

Bispectral index monitor in anesthetic management during thyroidectomy of a patient with poorly controlled Graves' disease

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To the editor: We report a case of propofol anesthesia with bispectral index (BIS) monitoring during thyroidectomy of a patient with poorly controlled Graves' disease.

A 36-year-old, 151-cm, 43-kg woman was admitted for surgery. Graves' disease had been diagnosed at age 31. Both thyroid hormones, free triiodothyronine (T_3) and free thyroxine (T_4), were elevated at $12.1 \text{ pg}\cdot\text{ml}^{-1}$ (normal $1.92\text{--}3.38 \text{ pg}\cdot\text{ml}^{-1}$) and 5.2 ng/dl (normal $0.71\text{--}1.85 \text{ ng}\cdot\text{dl}^{-1}$), respectively. Following oral administration of thiamazole and Lugol the free- T_4 level improved to $1.73 \text{ ng}\cdot\text{dl}^{-1}$, but the free- T_3 level remained high at $6.74 \text{ pg}\cdot\text{ml}^{-1}$. Cardiovascular agents such as β -blockers were not administered. Because of her mental anxiety, an operation under general anesthesia was chosen after consent was obtained from the patient and her family.

On the day of the operation, premedication with 5 mg of diazepam was administered intramuscularly. A BIS sensor (BIS-2000; Nihon Kohden, Tokyo, Japan) was applied to the forehead, and continuous measurement was started. Anesthesia was induced with 100 mg of propofol and 0.2 mg of fentanyl, and 8 mg vecuronium was administered to facilitate endotracheal intubation. Anesthesia was maintained referring to BIS values with continuous administration of propofol and bolus administration of fentanyl and vecuronium as needed. The maintenance dose of propofol was $7\text{--}8 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{h}^{-1}$. When manipulation of the thyroid tumor commenced, her blood pressure rose from 142/88 to 202/110 mmHg. However, the BIS values were stable in the 50s. Therefore, instead of increasing the propofol, supplemental fentanyl was administered, but it failed to lower the blood pressure. Because there was no severe tachycardia, continuous administration of prostaglandin E_1 ($0.05\text{--}0.15 \text{ }\mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) was employed to control blood pressure without a β -blocker. Thereafter, the blood pressure was stable (around 120/80 mmHg). The operation was completed smoothly, and the patient awoke quickly.

It is thought that a high dose of propofol is necessary to achieve sufficient sedation because propofol clearance is elevated in hyperthyroid patients [1]. Therefore, when hypertension occurs during anesthesia in hyperthyroid patients, additional propofol is often administered because of the perceived "elevated clearance". However, if propofol clearance is not elevated and propofol sedates patients sufficiently, the additional administration makes the dose excessive, and hemodynamic stabilization often is difficult to achieve [1,2]. Moreover, excessive administration of propofol may result in delayed awakening, as the propofol that has accumulated in fatty tissues diffuses reversely to the bloodstream after administration is discontinued even in the hyperthyroid state [2]. By referring to BIS values, excessive administration of propofol can be avoided and cardiovascular agents can be used for hemodynamic stabilization. In our case, the BIS values were in the 50s when blood pressure began to rise with manipulation of the thyroid tumor, indicating that the patient was sufficiently sedated. Supplemental administration of fentanyl, a narcotic analgesic, failed to lower the blood pressure. Thus, blood pressure elevation was thought to be caused by increased secretion of thyroid hormones induced by surgical manipulation. This showed that BIS was useful for determining the optimal dose of propofol and the appropriate use of circulatory agents for thyroidectomy in a patient with Graves' disease, which supports a report by Kamata et al. about the use of BIS during nonthyroid operations in two patients with secondary hyperthyroidism [3].

References

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