



# Management of hyperthyroid patients in dental emergencies: a case report

Kyung-Jin Lee\*, Wonse Park\*, Nan-Sim Pang, Jin-Hyung Cho, Kee-Deog Kim, Bock Young Jung, Eun-Jung Kwak

Department of Advanced General Dentistry, Yonsei University College of Dentistry, Seoul, Korea

The prevalence of thyroid disease, particularly hyperthyroidism, has rapidly increased in Korea in the past 10 years. Therefore, it is important to consider the complete medical history including thyroid disease in patients under dental treatment. Both the drugs used for dental treatment and psychological symptoms associated with treatment can induce emergencies in hyperthyroid patients. This case report considers emergency situations during dental treatment for hyperthyroid patients, and discusses risk factors and related concerns.

**Keywords:** Dental emergency; Graves' disease; Hyperthyroidism.

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\* These authors contributed equally to this work.

Thyroid diseases are relatively common; according to the National Health Insurance, the prevalence of thyroid disease in the past 10 years has rapidly increased. Furthermore, there has been a steady increase in the frequency of hyperthyroidism and thyrotoxicosis (Graves' disease). Therefore, careful assessment of previous medical history for systemic or thyroid disease is essential prior to dental treatment. Thyroid disorders are caused by either overproduction of thyroid hormones (hyperthyroidism) or underproduction (hypothyroidism), and their clinical severity varies widely, from asymptomatic to life-threatening [1].

Drugs used during dental treatment may cause reactions in patients with thyroid disorders, and must be considered prior to treatment. Patients with hypothyroidism are sensitive to central nervous system (CNS)-active drugs such as antidepressants and sedatives, resulting in severe

side effects. On the other hand, patients with thyrotoxicosis are sensitive to catecholamine drugs such as epinephrine, and injection can induce high blood pressure, tachycardia, or marked dysrhythmia [2,3].

This case report analyzes emergency situations during dental treatment of patients with a history of hyperthyroidism, and discusses risk factors and related concerns.

## CASE REPORT

A 40-year-old woman visited the department of advanced general dentistry in May 2016 with pain in a right maxillary molar during mastication. Her medical history included left breast cancer treated with neoadjuvant chemotherapy, left partial mastectomy with axillary node

Received: 2016. June. 22. • Revised: 2016. June. 28. • Accepted: 2016. June. 29.

Corresponding Author: Eun-Jung Kwak, Department of Advanced General Dentistry, Yonsei University College of Dentistry, 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Korea

Tel: +82-2-2228-8982 Fax: +82-2-2227-8906 E-mail: [puttiquak2@yuhs.ac](mailto:puttiquak2@yuhs.ac)

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dissection, and radiation therapy. She also had a confirmed history of Graves' disease treated with methimazole. She reported nausea, dizziness, and fainting after prior dental treatment with local anesthesia. The second right maxillary molar was restored with gold inlay. Despite normal tooth mobility and vitality, she complained of pain during percussion or mastication. Crown restoration was planned after diagnosing cracked tooth syndrome.

Baseline blood pressure prior to dental treatment was 110/68 mmHg. There was a risk of Graves'-related complications from local anesthesia, and also a history of side effects after local anesthesia. Therefore, infiltration anesthesia using mepivacaine (without epinephrine) was performed. The tooth was removed and an impression was taken, but the patient complained of dizziness an hour after treatment began. Her blood pressure increased to 160/120 mmHg. Treatment was discontinued; the patient was placed in a supine position and administered nasal oxygen. The dizziness resolved after 15 min, blood pressure decreased to 120/80 mmHg, and the tooth was temporarily cemented. Despite normal examination findings, the patient was still dizzy and was transferred to the emergency department. While waiting for treatment, the patient's condition improved. At her request, she was discharged, with instructions to return with any cardiovascular symptoms, and to report any anesthesia side effects.

## DISCUSSION

Thyrotoxicosis presents with various clinical symptoms due to excessive circulating thyroid hormones that affect the peripheral blood vessels and tissues, and can be

caused by different diseases. Hyperthyroidism results from abnormally high production of thyroid hormones, with Graves' disease as an example [4]. Graves' disease is an autoimmune disorder in which autoantibodies to the thyroid-stimulating hormone (TSH) receptor stimulate the thyroid, resulting in hyperthyroidism. Hyperthyroid patients are often anxious, with warm and sweaty hands, and an occasional tremor. They also may have increased blood pressure and heart rate. Treatment includes antithyroid drugs, radioactive iodine, and thyroidectomy. Factors such as age, goiter size, symptom severity, and surgical skill determine treatment [5]. In Korea, Graves' disease is treated early with antithyroid drugs, which are administered for 12-18 months. Therefore, it is important to inquire about thyroid-related medication on the first visit. Thyroid diseases have a high probability of inducing cardiovascular disease owing to the direct action of thyroid hormones on the myocardium [6]. Angina can be worsened by thyrotoxicosis. Epinephrine and other vasoconstrictors in local anesthetic drugs cause cardiovascular stimulation, and hyperthyroid patients can develop dysrhythmias, tachycardia, and thyrotoxic crisis when administered these drugs. Therefore, if local anesthesia is required, minimal doses of epinephrine should be administered, with aspiration prior to injection [7].

Patients with thyroid diseases who underwent prior treatment often show normal thyroid function, and risk is not elevated during dental treatment. However, undiagnosed thyroid conditions present a risk. According to the American Society of Anesthesiologists (ASA) score, untreated thyroid patients should be considered to demonstrate Class III status (Table 1) [8]. The risk of hyperthyroid patients not regaining consciousness following dental treatment is low, but complications such as

Table 1. ASA categorization based on thyroid malfunction and physical status

Severity of thyroid dysfunction	ASA Physical Status	Precautions
No symptoms of thyroid dysfunction Hyper/hypothyroidism on medication	II	Usual precautions for Class II
Symptoms indicating thyroid dysfunction Hyper/hypothyroidism	III	Usual precautions for Class III, including prohibition of vasoconstrictors (hyperthyroidism) or CNS inhibitors (hypothyroidism) Examination for cardiovascular diseases

Table 2. The results of thyroid test

Examination	Results			Reference values
	9.11.2015	4.26.2016	6.9.2016	
T3	0.93	0.78	0.94	0.58-1.59 (ng/mL)
Free T4	0.82	0.92	1.14	0.70-1.48 (ng/dL)
TSH	<0.025 (L)	1.34	1.30	0.35-4.94 ( $\mu$ IU/mL)
TSH receptor antibody (Ab)	-	1.70	1.81	0-1.75 (IU/L)
Thyroglobulin Ab	-	42.7	193.2	0-130.6 (IU/mL)
Thyroid peroxidase Ab	-	12.3	23.6	0-13.7 (IU/mL)

fainting and hyperventilation due to stress-induced psychological factors or local anesthesia and pain can occur. Untreated hyperthyroidism can exhibit acute symptoms, including thyroid crisis, and must be evaluated in advance.

Thyroid storm is an emergency condition associated with untreated hyperthyroidism, and is caused by a hypermetabolic state. Symptoms may include tachycardia, atrial fibrillation, fever, excessive sweating, nausea, vomiting, and others. CNS-related symptoms include excessive shaking, confusion, loss of consciousness, and coma. Thyroid storm is distinguishable from severe hyperthyroidism by sudden fever [9]. Syncope occurs due to an acute CNS reaction to mental stress induced by dental treatment. A hyperactive vasovagal parasympathetic reflex results in musculoskeletal and internal organ vasodilation. Reduced blood returning to the heart results in bradycardia, low blood pressure, and reduced cerebral blood flow, which leads to loss of consciousness. Premonitory symptoms may include a suffocating sensation, nausea, lethargy, vomiting, and dizziness [10]. Hyperventilation occurs with extreme emotional instability or fear, and symptoms include chest pain, pressure, and a suffocating sensation. Hyperventilation induces respiratory alkalosis, and respiratory failure due to muscle spasm can occur. In severe cases, the patient can faint due to CNS activity [11].

The patient in this case had a history of antithyroid drug administration for over 10 months, and had confirmed side effects after local dental anesthesia. Based on this, treatment was performed after carefully considering the choice of anesthesia, limiting the number of doses, and monitoring the patient during treatment.

Additional local anesthesia may be required when epinephrine is omitted, and treatment should be performed promptly. Dizziness and increased blood pressure an hour after treatment was thought to represent a stress-induced reaction caused by the lengthy procedure. Without prompt treatment, the patient could have lost consciousness. Although the patient was diagnosed with Graves' disease elsewhere, our endocrinology department prescribed methimazole after transfer to our center for breast cancer treatment. Typically, a patient is monitored by measuring free thyroxine (T4) and TSH every 4-8 weeks. After recovery, monitoring is usually performed every 2-3 months [3]. Serum TSH levels provide the highest sensitivity, and Graves' disease patients show low levels of TSH and high levels of triiodothyronine (T3) and free T4 [1]. Initial blood test result at the first endocrinology department visit on September 11, 2015 indicated sub-normal TSH. Results on April 26, 2016, when the patient had stopped taking methimazole, showed a normal TSH level. Following treatment, the TSH level was normal on June 9, 2016 (Table 2). No further antithyroid treatment was administered, and the patient is followed monthly. If a patient with a thyroid condition loses consciousness during dental treatment, the treatment should be discontinued immediately and emergency treatment performed. Patients should be placed supine with the legs raised and the airway secured. Ventilation and circulation should be assessed. If body temperature suddenly increases while the patient is unconscious, potential thyroid storm should be considered. This is not due to reduced oxygen levels, and basic first aid may not be adequate. In this case, call for emergency transport [8].

The dentists should have good prior knowledge of medical history for thyroid disease patients, in order to prepare for emergencies, including potential thyroid storm. When treating hyperthyroid patients, monitoring for systemic complications or altered consciousness due to stress is necessary, and clinicians should be capable of active emergency management.

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