

FIRST TRIMESTER

BLEEDING

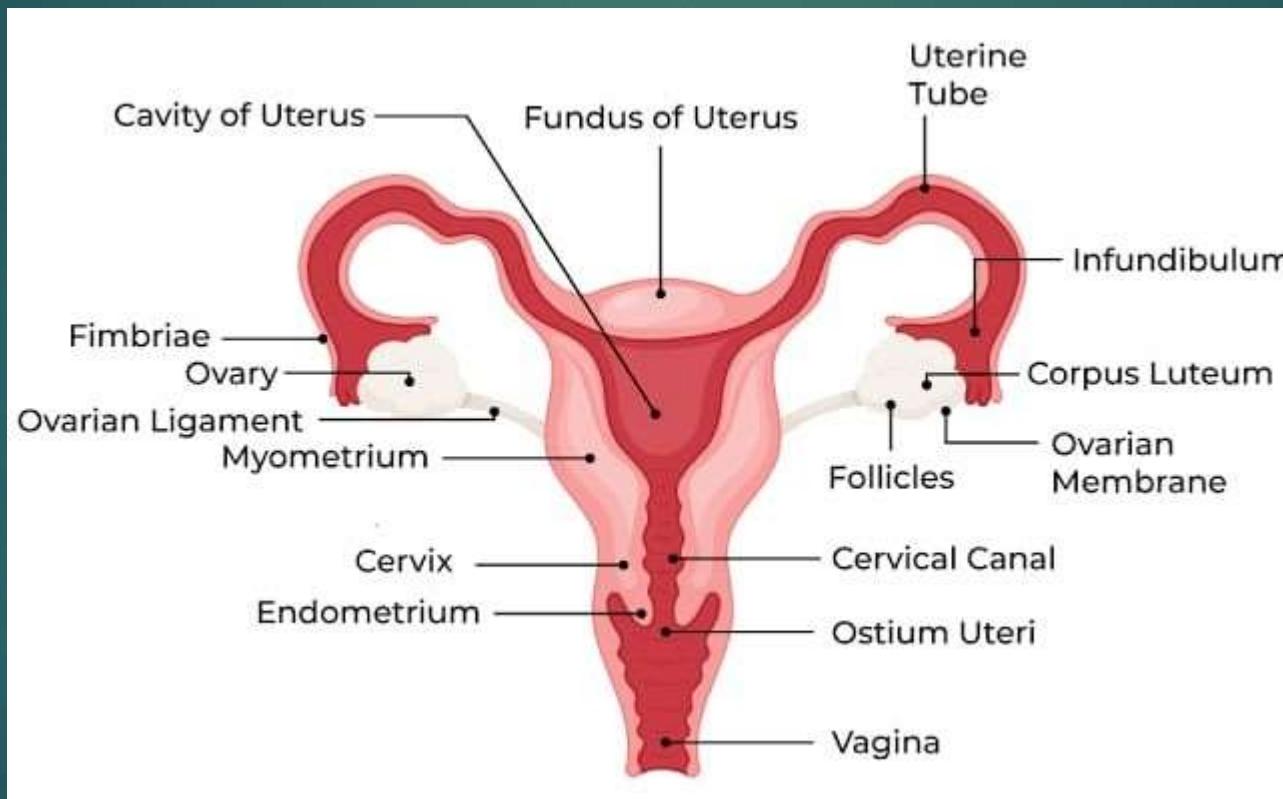
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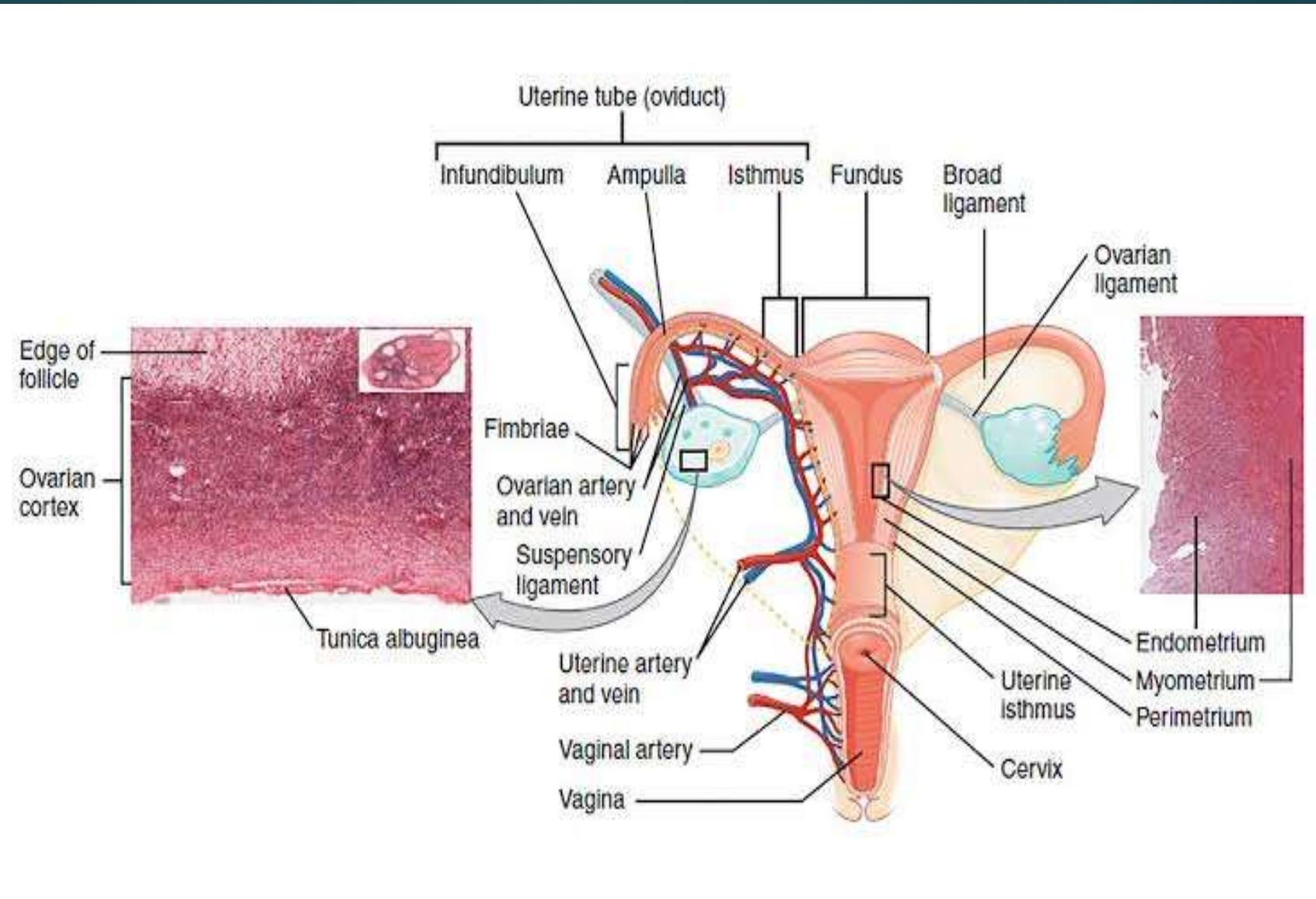
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Normal Anatomy





Causes of bleeding in first trimester

- ▶ Spontaneous abortion/early pregnancy failure (Most common cause)
- ▶ Subchorionic haemorrhage
- ▶ Retained product of conception
- ▶ Ectopic pregnancy
- ▶ Gestational trophoblastic disease
- ▶ Implantation bleeding

SPONTANEOUS ABORTION

- ▶ Termination of a pregnancy before the 20th completed week of gestation (more common in 16 weeks of pregnancy).

Recurrent abortion - 3 or more consecutive spontaneous abortions.

- ▶ Commonly caused by maternal and environmental factors.

CAUSES OF SPONTANEOUS ABORTION

Etiology of Spontaneous Abortion		
Genetic or foetal causes		Trisomy Polypoidy or aneuploidy Translocations
Environmental or maternal causes	Uterine	Congenital uterine anomalies Fibroids Intrauterine adhesions or synechiae (Asherman's syndrome)
	Endocrine	Progesterone deficiency (luteal phase defect) Hypothyroidism Diabetes mellitus (poorly controlled)
	Immunologic	Autoimmunity: antiphospholipid syndrome, systemic lupus erythematosus
	Infections	Toxoplasma gondii, Chlamydia trachomatis, Ureaplasma urealyticum, Mycoplasma hominis, herpes simplex, Treponema pallidum, Borrelia burgdorferi, Neisseria gonorrhoea.

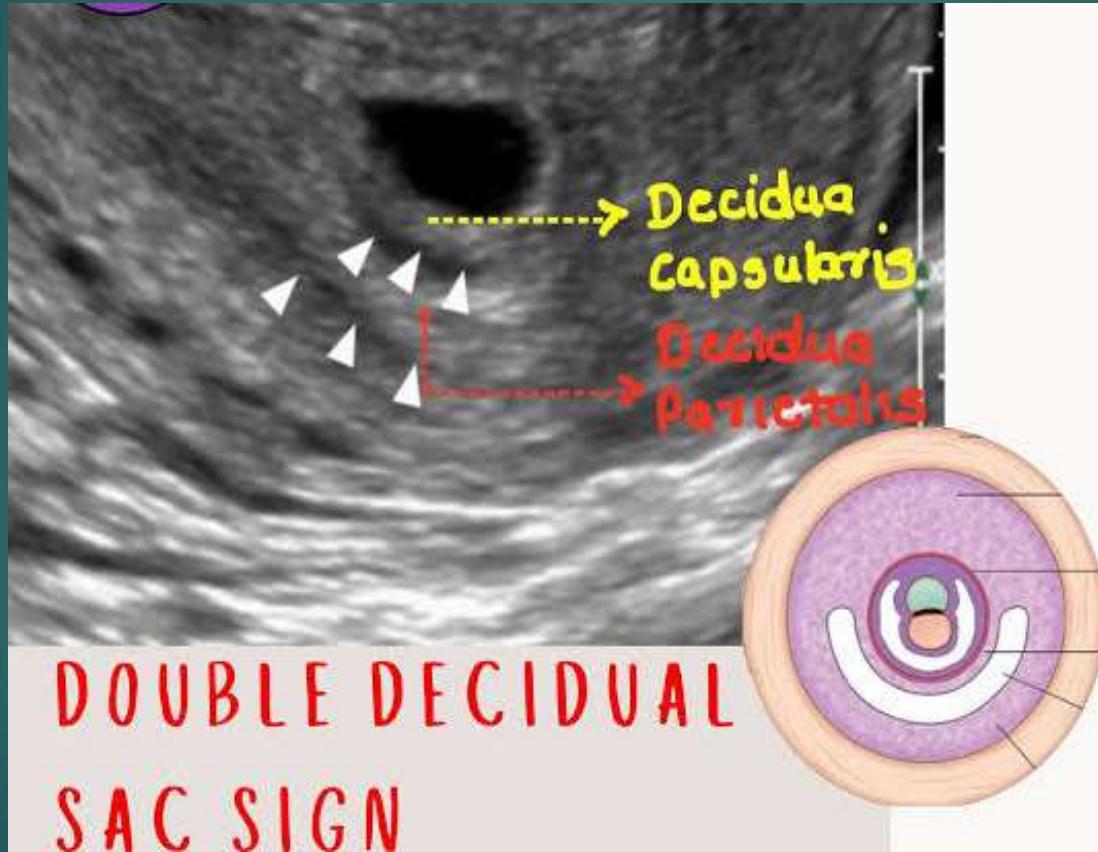
Classification and corresponding sonographic features seen in first trimester spontaneous abortion

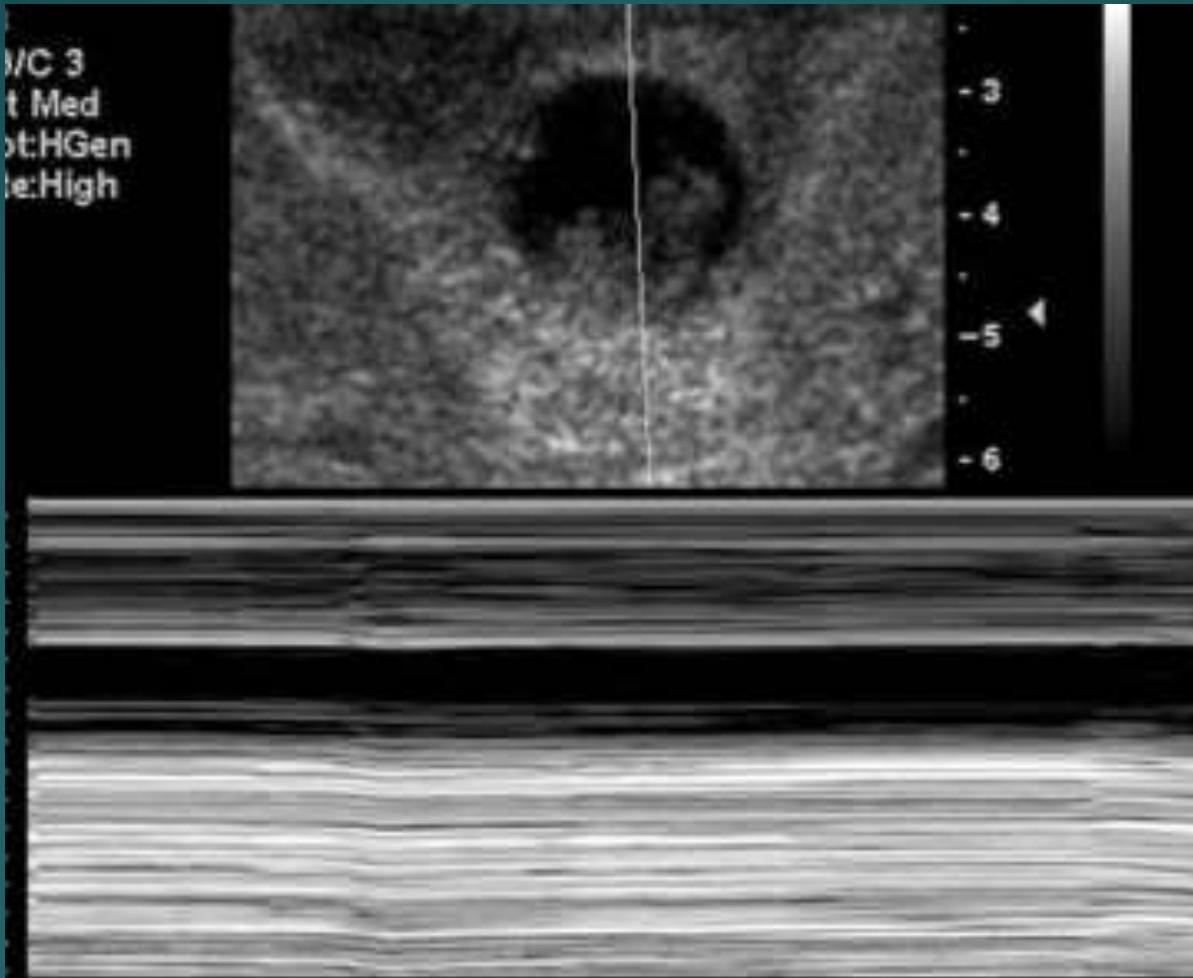
Sonographic Findings in Spontaneous Abortion

Type	Clinical Definition	Sonographic Features
Threatened abortion	Bleeding without cervical dilatation	Empty uterus or intrauterine gestational sac with or without an embryo (depends on the stage of gestation)
Missed abortion	Fetal demise without expulsion of products	Absence of cardiac activity; Embryo may be small for gestational age
Incomplete abortion	Cervical dilatation with partial expulsion of products	Retained products of conception or trophoblastic tissue
Complete abortion	Complete expulsion of products	Empty uterus with normal appearance of endometrium

Embryonic Bradycardia - FHR < or = 100 bpm at 6.2 weeks and < or = 120 bpm at 6.3–7 weeks has a high association with spontaneous abortion.

Double decidua sign





M-mode sonogram shows absence of a fetal heartbeat - confirming missed abortion.

EARLY PREGNANCY FAILURE

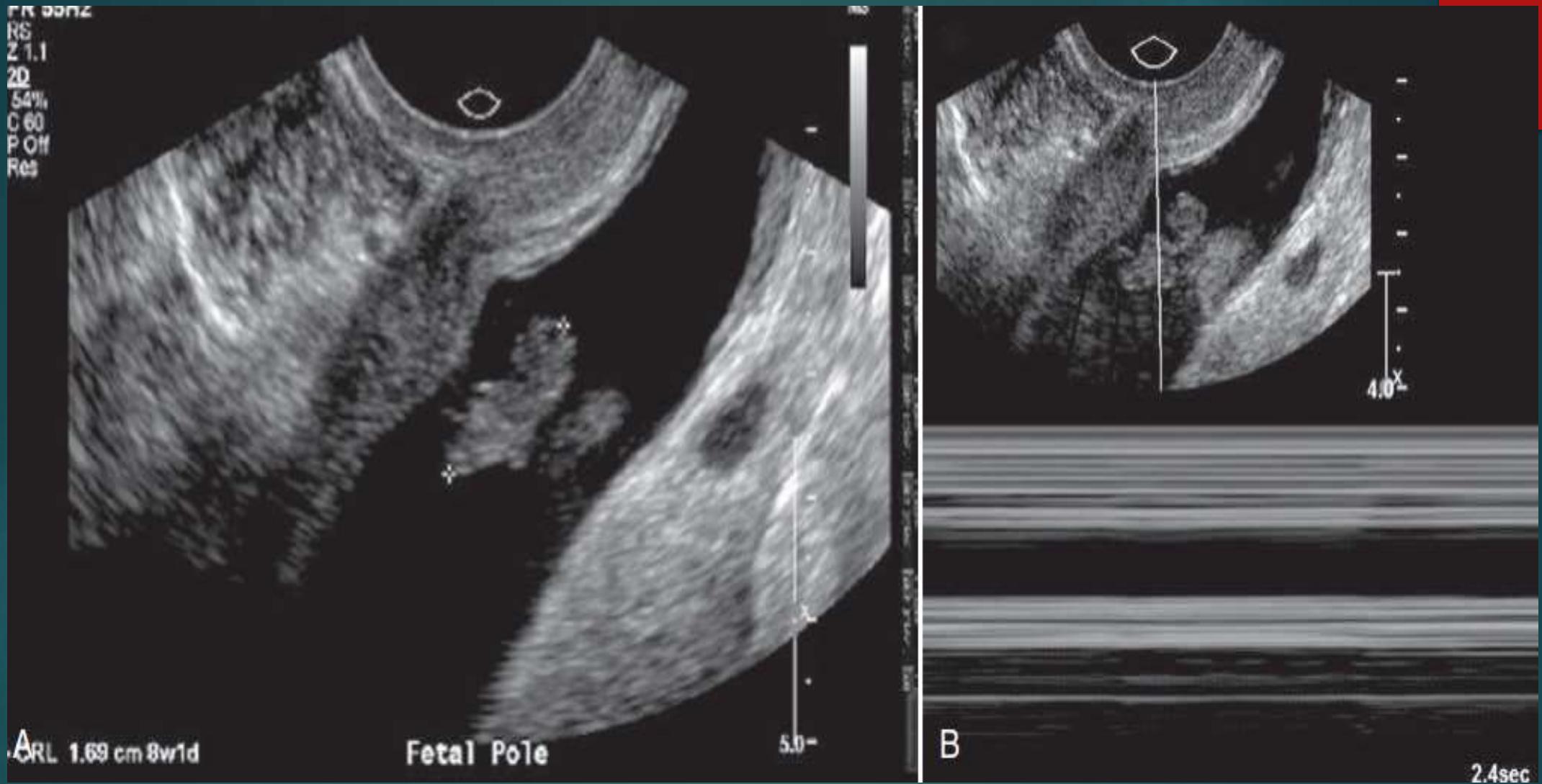
Diagnostic findings (criteria) of early pregnancy failure:

- ▶ GS with Mean sac diameter (MSD) of 8 mm without a yolk sac
- ▶ Mean sac diameter (MSD) > or = 25mm and no embryo
- ▶ CRL(crown rump length) > or = 7mm and no cardiac activity
- ▶ Absence of embryonic cardiac activity > or = to 2 weeks after a scan demonstrating gestational sac without a yolk sac
- ▶ Absence of embryonic cardiac activity > or = to 11 days after a scan demonstrating gestational sac with a yolk sac

EARLY PREGNANCY FAILURE

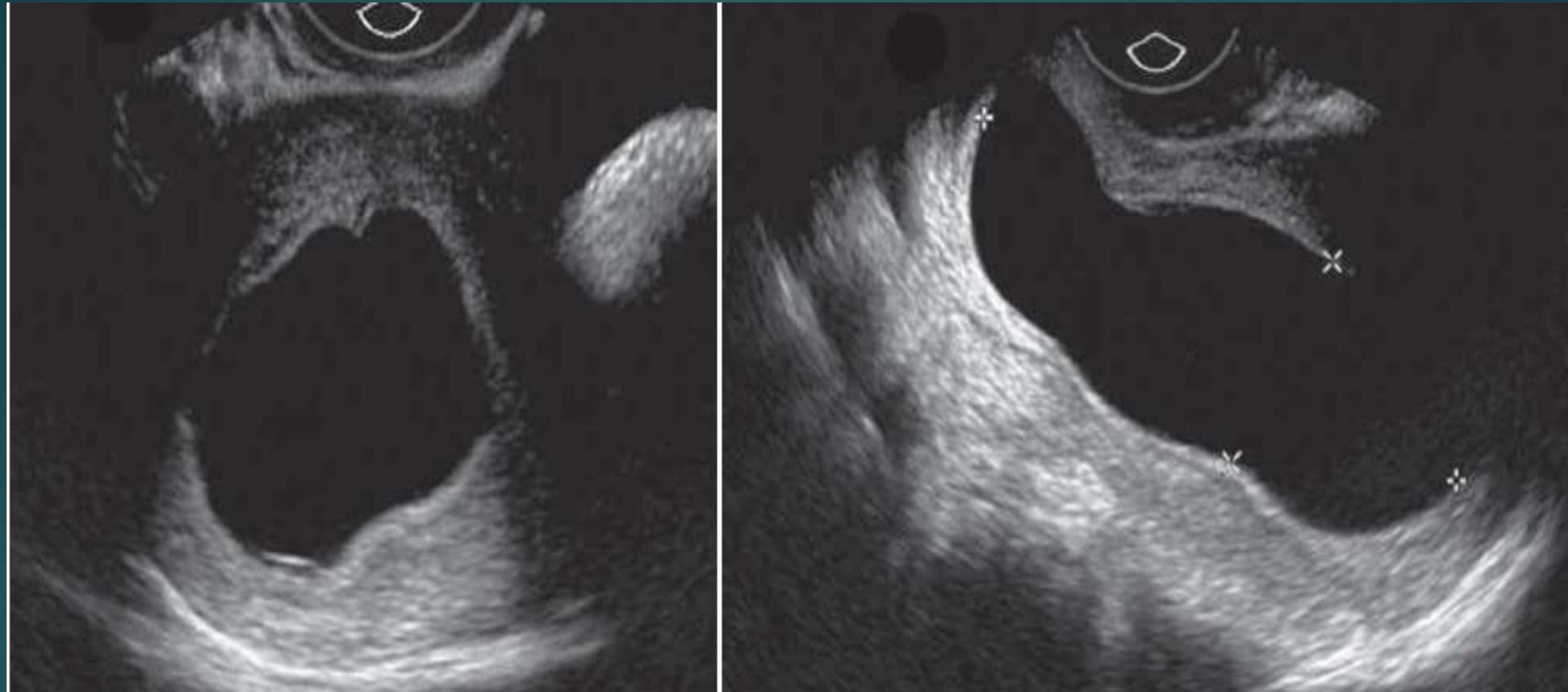
Findings suspicious for pregnancy failure (not diagnostic)

- ▶ CRL < 7mm and no cardiac activity
- ▶ MSD 16-24mm and no embryo
- ▶ Absence of embryonic cardiac activity 7-13 days after a scan demonstrating gestational sac without a yolk sac
- ▶ Absence of embryonic cardiac activity 7-10 days after a scan demonstrating gestational sac with a yolk sac



(A) embryo measuring larger than 7 mm(CRL) without cardiac activity

(B) M-Mode confirms no fetal cardiac activity.



Transverse and sagittal images of an empty gestational sac with MSD greater than 25 mm. No yolk sac or embryonic pole is visualized

A blighted ovum or anembryonic pregnancy - an early failure of the embryo to develop within the GS.

A pseudogestational sac is seen with an ectopic pregnancy and corresponds to intrauterine fluid collection rimmed by the endometrium.

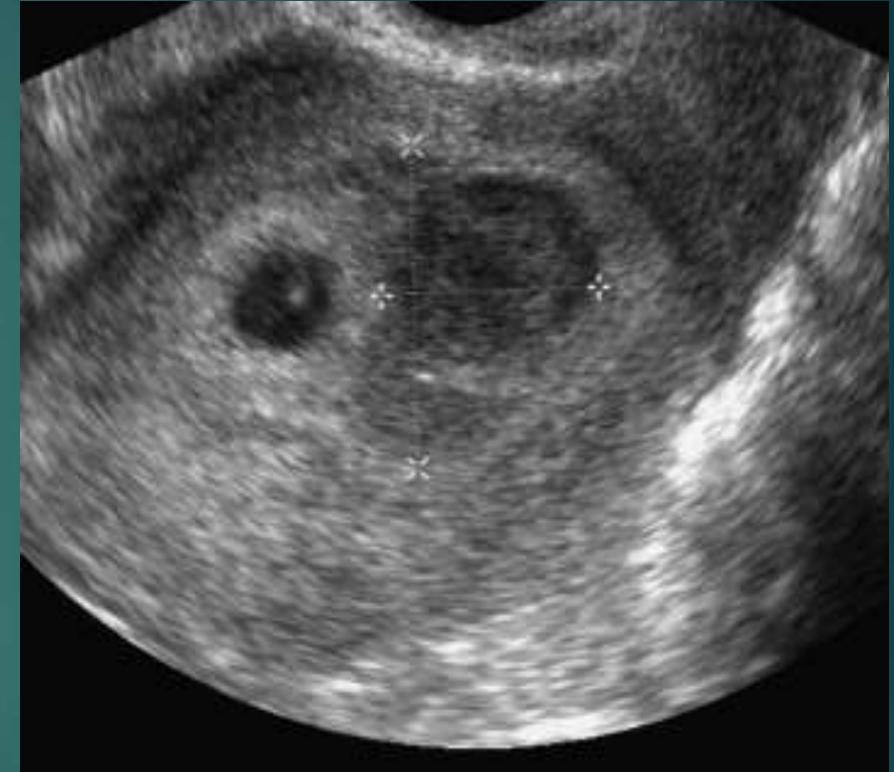
- ▶ centrally located in the uterine cavity (a true sac is eccentric), has sharp angulations, and has an absent double decidual sign without a yolk sac.



Sagittal and transverse sonogram of the uterus shows no embryonic pole. The absence of a yolk sac suggests an anembryonic gestation.

SUBCHORIONIC HEMORRHAGE

- ▶ Bleeding resulting in marginal abruption with separation of the chorion from the endometrial lining.
- ▶ The separation can extend to the margin of the placenta.
- ▶ On sonography, subchorionic hemorrhage is either hypoechoic or hyperechoic depending on the age of the blood products at the time of the scan

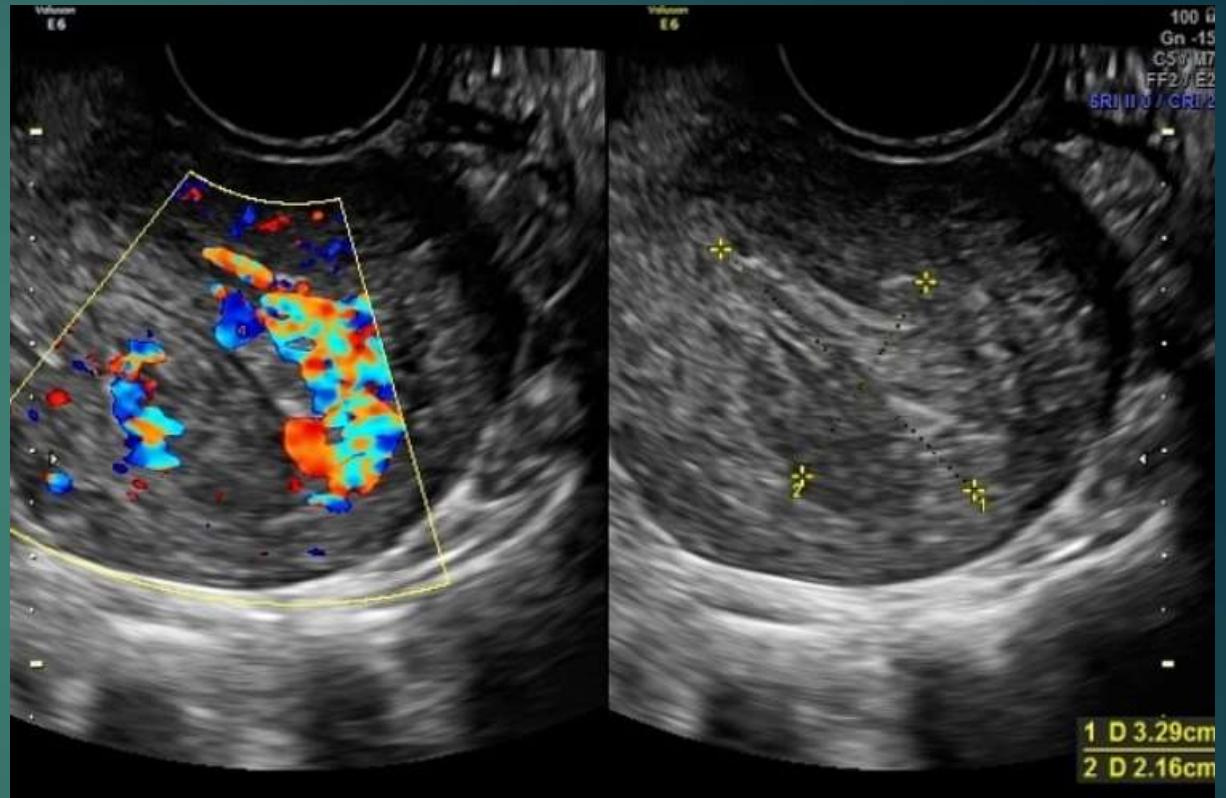


SUBCHORIONIC HEMORRHAGE



RETAINED PRODUCT OF CONCEPTION

- ▶ Persistent vaginal bleeding after an abortion may be due to retained trophoblastic tissue.
- ▶ thickened endometrial lining >8 mm and with or without hypoechoic material in the endometrial cavity
- ▶ a variable amount of echogenic or heterogeneous material within the endometrial cavity
- ▶ presence of vascularity within the endometrial echogenic material



Thickened endometrium with increased vascularity within suggestive of retained products of conception

RETAINED PRODUCT OF CONCEPTION



ECTOPIC PREGNANCY

- ▶ Defined as a pregnancy that occurs outside the uterine cavity.
- ▶ Risk factors for Ectopic Pregnancy
 1. tubal abnormality
 2. Previous tubal pregnancy
 3. History of tubal reconstructive surgery
 4. Pelvic inflammatory disease
 5. Intrauterine contraceptive device
 6. Increased maternal age
 7. Increased parity
 8. Previous cesarean section

Ectopic pregnancy

- ▶ CLASSICAL TRIAD
 - seen in only 45% of patients

Abnormal vaginal
bleeding



SPECIFIC SONOGRAPHIC FINDING IN ECTOPIC PREGNANCY

- ▶ Most definitive - visualization of an extrauterine GS with a yolk sac or an embryo.
- ▶ In the normal GS, the intradecidual sign and the double decidual sign used to identify an intrauterine pregnancy before visualization of the yolk sac or the embryo; however, it is to be distinguished from pseudogestational sac of ectopic pregnancy

NON - SPECIFIC SONOGRAPHIC FINDING IN ECTOPIC PREGNANCY

ADNEXAL MASS

- ▶ fallopian tube - most common location for ectopic pregnancy
- ▶ Produce solid or heterogeneous mass in the adnexa comprised mostly of blood products from bleeding into the wall and lumen of the fallopian tube.
- ▶ Containing a tubal ring with or without central identifying features such as yolk sac or embryo.
- ▶ Other causes of adnexal mass, hemorrhagic corpus luteum cyst, endometriosis and abscess

Tubal ring

- ▶ Concentric ring created by the trophoblast of the ectopic pregnancy surrounding the chorionic sac.
- ▶ More echogenic than ovarian parenchyma and endometrium.
- ▶ Hyperemic (showing ring of fire) on Color Doppler

Corpus luteal cyst

- ▶ Eccentrically located with a rim of ovarian tissue.
- ▶ Echogenic or less echogenic than ovarian parenchyma and endometrium.
- ▶ hyperemic and more common than ectopic pregnancy

FREE FLUID:

- ▶ Presence of echogenic free fluid or blood clots in the posterior cul-de-sac without sonographic evidence of an IUP
- ▶ Found in high quantities or in association with an adnexal mass
- ▶ Indicates a high risk of ectopic pregnancy (also be seen in cases of ruptured corpus luteum cyst).

Endometrium:

- ▶ No specific endometrial appearance or thickness distinguish ectopic pregnancy from an early IUP.
- ▶ The most common appearance of the endometrium is normal or a generalized increased echogenicity due to decidual reaction.
- ▶ Pseudo gestational sacs are endometrial fluid collections surrounded by echogenic endometrium from a prominent decidual reaction.

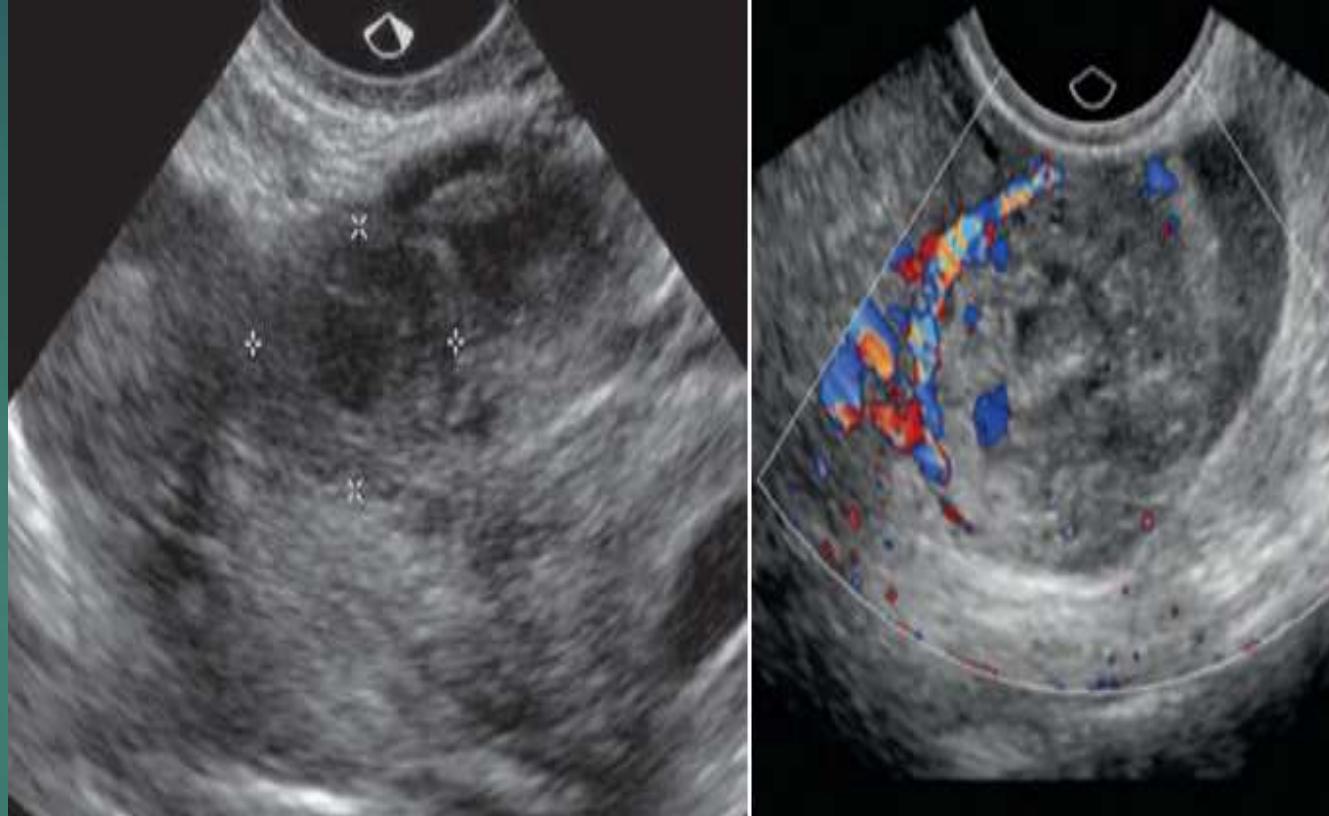
IMPLANTATION SITES

- ▶ 95% occur in the ampullary or isthmic portions of the fallopian tube.
- ▶ Second most common site is an interstitial pregnancy- occurring in the intramural portion of the tube, where it traverses the wall of the uterus to enter the endometrial canal
- ▶ Implantation in the superior lateral portion of the endometrial canal but not within the intramural portion of the tube is normal and is not an ectopic pregnancy. but echogenic endometrium can be seen around the sac (double-decidua sign)

IMPLANTATION SITES

Fallopian tube

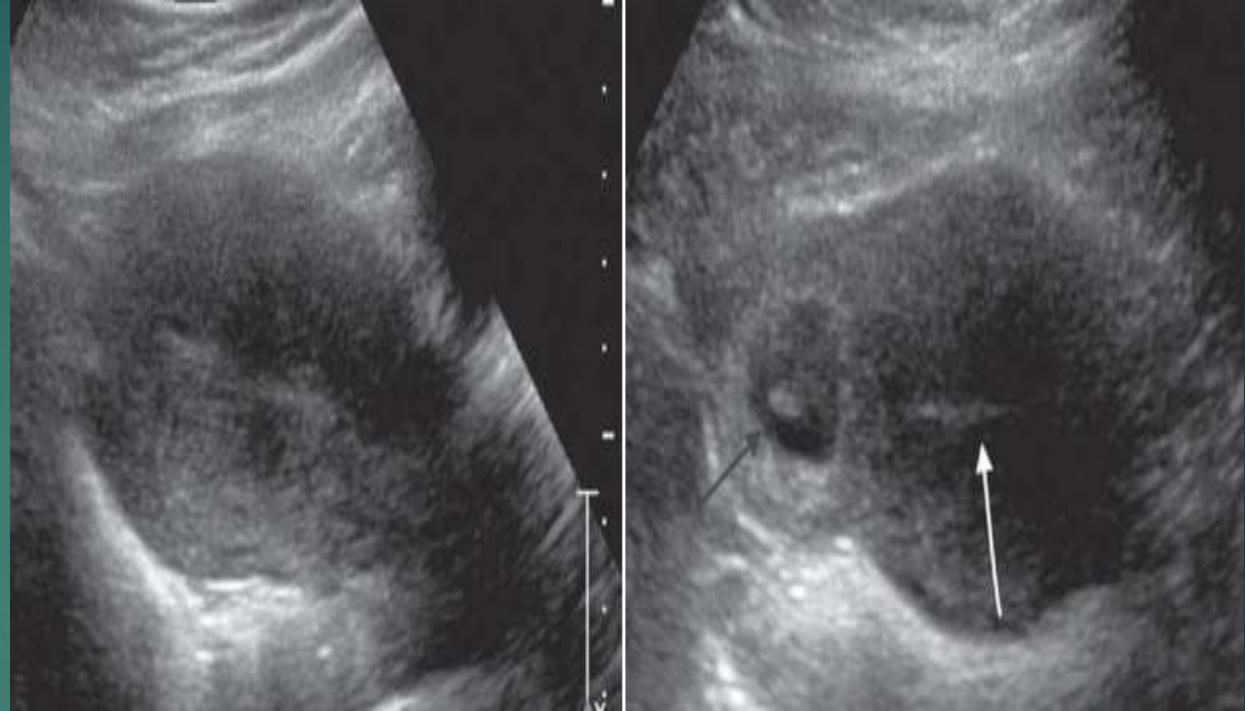
- ▶ The tubal ring in the adnexa - sonographic sign
- ▶ Echogenic fluid in the cul-de-sac - important feature of ectopic pregnancy



Tubal Findings in Ectopic Pregnancy. left adnexa shows an extraovarian tubal mass (calipers). Color Doppler demonstrates concentric low around the mass. Hypoechoic material surrounds the tubal ring consistent with hematoma. ectopic mass (thin arrows) inferior to the ovary (dashed arrow).

Interstitial or Corneal Pregnancy

- ▶ **Implantation of the GS in the proximal portion of the fallopian tube that is within the muscular wall of the uterus.**
- ▶ **an eccentric location of the GS with a thin or incomplete myometrial mantle around the sac**
- ▶ **The thickness of the surrounding myometrial mantle is generally <5 mm**



Sagittal image shows unremarkable endometrial stripe.
Transverse TAS shows a gestational sac containing an embryo (black arrow) eccentrically positioned within the uterus, separate from the endometrial stripe (white arrow).

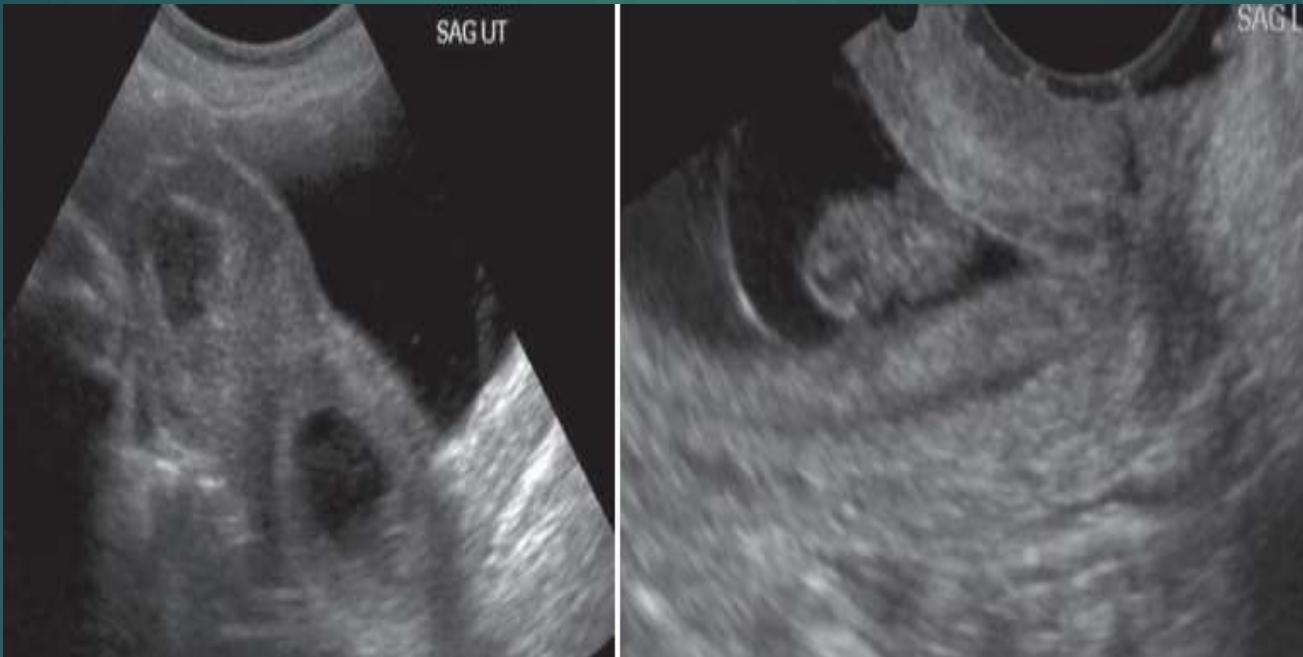
Cervical Pregnancy

- ▶ The GS is round or oval, (in a cervical abortion is crenated)
- ▶ Peritrophoblastic flow on Doppler sonography

Ovarian Pregnancy

- ▶ location of the GS in the region of the ovary
- ▶ attachment of the ectopic gestational gestation to the uterus by the ovarian ligament
- ▶ intact ipsilateral fallopian tube
- ▶ the presence of ovarian tissue in the GS wall.
- ▶ In transvaginal sonography, well-defined echogenic ring that is indistinguishable from a corpus luteum cyst.

Cervical ectopic Pregnancy



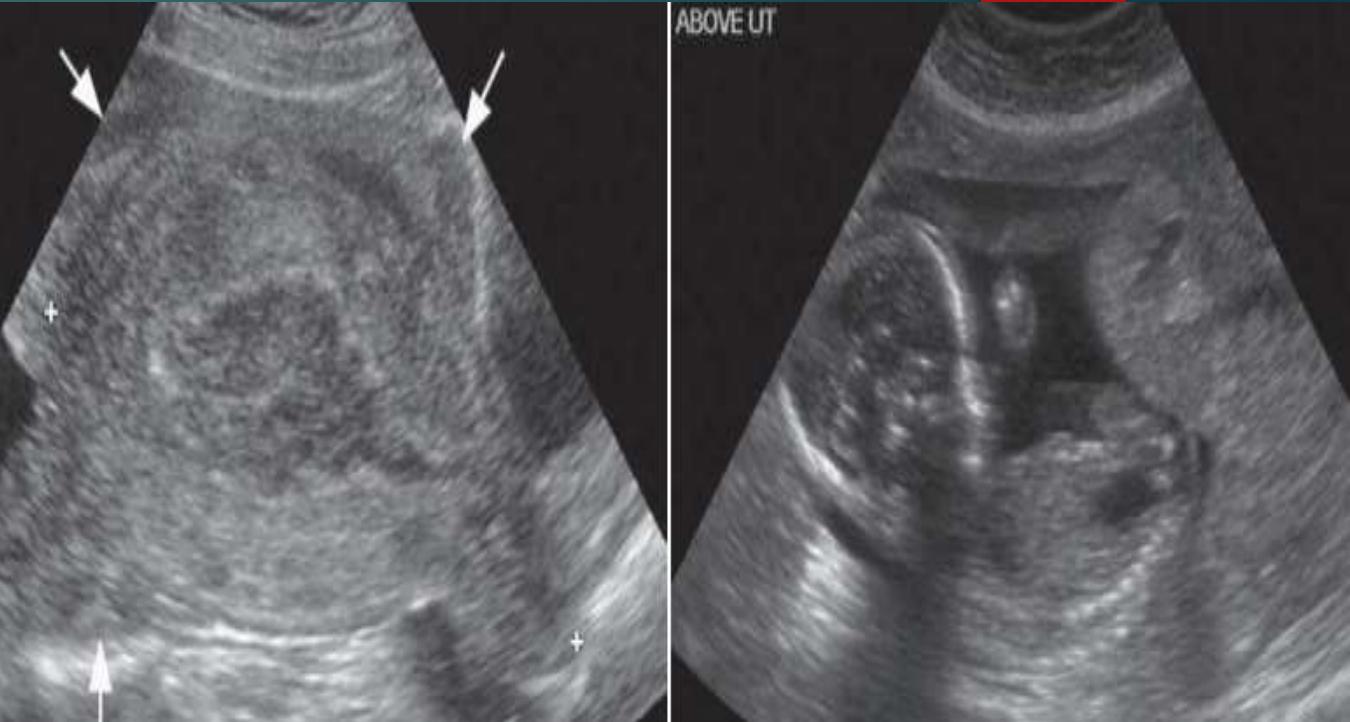
TAS sagittal view of the uterus shows a pseudogestational sac in the endometrium.

A second fluid collection is seen in the cervix secondary to the gestational sac.

Sagittal TVS of the cervix shows a gestational sac containing an embryo.

Abdominal ectopic pregnancy

- ▶ Intrabdominal pregnancy secondary to expulsion of the GS following a tubal abortion or minor rupture of a tubal pregnancy.
- ▶ also be a primary event with implantation at the pouch of Douglas, posterior uterine wall, uterine fundus, liver, spleen, lesser sac of the peritoneal cavity, or diaphragm.
- ▶ uterus appears empty and the fetus is seen in the maternal abdominal cavity.



Sagittal TAS demonstrates a mildly enlarged uterus with an endometrial cavity distended with blood. Blood is also seen surrounding the uterus (arrows). TAS superior to the uterine fundus demonstrates abdominal ectopic pregnancy.

Ovarian ectopic pregnancy with ring of fire appearance

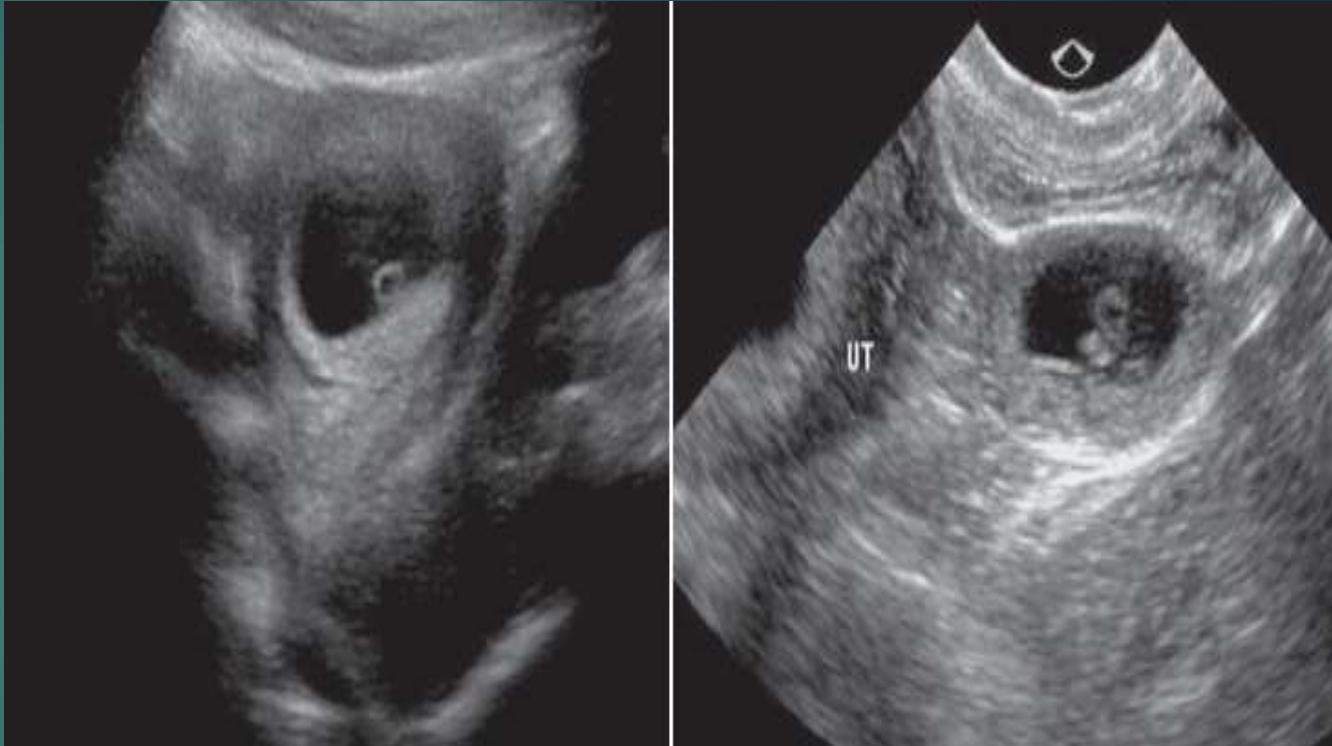


CHRONIC ECTOPIC PREGNANCY

- ▶ form of tubal pregnancy
- ▶ Gradual disintegration of the tubal wall with slow and/or repeated episodes of hemorrhaging leading to the formation of a pelvic mass.
- ▶ Blood, trophoblastic tissue, and disrupted tubal tissue in the peritoneal cavity causes an inflammatory response, resulting in adhesions and hematoma formation.
- ▶ The sonographic appearance - A complex adnexal mass without an intrauterine pregnancy, positive serum b-hCG assay

HETEROTOPIC PREGNANCY

- ▶ simultaneous occurrence of 2 or more implantation sites - concomitant intrauterine pregnancy and ectopic pregnancy.
- ▶ Risk factors: pelvic inflammatory disease, common use of ovarian stimulation, and assisted reproductive techniques



intrauterine gestational sac containing a yolk sac.
extrauterine gestational sac in the left adnexa.
UT, Uterus.

B-hCG Levels

- ▶ Improves the ability of sonography - distinguish between an intrauterine and an ectopic pregnancy.
- ▶ A negative b-hCG excludes the presence of a live pregnancy.
- ▶ transabdominally, b-hCG level of 1,800 mIU/ml - threshold for visualization of a normal intrauterine GS
- ▶ 1,000 mIU/ml threshold for transvaginal sonography.
- ▶ serial quantitative b-hCG levels helpful in distinguishing between ectopic,pregnancy, abortion, and early intrauterine pregnancy.
- ▶ The b-hCG level in a normal pregnancy has a doubling time of approximately 2 days.
- ▶ In an aborting gestation have falling b-hCG levels.
- ▶ Patients with ectopic pregnancy may have a slower increase in b hCG levels.

GESTATIONAL TROPHOBLASTIC DISEASE

- ▶ Spectrum of medical conditions including hydatidiform mole, invasive mole, and choriocarcinoma.
- ▶ Clinical signs and symptoms include rapid uterine enlargement, excessive uterine size for gestational date, and hyper-emesis gravidarum or pre-eclampsia that occurs before 24 weeks.
- ▶ The common feature for this is the abnormal proliferation of trophoblastic tissue with excessive production of b-hCG.

Hydatidiform molar pregnancy

- ▶ Most common and benign form of gestational trophoblastic disease
- ▶ Characterized histologically by cystic (hydatidiform) degeneration of chorionic villi, with absent or inadequate vascularization and abnormal trophoblastic proliferation.
- ▶ Serum β -hCG levels abnormally elevated greater than 100,000 mIU/mL.
- ▶ The ovaries may be greatly enlarged with bilateral theca lutein cysts. large, usually multilocular, and may undergo hemorrhage or torsion and can be a source of pelvic pain.
- ▶ Theca lutein cysts are most marked when trophoblastic proliferation is severe, and when hCG is elevated.

- ▶ Hydatidiform molar pregnancy is classified as either complete molar pregnancy or partial molar pregnancy on the basis of cytogenetic and pathologic features.

Complete Molar Pregnancy

- ▶ characterized by a diploid karyotype of 46,XX with the chromosomal DNA being exclusively paternal in origin.
- ▶ occurs when an ovum with absent or inactive maternal chromosomes is fertilized by a normal haploid sperm.
- ▶ Occasionally, fertilization of an empty ovum by two haploid sperm results in a 46,XY pattern.
- ▶ no fetal parts are seen and placenta is entirely replaced by abnormal, hydropic chorionic villi with excessive trophoblastic proliferation.

Classic sonographic features

- ▶ an enlarged uterus with a central heterogeneous echogenic mass that expands the endometrial canal.
- ▶ mass contains multiple cystic spaces of varying size, representing the hydropic villi
- ▶ “snowstorm” pattern / “bunch of grapes.”

Partial molar pregnancy

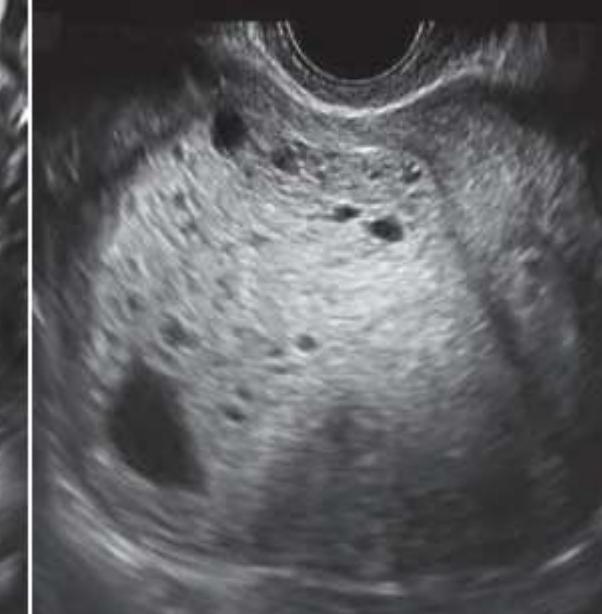
- ▶ triploid karyotype of 69,XXX, 69,XXY, or 69,XYY - "triploidy." Most partial moles have one set of maternal chromosomes and two sets of paternal chromosomes, resulting from fertilization of a normal ovum by two haploid sperm.
- ▶ well-developed but anomalous (triploid) fetal tissues.
- ▶ Hydropic degeneration of placental villi is focal, interspersed with normal placental villi



Complete Molar
Pregnancy



Partial Molar Pregnancy



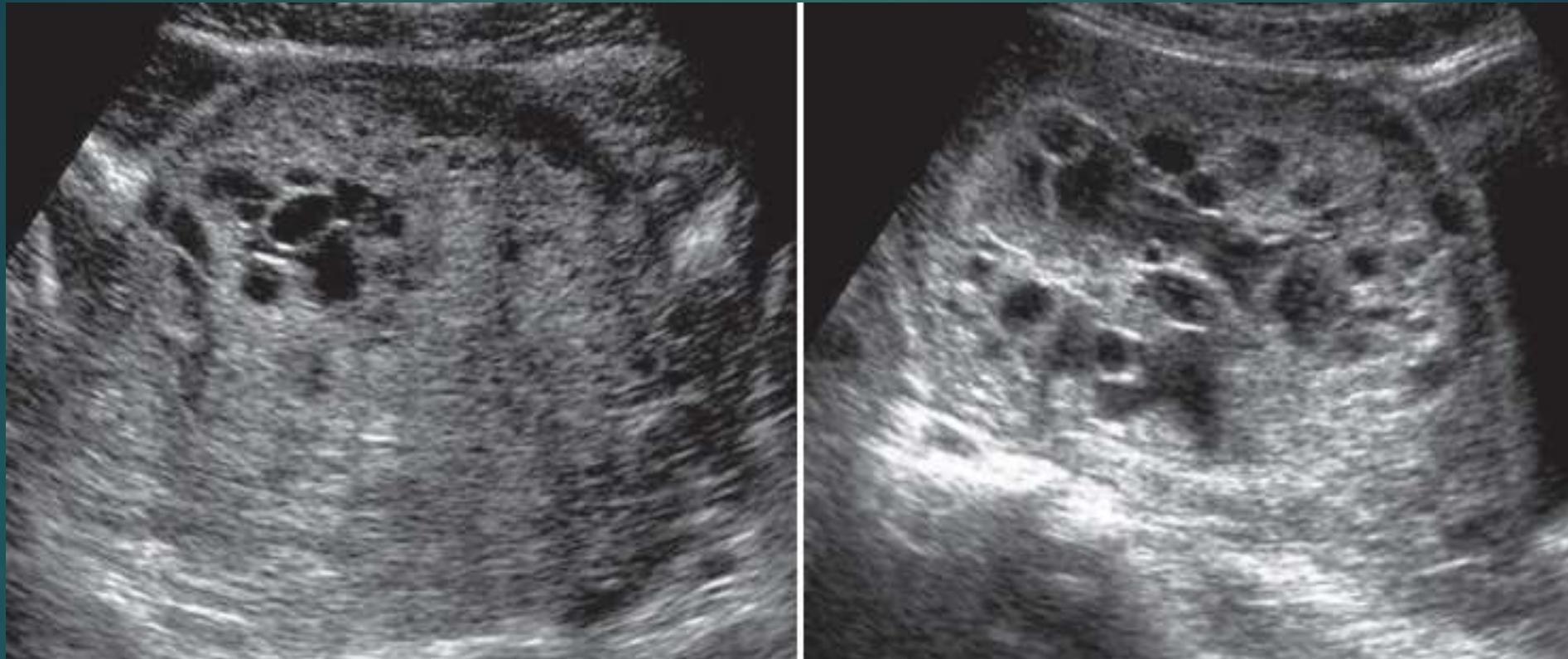
Persistent Trophoblastic Neoplasia

- ▶ life-threatening complication of pregnancy that includes invasive mole and choriocarcinoma
- ▶ PTN occurs most after molar pregnancy
- ▶ Complete moles with severe degrees of trophoblastic proliferation are at the highest risk.

Invasive Mole

- ▶ most common form of PTN
- ▶ vaginal bleeding and persistent elevation of serum hCG within 1 to 3 months after molar evacuation.
- ▶ characterized by the presence of formed chorionic villi and trophoblastic proliferation deep in the myometrium
- ▶ biologically benign and is usually confined to the uterus; in rare cases, penetrate the whole thickness of the myometrium, leading to uterine perforation and severe hemorrhage.

Invasive Mole



Images show large mass filled with multiple cystic spaces extending deep into the myometrium

Choriocarcinoma

- ▶ extremely rare malignancy
- ▶ purely cellular lesion characterized by the invasion of the myometrium by abnormal, proliferating trophoblast and the absence of formed villi. Hemorrhage and necrosis are prominent features. Early vascular invasion resulting in distant metastases, most frequently affecting the lungs > liver, brain, gastrointestinal tract, and kidney.
- ▶ Venous invasion and retrograde metastases to the vagina and pelvic structures

Choriocarcinoma

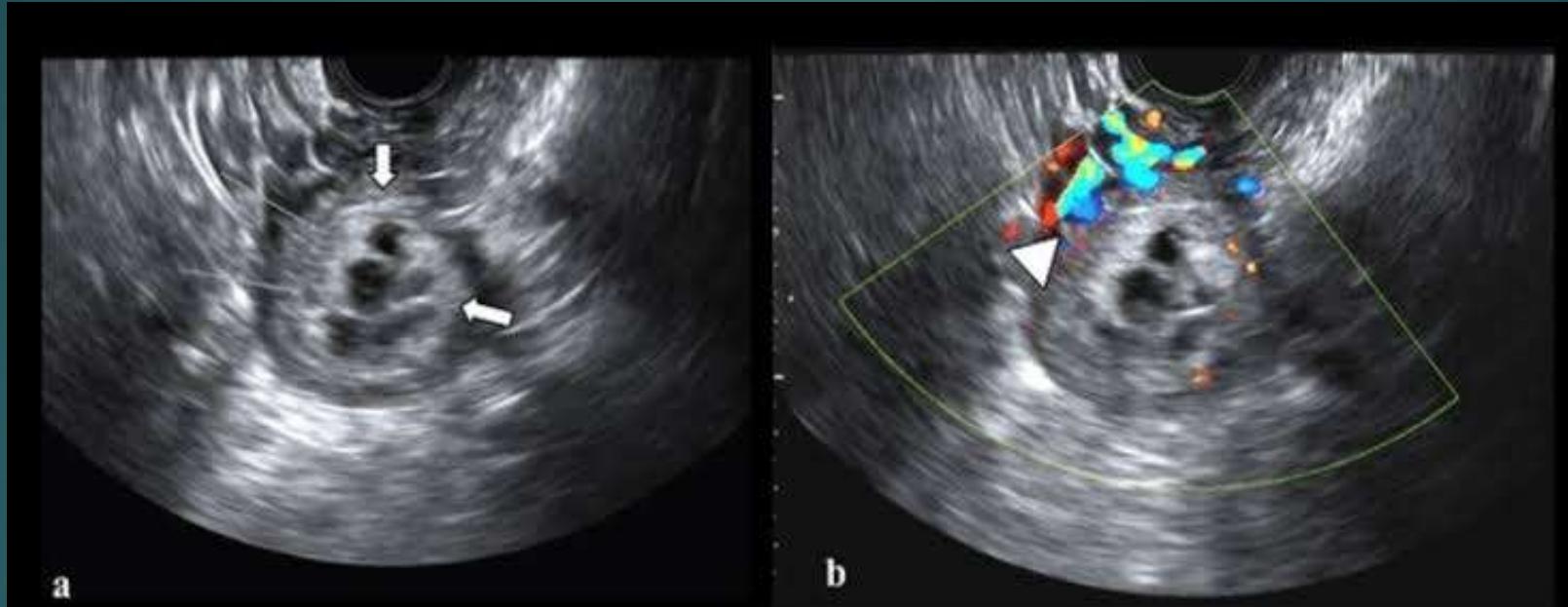


Figure 6: Choriocarcinoma (a) Transverse transvaginal sonography (TVS) image of the uterus shows infiltrative heterogeneous mass distending the uterine cavity (thick arrows) and ill definition of the myometrium in the right side (thin arrows) indicative of invasion of the myometrium. (b) Color flow Doppler shows areas of increased vascularity mainly in the right side (arrowhead).



THANK YOU