Peri-mortem laparotomy in a patient with a ruptured intra-abdominal pregnancy

Césarienne périmortem chez une patiente présentant une grossesse extra-utérine rompue

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Abstract Introduction: Intra-abdominal pregnancies can present at an advanced stage of pregnancy and can have the potential for life-threatening rupture and haemorrhage. The purpose of this case report was to discuss the early recognition and prompt management options of a patient with a life threatening ruptured intra-abdominal pregnancy.

Case report: We report what we believe to be the first case of a patient who presented with an intra-abdominal pregnancy who underwent a peri-mortem laparotomy in the Emergency Centre following a cardiac arrest, and who exhibited a return to spontaneous circulation (ROSC).

Conclusion: Peri-mortem laparotomy/thoracotomy coupled with high quality CPR and resuscitation may be lifesaving in a patient with a life threatening ruptured intra-abdominal pregnancy.

Peri-mortem laparotomy in a patient with a ruptured intra-abdominal pregnancy

African relevance

- Advanced intra-abdominal pregnancies and their complications are more likely to present in the resource limited developing world due to sub optimal antenatal screening.
- Peri-mortem laparotomy/thoracotomy may be a lifesaving procedure and must be considered by the appropriately trained physician when indicated.
- Continual post resuscitation management and support in a critical care setting are necessary for improved outcomes.

What's new?

- Abdominal pregnancies can present at an advanced stage of pregnancy and can have the potential for life-threatening rupture and haemorrhage.
- A peri-mortem laparotomy/thoracotomy must be considered early in the ED by the appropriately trained physician.
- Vigilant post-resuscitation management in theatre and the intensive care unit are paramount to improve outcomes.

Introduction

Ruptured ectopic pregnancy is a common pregnancy related complication and is one of the leading causes of first trimester maternal mortality. Ninety-five percent of ectopic pregnancies occur in the fallopian tube and usually present at less than 9 weeks gestation. Only 1.3% of ectopic pregnancies occur in the abdominal cavity.1

We report what we believe to be the first case of a patient who presented with an intra-abdominal pregnancy who underwent a peri-mortem laparotomy in the Emergency Centre (EC) following a cardiac arrest, and who exhibited a return to spontaneous circulation.

Case report

A 33-year-old female presented to the EC with a history of syncope preceded by severe abdominal pain. No other history was available at the time of presentation. On arrival she was obtunded, a manual blood pressure reading was unobtainable and she had a pulse rate of 122 bpm. Her abdomen was mildly distended. Resuscitation with intravenous fluids was commenced. As a result of further physiologic deterioration, rapid sequence intubation followed. Arterial blood gas analysis revealed a severe metabolic acidosis (pH 6.90), ScvO2 of 46% and a haemoglobin of 4 g/dl. An emergency ultrasound protocol for hypotension was performed which revealed large amounts of intra-abdominal fluid and a flat inferior vena cava (IVC). Further ultrasound examination revealed an empty uterus and an intra-abdominal foetus with a visible heartbeat. An urgent blood transfusion was initiated. The obstetrics and gynaecology specialist registrar from the satellite women and children’s hospital and the on-site surgical specialist registrar were urgently notified. Prior to their arrival, the patient deteriorated and went into cardiac arrest. The arrest rhythm proved to be a pulse less ventricular tachycardia. She was promptly defibrillated and cardiopulmonary resuscitation (CPR) was commenced as per advanced cardiac life support guidelines. On repeat examination during CPR, the abdomen was tensely distended. A decision was made to perform an ED laparotomy. The abdomen was opened up via a midline incision from xiphisternum to pubic symphysis during CPR. Approximately 5 L of blood was suctioned from the abdominal cavity. An extra-uterine gestational sac, which was attached to the fundus of the uterus via a pedicle, was ligated. A 12 cm long foetus was found amongst loops of small bowel. CPR was continued for a further 15 min before a return of spontaneous circulation (ROSC) was achieved. Post ROSC red blood cell, fresh frozen plasma and platelet transfusion were continued and an adrenaline infusion (0.8 mcg/kg/min) was commenced. One gram of tranexamic acid was administered and an infusion of 1 g to run over 8 h was commenced. The abdomen was packed and the patient transferred to theatre. Thirty minutes post ROSC, the following parameters were recorded: SBP – 96 mmHg, HR – 113 bpm, ScvO2 – 66%, pH – 7.04. Post theatre the patient was sent to ICU with the abdomen surgically closed. SBP was recorded as 110 mmHg and the adrenaline infusion, now running at 0.4 mcg/kg/min was continued. The patient died in ICU three days later secondary to multi-organ failure and DIC.

Discussion

An extra-uterine/ectopic pregnancy is any implantation of the fertilised ovum outside the endometrium of the uterus.2 Causes of ectopic pregnancy include previous pelvic infection, prior ectopic pregnancy, tubal surgery/ligation, assisted reproduc-

Abstract

Introduction: Les grossesses extra-utérines peuvent se présenter à un stade avancé de la grossesse et peuvent entraîner une rupture mortelle et une hémorragie. L’objet de cette observation était de discuter de l’identification précoce et des options de prise en charge rapide d’une patiente présentant une grossesse extra-utérine rompue mortelle.

Observation: Nous faisons état de ce qui semble être le premier cas de patiente se présentant avec une grossesse extra-utérine et ayant subi une césarienne périmortem au service des urgences suite à un arrêt cardiaque, avec retour spontané de la circulation.

Conclusion: Une césarienne/thoracotomie périmortem, associée à une réanimation cardio-respiratoire de qualité et aux techniques de réanimation, peut sauver la vie d’une patiente présentant une grossesse extra-utérine rompue mortelle.

tion, use of intrauterine devices, advanced age and smoking. The incidence of abdominal pregnancy has been reported as 1 per 3372–7931 births. The mortality rate of abdominal pregnancy is seven times higher than fallopian tube pregnancies. Most abdominal pregnancies originate as tubal or ovarian pregnancies and then rupture into the peritoneal cavity where they then implant for a second time (secondary abdominal pregnancy). Abdominal pregnancies can present at an advanced stage (>24 weeks) and may have the potential for life-threatening rupture and haemorrhage. The above-mentioned patient presented at >14 weeks gestation (based on the size of the foetus). Later investigation of the patient’s background history revealed that she had undergone a previous tubal ligation, placing her at a higher risk of developing an ectopic pregnancy.

With recent advances in the use of ultrasonography in the EC, focused EC ultrasound can be used to better define the cause of shock when it is not immediately apparent (especially hypovolaemic and cardiogenic causes). Free fluid in the abdomen together with a small IVC diameter is suggestive of hypovolaemic/haemorrhagic shock.

The emergent management of any patient in haemorrhagic shock is to stop the bleeding and concurrently optimise circulating blood volume in order to maintain perfusion to vital organs so as to prevent irreversible end organ ischaemia. Due to unavoidable delays in taking our patient to the operating theatre and on-going internal bleeding she went into cardiac arrest.

The only interventions in cardiac arrest that have been proven to have an impact on morbidity and mortality are early defibrillation with high quality CPR and addressing the underlying cause. Therefore after our patient was promptly defibrillated and CPR commenced, a peri-arrest laparotomy was performed in the EC in order to treat the underlying cause of the arrest. The performance of the peri-mortem laparotomy served a dual purpose – firstly to stop the bleeding and secondly to relieve the intra-abdominal pressure, thereby improving the already compromised IVC capacitance and venous return to the heart.

PubMed and Google searches using the keywords “peri-mortem” and “laparotomy” revealed only one previous case study of a patient who underwent a laparotomy in the EC following asystolic cardiac arrest secondary to a ruptured ovarian malignant mass, resulting in massive intra-abdominal haemorrhage. No ROSC was achieved. Perhaps not much has been published in the literature, likely due to dismal results and high mortality rates associated with EC laparotomy. The survival rate from blunt trauma is less than 1% whilst the survival rate from penetrating trauma is not much higher. However ruptured abdominal ectopic pregnancies are rare and bleeding is usually from an isolated site. It is assumed that the survival rates would be better than that for blunt trauma. Therefore every effort towards resuscitation should be attempted, bearing in mind available resources.

Many case studies and protocols have been described regarding peri-mortem caesarean section in the EC. The main objective is to relieve the pressure of the gravid uterus on the IVC, thus improving maternal venous return. The goal is to remove the foetus within 5 min of cardiac arrest in order to improve maternal outcomes. According to a recent systematic review there are very few instances where a caesarean section had been performed within 5 min of cardiac arrest.

There are many reports of peri-mortem EC thoracotomy for various indications such as internal cardiac message, pericardiotomy for pericardial tamponade and to clamp the descending aorta in trauma patients with uncontrolled intra-abdominal haemorrhage. We chose to perform a laparotomy in our patient since ruptured ectopic pregnancies usually have a single source of haemorrhage and are easily controlled via the abdominal approach. This also allowed us to relieve pressure off the IVC and thus improve venous return. The thoracotomy approach may also have been considered in this patient. This would have allowed us to clamp the descending aorta, thereby controlling distal haemorrhage and would have facilitated internal cardiac message. However with this approach it would not be possible to relieve external IVC pressure.

Conclusion

Peri-mortem laparotomy/thoracotomy coupled with high quality CPR and resuscitation may be lifesaving in a patient with a life threatening ruptured intra-abdominal pregnancy.

Our recommendations for intra-abdominal, non-traumatic haemorrhage in the peri-arrest patient in the EC:

- Use emergency ultrasound techniques early in the resuscitative phase of management to aid diagnosis and management
- Maintain a high index of suspicion of pregnancy and its complications in any female of childbearing age
- Contact gynaecologist/surgeon promptly
- Employ early fluid resuscitation whilst keeping in mind the principles of permissive hypotension
- Consider early blood/blood product administration with packed red blood cells: fresh frozen plasma: platelets in a ratio of 1:1:1
- Consider Anti Shock Garment (PASG/MASG) if available (Class II b evidence)
- Consider inotropic support if the patient remains hypotensive despite demonstrably sufficient fluid resuscitation

If the patient develops cardiac arrest in the EC:

- Perform early defibrillation (when appropriate) with high quality CPR
- Perform peri-mortem laparotomy/thoracotomy in the EC as soon as possible after CPR is initiated so as to achieve homoeostasis. A laparotomy/thoracotomy set should be available in the EC
- Provide vigilant post-resuscitation management in theatre and the intensive care unit.

Appendix A. Short answer questions

Test your understanding of the contents of this case report (answers can be found at the end of the regular features section)

1. Regarding peri-mortem caesarean section:
   a. The goal is to remove the foetus within half an hour of cardiac arrest
   b. In most instances a peri-mortem caesarean section is performed within the recommended time frames
c. The main objective is to relieve the pressure of the gravid uterus on the IVC, thus improving maternal venous return.
d. The goal is to remove the foetus within 5 min of cardiac arrest.
e. The goal is to remove the foetus within 15 min of cardiac arrest.

2. Indications for ED thoracotomy include:

a. Cardiac in a patient with blunt chest trauma.
b. Pericardiectomy in a trauma patient with a pericardial tamponade and ineffective pericardiocentesis.
c. Clamping of the descending aorta in trauma patients with uncontrolled intra-abdominal haemorrhage.
d. Large pericardial effusion with a normal blood pressure.
e. Bilateral large pleural effusions in a severely distressed patient with lymphoma.

3. Management recommendations for intra-abdominal, non-traumatic haemorrhage in the peri-arrest patient in the ED include:

a. Contact gynaecologist/surgeon promptly.
b. Only contact the gynaecologist/surgeon if the patient is not responding to resuscitative measures.
e. Maintain a high index of suspicion of pregnancy and its complications in any female between the age of 19 and 36.

Conflict of interest

The authors declare no conflict of interest.

References