Tokai J Exp Clin Med., Vol. 24, No. 2, pp.53-55, 1999

The use of Sevoflurane Anesthesia during Early Pregnancy

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(Received January 21, 1999; Accepted February 22, 1999)

Sevoflurane has favorable pharmacodynamic properties such as a rapid, smooth induction and emergence from anesthesia. However, there is only one report of sevoflurane anesthesia during early pregnancy. We report the use of sevoflurane for maintenance of general anesthesia in a pregnant patient undergoing non-obstetric surgery. A 25-year-old, female patient, at 13 weeks gestation, was diagnosed as having a strangulated ileus. General anesthesia was performed and maintained with oxygen, nitrous oxide, and sevoflurane. Six months later a healthy infant without abnormalities was delivered.

Keywords : Sevoflurane, General anesthesia, Pregnancy, Non-obstetric surgery

INTRODUCTION

Despite the risk of teratogenesis, general anesthesia must sometimes be used in patients during the first trimester of pregnancy. The site of surgery and the patients disease can limit the choice of general anesthesia. We report the use of sevoflurane for maintenance of general anesthesia a patient undergoing non-obstetric surgery early in pregnancy.

CASE REPORT

A 25-year-old, female patient weighing 50 kg was admitted after complaining of abdominal pain and distension. She was at 13 weeks gestation and had undergone total colectomy for ulcerative colitis previously. The patient was diagnosed as having a strangulated ileus, without x-ray examination, and was scheduled for an emergency operation. We assumed that major organ development in the fetus had been completed. However, we informed the patient and her family that the possibility of cleft palate, cleft lip, and abnormalities of the extremities still existed.

No premedication was given. As a heavy fluid discharge was observed through the nasogastric tube, a very high risk of aspiration was predicted despite whether rapid sequence intubation with cricoid pressure was performed or not. To avoid this possibility, we selected awake intubation in the present case. Fentanyl 0.1 mg was administered intravenously, the airway was localized prior to awake intubation, and the patient received the intubation easily without aspiration. Immediately after intubation, sodium thiopental 125 mg and vecuronium 4 mg were injected intravenously. General anesthesia was maintained with oxygen and 1-2.5 % sevoflurane. Nitrous oxide was used after decompression of the bowel. Systolic blood pressure was maintained above 80 mmHg by injections of ephedrine and infusion of lactated Ringer's solution. End-tidal CO_2 was maintained between 35 and 38 mmHg. Partial resection of ileum was performed about stragulating ileus. The duration of the anesthesia was one hour and forty-five minutes. The patient's trachea was extubated in the operating room. Concerning postoperative pain, epidural injection of 0.25% bupivacaine (2 ml/h) was administered for 3 days after the operation.

Ritodorine hydrochloride was given to avoid abortion for 3 days. The remainder of the pregnancy was uncomplicated. Six months later, the patient underwent Caesarean section and delivered a female infant weighing 2820 g (Apgar score of 9).

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No external deformities were observed.

DISCUSSION

Anesthesia during early pregnancy often presents a difficult choice. The relation between general anesthesia and the risk of teratogenesis is unclear in humans. Although regional anesthesia is recommended generally whenever possible [1-4], general anesthesia with endotracheal intubation was selected in the present case. With regard to the patient's hemodynamic status, blood pressure and heart rate were not stable (BP 90/58 mmHg, HR 110 bpm) after administration of 1000 ml crystalloid solution. Difficulty was expected in controlling the patient's hemodynamic status after epidural or spinal anesthesia.

At first, a rapid sequence intubation with cricoid pressure was planned for the patient. However, we considered that awake intubation should be selected because we found that the patient had vomited gastrointestinal juice, even after aggressive nasogastric suctioning. We therefore decided that awake intubation was the proper choice.

Drugs which depress uterine blood flow or cause uterine contractions should not be used. To induce anesthesia, we used 2.5 mg/kg of sodium thiopental which seemed to present no problem [5, 6].

It has been reported that operating room nurses and nurse anesthetists, exposed to inhalation of anesthetics such as halothane or enflurane, exhibited a significantly increased incidence of spontaneous abortion or fetal teratogenesis [7, 8]. Another report has also shown a correlation between the incidence of congenital abnormalities and anesthetic gases [9].

Concerning inhalation anesthetics such as isoflurane or sevoflurane, their safety for human patients during early pregnancy has not yet been determined. In rats or rabbits, these agents have not been positively implicated in teratogenicity [10-13]. Mazze reported that isoflurane is associated with a higher (about 6 times) incidence of cleft palate in mice than enflurane [14], although it has not been reported that isoflurane is associated with teratogenicity in humans. With consideration to the above reports, we selected sevoflurane in the present case.

Sevoflurane (fluoromethyl-1,1,1,3,3,3,-hexafluoro-2-propyl ether) has favorable pharmacodynamic properties [15]. It is a pleasant smelling liquid, boils at 58.5℃ in 760 torr and has a vapor pressure of 200 torr at 25℃. It has a low blood-gas partition coefficient of 0.6 and a MAC (Minimum Alveolar Concentration) of 1.71% in man. Therefore, it provides rapid anesthetic induction and emergence from anesthesia compared to other inhalational anesthetic agents.

There are many reports about the side effects of nitrous oxide. It was found that when pregnant rats were exposed to nitrous oxide, the incidence of intrauterine fetal death and skeletal abnormalities increased [16, 17]. It also has been reported that when pregnant mice were exposed to nitrous oxide, the incidence of abnormalities did not increase [18]. In humans, conflicting reports exist concerning whether the incidence of fetal abnormalities increases or not following inhalation of nitrous oxide during early pregnancy [19-21]. In the present case, we used nitrous oxide only after the ileus was corrected. The period of the inhalation was limited to 40min. We considered nitrous oxide beneficial since its combined effect with inhalation anesthetics shows a reduction in the MAC of the anesthetics. Nevertheless, its concentration should probably be limited to less than 50% [22] and the period of inhalation should be as short as possible.

Vecuronium as a muscle relaxant was selected in the present case. Concerning muscle relaxant antagonists, Shiomi et al reported that neostigmine caused uterine contraction [24]. Therefore, it was not administerd to our patient. However, we consider that neostigmine can be used in the early pregnant patient as a muscle relaxant antagonist.

Postoperative pain may cause harmful stress. Epidural injection was useful in the present case and no signs of abortion in the patient appeared after surgery. Bupivacane is believed to be safe even during pregnancy [23].

We performed general anesthesia with sevoflurane in an ileus patient during early pregnancy. It was assumed that fetal organ development was complete, but there remained the possibility of teratogenesis such as cleft palate and cleft lip. This report is the second concerning general anesthesia plus sevoflurane in patients during early pregnancy [24], and we hope it will contribute to our knowledge on this subject.

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