ANESTHESIA WITH ETOMIDATE AND REMIFENTANIL FOR CESAREAN SECTION IN A PATIENT WITH SEVERE PERIPARTUM CARDIOMYOPATHY

- A Case Report -

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Abstract

Patients with peripartum cardiomyopathy may require analgesia/ anesthesia for delivery or cesarean section. Many different methods of anesthesia has been used for this purpose. Remifentanil was used safely in peripartum cardiomyopathic patients, but there is not any report about etomidate usage in such patients. We report on a 19 years old patient, at 32 weeks of gestation, with severe peripartum cardiomyopathy, in uncompensated heart failure and pulmonary edema. She was scheduled for emergency cesarean section becaue of threatening mother's life and fetal distress. General anesthesia was induced with etomidate and maintained with remifentanil infusion safely, without any adverse outcome on mother or newborn.

Keywords: peripartum cardiomyopathy, cesarean section, etomidate, remifentanil, general anesthesia.

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Introduction

Peripartum cardiomyopathy is a dilative cardiomyopathy of unknown cause. Different analgesia and anesthesia methods have been used in these patients either for delivery or cesarean section: continuous epidural or spinal blockade, combined spinal/epidural blockade and general anesthesia. Recently remifentanil infusion has been used for delivery or cesarean section in peripartum cardiomyopathic patients but there is not any report about etomidate usage in these patients.

In this case, we report the use etomidate and remifentanil for emergent cesarean section in a 19 years old woman at 32 weeks of gestation suffering of peripartum cardiomyopathy. Operation was performed safely and the patient and newborn had a successful outcome.

Case Report

The patient was 19 years old, 32 weeks of gestation, weight 88 kg, referred for emergency cesarean section with a diagnosis of uncompensated heart failure and pulmonary edema due to severe peripartum cardiomyopathy. Her chief compliant was dyspnea, orthopnea and palpitation. She had history of a previous pregnancy, 18 months previously that was complicated with palpitation and hypertension in 20th week of gestation. In spite of medical treatment, she lost her baby in the 23th week. She was symptom free until the start of the ongoing pregnancy in the 20th week when she again developed progressive palpitation, activity dyspnea and early onset of fatigue. Hydralazine, methyldopa and low molecular weight heparin were administrated. At 28th week she was admitted to CCU because of worsening clinical status, fever and productive cough. Because of diagnosis of pneumonia, a period of antibiotic therapy (cefixime) was added. The clinical condition did not recover completely at discharge to ward and later to home.

In the last preoperative week, she was admitted again to a general hospital with a diagnosis of superimposed infection, and antibiotic therapy was repeated. She was referred to our Heart Hospital for emergency

cesarean section, because of uncompensated heart failure and pulmonary edema, resistant to medical therapy. In our Hospital she complained of severe respiratory shortness and palpitation. Her vital signs revealed: BP = 120/80 mmHg, RR = 47, PR = 138 (sinus tachycardia) and BT (auxiliary) was 36°C. Diffuse bilateral crackles were heard on chest auscultation. The drug regimen she was on consisted of captopril, spironolactone, isosorbide dinitrate, hydralazine, methyldopa and cefixime. Transthoracic echocardiography (TTE) revealed: *four chamber dilation, LVEF (left ventricular ejection fraction) < 10%, moderate MR (mitral regurgitation), moderate AI (aortic insufficiency), moderate TR (tricuspid regurgitation), RVSP (right ventricular systolic pressure) = 50 mmHg.*

Cardiac enzymes, liver and renal function tests and urine analyses were within normal limits. Blood tests revealed: ESR = 104/125, HCT = 30%, CBC = 8200/mm^3 with neutrophilia (neutrophile = 85%, lymphocyte = 10%), PLT = 280000/mm^3, Na = 134 meq/L, K = 3.2 meq/L.

Bed side sonography showed a 31-32 week fetus with normal heart rate and normal movement with a weight of about 2000 gr CXR revealed cardiomegaly and pulmonary edema.

Because of the worsening of clinical condition, the attending obstetrician recommended emergency cesarean section because of fetal distress and mother's life being at risk. Patient was transferred to the operating room with severe respiratory distress, orthopnea and sinus tachycardia (HR = 142). Arterial and central venous catheters were inserted in semi-sitting position. Arterial and central venous pressures were 210/120 and 18 mmHg respectively. General anesthesia was induced with intravenous etomidate 18 mg, midazolam 2 mg and cisatracurium 16 mg and patient's was intubated using Sellick maneuver (7.5 mm ID cuffed tracheal tube). Remifentanil and tri-nitroglycerin infusion was started. Remifentanil infusion was increased from 1 to 2 μg/kg/min because of hypertension. Mechanical ventilation consisted of FiO_2 = 0.7, PEEP = 10 mmHg, TV = 600 ml, RR = 18 cycle/min with a peak airway of 42 mmHg. The systolic blood pressure was maintained about 140-150 mmHg. Fifteen minutes after induction a preterm female newborn was born (weight

2200gr. and APGAR score 8 and 9 in first and 5th post-delivery minutes respectively). Mother's arterial and newborn's umbilical artery blood gases glucose and electrolytes were within normal limits except the mother's hypokalemia (2.6 meq/lit). Operation lasted for 80 min. After IV injection of 5 mg morphine sulfate and discontinuing of remifentanil infusion, neuromuscular blockade was reversed with neostigmine 2 mg IV at the end of surgery. Patient was then extubated when she was awake and transferred to postcardiac surgery ICU where she underwent invasive hemodynamic monitoring. After 12 hour, patient was transferred to CCU in good clinical condition. On the 7th postoperative day, TTE showed: *LVEF (left ventricular ejection fraction) = 15%, LVEDD (left ventricular end diastolic diameter) = 8.28 cm, LVSD (left ventricular systolic diameter) = 7.38 cm, LAD (left atrial diameter) = 5.50 cm, mean PAP (pulmonary artery pressure) = 30 mmHg, RVSP = 50 mmHg, moderate TR, near severe MR.*

On the 7th postoperative day patient was discharged home with a drug regimen of: carvedilol, captopril, furosemide and warfarin. Newborn breast feeding started at second day and had no problems except a brief physiologic hyperbilirubinemia. Two and eight weeks later the newborn had no problem and mother was in physical functional class III. Echocardiography at 8th week revealed: *LVEF < 15%, severe MR, moderate TR, moderate AI, moderate PAH (pulmonary artery hypertention)*.

Discussion

Peripartum cardiomyopathy is a rare but life threatening disease. Its incidence is 1/1300-1/15000 pregnancies[1,2]. Its etiology is still unknown, but it may be due to nutritional deficiencies, small vessel coronary artery abnormality, hormonal effects, pre-eclampsia/toxemia, myocarditis or abnormal immunologic response to fetal antigens[3,4]. Its treatment is same as other dilative heart failure. Peripartum cardiomyopathy with normal pregnancy, may be mistaken for preeclampsia or present itself as cardiac arrest[5,6].

Previously there was no clear definition of its diagnosic, and any

dilative heart failure happening during pregnancy or after delivery was labeled as peripartum cardiomyopathy. After 1997, however, four criteria were established for the diagnosis of peripartum cardiomyography[2]:

1 - *Development of heart failure in the last month of pregnancy or within 5 month after delivery.*
2 - *Absence of an identifiable cause for heart failure.*
3 - *Absence of recognized heart disease prior to the last month of pregnancy.*
4 - *Evidence of left ventricular dysfunction and dilation in echocardiography.*

Our patient may not meet these criteria, clearly, but she was managed as peripartum cardiomyopathy by cardiologists and obstetricians. Without regard to definition or cause of peripartum cardiomyopathy, anesthetic management of these patients is the same as of other dilative heart failure, keeping in mind, however, the pathophysiology of pregnancy (ex. unique hemodynamic changes during pregnancy and delivery and the anesthetic drugs side effect of drugs on newborn).

Recovery of cardiac function in peripartum cardiomyopathy is usually slow and incomplete, and the risk of recurrence or worsening of the clinical condition in the following pregnancies is very high[7].

Different analgesic and anesthetic methods have been used for delivery or cesarean section in these patients, whose main purpose is to prevent further cardiac depression and uncontrolled changes in after load and preload. Invasive hemodynamic monitoring is useful[3,7-9]. Continuous epidural blockade usually is the preferred analgesic method that can be used for delivery, cesarean section or post operative analgesia. Continuous intrathechal or combined intrathechal/epidural blockade have also been used safely[10-13].

There are many recent reports of remifentanil being used as a safe anesthetic agent for analgesia, anesthesia and patient control analgesia (PCA), in delivery or cesarean section. Remifentanil is a titratable ultra short half-life opioid that has minimal side effects on mother or newborn.

It is used for induction and maintenance of anesthesia in cesarean section, in patients with peripartum cardiomyopathy[14-17].

Etomidate synthesized in 1964, was introduced into clinical practice in 1972. Hemodynamic stability of etomidate is unique as a rapid-onset induction agent. However after its widespread use for about one decade for induction, maintenance of anesthesia and prolonged sedation of critically ill patients in the ICU, its use became limited significantly because of reports in 1984 of temporary inhibition of adrenal steroid synthesis[18-19]. However, its unique properties (hemodynamic stability, cerebral protection and a rapid recovery after either a single dose or a continuous infusion did not change). Because of these beneficial properties and lack of any recent reports of clinical adrenocortical suppression or poor outcome, following a single dose or brief infusion, its use was resumed again for anesthesia induction. In a few recent studies in 1993, when etomidate was compared to other induction agents[18] there were no differences in wound infection, sepsis, MI, hypotension/need for inotropic support and plasma sodium level in high stress surgeries after anesthesia induction. In 1994, in a study in coronary artery bypass graft surgeries, except first post induction hour, cortisol level was same or higher in total intravenous anesthesia (TIVA) with etomidate/fentanyl group compared to the midazolam/fentanyl group. These studies showed that etomidate is still safe for major surgeries[18].

With regard to its hemodynamic stability and other properties, etomidate has been primarily used in sick patients or patients with cardiovascular disease. Anesthesia induction with etomidate in heart failure seems safe[18,20-25].

There are new case reports about etomidate use in other compromised cardiovascular diseases, but there are not any new study or case report about etomidate use in patients with peripartum cardiomyopathy. In our patient, with severe left ventricular dysfunction (LVEF < 10%), we used etomidate for induction and then Remifentanil for maintenance of anesthesia. This method provides good clinical conditions for surgery with minimal anesthetic side effect on the newborn. Considering authors experiences in cardiovascular anesthesia, this method has been used safely in our hands.

However, it may not be recommended in other operating theaters. In those conditions, continuous epidural blockade may be the best method.

In summary, patients with severe left ventricular dysfunction, the combined use of etomidate and remifentanil as safe agents for anesthesia induction and maintenance in patient with peripartum cardiomyopathy, is recommended.

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Peripartum cardiomyopathy (PPCM) is a rare, often dilated, cardiomyopathy with systolic dysfunction that presents in late pregnancy or, more commonly, the early postpartum period. Although the condition is prevalent worldwide, women with black ancestry seem to be at greatest risk, and the condition has a particularly high incidence in Nigeria and Haiti. Other risk factors include pre-eclampsia, advanced maternal age, and multiple gestation pregnancy. Although the complete pathophysiology of peripartum cardiomyopathy remains unclear, research over the past decade suggests the importance of vasc