ULTRASOUND SOCIETY OF THE PHILIPPINES

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ESSENTIALS AND UPDATES IN OB-GYNE AND BREAST SONOGRAPHY

ESSENTIAL AND UPDATES IN OB-GYNE ULTRASOUND

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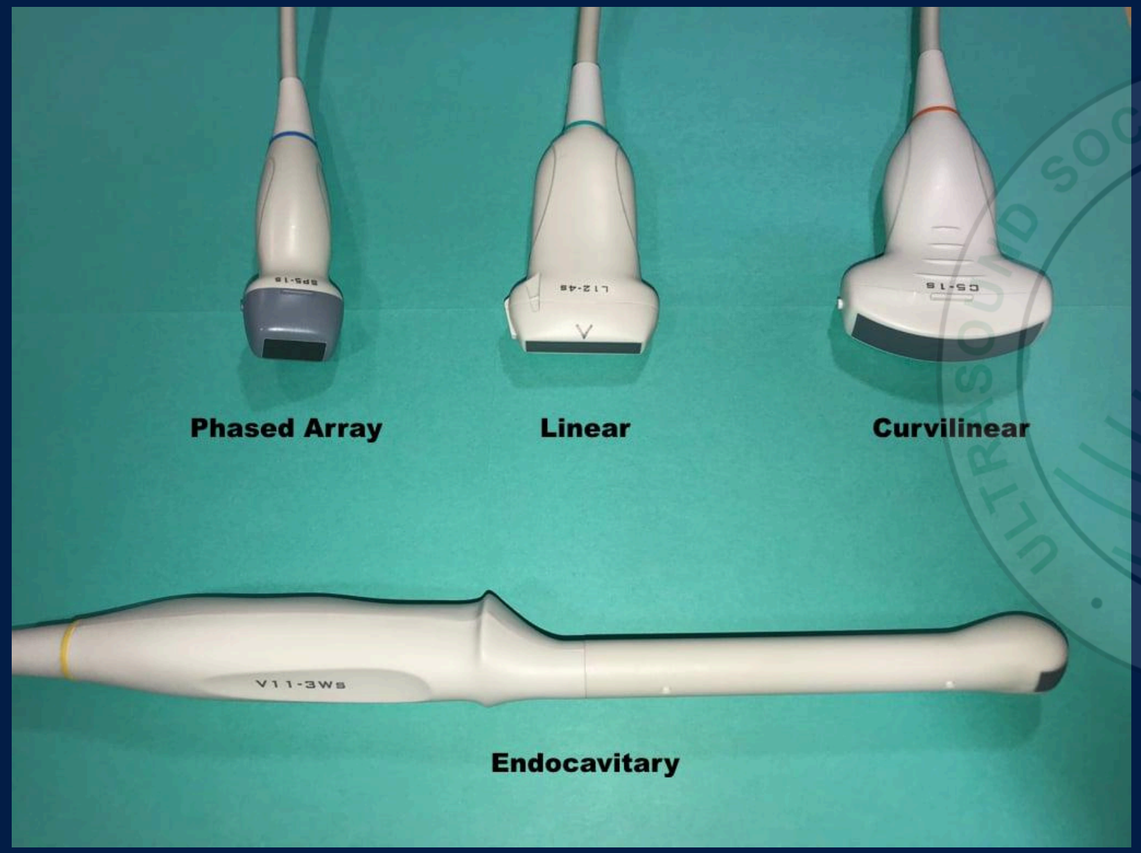
TOPICS

1. Pregnancy Trimesters
2. Fetal Demise
3. Cervical Incompetence
4. Ectopic Pregnancy
5. Interesting Case
6. Common Uterine Pathologies

OBSTETRIC ULTRASOUND

Obstetric Ultrasound



- Ultrasound –most frequently used modality for assessment of pregnancy
- Dependent on examiner's training and experience
- Technique:
  - Transabdomen – convex linear array (3 to 4 MHz)
  - Transvaginal –transvaginal probe (5 to 10 MHz)

First Trimester Sonography

Indications for First-Trimester Ultrasound

Confirmation of the presence of an intrauterine pregnancy
Suspected ectopic pregnancy
Vaginal bleeding
Pelvic pain
Estimation of gestational age
Diagnosis or evaluation of multiple gestations
Confirmation of cardiac activity
Adjunct to chorionic villus sampling, embryo transfer, and localization, and removal of an intrauterine device
Assessment for certain fetal anomalies, such as anencephaly, in high-risk patients
Measurement of nuchal translucency when part of a screening program for fetal aneuploidy
Suspected ectopic pregnancy
Suspected hydatidiform mole
Maternal pelvic masses and/or uterine abnormalities

What should we look for during a First Trimester scan?

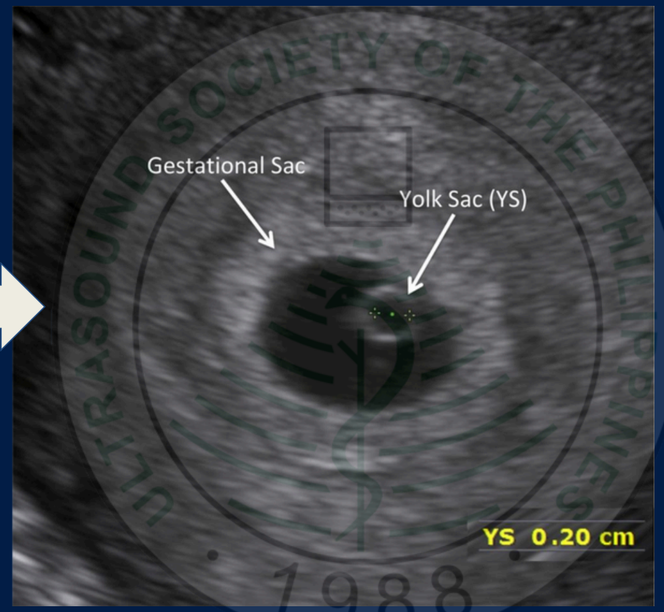
- Gestational sac
- Gestational age
- Yolk Sac
- Embryo/Fetal number
- Cardiac Activity
- Maternal anatomy

First Trimester

Gestational sac

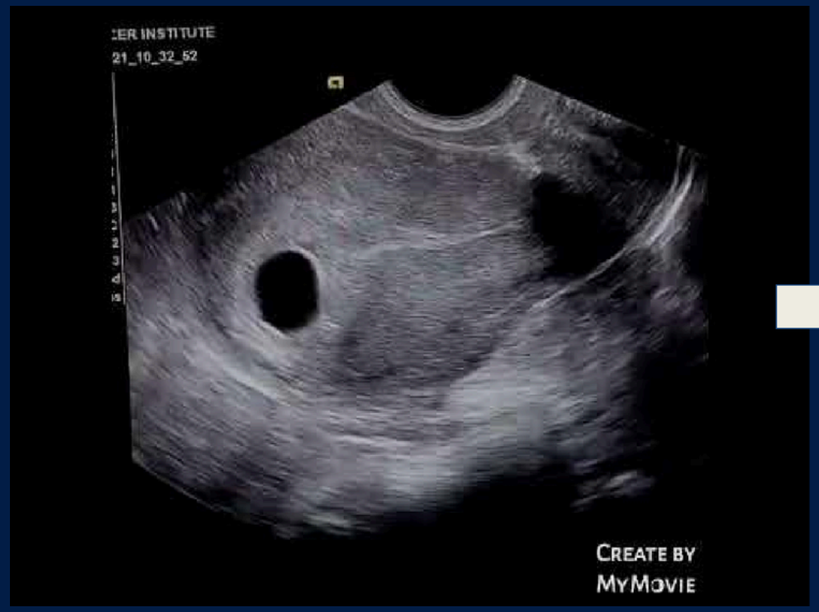
First Trimester

Gestational sac

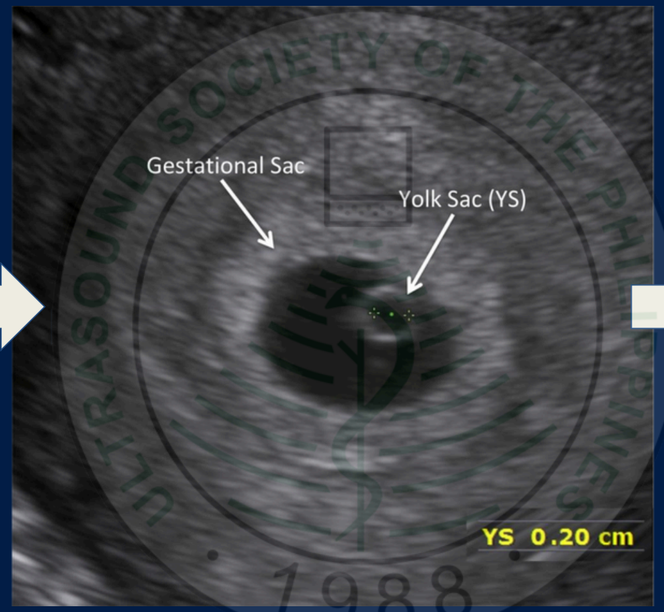


Yolk sac

First Trimester



Gestational sac

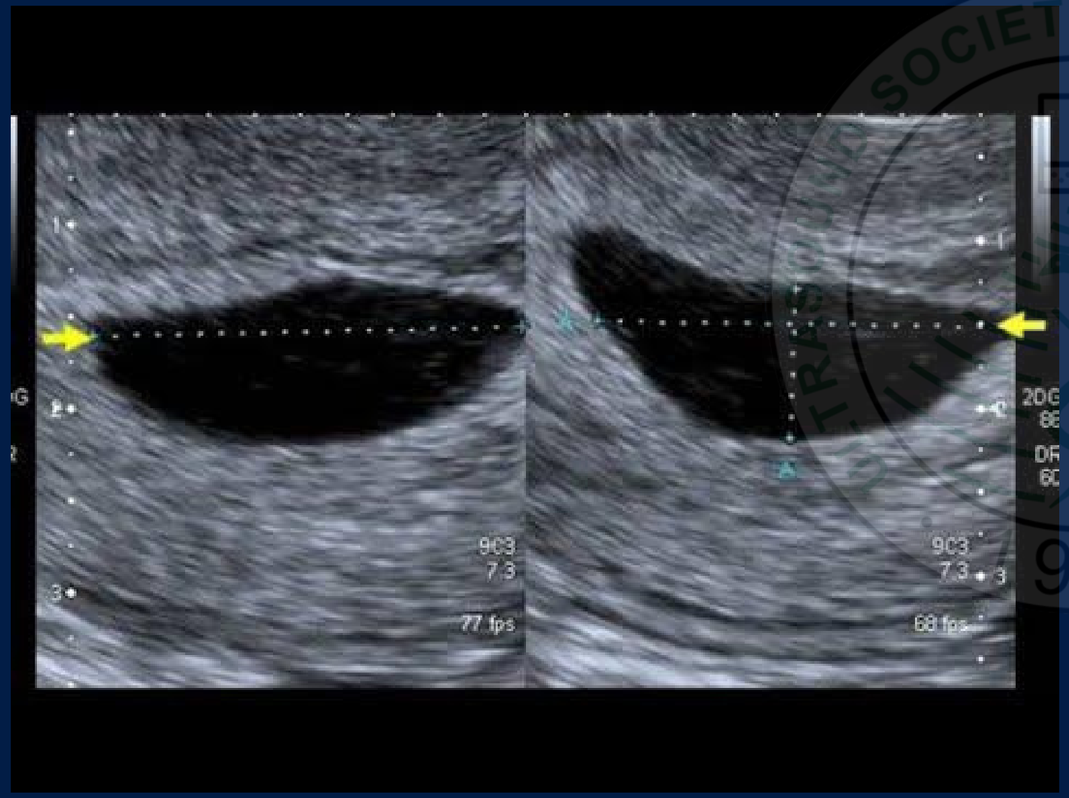


Yolk sac

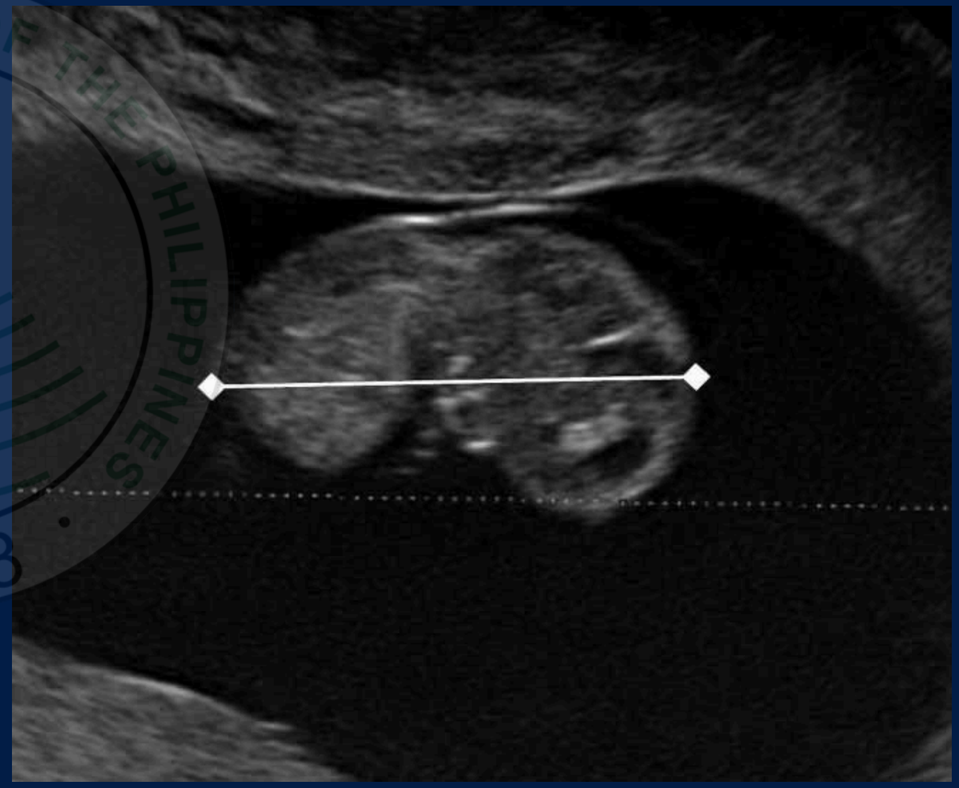
Embryo

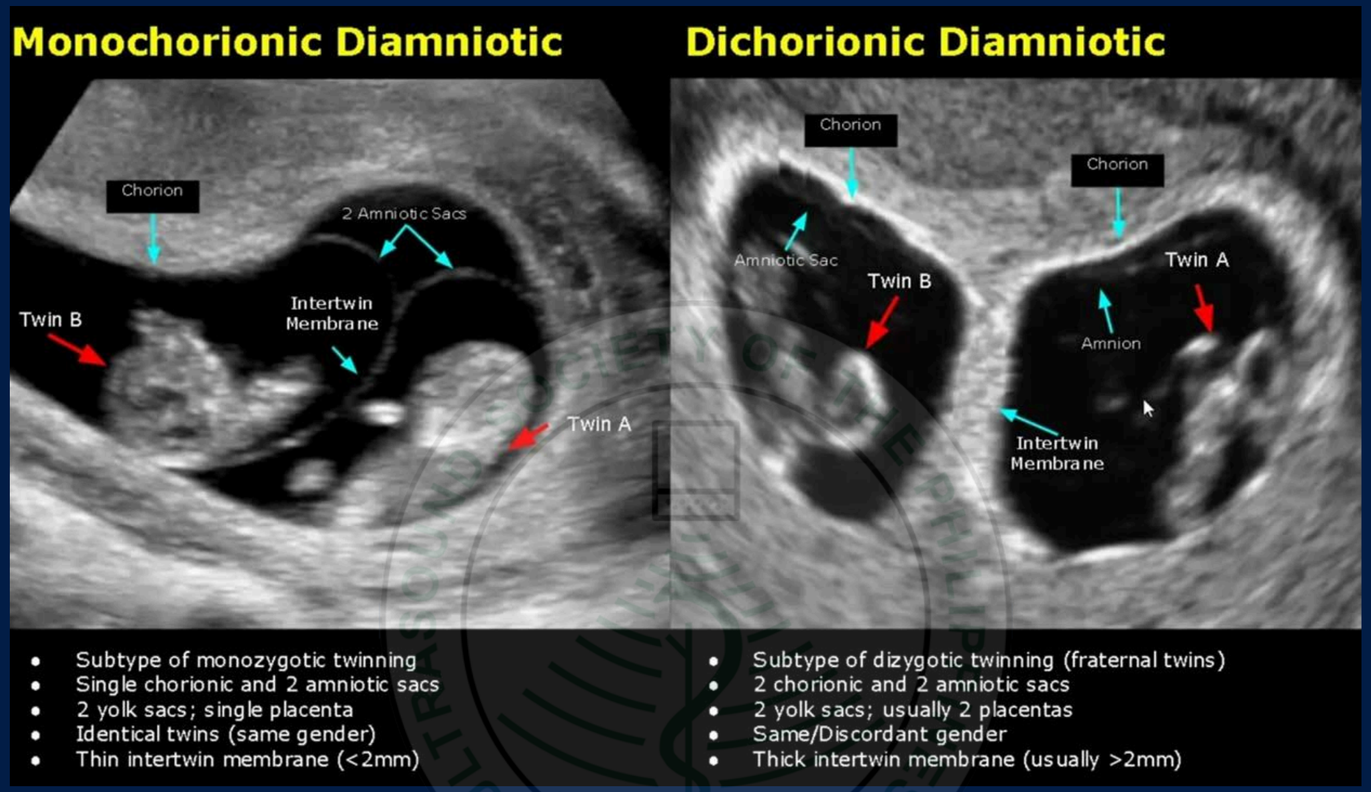
Gestational Age

Mean Sac Diameter



Crown-Rump Length

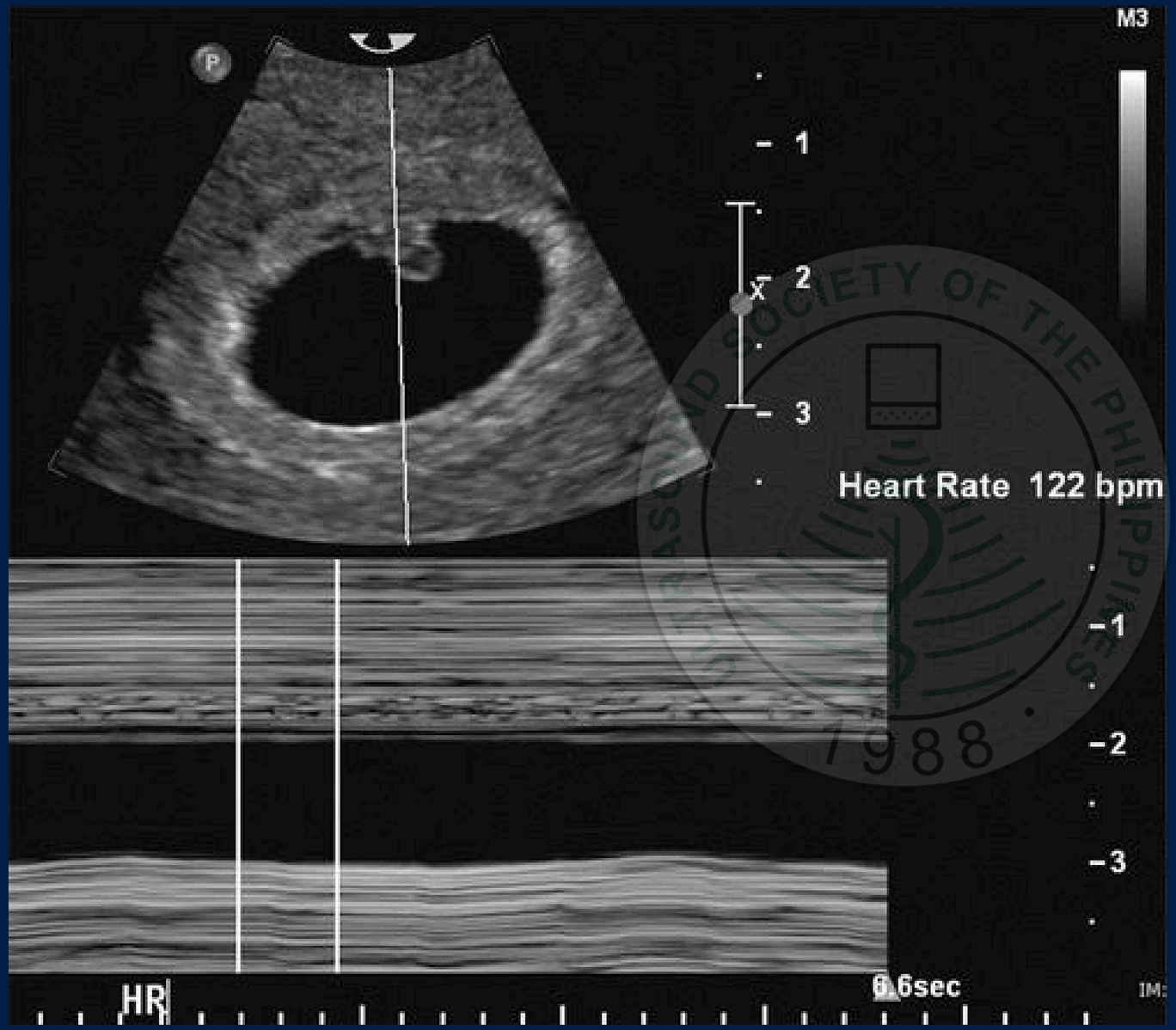




Embryonic or Fetal Number

Amnionicity

Chorionicity



Cardiac activity

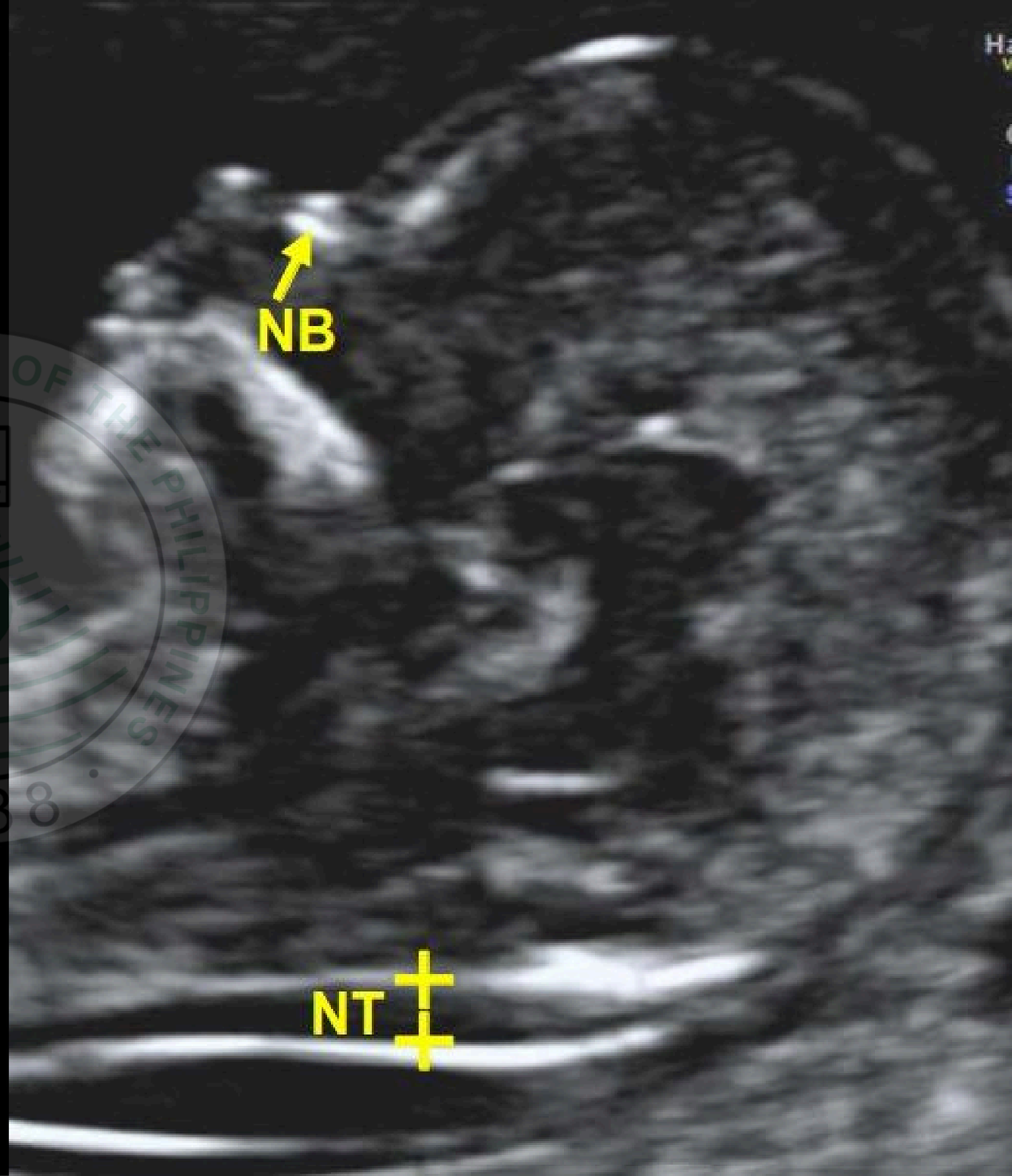
Screening for Aneuploidy

Current screening options

- Traditional serum analysis with or without nuchal translucency ultrasound
- cell-free DNA

Nuchal Translucency

- Between 11 and 14 weeks of gestation



Second and Third Trimester Sonography

Indications for Second- and Third-Trimester Ultrasound

- Estimation of gestational (menstrual) age
- Evaluation of fetal growth
- Evaluation of fetal anatomy and fetal well-being
- Vaginal bleeding
- Abdominal or pelvic pain
- Cervical insufficiency
- Determination of fetal presentation
- Suspected multiple gestation
- Adjunct to amniocentesis or other procedure
- Evaluation of discrepancy between uterine size (as measured by fundal height) and clinical dates
- Pelvic mass
- Suspected hydatidiform mole
- Adjunct to cervical cerclage placement
- Suspected ectopic pregnancy
- Suspected fetal death
- Suspected uterine abnormality
- Suspected amniotic fluid abnormalities
- Suspected placental abruption
- Adjunct to external cephalic version
- Premature rupture of membranes and/or premature labor
- Previous abnormal screening exams
- Follow-up evaluation of placental location for suspected placenta previa or accreta
- Previous congenital anomaly
- Screening for or follow-up of fetal anomalies

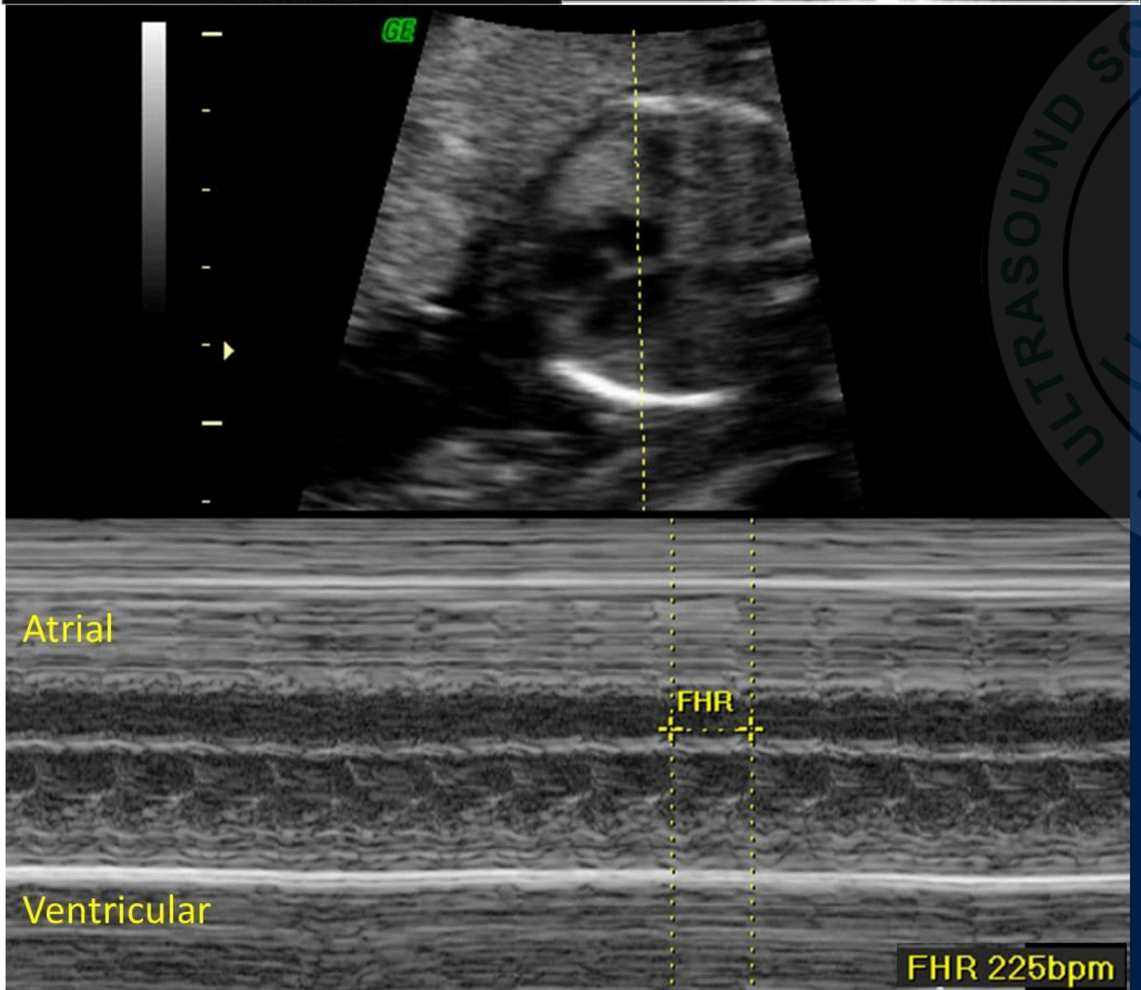
Level I Examination	Level II Examination
● Standard or routine ● Maternaluterus,ovaries, cervix and placenta ● Systematic review of fetal anatomy	● High risk, specialized or detailed ● Specific indication ● Performed if anomaly is suspected

What should we look for during the 2nd& 3rd Trimester scan?

General Survey

- Cardiac Activity
- Number
- Presentation
- Gestational age and weight assessment
- Amniotic Fluid
- Placenta
- Maternal Anatomy

Fetal Anatomic Survey



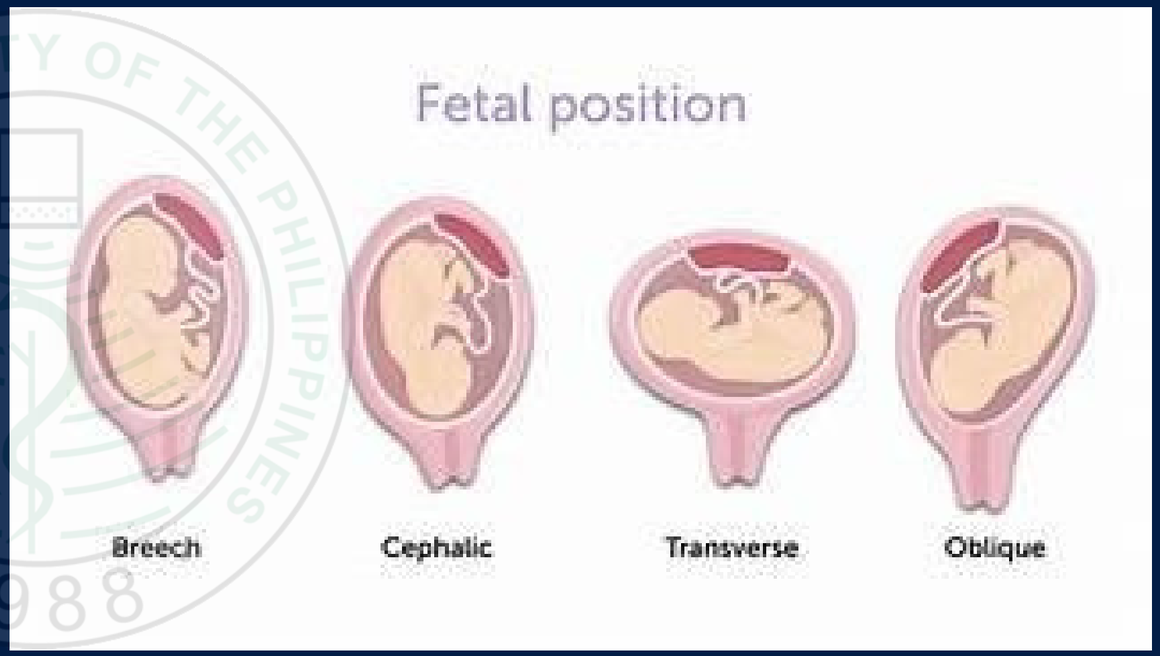
Fetal Cardiac Activity
FetalNumber

- Abnormal heart rate and rhythm
- Multiple gestations
  - Chorionicity
  - Amnionicity
  - Comparison Of Fetal Sizes
  - Amniotic Fluid Volume
  - Genitalia

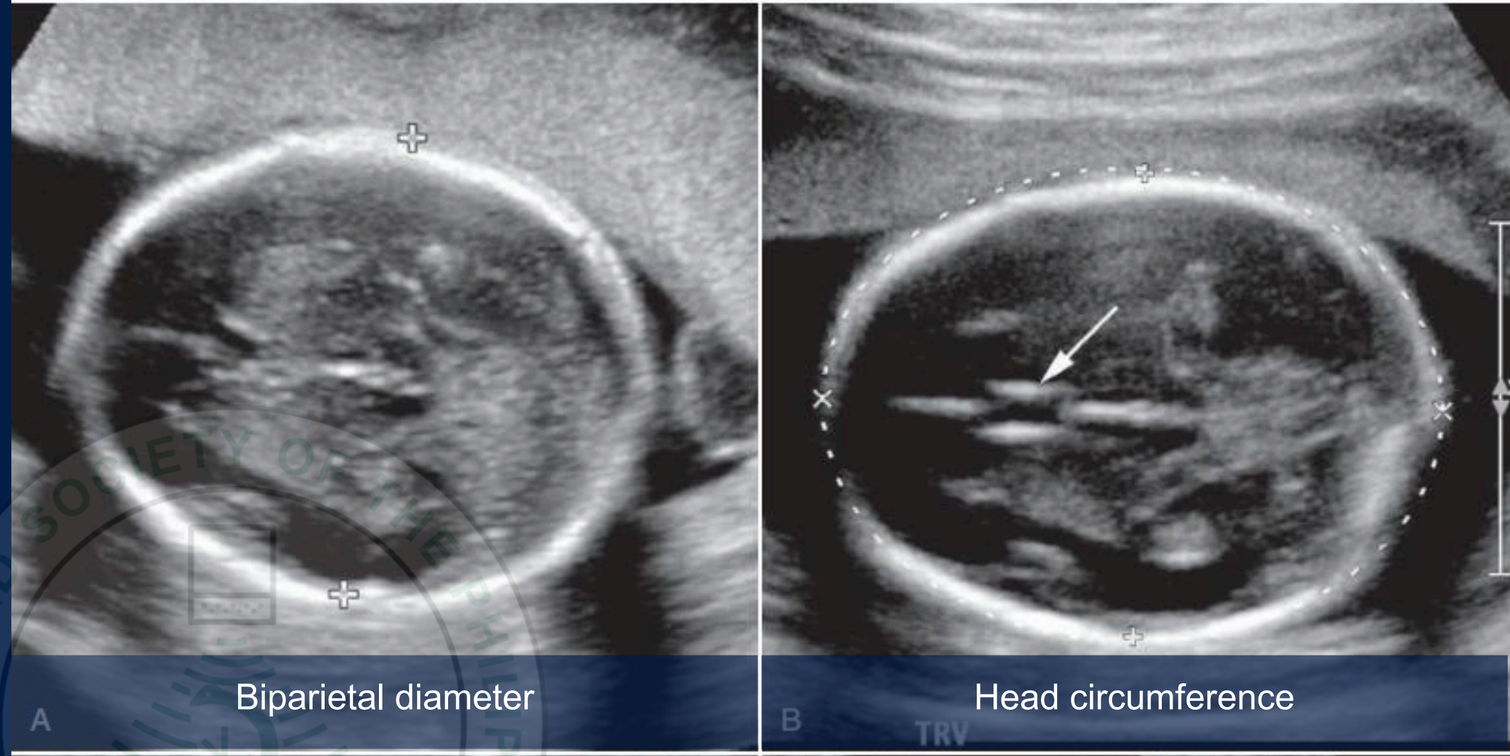
Fetal Presentation

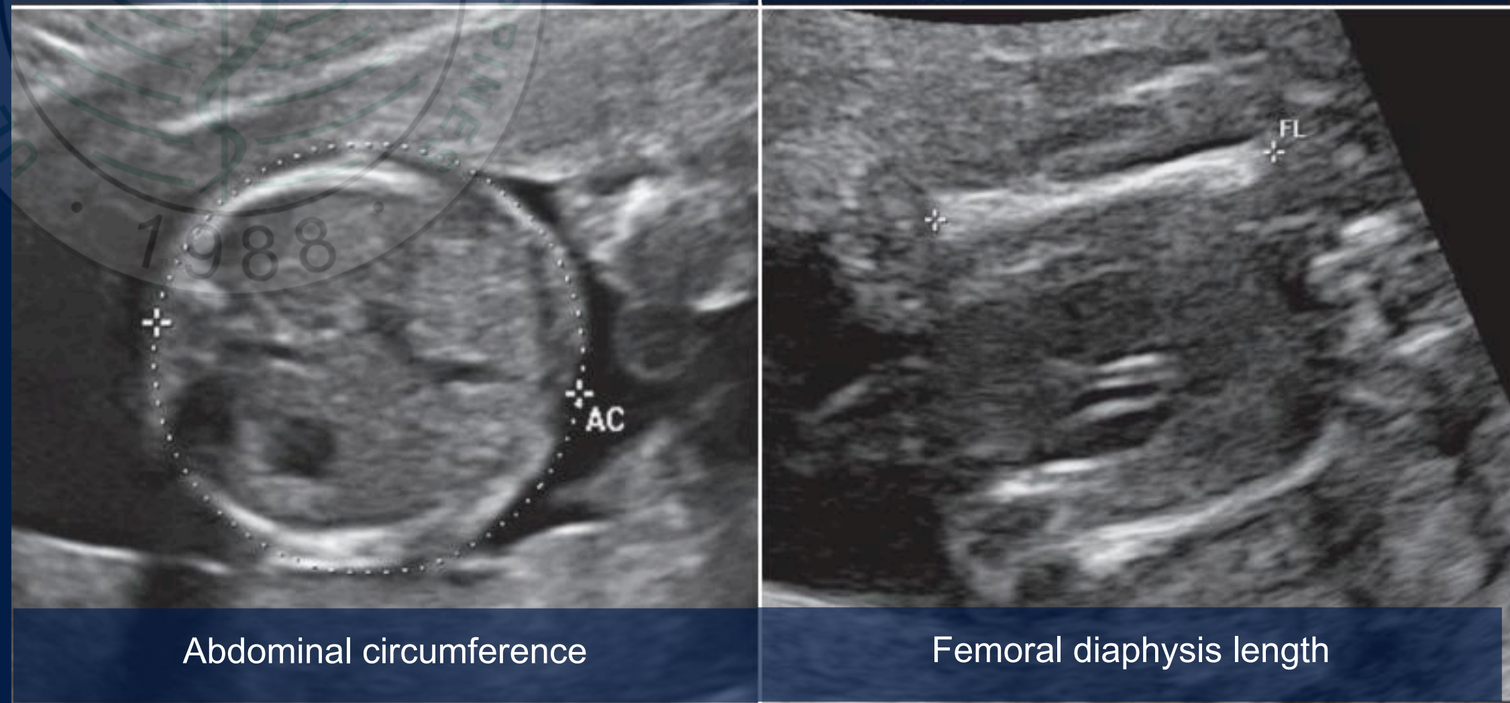
- Fetal Presentation
  - Presenting fetal part closest to the cervix
    - Head –most common presenting part

- Fetal lie
  - relationship of the long axis of the fetus to the long axis of the uterus
    - Longitudinal –most common



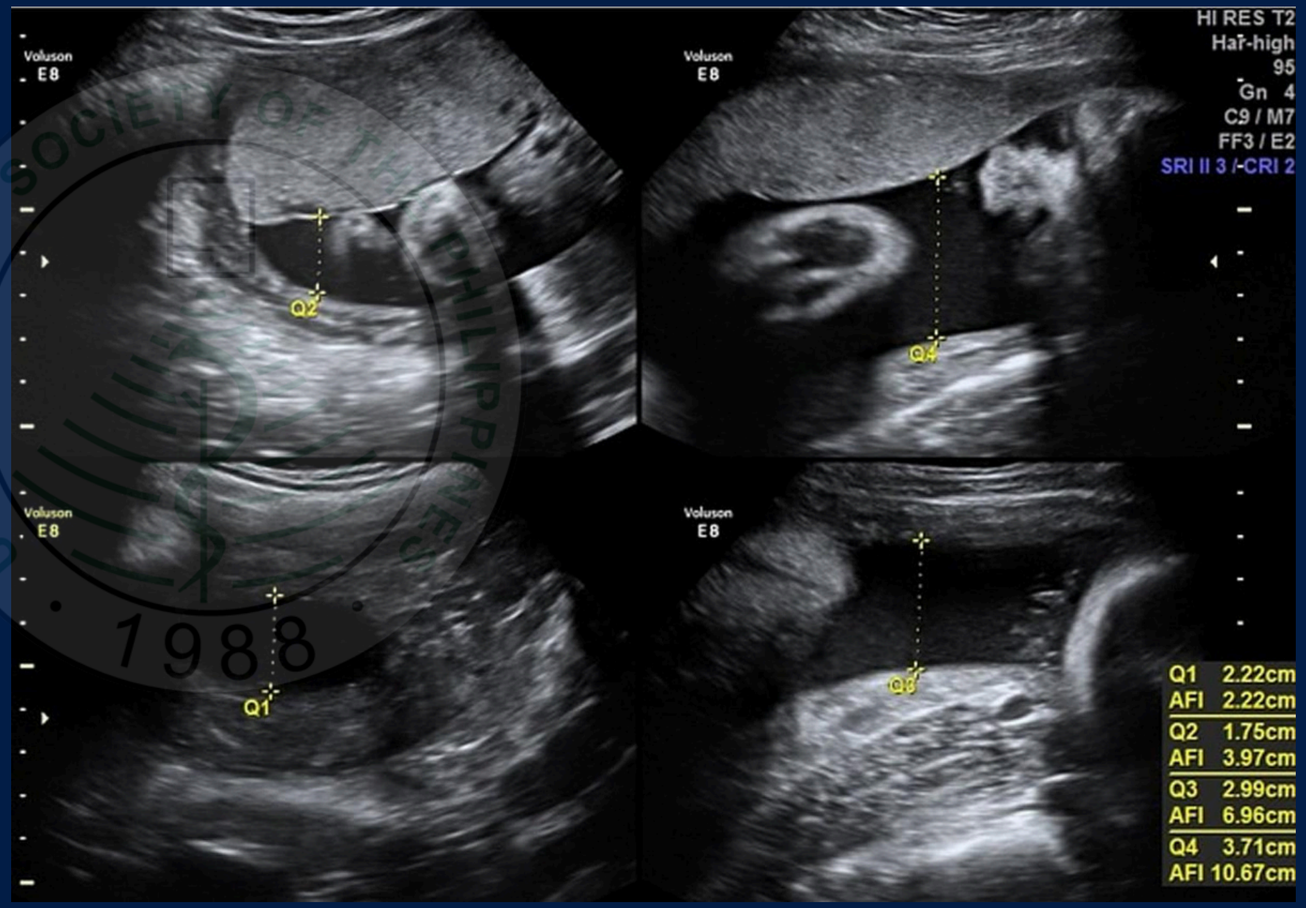
Gestational Age and Weight





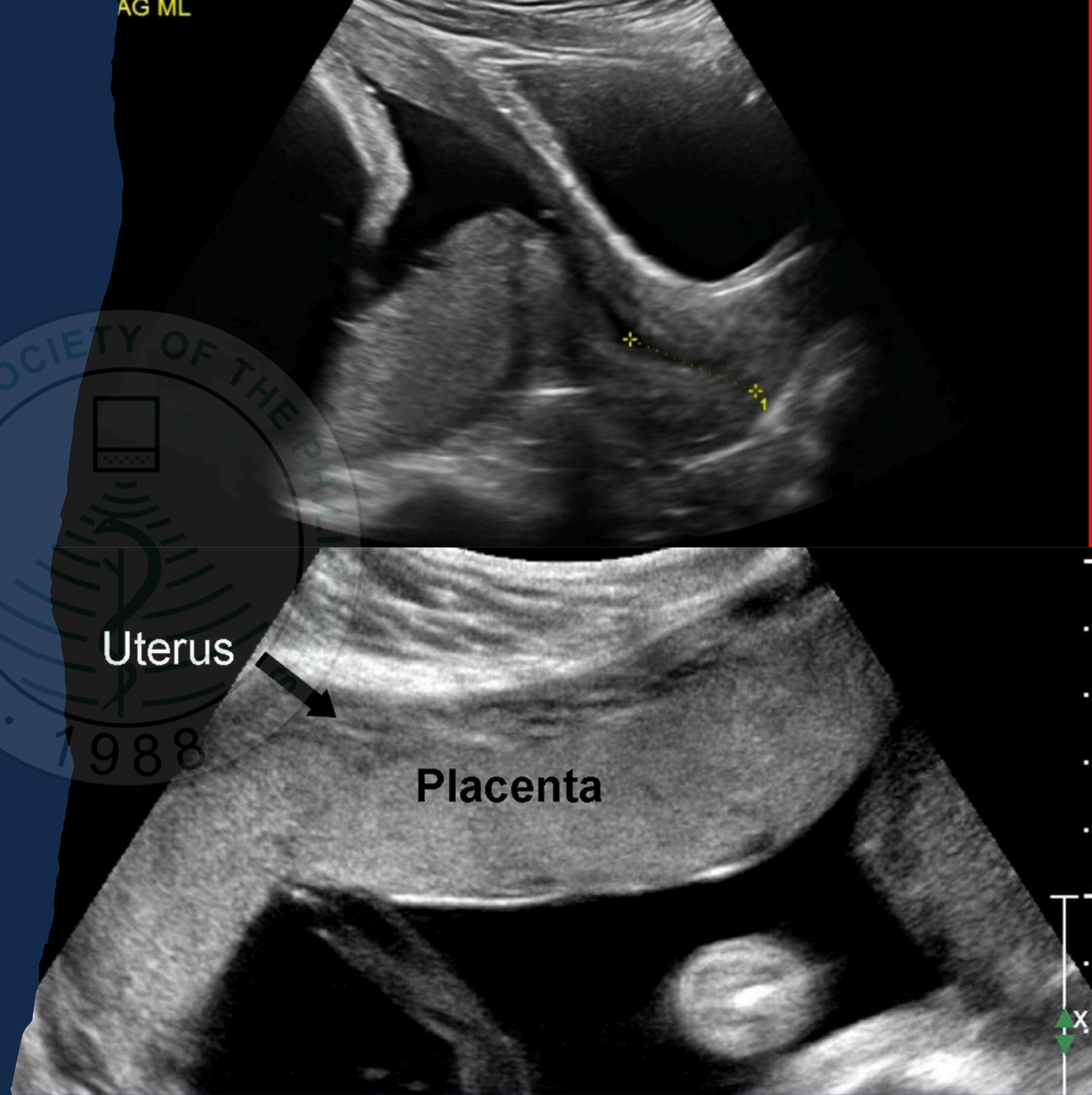
Amniotic Fluid Volume

- Amniotic fluid index
- Single deepest pocket
- 2-diameter pocket

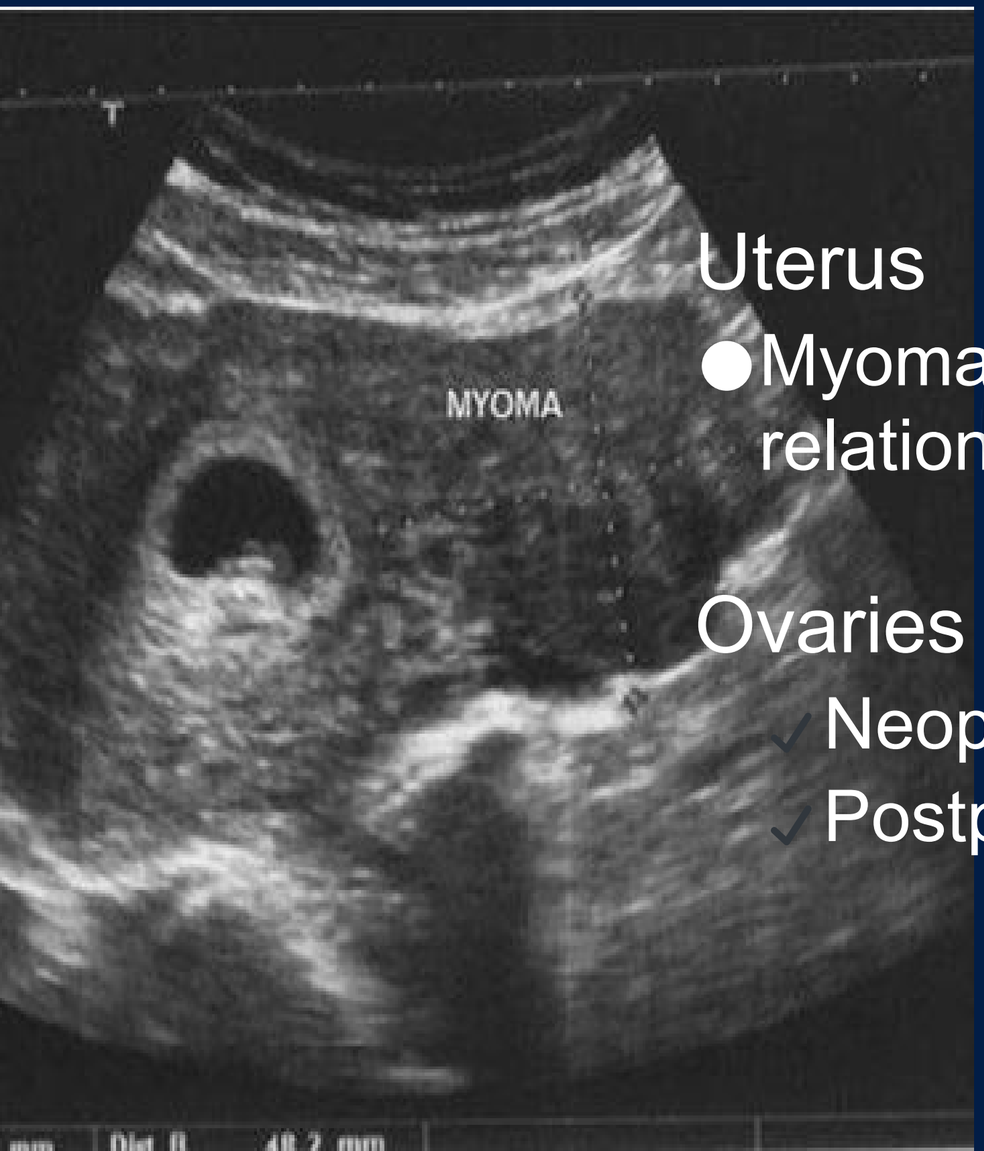


Placenta

- Location
- Relationship to the internal cervical os
- Umbilical cord and number of vessels in the cord
- Placental cord insertion site



Uterus and Adnexa

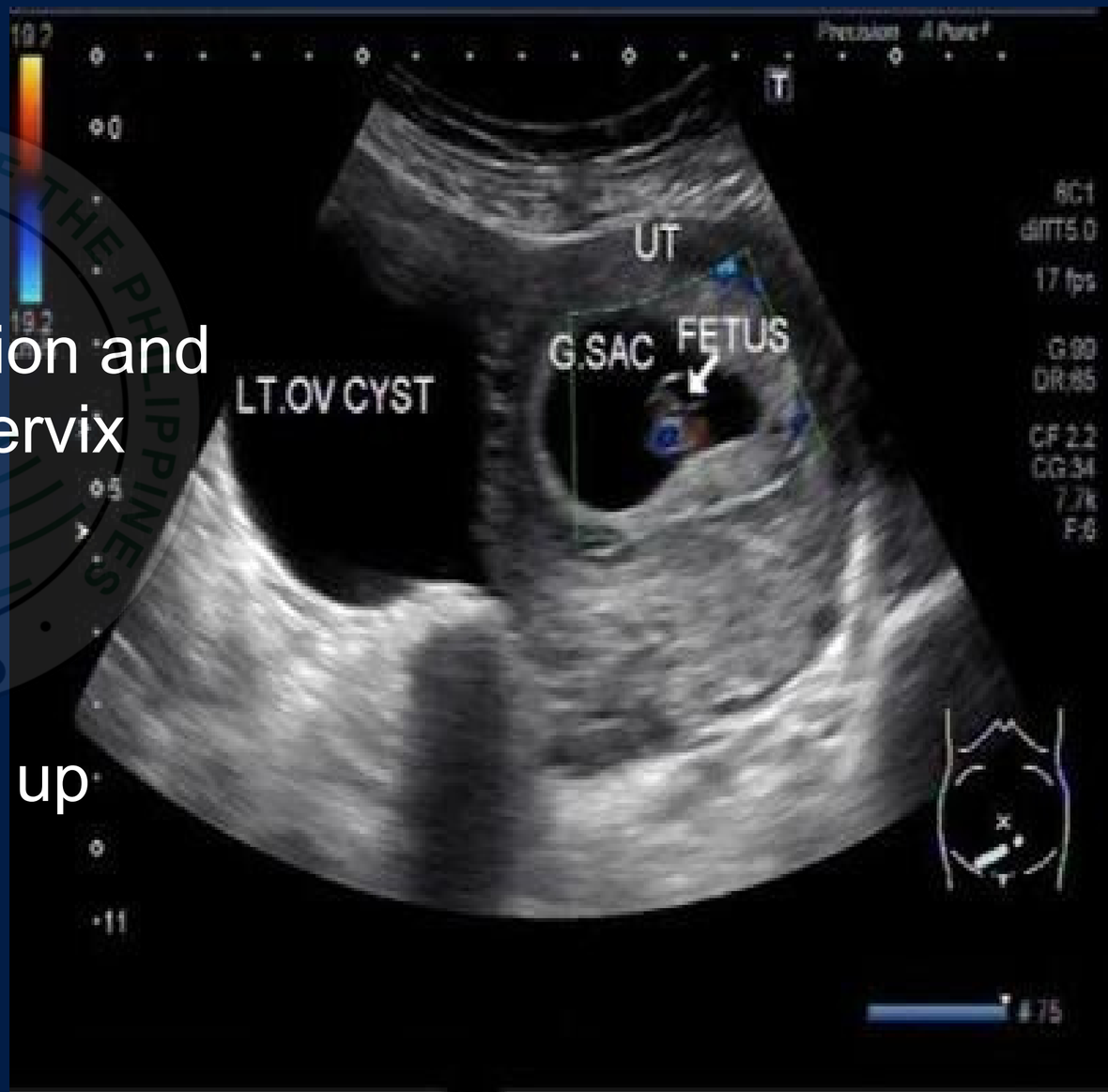


Uterus

- Myomas: size, location and relationship to the cervix

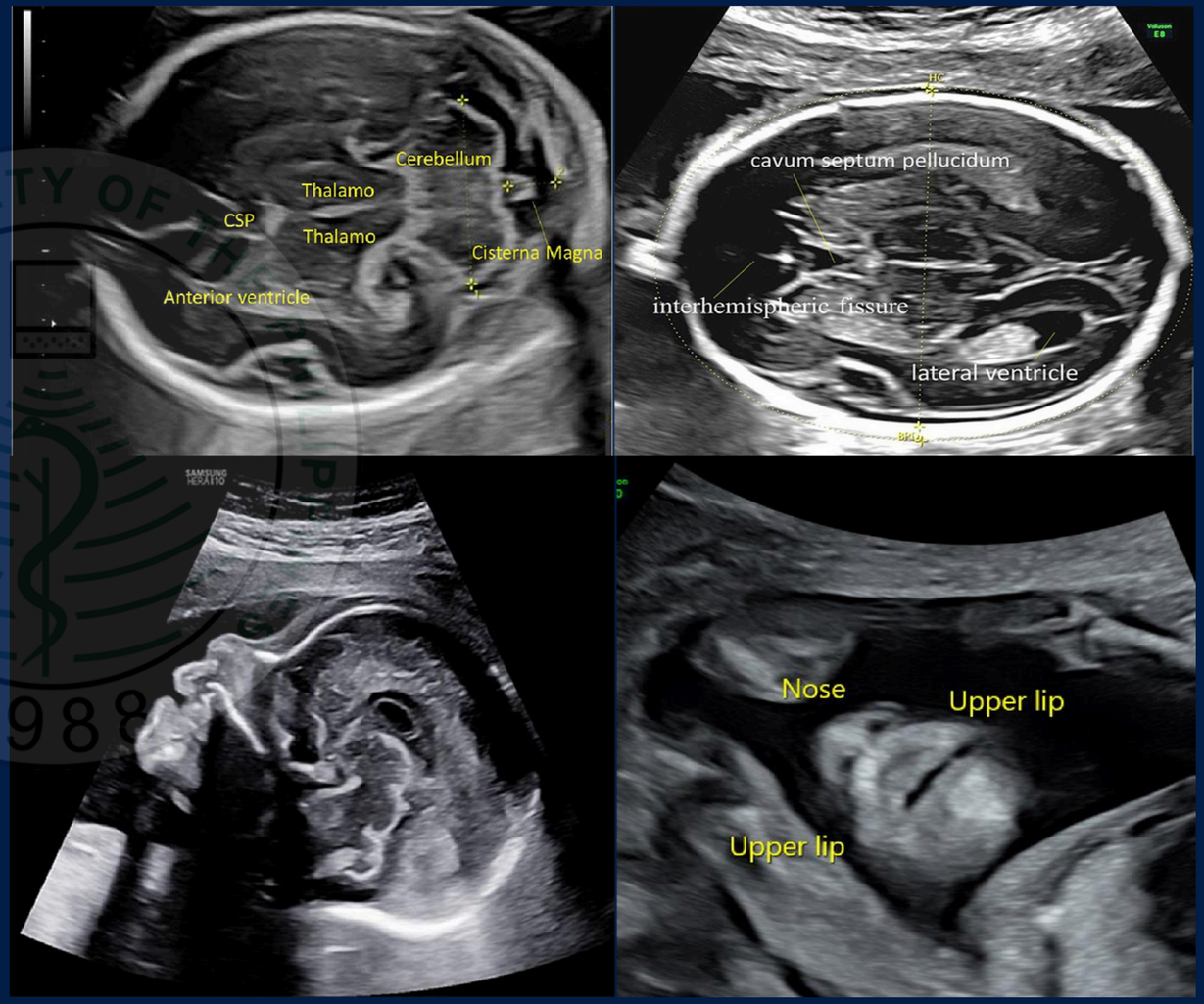
Ovaries

- ✓ Neoplasms, cysts
- ✓ Postpartum follow up



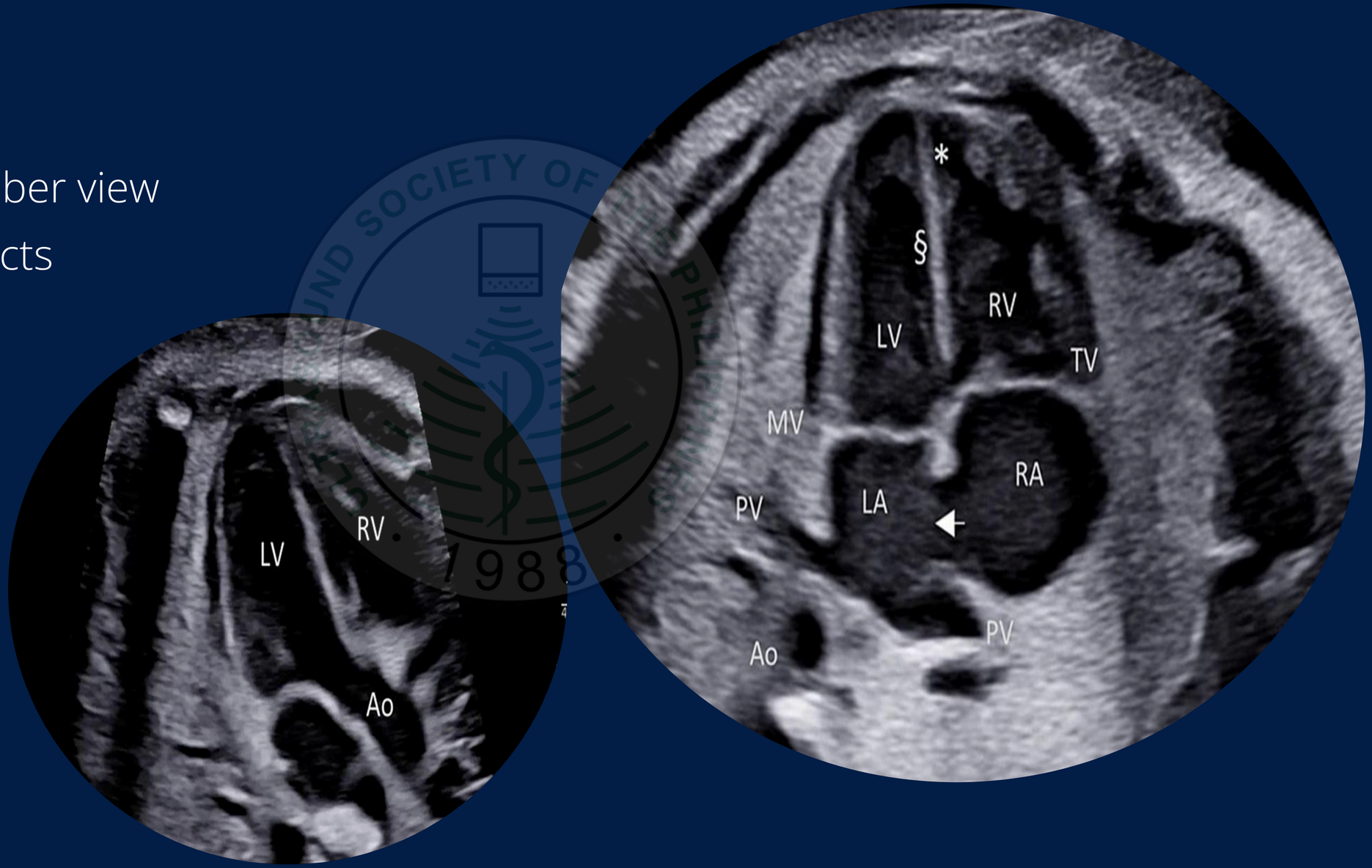
Fetal Anatomic Survey

- **Head, Face, and Neck**
  - Cerebellum Choroid
  - plexus Cisterna magna
  - Lateral cerebral ventricles
  - Midline falx Cavum septi
  - pellucidi Upper lip
  -
  -



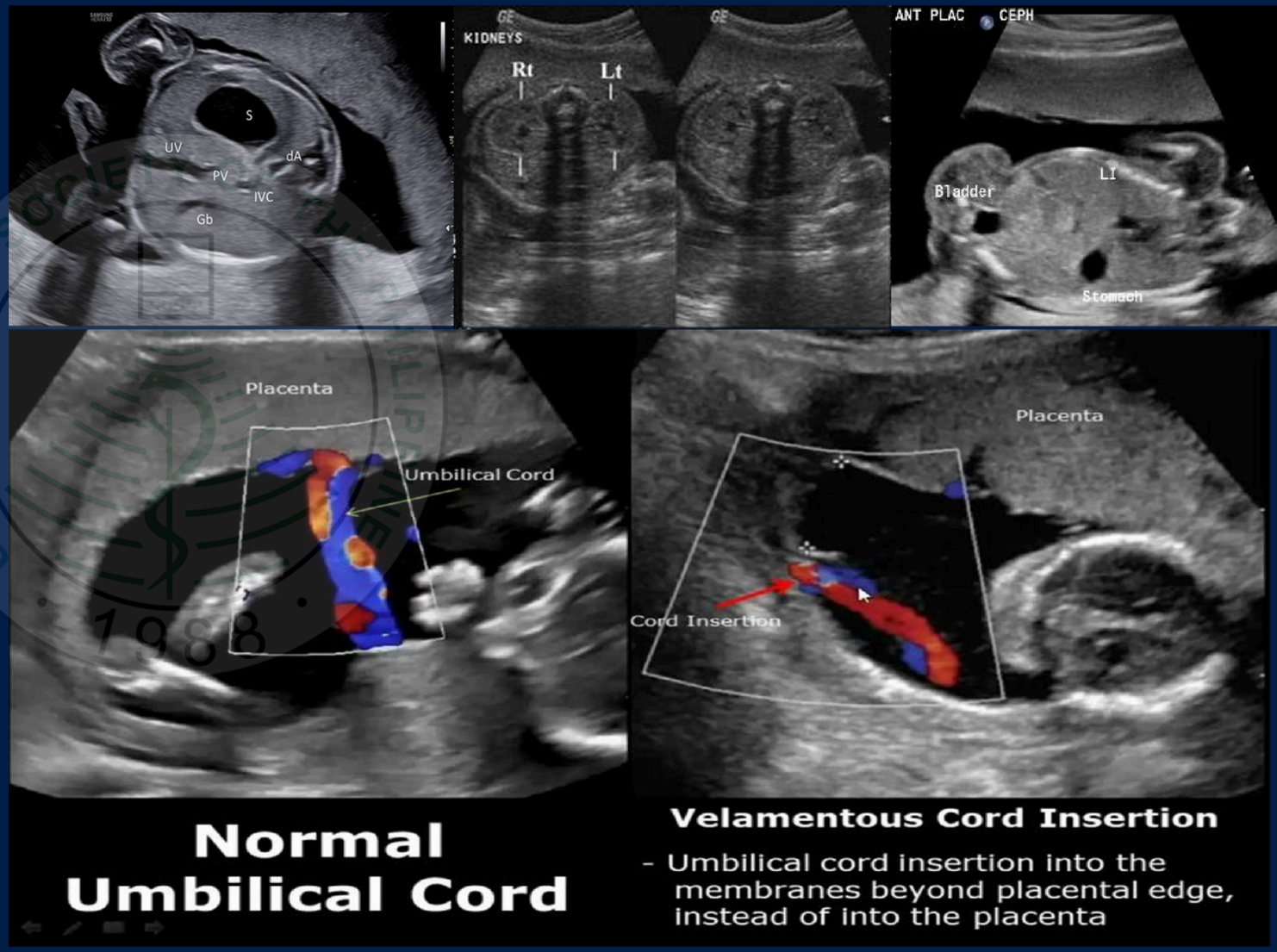
Fetal Anatomic Survey

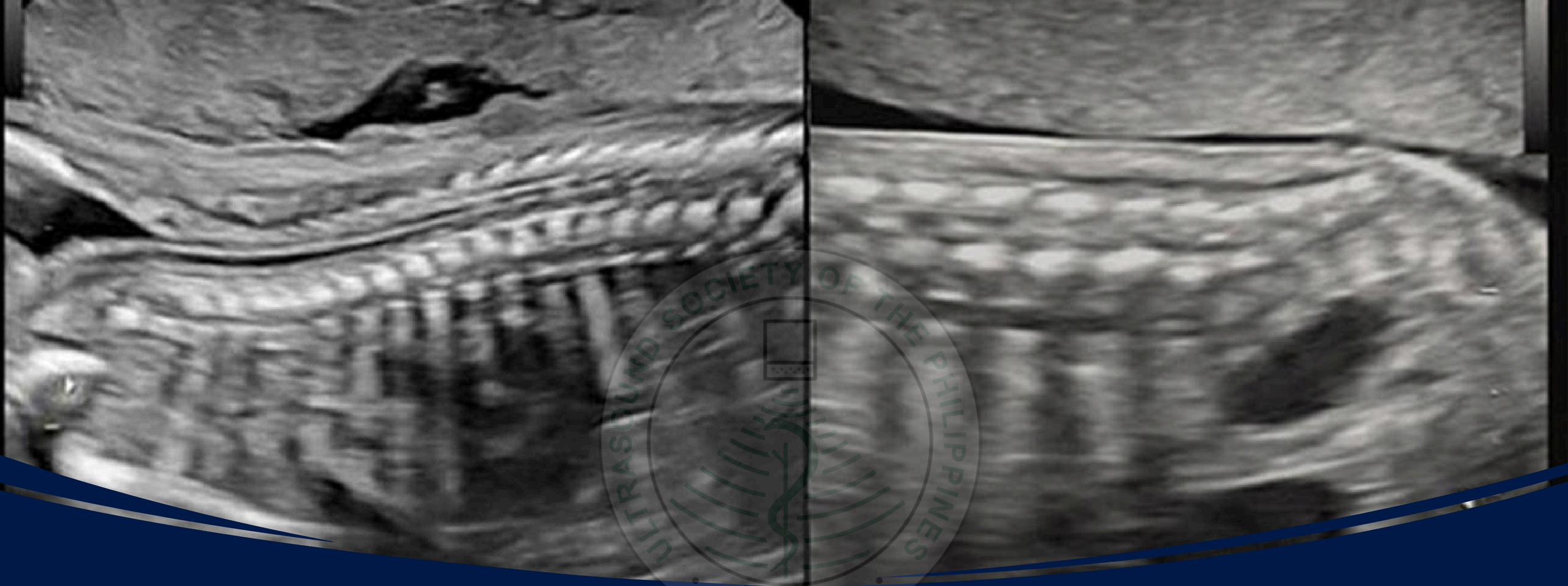
- **Chest**
  - Four-chamber view
  - Outflow tracts



Fetal Anatomic Survey

- **Abdomen**
  - Stomach (presence, size, and situs)
  - Kidneys, bladder
  - Umbilical cord insertion site into fetal abdomen
  - Umbilical cord vessel number



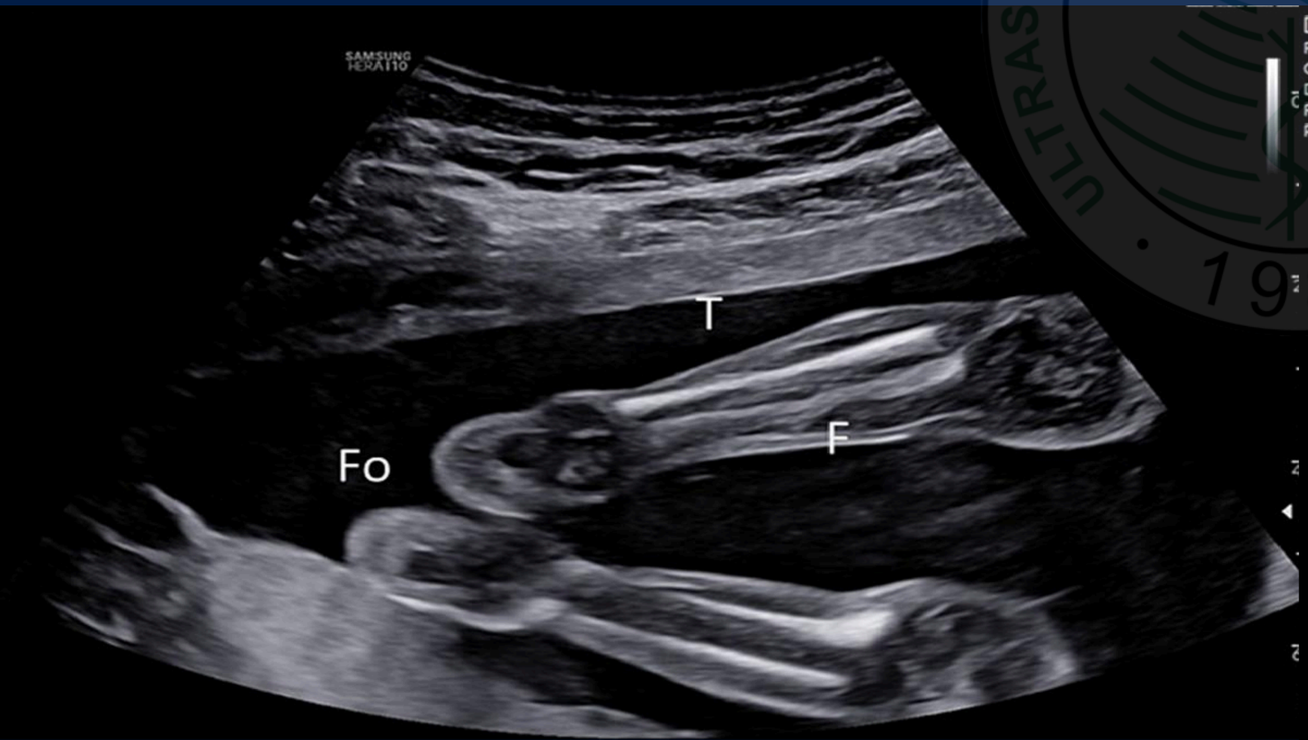


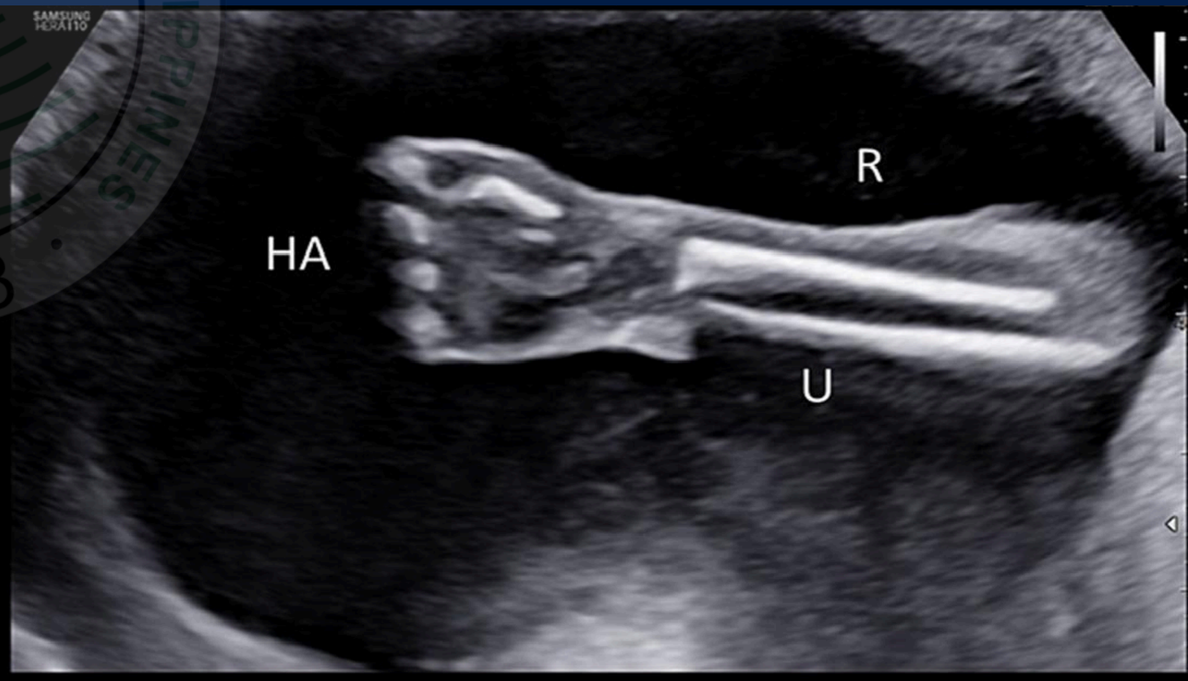
Fetal Anatomic Survey

- **Spine**
  - Cervical, thoracic, lumbar, and sacral

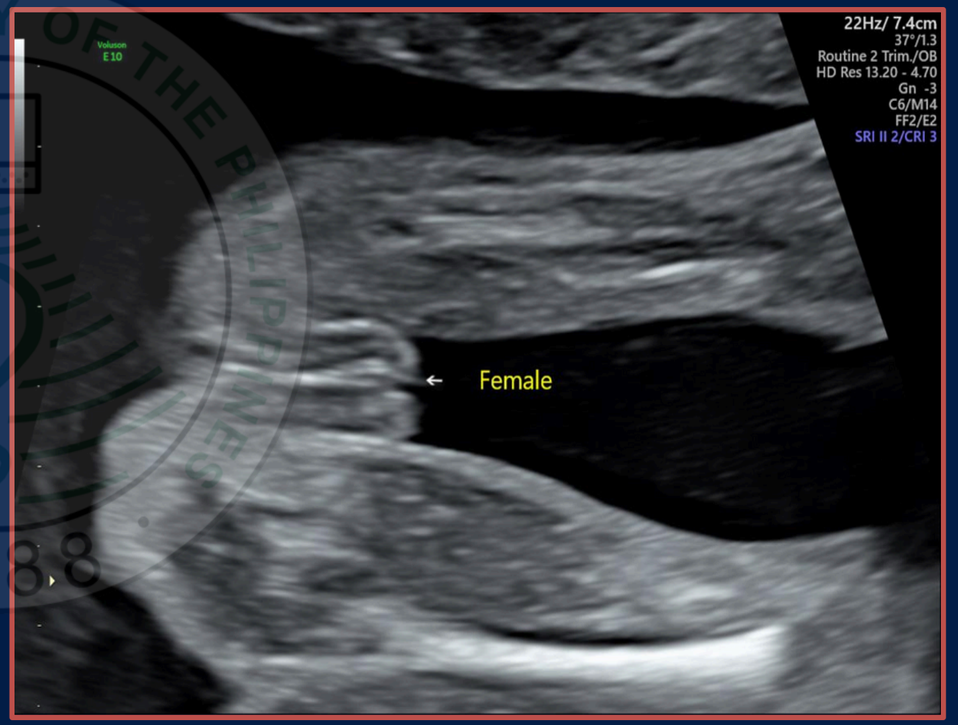
Fetal Anatomic Survey

- **Extremities**
  - Legsandarms





Fetal Anatomic Survey



INTRAUTERINE FETAL DEMISE (IUFD)

Intrauterine Fetal Demise (IUFD)

***Death of a fetus in utero at or greater than* 20 weeks AOG or birth weight ≥350 grams**

Intrauterine Fetal Demise (IUFD)

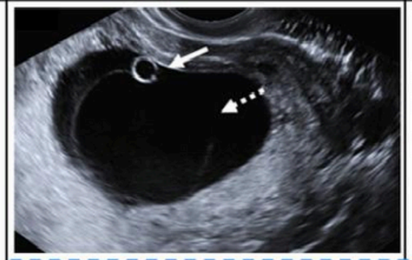
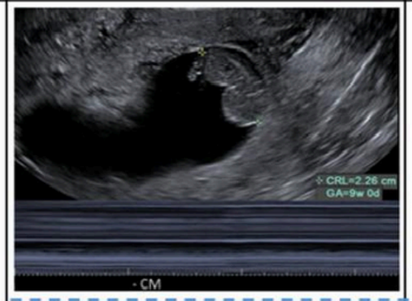
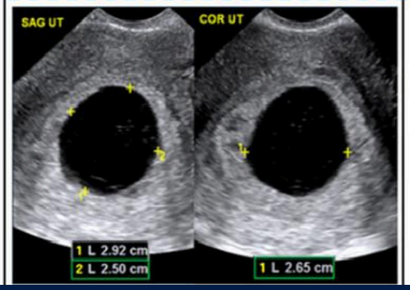
- 5th leading cause of death worldwide
- unexplained stillbirth: 76% of cases
  - Asia and Africa higher stillbirths

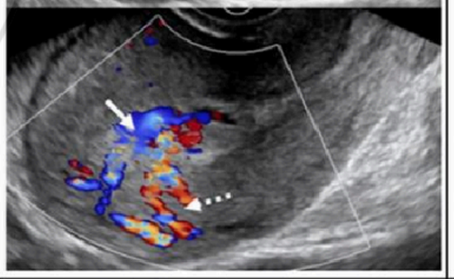
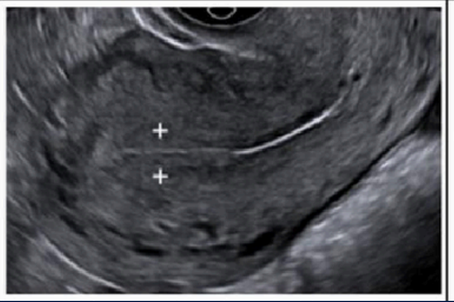
Intrauterine Fetal Demise (IUFD)

Causes

- intrapartum complications
- hypertension, diabetes
- infection
- congenital and genetic abnormalities
- placental dysfunction
- pregnancy >40 weeks

LEXICON FOR EARLY PREGNANCY LOSS

Term(s) *Alternate Term(s)*	Image Example(s)	Image Key	Definitions/ Applications
Concerning for EPL *Concerning for miscarriage* *Concerning for spontaneous abortion (SAB)* *IUP of unknown prognosis*	 	Solid arrow = YS Dotted arrow = amnion Calipers = YS (YS = 8 mm)	Normally located GS with findings that suggest a pregnancy may not progress
Diagnostic of EPL *Diagnostic of miscarriage* *Diagnostic of SAB* <u>Special scenarios:</u> *Embryonic/fetal demise* *Anembryonic pregnancy*	 	Calipers = embryo (CRL = 23 mm; No cardiac motion) Calipers = MSD (MSD = 27 mm)	Normally located GS with findings definitive for a pregnancy that will not progress

Term(s) *Alternate Term(s)*	Image Example(s)	Image Key	Definitions/ Applications
EPL in progress *Miscarriage in progress* *SAB in progress*		Arrow = embryo in LUS/upper cervix (No CM)	GS located in cavity of lower uterine segment or endocervical canal in process of expulsion
Incomplete EPL *Retained (or residual) products of conception (RPOC)* *Incomplete Miscarriage/SAB* Description of findings in lieu of term	 	Calipers = endometrial thickness (ET = 14 mm) Solid arrow = RPOC Dotted arrow = EMV	Residual intracavitary tissue or thickened endometrium following EPL, typically with internal vascularity; ± persistent GS
Completed EPL *Completed miscarriage* *Completed SAB*		Calipers = endometrial thickness (ET = 7 mm)	No intracavitary tissue or persistent GS following EPL

Ultrasound Diagnosis:
EARLY PREGNANCY LOSS

FIRST TRIMESTER

EMBRYO WITH NO CARDIAC ACTIVITY

- CRL **≥7mm** without heartbeat

GESTATIONAL SAC CONTAINING NO EMBRYO WITH HEARTBEAT

-MSD **≥25 mm**without embryo

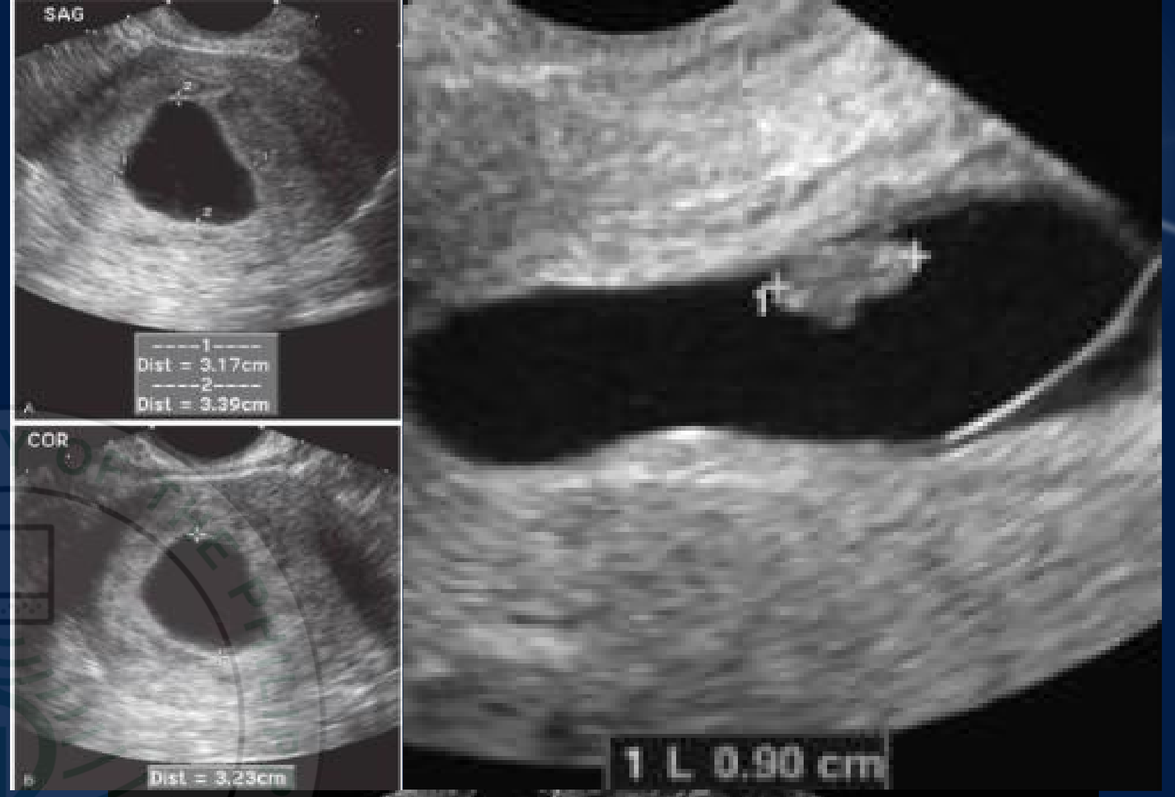
Ultrasound Diagnosis: EARLYPREGNANCY LOSS

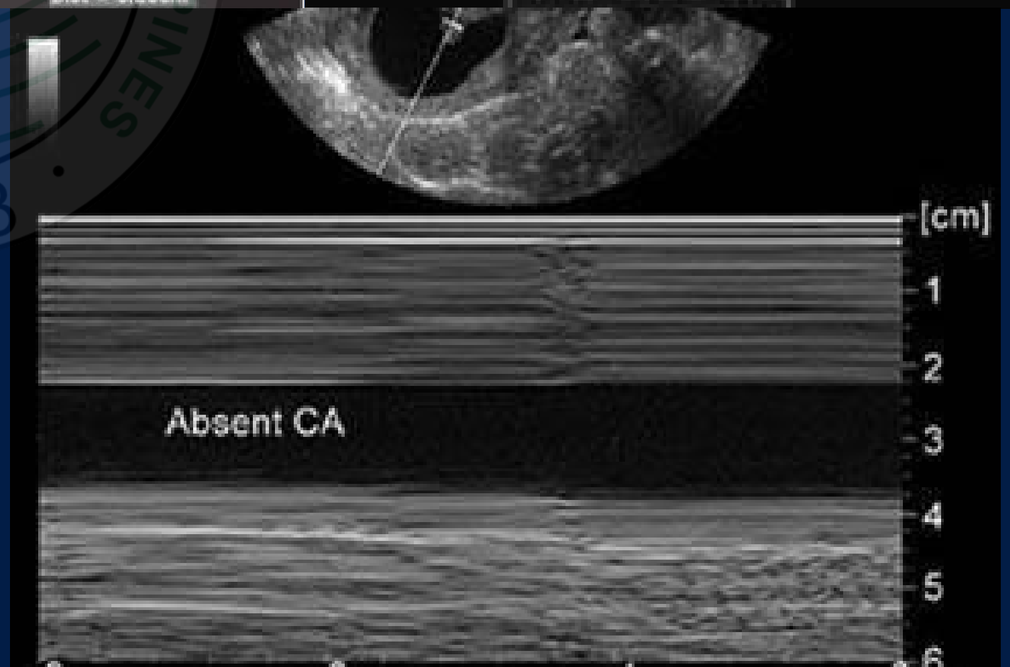
FIRST TRIMESTER

TIME BASED FINDINGS

- No embryo with heartbeat on a follow-up scan at least 2 weeksafter initial scan that showed GS without a yolk sac

- No embryo with heartbeat on a follow-up scan ~~at least 11 days~~after an initial scan that showed a GS with YS





Intrauterine Fetal Demise (IUFD)

Second and Third Trimesters

No cardiac or movement

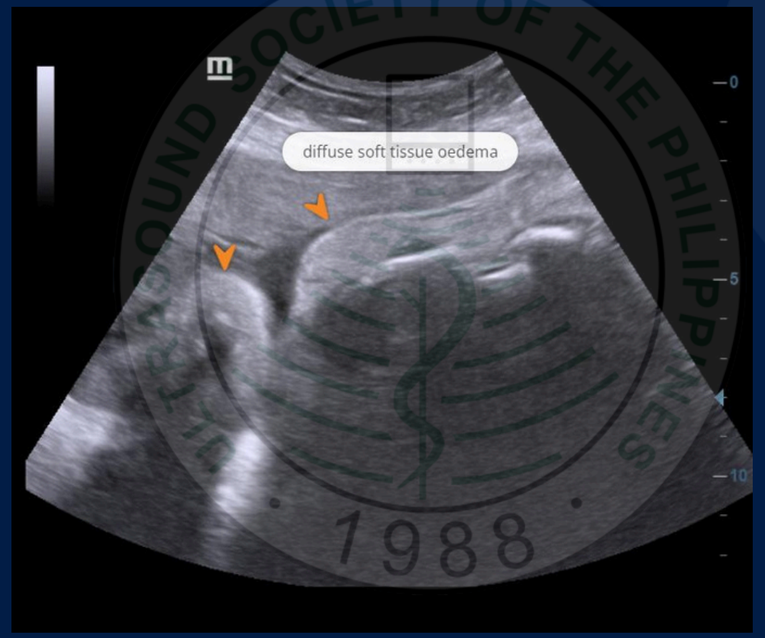
Maceration
12-24 hours

Robert's sign
1-2 days

Intrauterine Fetal Demise (IUFD)

Second and Third Trimesters

Spalding sign
≥ 1 week



Soft tissue edema
at least 5 mm

Echogenic amniotic fluid

Intrauterine Fetal Demise (IUFD)

Diagnostic Protocol

- Use M-mode or Color Doppler to confirm absent cardiac activity
- Repeat scan after 7-10 days if uncertain
- Correlate with clinical signs
  - Nofetal movement
  - Fundal height decrease

CERVICAL INCOMPETENCE

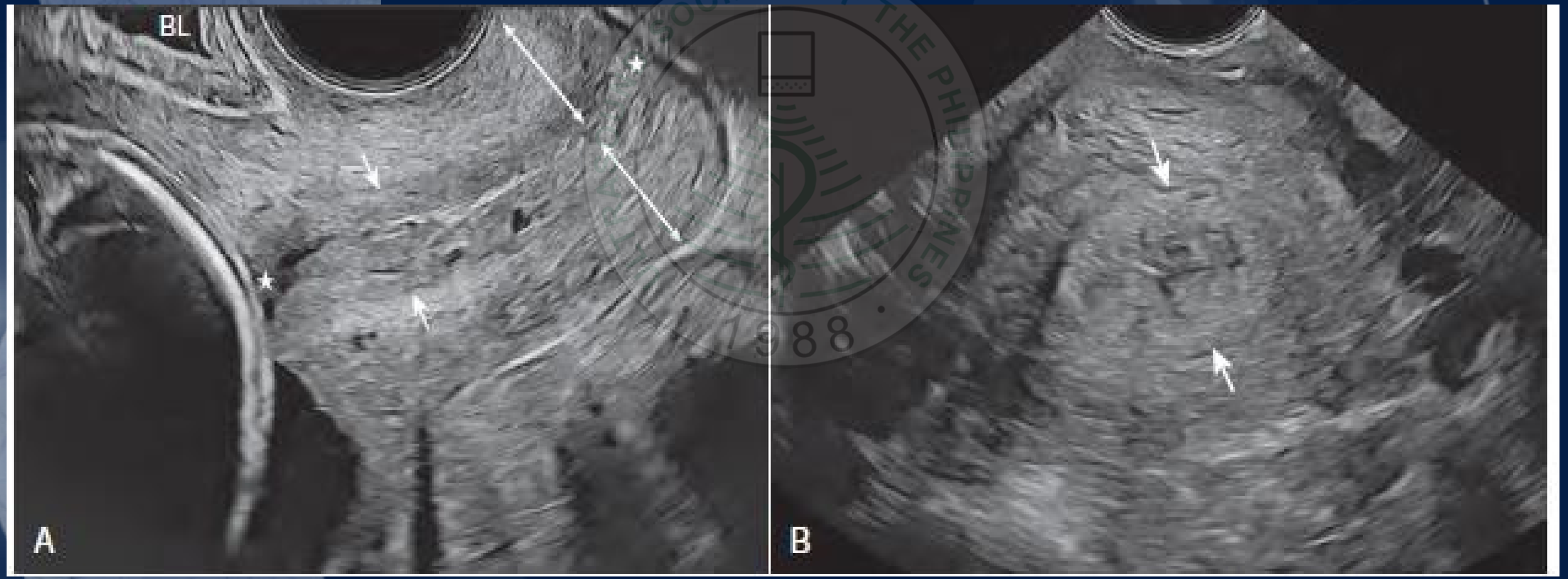
Cervical Incompetence

General Data	● 21F
Presenting Complaint	● Occasional hypogastric pain ● No vaginal bleeding
OBGyne History	● G1P0 ● 21 weeks AOG

Cervical Incompetence

CERVICAL LENGTH (CL)

- Measured from internal to the external os along the endocervical canal
  - the most reproducible and reliable measurement



CERVICAL LENGTH (CL)

14-30 weeks age of gestation	25 to 50 mm
18-22 weeks	Best time for screening
After 30 weeks	15-24 mm (physiologic)

Cervical Incompetence

Epidemiology	● 1-1.5% of all pregnancies
Clinical Presentation	●Second trimester ●spontaneous pregnancy failure ●Rupture of membraneswith resultant oligohydramnios

Cervical Incompetence

Funneling

- Dilated/open internal os
- Short cervical length
- Higher risk of preterm birth

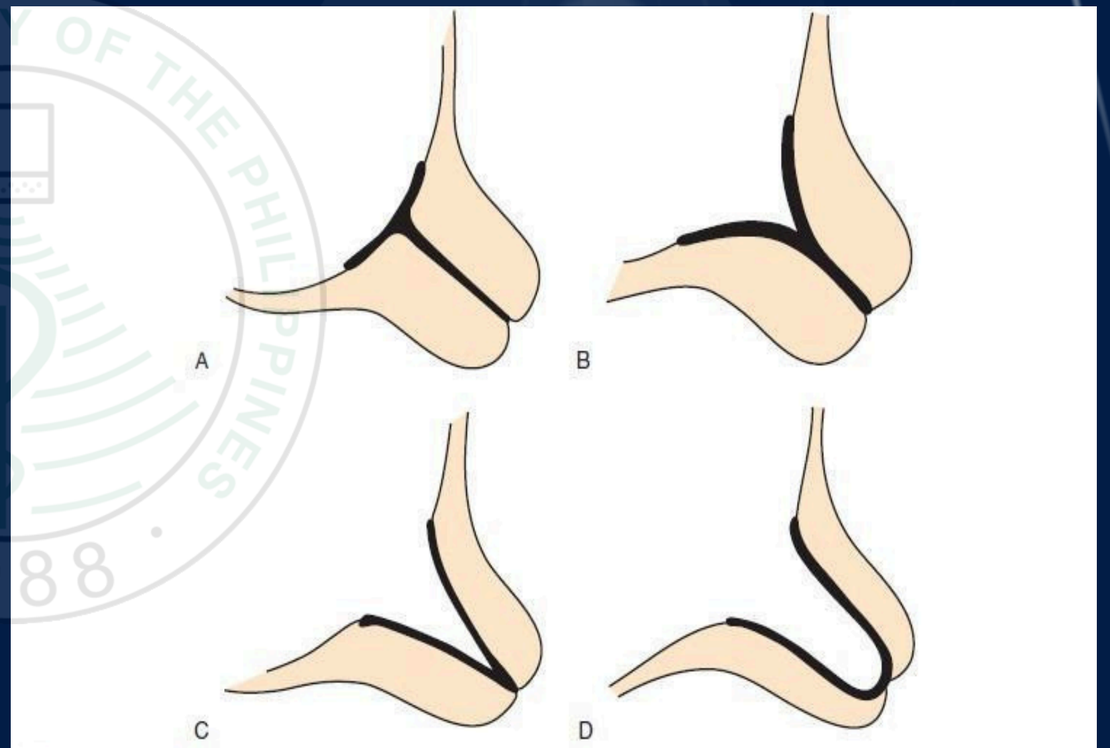


FIG. 44.11 Schematic of Normal Cervix and Cervical Funnel Shapes. (A) The normal closed internal os and the cervical canal appear T shaped. **(B)-(D)** Different stages of funneling resemble the letters Y, V, and U.

Cervical Incompetence

Funneling

- Recorded in shapes:
  - T-shaped –normal
  - Y or V-shaped
  - U-shaped –morelikelyto be associated with PTB

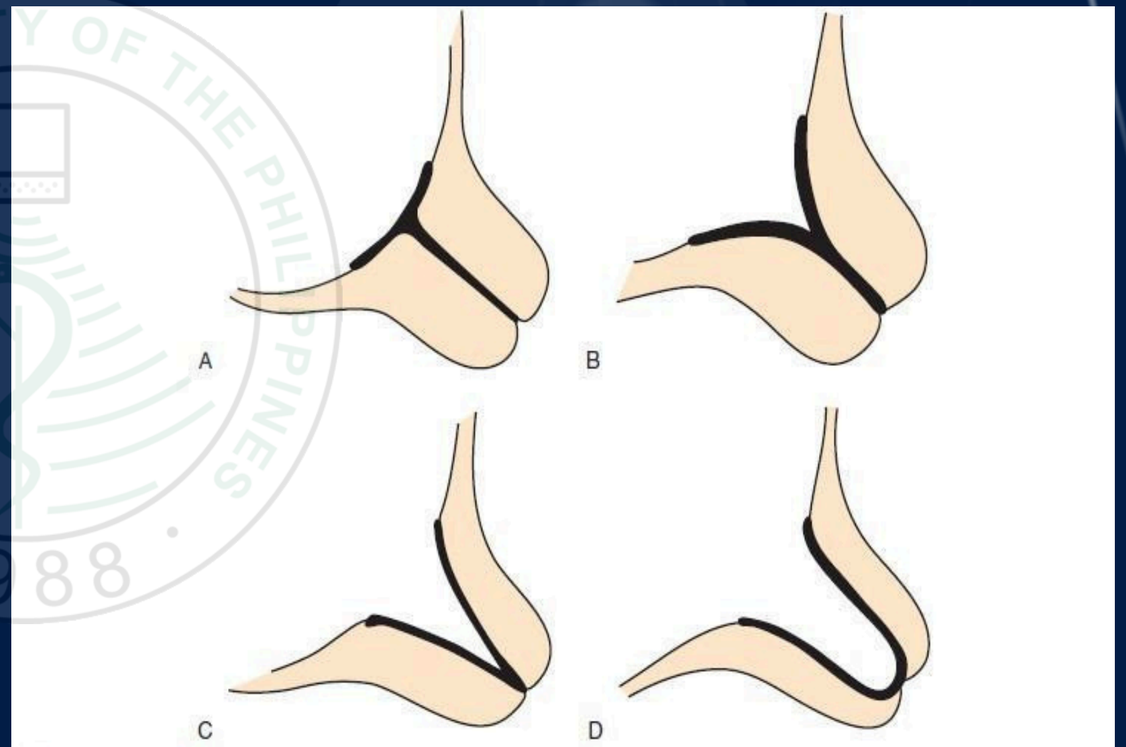


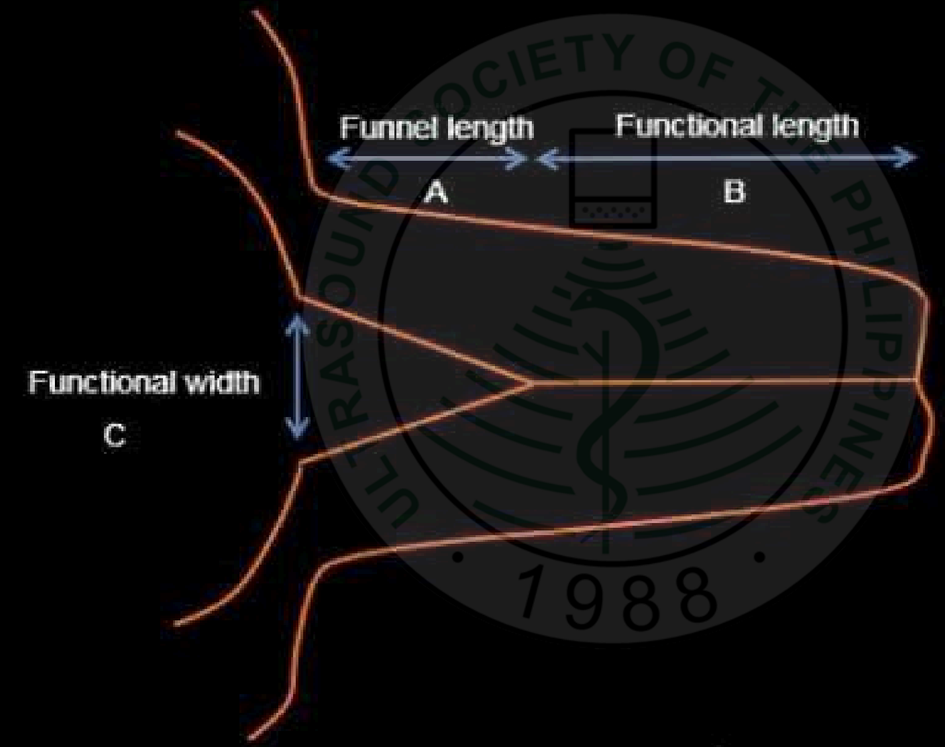
FIG. 44.11 Schematic of Normal Cervix and Cervical Funnel Shapes. (A) The normal closed internal os and the cervical canal appear T shaped. **(B)-(D)** Different stages of funneling resemble the letters Y, V, and U.

Short Cervix

- Cervical weakness (insufficiency)
- Inflammatory or infectious process
- Premature contractions

Cervical Funneling Measurement

RGP !



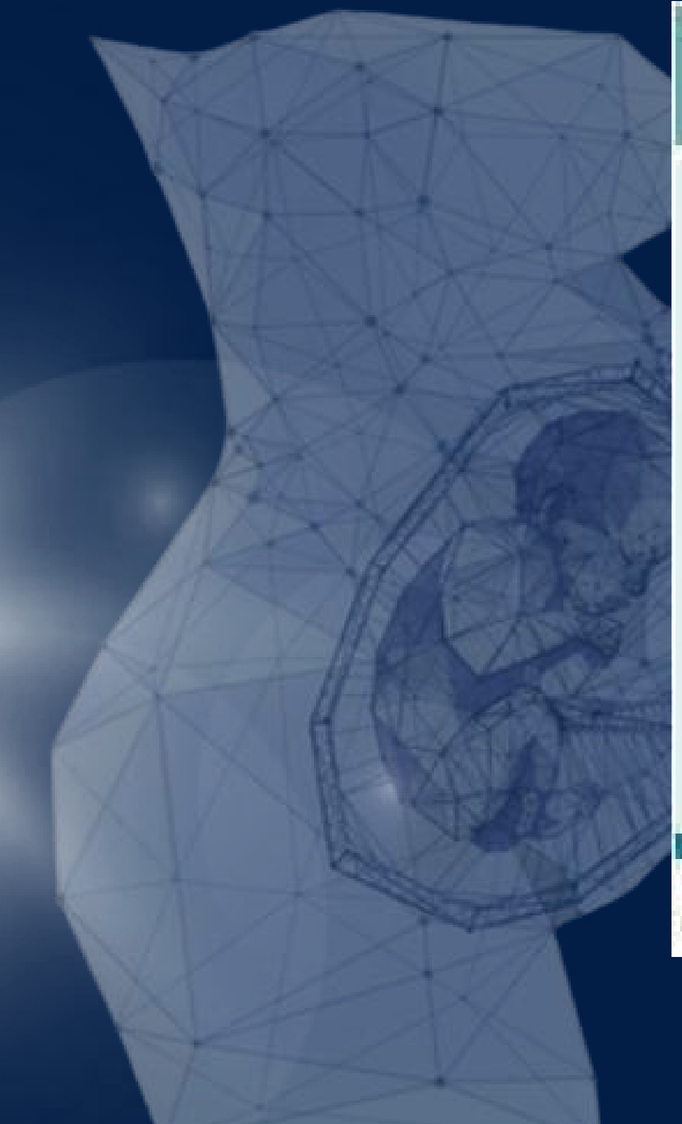
$$\% \text{ funneling} = \frac{A}{A + B}$$

Method for determining percentage funneling at internal cervical os.

Preterm Birth

- Delivery before 37 weeks of gestation
- The leading cause of neonatal morbidity and mortality not attributable tocongenital anomalies or aneuploidy

Preterm Birth



Risk Factors for Preterm Birth

- Short cervical length
- Prior preterm birth
- Uterocervical anomalies (such as müllerian duct abnormalities)
- Prior cervical surgery such as LEEP
- Multiple gestations
- Polyhydramnios

LEEP, Loop electrosurgical excision procedure.

Preterm Birth

High-risk women

- Those with history of cervical insufficiency, prior second trimester losses, early PTBs, or large cone biopsies).
- Recommended to have TVS of the cervix every 2 weeks, at least between 14 and 24 weeks.

Scanning Technique

- Transvaginal > transabdominal ultrasound
- Performed with an empty urinary bladder

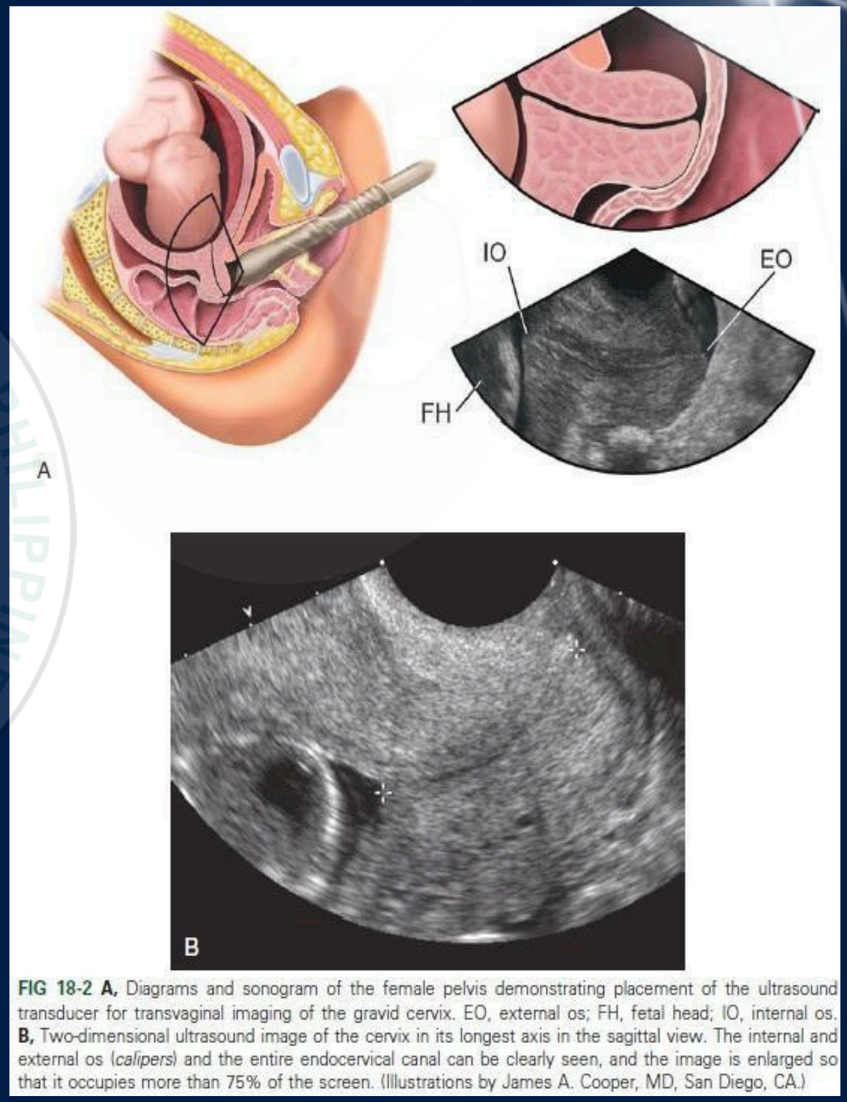
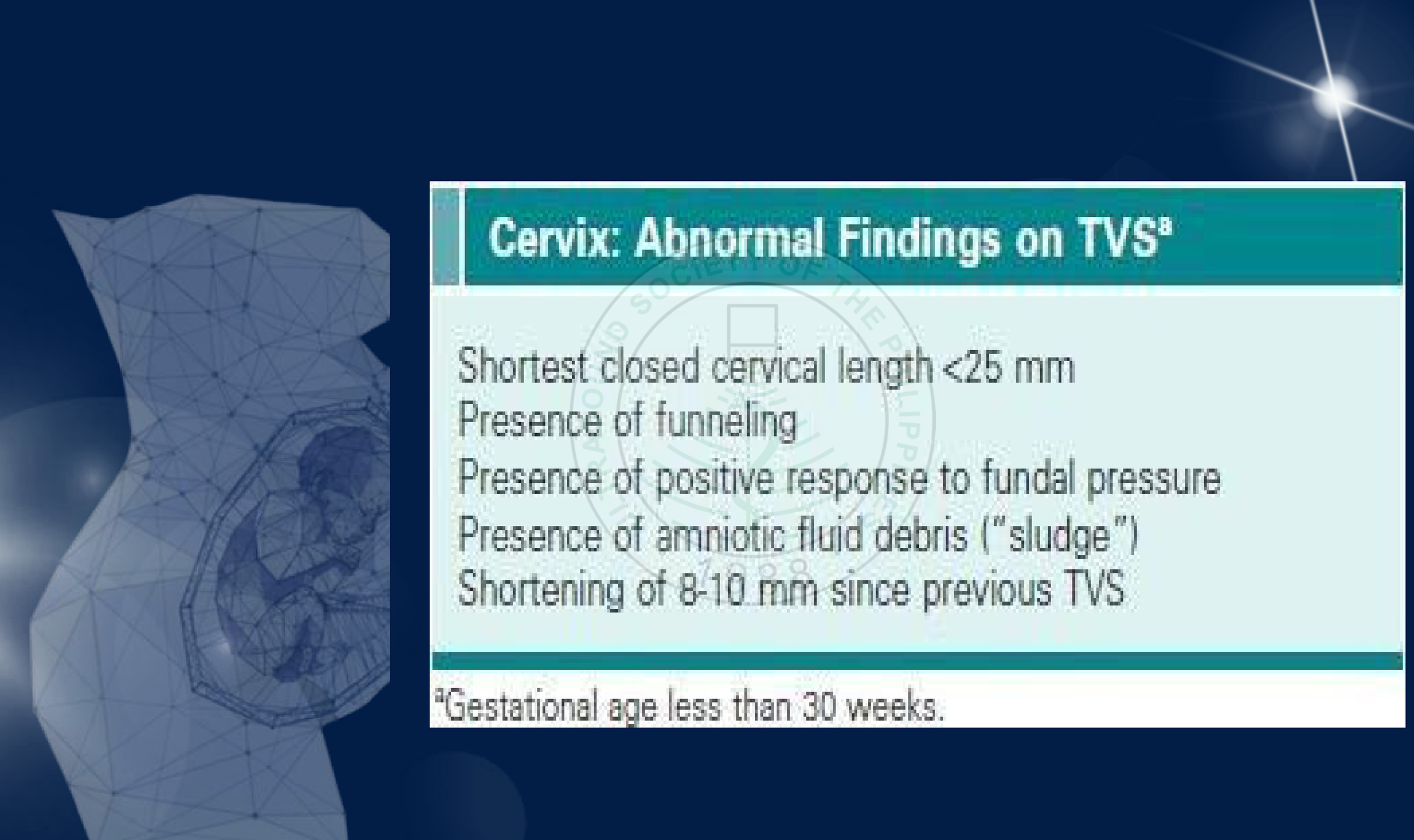


FIG 18-2 A, Diagrams and sonogram of the female pelvis demonstrating placement of the ultrasound transducer for transvaginal imaging of the gravid cervix. EO, external os; FH, fetal head; IO, internal os. **B,** Two-dimensional ultrasound image of the cervix in its longest axis in the sagittal view. The internal and external os (*calipers*) and the entire endocervical canal can be clearly seen, and the image is enlarged so that it occupies more than 75% of the screen. (Illustrations by James A. Cooper, MD, San Diego, CA.)



Cervix: Abnormal Findings on TVS[a]

Shortest closed cervical length <25 mm
Presence of funneling
Presence of positive response to fundal pressure
Presence of amniotic fluid debris ("sludge")
Shortening of 8-10 mm since previous TVS

[a]Gestational age less than 30 weeks.

Scanning Technique

- Limitations & Pitfalls
  - Fullbladder
  - Excessive pressure
  - Contraction
  - Underdevelopedlower uterine segment

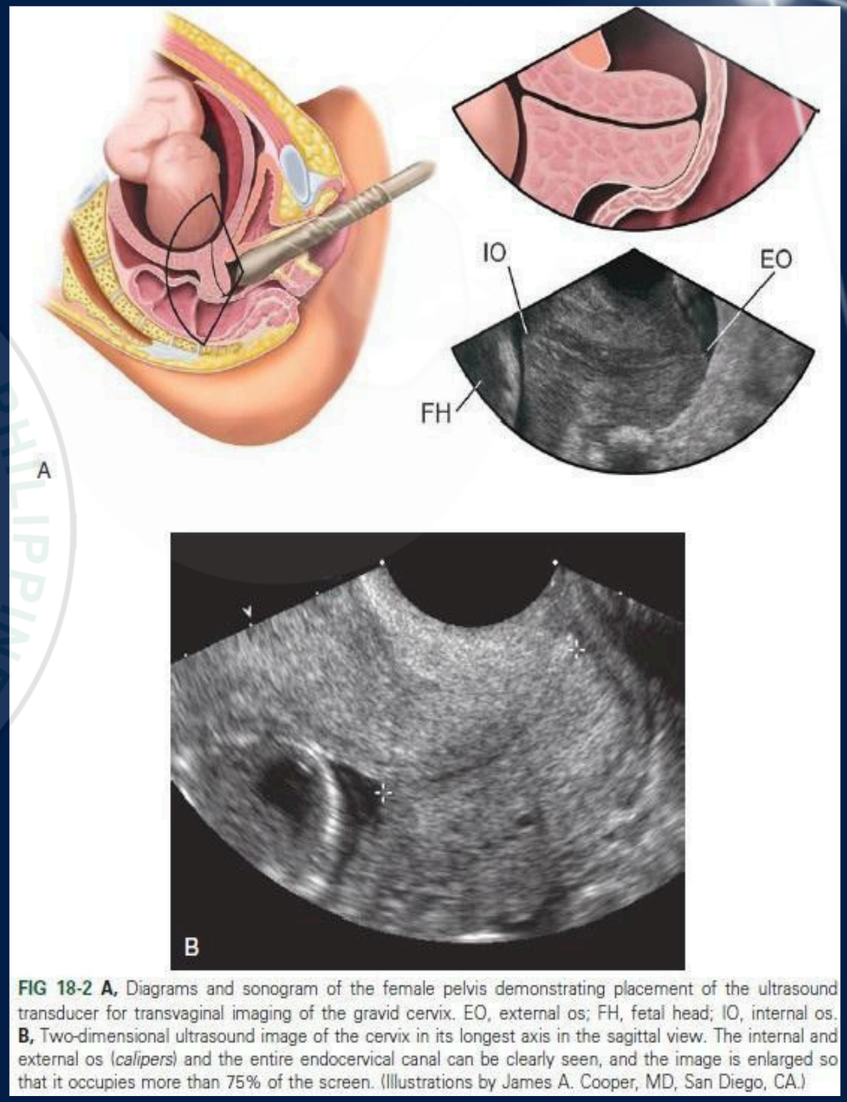


FIG 18-2 A, Diagrams and sonogram of the female pelvis demonstrating placement of the ultrasound transducer for transvaginal imaging of the gravid cervix. EO, external os; FH, fetal head; IO, internal os. **B,** Two-dimensional ultrasound image of the cervix in its longest axis in the sagittal view. The internal and external os (*calipers*) and the entire endocervical canal can be clearly seen, and the image is enlarged so that it occupies more than 75% of the screen. (Illustrations by James A. Cooper, MD, San Diego, CA.)

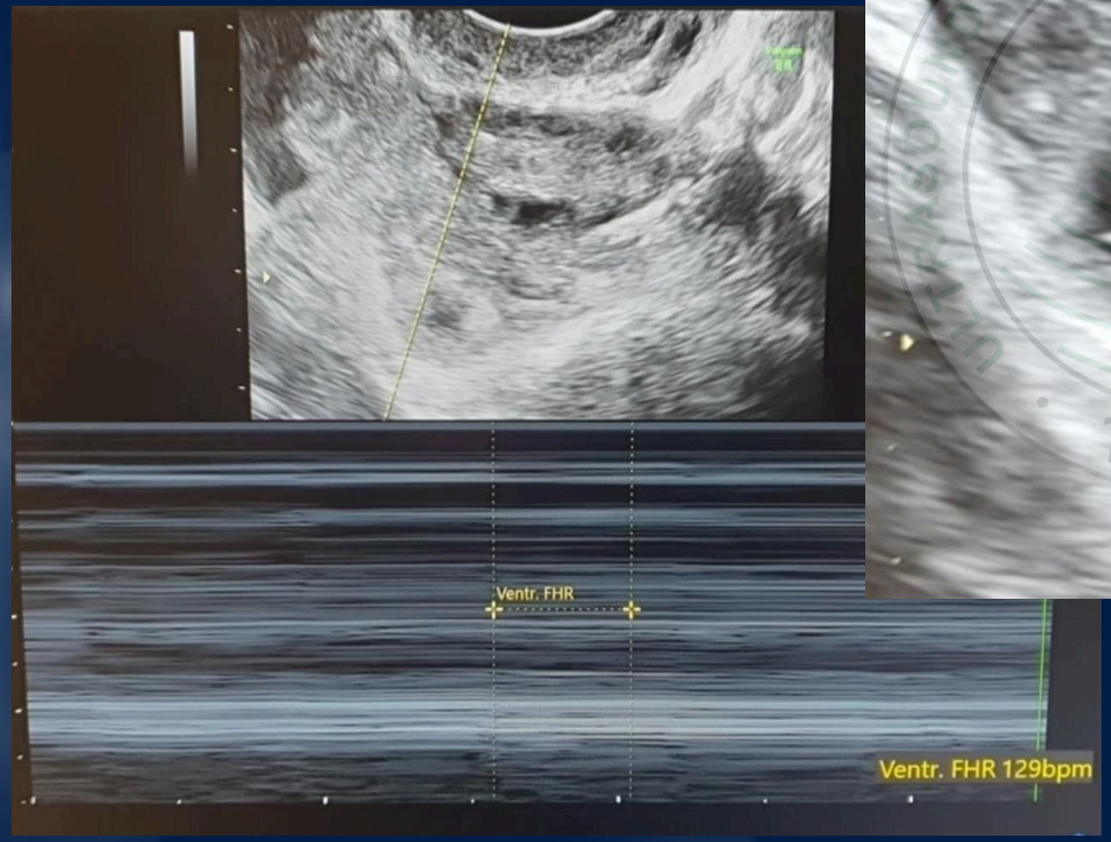
ECTOPIC PREGNANCY

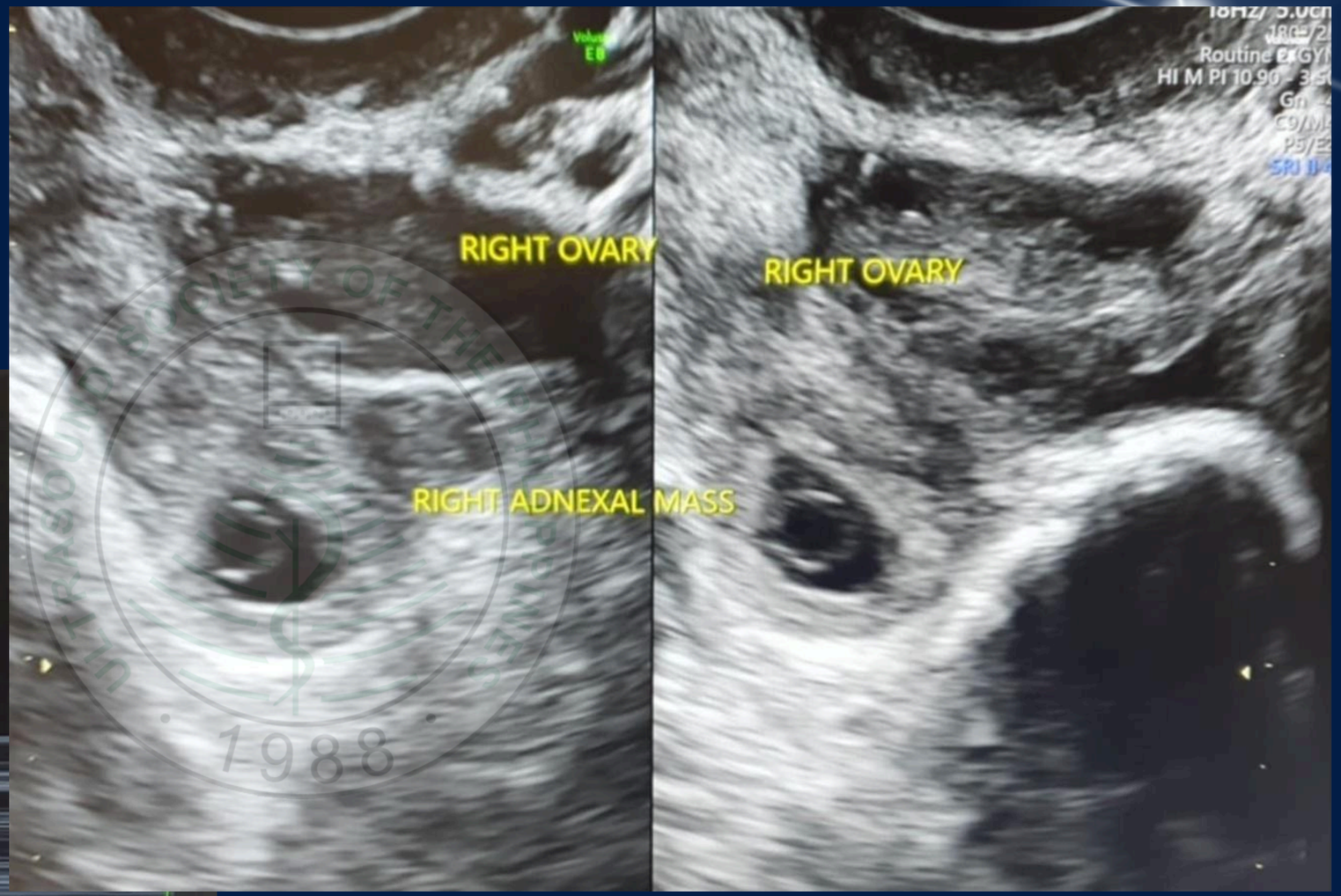
Ectopic Pregnancy

General Data	● 35F
Presenting Complaint	● Amenorrhea ● Vaginal spotting
bHCG	● 3,100 mIU/ml

TVS Findings

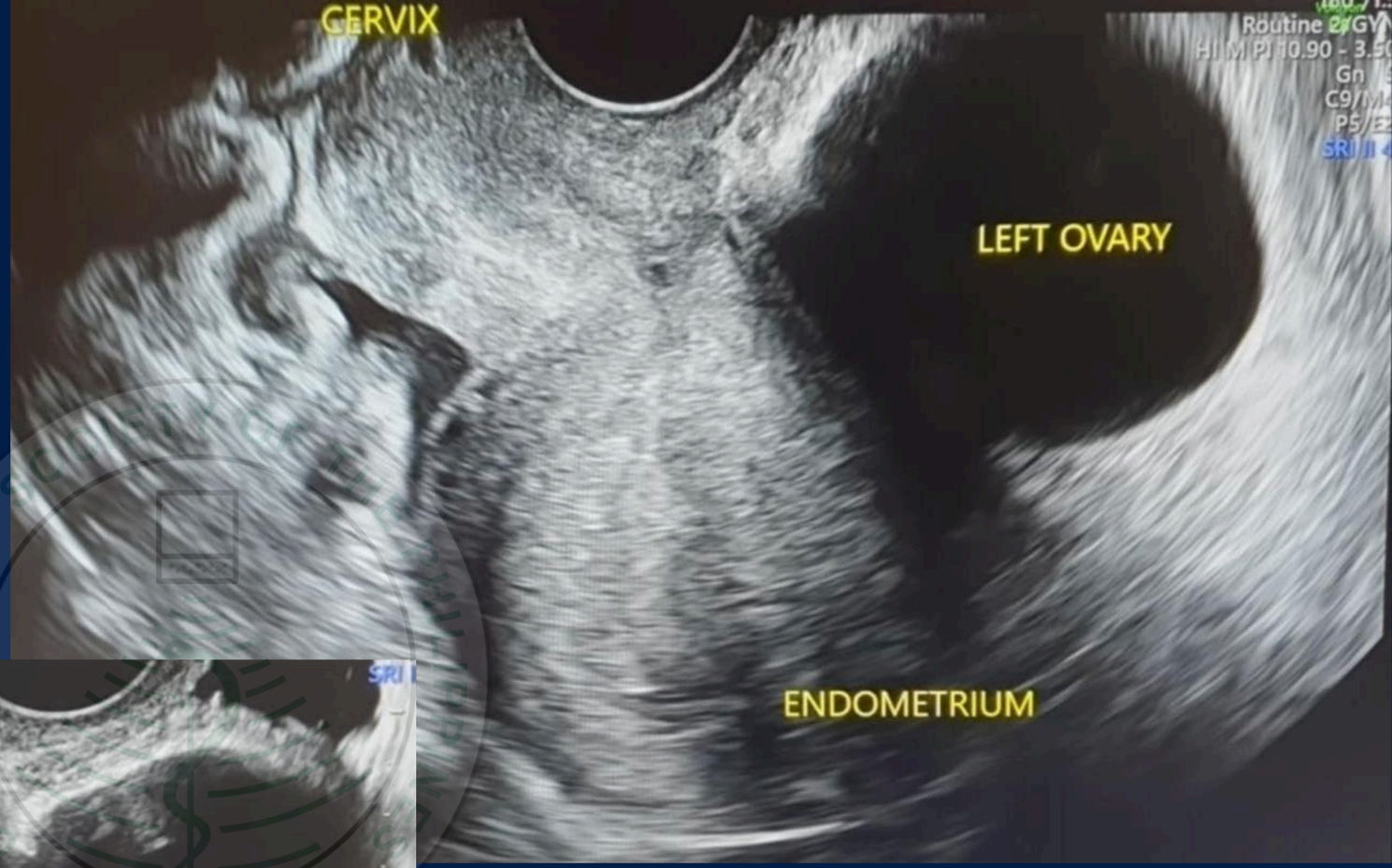
Rightadnexalmasswithgestational sac consistent with extra-uterinegestation probably tubal and unruptured
FHT: 129 bpm

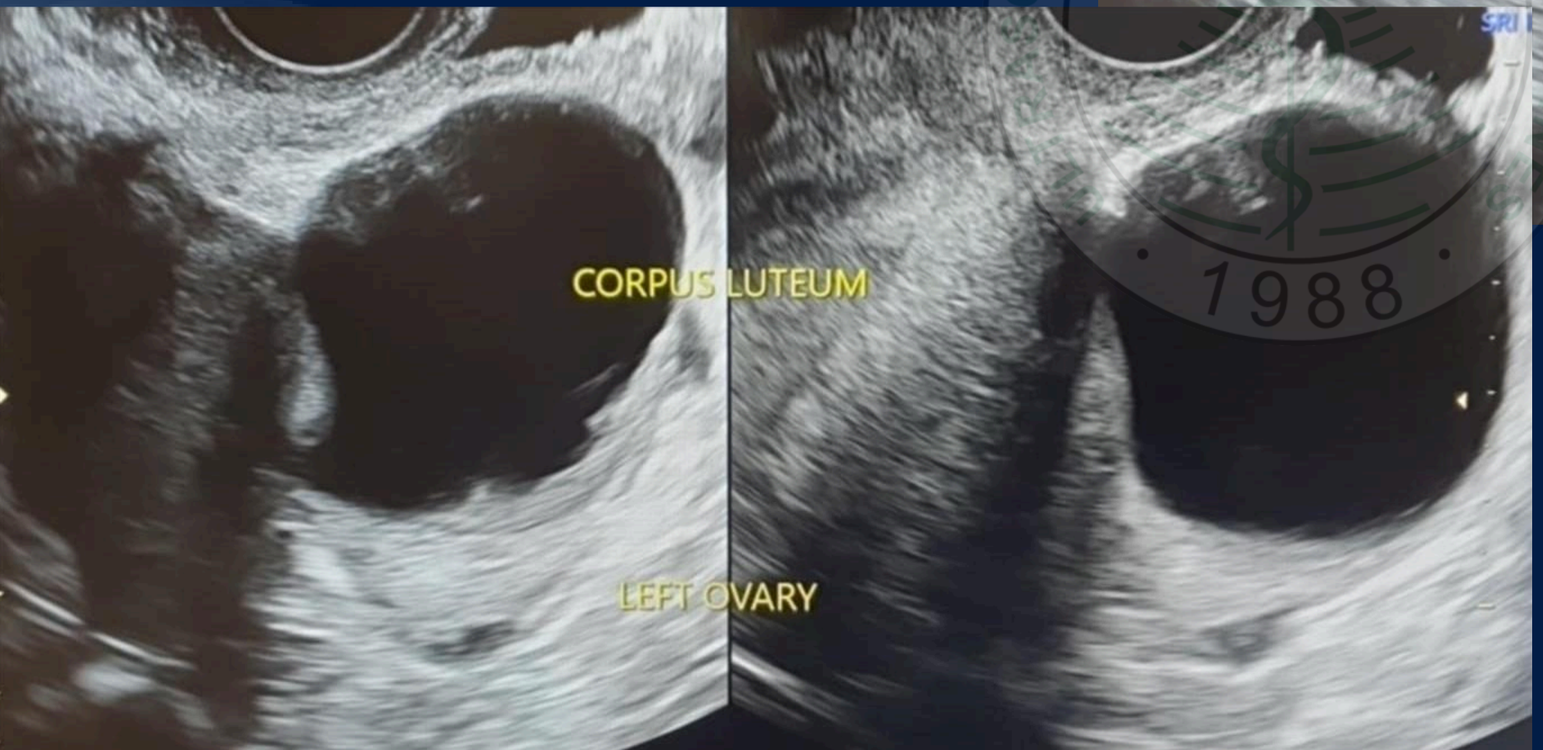




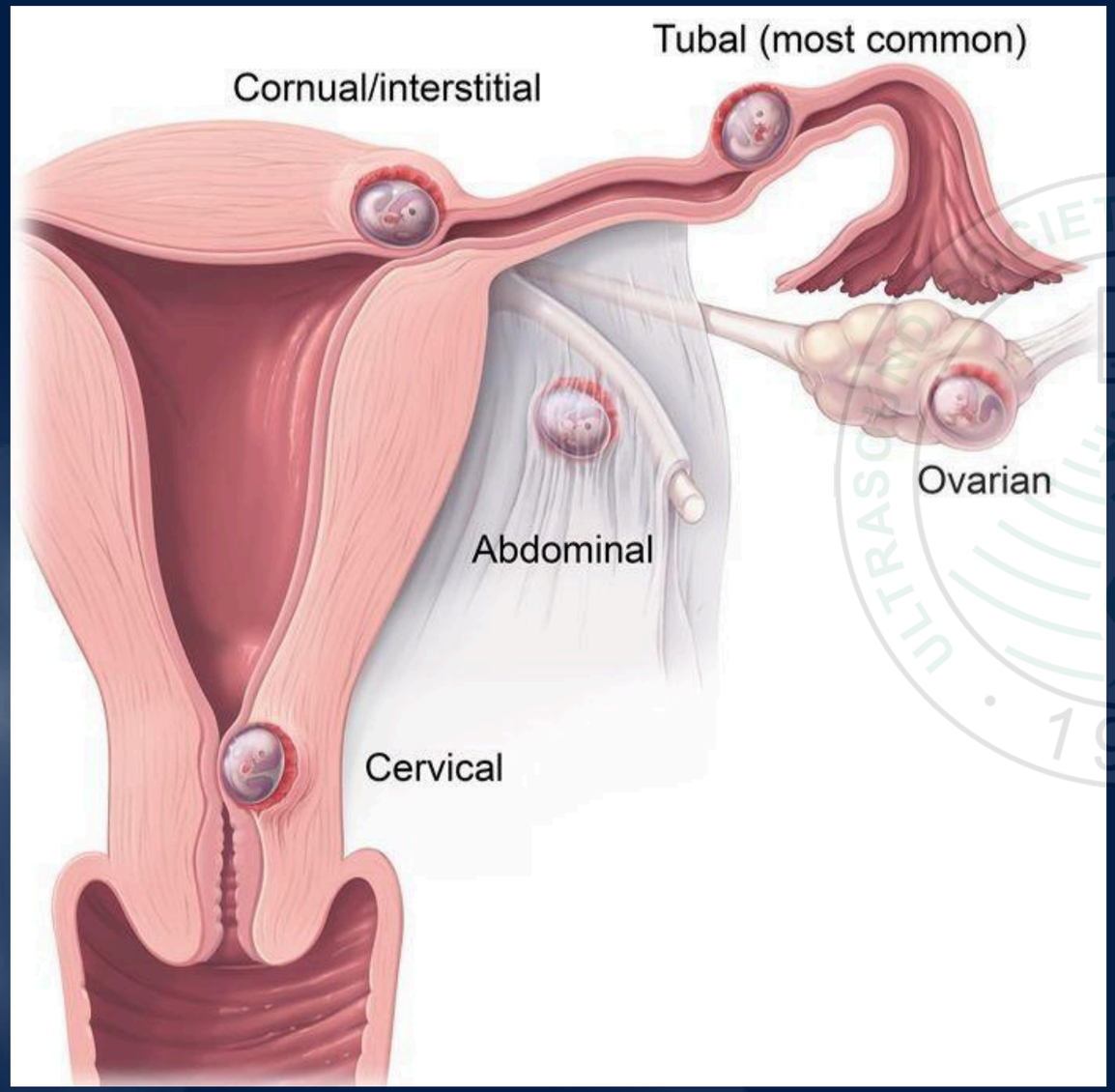
TVS Findings

- Normal-sized retroverted uterus with thick endometrium
- Normal right ovary
- Corpus luteal cyst in the left ovary
- Minimal cul-de-sac fluid



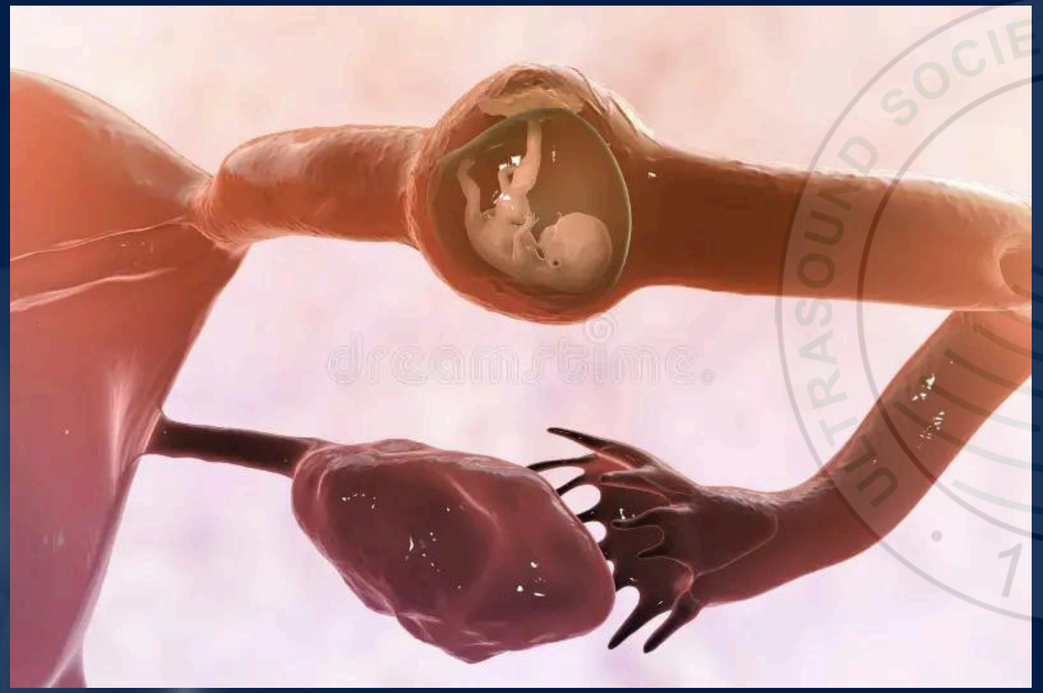


Ectopic Pregnancy



- Implantation of a fertilized ovum outside of the uterine cavity
- Leading cause of pregnancy-related deaths during the first trimester in the United States
- **Risk factors:**
  - IVF
  - prior ectopic pregnancy
  - tubal injury or surgery
  - pelvic inflammatory diseases
  - salpingitis

Sites of Implantation



Location

- A. Tubal ectopic (95-97%)
  -ampullary -most common
  -isthmus -second most common
  -interstitial (cornual) -rare (2-5%)
- B. Ovary 0.5-1%
- C. Cervix 0.1%
- D. Fimbria very rare
- E. Scar rare
- F. Abdominal rare 1.4%

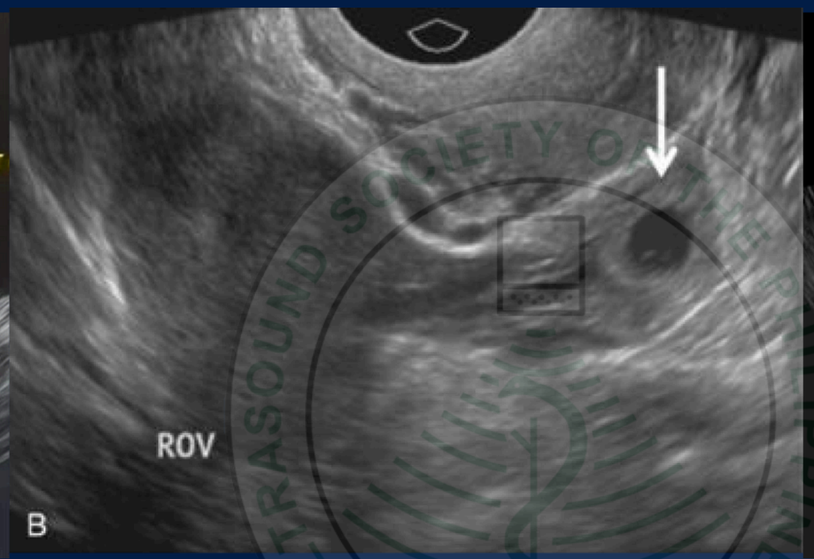
Clinical Features

- positive pregnancy test
- pain
- bleeding

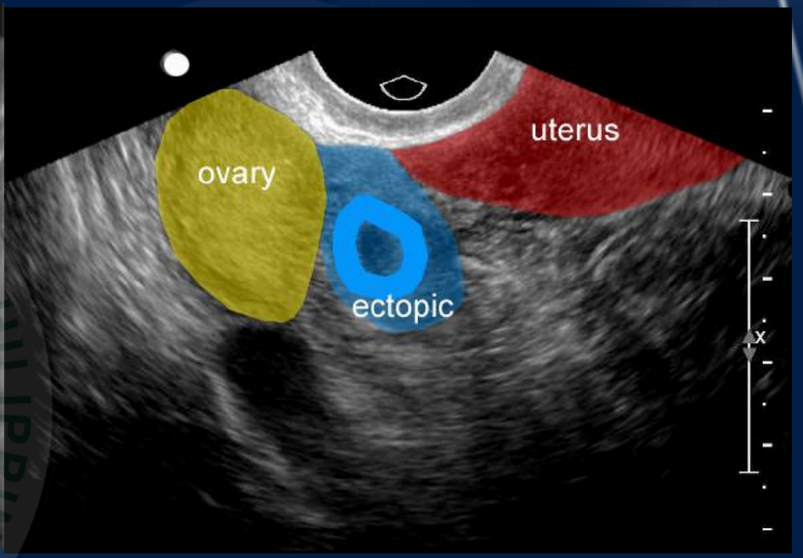
  Clinical triad
- adnexal mass

Ultrasound Findings

Empty uterine cavity

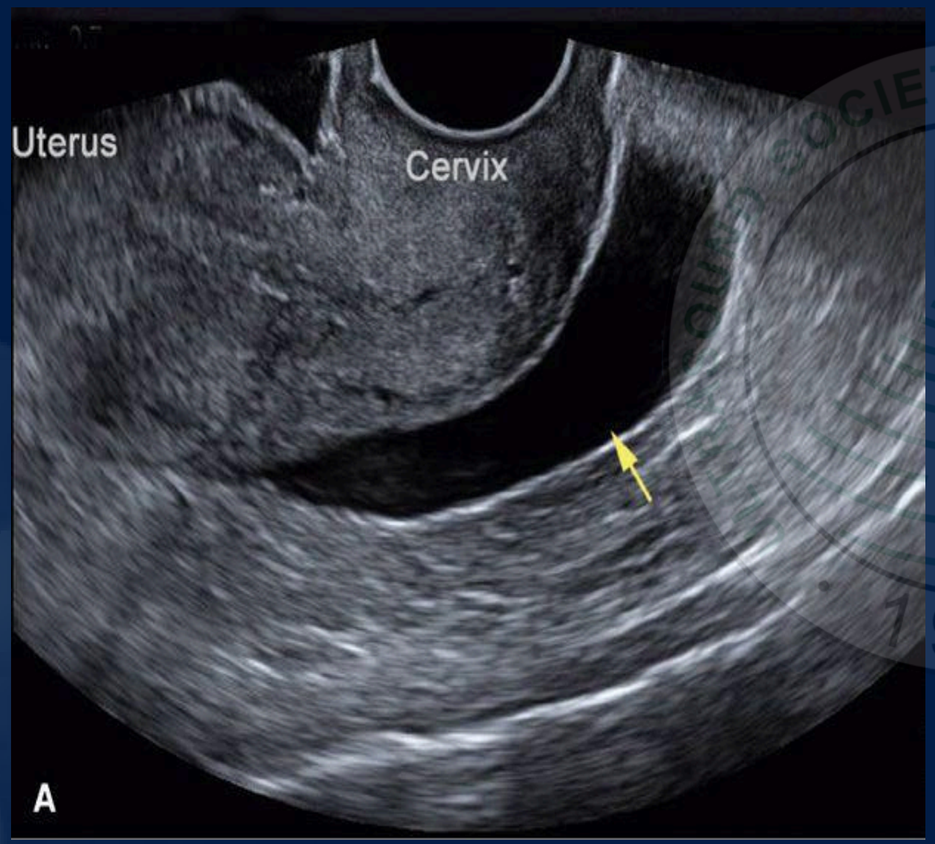


Extra-/adnexal mass

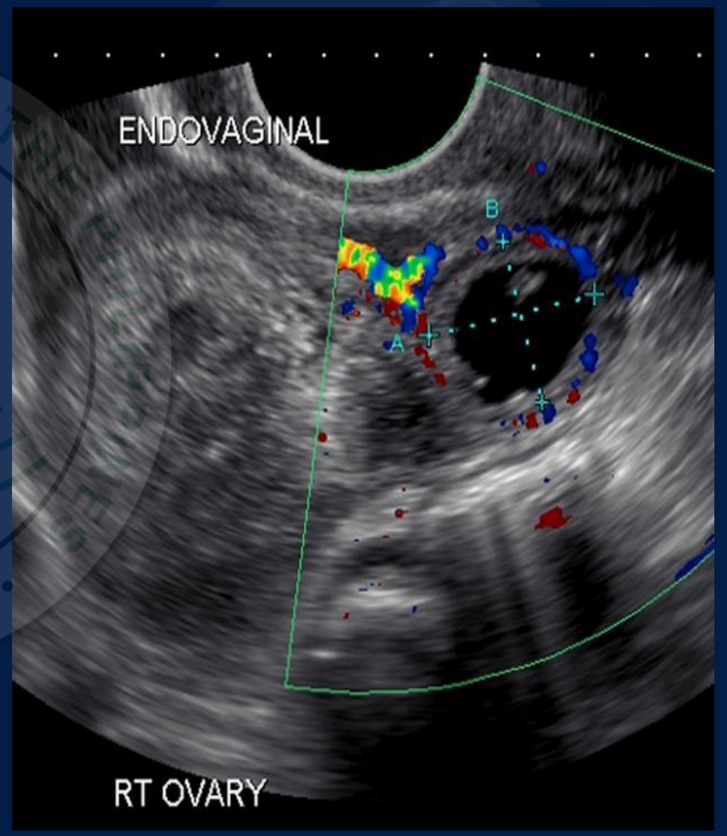


Tubal ring sign

Ultrasound Findings

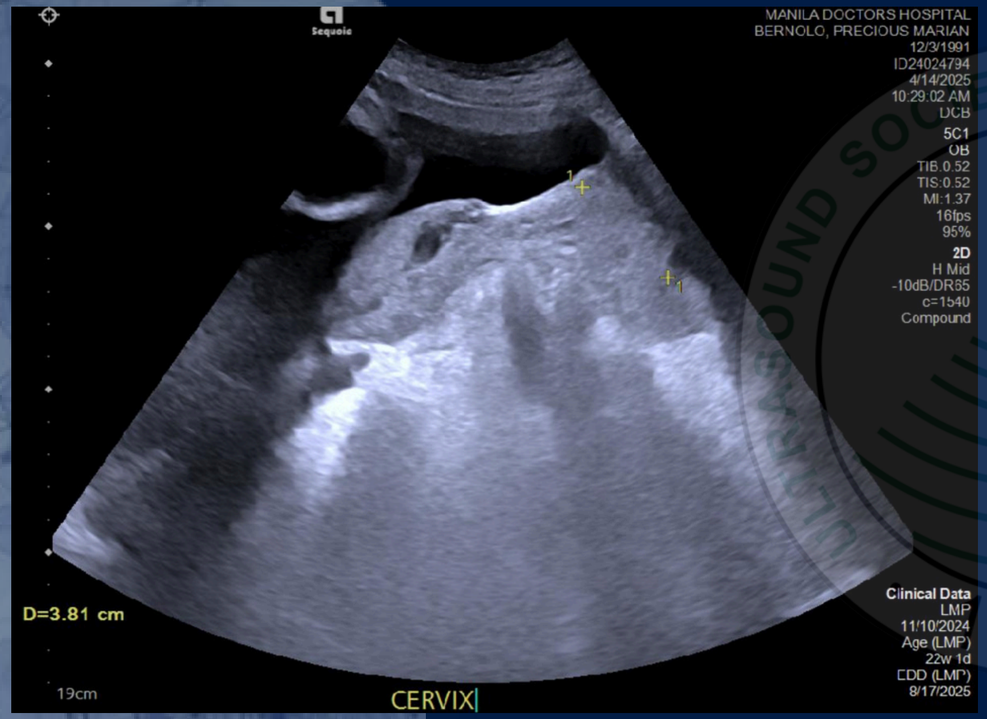


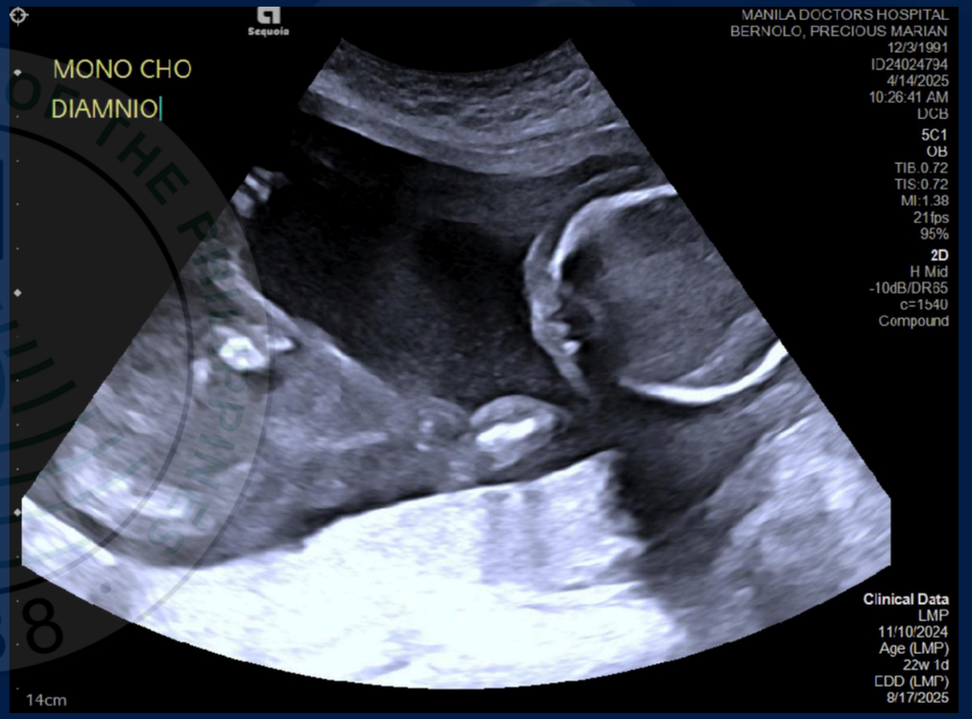
Free fluid

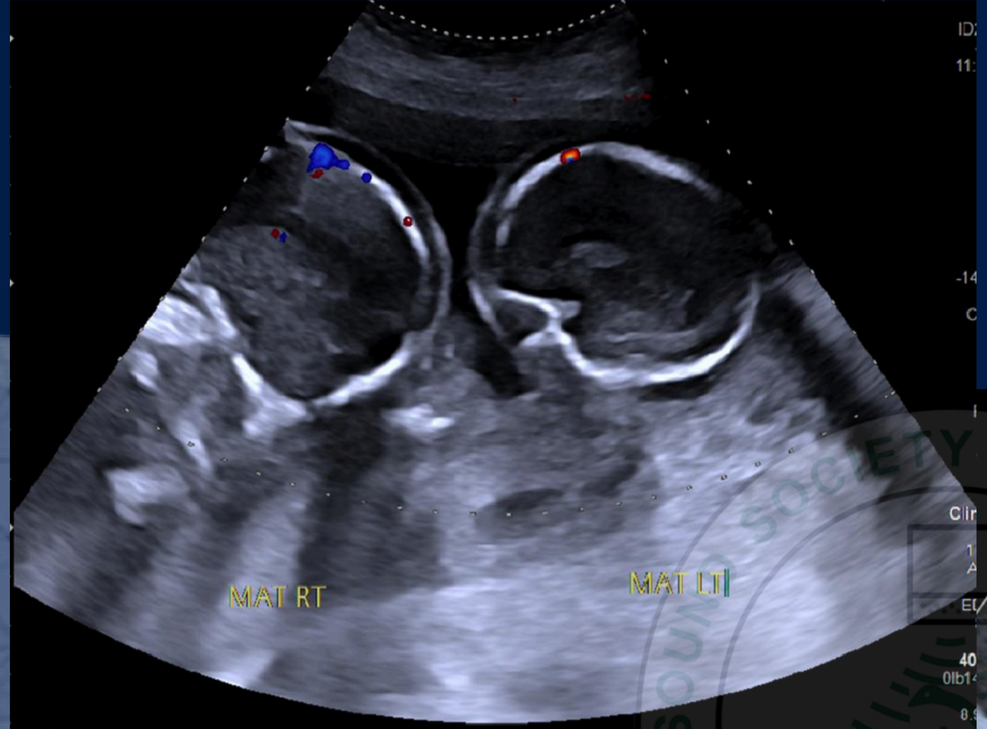


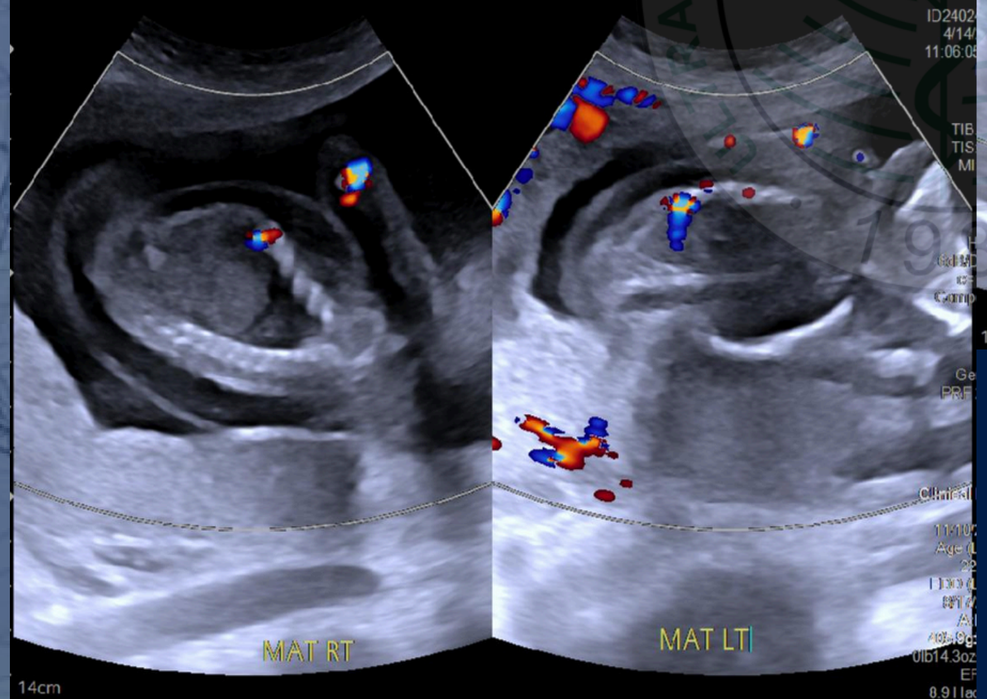
GS outside uterus

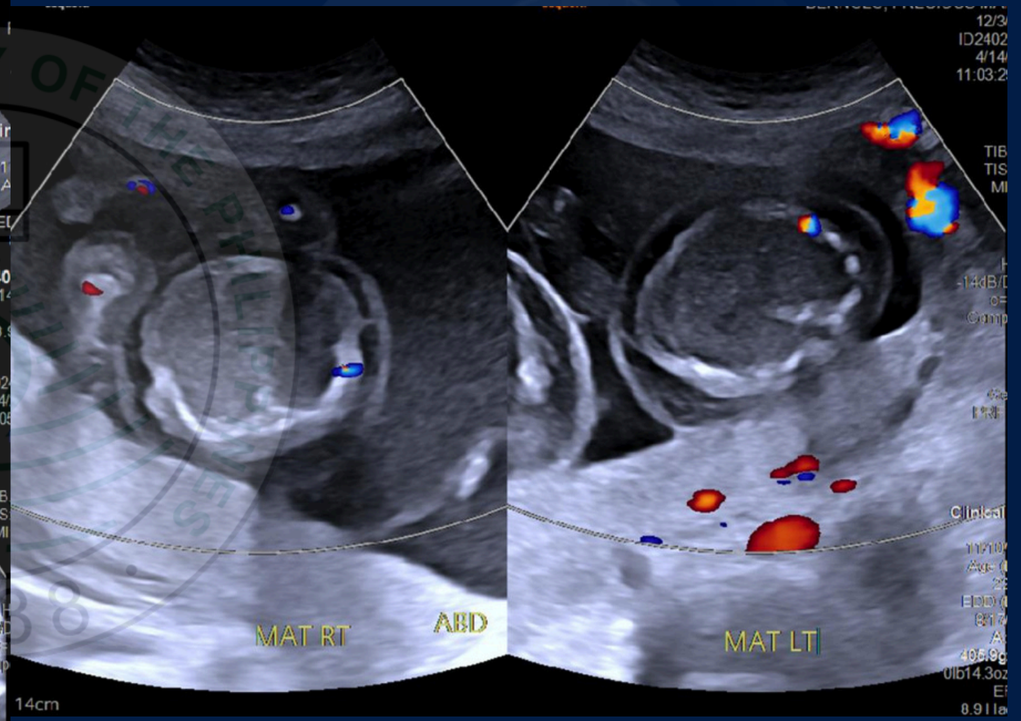
INTERESTING CASE

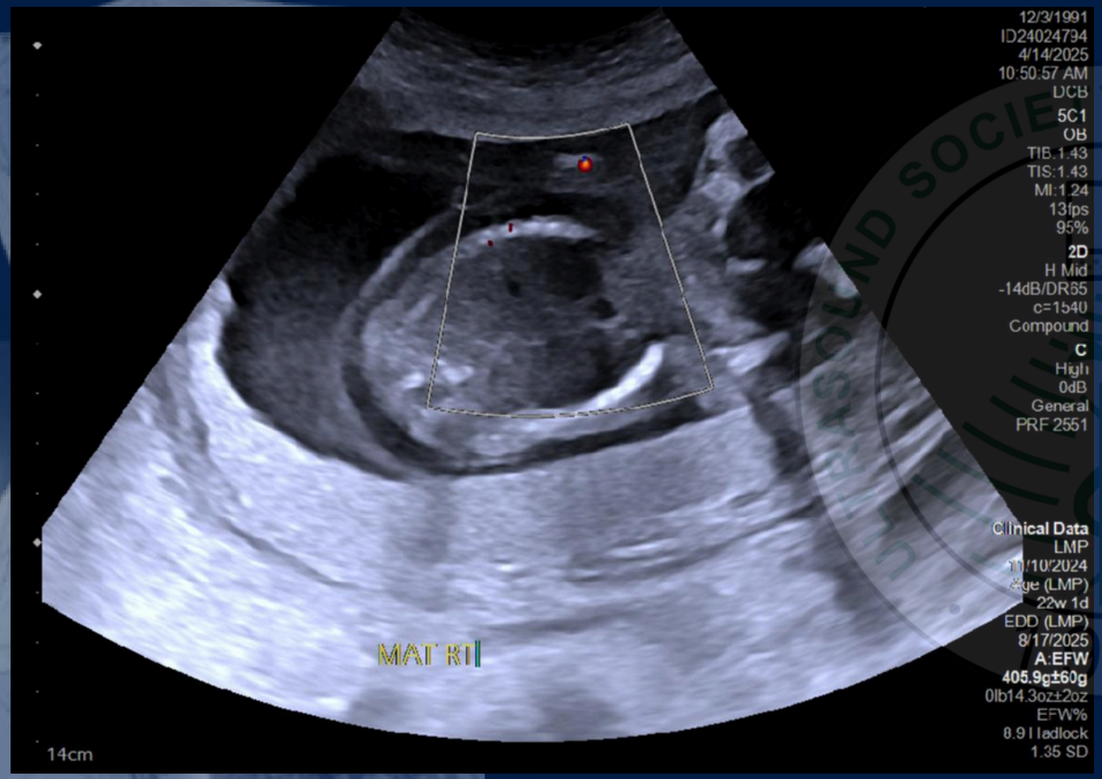

Sequoia
MANILA DOCTORS HOSPITAL
BERNOLO, PRECIOUS MARIAN
12/3/1991
ID24024794
4/14/2025
10:29:02 AM
DCB
5C1
OB
TIB:0.52
TIS:0.52
MI:1.37
16fps
95%
2D
H Mid
-10dB/DR55
c=1540
Compound
D=3.81 cm
Clinical Data
LMP
11/10/2024
Age (LMP)
22w 1d
EDD (LMP)
8/17/2025
19cm
CERVIX

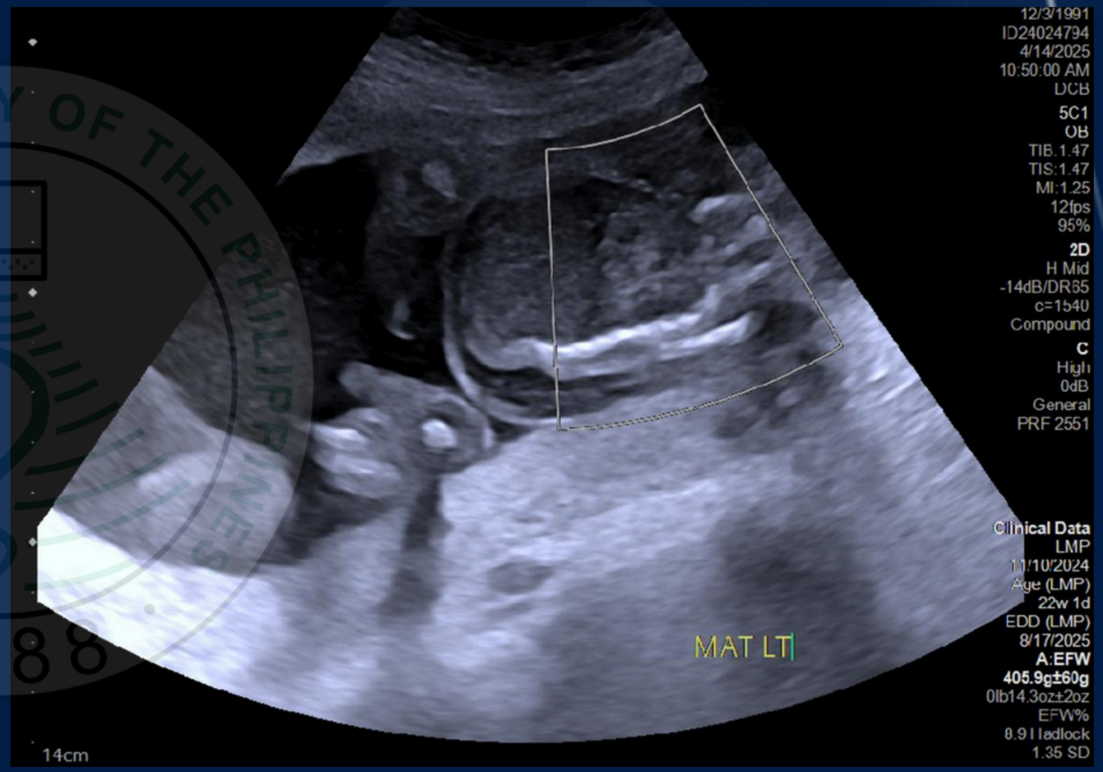

Sequoia
MANILA DOCTORS HOSPITAL
BERNOLO, PRECIOUS MARIAN
12/3/1991
ID24024794
4/14/2025
10:26:41 AM
DCB
5C1
OB
TIB:0.72
TIS:0.72
MI:1.38
21fps
95%
2D
H Mid
-10dB/DR55
c=1540
Compound
MONO CHO
DIAMNIO
Clinical Data
LMP
11/10/2024
Age (LMP)
22w 1d
EDD (LMP)
8/17/2025
14cm


MAT RT
MAT LT
14cm


MAT RT
MAT LT
14cm

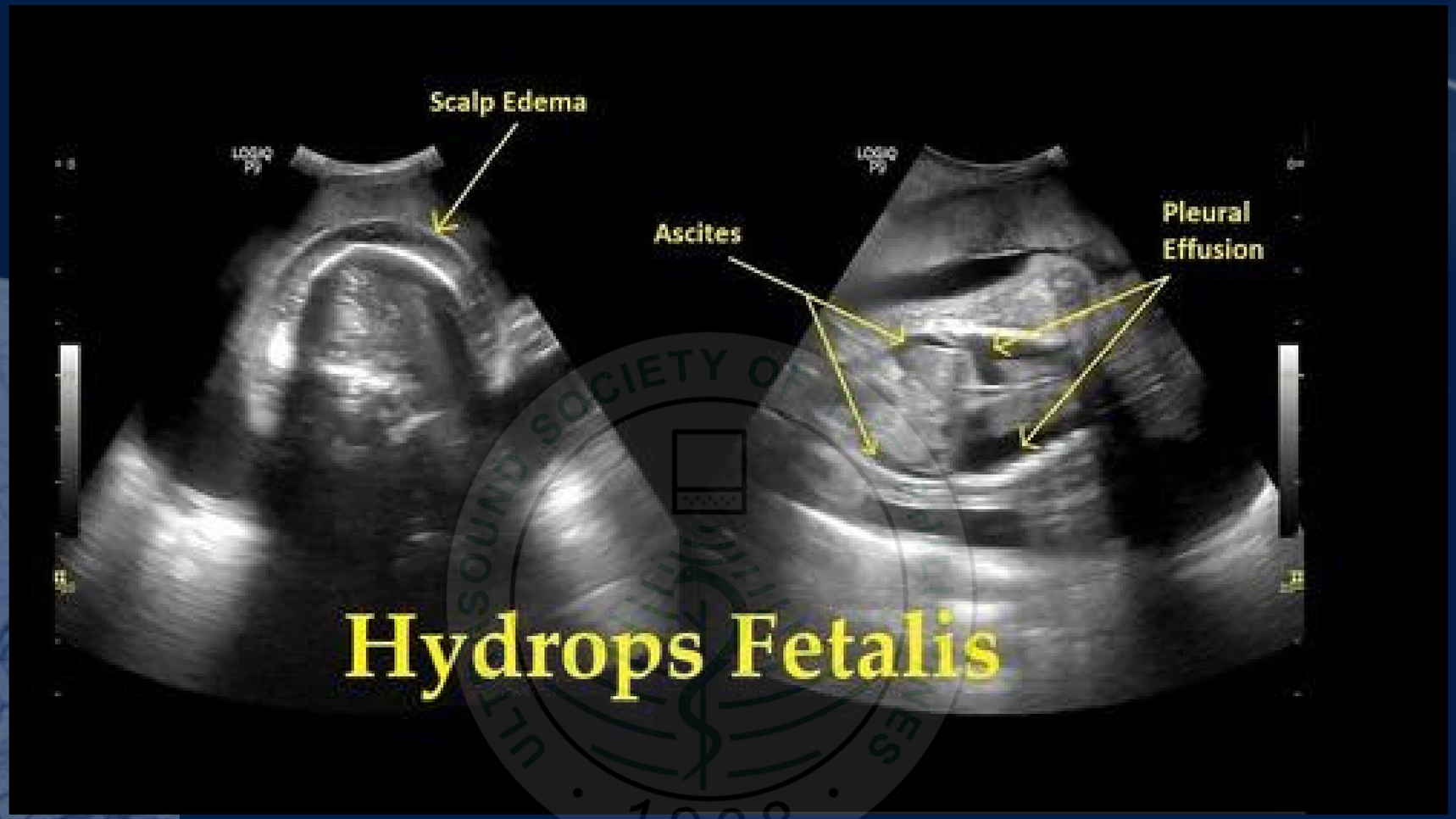

MAT RT
ABD
MAT LT
14cm


12/3/1991
ID24024794
4/14/2025
10:50:57 AM
DCB
5C1
OB
TIB:1.43
TIS:1.43
MI:1.24
13fps
95%
2D
H Mid
-14dB/DR55
c=1540
Compound
C
High
0dB
General
PRF 2551
Clinical Data
LMP
11/10/2024
Age (LMP)
22w 1d
EDD (LMP)
8/17/2025
A:EFW
405.9g±60g
0lb14.3oz±2oz
EFW%
8.9 Hadlock
1.35 SD
MAT RT
14cm


12/3/1991
ID24024794
4/14/2025
10:50:00 AM
DCB
5C1
OB
TIB:1.47
TIS:1.47
MI:1.25
12fps
95%
2D
H Mid
-14dB/DR55
c=1540
Compound
C
High
0dB
General
PRF 2551
Clinical Data
LMP
11/10/2024
Age (LMP)
22w 1d
EDD (LMP)
8/17/2025
A:EFW
405.9g±60g
0lb14.3oz±2oz
EFW%
8.9 Hadlock
1.35 SD
MAT LT
14cm

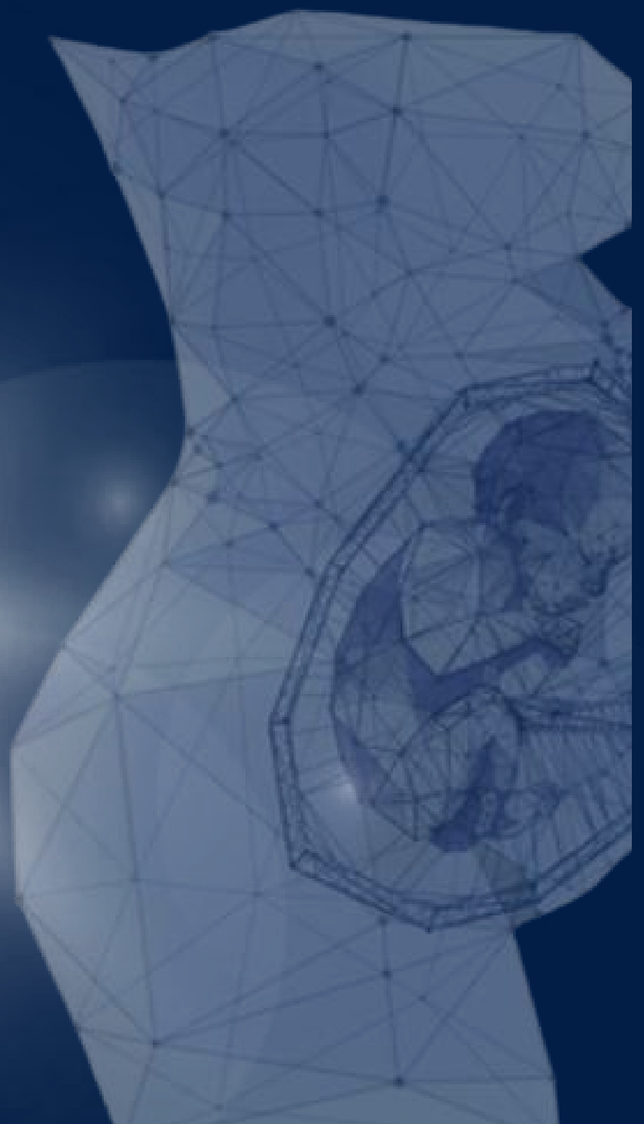
Hydrops Fetalis

- Pathologic accumulation of excessive fluid within two or more fetal compartments



Sonographic Findings

- scalp andbodywalledema
- pericardialeffusion,pleuraleffusion, ascites, polyhydramnios
- placental thickening



Immune Hydrops	Non-immune Hydrops
Fetalanemiadevelopingfrom RBC alloimmunization	Allotherconditions

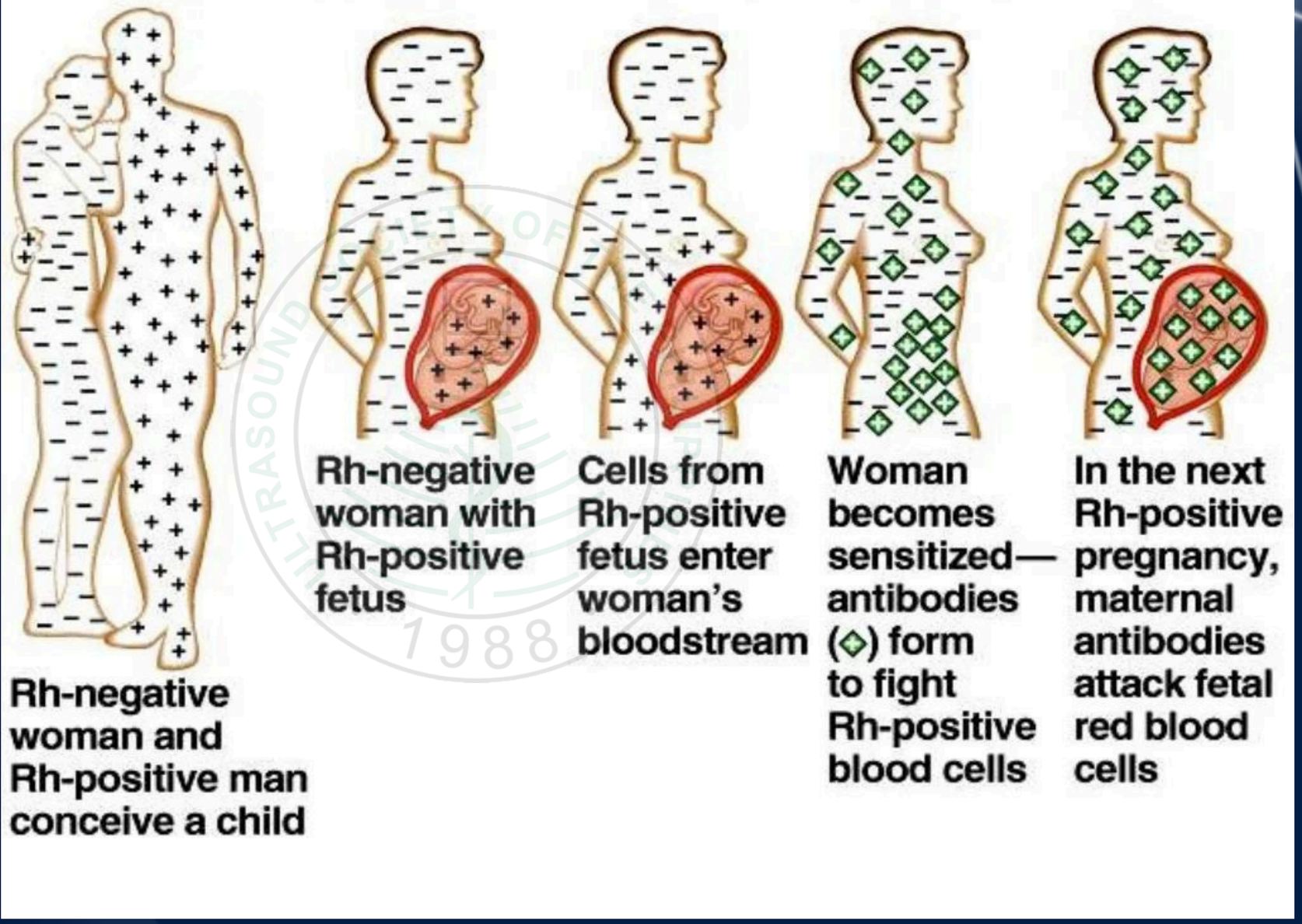


TABLE 17-8 Causes and Associations of Nonimmune Hydrops

Cause/Association	Frequency*
Focal Abnormalities	
Cranial	
Fetal intracranial hemorrhage	Low
Vein of Galen aneurysm	Low
Cerebral tumor	Low
Thoracic	
Cardiac structural defects	
AV septal defect, isolated or in association with Down syndrome	Low
AV septal defect in combination with heterotaxia syndrome (sinus ambiguus, left or right atrial isomerism) and bradyarrhythmia	High
Tricuspid dysplasia and Ebstein anomaly	Low
Severe obstruction of right ventricular outflow tract by pulmonary stenosis, pulmonary atresia, and premature closure of the ductus arteriosus (occurring spontaneously or induced with indomethacin)	Low
Absent pulmonary valve syndrome (typically combined with tetralogy of Fallot or agenesis of the ductus arteriosus)	Low
Truncus arteriosus communis with truncal valve insufficiency	Low
Pulmonary and Mediastinal	
Primary unilateral/bilateral hydrothorax, chylothorax	High
CPAM	
Macrocystic CPAM	Low
Microcystic CPAM	Low
Extralobar pulmonary sequestration	Low
Laryngeal atresia (CHAOS)	
Mediastinal teratoma	
Fibrosarcoma	
Intrathoracic alimentary tract duplication cyst	
Diaphragmatic hernia	Low
Pulmonary lymphangiectasia	
Gastrointestinal	
Diaphragmatic hernia	Low
Meconium peritonitis caused by bowel perforation; spontaneous bowel obstruction (various types of atresias of the intestinal tract, volvulus), or infection	Low
Intestinal hemorrhage caused by bowel perforation	Low
Hepatitis	
Hepatic fibrosis	
Hemachromatosis	
Cholestasis	

Maternal Risks from Hydrops Fetalis

Mirror syndrome

combination of symptoms mimicking preeclampsia

- edema (90%)
- hypertension (60%)
- proteinuria (40%)

COMMON UTERINE PATHOLOGIES

Leiomyoma

- Smooth muscle and fibrous tissue
- Abnormal vaginal bleeding

- Bowel or bladder dysfunction

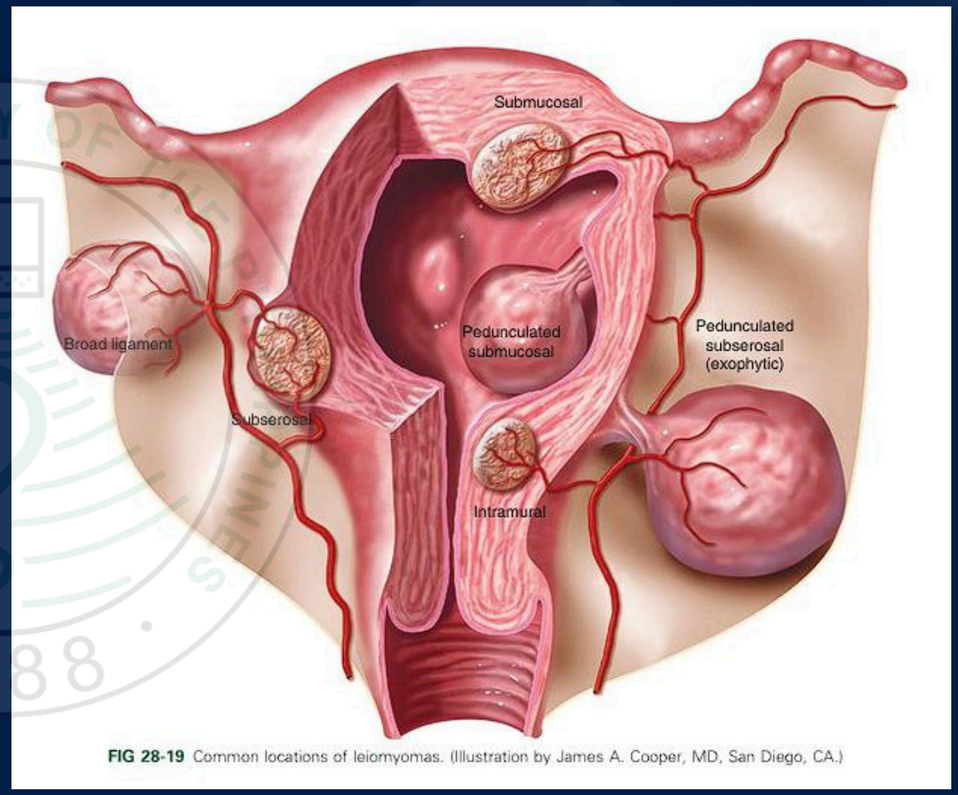
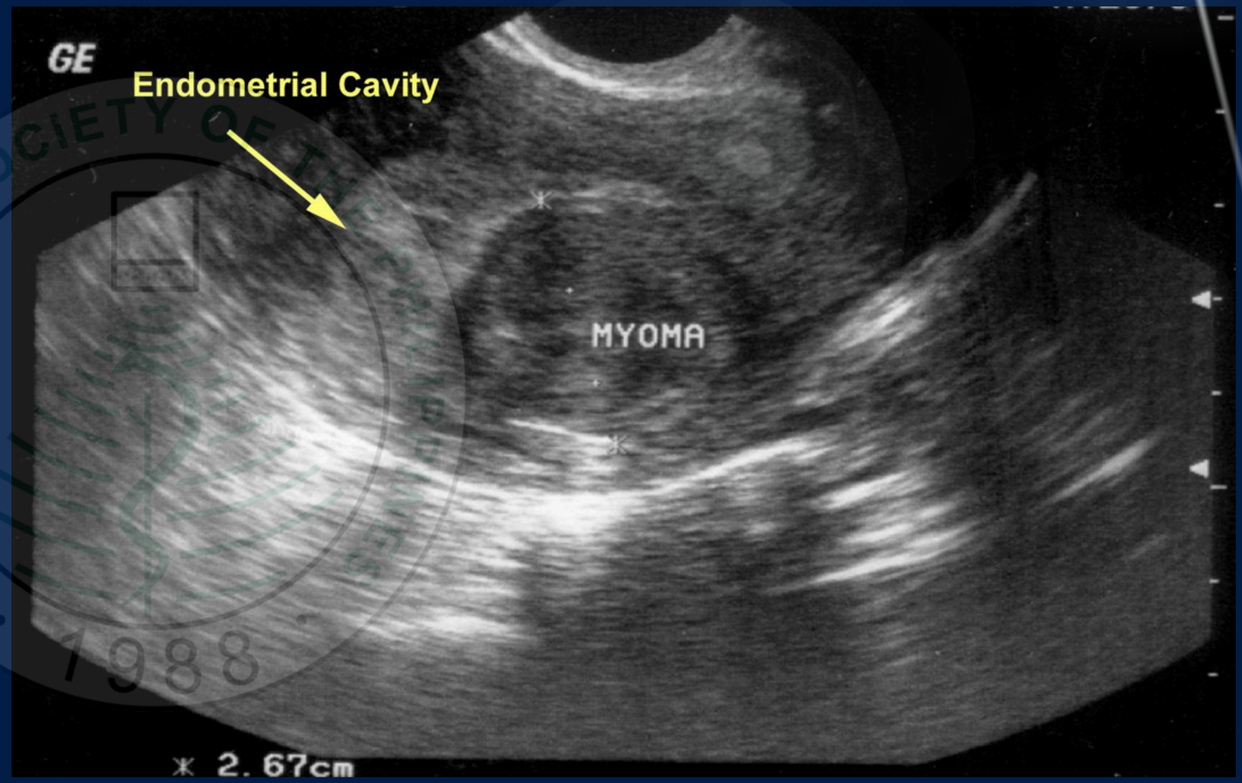


FIG 28-19 Common locations of leiomyomas. (Illustration by James A. Cooper, MD, San Diego, CA.)

Leiomyoma

- Hypoechoic compared to normal myometrium

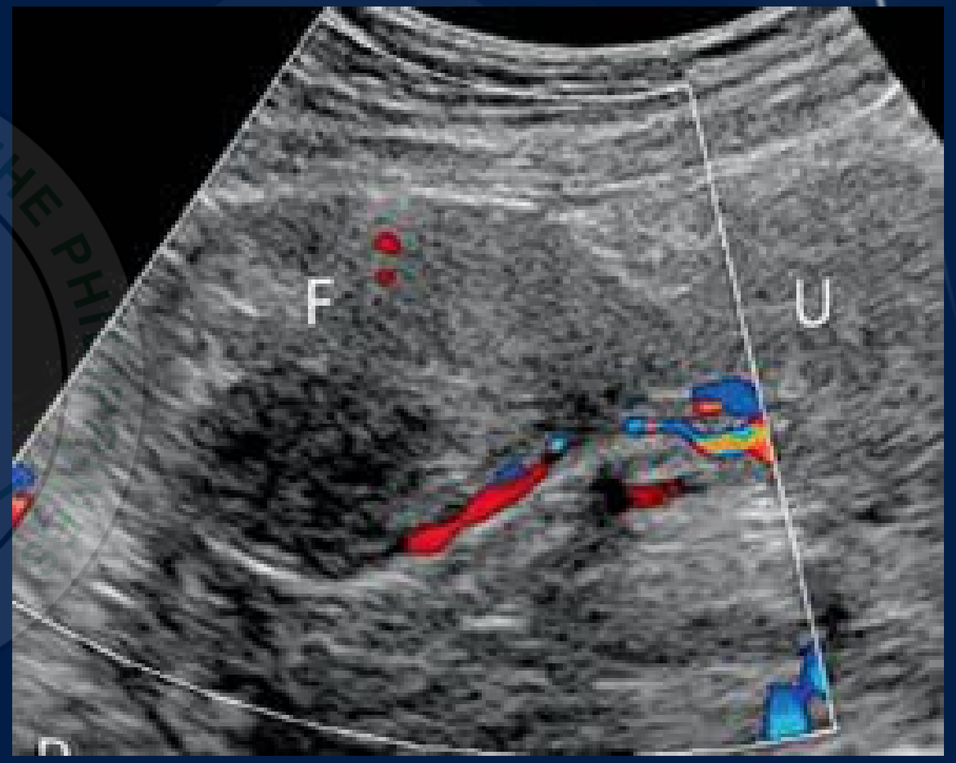


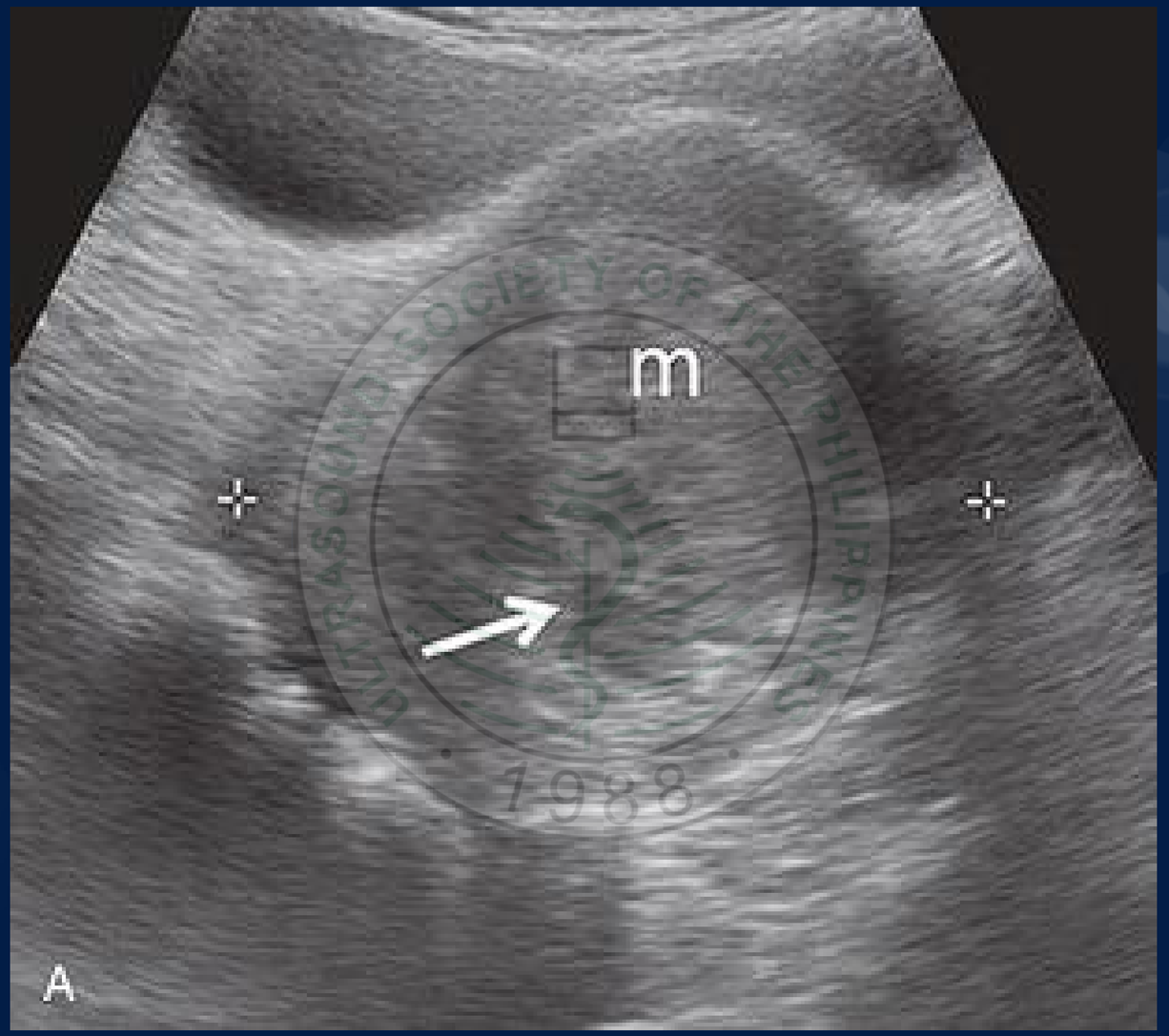
Pitfall!!

Pedunculated subserosal mass

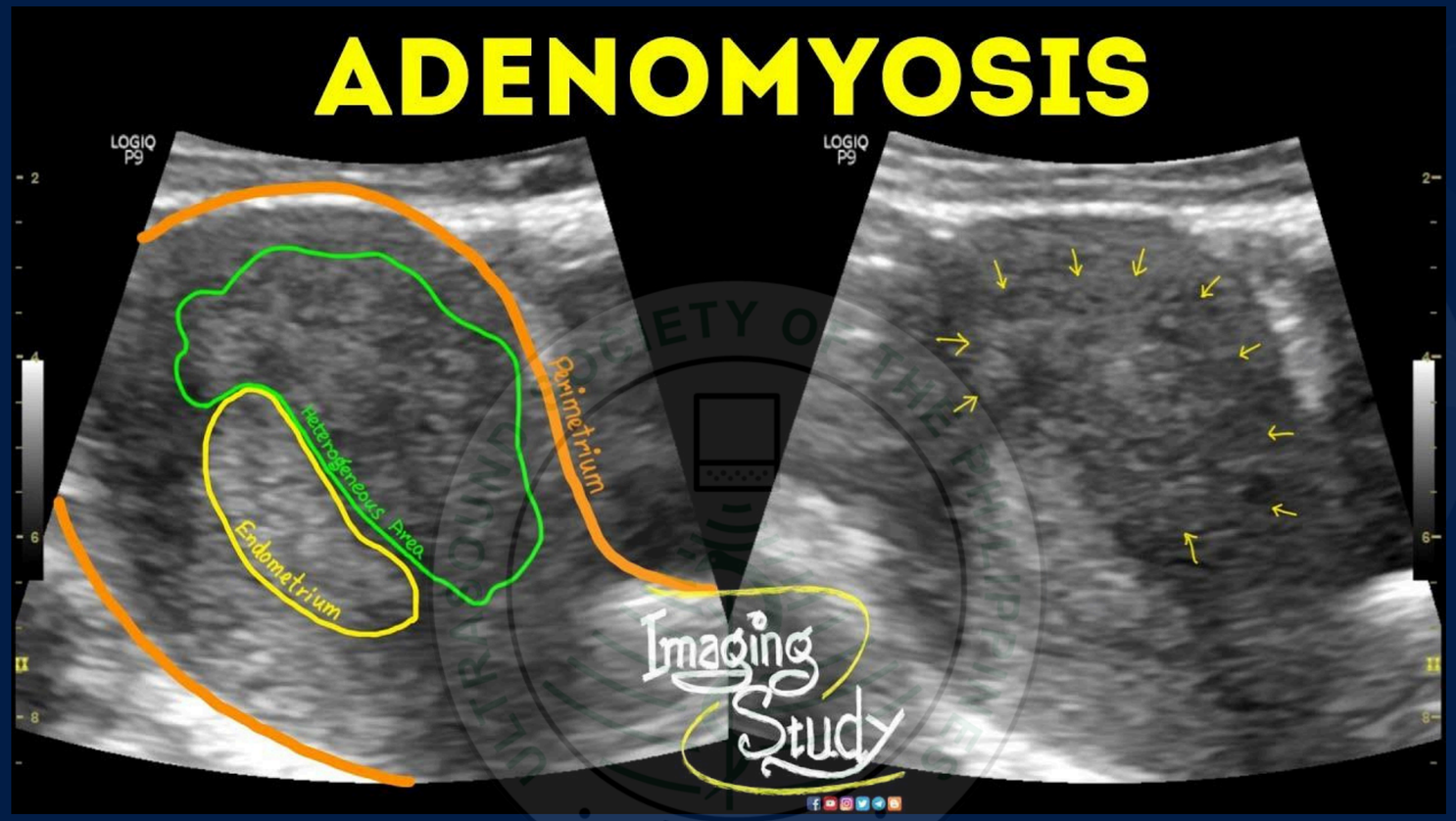
VS Solid ovarian neoplasm

Use color or power doppler imaging to search for vessels connecting leiomyoma to the uterus!





Leiomyoma



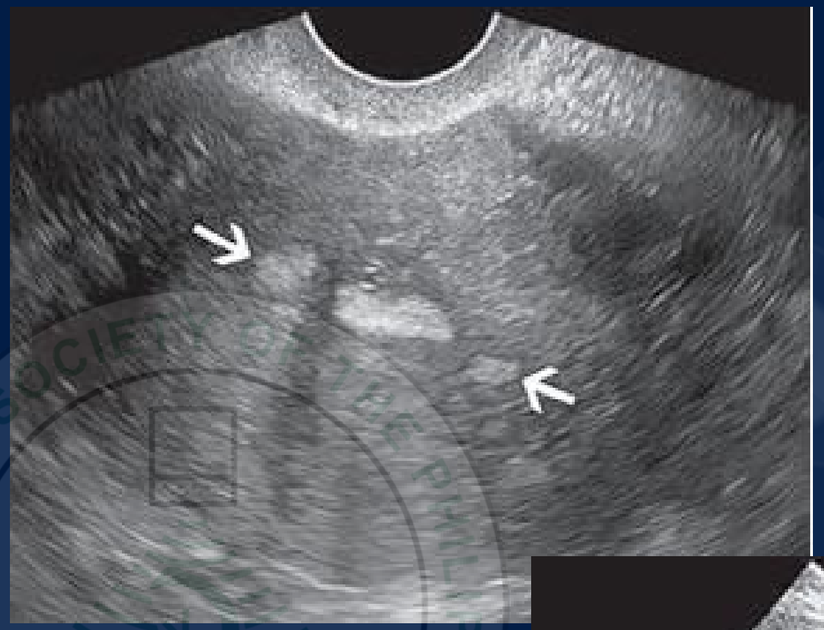
- Ectopic non neoplastic endometrial glands and stroma within the myometrium surrounded by hypertrophied smooth muscles

- Pathogenesis is unknown.

CLINICAL PRESENTATION

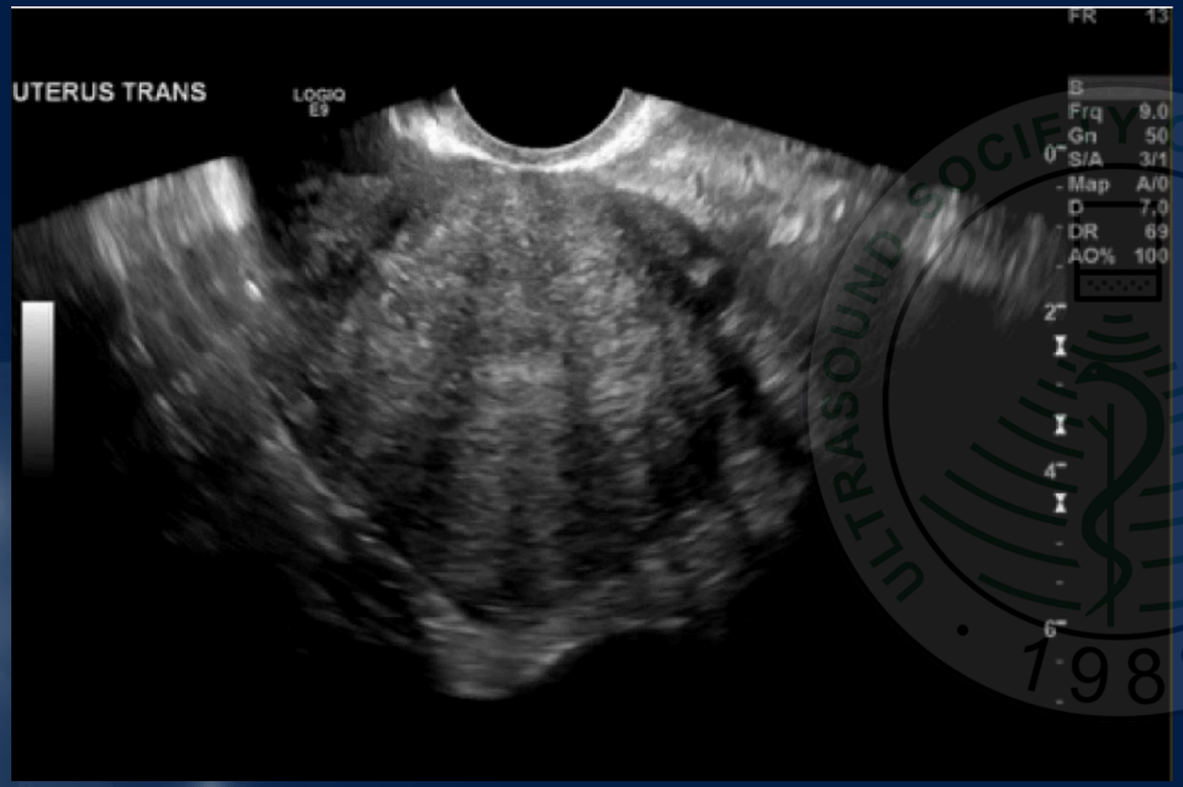
- Uterine tenderness and enlargement
- Dysmenorrhea
- Menorrhagia

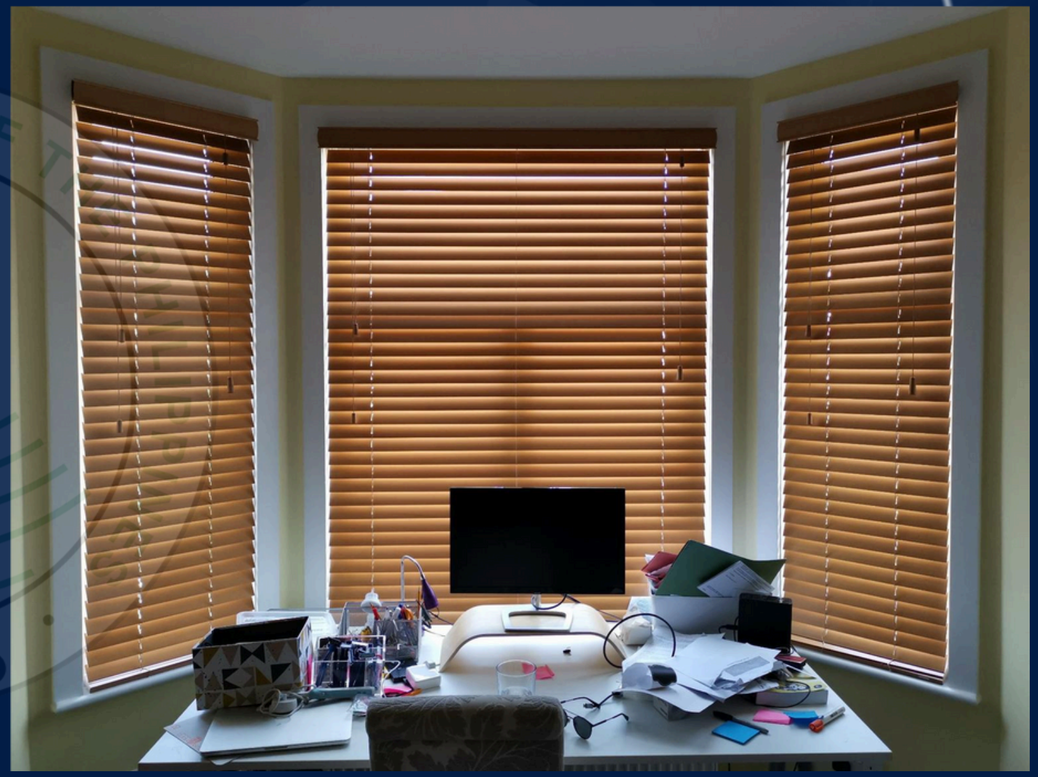
SONOGRAPHY is the first line imagingchoice todiagnose adenomyosis.



Adenomyosis: Sonographic Features
Diffuse, sometimes globular-shaped, uterine enlargement
Diffusely heterogeneous myometrium
Asymmetrical thickening of myometrium
Indistinct hypoechoic areas
Myometrial cysts
Poor definition of endometrial-myometrial border
Focal tenderness elicited when scanning over the uterus
Subendometrial echogenic linear striations
Subendometrial echogenic nodules

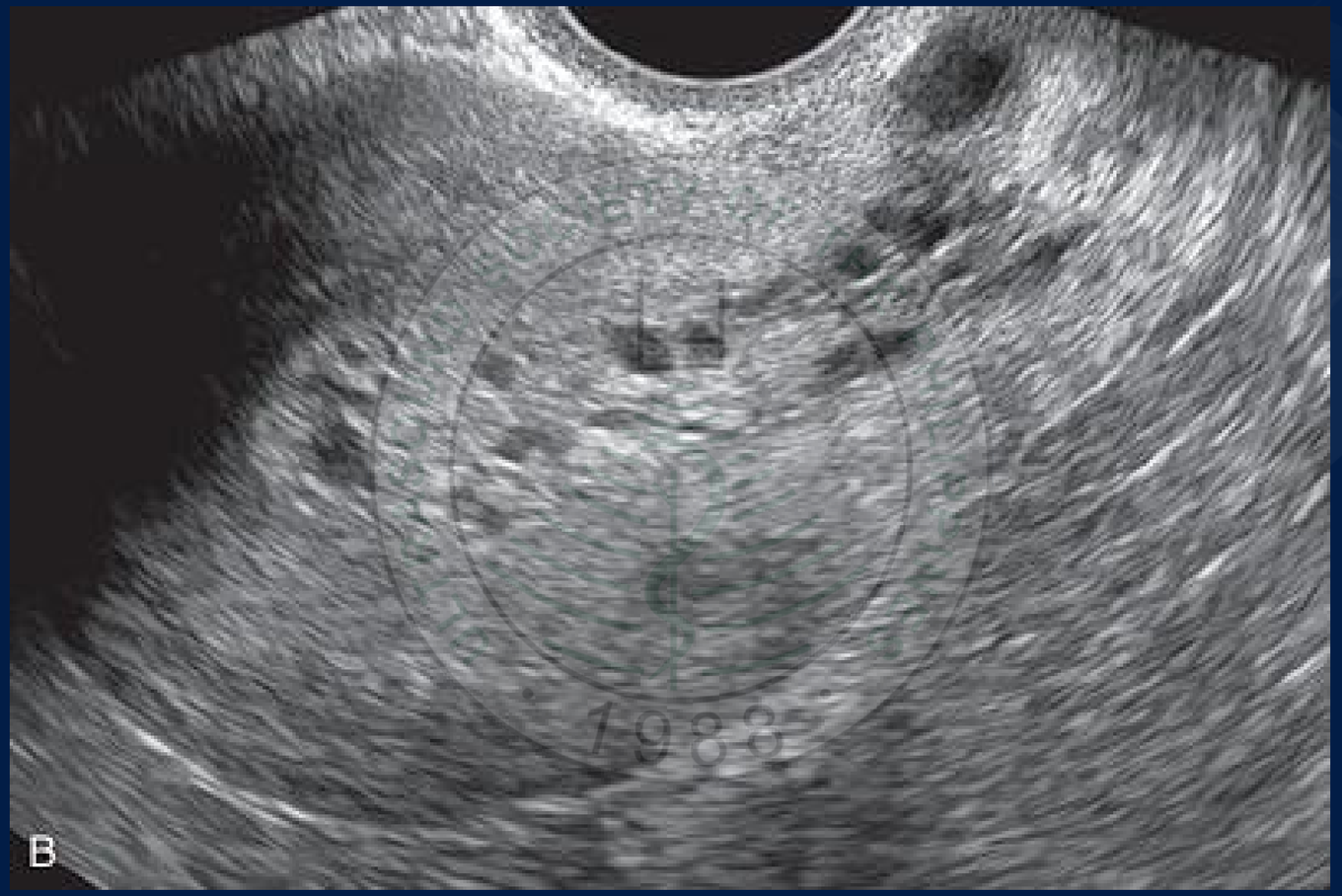
Adenomyosis





Venetian blind or rain shower appearance

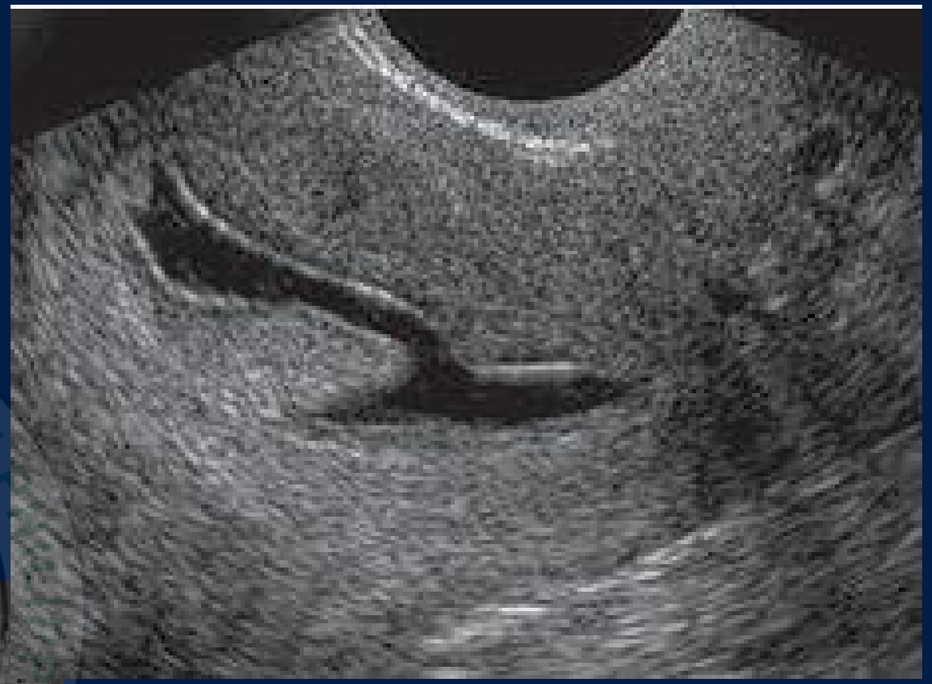
Endometrial Hyperplasia

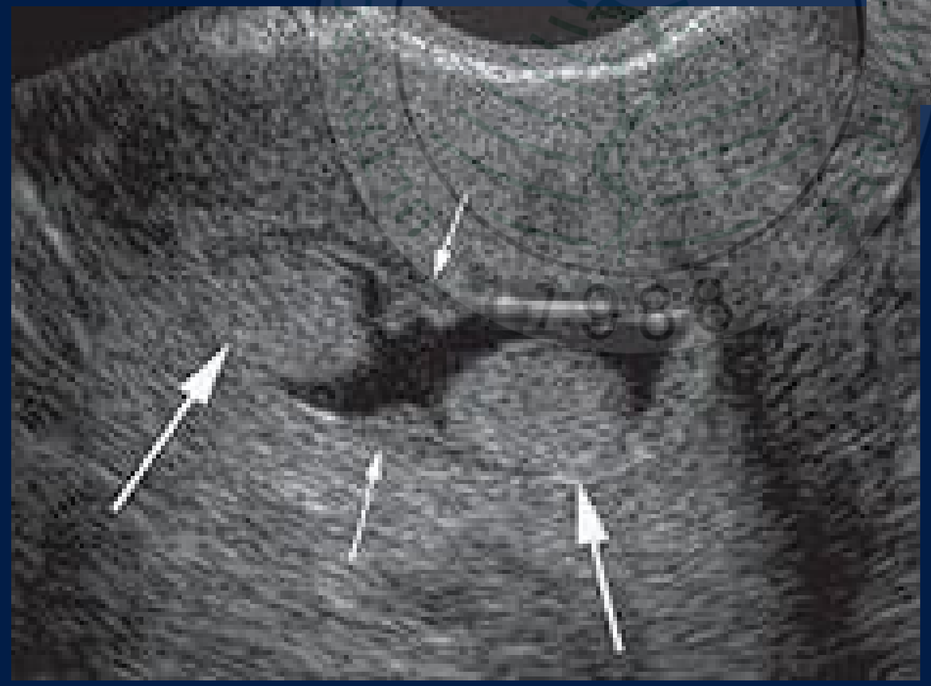


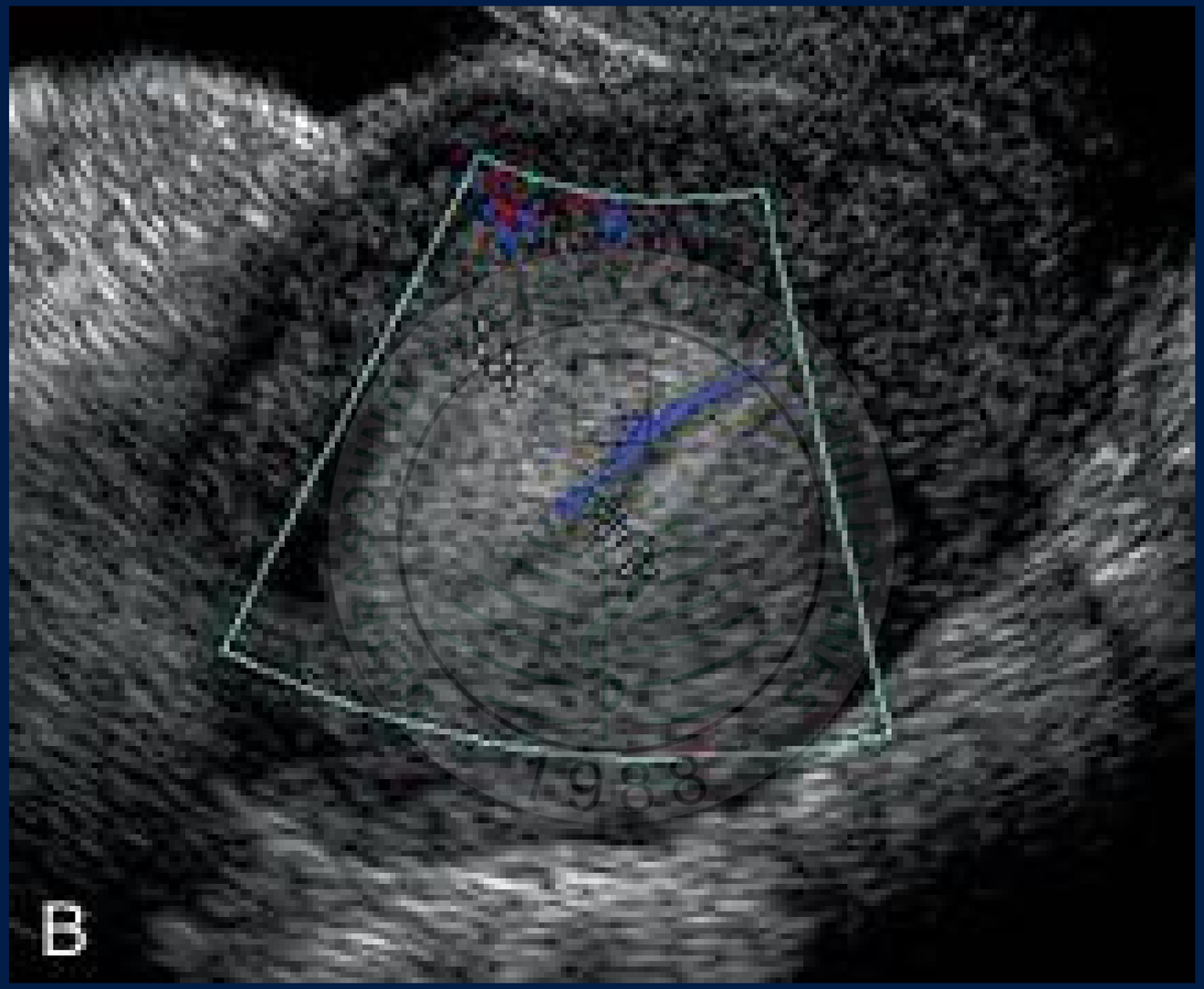
Proliferation of glands of irregular size and shape

Endometrial Polyp

- Echogenic endometrial thickening or cystic
- Sonohysterography may be more sensitive
- Increase risk in patient receiving tamoxifen



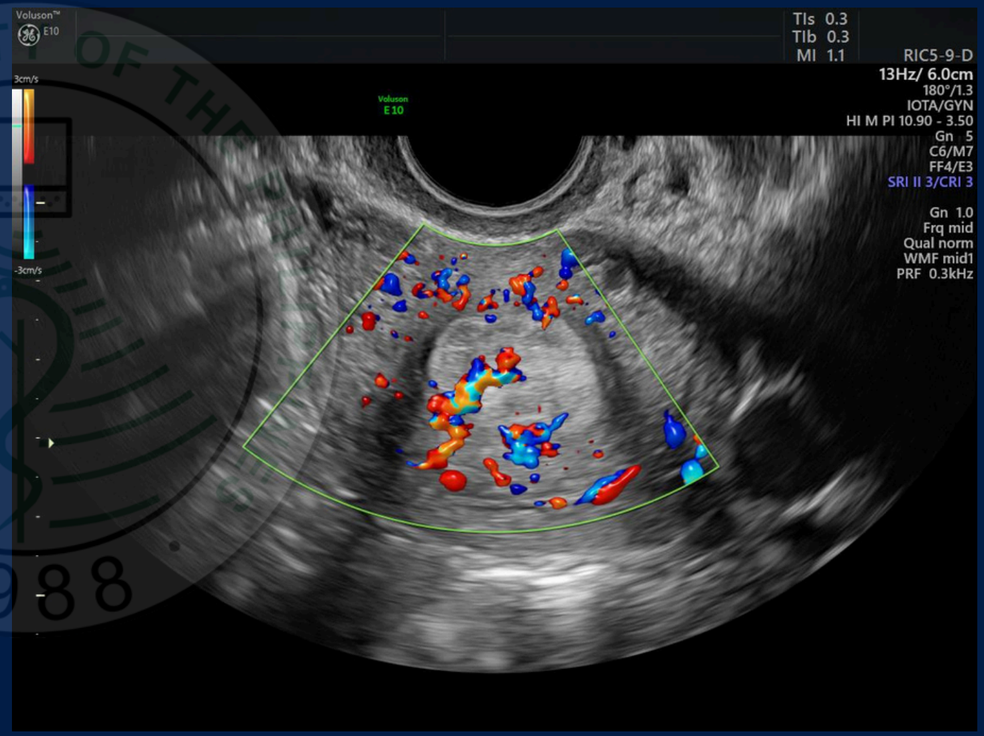




- **Pedicle artery sign**

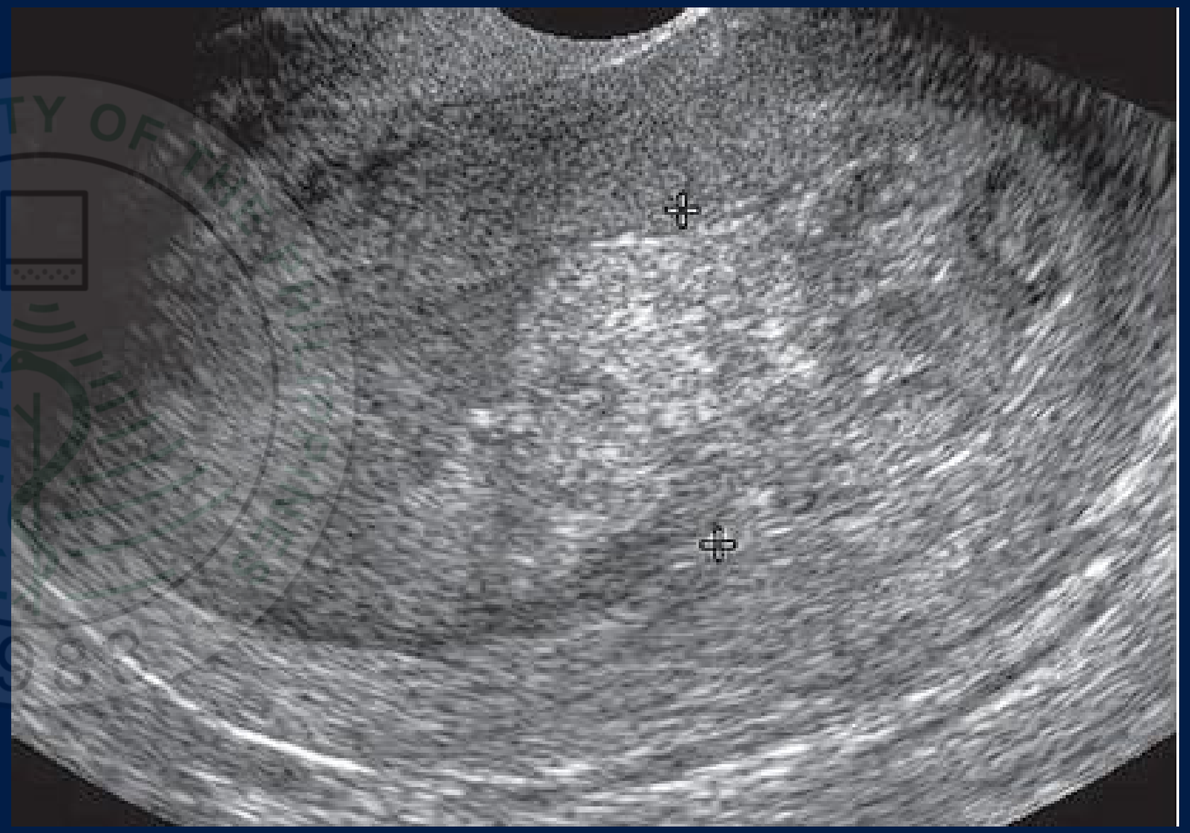
Endometrial Carcinoma

Most common primary gynecologic malignancy



Endometrial Carcinoma

Mostly occurs in postmenopausal women (75 –85%).
Strong association with estrogen replacement therapy in post menopausal women.



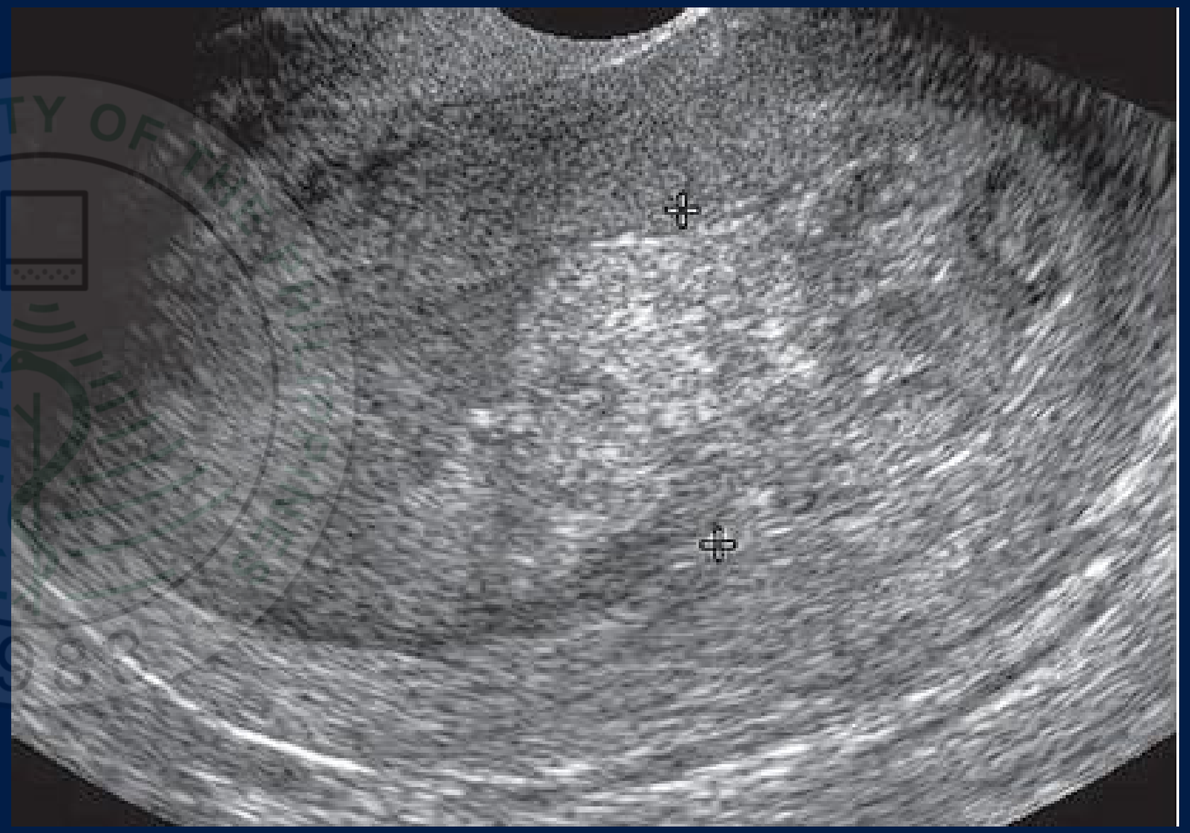
Endometrial Carcinoma

Other risk factors:

Obesity,Diabetes, Hypertension,
Low parity.

MC clinical presentation:

Bleeding



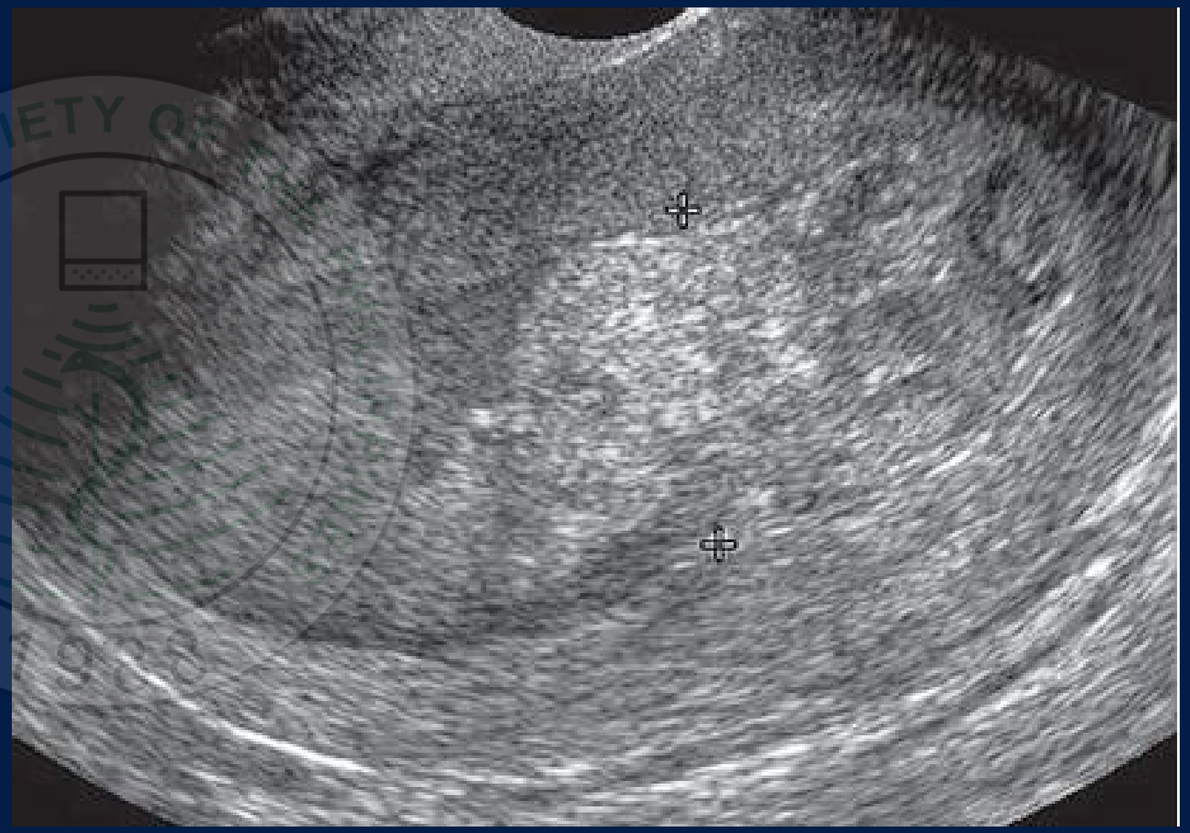
Endometrial Carcinoma

HYSTEROGRAPHY/SALINE INFUSION HYSTEROGRAPHY

- irregular endometrial surface

ULTRASOUND

- endometrialstripemaybethickened, consistent with ***carcinoma, endometrial hyperplasia, or an endometrial polyp***.



THANK YOU