Learning Objectives

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

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

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.

Lecture Outline

- Normal placental appearance
  - 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

Normal Placental Appearance

Second Trimester
**Normal Placental Appearance**

*Third Trimester: Scattered Calcifications*

**Normal Placental appearance**

*Third Trimester: Increasing Calcifications*

**Normal Placental Appearance**

*Late Third Trimester: Cotyledons Well Defined*

**Normal Placental Appearance**

*3D Assessment of Placental Size*

**Normal Placental Appearance**

*3D Assessment of Placental Size*

**Normal Placental Appearance**

*3D Assessment of Placental Size*

**Normal Placental Appearance**

*3D Assessment of Placental Size*

**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.

**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

**Normal Placental Appearance**

*3D Assessment of Placental Size*
Gross Placental Abnormalities

Succenturiate Lobe of the 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.

Circumvallate Placenta

Complete Circumvallate Placenta

Complete Molar Gestation

Placental Lesions
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.

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.

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.
**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.

**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.

**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.

*Preplacental Hematoma*
- Rare condition.
- Associated with maternal hypertension.
- Fetal blood on fetal surface of placenta.
- When very large, termed Breus mole.
Gross Placental Abnormalities

Preplacental Hematoma

- 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.

Chorioangioma of the Placenta

- 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.
- 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.
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.

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.

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; Fuz et al JMFNM 2003
Gross Placental Abnormalities
Placenta Accreta

Normal Placental Appearance
Normal Umbilical Cord

Normal Placental Appearance
Umbilical Cord Insertion: First Trimester

Normal Placental Appearance
Umbilical Cord Insertion: Second Trimester

Normal Placental Appearance
Umbilical Cord Insertion: Third Trimester

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.
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.

Two-vessel umbilical cords are associated with structural defects, aneuploidy, and growth restriction.

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

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.

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.
**Umbilical Cord Abnormalities**

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

**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.

**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.

**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.
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

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.

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.

Umbilical Cord Abnormalities

Vasa Previa: Venous Flow

- 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.
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.

Key References


