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CASE REPORT

General anesthesia with remifentanil for cesarean section in a parturient with severe mitral and tricuspid regurgitation

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Abstract

Valvular heart lesions have deleterious effects on hemodynamics in parturients during pregnancy. Cesarean section with an opioid-based general anesthesia is used to alleviate the adverse effects. We described a case of a 28-year-old primigravida at 37 weeks' gestation with a diagnosis of severe mitral regurgitation, tricuspid regurgitation, and pulmonary hypertension in active labor. Cesarean section under general anesthesia using remifentanil was planned to provide a stable anesthesia and analgesia to minimize hemodynamic changes during surgery. The patient maintained reasonable hemodynamics during surgery. The neonate required transient ventilatory support with bag and mask until she obtained spontaneous respiration.

We suggest that remifentanil is a reliable opioid that can produce stable hemodynamic conditions with transient neonatal respiratory depression during cesarean section under general anesthesia in a parturient with severe valvular heart disease and pulmonary hypertension.

Key Words: General anesthesia; Cesarean section; Remifentanil; Mitral regurgitation; Tricuspid regurgitation

Introduction

Mitral regurgitation is the second most common valvular heart disease in parturients with significant effects on the mother and the neonate especially after delivery. Regional anesthesia is preferred over general anesthesia for cesarean section due to decreased maternal mortality [1]. However, general anesthesia might be indicated where regional anesthesia is contraindicated or fails or when there is an emergency delivery. Application of systemic opioids is considered to blunt the hemodynamic responses during endotracheal intubation and hormonal stress response during surgery, especially in patients with compromised cardiac function [2-4]. However, they are associated with adverse effects on the neonate and are therefore avoided until after delivery. Remifentanil, an esterase metabolized synthetic opioid, might be an excellent choice for cesarean section under general anesthesia because of its fast onset and extremely short duration. It has been used successfully in the management of high risk parturients requiring cesarean section under general anesthesia [5-9].

We report the use of remifentanil for general anesthesia in a parturient with multiple cardiac lesions including severe mitral regurgitation, tricuspid regurgitation, and pulmonary hypertension requiring cesarean section.

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Cases

A 27-year-old, white woman with the weight of 78 kg and height of 161 cm (gravid 1 para 0), with a fetus of 37 weeks gestation was admitted to the hospital for semielective cesarean section due to cephalopelvic disproportion. The patient had a history of mitral regurgitation, tricuspid regurgitation, and pulmonary hypertension. She was on sildenafil 25 mg twice. An echocardiography one month ago indicated severe mitral regurgitation, left atrial, and right ventricular enlargement, ejection fraction of 50%, and pulmonary arterial pressure (PAP) of 35 mmHg. She had a history of an atrial septal defect (ASD) closure operation two years ago and chronic hepatitis. On examination, the patient had a blood pressure of 122/74 mmHg, pulse rate of 90 bpm, and respiratory rate of 18. Physical examination revealed a severe systolic murmur on the left sternal border. Her EKG showed right bundle branch block. Cesarean delivery under general anesthesia was planned to avoid further deterioration of hemodynamic status due to stress of the labor. After preoxygenation, anesthesia was induced with propofol 2 mg/kg, remifentanil 1 µg/kg. Suxamethonium 1.5 mg/kg was used to facilitate endotracheal intubation using rapid sequence technique. Cisatracurium 0.1 mg/kg was given after endotracheal intubation with remifentanil infused at 0.1 µg/kg/min and propofol 6-9 mg/kg/hr for maintenance. The patient was ventilated with volume ventilation (Drager, Fabius, Lubek, Germany) with tidal volume of 8ml/kg with 100% oxygen. Respiratory rate was adjusted to keep the end tidal carbonic acid (et CO2) between 30-40 mmHg. Standard monitoring included pulse rate, noninvasive blood pressure, (electrocardiogram) EKG monitoring, respiratory rate, pulse oxymetry, and etCO2. After delivery, remifentanil was increased to 0.2-0.4 µg/kg/min to maintain blood pressure and heart rate at 20% from baseline. An infusion of oxytocin (20 units in 0.9% normal saline over 30 minutes, and 30 units over 4 hours afterwards) was started. Prophylactic antibiotic (gentamicine and ceftriaxone) was also given. The patient did not show any significant hemodynamic changes after induction and had a mean arterial pressure (MAP) ranging from 75 to 92 mmHg and a heart rate ranging from 85 to 100. The oxygen saturation remained between 98-99% during the surgery. Five minutes before the end of surgery, the patient received fentanyl 1 µg/kg for postoperative pain relief. At the end of the surgery, residual neuromuscular block was antagonized with neostigmine 0.05mg/kg and atropine 0.02mg/kg. The patient was extubated while awake. She maintained reasonable hemodynamics after delivery with MAP ranging from 850 to 105 mmHg and heart rate ranging from 72 to 91. The estimated blood loss was considered 500mL and was replaced with 1500mL of normal saline cautiously. The patient was transferred to the cardiac care unit (CCU). She left CCU on the second day uneventfully and was discharged from the hospital on the third day.

A live 3250g female infant was delivered 5 minutes after skin incision with Apgar score of 5 and 9 at 1 and 5 minutes, respectively. She was apneic after birth and received ventilatory support with bag and mask of oxygen until she obtained spontaneous respiration after 90 seconds. She did not show any evidence of respiratory distress or depression afterwards. She was transferred to neonatal intensive care unit (NICU) for postoperative care where she had an uneventful stay.

Discussion

Rheumatic mitral regurgitation is the second most common clinically significant cardiac abnormality seen in pregnant women worldwide [10, 11]. Most patients with mitral regurgitation tolerate pregnancy well mainly because of the reduction in systemic vascular resistance. Afterload reduction may be helpful in the first 24-48 hours post-partum [11]. However, the patient condition may deteriorate after delivery when systemic vascular resistance increases.

In a parturient with valve disease, a short pain-free labor and delivery helps to minimize hemodynamic fluctuation. Vaginal delivery under regional anesthesia is the usual approach in patients with valvular heart disease [12].

Epidural anesthesia is preferred over spinal anesthesia due to its more controllable hemodynamic alterations [13]. Cesarean section results in greater hemodynamic changes and more blood loss and is therefore considered when there are obstetrical indications [9].

Intravenous fluid management should be carefully monitored to avoid both a lack of and an excess fluid. Arterial, central venous (CV), and/or pulmonary artery monitoring may be required to optimally mange the patient. However, we did not use a CV line or arterial line because the patient did not show any evidence of significant hemodynamic impairment.

General anesthesia was planned for our patient because of cephalopelvic disproportion. On the other hand, our patient also had pulmonary

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hypertension that made her more vulnerable to adverse effects of labor.

We used remifentanil before delivery to attenuate the deleterious effects of endotracheal intubation and surgical pain to reduce further hemodynamic compromise during surgery. Our patient did not show significant hemodynamic changes after induction, before delivery, and throughout the surgery.

Several studies have reported beneficial effects of remifentanil in high risk patients including aortic stenosis [5], mitral stenosis [6], acoustic neuroma [7], recurrent aortic coarctation [8], and aortic stenosis accompanied by coarctation of aorta [9] requiring cesarean section under general anesthesia. Nonetheless, it has been associated with some transient but adverse effects such as neonatal chest wall rigidity [14].

It has also been used with good results for anesthetic management of parturients requiring surgery during pregnancy including a patient requiring surgery for a large intracranial epidermal cyst [15]. However, its application in a parturient under anesthesia for cholesystectomy resulted in severe fetal bradycardia despite normal oxygenation and blood pressure [16].

On the other hand, some have reported transient respiratory depression of the neonate requiring short period of ventilation support of the neonate [17, 18]. Remifentanil administration before peritoneal incision can also reduce the hormonal stress response of the parturients [1].

The neonate in our case revealed transient respiratory depression after delivery that responded rapidly to short ventilatory support with bag and mask of oxygen without naloxone requirement. This is in keeping with findings of Negan Kee et al [19] and Van De Velde et al [18] who reported transient neonatal respiratory depression lasting up to 5 minutes in cesarean section under general anesthesia in spite of applying low bolus doses of remifentanil. Their findings indicated that even low doses of remifentanil can cause respiratory depression.

Our finding is in keeping with other published reports on the beneficial effects of remifentanil on hemodynamic parameters during cesarean section [5, 20].

More et al used remifentanil for cesarean section in 4 parturients with critical aortic stenosis. All the patients maintained reasonable hemodynamics during surgery. In all cases, the infants were born in good condition, as evidenced by their Apgar scores and umbilical cord blood gases [16]. However, one of the neonates in their series showed transient respiratory depression requiring bag and mask ventilation for a short time. It was attributed to the relatively long incision to delivery time of 15 minutes.

In one study, Mc Caroll et al used a target-controlled infusion of propofol and an intravenous infusion of remifentanil at a dose of 0.8 to 2μg/kg/min in a patient with peripartum cardiomyopathy requiring cesarean section [20]. Although remifentanil could produce hemodynamic stability in the patient, the neonate required intramuscular naloxone to reverse the respiratory depression. It can be attributed to high doses of remifentanil in this patient.

However, Draisci et al did now show any significant difference in blood pressure and heart rate in parturients undergoing cesarean section with remifentanil in comparison to the control group [1].

Conclusions

We demonstrated the effective application of remifentanil for general anesthesia in a parturient in active labor with severe mitral stenosis, mitral regurgitation, tricuspid regurgitation, and pulmonary hypertension and pulmonary edema requiring cesarean section with no adverse effect on the neonate. The patient showed reasonable hemodynamics during surgery. We recommend the use of remifentanil in parturients with cardiac dysfunction and/or unstable hemodynamics requiring cesarean section under general anesthesia. We also recommend appropriate facilities for neonatal resuscitation to be available in case of respiratory depression of the neonate.

We, as authors, certify that we have had no personal, financial, political, or academic interests in this article.

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