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□ Case Report □

Awareness during total intravenous anesthesia for endoscopic thyroidectomy

— A case report —

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A 24-year-old woman underwent endoscopic thyroidectomy with total intravenous anesthesia technique. Immediately after surgery, she said that she had experienced intraoperative awareness for a while. She had vague auditory recall and some degree of pain at the incision site. She was given adequate doses of anesthetics during the operation and the drug delivery system was not compromised. We report awareness during total intravenous anesthesia for endoscopic thyroidectomy. **(Korean J Anesthesiol 2009; 57: 670～2)**

Key Words: Awareness, Total intravenous anesthesia.

Total intravenous anesthesia (TIVA) with propofol and remifentanil provides excellent anesthesia for long procedures. A particular advantage of this technique is the rapid and predictable recovery. Remifentanil-based anesthesia also allows a reduction in the requirements for other anesthetic agents and muscle relaxants. One reason for reluctance to use TIVA is the belief that the incidence of awareness under anesthesia is greater than with volatile anesthetic agents. Awarenes during anesthesia is a serious complication with potential long-term psychological consequences [1]. This case demonstrates that when using propofol-remifentanil anesthesia, one must remember that awareness may occur during what may otherwise appear adequate anesthesia.

CASE REPORT

A 24-year-old female patient was found an abnormal finding in a thyroid ultrasonography by routine company medical check up, she was diagnosed with papillary thyroid cancer after a biopsy, and was admitted for endoscopic total thyroidectomy. Her previous medical history included 3 times operations from March, 2006 to September, 2006 because both 4th toe brachymetatarsia had not grown, which was diagnosed when she was 5 years old. All operations had been done under inhalational general anesthesia; there was no complication or side effect by anesthesia.

Her preoperational evaluation was normal except ALT (alanine aminotransferase) was slightly increased up to 71. Her vital signs in general ward were a heart rate of 74－103 beats/min, a blood pressure of 98/54－127/74 mmHg and an arterial oxygen saturation of 98%.

We didn't give her any premedication. Upon arrival in the operating room, her heart rate was 65 beats/min, blood pressure 135/72 mmHg, and arterial oxygen saturation 100% was checked. Following pre-oxygenation, a target-controlled infusion of propofol was administered at an initial target plasma concentration of 6 μg/ml together with an infusion of remifentanil at a rate of 4 ng/ml (Ochestra infusion workstation, VO3. OS-1, Fresenius Vial, France). After intubation was facilitated with 35 mg rocuronium, the mechanical ventilation with 40 vol% oxygen with medical air was applied to the patient, and the target propofol concentration reduced to 3.5 μg/ml. The remifentanil infusion was adjusted according to the blood pressure.

After surgical incision, continuous high blood pressure (ranging from 150/80 to 160/90 mmHg) and high heart rate (ranging from 80－90 beats/min) presented for 30 minutes. So the drug level was adjusted to propofol of 5.5 μg/ml, remifentanil of 5.0 ng/ml

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and 5 mg labetalol was given twice, but there was no significant change in her vital signs. We checked the anesthetic drug delivery machine and we did not find any default in functioning. So we readjusted drug level to propofol of 4.0 μg/ml, remifentanil of 4.0 ng/ml. Even 1hr after surgical incision her vital signs were maintained to high range and her self respiration was resumed. For that reason, nicardipine 100 μg was given twice and vecuronium bromide 1 mg was given intravenously, but there was no significant change in her vital signs. A total operation time was three and a half hours and she was transferred to PACU with intubated.

Immediately after arrival at PACU, she was extubated under confirmation of full self respiration and was given demerol 25 mg intravenously for pain.

Forty-five minutes later the patient reported that during her operation, she had felt pain at the incision site, and she had heard what medical staffs were saying, had felt like she had opened her eyes slightly and had seen people were passing by. She felt dreadful and tried to move her limbs but couldn't. She thought it lasted for a long time because of fear and pain. We explained to her about the possibility of intraoperative awareness, incidence rate with relevant causes, and it could occur with no particular reason. The patient's mood became stabilized by our explanation as above. She was transferred to general ward, and she was discharged to home without problem after several days.

DISCUSSION

The incidence of intraoperative awareness has decreased over the last 40 years and is now 0.1−0.2% [2,3]. Most patients have vague auditory recall or dreaming rather than pain. Some patients experienced pain, ranging from sore throat caused by an endotracheal tube to severe pain at the incision site. They may recall these events immediately after surgery, or hours or days later [3].

There are several risk factors of awareness, including young age, limited cardiac reserve, substance abuse, some types of surgery (Cesarean section, cardiac surgery, trauma surgery) [2-6].

The causes of intraoperative awareness are as yet unknown, but 4 broad categories of causes are plausible. First, patient specific variability in dose requirements of anesthetic drugs because of altered expression or function of target receptors. Second, patients who have poor cardiac function or severe hypovolemia can't tolerate a sufficient dose of anesthetic. Third, patient's vital signs that would indicate the need for a dose control may be masked by factors such as use of β-adrenergic receptor blockers or the presence of a pacemaker. Fourth, the inevitability of human error and equipment malfunction can give rise to intraoperative awareness. And anaesthetist fatigue, lack of vigilance, and inadequate supervision or training can also occur [3,7].

During inhaled anesthesia it is possible to assess the MAC of the volatile anesthetic blunting cardiovascular responses to surgical stimuli (MAC BAR), but it is more difficult during TIVA. Thus, sympathetic responses to tracheal intubation and skin incision are used as relevant end-points to assess the depth of anesthesia [8]. According to Kil et al., in Korean people, the target effect-site concentration of propofol 3.5 μg/ml correspond to BIS 41.4 [9], and Albertin et al. said when propofol was 4.0 μg/ml, EC 95 of remifentanil blunting sympathetic response to skin incision was 3.6 ng/ml [8]. Kim et al. said propofol and remifentanil co-administration showed dose-dependent synergism [10]. Considering above suggestions, we thought she was given not insufficient doses of anesthetics during operation. Finally we deduced her awareness was related to the first cause of 4 categories [3,7].

We discussed about the reluctancy to use TIVA. We are apt to believe the incidence of awareness under TIVA is greater than with volatile anesthetic agents. There is no objective evidence that TIVA increases the risk of awareness. But the depth of anesthesia is more important than the type of anesthetic administered [1,5].

Then what can we do to reduce the incidence of intraoperative awareness? To maintain adequate depth of anesthesia, the dose of administered anesthetics is adjusted by an experienced anesthesiologist, judging by patient's various vital signs, lacrimation and movement. Unfortunately, episodes of awareness have occurred with no hemodynamic changes [3,4,7,11]. So some other objective monitoring devices like bispectral index system (BIS) were required. There are debates about the efficacy of the BIS [11] and use of this device can't guarantee the prevention of intraoperative awareness.

Sebel et al. [11] found the BIS-monitored group had a higher incidence of awareness (0.18%) than the control cohort (0.10%) in their study compared with the studies from Myles et al. [12] and Ekman et al. [13] where the incidence of awareness was reduced. "Practice advisory" recommend the use of brain function monitoring for general anesthesia patients is not routinely indicated but should be used on a case-by-case basis [3,4,11-14]. And prophylactic use of benzodiazepine also should be done on a case-by-case basis for selected patients [4,7,15].

When intraoperative awareness does occur, we should manage the patient in a frank and expert manner by understanding and documenting the patient's experience and should identify contributing factors. If possible, the anesthesiologist should provide an

explanation of its cause and reassurance that the chance of a recurrence is rare. The patient should be instructed to let future anesthesiologists know about the event. Some patients should need psychological counselling and additional supportive care [3].

This case demonstrates that when using propofol-remifentanil ansthesia, one must remember that awareness may occur during what may otherwise appear adequate anesthesia.

Even though the benefit of BIS monitoring and administration of benzodiazepine is controversial, for patient's safety, we should consider application of BIS monitoring or midazolam premedication. Further research about the criteria for application of BIS monitoring and use of benzodiazepine is required.

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