Trauma in Pregnancy

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Patient #1
- 28 yo pregnant female restrained passenger low speed MVC (rear-ended) with no complaints
- Vitals: BP 95/60   HR 90   RR 20

Patient #2
- 32 yo pregnant female unrestrained driver of a high speed rollover MVC
- Vitals: BP 80/palp   HR 120   RR 12
Patient #3
- 21 yo pregnant female s/p stab wound
- Vitals: BP 105/74 HR 100 RR 24

Patient #4
- 27 yo pregnant female auto vs pole
- Vitals: 160/120 HR 98 RR 24

Statistics
- Leading cause of non-obstetric related death in pregnant patients
- Occurs in 7-8% of all pregnancies
  - 2/3 are MVC
  - 20% related to domestic violence
- Prevalence of domestic violence in pregnancy 6-20%

Outcome
- Depends on to a great extent the clinicians’ awareness of altered intra-abdominal injury pattern and normal physiologic changes
A woman with a normal heart may have an ECG that appears ischemic.

A. TRUE
B. FALSE
ECG Changes in Pregnancy

- Common ECG changes for pregnant women
  - LAD
  - Q wave in III and aVF
  - flattened or inverted T in III

Respiratory

- Respiratory rate increases
- Tidal volume increases
- Functional residual capacity decreases
- Oxygen consumption increases
- Respiratory alkalosis

Hematologic

- Blood volume increases
- Dilutional anemia
- WBC count increased
- Platelet count decreased
- ESR increased
- Increased risk of thromboembolic event

When would you expect a pregnant woman’s HCT to be the lowest?

A. 1st trimester
B. 2nd trimester
C. 3rd trimester
**Lab Values**

**Hematocrit (%)**
- Pregnant women:
  - 1st trimester: 35–46
  - 2nd trimester: 30–42
  - 3rd trimester: 34–44
  - Postpartum: 30–44

**Hemoglobin (g/dL)**
- Pregnant women:
  - 1st trimester: 11.4–15.0
  - 2nd trimester: 10.0–14.3
  - 3rd trimester: 10.2–14.4
  - Postpartum: 10.4–18.0

**Gastrointestinal**
- Motility decreased
- LES tone decreased
- Albumin and total protein levels decreased

**Metabolic-Endocrine**
- Total body water increased
- GFR increased
- BUN and creatinine decreased
- Aldosterone and cortisol levels are increased
- Peripheral resistance to insulin

**Injury Patterns**
- Growing uterus effects normal position of other organs
**Blunt Trauma**
- MVC - common
- Restraints
- Location of organs changed due to pregnancy
  - Hepatic, splenic, uterine and bladder injuries
  - GI injuries less common
- Think abruption
  - Can be delayed

**Penetrating Trauma**
- If chest tube necessary, consider inserting tube higher than usual by a couple rib spaces
- Uterus more prominent
  - Direct fetal injury more likely

**Pelvic Trauma**
- Bony pelvis becomes more lax with pregnancy
- Consider repositioning the patient
  - McRobert or lithotomy
- More common injury in pregnancy
  - Think bowel, bladder and urethral injuries
  - Vascular injury?

**The Trauma Room**
Resuscitation

- Airway
- Breathing
- Circulation (positioning key)

Manually displace uterus

Resuscitation

- Airway
- Breathing
- Circulation (positioning key)
- Definitive Treatment
  - IV, oxygen and monitor are key to a successful resuscitation!
  - ★ Check Rh status

Check Rh status
Radiation Exposure
- Abdomen 200-500 mrad
- C-Spine < 1 mrad
- Chest 1-3 mrad
- L-spine 600-1,000 mrad
- Pelvis 200-500 mrad
- CT brain 1 rad
- CT abd/pelvis 1-3 rad

Diagnostics
- Ultrasound is screening modality of choice
  - HOWEVER when US is negative or inconclusive in patient who hemodynamically unstable, DPL may be study of choice
  - Safe in pregnancy
- Use open DPL approach

Resuscitation
- Take Care of the Mother First

ACLS Drugs

<table>
<thead>
<tr>
<th>Category B</th>
<th>Category C</th>
<th>Category D</th>
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<tbody>
<tr>
<td>Atropine</td>
<td>Epinephrine</td>
<td>Amiodarone</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Lidocaine</td>
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</tr>
<tr>
<td></td>
<td>Bretylium</td>
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</tr>
<tr>
<td></td>
<td>Bicarbonate</td>
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<tr>
<td></td>
<td>Dopamine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dobutamine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adenosine</td>
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</tbody>
</table>
Modifications of CPR

- Before fetal viability
  - No modifications necessary – focus on mother
- After fetal viability (24 weeks)
  - Patient positioning
  - Consider C-section

Hemodynamically Stable Patient

Ultrasound is the test of choice to identify abruption.

A. TRUE
B. FALSE

Don’t forget fetal monitoring!
Placenta Abruptio

- Painful bleeding
  - Blood usually dark
  - 20% without bleeding

Placental Abruption

- 40-50% major traumas
- 1-3% minor traumas
- US not sensitive enough
- Must monitor patients
- Check Rh status

There is no indication to order a Kleinhauer Betke test in the ED.

A. TRUE
B. FALSE

Kleinhauer Betke test

Detects transplacental hemorrhage and independent indicator of risk of pre-term labor (LR 20.8)

J Trauma. 2004 Nov;57(5):1094-8
Monitoring

- Fetal heart rate
- Variability
- Pattern of contractions
- Decelerations

Uterine Rupture

Perimortem C-section

- Who?
- What?
- When?
- Why?
Who?
- >24 weeks gestation
- Maternal arrest
  - preferably sudden
- <15 minutes from maternal arrest,
  - <5 is better, best

What to do?
- Decide SOON
- Get help!
  - OB, NICU, Peds, Surg, L&D staff, anyone...

Perimortem C-section

<table>
<thead>
<tr>
<th>Time to Delivery</th>
<th>GA in weeks</th>
<th># normal infants</th>
<th>total # of infants</th>
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<tbody>
<tr>
<td>0-5 min</td>
<td>25-42</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>6-10 min</td>
<td>26-37</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>11-15 min</td>
<td>38-39</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>&gt;15 min</td>
<td>30-38</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

Effect of Perimortem C-section on Maternal Survival

<table>
<thead>
<tr>
<th>Time from Arrest (min)</th>
<th>RSOC or improved hemodynamics</th>
<th>No change in maternal status</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6-10</td>
<td>3</td>
<td>---</td>
</tr>
<tr>
<td>11-15</td>
<td>1</td>
<td>---</td>
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<tr>
<td>&gt;15</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Not reported</td>
<td>1</td>
<td>1</td>
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**Improved Fetal Survival**

- Fetal age > 28 weeks or 1 kg
- Short interval from maternal death to delivery
- Maternal death not from chronic hypoxia
- Fetal status before maternal death
- NICU
- Quality of maternal resuscitation

**Perimortem C-section**

- Prognosis best if performed within 5 minutes of maternal arrest and initiation of CPR
- CPR should continue during the procedure and brief time afterward

**Perimortem C-section Equipment**

- Scalpel
- Mayo Scissors
- Toothed forceps
- Needle holder
- Needle and 0 or 1 chromic sutures
- Richardson retractors

**Critical Steps**

- Continue maternal resuscitation
- Vertical midline incision through abdominal wall
  - 4-5 cm below xiphoid to pubic symphysis
- Incise fundus
- Consider blunt scissors
- Deliver baby
  - APGARS
- Remove placenta
- Oxytocin
Neonatal Life Support

Resuscitate
Broad spectrum abx
Carefully close the incision

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Summary
- Must understand normal maternal physiology & anatomical changes
- Perform perimortem C-sections early
- Treat the mother first – but don’t forget about the infant