INTRODUCTION

Trauma affects approximately 7% of pregnancies which approaches rates in the general population. Premature labour, placental abruption, foeto-maternal haemorrhage and foetal demise are pregnancy related complications which can occur in trauma – even in the setting of seemingly minor injury.

Approximately half of the trauma experienced in pregnancy is secondary to motor vehicle accidents, with falls, assaults and burns occurring less frequently. Trauma during pregnancy is the leading cause of non-obstetric death, with an overall mortality of 6-7%. Foetal mortality may be as high as 80% if maternal shock is present. Foetal morbidity and mortality increases along with gestation as the uterus moves out of the pelvis.

Important physiological changes occur in pregnancy which impact on maternal and foetal risk in trauma.

<table>
<thead>
<tr>
<th>Physiological Changes during Pregnancy</th>
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<tbody>
<tr>
<td><strong>CARDIOVASCULAR</strong></td>
</tr>
<tr>
<td>CO increases 1-1.5L/min</td>
</tr>
<tr>
<td>BP decreases 5-15mmHg (normalises in 3\textsuperscript{rd} trimester)</td>
</tr>
<tr>
<td>HR increases 15-20 bpm</td>
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<tr>
<td>Uterus compresses IVC when supine</td>
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<tr>
<td><strong>AIRWAY</strong></td>
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<tr>
<td>Oedema to upper airway</td>
</tr>
<tr>
<td>Enlarged breasts</td>
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<tr>
<td><strong>RESPIRATORY</strong></td>
</tr>
<tr>
<td>Diaphragmatic elevation → reduced FRC</td>
</tr>
<tr>
<td>Increased MV with respiratory alkalosis</td>
</tr>
<tr>
<td>Reduced respiratory reserve</td>
</tr>
<tr>
<td><strong>HAEMATOLOGICAL</strong></td>
</tr>
<tr>
<td>Blood Volume increases 40-50%</td>
</tr>
<tr>
<td>Dilutional anaemia (Hb decreases 1-2g/dL)</td>
</tr>
<tr>
<td><strong>GASTROINTESTINAL</strong></td>
</tr>
<tr>
<td>Slowed gastric emptying</td>
</tr>
<tr>
<td>Intestines displaced to upper abdomen</td>
</tr>
<tr>
<td><strong>GENITOURINARY</strong></td>
</tr>
<tr>
<td>Ureteric dilation</td>
</tr>
<tr>
<td>Bladder displaced intra-abdominally</td>
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<tr>
<td>Increased uterine size &amp; blood flow</td>
</tr>
</tbody>
</table>

MATERNAL RISK

- Relative hypervolaemia can mask haemorrhagic shock
- Pregnant women have a relative reduction in respiratory reserve
- Pregnant women are more prone to aspiration
- Potentially a difficult airway / intubation due to airway oedema, larger breasts, rapid desaturation, relative hypovolaemia, aspiration risk
FOETAL RISK

- Maternal hypovolaemia significantly threatens the developing foetus at any stage of gestation – emphasising the importance of maintaining adequate maternal blood volume
- In the 1st trimester the uterus resides within the bony pelvis, which affords it relative protection from direct trauma. Direct trauma can have implications for the foetus beyond the 1st trimester

OBSTETRIC COMPLICATIONS OF TRAUMA

Premature Labour
Trauma may precipitate premature labour, particularly in association with placental abruption.

Placental Abruption
Shearing forces from deceleration injuries can separate the placenta from the underlying uterine wall causing an abruption. It occurs in 1-5% minor trauma in pregnancy and in 20-50% major trauma. Importantly it can have a delayed manifestation 24 to 48 hours after the initial injury.

Uterine rupture
Uterine rupture is a rare but devastating injury. It complicates 0.6% of traumatic injury. It occurs typically in later pregnancy often from a high energy direct blow to the abdomen. It almost always results in foetal demise.

Foeto-maternal Haemorrhage
Foeto-maternal haemorrhage is reported in 9-30% of cases of trauma in pregnancy, most frequently occurring after motor vehicle accidents. It is an issue in Rhesus-negative women who are at risk of sensitisation if the infant is Rhesus-positive. Any antibodies forming from the exposure has implications for subsequent pregnancies with Rhesus-negative foetuses and can result in foetal anaemia and non-viability. Foeto-maternal haemorrhage can be detected and quantified by the Kleihauer Betke test. Anti-D immunoglobulin should be administered to Rhesus-negative women with foeto-maternal haemorrhage.

OTHER CONSIDERATIONS

Cardiotocographic (CTG) Monitoring
All pregnant women greater than 20 weeks gestation should have CTG monitoring for a minimum of 4-6 hours even after minor trauma. Monitoring should be continued along with further evaluation in the instance of significant maternal trauma, abdominal / uterine tenderness, uterine irritability / contraction, vaginal bleeding or rupture of amniotic membranes.

Predictors of Foetal Morbidity / Mortality
- Vaginal bleeding
- Uterine tenderness
- Palpation of foetal parts
- Contractions
- Abnormal foetal heart rate on CTG
ASSESSMENT

**Primary Survey** along standard lines

**Secondary Survey**
- Head to toe assessment along standard lines
- Obstetric Examination
  - Fundal Height
  - Uterine Examination (tenderness/contractions)
  - Pelvic examination
  - FHR

**Investigations**

**Bedside**
- BSL
- Venous Blood gas
- FAST
- CTG monitoring

**Bloods**
- FBC, ELFT, lipase, coags
- Group & Hold / Crossmatch
- Kleihauer Betke

**Imaging**
- Plain film trauma series as indicated
- Foetal ultrasound
- CT as indicated
- Consider MRI in suitable candidates

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**Imaging in Pregnancy**

Radiation exposure in pregnancy is not without risks – with foetal loss, growth restriction or malformation theoretically possible. Imaging should be ordered judiciously with avoidance of redundancy. Counselling and informed consent should be undertaken where possible prior to any imaging. Imaging should always be in keeping with ALARA principle.

In general, exposure of < 5 rad is though to be safe.

<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>FOETAL EXPOSURE (rad)</th>
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</thead>
<tbody>
<tr>
<td>CXR</td>
<td>0.00002 – 0.00007</td>
</tr>
<tr>
<td>AXR</td>
<td>0.1</td>
</tr>
<tr>
<td>IVP</td>
<td>1</td>
</tr>
<tr>
<td>Hip XR</td>
<td>0.2</td>
</tr>
<tr>
<td>CT head</td>
<td>&lt;1</td>
</tr>
<tr>
<td>CT chest</td>
<td>1</td>
</tr>
<tr>
<td>CT abdomen</td>
<td>3.5</td>
</tr>
<tr>
<td>CT L spine</td>
<td>3.5</td>
</tr>
<tr>
<td>Pan scan</td>
<td>&lt; 5</td>
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</tbody>
</table>
MANAGEMENT

The first priority in the care of the injured pregnant patient is adequate maternal resuscitation. The well-being of the foetus is wholly dependent on that of the mother. As in any trauma, activation of the trauma team early where appropriate is crucial to ensure co-ordinated multi-disciplinary care. Early involvement of an obstetrician is important in case of precipitous delivery.

Resuscitation

Positioning The weight of the gravid uterus can compress the IVC reducing venous return
This can be addressed with:
- Manual uterine displacement
- Left lateral positioning
- Wedge beneath patients right side

Airway, Breathing & Circulation are managed along standard lines remembering specific pregnancy related risks:
- hypervolaemia can mask circulatory shock
- reduced respiratory reserve
- prone to aspiration
- expected airway difficulties

Specific care
- treat specific injuries along standard lines
- anti D immunoglobulin to Rhesus negative mothers with evidence of foeto-maternal haemorrhage

Supportive care
- keep warm
- ensure adequate analgesia
- ensure adequate anti-emetics charted
- consider NGT
- consider IDC
- update NOK
- ensure documentation completed

Disposition
Even seemingly minor trauma requires a period of observation in the labour ward with continuous CTG monitoring for a minimum of 4 - 6 hours.

Perimortem Caesarean Section
Should be considered in a moribund pregnant patient after trauma if the gestation is ≥ 24 weeks and there is presence of foetal heart beat. Delivery should start as soon as possible, ideally within 4 minutes of maternal arrest, and must occur within 20 minutes of maternal death as foetal neurological outcome is related to delivery time after maternal death.
FURTHER READING


REFERENCES


