BLUNT ABDOMINAL TRAUMA IN PREGNANCY

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OBJECTIVES

01 Understand the risk factors for blunt abdominal trauma in pregnancy

02 Define the history elements that predict poor pregnancy outcomes

03 Understand the evidence supporting current monitoring and evaluation practies
<table>
<thead>
<tr>
<th>ROADMAP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
</tr>
<tr>
<td>• Anatomy and Physiology of Pregnancy</td>
</tr>
<tr>
<td>• Epidemiology</td>
</tr>
<tr>
<td><strong>Patient Case</strong></td>
</tr>
<tr>
<td>• ACOG Pathway</td>
</tr>
<tr>
<td>• Supporting Evidence</td>
</tr>
<tr>
<td><strong>Guidelines</strong></td>
</tr>
<tr>
<td>• AAFP vs.ACOG</td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
</tr>
<tr>
<td>• Prognosis</td>
</tr>
<tr>
<td>• Summary</td>
</tr>
</tbody>
</table>
PREGNANCY ANATOMY

- Uterus is abdominal organ after 1\textsuperscript{st} trimester
- Change to maternal center of gravity at mid-2\textsuperscript{nd} trimester
- Increased blood volume
PREGNANCY PHYSIOLOGY

Cardiovascular
- Increased CO, HR, SV
- Decreased systemic vascular resistance

Hematologic
- Physiologic anemia
- Increased clotting

Respiratory
- Increased ventilation
- Increased aspiration risk

Gastrointestinal
- Decreased gastric motility
- Decreased sphincter tone
BACKGROUND

• Leading type of traumatic injury in pregnancy

• MVC, falls, assault most common causes

• ~3-8% of pregnancies (260/100,000)
WHO IS AT INCREASED RISK?

1. Women who do not wear a seatbelt

2. Women in the third trimester

3. Women with a history of interpersonal violence (IPV)
PATIENT CASE

Motor Vehicle Crash
25-year-old, 35 weeks gestation, Rh-
- Restrained driver
- ~35 mph, head-on
- Airbags deployed
- Self-extricated
- No head injury or LOC
- Feeling baby move and having some abdominal pain
- BP 132/96, HR 112, Sp02 98%, speaking easily in full sentences
MAJOR TRAUMA PEARLS

Best treatment for fetus is maternal resuscitation

• Stop fetal assessment

ABCDDE

• Displacement of uterus

Prehospital care

• >20 weeks, trauma center

Chest tubes 1-2 intercostal spaces higher

• Avoid uterus
>20 weeks gestational size or uterus is palpable or visible

Left Uterine Displacement
One handed Technique

Left uterine Displacement
-2 Handed Technique

Figure 4. Patient in a 30° left lateral tilt using a firm wedge to support pelvis and thorax.
MAJOR TRAUMA PEARLS

Standard CPR/ACLS algorithm
- Vasopressors do decrease placental blood flow

Stop magnesium, give calcium gluconate
- Usually in setting of eclampsia

Resuscitative Hysterotomy
- >20 weeks (palpate fundus)
- Prepare immediately, start at 4 minutes
Blunt abdominal trauma *without* serious maternal injury
INITIAL ASSESSMENT

HISTORY AND PHYSICAL

• 36w, restrained driver, airbags
• No LOF/vaginal bleeding
• HR 105, BP 128/86, normal respiratory
• Mild pain without bruising at seatbelt area
MAJOR TRAUMA

- Direct abdominal injury
- Rapid deceleration
- Shearing forces
- Abdominal pain
- Decreased fetal movement
- Vaginal bleeding or LOF

Where does our patient fit?
MAJOR TRAUMA

• Direct abdominal injury
• **Rapid deceleration**
• Shearing forces
• **Abdominal pain**
• Decreased fetal movement
• Vaginal bleeding or LOF

**Where does our patient fit?**
MAJOR VS. MINOR TRAUMA

• 90% of abdominal injuries classified as minor trauma

• 60-70% of fetal loss associated with trauma after minor trauma

• Major vs. minor criteria not helpful in assessing fetal risk
TWO HELPFUL QUESTIONS

1. Seatbelts properly worn?

2. Alcohol/drugs involved?
WHAT ABOUT AIRBAGS?

• Not shown to increase risk of abruption

• Likely not helpful to determine risk to patient/pregnancy
ULTRASOUND

- Evaluation of FHR, placental location, AFI, gestational age

- Not reliable for detection of placental abruption (sensitivity 24%)

- Useful to help rule in abruption if found (specificity 96%)

- FAST for other abdominal trauma
RHOGAM

Give to all Rh- or Rh unknown mothers to prevent Rh isoimmunization

Typical dose is 300 mcg, protects against ~30mL of fetal blood

Must be given within 72 hours

Use Kleihauer-Betke to detect larger fetomaternal hemorrhage (more to come)
LABORATORY STUDIES

- CBC
- Coagulation studies
- Type and screen
- Kleihauer-Betke
  - Flow cytometry if available
CBC

- Blood loss anemia
  - Lags behind bleeding for hours

- Elevated WBC
  - Infection

- Thrombocytopenia
  - Increased risk for major bleeding

**Normal Values in Pregnancy**

- **WBC**: 5.9-16.9
- **HGB**: 9.5-15.0
- **HCT**: 28-40
- **PLT**: 146-429
COAGULATION STUDIES

• Fibrinogen
  • Hemorrhage is consumptive
  • “normal” is low in pregnancy
  • Earlier marker of acute hemorrhage

• PT/PTT, INR
  • Coagulopathies

• Thrombocytopenia
  • Increased risk for major bleeding

Normal Values in Pregnancy

- PT 9.6-12.9
- PTT 22.6-35.0
- Fibrinogen 301-696
- D-dimer 400-500
- PLT 146-429
Assessment of fetal maternal hemorrhage
- Can take >24 hours for result
- Reported as % of fetal cells in maternal circulation

\[
\text{\% of fetal cells} \times 50 = \text{mLs of fetal blood in maternal circulation}
\]

Average total term newborn blood volume
- ~110mL/kg
- Flow cytometry faster alternative if available
FETAL MONITORING

• Four hours adequate for initial assessment

• Both elements critical – FHT and tocometry

• Tocometry
  • ≥8 contractions/hours associated with abruption

• Low quality evidence – prospective studies from early 1990s, ~60 patients
FETAL MONITORING

- AAFP
  - <6 contractions/hour, consider discharge
  - ≥6 contractions/hour, consider admission

- ACOG
  - >4 contractions/hour, admission

- ~70% required 24 hours monitoring in 1990 study based on contractions

- Clinical judgement for FHT
PATIENT CASE

- WBC 14, Hgb 10.6, Fibrinogen 550
- Received Rhogam during initial assessment
- Vitals remained stable
- Pain improved with acetaminophen
- US negative for abruption
- <3 contractions/hour after 4 hours monitoring
- Reassuring NST
- No speculum exam

Discharge Home
Management of Trauma in Pregnancy

Assess maternal status
Cardiac arrest
Unresponsive
Loss of airway/respiratory arrest
Blood pressure < 80/40 mmHg or heart rate < 50 or > 140 bpm
If fetus viable, FHR < 110 or > 160 bpm

Present

Advanced cardiac life support
Airway/cervical spine control
Breathing
Circulation
Disability
Exposure
Consultation with trauma team; notify neonatal intensive care unit
Supplemental oxygen
Displace uterus to left if gestational age > 20 weeks
Intravenous access (two peripheral lines)
Laboratory tests: complete blood count, coagulation profile (type and screen), Kleihauer-Betke test if Rh-negative (type and cross)
Viable fetus: continuous FHR monitoring
Preivable fetus: FHR via Doppler auscultation or electronic fetal monitoring
Tocodynamometric monitoring if concern for abruption

Absent

Maternal injury greater than minor bruising, lacerations, or contusions

Consider trauma team consultation
Intravenous access
Laboratory tests: complete blood count, coagulation profile (type and screen), Kleihauer-Betke test if Rh-negative
Viable fetus: FHR monitoring for four hours
Contractions < 6 per hour, consider discharge
Contractions ≥ 6 per hour, consider admission
Preivable fetus: FHR via Doppler auscultation or electronic fetal monitoring
Tocodynamometric monitoring if concern for abruption

Once the patient is stable
Fetal ultrasonography with or without biophysical profile
Consider other laboratory tests: chemistries, urinalysis, urine toxicology screen
Radiologic assessment, peritoneal lavage, focused assessment with ultrasonography for trauma, ultrasonography (if indicated)

Motor vehicle crash
Determine whether patient was wearing seat belt
Slips or falls
Assess for abdominal trauma and extremities for fractures/ligament damage
Burns
Aggressive fluid resuscitation
Consider delivery if burn area > 50%
Domestic violence/ intimate partner violence
Assess for depression and suicide risk
Penetrating trauma
Level of entry determines affected organ; gravid uterus may protect from visceral injury
Toxic exposure
Agent and gestational age at exposure guide maternal therapy and counseling
MATERNAL PROGNOSIS

• 37.7% resulted in delivery during that hospitalization

• motor vehicle accidents had reduced odds of delivery (OR 0.36, 95% CI 0.23-0.58)

• Mortality
  • 9% if pelvic fracture
  • 10% if uterine rupture
FETAL PROGNOSIS

- Increased mortality risk:
  - maternal hypotension
  - ejection from motor vehicle
  - maternal pelvic fracture
  - automobile vs. pedestrian accident
  - maternal history of alcohol use
  - young maternal age
  - motorcycle crashes
  - maternal smoking history
  - uterine rupture

- Mortality after maternal blunt trauma 3.4% - 38%
SUMMARY

- Follow a protocol
- High index of suspicion for injury
- US to rule in, not out
- 4 hours of monitoring likely adequate
- Contractions matter
- Major trauma pearls
- Rhogam
- Careful screening for IPV
REFERENCES


