Trauma and Pregnancy

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• 5-20% of pregnancies.
• MVC 42%, falls 34%, assault 18%.
• Incidence rising yearly.
• Incidence increases with advancing gestational age.
• Leading cause of non-obstetric maternal death.
• 6-7% maternal mortality.
• Fetal mortality as high as 61% in major trauma.
• Maternal-fetal physiology complicates diagnosis and intervention.
• Two patients in one.
Maternal Physiology

- **Cardiovascular**
  - Increased cardiac output.
  - Hypervolemia.
  - Hemodilution.
  - Delayed manifestation of shock.
  - IVC compression.
  - Cardiac enlargement.
  - EKG changes.

- **Respiratory**
  - Upper airway edema.
  - Decreased chest wall compliance.
  - Decreased FRC.
  - Increased O2 demand.
  - Increased minute ventilation.
  - Respiratory alkalosis.
Maternal Physiology

- **GI**
  - Decreased PH.
  - Delayed gastric emptying.
  - Increased intraabdominal pressures.
  - Reduced LES tone.
  - Increased aspiration risk.

- **Hematologic**
  - Increased platelet turnover and shorter half life.
  - Increased levels of factor VII, VIII, X, XII and Fibrinogen.
  - Reduced ATIII
  - Hypercoagulable state.

- **Renal**
  - Increased GFR with decreased BUN and CR.
  - Normal CR could represent a decline in renal function.
Approach

- Primary focus is resuscitation of mother.
- Priorities of treatment remain same as non-pregnant trauma patient.
- ABCs, cervical spine, aggressive volume resuscitation, control of hemorrhage.
- Left uterine displacement.
  - 15-30 degrees.
  - Wedge, spine board, manual, or right uterine displacement.
- Secondary survey
  - H&P, Obstetrical history, Fetal evaluation – gestational age, imaging.
Approach

- Imaging
  - Ultrasound is preferred modality.
  - Fetal adverse effects often a concern with ionizing radiation.
  - A priority if indicated.
  - Adverse effects unlikely at less than 5 – 10 rads.
    - CT abdomen ~ 2.8 rads, AP CXR ~0.004 rads.
  - Risk higher in first 8 weeks.
  - Shielding of uterus helpful.
Emergent cesarean section

- Indications in the setting of trauma
  1. Imminent maternal death..
  2. Ineffective cardiopulmonary resuscitation within 4 minutes.
  3. Stable mother with non reassuring fetal heart rate.
- Facilitates effective CPR.
  - Removal of aortocaval compression.
  - Benefits seen in >20 Wks gestation.
- Fetal indication depends on viability.
- Neonatal viability is an imprecise assessment.
  - At least 22-24 weeks.

- Meta-analysis
- 1600 papers screened with 76 papers referenced.
- Class I: Prospective randomized control trials. (0 studies)
- Class II: Prospective and retrospective analysis, clearly reliable data. Observational studies, cohort studies, prevalence studies and case control studies. (18 studies)
- Class III: Retrospective data. (58 studies)
- Recommendations made based above studies.

- **Level 1 recommendations**
  - None

- **Level 2 recommendations**
  - a. All pregnant women > 20 weeks’ who suffer trauma should have cardiotocographic monitoring for a minimum of 6 hours. Monitoring should be continued and further evaluation should be carried out if uterine contractions, a nonreassuring fetal heart rate pattern, vaginal bleeding, significant uterine tenderness or irritability, serious maternal injury or rupture of the amniotic membranes is present.
  - b. Kleihauer-Betke analysis should be performed in all pregnant patients > 12 weeks’ gestation.
Level 3 recommendations

a. The best initial treatment for the fetus is the provision of optimum resuscitation of the mother and the early assessment of the fetus.
b. All female patients of childbearing age with significant trauma should have a β-HCG performed and be shielded for X-rays whenever possible.
c. Concern about possible effects of high-dose ionizing radiation exposure should not prevent medically indicated maternal diagnostic X-ray procedures from being performed. During pregnancy, other imaging procedures not associated with ionizing radiation should be considered instead of X-rays when possible.
d. Exposure to less than 5 rad has not been associated with an increase in fetal anomalies or pregnancy loss and is herein deemed to be safe at any point during the entirety of gestation.
e. Ultrasonography and MRI are not associated with known adverse fetal effects. However, until more information is available, MRI is not recommended for use in the first trimester.
Level 3 recommendations cont’d

f. Consultation with a radiologist should be considered for purposes of calculating estimated fetal dose when multiple diagnostic X-rays are performed.
g. Perimortem Cesarean section should be considered in any moribund pregnant woman of ≥ 24 weeks gestation.
h. Delivery in perimortem cesarean sections must occur within 20 minutes of maternal death but should ideally start within 4 minutes of the maternal arrest. Fetal neurological outcome is related to delivery time after maternal death.
i. Consider keeping the pregnant patient tilted left side down 15 degrees to keep the pregnant uterus off the vena cava and prevent supine hypotension syndrome.
j. Obstetric consult should be considered in all cases of injury in pregnant patients.

Outcomes associated with appropriate mobilization of resources.
Proper trauma level assignment helps mobilize resources.
Institution based practice guidelines beneficial.
Stabilize the pregnant woman using "ABC" protocols.

- Supplemental oxygen
- Intravenous lactated Ringer's solution in 3:1 ratio based on blood loss
- Laboratory studies: complete blood cell count, blood type, Rhesus factor
- If injuries are severe, consider coagulation studies, chemistry panel, and arterial blood gas measurements.
- Deflect uterus off great vessels if more than 20 weeks of gestation.
- Radiologic studies as needed

Secondary survey

Examine for obstetric injury.

Check fetal heart tone.

Speculum examination to rule out spontaneous rupture of membranes, vaginal bleeding

Fetal heart tone absent

Maternal treatment only; no fetal resuscitation

Fetal heart tone present

Estimate gestational age (history, fundal height, Leopold’s maneuvers, ultrasonography).

< 24 weeks of gestation*

Document fetal heart tone. No fetal resuscitation

≥ 24 weeks of gestation*

Electronic fetal monitoring for four hours

Vaginal bleeding
  Spontaneous rupture of membranes
  Fetal heart tone abnormality
  Uterine contractions for at least four hours
  High-risk mechanism of injury (automobile versus pedestrian injury, high-speed motor vehicle crash)
  Uterine tenderness
  Abdominal pain
  Maternal anesthesia

No

Discontinue monitoring and discharge to home with instructions to return to labor and delivery if there is any vaginal bleeding, decreased fetal movement, loss of fluid vaginally, repetitive uterine contractions, abdominal pain, or tenderness.

Yes

Electronic fetal monitoring for 24 hours. Intervene as needed for fetal distress.

More abnormalities?

No

Discontinue monitoring and discharge to home.

Yes

Admit to hospital. Intervene as needed for fetal distress.