

Placenta and Umbilical Cord

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Relevant Financial Relationships: None

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Learning Objectives

After completing this presentation, the learner will be able to:

1. Discuss the normal appearance of the placenta and umbilical cord.
1. Understand the normal development of the placenta and umbilical cord.
2. Be able to identify abnormalities of the placenta and umbilical cord.

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Introduction

The placenta and umbilical cord mature throughout gestation, and knowledge of the normal and changing appearance will allow the identification of placental and umbilical cord abnormalities when they are present.

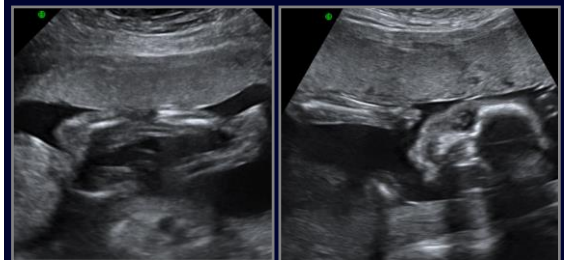
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Lecture Outline

- Normal placental appearance/3D
- Bilobed placentae/succenturiate lobes
- Circumvallate placenta
- Molar pregnancy
- Placental cysts/infarctions/abruptions
- Placental chorioangiomas
- Placenta previa
- Normal umbilical cord appearance
- Nuchal cords
- Single umbilical artery
- Umbilical cord cysts
- Uncoiled umbilical cords
- Velamentous umbilical cord insertions
- Vasa previa

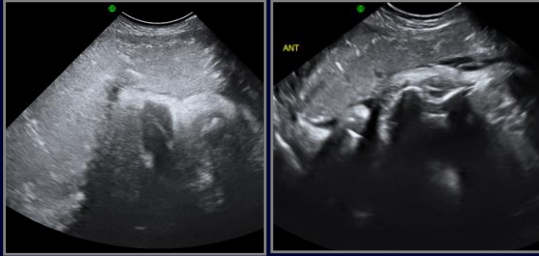
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Normal Placental Appearance Second Trimester



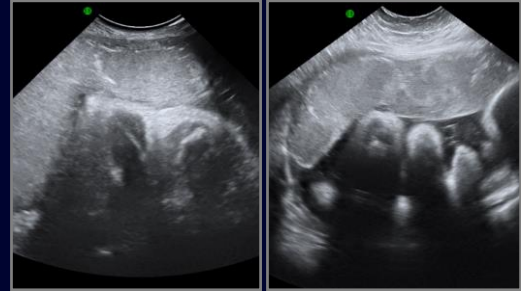
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Normal Placental Appearance
Third Trimester: Scattered Calcifications



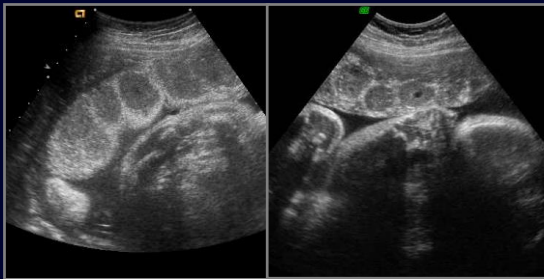
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Normal Placental appearance
Third Trimester: Increasing Calcifications



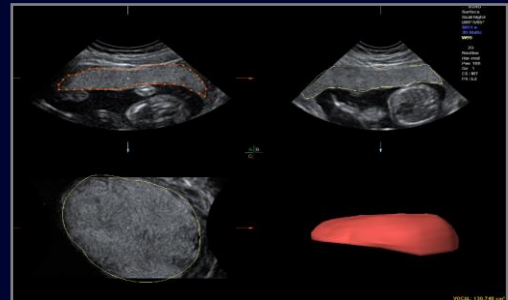
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Normal Placental Appearance
Late Third Trimester: Cotyledons Well Defined



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Normal Placental Appearance
3D Assessment of Placental Size



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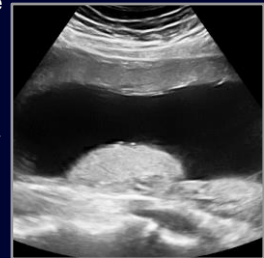
Normal Placental Appearance
3D Assessment of Placental Size

- First trimester placental volumes (PV) correlate with birth weight and placental weight.
Effendi et al Plac 2014; de Almeida et al JUM 2014
- Small first trimester PV are associated with abnormal uterine artery perfusion.
Hafner et al Plac 2001
- First trimester PV + uterine artery velocimetry may help identify women at risk for hypertension, placental abruption, and fetal growth restriction.
Schuchter et al UOG 2001; Rizzo et al EJOGRB 2008

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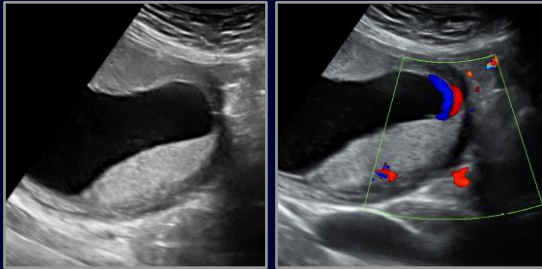
Gross Placental Abnormalities
Succenturiate Lobe of the Placenta

- Accessory lobes of the placenta can occur in up to 5% of pregnancies.
- They are a cause of retained placenta after delivery.
- There must be some vascular connection between the placenta and accessory lobe.



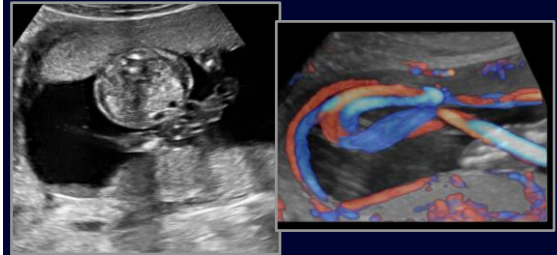
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Gross Placental Abnormalities Succenturiate Lobe of the Placenta



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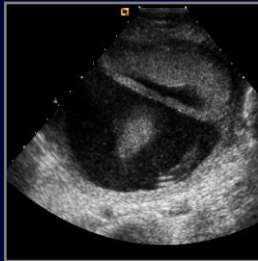
Gross Placental Abnormalities Bilobed Placenta



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Gross Placental Abnormalities Circumvallate Placenta

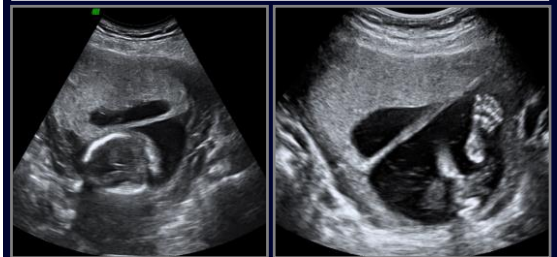
- Partial circumvallate placentae are common and should be seen as normal variants.
- Complete circumvallate placentae are rare and are associated with adverse neonatal outcome.



Shen et al OG 2007; Suzuki JOGR 2008

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Gross Placental Abnormalities Circumvallate Placenta



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Gross Placental Abnormalities Complete Circumvallate Placenta



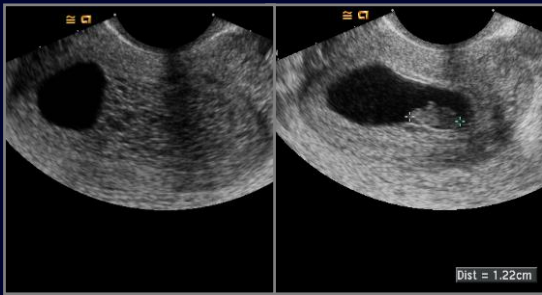
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Placental Lesions Complete Molar Gestation



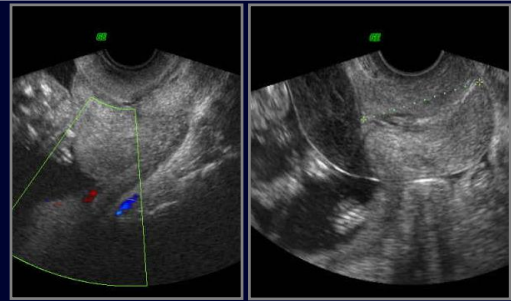
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Placental Lesions Partial Molar Gestation



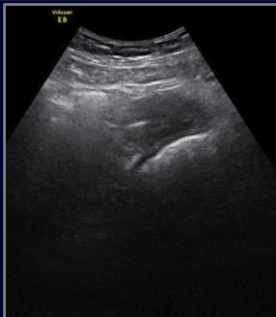
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Placental Lesions Subchorionic Hematoma and Follow-up



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Placental Lesions Subchorionic Hematoma



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Placental Lesions Intraplacental Cysts

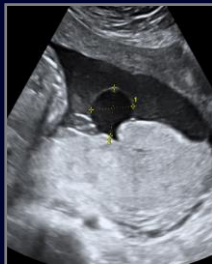
- By term, most pregnancies will have at least 1 placental cyst.
- Typically these are benign findings, even when large.
- They should be correlated with number, size, and presence of maternal disease.



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Placental Lesions Placental Surface Cysts

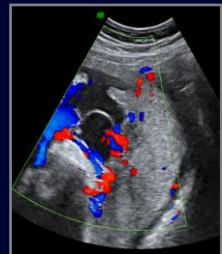
- Subchorionic placental cysts are usually more sonolucent than amniotic fluid and are almost always benign findings.
- Most fetuses will have normal outcomes.
- Large cysts (>4.5 cm) can be associated with fetal growth restriction.



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Placental Lesions Placental Surface Cysts

- They are commonly located near the placental umbilical cord insertion.
- Correlation with maternal disease, especially vascular disease, is also recommended.
- Maternal floor infarction is also associated with these cysts.



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Placental Lesions Maternal floor infarction

- Diffuse pathology with fibrinoid deposition at basal plate and maternal surface.
- Hyperechoic areas will organize and become hypoechoic spaces.
- Basal plate calcifications can develop.



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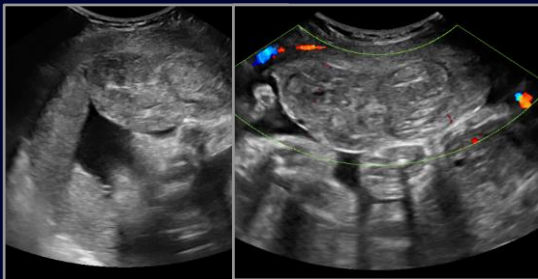
Placental Lesions Placental Infarctions

- Occur throughout the placenta and are common at term.
- If >3 cm or involve >5% of the placenta, there is increased perinatal morbidity.
- Maternal and fetal thrombophilias can be etiologically associated.



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Gross Placental Abnormalities Placental Abruption



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Gross Placental Abnormalities Placental Abruption

- Typically present with pain and bleeding in third trimester.
- 0.5% of pregnancies.
- Acute clots can be difficult to diagnose, as they have a similar echogenicity as the placenta.
- Over time, they become more organized.



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Gross Placental Abnormalities Placental Abruption



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Gross Placental Abnormalities Preplacental Hematoma

- Rare condition.
- Associated with maternal hypertension.
- Fetal blood on fetal surface of placenta.
- When very large, termed Breus mole.



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Gross Placental Abnormalities Preplacental Hematoma



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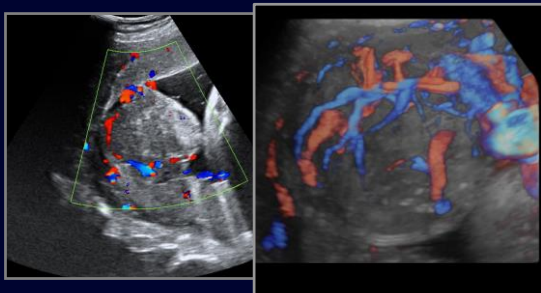
Gross Placental Abnormalities Chorioangioma of the Placenta

- Most common benign tumor of the placenta, occurring in approximately 1% of pregnancies.
- When large (>5 cm), they can be associated with high-output heart failure, anemia, hydrops, and fetal death.



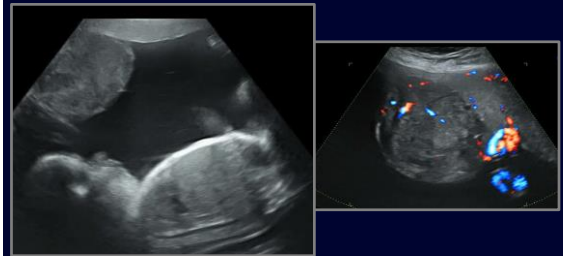
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Gross Placental Abnormalities Chorioangioma of the Placenta: Color Doppler



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Gross Placental Abnormalities Chorioangioma of the Placenta



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Gross Placental Abnormalities Placenta Previa: Definitions

- Ultrasound is vital to the diagnosis:
 - Complete previa: placenta covers the internal cervical os.
 - Marginal previa: placenta encroaches on the internal cervical os, lying within 1 cm of the internal cervical os.
 - Low-lying placenta: placenta lies within 2 cm of the internal cervical os.

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Gross Placental Abnormalities Placenta Previa

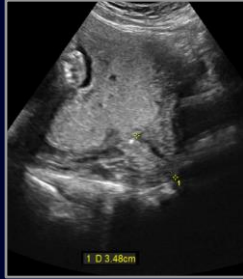
- Transvaginal sonography is safe and indispensable for diagnosing placenta previa.
- Follow-up sonography is frequently necessary, as many with low-lying placentae will migrate away from the internal cervical os by term.



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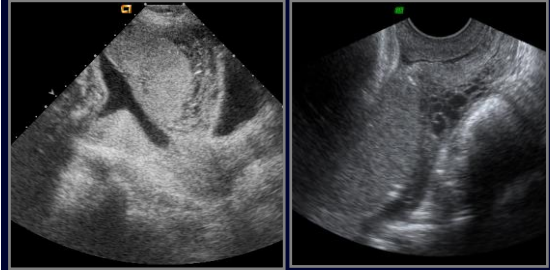
Gross Placental Abnormalities Complete Placenta Previa

- Placenta previa refers to a placenta that is “previous” to the fetus.
- Bleeding is the hallmark.
- Accurate diagnosis is critical for optimizing the outcome for mother and fetus.



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Gross Placental Abnormalities Marginal Placenta Previa



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Gross Placental Abnormalities Low Placenta

- Low-lying placentae are common in the second trimester as the placenta occupies a relatively larger portion of the uterus.
- The term “low-lying” is used for placentae in the second trimester when the internal cervical os is not precisely seen, yet the placenta is proximate to the cervix.



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Gross Placental Abnormalities Low Placenta/Placenta Previa

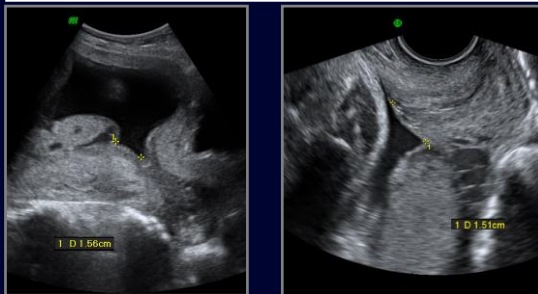
- Risk factors for persistent placenta previa include advanced maternal age, increasing parity, increasing number of prior Cesarean deliveries, and a prior spontaneous or induced abortion.



Ananth et al AJOG 1997; Faiz et al JMFNM 2003

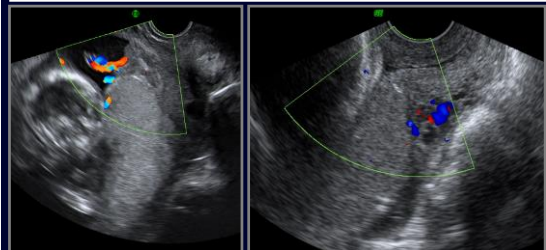
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Gross Placental Abnormalities Low Placenta



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Gross Placental Abnormalities Placenta Previa: Color Doppler



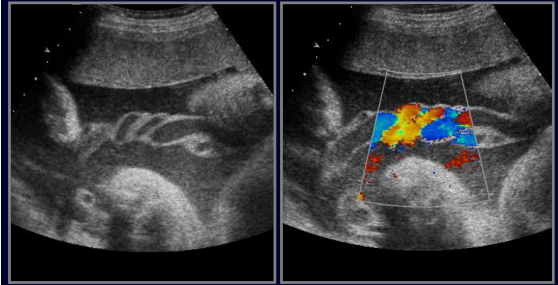
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Gross Placental Abnormalities
Placenta Accreta



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Normal Placental Appearance
Normal Umbilical Cord



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Normal Placental Appearance
Umbilical Cord Insertion: First Trimester



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Normal Placental Appearance
Umbilical Cord Insertion: Second Trimester



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Normal Placental Appearance
Umbilical Cord Insertion: Third Trimester



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Umbilical Cord Abnormalities
Normal Umbilical Cord Anatomy

- Blood flow in the umbilical cord can be documented using Doppler imaging.
- Color Doppler demonstrates the difference in the arteries (red) and vein (blue) since flow is directionally assessed.



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Umbilical Cord Abnormalities

Two-Vessel Umbilical Cord

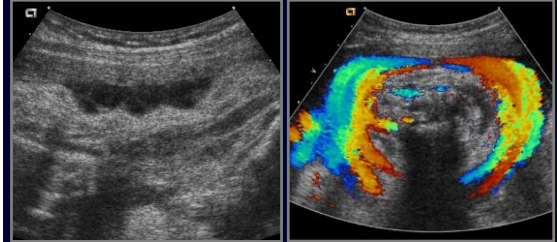
- Assessing the arteries as they course around the bladder is an easy way of documenting the number of umbilical arteries.
- Two-vessel umbilical cords are associated with structural defects, aneuploidy, and growth restriction.



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Umbilical Cord Abnormalities

Nuchal Cord

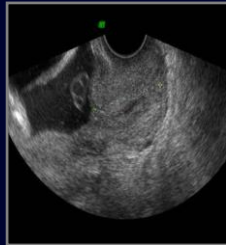


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Umbilical Cord Abnormalities

Funic Presentation

- A funic presentation is diagnosed when the umbilical cord is presenting.
- Management must be individualized depending on gestational age, fetal position, and labor.



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Umbilical Cord Abnormalities

Umbilical Cord Cyst

- Umbilical cord cysts can be seen throughout gestation.
- Most occur near the fetus.
- They are associated with structural defects and aneuploidy, especially trisomies 13 and 18.



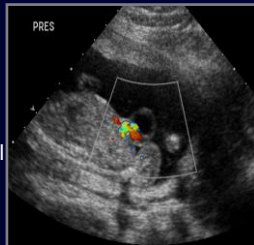
Shipp et al IJGO 1995; Ghezzi et al UOG 2003

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Umbilical Cord Abnormalities

Umbilical Cord Cyst

- Genitourinary and gastrointestinal abnormalities are the most common defects seen with cord cysts.
- A detailed structural fetal survey and correlation with serum screening should occur when umbilical cord cysts are identified.



Tong et al PD 2007; Sepulveda et al UOG 2003

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Umbilical Cord Abnormalities

Uncoiled Umbilical Cords

- Uncoiled umbilical cords are associated with single umbilical arteries, multiple gestations, smaller fetal size, and fetal demise.
- Assessment of the degree of coiling in the second trimester does not correlate well with that seen at term.



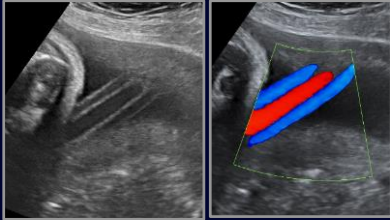
Lacro et al AJOG 1987; Otsubo et al JCU 1999; Strong et al OG 1993; Qin et al UOG 2002

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Umbilical Cord Abnormalities Uncoiled Umbilical Cords

- Umbilical cord index = cord length / # helices.
- Mean UCI is 0.44 antenatally and 0.28 after delivery.

Degani et al OG 1995



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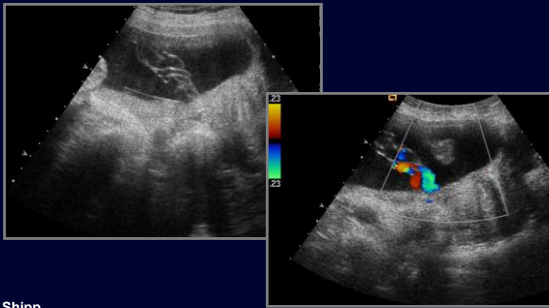
Umbilical Cord Abnormalities Marginal Umbilical Cord Insertion

- A marginal cord insertion occurs when the umbilical cord inserts into the placental margin.
- AKA battledore placenta
- 7% of normal singleton pregnancies.
- More common in multiple gestations and SUA.



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Umbilical Cord Abnormalities Velamentous Umbilical Cord Insertion



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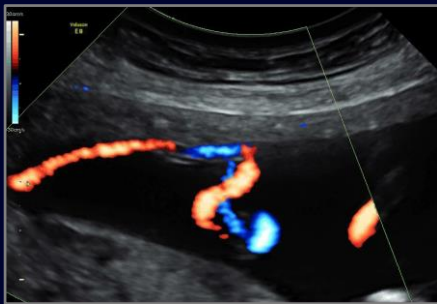
Umbilical Cord Abnormalities Velamentous Umbilical Cord Insertion

- Seen in 1% of normal singleton pregnancies.
- Velamentous umbilical cord insertions can be identified in the vast majority of scans.
- Associated with SUA, fetal growth restriction, preterm delivery, structural defects, neonatal death, and retained placentae.



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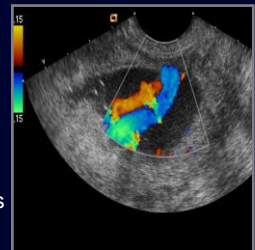
Umbilical Cord Abnormalities Velamentous Umbilical Cord Insertion



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Umbilical Cord Abnormalities Velamentous Umbilical Cord Insertion

- More recent data suggest that velamentous umbilical cord insertions are associated with intrapartum fetal heart rate abnormalities, especially with insertions low in the uterus, and with increasing length of unsupported vessels.



Hasegawa et al IJGO 2005

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Umbilical Cord Abnormalities Furcate Umbilical Cord Insertions

- The umbilical cord vessels can prematurely divide prior to insertion into the membranes, aka "Mangrove sign".

Kuwata et al UOG 2012



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Umbilical Cord Abnormalities Vasa Previa

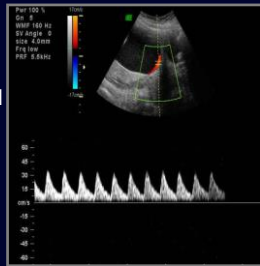
- A vasa previa occurs with umbilical vessel(s) overlying the internal cervical os.
- Vasa previa is a cause of painless vaginal bleeding, especially late in gestation.
- Fetal death can quickly result from exsanguination.



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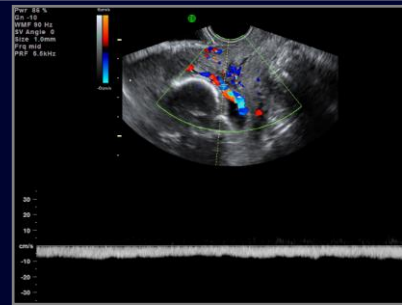
Umbilical Cord Abnormalities Vasa Previa

- Risk factors for vasa previa include: velamentous cord insertions, marginal cord insertions, especially with aberrant vessels, bilobed or succenturiate placental lobes, prior low-lying placentae, multiple gestations, and in vitro fertilization.



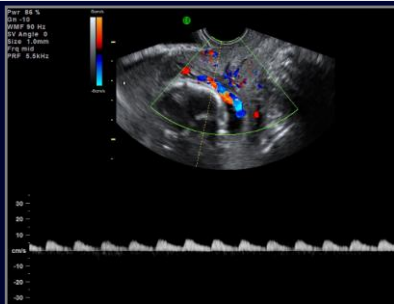
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Umbilical Cord Abnormalities Vasa Previa: Venous Flow



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Umbilical Cord Abnormalities Vasa Previa: Arterial Flow



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Umbilical Cord Abnormalities Vasa Previa

- When any of the risk factors for vasa previa are identified, at a minimum, the internal cervical os should be evaluated to determine whether a vasa previa is present.
- There should be a low threshold for use of the transvaginal probe.



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Conclusions

- Many of the abnormalities with the placenta and umbilical cord can be identified with prenatal sonography.
- A basic understanding of placental structure and function is vital to determine the context in which to interpret normal and abnormal findings of the placenta.
- Umbilical cord abnormalities can be associated with adverse perinatal outcomes.

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Key References

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