Topic Overview: Trauma and Cardiac Arrest during Pregnancy

Module Obstetrics 4

Date of last update: 4th March 2012

Topic overview (Handout)

Management of Trauma in the Pregnant Patient

Maternal mortality in income rich countries, such as Australia, remains low, at approximately 8.4 per 100000 women giving birth. Trauma contributes significantly to maternal morbidity, though death from trauma mechanisms may not be captured in maternal mortality data because they may be classified as incidental rather than direct or indirect. The common causes of trauma in the pregnant population are motor vehicle accidents, attempted self-harm and domestic violence.

Trauma in the pregnant patient provides a challenge to the treating team. There may be difficult management decisions to be made affecting two patients, the mother and the unborn child. On occasions management decisions may appear to be in conflict, however effective maternal resuscitation is be considered the best initial treatment for the child *in utero*. The principles of assessment and management are essentially the same for the pregnant and non-pregnant patient. It is important to recognise the changes of pregnancy to both anatomy and physiology which affect injury pattern and provide implications for management.

Severe Trauma

A multidisciplinary trauma team commonly provides care for the severely injured trauma patient. In NSW, a trauma system filters these patients to major trauma centres utilising the trauma triage protocol for the ambulance service. When considering transfer to a major trauma centre the availability of neonatal and obstetric services should ideally be available at the receiving centre. In smaller centres local obstetric and paediatrics services should be mobilised, it is important to remember that as well as adult retrieval services, the Newborn and Paediatric Emergency Transport Service (NETS) may be required for critical care management of the newborn.

Primary Survey

Immediately life threatening injuries and complications are looked for and treated in the familiar AcBCDE fashion. Airway, breathing, circulation and disability are priorities with precautions being taken for cervical, thoracic and lumbar spine injury. Remembering that resuscitation of the mother is the best initial care for the child and that avoidance of secondary injury may reduce morbidity and mortality.

Attention needs to be drawn to the possibility of aorto-caval compression in the pregnant patient, particularly in the third trimester. Compression of the vena cava by the uterus leads to a decrease in venous return and hypotension. Left lateral tilt moves the uterus off the inferior vena cava can help decrease the effects of supine hypotension. This is achieved by manually displacing the uterus, wedging the pelvis or using a spine board to tilt the patient to maintain spinal control.

Special considerations for the pregnant patient include the increased occurrence of a difficult airway, especially with increasing gestational age. These airway challenges are amplified by the in line immobilisation usually required in trauma situations. The reasons for this include an increase in airway oedema and increased breast

size making it more difficult to obtain an ideal laryngoscopic view. If the patient requires intubation, remember that the pregnant patient has higher oxygen requirements and hence desaturates much more rapidly than the non-pregnant patient. This is compounded by the increased intra-abdominal pressure further reducing the functional residual capacity.

The pregnant patient is also at a higher risk of aspiration due to relaxation of the gastrooesophageal sphincter in pregnancy, increased intra-abdominal pressure, and elevation of the diaphragm in advanced stages of pregnancy.

Assessment of circulation can also be more difficult in the pregnant patient. The physiological changes of pregnancy result in a relative resting tachycardia and relative hypotension, which then makes these signs difficult to interpret as markers of shock and haemorrhage. There is increased capillary leak, which also means that pregnant patients do not tolerate large volumes of fluid loading and may go into pulmonary oedema earlier than would be expected with a young non-pregnant patient. Arterial flow to the uterus is not auto regulated, therefore any drop in maternal blood pressure will cause a decrease in uterine blood flow and potential foetal hypoxia.

Pregnancy is also a hypercoagulable state, with a relative increase in fibrinogen, plasminogen activator inhibitor and thrombin. The anti-coagulants Protein C and antithrombin III remain at their usual levels. Increasing the risk further is the increased risk of venous stasis in the third trimester with increased venous capacitance and compression on the vena cava by the gravid uterus when the patient is supine This may increase the risk of thromboembolic disease in the recovery period, as during all stages of pregnancy. A Pregnancy Primary survey has also been described and should be performed immediately after the maternal primary survey. The foetus should be assessed for movement and heart rate. The mother should be examined for uterine activity, vaginal bleeding and discharge. Clinical assessment of the pregnancy has limited sensitivity, serial assessment and investigations should be undertaken to monitor for foetal distress.

Secondary Survey and Investigations

Following initial resuscitation measures, the secondary survey involves a more detailed examination of the history and circumstances around the trauma and then the patient. This allows the diagnosis and management of other non-life threatening injuries during the head to toe assessment. Head, chest injury management in the pregnant patient is similar to that in non-pregnant patient.

Blunt trauma, such as that sustained during a motor vehicle accident is a common mechanism of injury. Assessment and investigation of abdominal injury or suspected abdominal injury provides a challenge in the pregnant patient. The usual methods of seeking intra-abdominal blood and injury can be more difficult due to increased maternal size and displacement of the internal organs. A fast scan to seek intra-abdominal blood should be performed as usual, but it is essential to recognise increased difficulty with the procedure. An ultrasound of the foetus can examine movement and the foetal heart beat, but is poorly sensitive for detecting uterine or placental injury.

There are radiation risks to the baby from radiation exposure, which are reduced by the third trimester, however the risks to both the mother and child from unrecognised injury may significantly outweigh the risk to the foetus. The highest central nervous system risk period is between 8-15 weeks gestation. In this time abdominal shielding is necessary and choice of imaging modalities that do not involve radiation (such as ultrasound) are preferred when possible. The estimated exposure from most imaging is less than 5 rad, which is the dose exposure considered safe for the foetus. Risks of radiation exposure should be considered by a senior clinician in conjunction with the radiologist and surgeons, but they should not delay urgent imaging.

Continuous foetal monitoring using cardiotocography (CTG) should be commenced in all patients after 20 weeks of gestation with suspected abdominal injury. This monitoring should continue for at least 4 hours assessing for suspicious changes in the CTG tracing, however there should be ongoing reassessment of the need for monitoring

in consideration of the mechanism of injury, presence of vaginal bleeding and significant and ongoing uterine pain. Placental abruption, which can occur up to 48 hours after the initial injury is the most common cause of intrauterine foetal death after trauma.

Kliehauer-Betke (foetal maternal haemorrhage) test should be performed after 11 weeks gestation to examine for foeto-maternal haemorrhage. Likewise a group and hold is essential, both to cross match blood for transfusion and to ensure Rhesus status is known so that anti-D is given to all Rhesus negative women.

References

Sullivan, EA, Hall, B. & King, JF. 2007. Maternal Deaths in Australia 2003-2005

Barraco, RD et. al., Practice Management guidelines for the diagnosis and management of injury in the pregnant patient: The EAST Practice Management Guidelines Work Group.   J Trauma 2010; 69: 211-214

Advanced Obstetrics LIfe Support Course manual, 2009

Management of a cardiac arrest in a pregnant patient

Cardiac arrest in pregnant women occur suddenly without any prior warning signs. Young patients even during advanced stages of pregnancy have significant physiological reserve. Cardiac arrests in pregnant women are uncommon. Therefore when an arrest occurs, a multidisciplinary team approach and calling for senior assistance is a priority. The principles of management of a cardiac arrest in pregnant patients are similar to that in non-pregnant patients. There are specific pregnancy related causes of cardiac arrest that need to be considered and excluded or treated. As with the management of trauma, it is best to remember that timely and best care for the mother is ultimately what is best for the foetus. The unfamiliarity of the situation as well as the consideration of two patients means that there is an atmosphere of heightened stress.

Non-obstetric causes of cardiac arrest include previous cardiac disease such as valvular disease, myocardial infarction, cardiomyopathy or collagen disorders leading to aortic dissection. Septic shock and trauma also lead to cardiac arrest. Pregnancy increases the risk of pulmonary embolism, which is not an uncommon cause of cardiac arrest.

Pregnancy specific causes of cardiac arrest include
     Severe obstetric haemorrhage and hypovolaemic shock
     The spectrum of hypertensive disorders (preeclampsia, eclampsia, HELLP)
     Amniotic fluid embolus
     Thromboembolism
     Anaphylaxis/overdose of tocolytics or anaesthetic drugs
     Anaesthetic complications such as failure to intubate or ventilate

Management of these difficult situations is to firstly identify potentially reversible causes while concurrently commencing advance life support and preparing for delivery of the foetus.

The standard advance cardiac life support (ACLS) algorithm is applied to the pregnant patient. The main additional considerations are related to the effects of the gravid uterus on resuscitation efforts. The uterus, particularly in the third trimester can cause a decrease in venous return. Manually shifting the uterus to the left off the inferior vena cava and applying some degree of left lateral tilt may be sufficient. Note however that increasing left tilt may decrease the effectiveness of chest compressions

As discussed above, timely securing of airway is important, however only experts in the area should attempt endotracheal intubation,and basic airway manoeuvres or the insertion of a laryngeal mask are considered sufficient prior to arrival of expert team members.

Perimortem Caesarean Sections

Perimortem caesarean sections are indicated in cases of maternal arrest to improve the maternal survival and potential survival of the foetus. The best outcomes for the foetus are achieved if the delivery can occur within 5 minutes of maternal cardiac arrest although longer periods of relative foetal asphyxia have been described. In cases of maternal cardiac arrest a team should be rapidly assembled and prepared to perform this should their be failure of maternal return of spontaneous circulation beyond 4 minutes.

References
- Australian Resuscitation Council. Arrest in Special Circumstances. Guideline 11.10 (2011)
- Jeejeebhoy, FM., Zelop, CM., Windrim, R., Carvalho, JC., Dorian, P., Morrison., LJ. Management of cardiac arrest in pregnancy: A systematic review. Resuscitation. 2011: 82(7): 801-9
- Farinelli, CK. & Hameed, AB. Cardiopulmonary Resuscitation in Pregnancy. Cardiol Clin 30 (2012) 453-461
- Advanced Life Support in Obstetrics Manual, 4th edition

HealthWorkforce AUSTRALIA

An Australian Government Initiative

NSW GOVERNMENT | Health

Sydney Clinical Skills and Simulation Centre