ISUOG Basic Training
Assessing the Placenta & Amniotic Fluid in Singleton & Twin Pregnancies
Learning objectives

At the end of this session, you will be able to:

• Recognise the differences in ultrasound appearance between placentas that are low lying & those which are not

• Describe how to distinguish between normal & abnormal amniotic fluid volumes in singleton and twin gestations
Key questions

1. What are the key features that should be included in the correct ultrasound assessment & reporting of placental site?
2. How should amniotic fluid be correctly assessed & reported?
3. What fetal conditions are most frequently associated with oligohydramnios?
4. What fetal conditions are most frequently associated with polyhydramnios?
Placenta

- How to evaluate the placenta
- Placenta previa
- Morbidly Adherent placenta
- Placental Abruption
- Placenta in twins
Basic Training

Placenta in the 2nd trimester

- Placental site
- Relationship of placenta to internal cervical os
- Distance from inferior edge of placenta to internal os, for assessment of potential placenta previa
- TV imaging preferable to TA
Placenta in the 2nd trimester

- Transabdominal ultrasound restricted by:
  - need for full bladder
  - maternal BMI or scars
  - uterine contractures

- Transvaginal imaging preferable
- Safety is well established
2nd trimester TV

Normal

Low lying

23 week singleton pregnancy
Anterior placenta
Posterior placenta
Fundal placenta
Placenta previa
Placenta previa

- Placenta covers part or all of the internal cervical os
- Incidence: 5/1,000 deliveries
- 2nd-3rd trimester painless vaginal bleeding, treat as previa until proven otherwise
- Clinical implications
  - Antepartum bleeding, transfusions
  - Hysterectomy
  - Sepsis
  - Maternal death
  - Prematurity, with 3-4 increase in perinatal mortality rate
**Placenta previa**

- Placental edge < 2.0 cm, or covering, internal os from 16 wks
- Resolved with advancing gestation, “placental migration” from lower segment

<table>
<thead>
<tr>
<th>Placenta relative to cervical os</th>
<th>Likelihood of resolution &gt; 26 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covering os by &gt;2cm</td>
<td>0</td>
</tr>
<tr>
<td>&gt; 2.0 cm from os</td>
<td>100%</td>
</tr>
<tr>
<td>&lt; 2.0 cm from os</td>
<td>89%</td>
</tr>
</tbody>
</table>

- 32 weeks TV, still present
- 36 weeks TV

Oppenheimer L et al. UOG 2001;18:103-8
Risk factors for placenta previa

- History of prior Cesarean delivery
- Prior pregnancy termination
- Prior uterine surgery
- Maternal smoking
- Advanced maternal age
- Multiparity
- Cocaine use
- Multiple pregnancy

Pitfalls in diagnosing placenta previa

40 minutes later, note effect of maternal bladder filling
Pitfalls in diagnosing placent previa

20 minutes later, note effect of uterine relaxation
Morbidly adherent placenta

- Abnormal implantation of placenta into the uterine wall
  - Accreta: adherent to the myometrium (75%)
  - Increta: invades the myometrium (18%)
  - Percreta: through the myometrium (7%)
- Associated with massive haemorrhage, transfusion, hysterectomy, multi-system organ failure & maternal death

Prenatal diagnosis essential to optimise maternal-fetal outcomes
Risk factors for placenta accreta

• Placenta previa & prior Cesarean section
• Advanced maternal age
• Multiparity
• Uterine surgery or endometrial ablation
• Leiomyomas
• Uterine anomalies
• Hypertension
• Smoking

Ultrasound findings in placenta accreta

- Gestation sac implanted:
  - In lower uterine segment
  - In cesarean section scar
- Multiple vascular lacunae in 2\textsuperscript{nd} & 3\textsuperscript{rd} trimesters
- Loss of normal hypoechoic retroplacental zone
- Abnormality in uterine-serosa-bladder interface
- Retroplacental myometrial thickness of $< 1$ mm
- Turbulent blood flow with colour Doppler through lacunae
- Extension villi into myometrium, serosa or bladder

Ultrasound findings in placenta accreta

- Loss of hypoechoic retroplacental zone
- Vascular lacunae
Placenta accreta 2\textsuperscript{nd} & 3\textsuperscript{rd} trimester TV
US identification of invasive placentation*

<table>
<thead>
<tr>
<th>Diagnostic Method</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>91%</td>
<td>97%</td>
</tr>
<tr>
<td>Placental lacunae</td>
<td>77%</td>
<td>95%</td>
</tr>
<tr>
<td>Loss of hypoechoic space</td>
<td>66%</td>
<td>96%</td>
</tr>
<tr>
<td>Abnormal uterine bladder interface</td>
<td>50%</td>
<td>99%</td>
</tr>
<tr>
<td>Colour Doppler abnormal</td>
<td>91%</td>
<td>88%</td>
</tr>
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* At risk population: history of uterine surgery with placenta previa or low lying

Placenta abruption

- Bleeding behind or within the placenta
  - Painful uterine or lower back
  - With contractions
- Incidence 0.5-1%
- Hypoechoic subchorionic thickening
- Ultrasound detection rate - 50%
  - Normal ultrasound does not rule out an abruption

Placental separation with active bleeding - materno-fetal emergency, immediate triage required
Placental abruption

Crescent of avascular, low echogenicity between placenta and uterine wall

Case courtesy of Dr Andrew Dixon, Radiopaedia.org, RID: 14281
Twins: amnionicity & chorionicity
Amniotic fluid

- How to evaluate
- Polyhydramnios
- Oligohydramnios
- Twins
Amniotic fluid

- **1\textsuperscript{st} trimester**
  - Production poorly understood
  - Multiple sources (maternal: placenta and membranes)

- **2\textsuperscript{nd} & 3\textsuperscript{rd} trimesters**
  - Fetal urine major contributor, from 16 weeks’ onwards (and lungs)
  - Assessment of AF volume = assessment of fetal well being

- **Abnormal amniotic fluid volume**
  - Increased – polyhydramnios
  - Decreased – oligohydramnios
  - No fluid - anhydramnios
Measuring amniotic fluid

• Measurement of a pocket of amniotic fluid perpendicular to the floor
Technique: minimise pressure
Amniotic fluid index (AFI)

- Sum of deepest vertical pocket from 4 quadrants
- Measure > 16 weeks
- Normal AFI = 5.0 - 24.0 cm
- Oligohydramnios < 5.0 cm
- Polyhydramnios  > 24.0 cm

Deepest vertical pocket (DVP)

- Measure DVP in any quadrant of the uterus
  - Normal 2.0 - 8.0 cm
  - Oligohydramnios < 2.0 cm
  - Polyhydramnios > 8.0 cm

- DVP - diagnosis of oligohydramnios → fewer obstetrical interventions (with no difference in outcome) when compared to AFI

<table>
<thead>
<tr>
<th></th>
<th>Polyhydramnios</th>
<th>Oligohydranyeios</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVP</td>
<td>≥ 8.0cm</td>
<td>&lt;2.0cm</td>
</tr>
<tr>
<td>AFI</td>
<td>≥ 24.0cm</td>
<td>&lt;5.0cm</td>
</tr>
</tbody>
</table>
Polyhydramnios

- Idiopathic
- Maternal diabetes
- Fetal
  - Anemia
  - Structural malformations
  - Chromosomal abnormal
  - Infections
  - Genetic syndromes
  - Complicated twins

- Increased incidence of preterm labor & delivery; abruption
  2-5 fold ↑ perinatal mortality
Oligohydramnios

- PROM - most common reason
- Fetal condition
  - Bladder obstruction
  - Renal failure
- Placental insufficiency - IUGR
- Maternal disorders
  - Hypertension
  - Renal disease
- Multiple pregnancy
  - Twin-twin transfusion syndrome
  - Selective fetal growth restriction
- Other
  - Maternal medication ingestion and substance abuse
  - Infections
- Increased Incidence of
  - Potter Cascade/deformations
  - Fetal heart rate abnormalities
  - Meconium stained fluid

15-50 fold ↑perinatal morbidity & mortality
Keep in mind

- Measure AFI with the transduce held sagitally and perpendicular to the floor
- In case of suspected polyhydramnios, measure all 4 vertical fluid pockets
- In case of oligohydramnios, measure the single deepest vertical pocket
- Look for maternal disease/fetal structural abnormalities with abnormal AFI
- Follow progression closely by ultrasound
Amniotic fluid assessment in twins

- Use DVP **not** AFI

- DVP
  - AFV stable in normal MC & DC twins between 17 & 37 wks
  - Definitions for oligohydramnios & polyhydramnios for twins same as for singletons

- Dichorionic etiologies comparable to those of singletons

- Monochorionic
  - Twin to twin transfusion syndrome (oligo/poly)
  - Selective fetal growth restriction (oligo/normal)
Amniotic fluid assessment in twins

Image adapted from Abuhamad et al. Ultrasound in Obstetrics & Gynecology: A Practical Approach . 2014.
Amniotic fluid assessment in twins

MCDA twin pregnancy

Twin 2 – DVP 2.4mm

Twin 1 – DVP 11.9cm (polyhydramnios)

Diagnosis - twin to twin transfusion syndrome
Key points

1. A placental edge < 2.0 cm from the internal os should be considered an “at risk pregnancy”, additional ultrasound scans are required.

2. Vaginal bleeding with ultrasound evidence of placental separation is an obstetric emergency.

3. Placenta accreta should be excluded in all cases of low anterior placenta with previous Cesarean section.
4. Normal amniotic fluid volume:
   - AFI = 5.0 – 24.0cm
   - MVP = 2.0 – 8.0cm

5. MVP, not AFI, should be used in assessment of amniotic fluid volume in twin pregnancies

5. Polyhydramnios is associated with increased risk of poor outcome due to preterm delivery