sa military health service
Department:
Defence
REPUBLIC OF SOUTH AFRICA

23RD ANNUAL CONTROVERSIES AND PROBLEMS IN SURGERY 2019

SURGERY IN HIGH RISK POPULATION

MANAGEMENT OF MAJOR ABDOMINAL TRAUMA IN PREGNANCY

THABO MOTHABENG

Case Scenario

M	35-year-old female transported to trauma/emergency unit; Unrestrained passenger, ejected from vehicle; appears to be in the third trimester of pregnancy
I	Multiple abrasions and laceration scalp Penetrating wound right chest
S	Unconscious; noisy breathing and Bleeding from scalp
T	Oxygen mask, intravenous line, Dressing and immobilized on long spine board

Emergency practitioner called:

- ✓ Trauma surgeon
- ✓ Obstetrician
- ✓ Paediatrician
- ✓ Intensive care Operational nursing manager

How do we proceed

- Who is the primary clinician?
- What are the priorities in caring for this patient?
- What pregnancy related changes do we expect?
- How do the changes impact presentation and management?

Disclaimer

- Nothing to declare
- No conflict of interest
- No financial reward
- I swear: " I am not pregnant!"

Overview

Epidemiology of the injured pregnant patient

Changes that occur in pregnancy

Primary survey/ managing two patients

Foetal management

Adjuncts to primary survey

Controversies

Conclusion

Epidemiology of trauma in pregnancy

- Trauma is the leading cause of non obstetric maternal mortality
- Complicates 8 to 12% of the pregnant population
- Risk increase with advancing pregnancy

Mirza FG, 2010
Brown S, 2013
Deshpande NA, 2017

- in South Africa 4% of trauma patients are pregnant

Nel D, 2018

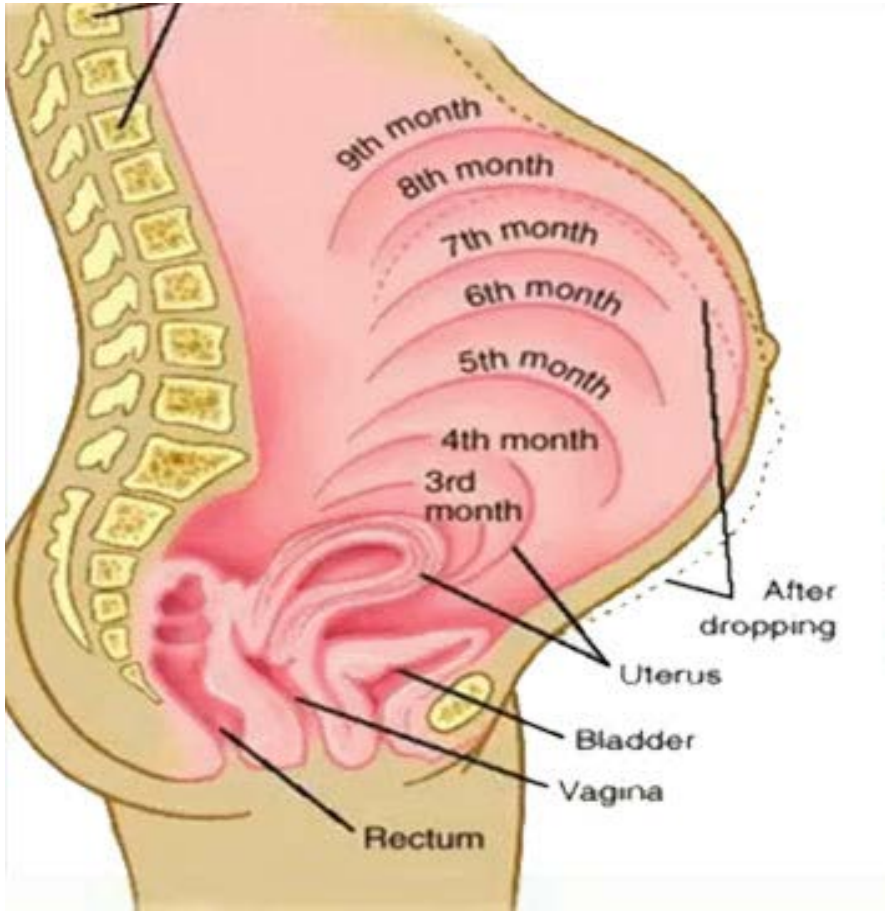
Epidemiology of trauma in pregnancy

- Blunt trauma 57%
- Penetrating 21%
- Burns 12%
- Intentional trauma 52%
  - Perpetrators known 81%
  - Intimate partner 55%
- Self inflicted 5%
- Road traffic accidents 26%

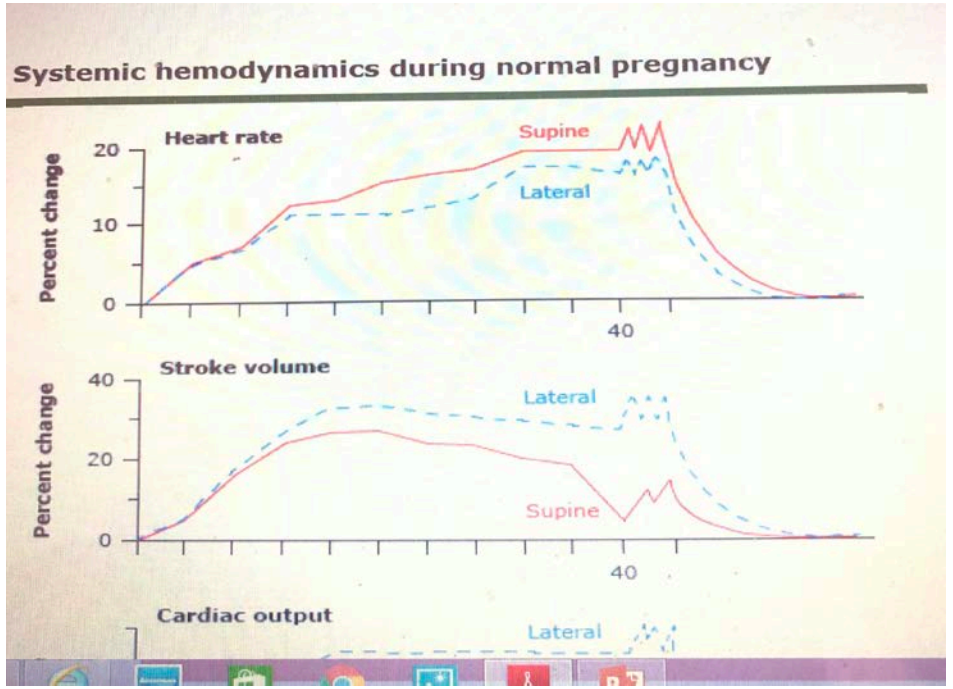
Anatomic changes

- First trimester Fetus is protected by pelvis and thick walled uterus
- Fundal height 12 weeks: limited to the pelvis
- 20 weeks: at the umbilicus
- 34 weeks: at the costal margin
- Second and third trimester: Fetus more exposed
- Thinning uterus and maternal abdominal wall

Anatomic changes



Physiologic changes



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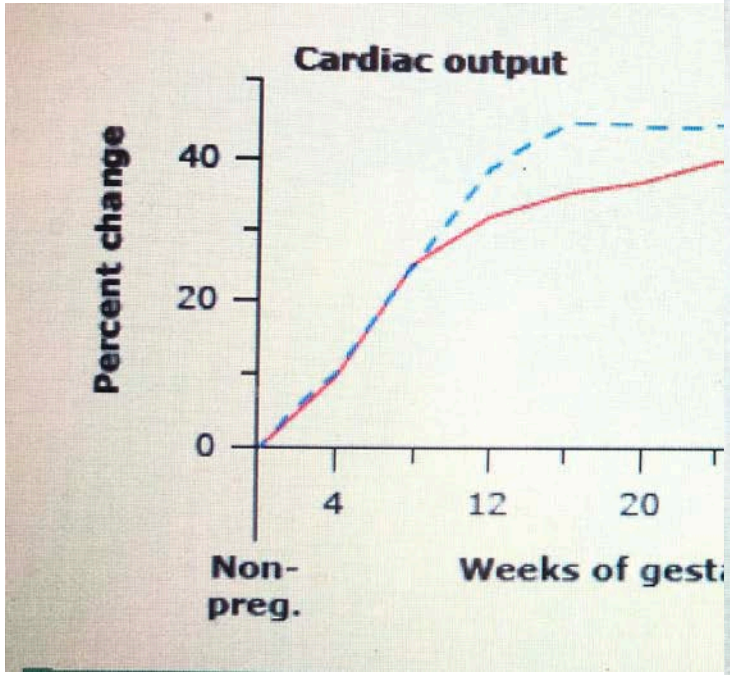

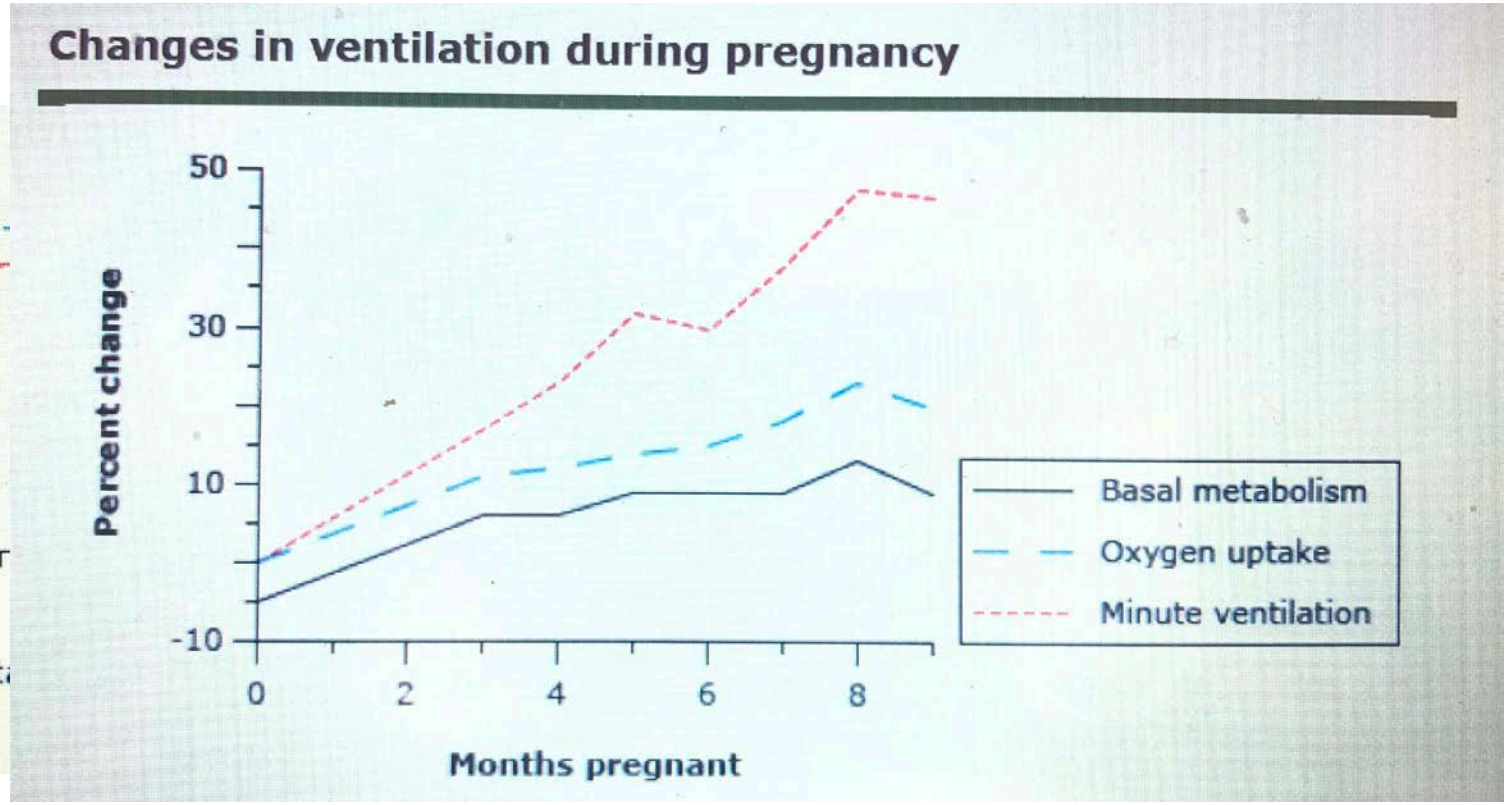

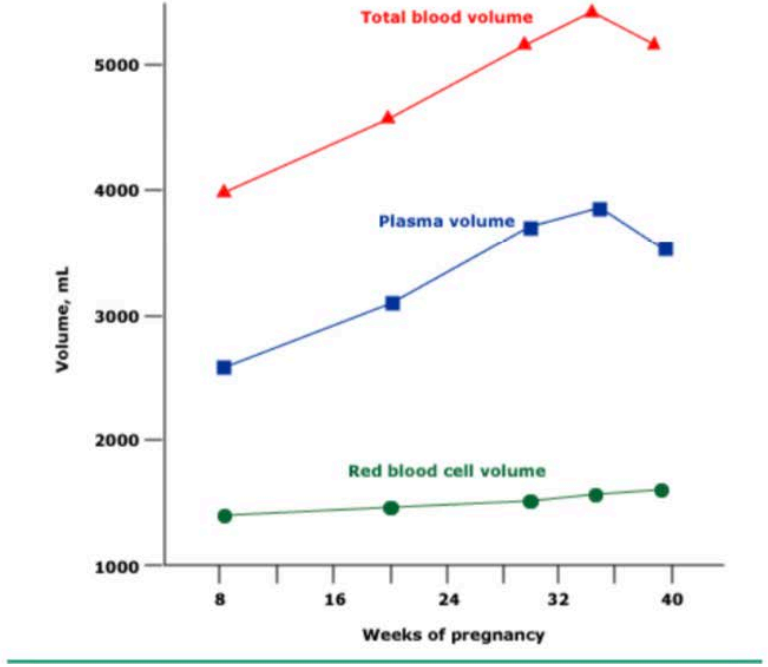
Total blood volume, plasma volume, and red cell volume in normal pregnancy
Total blood volume
Plasma volume
Red blood cell volume
Volume, mL
5000
4000
3000
2000
1000
8
16
24
32
40
Weeks of pregnancy

“Normal” laboratory values in pregnancy

Hematocrit: 32%–42%

White blood cell count: 5,000–12,000/L

Arterial pH 7.40–7.45

Bicarbonate: 17–22 mEq/L

PCO2 25–30 mm Hg

Fibrinogen: 400 mg/dL

Mattox k, Crit Care Med 2005

Respiratory changes

Expiratory reserve volume ↓ 25%

Residual volume ↓ 15%

Functional residual capacity ↓ 20%

Tidal volume ↑ 45%

Inspiratory reserve volume ↑ 5%

Inspiratory capacity ↑ 15%

Vital capacity No change

Total lung capacity ↓ 5%

Pradeep Bhatia, Indian Journal of Anaesthesia. 2018

Arterial blood gas values in pregnant and nonpregnant women

Parameter	Pregnant, mmHg	Nonpregnant, mmHg
pCO2	27 to 32	39 to 40
pO2	100 to 108	95 to 100
pH	7.40 to 7.45	7.40
Bicarbonate	18 to 21	24 to 29

Pregnancy outcome after motor vehicle accidents

Outcome	Controls, no crash, percent (n = 17,274)	Uninjured, ISS 0, percent (n = 189)	Nonsevere injury, ISS 1 to 8, percent (n = 308)	Severe injury, ISS 9 or more, percent (n = 84)
Preterm labor	6.6	51.3*	24.6*	13.1
Abruption	1.4	8.5*	7.4*	13.1*
Preterm birth	8.0	13.9	12.1	5.0
Fetal death	0.3	0	1.6	9.0*

ISS: Injury Severity Score.
* Significant compared to controls.

Adapted from: Schiff MA, Holt VL. Am J Epidemiol 2005; 161:503.

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Physiologic changes

Increased circulating blood volume Systemic vasodilation & decreased peripheral vascular resistance

Uterus and placenta are vascular organs

CO up to 45% greater than normal

Mild tachycardia and hypotension normal in the third trimester

Physiologic anemia of pregnancy: plasma volume > red cell mass

Hypercoaguable state leaves pregnant patients predisposed to consumptive coagulopathies, e.g. DIC

Fibrinogen is often slightly elevated at baseline in pregnancy

Gastric emptying delayed, high aspiration risk

Primary survey

- Consider all females of child bearing age pregnant until proven otherwise
- Priorities of management remain the same
- Resuscitation of the mother ensures foetal wellbeing
- Monitoring of the foetus is crucial

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Airway and breathing

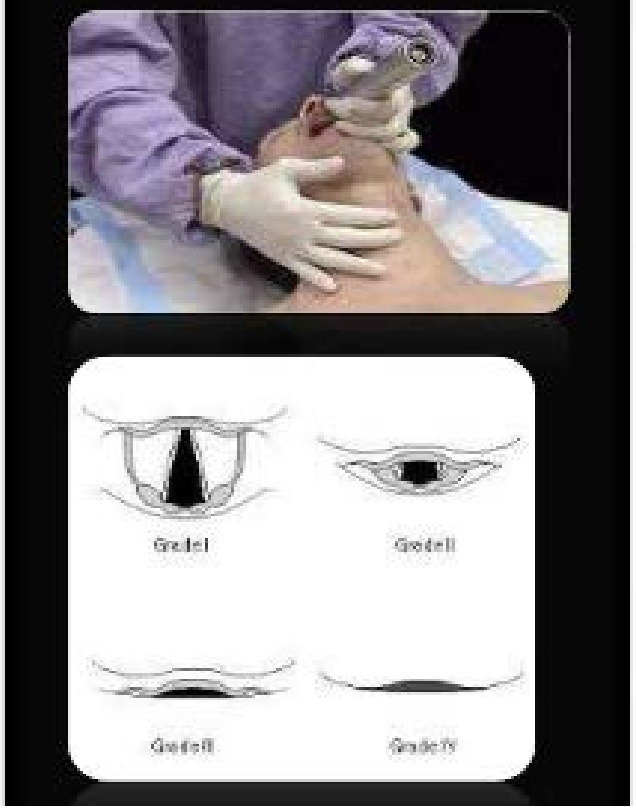
- Difficult laryngoscopy, bleeding
- Decreased FRC, increased oxygen demand with decreased reserves
  - NB: Foetus sensitive to mother's hypoxia
- Plan and execute early rapid sequence intubation **How early?**
- Keep saturation above 95%
- keep Pco2 at – 30mmHg
- Chest drain – two spaces higher

Biro P, 2013
Heidemaun BH, 2003

Precautions during intubation

- Preoxygenation
- Rapid sequence intubation
- Cricoid pressure must die! Long live BURP
- Smaller endotracheal tube?
- Difficult intubation cart to be ready
- Scoline in patients with TBI

BURP



"BURP" Maneuver

The "BURP" maneuver consists of displacement of the larynx in 3 specific directions, posteriorly against the cervical vertebrae (Back), as far superior (Upward) as possible and slightly laterally to the right (Rightward Pressure).

In a Japanese study, both cricoid pressure and the "BURP" maneuver significantly improved laryngoscopic visualization, with the "BURP" maneuver being more effective.

Osamu Takahata, MD, Munehiro Kubota, MD, Keiko Mamiya, MD, et al. The Efficacy of the "BURP" Maneuver During a Difficult Laryngoscopy. Anesthesia Analgesia 1997:84:419-21

Circulation and haemorrhage control

- Fresh warm whole blood better than PRBC's
- Delayed signs of shock
- Supine hypotensive syndrome
- Vasopressors should be avoided/ last resort
- In case of emergency transfusion: O-negative

Left lateral or tilt!

Norwitz ER, Critical Care Obstet 5ed. 2010
Atta E, Obstet Gynecol Clin North Am 2007
Kinsella SM, Anaesthesia 2003

With maternal blood loss, foetal distress precedes changes in maternal vital signs.

Disability

- Rapid and directed neurological examination
- Evaluation of Glasgow coma score
- Decrease raised intracranial pressure
- Prophylactic anticonvulsants and Seizure treatment
- Beware PET vs. TBI
- Mandatory CT scan
- Termination of pregnancy?
- Futility of care!

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Contraindication for tocolysis

- Abnormal foetal heart rate pattern
- Lethal foetal anomaly
- Intrauterine foetal death
- Suspected chorioamnionitis (clinical signs of infection)
- Severe hypertensive conditions in pregnancy
- Abruption of placenta
- Severe intrauterine growth retardation (IUGR).

Richa Aggarwal, Journal Obst Anaesth and Critical care. 2018

Peculiar to pregnant patient

- DIC due to placental abruption and uterine rupture
- Amniotic fluid embolism
- Preterm labour and delivery
- Uterine rupture
- Emergency caesarean section
- Isoimmunisation in Rh-negative woman

Foetal monitoring

- Less than 10 weeks – Doppler ultrasound
- 20 – 24 weeks: continuous tocodynanometer
- Duration: six to 12 hours
- Maternal heart rate >110
- Ejection out of a vehicle during a motor vehicle crash
- Injury severity score >9
- Evidence of placental abruption
- Foetal heart rate >160 or <120
- Preterm labour

Mandatory 24 hours!

Adjuncts to primary survey

- Vitals and foetal monitors
- Blood: crossmatch and fibrinogen
- X-rays as indicated but limit radiation exposure before 18 weeks
- Keep radiation dose below 5 rads
- CT is bad! You need one
- eFAST is safe

Kleihauer-Betke test

- Testing should be routine
- Blunt trauma uterine injury suspected.
- Increased incidence of abruptio placentae in those with a positive test.
- Predictor of preterm labour.
- Main utility of the test - Restrict Rh immune globulin use

Pearlman MD, *Am J Obstet Gynecol.* 1990
Muench MV, *J Trauma.* 2004
Rose PG, *Am J Obstet Gynecol.* 1985
Rothenberger D, *J Trauma.* 1978

More Controversies or Perhaps Not!

- Perimortem caesarean section
- Low birth weight deliveries in resource depleted country
- Viable foetus in a brain dead patient
- Dialysis in an HIV positive patient

Take Home Message

- Think about it
- It's a Team work
- Treat the mother first, most of the time it is also the best way to treat the foetus
- Monitor the foetus
- Do not deviate from established trauma guidelines
- Image when indicated but be wise
- Left lateral decubitus position
- Consider need for RhoGAM
- Buckle up, especially if you are pregnant

Take Home Message

- Say NO to Women and Child Abuse

- Be Kind to animals and men!

Changes in **structure and function** can influence the **evaluation** of injured pregnant patients by altering the **signs and symptoms** of injury, the **approach and responses** to resuscitation, and the **results of diagnostic tests**.

ATLS 9th Edition

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Department: Defence
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