

Combined spinal epidural anesthesia and non-invasive positive pressure ventilation for emergency cesarean section in a parturient with acute pulmonary edema due to pre-existing multivalvular cardiac disease

B. Tuncali¹, H.M. Ozsoy²

¹ Department of Anesthesiology, Baskent University Zubeyde Hanim Practice and Research Centre, İzmir

² Department of Obstetrics and Gynecology, Baskent University Zubeyde Hanim Practice and Research Centre, İzmir (Turkey)

Summary

Acute pulmonary edema in pregnant women with pre-existing cardiac disease is an uncommon problem, which may lead to significant maternal morbidity and mortality. It may occur due to superimposed characteristic features of the physiological changes related to pregnancy. The management is difficult, because there is no controlled trials or guidelines. The authors present their management of combined spinal epidural anesthesia with non-invasive ventilation in a parturient with acute pulmonary edema, due to pre-existing multivalvular heart disease and pulmonary hypertension, who underwent an emergency cesarean section because of preterm labour and fetal distress.

Key words: Pulmonary edema; Pulmonary hypertension; Cesarean section; Multivalvular heart disease; Combined spinal epidural anesthesia; Non-invasive ventilation; Back-up position.

Introduction

Acute pulmonary edema is a rare but life-threatening problem which may cause significant morbidity and mortality in pregnant women. It may occur due to pathologies such as pre-eclampsia, sepsis, amniotic fluid embolism, fluid-overload or beta-adrenergic tocolytic drugs during the antenatal, intrapartum or postpartum periods. Moreover, pre-existing cardiopulmonary diseases may worsen due to the superimposed effects of physiological changes related to pregnancy [1]. Management of these patients is a challenge for the anesthesiologists, because there are no controlled studies or guidelines pointing out the best type of anesthetic technique in these patients [2].

Case Report

A 38-year-old, pregnant patient with a history of rheumatic mitral valve disease was admitted to the obstetric clinic due to preterm labour at 37 weeks gestation. Cardiology consultation and transthoracic echocardiography revealed severe pulmonary hypertension with a systolic pulmonary artery pressure of 90 mmHg associated with moderate mitral stenosis and severe mitral regurgitation with a mitral valve area of 1.7 cm², moderate tricuspid regurgitation, and moderate aortic regurgitation. Because of fetal distress, according to non-reactive cardiotocography and late deceleration signs, an urgent cesarean section was planned. The patient was transferred to the operating room in a sitting position with symptoms of tachypnea, orthopnea, breathlessness, cough, and mild cyanosis. Respiratory rate

was 22/minute and cough with pink coloured sputum was present. Physical examination revealed bilateral pretibial edema with crackles on chest auscultation. Monitoring including non-invasive blood pressure, electrocardiogram, and pulse oximetry revealed a blood pressure of 130/80 mmHg, sinus rhythm with a heart rate of 119, and peripheral oxygen saturation (SpO₂) of 89 %, respectively. Following the initiation of supplemental oxygen 6 l. min⁻¹ via a face mask, the SpO₂ reached 92%. After obtaining intravenous access, a combined spinal epidural anesthesia (CSEA) was performed in the sitting position with 1.6 ml 0.5% hyperbaric bupivacaine, followed by placement of an epidural catheter. A Foley catheter was placed and 20 mg of furosemide was given intravenously. At the sixth minute after CSEA achieving the sensory block level reached T5 level, the operation was begun and performed in a semi-sitting position except for one minute period during uterine incision and delivery of the baby, because the patient did not tolerate the supine position with a decrease in SpO₂ to 88%. The authors also used non-invasive positive pressure ventilation (NPPV) with a NPPV mask throughout the operation with an inspiratory and expiratory pressure of ten and eight cm, H₂O respectively, which allowed an improvement in oxygenation with an SpO₂ of 94-97%. A baby boy was delivered at the fourth minute after the skin incision with APGAR Scores of 6 and 8 at first and fifth minutes, respectively. The surgical procedure lasted 28 minutes, haemodynamic status was stable, and there was no need for ephedrine or atropine requirement. In the operation, a total of 900 ml crystalloid solution was given and the urine output was 1,600 ml. In post-anesthesia care unit, the patient's symptoms improved gradually and she was transferred to ward in a sitting position with an SpO₂ of 92 with room air. Postoperative pain control was provided by epidural bupivacaine 0.125% and intravenous analgesics afterwards. She was discharged uneventfully on postoperative day 3.

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Discussion

Acute pulmonary edema is not only a cause of maternal morbidity, but also the reason for intensive care admission [1]. Cardiovascular stress related to pregnancy, labour, and delivery may induce various degrees of cardiac failure in pregnant women with cardiac diseases [2]. A systolic pulmonary artery pressure above 50 mmHg is associated with cardiac complications during pregnancy, as functional status worsens more rapidly in pregnant patients with mitral valve stenosis. Cardiac decompensation and pulmonary edema may occur at any time during the second or third trimester. Fluid restriction, diuretics, and control of atrial fibrillation are basic measures that can prevent pulmonary congestion [2]. Safe use of NPPV and regional anesthesia combination for cesarean section have previously been described, with several case reports in patients with respiratory failure due to kyphoscoliosis, neuromuscular diseases, acute respiratory distress syndrome, pneumonia, and non-cardiogenic pulmonary oedema [3-5].

In the present patient, acute pulmonary edema developed presumably because of tachycardia caused by anxiety and pain of preterm labour, with pre-existing multivalvular heart disease and limited cardiac reserve. Management of these patients is difficult, because guidelines and standards are lacking. Some authors have described the use of general anesthesia with good maternal outcome, whereas others have reported increased pulmonary arterial pressure during laryngoscopy and tracheal intubation, and the adverse effects of positive-pressure ventilation on venous return advocating regional anesthesia [6, 8]. In the patient, the authors did not use invasive monitoring, such as arterial or central venous catheter placement, because these procedures would be stressful for the patient and likely result in a further increase in heart rate. Additionally, fetal distress was present. Various options including general or regional anesthesia were discussed with anesthesiologist, cardiologist, obstetrician, and the patient. The authors decided to proceed with CSEA due to its advantages in terms of rapid onset and superior postoperative analgesia. Since, the patient did not tolerate the supine position, the authors used NPPV and backup position throughout the procedure. Spinal anesthesia provided peripheral vasodilation and a decrease in filling pressure, as well as postoperative epidural analgesia that allowed the maintenance of these beneficial effects. Additional diuretic therapy contributed to rapid improvement of the symptoms.

Because the postpartum period is the most critical period for acute pulmonary hypertension decompensations, symp-

tomatic therapy including inhaled nitric oxide and epoprostenol infusion or inhaled iloprost during this period is recommended [9]. In the present case, acute pulmonary edema which occurred immediately before cesarean section was resolved with diuretics, with no need of inhaled nitric oxide or other pulmonary vasodilators.

In summary, the present case showed that CSEA and non-invasive positive pressure ventilation combination with diuretic therapy can provide sufficient analgesia, perioperative haemodynamic stability, and improved oxygenation during cesarean section in patients with acute pulmonary edema.

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Corresponding Author:

B. TUNCALI, M.D.

Department of Anaesthesiology and Reanimation
Baskent University Zubeyde Hanim Practice
and Research Centre

Caher Dudayev Bulvari, Karsiyaka

Izmir, 35540 (Turkey)

e-mail: tuncali.bahattin@gmail.com