

A Case of Thyroid Crisis Occurring during Surgery

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The improvements in perioperative management of thyrotoxic disease have markedly reduced the incidence of so-called "surgical" thyroid crisis. Now, thyroid crisis is a rare complication for the patients undergoing subtotal thyroidectomy. However, we recently experienced a case of thyroid crisis which occurred during subtotal thyroidectomy under general anesthesia. The problems in the perioperative management of the case are discussed.

Case Report

A 39-year-old woman weighing 59 kg was admitted because of deterioration of thyrotoxic symptoms after interruption of anti-thyroid medications and was scheduled to undergo subtotal thyroidectomy. The patient had neither remarkable past history nor family history. The patient had been diagnosed as thyrotoxicosis and had been receiving anti-thyroid agents for the past 2 years.

After admission, the thyroid function was controlled with propylthiouracil $150 \text{ mg}\cdot\text{day}^{-1}$ and metoprolol $40 \text{ mg}\cdot\text{day}^{-1}$ for 4 weeks. Iodo (20

-25 drops per day) was added 2 weeks before the operation. The results of the preoperative test for the thyroid function were as follows: TSH $0.02 \mu\text{U}\cdot\text{ml}^{-1}$ (normal < 8.0), T_4 $9.4 \mu\text{g}\cdot\text{dl}^{-1}$ (normal $4.5\text{--}13.0$), T_3 $1.8 \text{ ng}\cdot\text{dl}^{-1}$ (normal $0.8\text{--}1.8$), free T_4 $2.0 \text{ ng}\cdot\text{dl}^{-1}$ (normal $0.85\text{--}2.15$), and free T_3 $6.4 \text{ pg}\cdot\text{ml}^{-1}$ (normal $2.8\text{--}6.0$).

The patient was premedicated with scopolamine 0.5 mg and hydroxyzine 75 mg intramuscularly 30 min before the operation. Anesthesia was induced intravenously by droperidol 5 mg, fentanyl 0.2 mg and thiopental 100 mg. Tracheal intubation was accomplished after intravenous administration of succinylcholine 60 mg (fig. 1). Anesthesia was maintained with fentanyl $675 \mu\text{g}$ in total, 66% nitrous oxide in oxygen and intermittent administration of enflurane 0.5-1.0%. Pancuronium was used for intraoperative muscle relaxation, and ventilation was controlled manually.

Soon after the thyroid gland was removed, multifocal premature ventricular contractions (PVCs) accompanied by tachycardia and hypertension were seen frequently on the ECG monitor. Although lidocaine (total 100 mg) was administered intravenously, PVCs were sustained. Tachycardia and hypertension continued. At the end of surgery, not only abnormal quantities of sweat on the patient's face, but also a rise in rectal temperature to 38.0°C were

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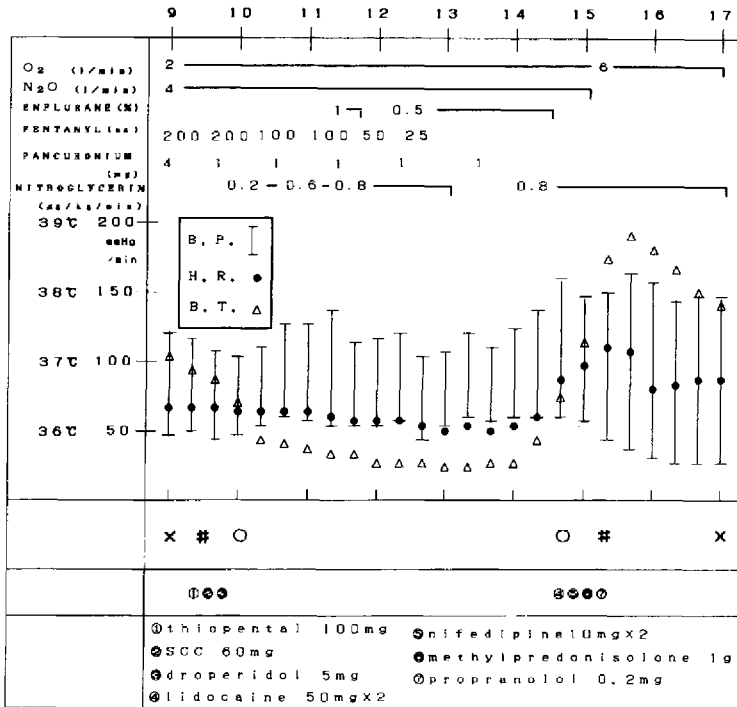


Fig. 1. Anesthetic course of the case.

noticed. As thyroid crisis was strongly suspected, methylprednisolone 1g and propranolol 0.2 mg were administered i.v. immediately. Her rectal temperature rose to 39.0°C, but fell below 38.0°C within an hour with the aid of a cooling blanket. When the patient's vital signs became stable, she was transferred to the recovery room.

After arrival in the recovery room, multifocal PVCs appeared again and continued for 24 hrs despite the frequent administration of propranolol. The temperature fell to 37.0°C within 8 hr. Three days after the operation, she was moved to the ward and passed uneventfully until her discharge.

Discussion

Preoperative control of thyroid function is the most important point for the anesthetic management of the patient with thyrotoxicosis. It is reported that inadequately controlled patients tend to suffer thyroid crisis¹. Generally, anti-thyroid drugs, iodine, beta-

blocking agents and glucocorticoids are combined to control thyrotoxicosis preoperatively.

Anti-thyroid drugs such as propylthiouracil and methimazol block the synthesis of thyroid hormone. Because hormone release from the colloid of the thyroid gland is not affected, the patient may not become euthyroid for 4 to 6 weeks. Iodine should be administered for 7-10 days prior to operation. Acute administration of excess iodine causes transient inhibition of thyroid hormone formation and secretion. In addition, iodine decreases vascularity and hyperplasia of the overactive gland. Beta-blocking agents such as propranolol have been recommended before surgery in thyrotoxic patients as an adjuvant to other anti-thyroid medications². Propranolol antagonizes most of the peripheral manifestations of hyperthyroidism such as tremor, tachycardia and hyperhidrosis. In large doses, propranolol may also block the conversion of T₄ to T₃³.

Large doses of glucocorticoids have been used in severe thyrotoxicosis, particularly in patients with thyroiditis. Glucocorticoids inhibit the conversion of T_4 to T_3 . In addition, patients with hyperthyroidism may have relative adrenocorticoid deficiency. Preoperative steroids are then recommended¹.

In the present case, serum examinations showed only free T_3 to be higher than normal. Serum T_4 , T_3 and free T_4 were normal and preoperative thyrotoxic symptoms were controlled completely. Since serum levels of free T_4 and T_3 are reported to be the most accurate indicators of increased thyroid activity⁴, preoperative thyroid function of this patient may not be euthyroid in a strict sense. While the pathogenesis of thyroid crisis is unclear, it is reported that decreased binding affinity of thyroid hormones with plasma proteins is a possible cause⁵ and total serum thyroxine and triiodothyronine levels are not higher in thyroid crisis than in uncomplicated thyrotoxicosis⁶. Free thyroid hormones should be examined preoperatively even if the total thyroid hormones are within normal limits.

On the other hand, it was possible that in the present case, the use of beta-blocking agents might have covered the fact that the patient was not completely euthyroid. The preoperative period in the case was only 4 weeks, which were too short to control thyrotoxic symptoms with only anti-thyroid drugs. Although the incremental use of beta-blocking agents in recent years has been giving patients good symptomatic relief preoperatively, it may increase the number of patients whose thyroid function is not well controlled and, therefore, apt to suffer thyroid crisis. It is also reported that beta-blocking agents do not necessarily prevent thyroid crisis⁷.

In summary, perioperative management of patients with thyrotoxic disease was described. The thyroid function should be euthyroid before surgery in order to prevent perioperative thyroid crisis. The present case showed that free thyroid hormones were reliable indicators to tell whether the thyroid function is euthyroid; if not euthyroid, thyroid crisis could occur. Although the incidence of surgical thyroid crisis has recently been decreased, the mortality rate in patients with thyroid crisis approaches 25 per cent¹. Therefore, we should be aware that thyroid crisis is a serious complication of thyrotoxicosis and that strict perioperative management is indispensable.

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References

1. Stchling LC: Anesthetic management of the patient with hyperthyroidism. *Anesthesiology* 41:581-591, 1974
2. Hamilton WFG, Forrest AL, Gunn A, et al: Beta-adrenoreceptor and blockade and anaesthesia for thyroidectomy. *Anaesthesia* 39:335-342, 1984
3. Ingbar SH: The thyroid gland, Williams textbook of Endocrinology. Seventh Edition. Edited by Wilson JD, Foster DW. Philadelphia, WB Saunders, 1985, pp. 682-815
4. Halpern SS: Anesthesia for carcarn section in patients with uncontrolled hyperthyroidism. *Can J Anesth* 36:454-459, 1989
5. Brooks MH, Waldstein SS: Free thyroxine concentrations in thyroid storm. *Ann Int Med* 93:694-697, 1980
6. Brooks MH, Waldstein SS, Bronsky D, et al: Serum triiodothyronine concentration in thyroid storm. *J Clin Endocrinol Metab* 41:339-341, 1975
7. Eriksson E, Rubinfeld S, Garber AJ, et al: Propranolol does not prevent thyroid storm. *N Engl J Med* 296:263-265, 1977