

# **PERIMORTEM C-SECTION - SYSTEMATIC REVIEW**

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## INTRODUCTION

The term perimortem cesarean section (PMC) refers to the delivery via cesarean section in a situation of pregnant woman in extremis or under cardiopulmonary resuscitation.<sup>1</sup> Historically, the first reliable account of successful perimortem caesarean section is by Pliny the Elder, who describes birth in 237 BC. of Scipio Africanus, Roman general who defeated Hannibal. Subsequently, the practice of CPM was maintained in the Middle Ages, mainly for religious reasons.<sup>1</sup>

Perimortem cesarean section remains an alternative to maternal cardiorespiratory arrest (CPA) situations, it is a rare event (approximately 1:12 thousand hospitalizations for childbirth in the United States and Canada)<sup>13</sup>. CPA can be defined as the interruption of cardiac mechanical activity, confirmed by the absence of responsiveness, apnea or agonal breathing, and the absence of signs of circulation. In these cases, the time to start the intervention is of fundamental importance for both maternal and fetal prognosis. Time-consuming activities such as the fetal monitoring and transport to the operating room reduce the chance of survival for both and must be avoided.<sup>1</sup>

## GOAL

The objective of this literature review is to discuss the success rates of CPM and its indications, in order to encourage a more consistent practice of it.

## METHOD

A systematic review was carried out based on a bibliographic survey in the electronic databases: *Scientific Electronic Library Online* (SciELO), *Latin American and Caribbean Literature in Health Sciences* (LILACS), *Medical Literature Analysis and Retrieval System Online* (Medline) and PubMed where 10 articles were selected for full reading.

## RESULTS

After the search and research strategy, ten articles were found. Regarding the year of publication, one article was published in 2016, three in 2014, one in 2013, four in 2012 and one in 2011.

The articles were evaluated according to the following parameters: indication of perimortem cesarean section, therapeutic measures used in the care, time between the beginning of the surgery and the birth of the newborn, and, finally, neonatal care.

Regarding the indication of perimortem cesarean section, all articles indicate that it must only be performed if the pregnancy is longer than twenty weeks and if there is no return of spontaneous maternal circulation even after four minutes of cardiopulmonary resuscitation (CPR).

Regarding the therapeutic measures used in care, three of the articles concluded that early and targeted multidisciplinary intervention is more effective for the maternal-fetal binomial. Meanwhile, the others do not give relevance to this issue and do not comment on the importance of a team prepared to care for this pregnant woman. Regarding transfer to the operating room and anesthesia, two studies reported that there was no need. According to two studies, the midline incision is the most adequate, while two others advise that the incision of choice is the one in which the attending physician has greater skill.

Evaluating the time between the beginning of the surgery and the birth of the conceptus, the five articles indicate that it is up to one minute. However, about 90% of the ADCs took longer than the recommended time and only 17% of the teams performed the birth within five minutes.<sup>8</sup>

Regarding neonatal care, two articles defend the need for a neonatology team for conceptuses > twenty-two weeks. Another

also advises inducing hypothermia between 33.5 and 34.5°C in neonates older than 36 weeks with moderate or severe hypoxic-ischemic encephalopathy.<sup>1,9</sup>

## DISCUSSION

Cardiopulmonary arrest is the leading cause of death in North America, affecting more than 450,000 people each year. In European countries, in an out-of-hospital environment, it is responsible for 350,000 deaths. In Brazil, data on mortality after cardiac arrest are still scarce, but it is known that cardiovascular diseases, which can result in malignant arrhythmias and cardiac arrest, correspond to 250,000 annual deaths.<sup>2</sup>

The main etiologies of cardiac arrest among pregnant women are: venous thromboembolism, hypertensive disorders of pregnancy, sepsis, amniotic fluid embolism, hemorrhage, uterine rupture, uterine atony, placenta previa, disseminated intravascular coagulation, trauma, iatrogeny, allergic reaction to drugs, hypermagnesemia, anesthetic complications, previous, congenital and acquired heart diseases<sup>1</sup>. The same reversible etiologies of CPA in non-pregnant women can occur in pregnant women, but there are more prevalent causes in this population, such as magnesium sulfate intoxication, acute coronary syndromes, preeclampsia, aortic dissection, pulmonary embolism, stroke, embolism amniotic, trauma, and drug overdose<sup>2</sup>.

Among obstetric causes, preeclampsia is a significant factor in maternal and fetal death. Complications of preeclampsia that can precipitate cardiac arrest include eclampsia, stroke and cerebral edema, pulmonary edema, cardiac dysfunction, and HELLP syndrome.<sup>1</sup> In addition, the physiological changes associated with the pregnancy state contribute to an increased risk of cardiac arrest in these patients. Such changes include

increased blood volume with disproportion between plasma and red blood cells (the so-called physiological “anemia”), increased cardiac output due to the need for perfusion of the pregnant uterus, elevation of the diaphragm by uterine compression with deviation of the cardiac axis and alteration of lung volumes, with consequent compensated respiratory alkalosis, relaxation of the lower gastroesophageal sphincter and delay in gastric emptying, causing an increased risk of aspiration, nasal and tracheal edema due to increased blood flow, increased production of saliva, which can make it difficult to visualize the airways in cases of need to obtain a definitive airway and compression of the inferior vena cava by the uterus, which reduces venous return<sup>2</sup>.

A review study of MPS cases with 18 articles showed that most causes of CA in pregnant women were cardiovascular, with pulmonary embolism being the most common cause. In addition, the most common presenting rhythms were ventricular fibrillation and pulseless electrical activity.

According to the American Heart Association (AHA) and the Royal College of Obstetricians and Gynecologists, MPS will be indicated in the absence of return of the mother’s spontaneous circulation for four minutes after the start of cardiopulmonary resuscitation, provided that the estimated gestational age is higher. to 20 weeks (or the uterus is at or above the umbilicus, when the gestational age is unknown).<sup>1,3</sup>

The time between maternal CPA and maximum birth was established after a study published in 1985, in which it was observed that, of the 188 children who survived perimortem cesarean section, 90% were born within five minutes of maternal collapse. Based on this study, it was established that the time between maternal CRA and the beginning of cesarean section must be four minutes, with

birth occurring up to the fifth minute. After that time, the children's neurological sequelae were more frequent and severe.<sup>1</sup> However, there are reports of fetuses surviving after 10 and 30 minutes of PCR. Therefore, CPM must be recommended even after the time considered ideal.<sup>5,6</sup>

Currently, evidence shows that the four-minute rule must be replaced by starting a perimortem cesarean section immediately after the absence of spontaneous circulation. Despite this, reference books for students such as the book by Obstetrícia Rezende still refer to the four-minute rule (after 20 weeks of gestation) as a didactic way of learning that consists of: manual uterine displacement maneuver or left lateral tilt, followed by absence of spontaneous circulation after four minutes of CPR.

In perimortem cesarean section, the most important aspect is that it is performed in a timely manner. Thus, it is recommended to spend a minute between the beginning of the surgery and the birth of the baby.<sup>1</sup> However, approximately 90% of deliveries during perimortem cesarean section take more than one minute. This is supported by two other studies that indicate that 29% or 17% of teams manage to deliver within 5 minutes. Despite this, the maternal and fetal outcome demonstrated by one of the articles was a maternal survival rate of 54% and a neonatal survival rate of 64%.<sup>8</sup>

Regarding the technique used, despite being proposed in many articles that the midline incision must be chosen due to the absence of the need for dissection of the rectus abdominis muscle (necessary in Pfannenstiel), the physician must always choose the technique with which he is most comfortable. accustomed.<sup>1</sup>

The importance of a neonatal team ready for care is observed, since the neonates treated with this protocol had better development in

the first 18 months compared to those who did not receive.<sup>8</sup>

In case of fetal death, perimortem cesarean section must be performed to improve maternal resuscitation.<sup>1</sup> Therefore, the process will be peri-death and not post-death. However, if CA occurs before the 24th week of gestational age, there is no evidence that cesarean section will improve maternal prognosis. This is because the same hemodynamic benefits are not expected as those found in the removal of a larger fetal placental mass.<sup>1</sup>

## CONCLUSION

This review allowed us to conclude how scarce the evidence surrounding perimortem cesarean section is. This contributes to the fact that cesarean section at or close to maternal death is one of the procedures that most generate anxiety in physicians.<sup>12</sup>

Despite a recurring problem, CPM is not routinely performed. Its current indication is the absence of a maternal pulse after four minutes of CRP according to the AHA, with a gestational age greater than 20 weeks. Ideally, the fetus must be extracted no later than five minutes after PCR.<sup>1,5</sup> Throughout the surgery, the uterus must be shifted to the left and CPR must continue uninterrupted.<sup>13</sup>

We can conclude that the maternal and fetal survival rate decreases as the procedure takes longer. Therefore, it is important that CPM be performed by the most experienced physician available. In these situations, there is usually no need or time to transfer to the operating room or to perform anesthesia, although, in case of maternal recovery, analgesia is necessary. Laparotomy must be immediate and there is no need for auscultation of fetal heartbeats.<sup>1</sup>

As for the incision to be made, physicians must remember that it is not the type of incision, but the time between CRP and birth

that is most important for fetal survival. This time must not be spent reflecting on which type of incision is most appropriate. <sup>1</sup>

Finally, the approach must be multidisciplinary. CPR must be maintained during the procedure and antibiotics must be administered. If resuscitation is successful, the patient must be transferred to an intensive care unit. <sup>1</sup>

At this time, there are no clear, standardized guidelines on when to perform the procedure. The lack of consensus in the literature makes the performance of this procedure even more stressful. It is important that health professionals know the indications, as well as being able to perform the procedure efficiently, thus giving the binomial a greater chance of survival. <sup>12</sup>

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