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Advanced Emergency Trauma Course

Trauma Considerations in Special Populations

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Lecture Objectives

- To discuss trauma management and concerns as it relates to the gravid woman
- Trauma as it relates to children
- Special consideration based on altered physiology
- Special considerations based on population specific injury patterns

Pregnancy

Epidemiology:

- Trauma complicates 6% to 10% of all US pregnancies.
- It is the leading cause non obstetric maternal death
- According to a study published by *Gazamarian et al* there is a prevalence of 0.9% to 20% when it comes to violence in pregnancy.
- There is an increasing trend with each trimester
- 8% of violence occurs in first trimester, 40% in second trimester and 52% in the third trimester

Pregnancy

- Trauma, relatively minor or major, is associated with increased risk of:
  - Preterm Labor
  - Placental abruption
  - Fetal-Maternal Hemorrhage
  - Pregnancy loss
- The majority of the times when gravid women seek care, it is the result of:
  - Motor vehicle collision (MVC)
  - Assaults and falls
  - There are several normal anatomic and physiologic changes in pregnancy that need to be considered in the trauma patient

Pregnancy Physiology

- CARDIOVASCULAR
  - Plasma (blood) volume increases by 45% starting @ 6-8wks
  - Stroke Volume can decrease to 30% of normal in supine position
  - Chest compliance significantly decreased due to compression of the diaphragm

Cardiovascular

- Normal changes in pregnancy can appear very similar to shock
- In the first trimester blood pressure declines and then levels off in the second trimester
- During pregnancy, the amount of blood pumped by the heart (cardiac output) increases by 30 to 50%

Gastroenterology

- Delayed gastric emptying making them more likely to vomit
- Enlarged Uterine size reduces risk of GI injuries after lower abdominal trauma
- Dilated pelvic Vasculature increases risk of retroperitoneal hemorrhage
- Respiratory Alkalosis and compensatory metabolic acidosis.

Pregnancy

- "Supine Hypotensive Syndrome"
  - After about week 20 of gestation the uterus rises to the level of the inferior vena cava.
  - The weight of the uterus, infant, placenta, and amniotic fluids compress the inferior vena cava
  - Reducing return of blood to the heart and cardiac output

Supine Hypotensive Syndrome

- Along with the reduced blood pressure there will be other signs of shock:
  - Such as cool, moist and clammy skin
  - Increased heart rate (early sign), bradycardia (very late sign)
  - Dizziness, nausea, syncope or near syncope, pedal edema
  - Decreased femoral pulse, and signs of fetal distress

Supine Hypotensive Syndrome

- Should you see a patient that presents this way you have options:
  - You can use towels or sheet to lift the pelvis
  - You can manually shift the uterus to the patients left.
  - You can also tilt the woman onto her left side by roughly 30 degrees

Pulmonary

- The pregnant woman has a significantly reduced oxygen reserve
- This effect is mainly from compression of the diaphragm by the growing uterus
- There is also some narrowing of the airway do to swelling of tissues.

Complications

- Preterm Labor, Preterm delivery, Uterine rupture
- Feto-maternal hemorrhage and placental abruption.
- Abruption risks related to gestational age and severity and type of injury.

Complications

- Abruption
  - Incidence ranges from .4% to 1.3%.
- Ultrasound has high positive predictive value high but low sensitivity
- Over 50% of fetal losses from abruption are due to minor maternal trauma
- Use clinical suspicion and observation rules.

What about the Fetus?

- Continuous FHT's if fetus >24wks
- Urgent C-Section if >24wks gestation and imminent maternal death
- C-section in patient where CPR has not been effective after 5mins or Non Reassuring Fetal Heart tones with stable mother.
- Laboratory Evaluation
- Rho D for all unsensitized women

Pregnancy Take Home Points

- Proper evaluation and treatment of the trauma patient, who is gravid, requires a multidisciplinary team approach.
- Mother's welfare is PARAMOUNT
- The need for diagnostic imaging outweighs radiation risk to fetus, due to low risk.
- Time is life: No fetus with absent tones survived emergency delivery while 75% with FHT's and age >26wks survived.
  - Independent of maternal distress or injury score.

Children

- Most pediatric trauma occurs as a result of blunt trauma
- Penetrating injury accounting for 10-20% of all pediatric trauma admissions in the states
- Trauma remains the leading cause of death for children aged 1-17 years.
- Developmental milestones correlate with mechanisms of childhood injuries.

Children

- Head injuries are the most severe and cause the most deaths.
- Head injuries also account for most disability in children
- Just as in adults there is a way to standardized way to assess for evidence of neurological deficits

Children

- Glasgow Coma Scale (GCS)
  - Universal tool for the rapid assessment of the consciousness level of injured children.
- A modified verbal and motor version has been developed to aid in the evaluation of consciousness level in infants and young children.
- The GCS score and its modified version (with scores of 3-15) are based on children's best response in 3 areas:
  - (1) motor activity
  - (2) verbal response
  - (3) eye opening.
- Traumatic brain injury in children is classified as:
  - Mild (GCS 13-15)
  - Moderate (GCS 9-12)
  - Severe (GCS 3-8).

Children

- Before going further we should again make the point that there is a systematic approach to each and every patient
- AIRWAY
- BREATHING
- CIRCULATION
- DISABILITY
- EXPOSURE

PD-INEL

http://dukehealth1.org/images/deps_tape4_sm.gif
Accessed 9/20/09 – Yahoo Images

Broselow® Pediatric Emergency Tape

PD-INEL

http://www.cupola.be/catalog/images/MBU003.jpg

- Is a laminated folding piece of paper intended to quickly provide pediatric medication and resuscitation information

Broselow® Pediatric Emergency Tape

- The tape folds out to a length of 146.5 cm.
- Divided into different colored regions, which correspond to a patient's height.
- Each weight lists the appropriate concentration and dosage for emergency medications.

Broselow® Pediatric Emergency Tape

- Provides dosages of emergency resuscitation medications:
  - E.g. atropine, epinephrine, midazolam
- Provides appropriate sizes for airway tools
  - E.g Non-rebreather masks, Endotracheal tubes
- Place at patients side and based on the height at the feet

Anatomical Considerations

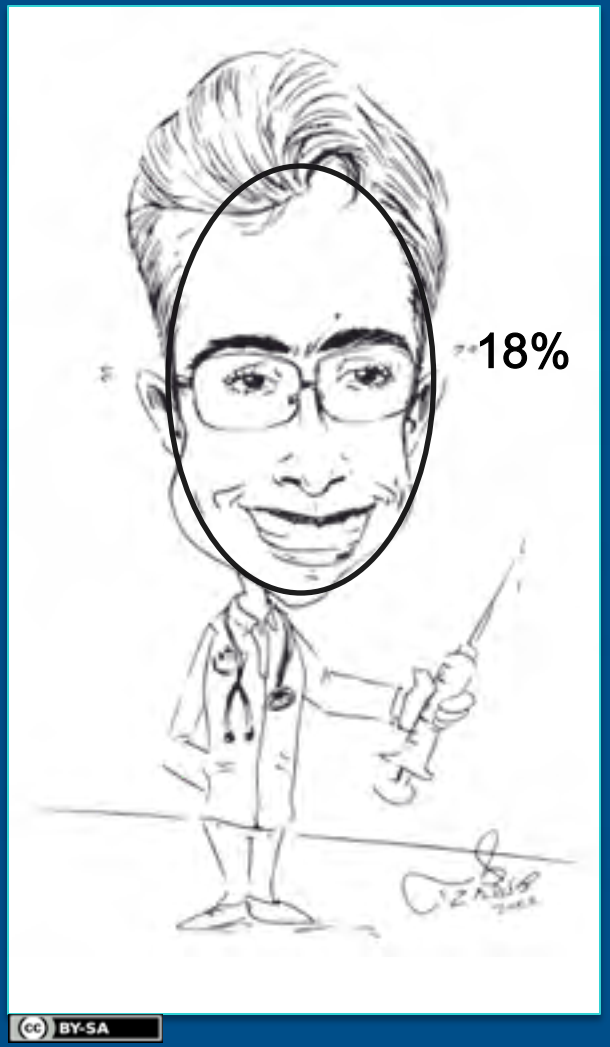
- The pediatric body size allows for a greater distribution of traumatic injuries
  - Thus, multiple traumatic injuries are common
- They also have greater relative body surface area
  - Greater potential for heat loss
- They have less abdominal musculature and fatty tissue
  - Less protection of the liver, spleen, pancreas and kidneys

Anatomic Considerations

- The head to body ratio is greater making it a tipping point
- The cranial bones are thinner
  - Giving the brain less protection
- Their small size also makes them more susceptible to injury
  - Small stature makes collisions more dangerous
  - Point of impact is a major concern

Relative Head to Body Size

- Based on body surface estimations in burn victims
- Younger children have a larger head compared to body ratio than adults



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Anatomic Considerations

- Anatomical differences in children make them more vulnerable to major abdominal injuries with very minor forces.
- In children, the abdomen begins at the level of the nipple.
- Their small, pliable rib cages and undeveloped abdominal muscles provide little protection of major organs.

Physiologic Considerations

- Studies have shown that compared with adults, injured children have higher metabolic demands
- Again recall the increased loss of body heat, so try to keep them warm
- Hypotension and hypoxia should be aggressively avoided and are known to produce secondary injury.

Physiologic Considerations

- Initiation of good nutritional support within hours of definitive stabilization is vital
- Attempt to meet the needs of increased metabolism and oxygen consumption during you pediatric trauma resuscitation

Children

- Airway control is the first priority.
- Unlike in adults, the cause of childhood cardiac arrest is primarily an initial respiratory arrest.
- A child's airway is anatomically different from an adult's.
- Children have shorter neck, smaller and anterior larynx, floppy epiglottis, short trachea, and large tongue.

Children

- As they cannot always communicate distress, look for secondary markers
  - Tachycardia is usually the earliest measurable response to hypovolemia.
  - Others include:
    - Mental status change
    - Respiratory compromise
    - Absence of peripheral pulses
    - Delayed capillary refill
  - Skin pallor, and hypothermia should be addressed

Pediatric Normal Vital Signs

	Pulse (beats/ min)	Systolic blood pressure (mm Hg)	Respiration (breaths/min)
Newborn	95-145	60-90	30-60
Infant	125-170	75-100	30-60
Toddler	100-160	80-110	24-40
Preschool	70-110	80-110	22-34
School age	70-110	85-120	18-30
Adolescent	55-100	95-120	12-16

Children

- Once airway and breathing have been stabilized
- Make vascular access the next priority
- Initial fluid resuscitation should consist of warm isotonic crystalloid solution at a bolus of 20 mL/kg

Children

- Definitive treatment can be accomplished safely once hypoxia, tachycardia, hypotension, and hypothermia have been managed.
- Then proceed to the secondary survey
  - Which involves a more detailed systemic evaluation and initiation of diagnostic studies.

Questions?

Dkscully (flickr)

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