

MAJOR TRAUMA IN PREGNANCY GUIDELINE

Network(s)	
Midlands Trauma Networks	
Publication:	
Document name: Major Trauma in Pregnancy Guideline	
Document purpose: This document contains information relating to the successful care and treatment of a pregnancy patient in trauma.	
Author: Midlands Trauma Networks	
Publication date: April 2022	Date reviewed:
Review due date: April 2025	Ref No. 109
Target audience: Major Trauma Centres, Trauma Units, Local Emergency Hospitals	
Action required: Dissemination to MTC, TU, LEH personnel for action.	
Contact details for further information: Midlands Critical Care, Trauma and Burns Networks 15 Frederick Road Birmingham B15 1JD	
Document status: The controlled copy of this document is maintained by the Midlands Critical Care & Trauma Networks. Any copies of this document held outside of that area, in whatever format (e.g. paper, email attachment), are considered to have passed out of control and should be checked for currency and validity.	

Date changed	
Section/Para	

Summary

- Pregnancy must be considered in all female trauma patients of child-bearing age (11-55 years)
- Optimal assessment and management of the maternal injuries will lead to the best prognosis for the fetus
- Clinicians should use the standard primary survey assessment to detect traumatic injuries and not be distracted by the pregnancy
- Immediate left lateral tilt or manual displacement of the uterus is essential if the fundal height is above the umbilicus
- Significant haemorrhage may occur in the pregnant woman before signs of hypovolaemia become evident: a tachycardia and low-normal blood pressure should raise suspicion
- The obstetric team should be contacted for all major trauma alerts involving pregnant patients
- Resuscitative hysterotomy is indicated in traumatic cardiac arrest if the fundal height is above the level of the umbilicus and there is no response to initial resuscitation (within 4 minutes)
- Clinicians should always consider whether the cause of the injury could be due to domestic abuse or underlying psychiatric conditions
- All pregnant women suffering trauma, no matter how apparently trivial their injuries, require assessment by the obstetrics and gynaecology team before discharge
- Refer to any local trust guidance regarding the management of less significant trauma in pregnancy.

Introduction

Major trauma in pregnancy should be managed as per any trauma alert but with some modifications to practice. These include understanding how the altered anatomy and physiology will impact on the detection of injury and the need for different procedural techniques (airway management, thoracostomy position, detecting hypovolaemia from pulse/blood pressure changes, the need for a manual displacement of the uterus, and indications for resuscitative hysterotomy). Successful management of the pregnant patient will require coordinated care from consultant members of the trauma team, surgical team, obstetric team. The neonatal team are also essential when emergency delivery is a possibility.

Summary

- Primary survey
 - with manual displacement of uterus/lateral tilt if >20 weeks
 - supplemental oxygen
 - thoracostomies in 3rd or 4th ICS if necessary
 - compensate for hypovolaemia – consider blood early
 - check for uterine tenderness/rigidity & PV loss
 - take Obstetric history in AMPLE
- Urgent senior obstetric review
 - Examination & fetal assessment
- Imaging same as non-pregnant patient
- Traumatic cardiac arrest
 - Follow standard protocol plus resus hysterotomy if >20 weeks

Definitions

ED = Emergency Department

RSI = Rapid Sequence Intubation

MHP = Massive Haemorrhage Protocol

ETA = Expected Time of Arrival

PV = Per Vaginum

CT = Computed Tomography

TTL = Trauma Team Leader

AMPLE = Allergies, Medications, Past medical history, Last ate/drank, Events

IUGR = Intrauterine Growth Retardation

G&S = Group and Save blood sample

CPR = Cardiopulmonary Resuscitation – chest compressions and ventilations

IV = Intravenous

RBC = Red Blood Cells

FFP = Fresh Frozen Plasma

ROSC = Return of Spontaneous Circulation

PRE-ALERT

Consultant/senior registrar obstetric and anaesthetic support should be called early, and before the arrival of the patient if there is a pre-alert message from the ambulance service. The patient should be received in resus with activation of the full trauma team.

If the history suggests a resuscitative hysterotomy (perimortem caesarean section PMCS) may be indicated, then activate both a TRAUMA ALERT and an OBSTETRIC EMERGENCY to attend before the patient's arrival. Local hospitals should know which team members will respond if an obstetric emergency is called in ED. The neonatal/paediatric team should also be notified before the patient's arrival.

PRIMARY SURVEY

Airway

- There is an increased risk of regurgitation and aspiration due to relaxation of the oesophageal sphincter by pregnancy hormones, delayed gastric emptying and increased intragastric pressure from the pregnant uterus. Intubation with a cuffed endotracheal tube is preferred over a supraglottic airway device, with early decompression of the stomach by an orogastric tube
- Intubation may be more difficult due to soft tissue oedema and enlarged breasts may impede laryngoscopy. The most experienced Anaesthetist available should undertake the RSI. The use of a smaller diameter endotracheal tube should be considered
- Rapid desaturation may occur during intubation attempts due to a reduced functional residual capacity. Ensure adequate pre-oxygenation and consider nasal apnoeic oxygenation
- In patients with hypovolaemia, RSI with drugs should be avoided until volume replacement with blood has been established
- If surgical cricothyroidotomy is indicated, a vertical incision may be necessary if landmarks cannot be palpated.

Breathing

- Hypoxia is more likely in pregnant women due to increased oxygen consumption and reduced functional residual capacity. Oxygen must be administered to all pregnant trauma patients to achieve SaO₂ 94-98.
- Ventilation may be more difficult due to weight gain, breast enlargement and increased intra-abdominal pressure
- Physiological hyperventilation of pregnancy caused by increased tidal volume leads to a respiratory alkalosis with a PaCO₂ below 4kPa. A higher PaCO₂ may indicate respiratory failure
- The diaphragm rises by up to 4cm as the uterus enlarges. Thoracostomy and chest drain insertion should be performed high (in the 3rd or 4th intercostal space) to reduce the risk of abdominal or diaphragmatic penetration.

Circulation

- After 20 weeks (fundal height at level of umbilicus) the pregnant uterus will compress the aorta and inferior vena cava in a supine position, which may lead to a reduction in venous return and therefore cardiac output. This can be prevented

by a left lateral tilt of 15 degrees in the medical patient. The patient may come in on a scoop stretcher which has been tilted to the left with blankets underneath the right side of the scoop. In the trauma setting to maintain spinal and pelvic alignment or in cardiac arrest when chest compressions are necessary, the preferred technique is manual displacement of the uterus to the left (using a member of staff to push or pull the uterus across with their hands)

- By the third trimester of pregnancy the resting heart rate is increased by 15-20 bpm and blood volume is increased by up to 50% of normal. Blood pressure falls by 10-15mmHg in the second trimester but returns to near normal by term. Blood may be shunted from the uterine and placental circulation into the maternal circulation to compensate for maternal hypovolaemia to the detriment of the fetus. Significant haemorrhage (>1.5 litres) may occur before signs of hypovolaemia become evident. Tachycardia and low normal blood pressures should raise suspicion for hypovolaemia and the need for fluid resuscitation. Activate the MHP early for pregnant trauma patients
- The uterine circulation is entirely dependent on the maternal blood pressure so a target systolic blood pressure of at least 90mmHg must be maintained by fluid resuscitation. An early arterial line may be useful for invasive blood pressure monitoring in severely injured patients
- In late pregnancy, the uterus displaces the abdominal viscera making abdominal examination for signs of injury more difficult. In the 'C' assessment of the primary survey, the abdomen should be palpated for tenderness, rigidity, contractions, and fundal height. A quick visual inspection should be made for external PV blood loss or discharge
- There is significantly increased vascularity of the pelvis which means pelvic fractures may easily cause life-threatening blood loss. Pregnant patients with a suspected unstable pelvic fracture should have a pelvic binder applied as per standard management
- If intraosseous access is required, the humeral site (above the diaphragm) should be used rather than the tibia. Avoid femoral trauma lines due to compression by the gravid uterus.
- Tranexamic acid should be given within three hours of injury for all patients with signs of hypovolaemia or suspected internal haemorrhage
- Avoid vasopressors as they may compromise utero-placental perfusion. Prioritise volume resuscitation and only consider for neurogenic shock or confirmed traumatic brain injury.

An obstetric NEWS chart may be helpful for patients over 16 weeks of pregnancy to ensure that the physiology of pregnancy is considered.

Imaging

- Accurate diagnosis and management of the maternal injuries will lead to the best prognosis for the fetus. Clinically indicated CT scans or plain x-rays should not be withheld because of concerns about radiation exposure to the fetus
- For patients who are very well with a low suspicion of injury then a more focused imaging approach may be taken: it may be useful for the ED consultant TTL to discuss with a second Consultant for a second opinion where imaging choice is not obvious.
- For plain x-rays, a lead gown can be positioned over the uterus to protect from the direct x-ray beam if it does not interfere with imaging. A lead gown must not be used in CT as it may deflect rays and actually increase radiation dose to the fetus.

SECONDARY SURVEY

The AMPLE history should obtain a full pregnancy history including gestation, singleton or multiple pregnancy, any problems identified in pregnancy (e.g., low lying placenta, IUGR), previous pregnancies and births, when did the patient last feel the baby move and is it moving normally, any contractions/tightening's or abdominal pain, any vaginal bleeding or discharge?

The Obstetric registrar/consultant should be given access to undertake an early obstetric assessment in resus, which may include Doppler ultrasound. This should not interrupt maternal resuscitation as the priority is the mother. In apparently stable patients, fetal distress may be an early indicator of placental abruption or uterine rupture requiring urgent delivery in theatre.

Prescribed analgesia should be carefully checked for any contraindications in the appropriate trimester of pregnancy. NSAIDs should be avoided, if possible, at any gestation but paracetamol is safe. Most opioids are safe to use (including dihydrocodeine preferably rather than codeine phosphate, tramadol, and morphine).

Anti-D immunoglobulin prophylaxis is indicated in previously non-sensitised Rh D Negative women who have sustained abdominal trauma, miscarriage or intrauterine death. Anti D Ig should be administered within 72 hours of the event so this not a priority during the reception and resuscitation of a pregnant trauma patient. The maternal G&S sample will be essential to confirm the Rh D group and check for the presence of immune Anti-D. In patients over 20 weeks gestation, the obstetric team may request a Kleihauer test to detect fetal cells in the maternal circulation (purple blood bottle). Refer to your local trust anti-D guideline.

TRAUMATIC CARDIAC ARREST IN PREGNANCY

The standard traumatic arrest protocol should be followed including the following simultaneous interventions (as indicated by mechanism of injury and clinical findings):

- CPR and rhythm check
- Activate emergency call to switchboard: "OBSTETRIC CARDIAC ARREST, A&E RESUS, PATIENT THERE NOW"
- Maintaining manual displacement of uterus to left (if fundal height at or above level of umbilicus)
- Intubation with endotracheal tube & ventilation with 100% oxygen
- Bilateral thoracostomies
- Large bore IV access & resuscitation with RBC & FFP via Belmont rapid infuser
- Stopping external haemorrhage, splinting pelvic & long bone fractures
- Consider need for resuscitative thoracotomy
- Consider need for resuscitative hysterotomy

Patients who have a pregnant uterus palpable at or above the level of the umbilicus or who are confirmed to be at least 20 weeks pregnant and are in traumatic cardiac arrest will require a **resuscitative hysterotomy at the location of the arrest** (e.g., ED). A fundal height below the umbilicus indicates that aortocaval compression will

not influence the survival of the mother or fetus and resuscitative hysterotomy is not indicated.

Resuscitative hysterotomy should be performed immediately if the mother has injuries incompatible with life, after a prolonged pre-hospital arrest, or within five minutes of witnessed cardiac arrest. The obstetric on call team should be summoned (if not already in A&E) via switchboard.

It may be beneficial to have the neonatal resuscitation team set up in a separate paediatric resus room. If this is not possible, consider a different room or location if space and equipment allow. Ideally neonatal resuscitation will occur separate from the maternal resuscitation team to allow both teams to operate without distracting the other.

Following delivery of the baby, the cord will be clamped/cut, and the baby passed to the neonatal resuscitation team. The placenta can be delivered, or left in situ, whilst maternal resuscitation continues

If ROSC is achieved, consider Tranexamic acid if not already administered. With ROSC, bleeding can arise from an atonic uterus and/or from the edges of uterine incision which may need packing and direct pressure.

OBSTETRIC COMPLICATIONS AFTER TRAUMA

Placental abruption is the premature separation of the placenta from the uterine wall. It may occur after relatively minor trauma and can present up to 24 hours after the initial incident. It can be caused by rapid deceleration injuries as well as direct trauma to the abdomen. There may be severe abdominal pain with premature contractions. PV bleeding may be external or may be concealed (majority of cases). Signs of hypovolaemic shock can occur late even with significant abruption.

Uterine rupture can occur after blunt trauma to the abdomen. The patient may present with severe abdominal pain, uterine tenderness with guarding, and hypovolaemic shock. The top of the fundus may be difficult to distinguish and there may be palpable fetal parts in the abdomen.

Premature labour may be provoked by trauma to the uterus causing the release of prostaglandins from the injured myometrium. In many cases, the contractions resolve without treatment.

Direct **fetal death** is rare but indirect injury may occur due to hypoxia, hypovolaemia, or placental/cord injury. Resuscitation of the mother is a priority to prevent secondary causes of fetal injury.

Penetrating injury to the uterus may occur. As pregnancy progresses the uterus acts as a shield for the maternal abdominal injuries but this means a poor prognosis for the fetus.

Maternal Death

All deaths of pregnant women, and women up to one year following the end of their pregnancy (regardless of the place and circumstances of death), are eligible for notification to MBRRACE-UK. The Consultant obstetrician on-call should be

contacted for pregnant women of any gestation who die in the ED or after admission.

The distress caused by a maternal death should not be underestimated. Staff members should be offered a hot debrief and signposted to pastoral support and counselling services within the trust.

Safeguarding

Domestic violence frequently goes unreported and may worsen during pregnancy. Clinicians should consider talking to the pregnant patient without any relatives present to establish the exact mechanism of injury. If the patient is experiencing domestic abuse but does not consent to further intervention, then referral to social services should still occur for the unborn child. When there are already children living in the household with the patient, then these children should also be referred to social services.

Pregnant patients may self-harm due to psychiatric problems as their mechanism of injury. These patients will require a full psychiatric assessment prior to discharge.

References cited in guideline
MBRRACE-UK. Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2016-18 (2020). https://www.npeu.ox.ac.uk/assets/downloads/mbrance-uk/reports/maternal-report-2020/MBRRACE-UK Maternal Report Dec 2020 v10 ONLINE VERSION 1404.pdf
ERC Guidelines 2021: Cardiac arrest in special circumstances. Resuscitation 2021;152-219. https://www.resuscitationjournal.com/article/S0300-9572(21)00064-2/fulltext
Resuscitation Council/Obstetric Anaesthetist's Association. Obstetric cardiac arrest https://www.resus.org.uk/sites/default/files/2021-08/Maternal%20Cardiac%20Arrest%20QRH%20OAA%20V1.1.pdf
Bisson DL, Newell SD, Laxton C, on behalf of the Royal College of Obstetricians and Gynaecologists. Antenatal and Postnatal Analgesia. Scientific Impact Paper No. 59. BJOG 2019. https://obgyn.onlinelibrary.wiley.com/doi/pdf/10.1111/1471-0528.15510

CHECKLIST FOR LOCAL DEPARTMENTS

How would you summon the Obstetric Registrar and Consultant on-call in an emergency?	
How would you summon a neonatal resuscitation team in an emergency?	
What equipment is available to perform a resuscitative hysterotomy in the ED and where is it kept?	
What area of resus would you use to resuscitate the mother (considering number of people attending)? What area of resus would you receive the baby post RH e.g., separate area to maternal resuscitation?	
How would staff be supported immediately after the incident and later on?	