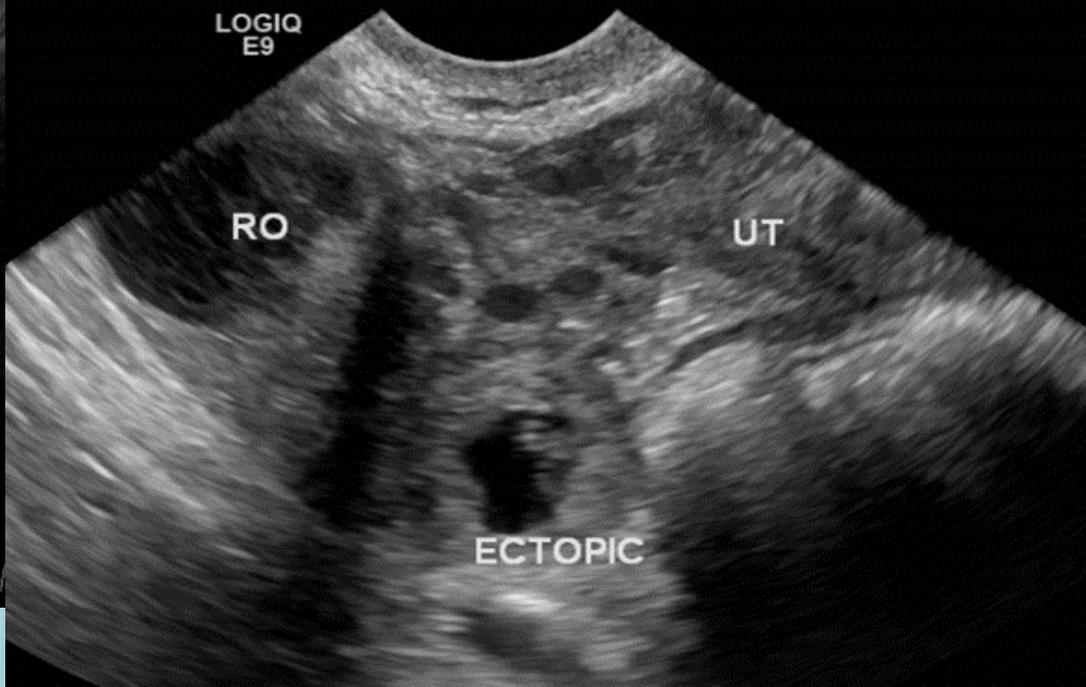
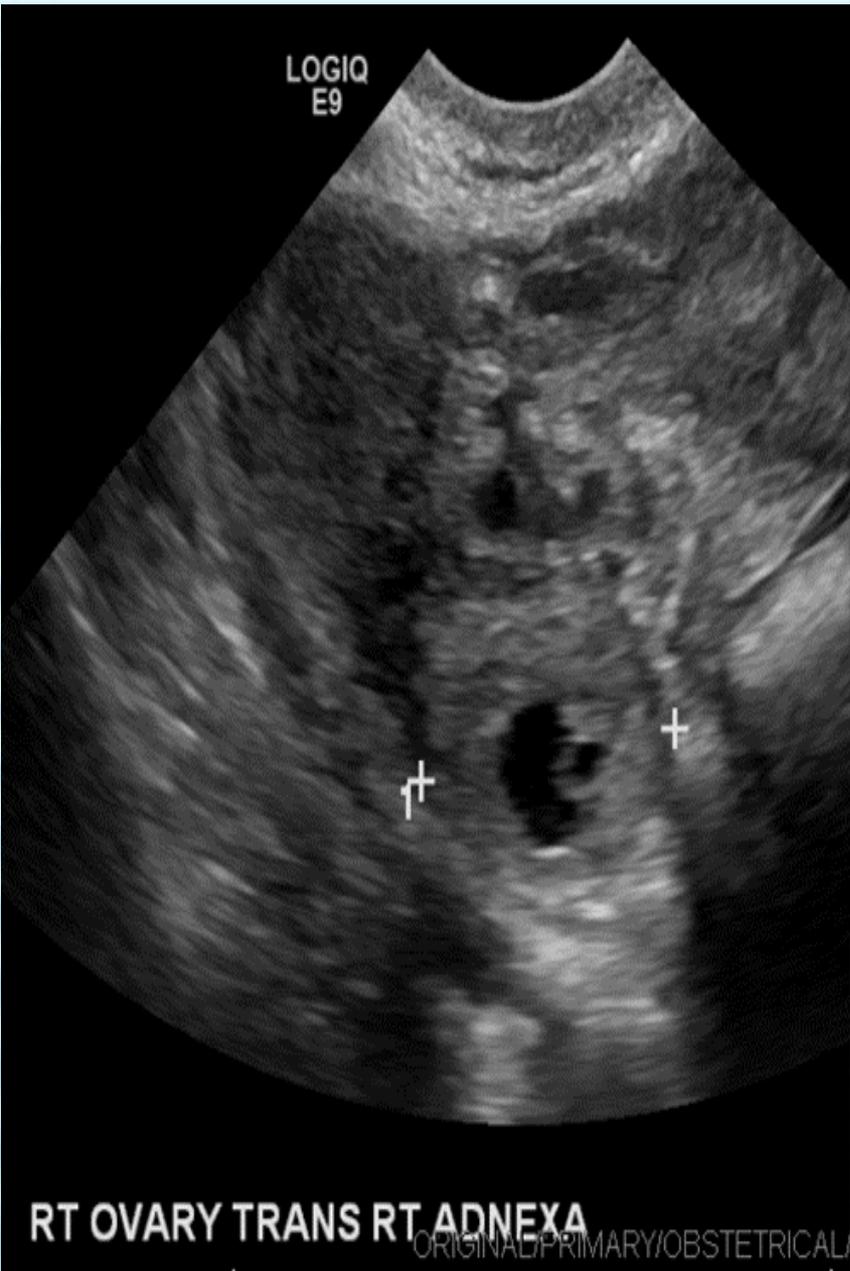


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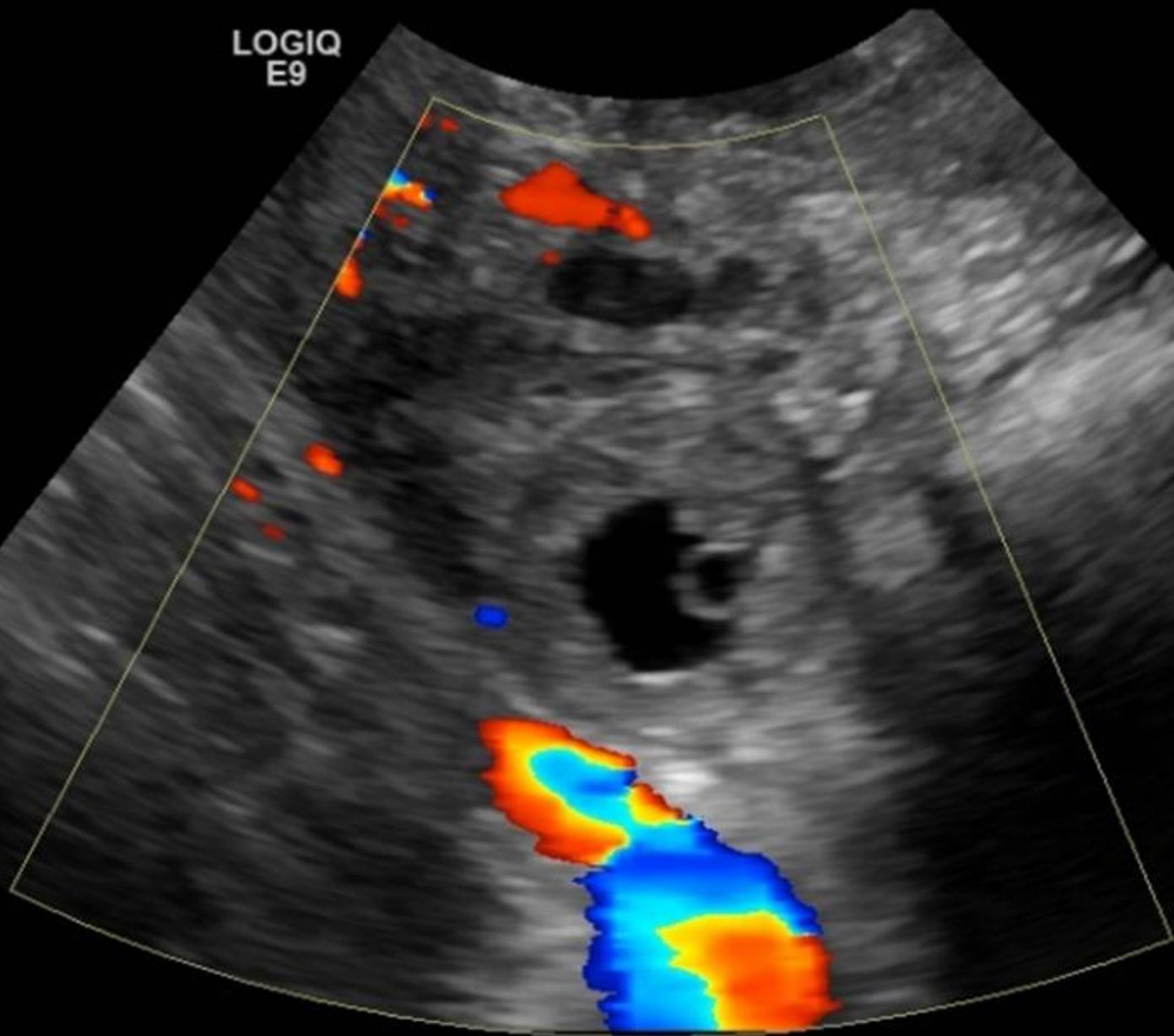
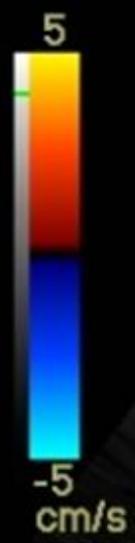
- × As many as 20% of patients with ectopic pregnancy demonstrate an intrauterine saclike structure known as the pseudogestational sac

- × Pseudogestational Sacs

- × Do not contain either a living embryo or yolk sac
- × Are centrally located within the endometrial cavity, unlike the burrowed gestational sac, which is eccentrically placed



LOGIQ  
E9



- 
- × Adnexa should always be sonographically examined when evaluating for ectopic pregnancy
  - × The identification of a live embryo within the adnexa is the most specific for ectopic gestation (occurs only 25% of the time)
  - × Only 10% of live ectopic pregnancies are identified using TA sonography

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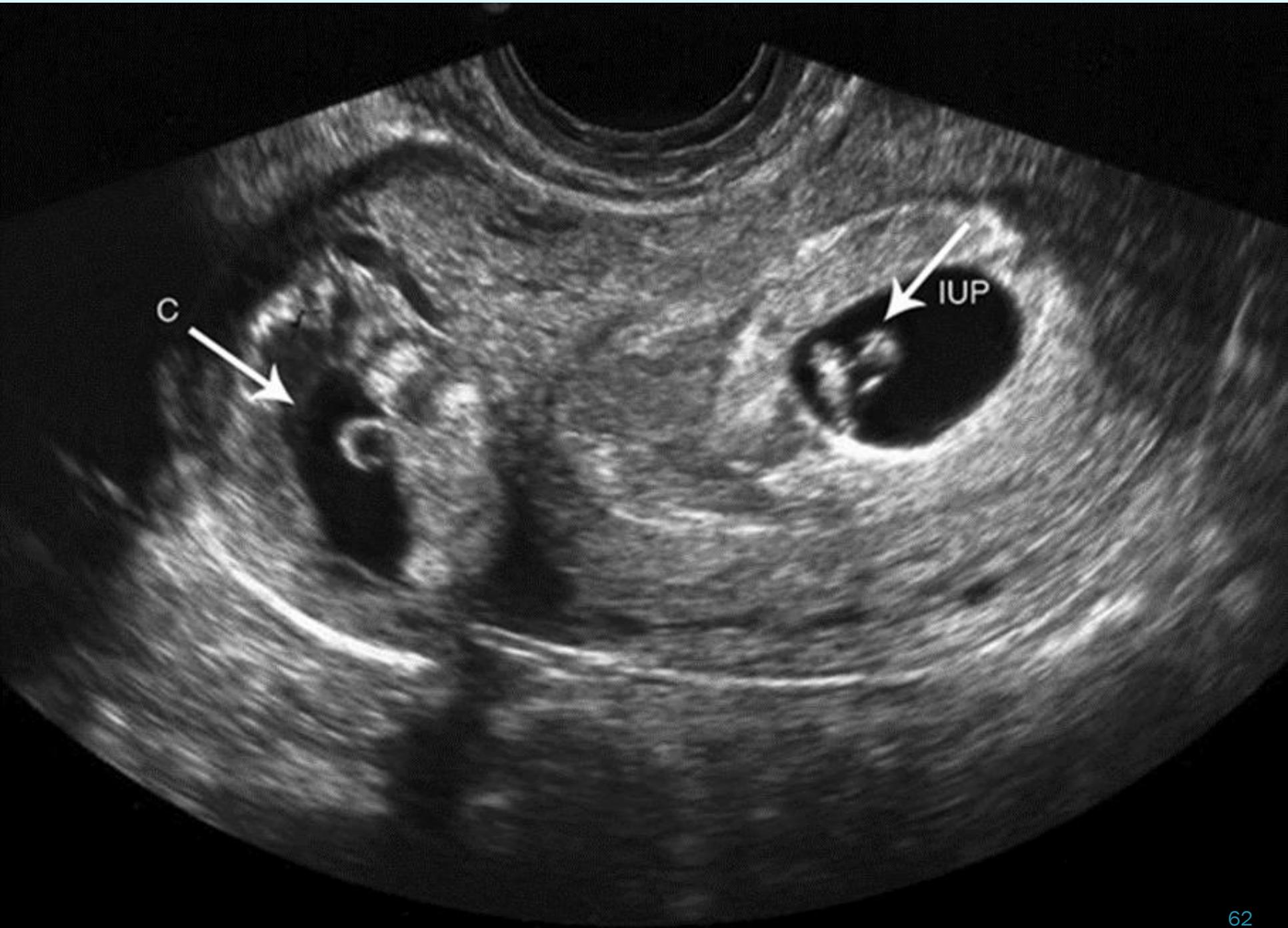
# **ADNEXAL MASS WITH ECTOPIC PREGNANCY**

- 
- × Risk of ectopic pregnancy is upward of 90% when intrauterine gestation is absent and there is a corresponding adnexal mass
  - × Complex adnexal masses (Not extrauterine GS)
    - + Often represent hematoma within the peritoneal cavity
      - × Usually contained within the fallopian tube or broad ligament (hematosalpinx)

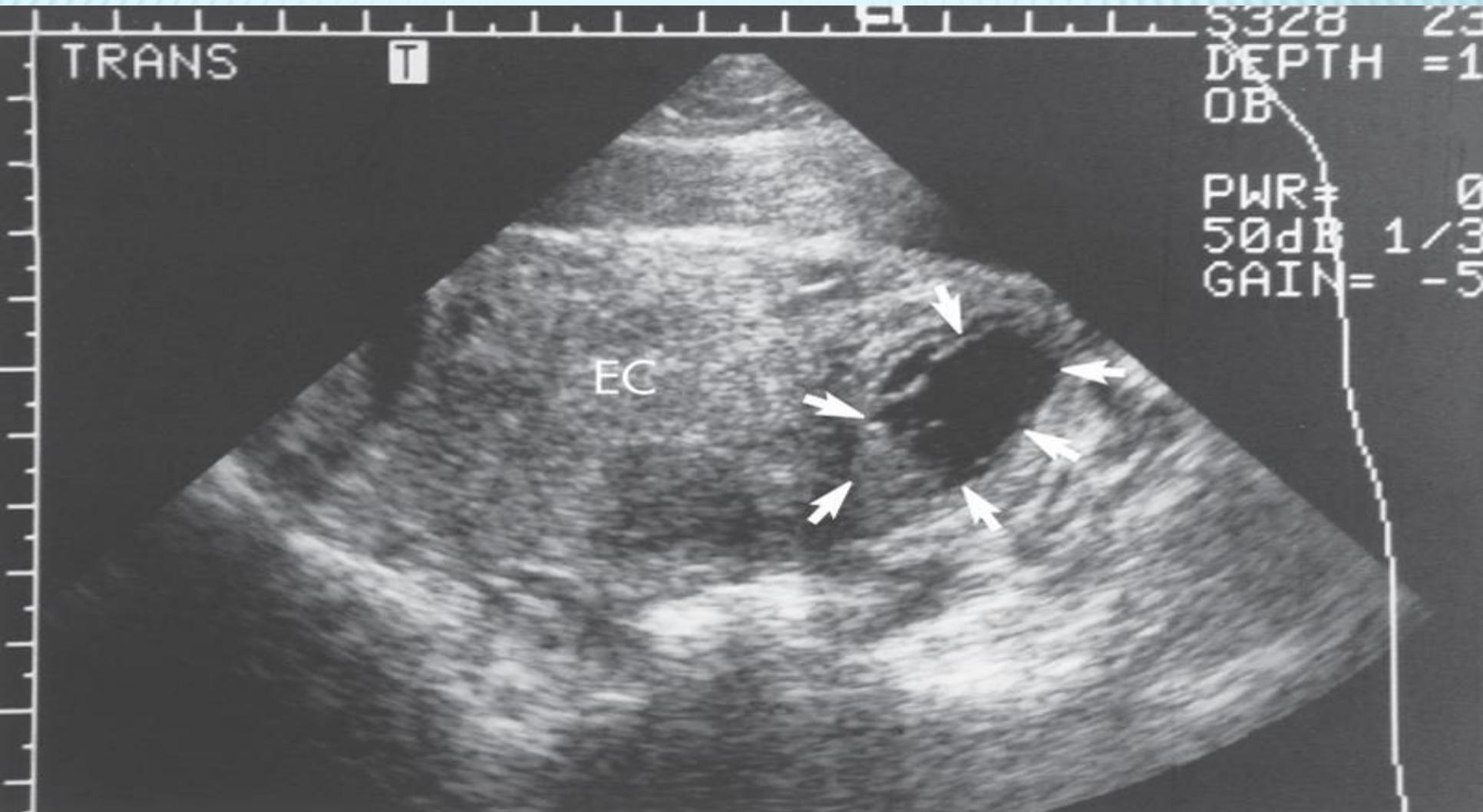
- 
- × **Studies have correlated increased risk of ectopic pregnancy with:**
    - + **Associated adnexal mass**
    - + **Moderate to large quantities of free intraperitoneal fluid**
      - × **92% risk of ectopic pregnancy with echogenic FF present**
      - × **15% of cases demonstrated echogenic FF as only sonographic finding**

# INTERSTITIAL PREGNANCY

- × Or cornual pregnancy (2% of all ectopic pregnancies)
  - + Potentially the most life-threatening of all ectopics
- × Creating life-threatening hemorrhage when rupture occurs
- × Identification is difficult
  - + Has been described as an eccentrically placed gestational sac within the uterus that has an incomplete myometrial mantle surrounding the sac



# INTERSTITIAL PREGNANCY



# CERVICAL PREGNANCY

- × Cervical pregnancy incidence of 1 in 16,000
- × Sonographic demonstration of a gestational sac within the cervix suggests a cervical pregnancy
  - + Spontaneous abortion may have a similar appearance
- × Increase risk of complete hysterectomy
  - + Uncontrollable bleeding caused by increased vascularity of cervix

# HETEROTOPIC PREGNANCY

- × Simultaneous intrauterine and extrauterine pregnancies are uncommon, including those in patients undergoing infertility workups
- × Ovulation induction and in vitro fertilization with embryo transfer not only lead to higher risk of heterotopic pregnancies, but also to an overall increase in ectopic pregnancies, including bilateral ectopics

# OVARIAN PREGNANCY

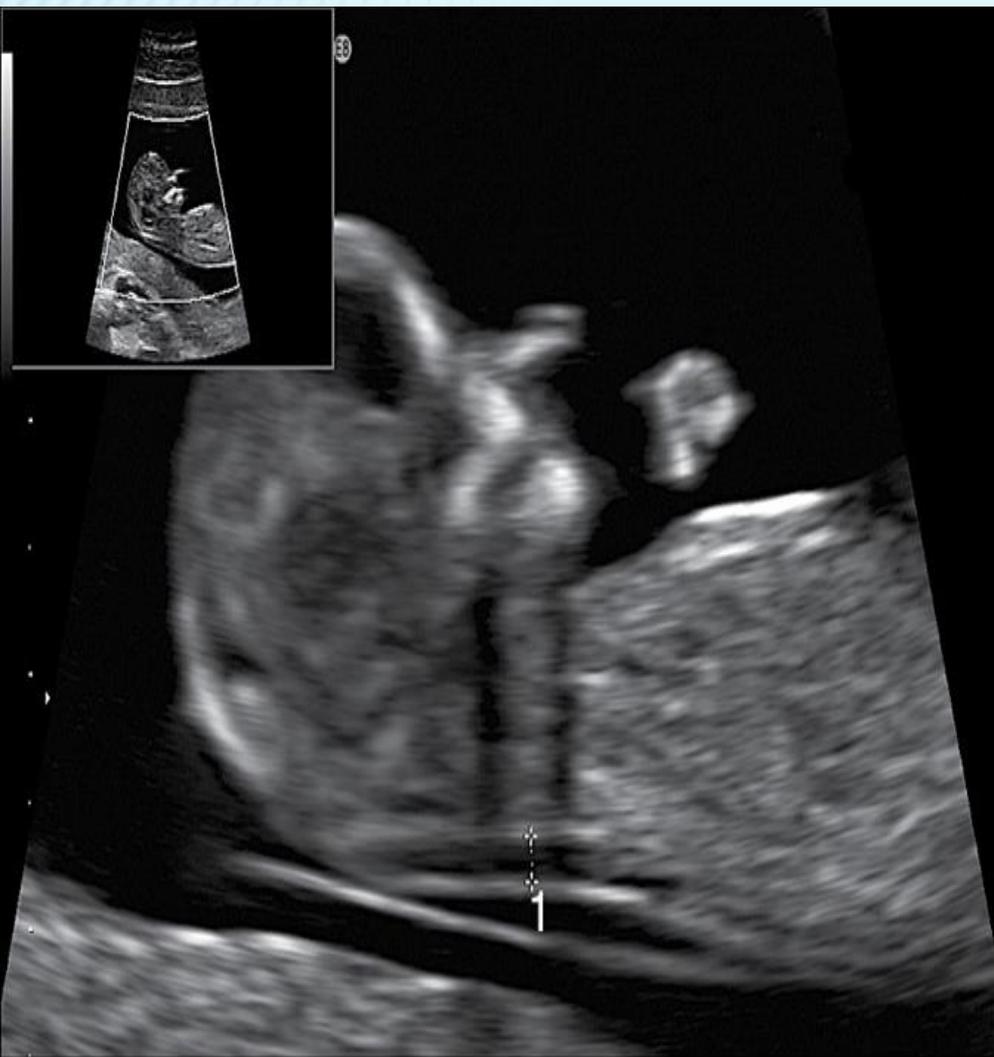
- × Very rare
  - + Accounting for less than 3% of all ectopics
- × Sonographic diagnosis of ovarian pregnancy may be difficult
  - + Reported cases have demonstrated complex adnexal masses that involve or contain the ovary

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# **NUCHAL TRANSLUCENCY**

# NUCHAL TRANSLUCENCY

- × Maximum thickness of subcutaneous lucency at back of neck in embryo at 11 to 13.6 weeks gestation
  - + Value of  $<2$  mm indicates a less than 1% risk of aneuploidy



**A**



**B**



1 D 0.44cm

C

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D

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# NUCHAL TRANSLUCENCY

- × Increased NT may be found with Trisomy 13, 18, or 21
- × Combine measurements with biochemical markers [free beta hCG, PAPP-A] to assess risk for aneuploidy

# NUCHAL TRANSLUCENCY

- × Fetuses must be between 11 weeks and 13 weeks 6 days
- × CRL must be between 45 mm and 84 mm
- × Sonographer must obtain image in mid-sagittal plane
- × Fetus must be away from amniotic membrane with head in neutral position

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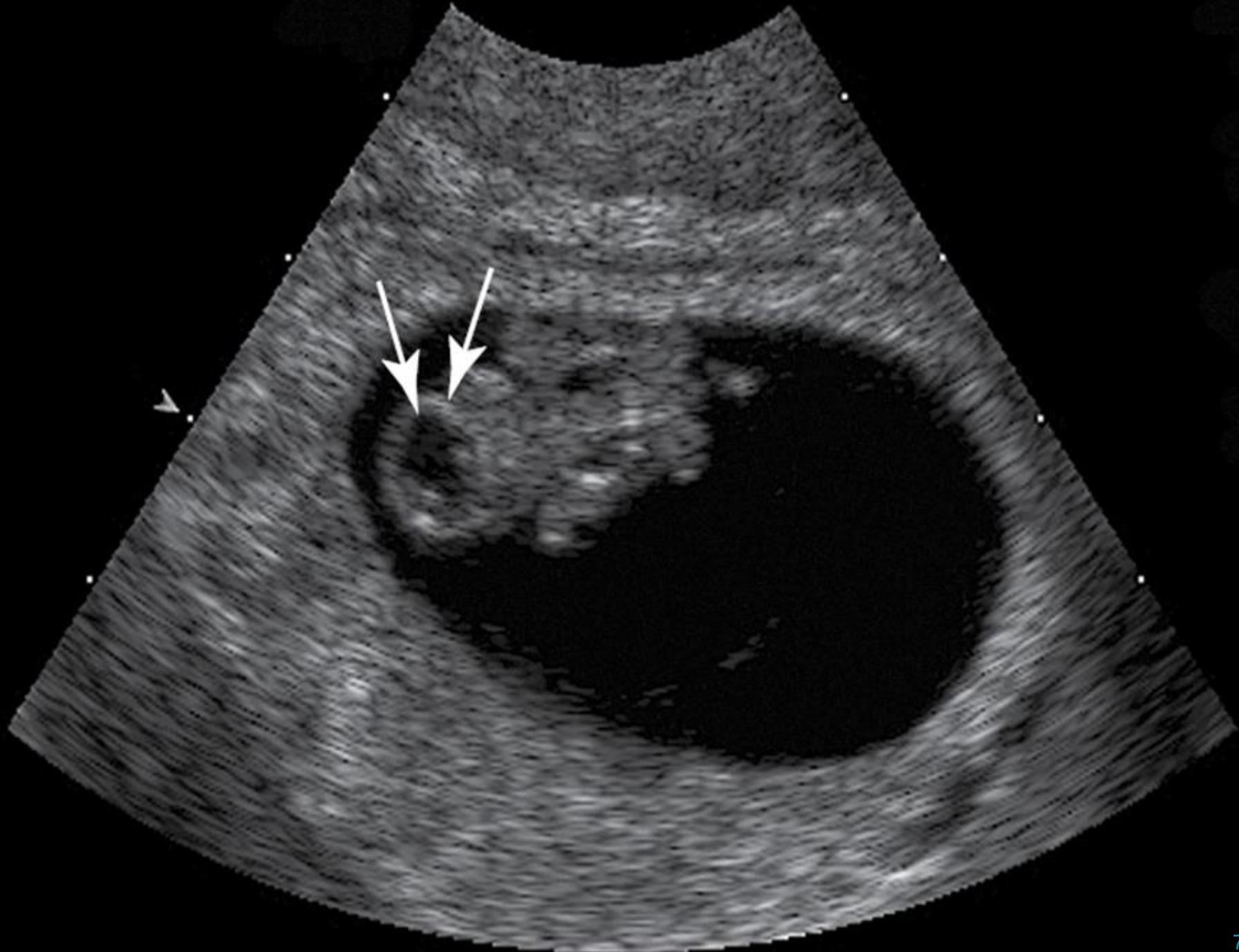
# **CARDIAC ANOMALIES**

# CARDIAC ANOMALIES

- × 4CH view and great vessels evaluated as early as 12 weeks
- × Serial exam to confirm suspected findings
- × Markers for cardiac defects:
  - + Increased NT
  - + Tricuspid regurgitation
  - + Reversal (or absence) of flow in ductus venosus
  - + Ectopia cordis and limb-body wall complex

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# **CRANIAL ANOMALIES**



# ACRANIA

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- × Partial or complete absence of cranium
- × Acrania is thought to be the predecessor of anencephaly
- × The ossification of the cranium begins after 9 weeks
- × Well-mineralized bone is very echogenic and easily imaged with sonography

# ACRANIA

- ✘ Acrania has been reported as early as the 12th week of gestation
- ✘ When this abnormality occurs, the fetus has an abnormally shaped head, referred to as a “Mickey Mouse” head





1. Trin  
Har-hic  
Pwr 100  
Gn  
C9 / M  
P2 / E  
SRI II

# ANENCEPHALY

- × Congenital absence of the brain and cranial vault
  - + With cerebral hemispheres either:
    - × Missing
    - × Reduced to small masses
- × May be seen near the end of the first trimester when there is absence of the cranium superior to the orbits with preservation of the base of the skull and facial features
- × [Health Beat: Baby survives exencephaly | Health Beat | wfmz.com](#)

# ANENCEPHALY

10cm 3548c  
LC OB-1  
FROZEN  
27G  
53DR



7-009

FETAL PROFILE  
ANENCEPHALY

MI < 8 4 AO=83%

# CEPHALOCELE

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- × Protrusion of the brain from the cranial cavity
- × Midline cranial defect in which there is herniation of the brain and meninges
- × May involve the occipital, frontal, parietal, orbital, nasal, or nasopharyngeal region of the head

# INIENCEPHALY

- × Rare, lethal anomaly of cranial development
- × The primary abnormalities include:
  - + 1. a defect in the occiput involving the foramen magnum
  - + 2. retroflexion of the spine in which the fetus looks upward with its occipital cranium directed toward the lumbar spine
  - + 3. open spinal defects

# VENTRICULOMEGALY

- × Dilatation of the ventricular system without enlargement of the cranium may be seen near the end of the first trimester
- × Normal lateral ventricles are quite prominent in the first trimester
- × Look for compression and thinning of the choroids plexus as the increased cerebrospinal fluid accumulates in the ventricular system
- × The choroid plexus is shown to be “dangling” in the dilated-dependent lateral ventricle

# VENTRICULOMEGALY



# HOLOPROSENCEPHALY

- × Failure of forebrain to divide into cerebral hemispheres
  - + Results in a single large ventricle with varying amounts of cerebral cortex
- × Known to occur with:
  - + Trisomy 13
  - + Trisomy 21
  - + Trisomy 18

# HOLOPROSENCEPHALY

- × Divided into three types:
  - + Alobar
  - + Semilobar
  - + Lobar
- × Alobar is the most serious and consists of a single ventricle, small cerebrum, fused thalami, agenesis of the corpus callosum, and falx cerebri

# NOTE

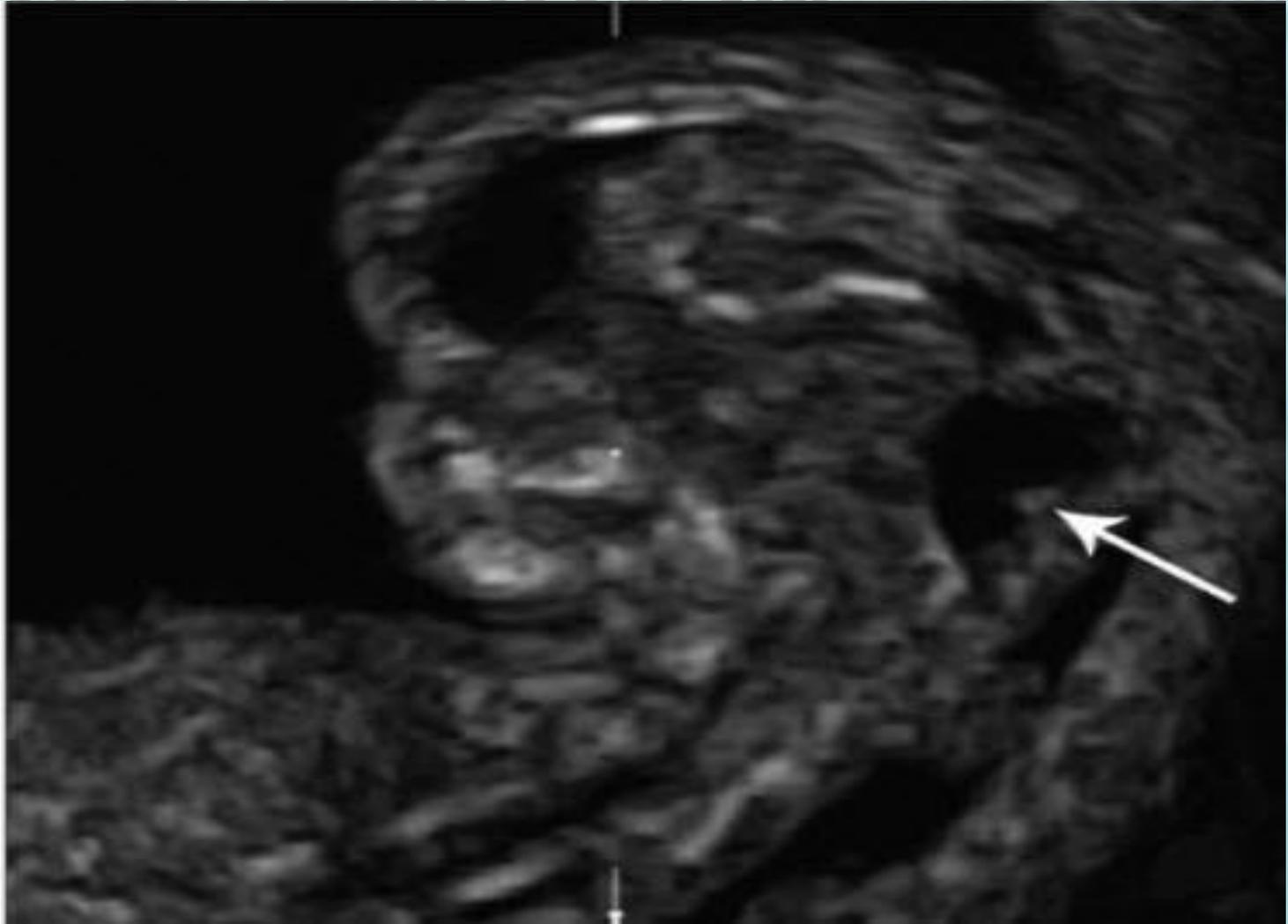
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- × Important to remember that before 9 weeks, the normal fetal brain appears to have a “single” ventricle until the falx cerebri develops after 9 weeks

# DANDY-WALKER MALFORMATION

- × Malformation results from a cystic dilatation of the fourth ventricle with dysgenesis or complete agenesis of the cerebellar vermis and frequently hydrocephaly
- × Occurs around the sixth to seventh week of gestation
- × On sonography, a large posterior fossa cyst that is continuous with the fourth ventricle,
  - + Dilatation of the third and lateral ventricles may be seen

# DANDY-WALKER MALFORMATION



# SPINA BIFIDA

- × May be detected at the end of the first trimester by noting spinal irregularities or a bulging within the posterior contour of the fetal spine and extrusion of the mass from vertebral column
- × Cranial signs appreciated closer to 12 weeks:
  - + Lemon sign – scalloping of frontal bones
  - + Banana sign – curved appearance of cerebellum

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# **ABDOMINAL WALL DEFECTS**

# ABDOMINAL WALL DEFECTS

- × Diagnoses of omphalocele, gastroschisis, and limb-body wall complex have been reported in the first trimester
- × Abdominal wall defects must be distinguished from normal physiologic midgut herniation

ABD



A

# ABDOMINAL WALL DEFECTS

- × Measuring normal gut herniation with TV approach:
  - +6 – 9 mm circumference at 8 weeks
  - +5 – 6 mm circumference at 9 weeks
- × Any gut herniation  $>6$  mm should be considered suspicious and be followed for resolution after 11 weeks 5 days

# OBSTRUCTIVE UROPATHY

- × Fetal bladder apparent at 10 to 12 weeks of gestation sonographically
- × Obstructive uropathy, especially when it occurs at the level of urethra, results in a very large urinary bladder and is well imaged
- × Bladder may be so large as to extend out of the pelvis into the fetal abdomen and may present as a cystic mass
- × Bladder outlet obstruction has been diagnosed at the end of the first trimester

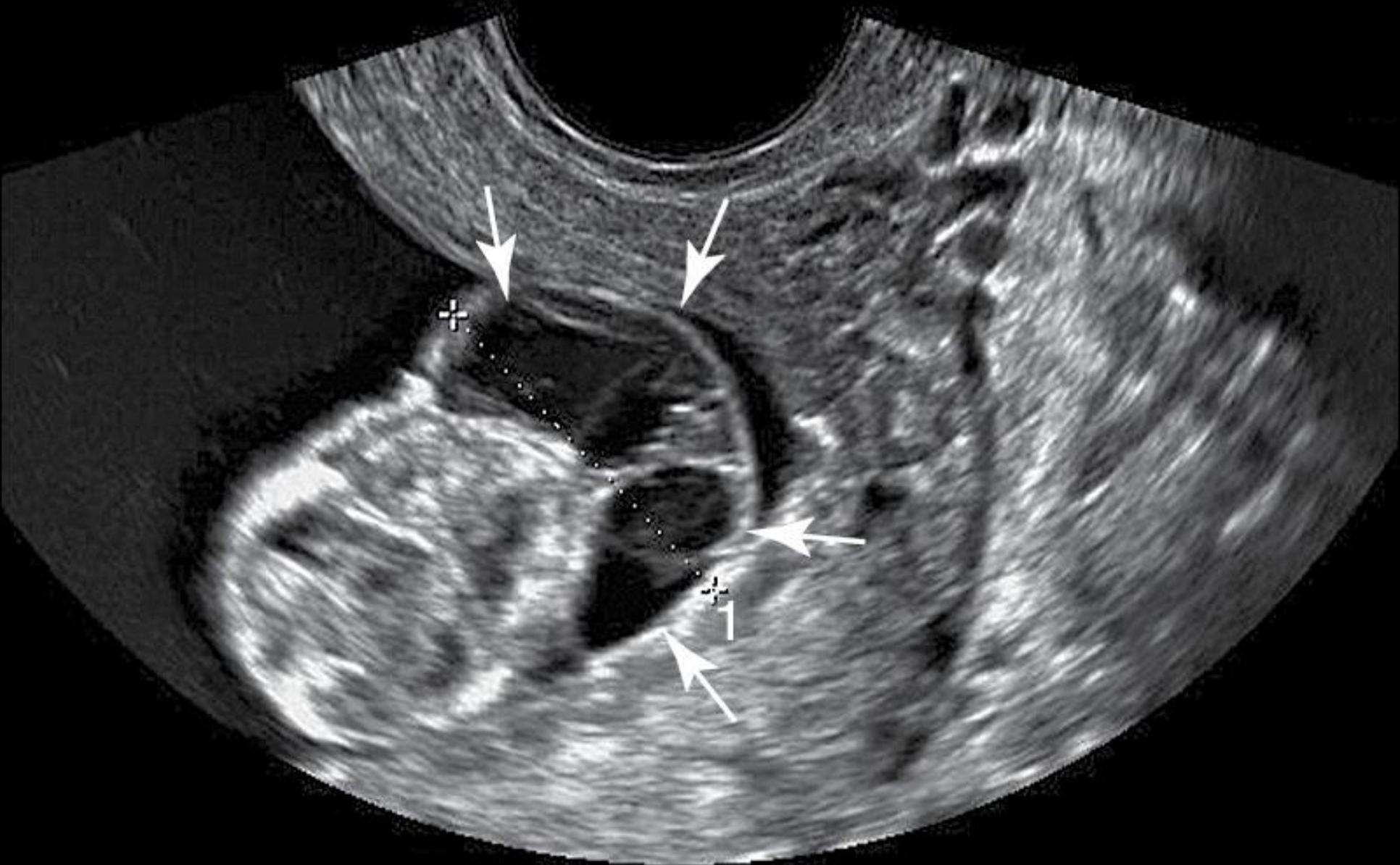
# CYSTIC HYGROMA

- × One of the most common abnormalities seen sonographically in the first trimester
- × Highly associated with chromosome abnormalities
  - + Trisomy 13
  - + Trisomy 18
  - + Trisomy 21

# CYSTIC HYGROMA

- × Visualized in the first trimester may vary in size, but all appear on the posterior aspect of the fetal neck and upper thorax
  - + Soft tissue thickening also may be present and should be considered as nuchal thickening
  - + Although cystic hygroma and nuchal thickening may be concordant, differentiation may be difficult

# HEAD FETal



# CYSTIC HYGROMA

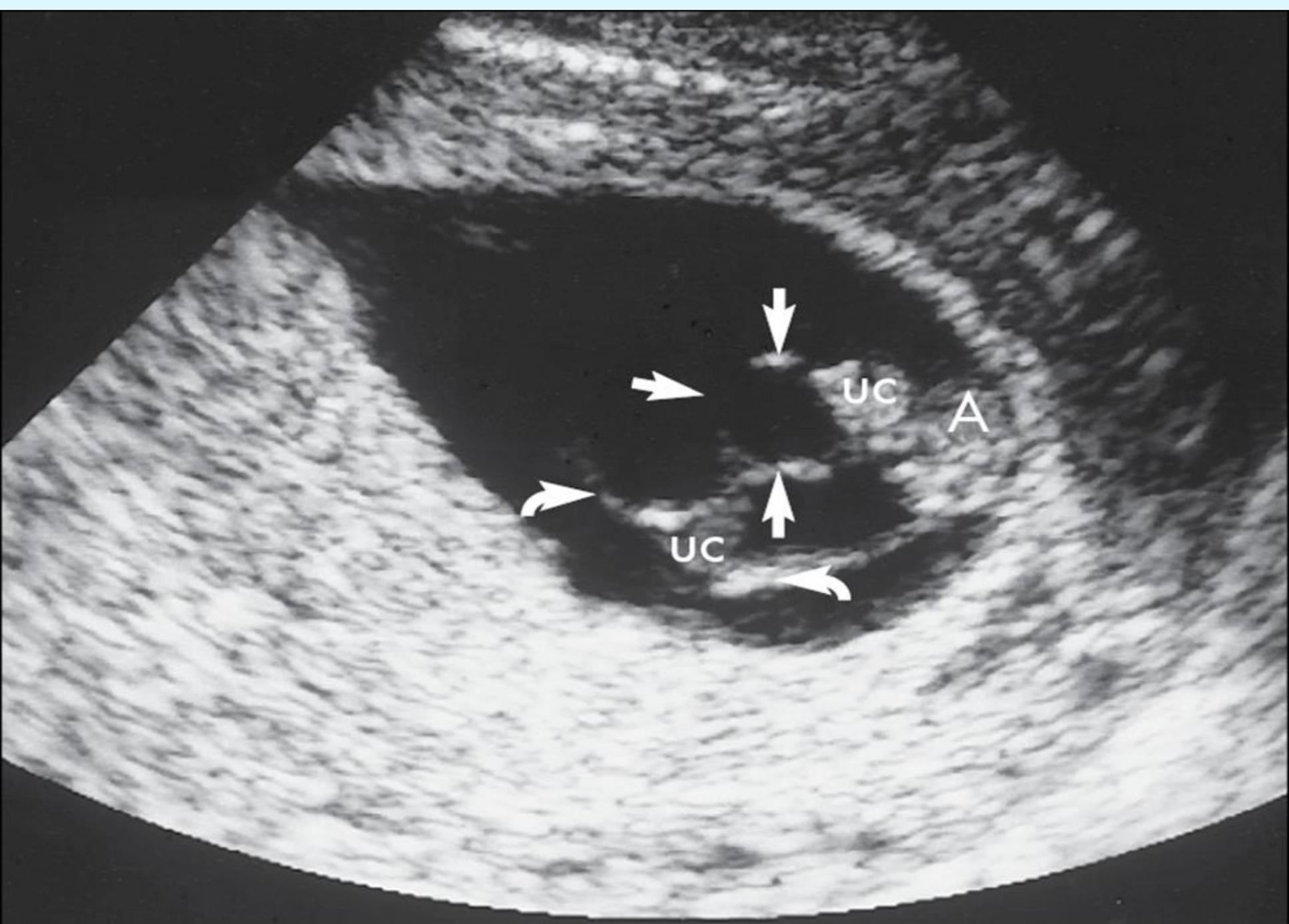
- × Cystic hygroma and nuchal thickening may be concordant; differentiation may be difficult
- × Any posterior neck thickness  $>3$  mm, with or without septations, should be followed
- × Differential diagnosis: cystic hygroma, encephalocele, cervical meningocele, teratoma, or hemangioma should be considered

# FIRST TRIMESTER UMBILICAL CORD CYSTS

- × Cyst size varies
  - + Range from 2.0 to 7.5 mm
- × Embryos whose cysts resolve by the second trimester go on to normal delivery
- × Umbilical cord cysts that persist through the second trimester or are associated with other abnormalities warrant further investigation and genetic evaluation

# FIRST TRIMESTER UMBILICAL CORD CYSTS

- × Differential diagnostic considerations of umbilical cord cysts include:
  - + 1. Amniotic inclusion cysts
  - + 2. Omphalomesenteric duct cysts
  - + 3. Allantoic cysts
  - + 4. Vascular anomalies
  - + 5. Neoplasms
  - + 6. Wharton's jelly abnormalities



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**FIRST  
TRIMESTER  
PELVIC MASSES**

# OVARIAN MASSES

## × Corpus Luteum Cyst

- + Most common ovarian mass seen in the first trimester

- + Preserves the embryo by secreting progesterone

- + Typically measures  $<5$  cm in diameter and does not contain septations

- × Can be large ( $>10$  cm) with internal septations and echogenic debris, which is thought to be secondary to internal hemorrhage

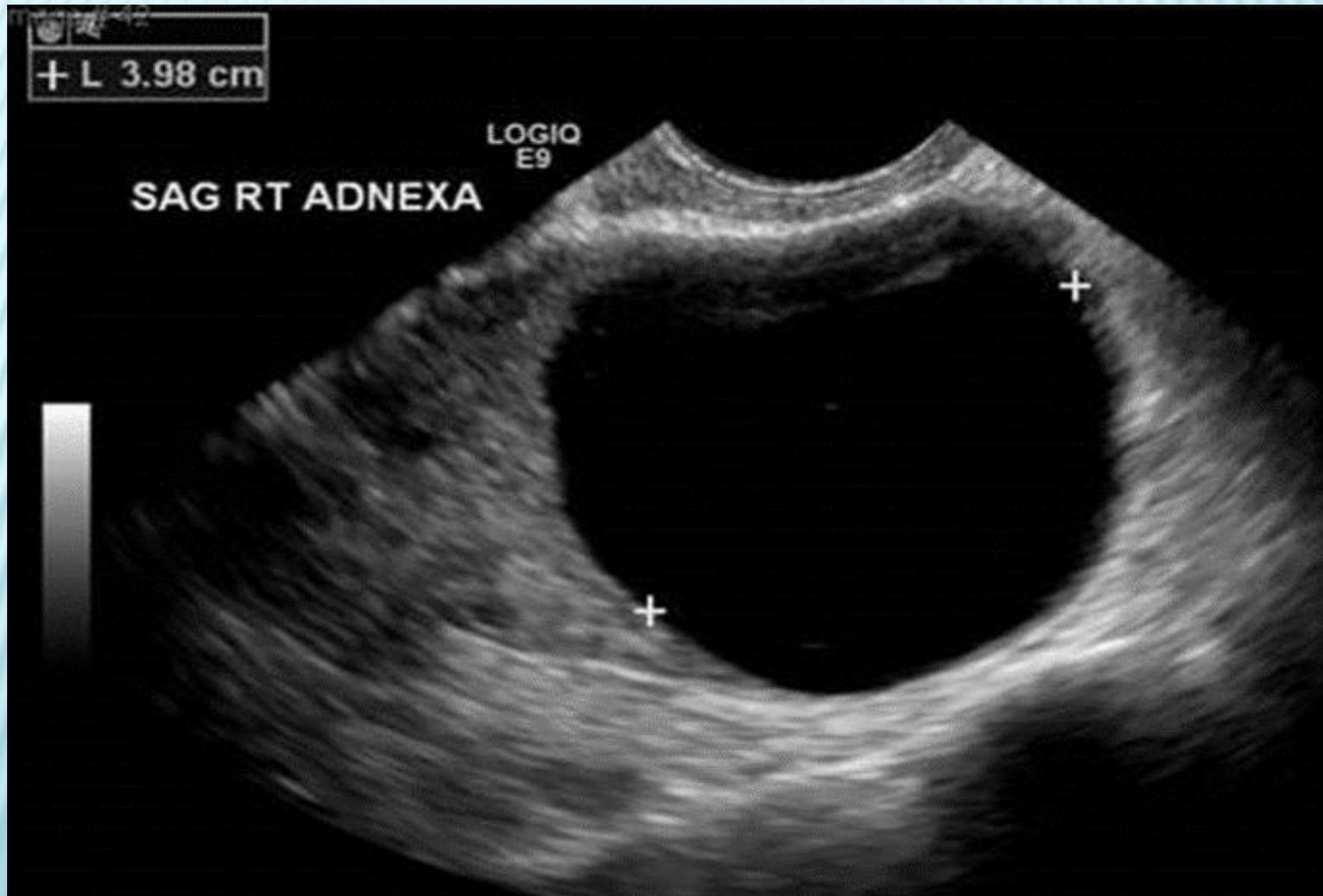
COR RT OVARY

Voluson  
E8

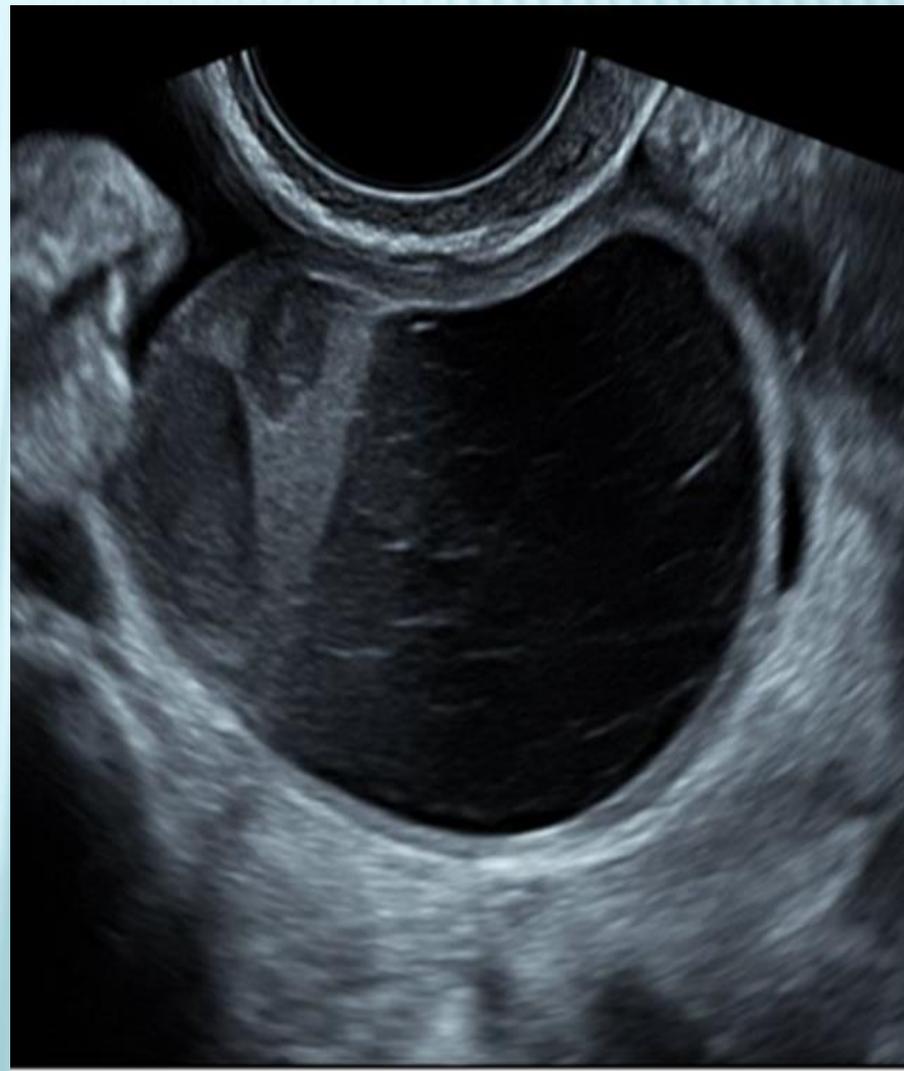
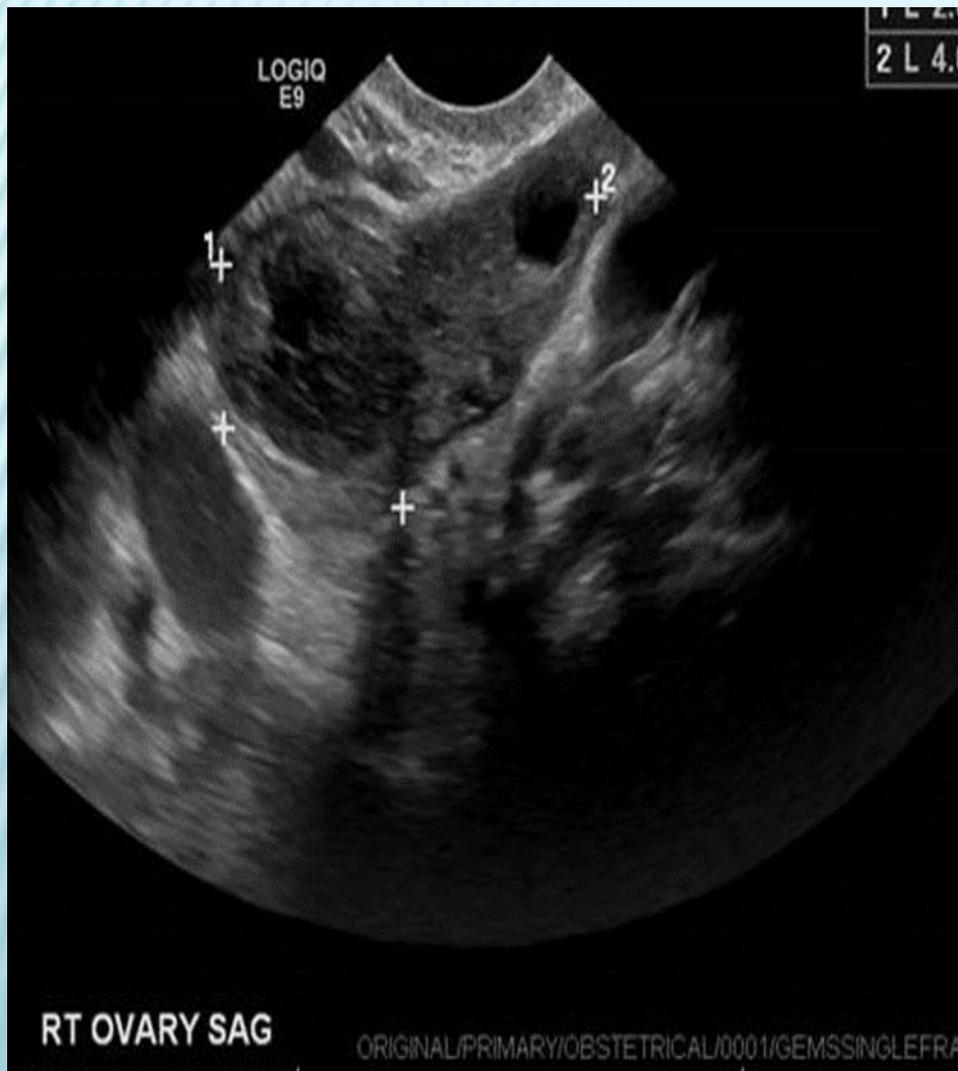


- 
- × Because of high metabolic activity, color flow imaging may demonstrate a ring of increased vascularity surrounding the corpus luteum, giving low-resistance (high diastolic) waveforms on pulsed Doppler
  - × As the pregnancy progresses, corpus luteum cysts regress and typically are not seen beyond 16 to 18 weeks' gestation

# TYPICAL CORPUS LUTEUM CYST



# HEMORRHAGIC CORPUS LUTEUM



# UTERINE MASSES

- × Uterine leiomyomas or fibroids
  - + Common throughout pregnancy
- × If fibroids coexist in first trimester pregnancy
  - + Fibroid should be identified in relation to the placenta
- × Fibroids may increase in size throughout the first trimester and early second trimester because of estrogen stimulation

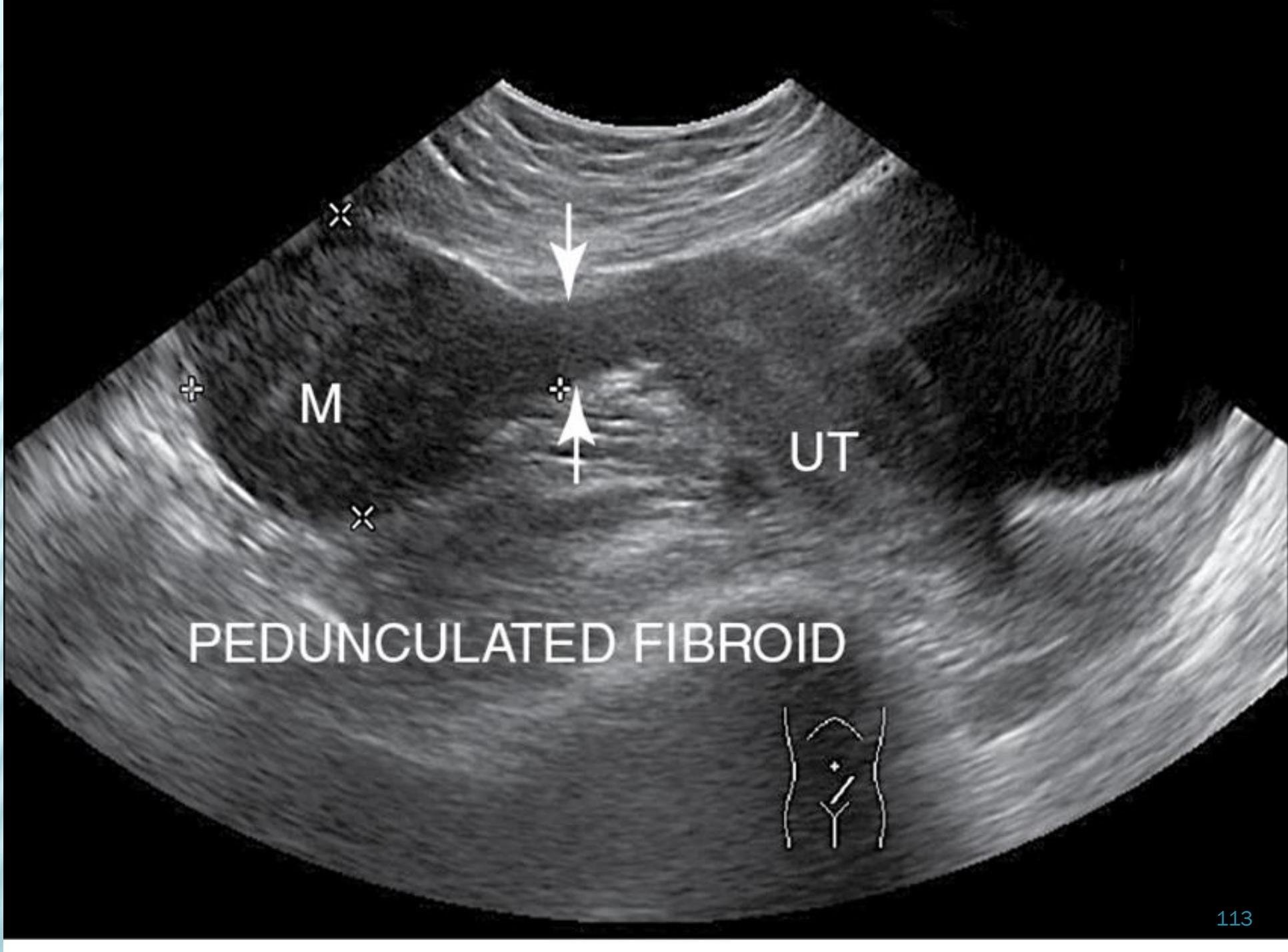


GS

X

# UTERINE LEIOMYOMAS

- × Rapid increase in fibroid size may lead to necrosis of the leiomyoma
  - + Giving rise to significant maternal symptoms that may require myomectomy
- × Rapidly growing fibroids may compress the gestational sac
  - + Causing spontaneous abortion



PEDUNCULATED FIBROID



# UTERINE LEIOMYOMAS

- × Fibroids may be:
  - + Hypoechoic
  - + Echogenic
  - + Isoechoic in relation to myometrium
- × They typically cause deformity or displacement of the uterus, endometrium, or both
- × Fibroids are high acoustic attenuators, which give rise to poor acoustic transmission

# UTERINE LEIOMYOMAS

- × Fibroids also may be differentiated from focal myometrial contractions by observing the focal lesion over time (typically 20–30 minutes)
  - + Myometrial contraction should disappear
  - + Fibroid would still be present