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Somatic support following cardiac arrest for 90 days leading to a healthy baby boy: A case report

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ABSTRACT

Due to a lack of published case reports regarding the somatic support of brain dead pregnant patients, each one adds to the limited knowledge that directs care for this patient population. A young woman experienced a cardiac arrest and was subsequently determined to be approximately 20 weeks pregnant following cardio pulmonary resuscitation. Soon after, she was diagnosed as brain dead, but her family chose to keep her supported in hopes of the delivery of a healthy child. She was transferred to our facility, where she was supported after being diagnosed as brain dead for a total of 90 days and delivered a healthy baby boy at almost 32 weeks gestational age. Following delivery, the pregnant patient expired per brain death protocol. The following case report outlines the details of her care and the outcome of our somatic support to share and collaborate with other healthcare professionals caring for this rare patient population.

Introduction

Somatic support refers to non-neurological care provided after brain death and involves maintaining adequate blood pressures, combating low body temperature, and staying ahead of massive fluid losses as a result of diabetes insipidus.[1,2] When trauma to a pregnant woman occurs, the fetus is often either emergently delivered or expires with the pregnant patient with it being too young to live outside the womb. Somatically supporting brain dead pregnant patients certainly isn't a novel idea, but it is a rare occurrence. According to the last published case review in 2010, there were only 19 case reports and 1 case series published between 1984 and 2010 worldwide.[3–22] Following a PubMed literature review with key search terms "somatic support", "brain death", and "pregnancy", an additional 3 case reports were found to have been published since the last review.[23–25] When the available case reports were reviewed individually, many were brief and provided only generalities regarding the patient's care. The cases primarily focused on cause of maternal brain death, length of time somatically supported, and fetal outcome. Few provided details regarding nutrition support such as calorie goals, calories successfully provided, or products used. Due to a wide range of medical complications that arise after brain death, safe and effective medication therapy in pregnant women is vastly untested. Nutrition support in this patient population is also a vital aspect of care but an area with limited published data.[1,2] Determining energy expenditure for supporting the brain-dead pregnant patient and the nutritional requirements for the developing fetus create a unique challenge for the various healthcare providers involved in their care.[1] Because of this, every case report shared provides more insight into caring for this unique patient population.

Patient's background

The patient was a 36-year-old woman with a past medical history of Hepatitis C, asthma, sleep apnea, and gestational diabetes. Her social history was significant for 10 years of past tobacco use and current cocaine use. Of note, urine drug screen (UDS) was only positive for benzodiazepines upon admission to the outside hospital (OSH). She was a single mother, with four other living children (ages ranging from 1 to 20 years old). Due to her previous children being born at hospitals others than ours, her medical record prior to this admission wasn't accessible. The patient's parents governed her medical care and that of the fetus.

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Clinical course: OSH hospital day (HD) 1–26

This young woman presented to the OSH Emergency Department, stating that she had felt "ill" for about one week with cough, congestion, and fever. She was noted to be hypoxic with an oxygen saturation of 78%, so she was started on Bi-level Positive Airway Pressure (BiPAP) and empiric antibiotics of Ceftriaxone and Levofloxacin at that time.

On the second day of her hospitalization, she became bradycardic and went into asystole after suffering a non-ST elevated myocardial infarction (NSTEMI). She was resuscitated with cardiopulmonary resuscitation (CPR), intubated, placed on a ventilator, and stabilized. She quickly progressed to develop pulmonary edema and acute respiratory distress syndrome (ARDS). At that time, the patient was found to be pregnant as the pregnancy wasn't reported by the patient upon admission to the OSH. There was questionable mention of cocaine use during this hospital stay before she coded, but no additional UDS was available for confirmation.

On HD 4, the patient became hypernatremic and her pupils were dilated and nonreactive. An ultrasound by the Obstetrics (OB) team estimated that the fetus was 19wks 4/7 days and developing normally for gestational age (GSA). A computerized tomography (CT) scan of the pregnant patient's head showed cerebral edema with transtentorial herniation and a left middle cerebral artery (MCA) infarction. Neurosurgery was consulted, and they determined that she was not a surgical candidate. The ICU (intensive care unit) team concluded that she had suffered an anoxic brain injury secondary to the code and also had herniation of her brain secondary to cerebral edema. At that point, brain death testing was performed and the pregnant patient was declared brain dead. Even though the patient was not expected to recover any meaningful function, her family decided to keep her somatically supported in order to sustain her pregnancy.

The OSH records reported her to be HIV negative and Hepatitis B negative. A percutaneous endoscopic gastrostomy (PEG) tube and tracheostomy had been placed at the OSH, with dates of placement and enteral nutrition used not available.

The patient was transferred two hours to our academic medical center for a higher level of care on HD 26 due to the OSH being a small facility not equipped to somatically support the patient long term and a premature baby upon delivery.

Clinical course: hospital day 26–93

Following transfer (HD 26, day 22 of somatic support), the OB team determined the fetus' GSA was 22 weeks and developing normally. The pregnant patient resided in the ICU with a tentative plan to keep the fetus growing in-utero as long as possible or until as close to 34 weeks as possible. The OB and ICU team monitored fetal heart rates, fetal growth, maternal complete blood counts (CBC) and basic metabolic panels (BMP), maternal finger stick blood glucose, maternal temperature and vital signs, and maternal urine outputs around the clock.

Overall, the pregnant patient and fetus remained stable, with occasional drops in blood pressure that responded adequately to fluid boluses and hemoglobin that responded to blood transfusions. Her hemoglobin ranged from 6.4 to 11.1 with an average of 9.09. Platelets were also often low: ranging from 61 to 207 with an average of 148. She had no kidney complications or kidney injury: her Cr ranged from 0.11 to 0.58 with an average of 0.28. Baseline bloodwork was not available as she had never been admitted to our facility before this visit.

On HD 54, she was noted to have periods of prolonged sinus pause and an episode of idioventricular escape rhythm. An echocardiogram (ECHO) showed that her left ventricle was mildly dilated, she had an Ejection fraction (EF) of >55%, and she exhibited moderate mitral, trace tricuspid, and trace pulmonic valve regurgitation. On HD 67, she had a few beats of ventricular tachycardia, but it was associated with low potassium and resolved after appropriate replacement.

Although white discharge was noted late in the hospital stay, ultimately ruled as a yeast infection, the patient never experienced amniotic fluid leakage or vaginal bleeding. She was noted to have polyhydramnios throughout the pregnancy, which the OB team associated with poor maternal glycemic control.

At 24 weeks GSA (HD 46), the pregnant patient received 2 doses of betamethasone IM to enhance the fetus' lung maturity in case an emergent delivery became necessary in the near future. The pregnant patient received a second steroid course on HD 82 (at 30 weeks GSA). Estimated fetal weights were 617 g at 20 weeks, 800 g at 26 weeks, 1243 g at 29 2/7 weeks and 30 4/7 weeks, and 1635 g when delivered at 31 6/7 weeks.

The patient did not experience contractions until HD 59 (at 26 weeks 6/7 GSA), and only intermittently after that. Contractions were mostly associated with fever or dehydration and subsided after the aggravating factor was corrected. Besides day of delivery, the only observed deceleration of fetal heart rate (HR) was on HD 73, with the HR in the 110s for 50–60 s. The OB team determined the HR change was associated with several doses of furosemide administered to reduce maternal edema and increase urine output (UOP) that day and days prior. During the hospitalization, fetal heart rate averaged in the 140s–180s.

Clinical course: hospital day 94 to delivery

The plan was to allow the pregnancy progress for as long as possible and to deliver the fetus by Cesarean-section at 34 weeks GSA. However, an emergent plan existed for an emergency Cesarean-section if either the pregnant patient or the fetus was noted to be in distress.

At 4am on HD 94 (90th day of somatic support), the pregnant patient became hypotensive with a mean arterial pressure (MAP) <60 with a HR in the low 60s. Three liters of IV fluids were administered and dopamine was initiated at 15 mcg/kg/min but without adequate blood pressure response. By 5:30am, the fetal HR was stable in the 140s with no deceleration despite the pregnant patient's MAP being 51. Since the fetus was stable, the OB team decided to continue to monitor closely.

Around 6:30 a.m., the pregnant patient experienced bigeminy with frequent runs of premature ventricular contractions (PVCs). Fetal distress was observed with decelerations to 70 bpm for 7 min prior to delivery. When fetal heart tones could not be detected, an immediate Cesarean-section was performed at the ICU bedside. The baby was immediately transported to the neonatal intensive care unit (NICU) for further monitoring. The patient was closed by OB and stabilized. Per brain death protocol that outlines steps for withdrawing life support, the ventilator was removed and the patient subsequently passed away. Her organs were not donated per the patient's parents' wishes.

Clinical course: interventions

Upon admission to our facility, the pregnant patient was found to have diabetes insipidus, panhypothyroidism, hospital acquired pneumonia, hypothermia, and hypotension secondary to anoxic brain injury and brain death. All of these conditions were monitored closely and treated according to the standards of care at the time.