



Perimortem Caesarean section because of a live fetus: case report and literature review

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Summary

Background Perimortem Caesarean section (PMCS) is a rare surgical procedure that is potentially lifesaving for mother and child.

Aim To describe a live fetus 1 h after maternal cardiac arrest and a rare hospital surgical event, PMCS.

Case report We report on a 22-year-old gravida 1 para 1 woman who had a convulsive loss of consciousness at 31 weeks' gestation. A convulsive loss of consciousness was accompanied by profuse vomiting of gastric contents. Cardiopulmonary resuscitation was initiated. Fetal heartbeats were recorded and the patient was referred to the Clinic for Gynecology and Obstetrics. Perimortem Caesarean section was performed. Neonatal cardiopulmonary resuscitation was initiated, but the infant was pronounced dead after 60 min of attempted resuscitation. Maternal cardiopulmonary resuscitation was without success and it was abandoned following discussion with family members.

Conclusion A cooperative team approach is the key factor to producing a good perinatal outcome.

Keywords Cardiopulmonary resuscitation · Maternal mortality · Parturition · Pregnancy · Resuscitative hysterotomy

Introduction

Perimortem Caesarean section (PMCS) is a rare surgical procedure that is potentially lifesaving for mother and child [1]. During resuscitation for cardiac arrest, the gravid uterus over 20 weeks' gestation can impair chest compressions and ventilation, and reduce venous return to the heart through compression of the aorta and vena cava. Therefore, the primary aim of PMCS is to empty the uterus to aid maternal resuscitation [2, 3]. PMCS is recommended to improve resuscitation efforts primarily with the mother's well-being in mind, in contrast to the past practice when it was performed on women after they died in childbirth [2, 3]. Current resuscitation and obstetrics guidelines recommend consideration of PMCS at 4 min of failed resuscitation with the aim of delivering the fetus within 1–2 min [2, 4].

Trauma is nowadays a leading cause of non-obstetric maternal cardiac arrest. Emergency physicians are more likely to be faced with the decision to perform an emergency PMCS without an obstetrician present [4]. The guidelines on timing, indication, and management of PMCS and maternal cardiac arrest are based on case reports and case studies, very limited available literature, and expert opinion [1, 2, 5–7].

This report's contribution is in that it describes a live fetus 1 h after maternal cardiac arrest and a rare hospital surgical event—PMCS. It shows that even when we are confronted with this rare case in the community, swift surgical action may be lifesaving for both mother and child.

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Table 1 Review of the 18 reported cases of perimortem Cesarean section (PMCS) from 1995 to 2020

Case (M)	Author and year (reference)	Mother's age (years)	Weeks of gestation	Time from collapse to PMCS (min)	Hospital/extrahospital PMCS	Maternal outcome	Neonatal outcome	Cause of maternal death/cardiac arrest
1	Lanoix et al. 1995 [4]	31	26	55	Extrahospital (emergency department) PMCS	Died	Survived, neurologically intact	Head gunshot wound (unknown, no reported findings of autopsy)
2		30	25	40	Extrahospital (emergency department) PMCS	Died	Died	Head and chest gunshot wound, pericardial tamponade
3	Tang et al. 2000 [9]	33	38	15	Hospital PMCS	Died	Survived, with cerebral palsy	Amniotic pulmonary embolism
4		20	36	20	Extrahospital (emergency department) PMCS	Died	Died	Trauma in vehicle accident, traumatic uterine rupture, unknown (no reported findings of autopsy)
5	Sasha 2007 [11]	35	39	10	Hospital PMCS	Survived	Survived, neurologically intact	Amniotic pulmonary embolism
6	McDonnell 2009 [15]	36	31	5	Hospital PMCS	Survived	Survived, neurologically intact	Uterine rupture
7		32	40	5	Hospital PMCS	Survived	Survived, neurologically intact	Severe preeclampsia
8	Vencken et al. 2010 [14]	35	41	5	Hospital PMCS	Survived	Survived, neurologically intact	Amniotic pulmonary embolism
9	Engels et al. 2011 [7]	23	37	5	Hospital PMCS	Died	Died	Severe preeclampsia
10	Gatti et al. 2014 [6]	–	36	12	Extrahospital (in ambulance) PMCS	Died	Survived, with neurological sequelae	Amniotic pulmonary embolism
11	Aronsohn et al. 2015 [12]	38	35	5	Hospital PMCS	Survived	Survived, neurologically intact	Preeclampsia, critical narrowing of trachea by thyroid goiter
12	De Silva et al. 2016 [2]	29	38	43	Extrahospital (emergency department) PMCS	Died	Died	Ruptured splenic arteriovenous malformation
13		35	38	18	Extrahospital (emergency department) PMCS	Died	Survived, neurologically intact	Subarachnoid hemorrhage
14	Pecher et al. 2017 [13]	24	34	40	Extrahospital (emergency department) PMCS	Survived	Survived, neurologically intact	Wolff–Parkinson–White syndrome
15	Lee et al. 2018 [3]	39	35	35	Extrahospital (emergency department) PMCS	Died	Died	Preeclampsia and placental abruption
16	Wu et al. 2019 [5]	36	38	43	Extrahospital (emergency department) PMCS	Survived	Survived, with cerebral palsy	Trauma in vehicle accident
17	Woods et al. 2020 [1]	41	30	31	Extrahospital (in the living room) PMCS	Died	Survived, neurologically intact	Cardiomyopathy
18	Yao et al. 2020 [10]	31	38	35	Extrahospital (emergency department) PMCS	Died	Died	Unknown (relatives refused autopsy)
–	Average	34 ± 5.75	35.27 ± 4.53	23.44 ± 16.73	Hospital: 7 (38.8%) Extrahospital: 11 (61.1%)	Survived 7 (38.8%)	Survived 12 (66.6%) Neurologically intact 9 (50%)	–

Case report

A 22-year-old gravida 1 para 1 woman had a convulsive loss of consciousness while drinking tea with her husband at home at 31-week gestation. A convulsive loss of consciousness was accompanied by profuse vomiting of gastric contents. The patient lived 5 min from primary health care and 20 min from the

clinical hospital. The patient had regular obstetric care. She also received endocrine care due to hyperthyroidism and nodular goiter of the thyroid gland, but during the pregnancy the patient was in a euthyroid state—hyperthyroidism was in remission thanks to propylthiouracil therapy at a dose of 50 mg. The patient had no other significant medical history.

When the ambulance arrived at 20:45, the patient showed no signs of life, no breathing or heartbeat. Cardiopulmonary resuscitation was initiated. The fetal heartbeats were recorded and the patient was referred to the Clinic for Gynecology and Obstetrics. Two obstetricians, one pediatrician, and an anesthesiologist were summoned prior to the patient's arrival. The patient arrived at the Clinic for Gynecology and Obstetrics at 21:30, with a perimortem Caesarean section (PMCS) conducted by an obstetrician at 21:40, after confirmed fetal heartbeats by ultrasound. Fetal heart rate was extremely bradycardic (20/min). The Caesarean section was performed using a Joel–Cohen incision with minimal cleaning and draping, using a disposable scalpel. A male infant was delivered within 1 min with a birth weight of 2130 g and birth length of 49 centimeters. He had an Apgar score of 1/1. Cardiopulmonary resuscitation was initiated in the delivery room and continued in the neonatal unit care, but the infant was pronounced dead after 60 min of attempted resuscitation. The maternal cardiopulmonary resuscitation was without success and abandoned following discussion with family members. The relatives refused autopsy, so the cause of maternal and neonatal death was unknown.

Discussion

A review of the literature was conducted using the research of the Medline database and PubMed, along with the references to international guideline documents. Searched terms included: pregnancy, obstetrics, and perimortem Caesarean section. We found out 18 case reports on the subject of maternal cardiac arrest and perimortem caesarean section (PMCS) in the literature ([1–14]; Table 1). In our review of the literature we have found out that average maternal age is 34, the average gestational age at the time of PMCS is 35 weeks, and 23 min is the average time from arrest to PMCS. We have found out that maternal survival rate is 38.8% while fetal survival rate is 66.6% (Table 1; [1–14]). A case of maternal cardiac arrest in pregnancy of gestational age greater than 20 weeks and PMCS is limited to once in a career, because of its rarity at 1 in 30,000 pregnancies [8]. Woods et al. described the sudden collapse of a primigravida after cardiac arrest with a presenting rhythm of ventricular fibrillation, her subsequent resuscitation and prehospital PMCS within 15 min after collapse [1]. In their case report the mother died but the infant survived and remained neurologically intact. They concluded that the presence of a prehospital practitioner able to undertake PMSC at the scene may eliminate the significant delays that are present when transferring to suitable facilities from the community, and bring benefits to both mother and baby [1]. De Silva et al. reported two cases of PMCS and concluded that timely PMCS and rapid decision-making and action is the widely accepted standard of practice in advanced ma-

ternal resuscitation [2]. If the cause of maternal cardiac arrest is determined to be irreversible or ongoing resuscitation considered ineffective, PMCS should be performed in an attempt to save the neonate life [8]. In our case PMCS was performed 1 h after collapse, because of fetal heart activity in ultrasound. However, the literature also reports successful maternal and/or neonatal outcome of PMCS when performed within 15 min, even up to 30 min, from maternal arrest, especially at gestational ages beyond 30 weeks [3, 9]. Outcomes of PMCS and prognosis are highly correlated with the primary etiology of maternal cardiac arrest [5, 10, 11]. Fetal survival rate following PMCS is unfortunately poor, only a 25–30%, depending on gestational age, the place where PMCS is performed, and neonatal resuscitation support [8]. Our patient had a thyroid goiter and an acute airway obstruction secondary to an enlarged thyroid as the cause of cardiac arrest during pregnancy, which has been reported by Aronsohn et al. [12]. In our case the dying mother and a potentially viable fetus were transported to the tertiary center, wasting precious time. In such circumstances emergency physicians have few options and must initiate the PMCS promptly [4, 13, 14]. In our case, the PMCS was performed by Joel–Cohen laparotomy. A midline abdominal laparotomy had been previously recommended. Given that there is meaningful time pressure in these situations, the surgeon should perform whichever technique he/she feels most comfortable with, so as to not unnecessarily delay delivery of the fetus and resuscitation of the mother [15]. There are no reported cases in the literature that a physician was prosecuted for performing PMCS, but there has been legal action against a doctor who did not perform PMCS [16].

Conclusion

A cooperative team approach is the key factor in producing a good outcome. In our institution and our country, there is a need for implementation of regular practical obstetric multiprofessional training courses and the presence at management of obstetric emergencies and trauma courses as in other developed countries.

Author Contribution Anis Cerovac wrote the main manuscript, critically reviewed the manuscript, participated in the treatment of patients from the case report, and is the corresponding author. Igor Hudić critically reviewed the manuscript, gave some suggestions for improvements of the paper and wrote some additions, participated in the treatment of patients from the case report. Dženana Softić critically reviewed the manuscript, gave some suggestions for improvements of the paper and wrote some additions, participated in the treatment of patients from the case report. Dubravko Habek critically reviewed the manuscript and gave some suggestions for improvements of the paper. All authors have met the criteria of authorship and have rights on intellectual content.

Declarations

Conflict of interest A. Cerovac, I. Hudić, D. Softić, and D. Habek declare that they have no competing interests.

Ethical standards For this article no studies with human participants or animals were performed by any of the authors. All studies mentioned were in accordance with the ethical standards indicated in each case. For images or other information within the manuscript which identify patients, consent was obtained from them and/or their legal guardians. We have permission of the ethics committee of our institution to publish a paper, decision number: 02-09/2-61/20.

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