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Case Report

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Resuscitative cardiac arrest during a Caesarean section–When every second counts: A case report

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ABSTRACT

Rationale: Cardiac pulmonary arrest is the most challenging and dreaded complication of neuraxial blockade.

Patient's concern: A 21-year-old patient at 37 weeks of gestation, with previous lower segment Caesarean section pregnancy presented for elective Caesarean section.

Diagnosis: Cardiac arrest after performing a subarachnoid block.

Intervention: Maternal resuscitation.

Outcome: Return of spontaneous circulation was achieved within 4-5 min of cardiopulmonary resuscitation. A single live healthy male baby was delivered.

Lesson: A careful preoperative evaluation, adequate preload, constant vigilant monitoring to recognize vasovagal response at the earliest, and immediate initiation of resuscitative measures play the most important role in saving the precious lives in case of pregnant patients undergoing Caesarean section under subarachnoid block.

KEYWORDS: Cardiac arrest; Pregnancy; Neuraxial blockade; Subarachnoid block

1. Introduction

Though uncommon, cardiac pulmonary arrest (CPA) is the most challenging and dreaded complication of neuraxial blockade (NAB)[1]. When it occurs in a pregnant patient, immediate resuscitation is necessary to save the lives of both mother and baby. We report a case of a pregnant patient who suffered cardiac arrest after performing a subarachnoid block (SAB) and underwent maternal resuscitation in the operation theatre. In addition, it also highlights the lack of anticipation of the occurrence of such events and the need for additional awareness and standardized protocols.

2. Case report

This study was approved by the Committee of Armed Forces Medical College, and informed consent was obtained from the patient.

A 21-year-old patient at 37 weeks of gestation, a case of previous lower segment Caesarean section (CS) pregnancy presented to us for elective CS. The patient had no other comorbidities and was accepted in the American Society of Anesthesia (ASA) grade-Ⅱ in light of pregnancy. An 18G intravenous (*i.v.*) cannula was secured. Routine monitoring was established as per ASA standards. The patient was preloaded with 500 mL of normal saline and 2.2 mL

Significance

Cardiac arrest is the most challenging and dreaded complication after subarachnoid block during a Caesarean section. When it occurs, immediate resuscitation is necessary to save the lives of both mother and baby. Adequate preload and constant vigilant monitoring and management of such events, if encountered, are of paramount importance. Anaesthesiologist must always be kept prepared to tackle such types of adverse situations before taking any case for surgery under subarachnoid block.

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of 0.5% bupivacaine was given intrathecally at a speed of 0.2 mL/second at the level of L3-4 by using a 25G Quincke needle in the left lateral position. The patient was turned supine immediately, and the block level was confirmed to T4 after 2-3 min. Surgery was started by the obstetrician after confirming the level of sensory block. Five to six minutes after the administration of SAB, the patient blood pressure drop to 72/40 and heart rate (HR) of 30/min. Injection of atropine 0.6 mg *i.v.* was given immediately. The patient did not respond to injection of atropine and suddenly lost consciousness, and there was asystole on the electrocardiogram. High-quality CPR was started immediately as per 2015 Adult Cardiac Life Support guidelines. Injection of adrenaline 1 mg was given i.*v.*. The patient was intubated immediately to secure the airway. Return of spontaneous circulation (ROSC) was achieved within 4-5 min of CPR. However, HR was not regular and the bradycardia recurred leading to another cardiac arrest. CPR was continued and the obstetrician was asked to go ahead with the CS. An arterial line was secured immediately for invasive monitoring of blood pressure. Central venous access was secured *via* the right internal jugular vein and injection of noradrenaline was started at 0.5 μg/kg/min and titrated to a target mean arterial pressure >65 mm of Hg. A single live healthy male baby was delivered who cried immediately after birth. CPR was stopped after the delivery of the baby and normal sinus rhythm and rate was achieved. Surgery was continued under general anesthesia, and the patient was extubated after the surgery. However, the patient continued to have hypotension so she continued to receive injection of noradrenaline. The patient was shifted to the intensive care unit (ICU) after the initial assessment on the table revealed that she was wide awake and responding to verbal commands. After around 60 min in ICU, the patient started becoming breathless. Immediately patient was put on non-invasive ventilation (NIV) with PS 12, PEEP 5, and FiO_2 of 0.5 in light of clinical suspicion of pulmonary edema. Immediate bedside 2D echo and lung ultrasound were performed confirming the presence of pulmonary edema. Diuretics were started, and the patient was continued on NIV. She improved gradually and weaned off from NIV as well as from noradrenaline support throughout 24 h. The subsequent course in the ICU was uneventful, and she was discharged after 4 d of ICU stay.

3. Discussion

Though NAB is considered a safe technique, it is not infrequently associated with fatal complications like CPA. The etiology of CPA is often multi-factorial and difficult to isolate. It is a rare adverse event with an incidence that varies 1.3 to 18 per 10 000 cases[2]. Exact etiology, frequency, and predisposing factors yet remain undefined.

Many factors are involved in the etiology of CPA under SAB, the vagal parasympathetic responses to reduced preload being the major offenders. Pollard *et al.* identified this as the primary etiology[3]. They also stated that patients who have high vagal tone preoperatively are at higher risk. If ROSC is not achieved within 4 min of initial resuscitation measures in form of basic life support and advanced cardiac life support, delivery of the fetuses is advised provided the size of the uterus is ⩾20 weeks[4]. The mother should be kept in the left uterine tilt position to optimize venous return throughout. Adequate preload is of utmost importance before giving SAB to prevent serious adverse events. This reduces the effects of vasodilatation due to sympathectomy which if occurs unopposed might lead to a respiratory and cardiac emergency in ~1% of the patients who undergo CS under SAB.

Although a decrease in HR during SAB is mild, profound changes might occur with sympathetic blockade beyond the level of T4, affecting cardio acceleratory fibers, especially in a high spinal blockade. Apart from high spinal causing a Bezold-Zarish reflex, an inappropriate vaso-vagal response that leads to a triad of hypotension, bradycardia, and apnea may also result in challenging events like CPA. Studies have shown that NAB has been associated with the onset of sick sinus syndrome and the progression of 10 heart blocks to 20 heart blocks[5]. It is specified that young patients having higher vagal tone are at higher risk. Literature also reported that patients in ASA physical status Ⅰ category are 3 times more prone to developing bradycardia during SAB[5]. It also has been shown that bradycardia often precedes the onset of more sinister cardiac events, like arrest, during NAB. Hence this might be a clue to get prepared or institute appropriate early treatment for these arrests and can serve as a surrogate marker of ongoing extensive sympathetic blockade. Jang *et al.* also suggested that vasovagal response is one of the most potential causes of cardiac arrest in such situations particularly when it happens during placental expulsion[6]. Other causes contributing to CPA and maternal death include preeclampsia and eclampsia and their complications. In our case, there was no history and features of hypertensive disorders of pregnancy. However, during post-arrest care, point of care 2D echo and lung ultrasound did show pulmonary edema, which may be a result of the arrest itself rather than the cause of arrest.

Another possible reason for arrest is embolism, either amniotic fluid or venous air embolism. Embolisms do manifest as an arrest and many times go undetected due to lack of a confirmatory test. In our case this may be considered as the timing of arrest (during uterotomy) corresponds to the most common time of occurrence of such phenomenon. Treatment is supportive only. Primary cardiac conditions such as perioperative ischemia, myocardial infarction, and peripartum cardiomyopathy are to be considered also. Co-existing cardiac diseases during pregnancy make a pregnant lady more prone to such events, in our case, there was no such cardiac condition prior nor detected in post-arrest investigations.

Early resuscitative measures in form of basic life support and advanced cardiac life support play an important role in improving the survival outcome. Escalated doses of atropine, ephedrine, and epinephrine have also been shown to be effective in the treatment of bradycardia and hence preventing the development of cardiac arrest. CPA is relatively more common in younger patients who have higher vagal tone and a decrease in sympathetic outflow leads to an increase in effective parasympathetic activity which further adds to the exaggerated vagal tone. Hence if a decision to administer spinal

or epidural anesthesia is made, a careful preoperative evaluation, adequate preload, constant vigilant monitoring to recognize vasovagal response at the earliest, and immediate initiation of resuscitative measures play the most important role in saving the precious lives in case of pregnant patients undergoing CS under SAB.

In conclusion, we emphasize the fact that although NAB like SAB is considered safe in pregnancy for elective CS, the chances of patients having a CPA cannot be overlooked. Adequate preload and constant vigilant monitoring and management of such events, if encountered, are of paramount importance. Operation Theatre must always be kept prepared to tackle such types of adverse situations before taking any case for surgery under SAB.

Conflict of interest statement

The authors report no conflict of interest.

Authors' contributions

R.N.H.: Concept, design, intellectual content, literature search, data acquisition, manuscript preparation; S,S: Literature search, editing, and review; P.R.: Intellectual content, data acquisition; N.T.: clinical studies, data acquisition; P.T.: manuscript editing, and review.

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