



## MINI REVIEW

## Perimortem Caesarean Delivery: Clinical Challenges Witnessed through the Eyes of an Obstetrician

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### “No Women Should Die While Bringing Life into This World”

Maternal collapse due to sudden cardiac arrest (SCA) is one of the most challenging clinical scenarios faced by an obstetrician. These continuing challenges demand a multidisciplinary team approach. Considering its rare incidence, ranging somewhere between 1 in 20,000 to 1 in 50,000 [1,2], current recommendations are mostly based on small case series and expert opinions. Maternal SCA refers to hemodynamic collapse resulting from sudden cessation of organized cardiac activity in an antenatal woman. Although underlying cardiovascular lesions are the leading causes across the globe, one cannot ignore the non-cardiac etiologies like pulmonary embolism, amniotic fluid embolism, massive antepartum haemorrhage, sepsis, trauma, anaphylaxis, anesthesia-related vascular collapses, etc.

The physiological changes in the cardiovascular system during the later half of pregnancy can act as a vulnerable substrate and predispose a woman with existing valvopathy or cardiomyopathy to SCA in the peripartum period [3]. Increased progesterone concentration in the plasma can lead to biochemical remodelling in the vessel wall that magnifies the shear forces during systolic blood flows [3]. At times, there can be a huge catastrophe. Thus, prompt and effective resuscitation is the only management modality that an obstetrician must resort to in such acute emergencies.

In the case of maternal SCA, the treating physician must make an urgent call to the “maternal code blue team” without delay [4]. This multidisciplinary team

generally includes members from anesthesia, critical care medicine, obstetrics, and neonatology. Wide bore intravenous access must be secured above the level of the diaphragm. High-quality chest compressions (with at least 100-120 compressions per minute, compressing the sternum up to 5 cm with each downstroke) with effective ventilation (2 after every 30 compressions) form the standard of care [4]. Failure of return of spontaneous circulation within 4 minutes of effective cardio-pulmonary resuscitation (CPR) mandates the need for a perimortem caesarean delivery (PMCD) [4-6], irrespective of the location [2,7].

Effective chest compressions produce approximately 30% of normal cardiac output in a non-pregnant individual in the best of circumstances [4]. Since stroke volume in a healthy woman at term in the supine position is only 30% of that of a non-pregnant counterpart, so effective chest compressions in a gravid female, at best, can produce not more than 10% of normal cardiac output. It is therefore necessary to relieve the aortocaval compression by either tilting the patient, manually displacing the uterus to a side, or emptying the uterus by resuscitative hysterotomy [5,8]. Tilting the mother during CPR compromises the effective chest compression and recoil. Manual displacement is a tiring process for the caregiver. Immediate hysterotomy, in such situations, is the most effective method to enhance chest compressions. Emptying the uterus relieves the compression upon the inferior vena cava. Moreover, autotransfusion of about one litre of blood into the systemic venous circulation after uterine contraction allows the redistribution of blood to more vital organs



**Citation:** Sarkar A, Zangmo R, Deedwania P, Suresh G (2023) Perimortem Caesarean Delivery: Clinical Challenges Witnessed through the Eyes of an Obstetrician. Int J Womens Health Wellness 9:149. doi.org/10.23937/2474-1353/1510149

**Accepted:** April 17, 2023; **Published:** April 19, 2023

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[8]. In cases of haemorrhagic shock secondary to trauma to the abdominal aorta, direct access to the abdominal cavity and aortic compression successive to emptying the uterus gives the advantage of treating the primary cause [5].

Though a debate still exists regarding the lower limit of fetal viability from country to country, considering the neonatal resuscitative facilities, a perimortem caesarean is justifiable at any gestation beyond 22-24 weeks [5,9]. It is worth mentioning that if the period of gestation is unknown, one should not waste time pondering upon the previous medical records to date the ongoing pregnancy. A resuscitative hysterotomy is recommended if the uterine height is found to be above the umbilicus [5]. PMCD has to be performed even in cases of fetal demise [10].

With no abdominal preparation and no wastage of time in shifting the mother to an operation theatre or labor ward, an urgent low transverse/vertical incision depending upon the surgeon's preference over the abdomen should be given [7]. The incision should be deep enough to get access to the uterus and deliver the foetus. Delivery can help in relieving the compression over the diaphragm and the aorta [8]. CPR must continue during PMCD. Since there is minimal circulation over the body, blood loss is estimated to be very less during the procedure. One must not waste time waiting for anesthesia or antibiotics [8]. Thus, it is mandatory to note that a scalpel is the only essential equipment necessary for an effective resuscitative hysterotomy. In cases of successful maternal resuscitation, initiation of broad-spectrum antibiotics, hemostasis with adequate closure of the wound in layers, oxytocics administration, drainage of urine by foley's catheterization and ICU care with a high threshold of extubation are extremely mandatory [5].

According to the Doctrine of necessity, any emergency procedure may be performed if it is in the patient's best interest. Given that the PMCD is the standard of care in maternal SCA, consent is not needed in case an emergency arises [9]. However, down the years, doctors have started harbouring the fear of litigation from the husband who is finally left with a neurologically impaired baby in addition to his dead wife. However, medical literature to date has not reported any case where survival beyond the early neonatal period was accompanied by neurological disability [11].

With critical care medicine reaching its zenith, it is quite disheartening to learn that there is a knowledge deficit in 20-40% of obstetric care providers leading to poor resuscitative skills in the golden "4-to 5-minute time" frame [12]. In a literature review of 57 PMCDs, only 7% of mothers (4/57) could be delivered within 5 minutes of SCA [13]. Overall neonatal survival was 64%, with in-hospital arrest being the only predictive

marker of successful feta-maternal outcome [12]. Although maternal and fetal injury-free survival rates diminish steadily with an increase in time-lapse, it is recommended that PMCD may still be beneficial beyond the "4-to 5-minutes golden time" and should be considered [10].

### ***"Women Are Dying Because Societies Have Yet To Decide That Their Lives Are Worth Saving."***

The number of high-risk women undergoing pregnancy is on a steep rise, and so are the complications. With the majority of obstetricians lacking skills in the organized management of a maternal SCA, chaos is likely to ensue. Mock drills, workshops, and training classes must be conducted from time to time. The Basic Life Support and Advanced Cardiac Life Support algorithms should become the backbone of the response plan, guiding obstetricians around the globe to react proactively in such challenging clinical scenarios.

### **Declarations**

#### **Funding**

None.

#### **Conflicts of interest**

None to disclose.

#### **Ethical approval**

Not applicable.

#### **Consent to participate**

Not applicable.

#### **Consent for publication**

Not applicable.

#### **Availability of data and material**

Not applicable.

#### **Code availability**

Not applicable.

#### **Authors' contributions**

All authors have contributed equally in manuscript preparation.

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