Maternal diseases & ultrasound – preterm labor

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Objectives

• To briefly discuss multifactorial etiologies of preterm birth
• To discuss
  • Ultrasound findings associated with uterine overdistension and preterm birth
  • Ultrasound findings associated with premature cervical ripening
  • Ultrasound findings associated with increased risk of inflammatory response
  • Ultrasound findings associated with decidual hemorrhage
• To present technique of transvaginal cervical length assessment
Spontaneous preterm birth

- Premature activation of the maternal or fetal HPA axis
- Uterine overdistension
- Decidual hemorrhage
- Exaggerated inflammatory response/infection

Final common pathway
Uterine overdistention

Due to decreased myometrial volume
Mullerian anomaly

- True incidence in general population is not accurately known
  - Mean prevalence in general population ~ 4.5%
  - Mean prevalence in infertile women ~ 3.5%
  - Mean prevalence in women with recurrent pregnancy loss ~ 13%
Mullerian anomaly

Septate ~ 35%
Bicornuate ~ 25%
Arcuate ~ 20%
## Pregnancy outcome in patients with uterine malformations

<table>
<thead>
<tr>
<th>Uterine shape</th>
<th>Pregnancy loss</th>
<th>Preterm birth</th>
<th>Term birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicornuate</td>
<td>38</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Septate</td>
<td>23</td>
<td>23</td>
<td>54</td>
</tr>
<tr>
<td>Arcuate</td>
<td>39</td>
<td>8</td>
<td>48</td>
</tr>
<tr>
<td>Malformed uterus*</td>
<td>36</td>
<td>18</td>
<td>44</td>
</tr>
<tr>
<td>No anomaly</td>
<td>8</td>
<td>6</td>
<td>85</td>
</tr>
</tbody>
</table>

* Reproductive outcome of all cases with malformed uterus (arcuate, septate, bicornuate, unicornuate, didelphys)

Patient is a 23 year old G1 who presents for prenatal visit.

- Uterine didelphys with bicollis diagnosed as a teen
- Longitudinal vaginal septum resected due to dyspareunia
- Patient found to have spontaneous twin gestation
  - One twin in each cavity
Patient counseled regarding the risks associated with Mullerian anomaly and adverse pregnancy outcome:

- Uterine overdistension/myometrial stretch leading to increased risk of preterm birth
- Fetal growth restriction
- Fetal malpresentation

Patient underwent serial assessment of fetal growth and cervical length. At 35 weeks she presented with PPROM.

- Sterile speculum exam ruled in rupture of membranes.
- Abdominal ultrasound revealed anhydramnios surrounding twin in right uterine horn
- Patient underwent cesarean delivery with dual hysterotomies
Uterine distension

Excessive myometrial stretch
Patient is a 31 year old Gravida 1 Para 0 at 28 weeks of gestation who presents with complaints of small leakage of fluid.

- Ruled out for PPROM
- Polyhydramnios diagnosed with AFI of 41 cm

Polyhydramnios is a result of abnormal production, movement, or resorption of amniotic fluid:

- Maternal disease
- Placental dysfunction
- Fetal abnormality
- Idiopathic
In this case, polyhydramnios due to fetal abnormality:
- Large fetal CCAM/CPAM resulting in compression and distortion of fetal esophagus and impaired swallowing

Patient represented at 29 weeks of gestation with large gush of fluid
- PPROM ruled in and patient admitted to antenatal service for management
- One week after presentation patient entered spontaneous labor and had a vaginal delivery at 30 weeks of gestation
Polyhydramnios

- Defined as AFI ≥ 24 cm or MVP ≥ 8 cm
- Associated with multiple adverse obstetric outcomes
  - Fetal abnormality
  - Perinatal death
  - Preterm birth

Polyhydramnios and Preterm birth

• 2005 Study by Chen evaluated fetuses with hydramnios and no anomalies evident on ultrasound.
  • Increased risk of preterm delivery in setting of polyhydramnios 25% versus 7.3% (aOR 2.4, 95% CI 1.7-3.4)

• 1995 Study by Many et al showed correlation between polyhydramnios and preterm birth.
  • 18.8% versus 12%, p<.001, but no correlation between severity of polyhydramnios and preterm birth

Polyhydramnios and Preterm birth

• Role of amnioreduction
  • Fetal anomaly is main indication in cases of amnioreduction (85% in recent retrospective review)
  • Amnioreduction in setting of symptomatic polyhydramnios may prolong gestation

<table>
<thead>
<tr>
<th>Complications of amnioreduction</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>PPROM ≤ 48 hours after procedure</td>
<td>1.1%</td>
</tr>
<tr>
<td>Delivery ≤48 hours after procedure</td>
<td>4.1%</td>
</tr>
<tr>
<td>Abruption</td>
<td>0</td>
</tr>
<tr>
<td>Fetal bradycardia requiring delivery</td>
<td>0</td>
</tr>
<tr>
<td>Chorioamnionitis</td>
<td>0</td>
</tr>
<tr>
<td>Fetal death &lt; 24 hours after procedure</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

Premature cervical ripening
Case 1: 32 year old G3P0020 at 18 weeks’ gestation. History of 2 first trimester SABs. Noted to have painless cervical dilation and prolapsed membranes.

- Is she a candidate for emergent cerclage?
- How would you treat her in a subsequent pregnancy.
Case 2: 25 year old G1 P0 at 25 weeks’ gestation presenting with dynamic cervix.
Case 3: 22 year old G2P0100 at 20 weeks gestation with a history of a 24 week preterm delivery.
• Is she a candidate for ultrasound indicated cerclage?
Cervical function during pregnancy

Multicenter randomized trial of cerclage for preterm birth prevention in high-risk women with shortened midtrimester cervical length.

Figure 2  Survival curves of women who remained undelivered across gestation

Figure 3  Survival curves of women whose cervical length at randomization was <15 mm

Cervical shortening noted on ultrasound between 16 and 24 weeks EGA

Indication for US is prior midtrimester loss or PTB <34 weeks

Cervical length < 25 mm

Offer ultrasound indicated cerclage*

Indication for US is symptoms of PTL, LEEP, uterine anomaly

Cervical length ≤ 20 mm

Offer vaginal progesterone supplementation

*Amniocentesis to rule out intraamniotic infection
Initiation of vaginal progesterone if not yet on 17-OHP
Case: Patient is a 34 year old G4P0121 with a history of prior preterm birth

- Obstetrical history:
  - G1 2\textsuperscript{nd} trimester D&E
  - G2 33 week vaginal delivery after presenting with ACD of 3 cm and subsequent PPROM
  - G3 17 week loss of DC/DA twin gestation after presenting with ACD of 3 cm
  - G4 current

...she requests advice regarding pregnancy management
Patient counseled regarding options. Opts for history suggested cerclage. Procedure performed at 14 weeks of gestation.

- Patient initiated on 17-OHP at 16 weeks of gestation.
Case: Cervical shortening noted at 18 weeks of gestation.
- Patient followed with serial cervical lengths & assessment for preterm labor symptoms

<table>
<thead>
<tr>
<th>Gestational Age</th>
<th>Cervical Length</th>
</tr>
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<tbody>
<tr>
<td>16 weeks</td>
<td>5 cm</td>
</tr>
<tr>
<td>18 weeks</td>
<td>1.7 cm</td>
</tr>
<tr>
<td>20 weeks</td>
<td>1.1 cm</td>
</tr>
<tr>
<td>22 weeks</td>
<td>1.3 cm</td>
</tr>
<tr>
<td>24 weeks</td>
<td>1.0 cm</td>
</tr>
<tr>
<td>28 weeks</td>
<td>0.9 cm</td>
</tr>
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</table>
Exaggerated inflammatory response/infection
Patient is a 32 year old Gravida 2 Para 0101 with a history of PPROM and subsequent preterm labor at 26 weeks 2 days

• Gynecological history is significant for CIN 2 treated with cryotherapy, LEEP, and cold knife cone biopsy
• Vaginal exam reveals cervix that is flush with anterior vaginal wall
Decidual hemorrhage
Case: Patient is a 31 year old Gravida 2 Para 0010

- Low lying placenta
- Recurrent episodes vaginal bleeding
Cervical length assessment
Length of the cervix and risk of spontaneous preterm birth

Transvaginal ultrasound assessment of cervical length

- Standardization of technique is critical
  - Maternal bladder emptied
  - Avoid excess pressure on anterior lip of cervix
  - Identify lower edge of empty maternal bladder and amniotic fluid
  - Identify internal os, canal, & external os
  - Manual pressure on uterine fundus or Valsalva will assess for dynamic changes
  - Shortest of 3 acceptable images chosen for recorded cervical length
References


• Pediatric and Adolescent Gynecology, 6th ed, Emans SJ, Lauffer MR (Eds), Lippincott Williams & Wilkins, Philadelphia 2012. Copyright 2012 Lippincott Williams & Wilkins.


