TRAUMA IN PREGNANCY

Oxford et al. , Clinical Obstetrics and Gynecology: Dec.,2009, vol 52,4:611-629

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Introduction

Background

- In the United States, trauma is the leading nonobstetric cause of maternal death. (5~8%)
- This study review the most common types of trauma seen in pregnancy and the epidemiology, risk factors, pathophysiology, and key management considerations

Risk factors

- Young age (<25 y/o)
- African-American or Hispanic race
- Illicit drug or alcohol use
  - Ikossi et al: 19.6%, 12.9%
  - 45% in MVAs
- Low socioeconomic status

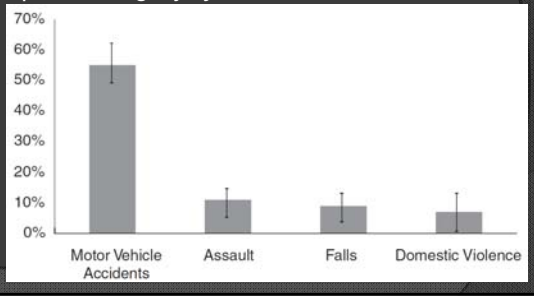
Risk factors

- Domestic violence
- Noncompliance with proper seatbelt use (34~64%)
  - The National Highway Traffic Safety Administration
  - 50% fetal loss associated with seatbelt use

http://www.vahealth.org

Typical mechanisms of trauma-related maternal injury

- Blunt trauma →homicide → burn → penetrating injury



Delivery rates and modes

- 5~ 24% patients are reported to be delivered.
  - Gestation age: viable fetus, > GA 28 wk
  - Maternal stability
  - Year of presentation
- 71~75% patients were delivered through cesarean section (C/S) within 24 hr (uteroplacental insufficiency)

Delivery rates and modes

- Mother should be made stable before fetal delivery is addressed.
- Malignant maternal arrhythmia (VT, PEA) or cardiac arrest → perimortem cesarean is performed to salvage the fetus (malignant maternal arrhythmia within 4 min/ cardiac arrest: 5 min)
- Outcome: GA> 25wk, 45% fetal survival, 72% maternal survival.

Maternal-Fetal Outcomes: Population-based Studies

- El Kady et al:
  - Risk of maternal death: 0.86% (vs uninjured :0.01%)
  - ORs in fetus: 2 of preterm labor, 4.6 of IUFD, 3 of neonatal demise
  - Fetal death was more commonly asoociated with maternal vascular injury and the largest contributor was GA <28wk
  - Injury severity score (ISS) was not predictive of outcomes
  - Maternal and fetal deaths were highest with internal injuries to the thorax, abdomen, and pelvis

- Schiff et al:
  - Term mothers with non-severely injury (ISS<9) vs severe injury (ISS>9)

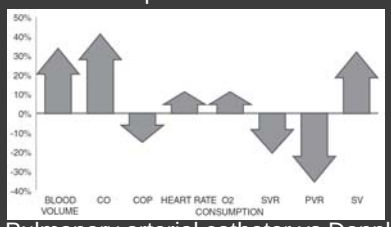
Non-severe		severe	
Abruption	RR 4.2	Abruption	RR 15.8
Infant hypoxia	RR 4.6	C/S	RR 4.3
Fetal death	RR 13.6	Non-reasuring fetal heart tracing	RR

- Women hospitalized after a MVA are at increased risk for adverse outcomes (preterm labor, abruption, meconium at delivery, neonatal respiratory distress) regardless ISS

Maternal physiology

Invasive hemodynamic monitoring

- Maternal adaptations



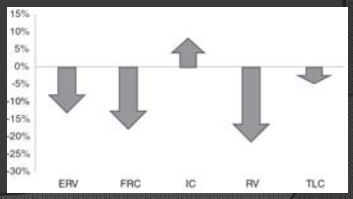
- Pulmonary arterial catheter vs Doppler echocardiogram (noninvasive arterial pressure waveform)

Choice of drug use

- Ephedrine / phenylephrine (C)
  - Least effect in uteroplacental vasculature
- If unstable or nonviable pregnancy → 1st line pressors: epinephrine/ norepinephrine (C)

Mechanical ventilator

- Only few studies address the appropriate ventilation strategy
  - volume control and assist control modes with tidal volumes set at 8~10 ml/kg ideal body weight



Utility of Kleihauer-Betke testing

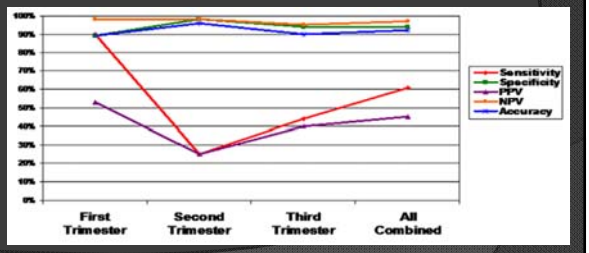
- Fetal maternal hemorrhage occurs 10~30% of pregnant trauma patients
- KB test (Se:100%, Sp: 96% for U/C):
  - 54% positive predictive value for preterm labor
  - 92.6% negative predictive value
- Repeat in 24~48hr after initial test → determine the chronicity of fetal maternal hemorrhage and guide observation

Imaging

- The International Commission on Radiological Protection, National Council on Radiation Protection and Measurements and the American College of Radiology and the American College of Obstetricians and Gynecologists:
  - The safest and most appropriate study that would yield the best result and chance at accurate diagnosis must be used.

Imaging

- Ultrasound: pelvic/ intrauterine structures, FAST



Imaging

- MRI
  - not recommended (time wasting)
- Radiography
  - 0.02~0.07 mrad (ok at any GA)
- Angiography
  - 2~10 mrad/min
  - Duration dependent
  - Use with caution but not avoided where indicated (pelvic fracture)

Imaging

- CT
  - Use low-exposure techniques to attenuate the radiation exposure to the fetus.
- Nuclear medicine
  - No indications except for cerebral flow studies in the confirmatory evaluations of brain death

Fetal monitoring

- Early recognition of fetal distress may improve outcomes and monitoring should begin once maternal stability is established.
- GA> 24 wk is considered viable
- Continuous fetal monitoring is the only way to identify fetal distress from an acute event.
- Most authors agree with continuous monitoring for initial 4~6hr (80% abruptions occurs in that time)

Blunt trauma

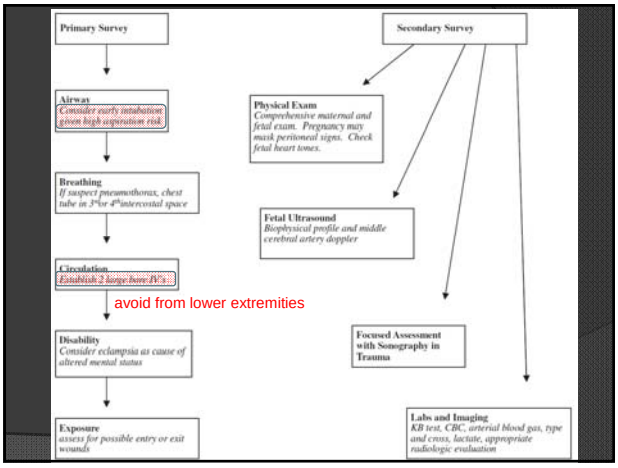
- Most blunt trauma from: MVAs
- High incidence for hepatic, splenic and uterine injuries.
- Direct fetal injury was rare (<1%)
- Pelvic fractures and abruption are the most common causes of fetal loss
- Abruption can occur in 40~ 50% of severe trauma. (6~ 66% among all comers)
  - abdominal pain out of proportion, vaginal bleeding, back pain
  - 75% fetal mortality

Penetrating injury

- In firearms injuries, 40~70% fetus and 5~10% mothers die.
- Immediate exploratory laparotomy is recommended in high-speed projectile injuries.
- Antibiotic prophylaxis:
  - Gram (+), clostridia
  - Gram (-), anaerobic if bowel involvement
- Exploratory laparotomoy is not indicated for C/S if the fetus is stable, especially in the extremely preterm.

General trauma management

- Management of the pregnant trauma patients should be commensurate with the ATLS management guildlines for general trauma victims.
- The evaluation is the same with the addition of obstetric considerations as maternal stability is achieved.
- ABCDs



General management considerations in relation to the obstetric patients

- ABCDs must be conducted
- Workup :
  - Fetal maternal hemorrhage
  - Preterm labor
  - Abruption
  - PPROM/ PROM
  - Speculum exam
- Necessary radiologic studies should not be avoided.

Summary

- Higher risk for preterm labor, placental insufficiency, and low birth weight .
- Education of seatbelt use
- Interpersonal violence and substance-abuse screening is paramount.
- The managing team should be multidisciplinary to understand the physiologic changes in pregnancy.

Thanks for your attention~