



ELSEVIER

Available online at www.sciencedirect.com

Seminars in Perinatology

www.seminperinat.com

Cardiac arrest in pregnancy

Jacqueline Kikuchi, MD, and Shad Deering, MD*

Department of Obstetrics and Gynecology, Uniformed Services University of the Health Sciences, 4301 Jones Bridge Rd, Bethesda, MD 20814

ARTICLE INFO

Keywords:

Cardiac arrest
Resuscitation
Pregnancy
Perimortem cesarean delivery

ABSTRACT

Cardiac arrest in pregnancy is a rare and frightening event. Although not every obstetrician will encounter cardiac arrest in pregnancy during their career, it is imperative to be prepared to manage this acute emergency. The management is particularly complex due to maternal physiologic changes from pregnancy and the simultaneous management of two patients, the mother and fetus. In 2010, the American Heart Association released their first scientific statement on guidelines for management of cardiac arrest in pregnancy that has since been updated in 2015. All providers who care for pregnant patients should be aware of these guidelines and ready to manage cardiac arrest in pregnancy because correct and timely interventions can affect real world outcomes.

Published by Elsevier Inc.

Background

Cardiac arrest is a rare event that affects approximately 1 in 12,000 hospital admissions for delivery in the United States.¹ Although maternal outcomes are largely dependent on the underlying etiology, prognosis is relatively good with up to 58% of patients surviving to hospital discharge.¹ Cardiac arrest has become a more pressing obstetrical issue given that maternal mortality has been on the rise over the past two decades. According to the Centers for Disease Control and Prevention, the maternal mortality rate increased to 17.3 deaths per 100,000 live births in 2013 from 7.2 deaths in 1987.² Part of this is likely due to the facts that in the U.S. women are having children at older ages, and there are a higher number of pregnant women with cardiac risk factors.³

Cardiac arrest in pregnancy is particularly distressing given its rare occurrence and the management of two simultaneous patients: the patient and fetus. It is imperative to perform resuscitative maneuvers that benefit both patients. Early recognition and intervention with effective chest compressions and airway management are crucial for improving

outcomes for the mother and fetus and consideration given to cesarean section depending on the gestational age. Even though many obstetricians may take the standard Advanced Cardiac Life Support (ACLS) course, specific information related to management during pregnancy is usually minimal.

Maternal physiology

To effectively manage cardiac arrest in pregnancy, it is important to understand the maternal physiologic changes that take place throughout pregnancy and how they can affect resuscitative efforts. Hormonal changes and the enlarging uterus lead to drastic alterations in the hematologic, cardiac, pulmonary, and gastrointestinal systems. Failure to acknowledge these changes can hinder successful resuscitation of the mother and baby.

Significant hematologic changes occur in pregnancy that must be taken into account during cardiac arrest. Pregnant patients experience plasma volume expansion by up to 15% at 12 weeks of gestation and up to 50% in the third trimester.⁴

* Corresponding author.

E-mail address: shad.deering@usuhs.edu (S. Deering).



Fig. 1 – Manual left uterine displacement during resuscitation.

This plasma expansion causes hemodilution with a subsequent decrease in the hematocrit, a phenomenon known as physiologic anemia of pregnancy. This ultimately causes decreased oncotic pressure, which can contribute to intravascular volume depletion.⁵ Severe anemia can significantly complicate cardiac arrest by causing further reductions in oxygen delivery to tissues.

Cardiovascular changes can be seen as early as 6 weeks of gestation with decreased systemic vascular resistance, which ultimately causes decreased blood pressure.^{6,7} The maternal heart rate increases by 20–30% or 15–20 beats per minute, and cardiac output increases by 30–50% or 1.8 L per minute with the uterus receiving approximately 17% of maternal cardiac output in the third trimester.^{6–9} As the uterus enlarges, it causes aortocaval compression (ACC), which leads to decreased cardiac preload resulting in subsequent hypotension and bradycardia. These effects are exacerbated in the supine position. Due to the potential for interference with maternal resuscitative efforts, ACC needs to be addressed during cardiac arrest management. The American Heart Association recommends manual left uterine displacement (LUD) throughout resuscitative efforts and during perimortem cesarean section until delivery of the infant.¹⁰ In the past, ACC was addressed by placing the patient in a tilt; however, this is no longer recommended. Numerous studies have shown that maternal tilt decreases efficacy of chest compressions, which hinders resuscitative efforts.^{11,12} Successful manual LUD can be performed from the patient's right and left side. From the right side, the uterus is pushed upward and leftward to relieve pressure from the maternal vessels. From the left side, the uterus should be cupped and lifted up and leftward (Figure 1).¹⁰ Care should be ensured that the uterus is not inadvertently pushed down.

Significant pulmonic changes also occur during pregnancy, and if unaccounted for, can hinder resuscitation efforts. Due to increased metabolic demands from the fetus and placenta, oxygenation consumption increases. The diaphragm elevates by up to 4 cm in the third trimester causing decreased chest compliance, and functional residual capacity decreases by up to 25% in the supine position at term.¹³ Elevated levels of progesterone also cause an increase in minute ventilation.⁵ Due to increased ventilation, pregnant patients typically

experience mild respiratory alkalosis. Hyperemia of the upper airway results from elevated estrogen levels and increased plasma volume can cause the tissues to become more friable and prone to increased bleeding.⁵ The overall decrease in the oxygen reserves makes pregnant patients particularly vulnerable to rapid respiratory decompensation.⁵ Thus, it is crucial to initiate rapid, high quality and effective airway interventions in these patients.

Gastrointestinal changes in pregnancy must also be accounted for during resuscitation. Pregnant patients experience delayed gastric emptying with relaxation of the lower esophageal sphincter. This results in a higher risk for aspiration during resuscitation.⁵ Despite this, cricoid pressure is not routinely recommended during intubation attempts given that it may not significantly prevent aspiration and impedes ventilation.^{10,14}

Etiology

There is a wide range of etiologies for maternal cardiac arrest. In the algorithm of cardiac arrest in pregnancy, the AHA has proposed the mnemonic ABCDEFGH for identifying potential underlying causes: anesthesia complications, accidents, bleeding, cardiovascular causes, drugs, embolism, fever, general, and hypertension (Table 1).¹⁰

In developed countries, the most common cause of maternal mortality is venous thromboembolism followed by preeclampsia and eclampsia.¹⁵ In an analysis of cardiac arrest in pregnancy in the United States from 1998 to 2011, the most common causes of arrest were hemorrhage, heart failure, amniotic fluid embolism, and sepsis.¹ Hemorrhage accounted for 38% of cardiac arrest and heart failure and acute myocardial infarction accounted for 15%.¹ Pregnant women who experienced cardiac arrest were more likely to be at least 35 years of age, minorities, and have medical care funded by Medicaid. Obstetric complications strongly associated with cardiac arrest were stillbirth, cesarean delivery, severe preeclampsia, eclampsia, and placenta previa.¹

Management of cardiac arrest

The management of cardiac arrest in pregnancy is significantly different compared to non-pregnant adults. The resuscitation team is usually much larger and should include specific providers for adult resuscitation, obstetrics, anesthesia, and neonatology if there is a potential for fetal viability.¹⁰ Since it can be challenging to coordinate care among four different teams of health care providers, each team should have a designated leader with constant communication among the teams.

Equipment for an emergency cesarean section and neonatal resuscitation should be readily available. The recommended equipment for an emergency cesarean section is listed in Table 2, with the most crucial instrument being a scalpel with a number 10 blade in the event that a perimortem cesarean section is indicated.¹⁰ The minimum equipment recommended for neonatal resuscitation and stabilization should include an over-bed warmer, neonatal

Download English Version:

<https://daneshyari.com/en/article/8768549>

Download Persian Version:

<https://daneshyari.com/article/8768549>

[Daneshyari.com](https://daneshyari.com)