



## Postoperative Thyroid Storm Associated with Strangulated Small Bowel Obstruction: A Case Report

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### Abstract

A 42-year-old woman was transferred to us because of abdominal pain and vomiting. She was suffering from Graves' disease; however, her thyroid function had been well-controlled with medication. Enhanced computed tomography revealed dilated and fluid-filled small bowel loops with reduced bowel wall enhancement and a beak sign. Under the diagnosis of strangulated small bowel obstruction, emergency surgery was performed under general anesthesia. Upon laparotomy, 45 cm of the ileum was strangulated by a fibrous band and had developed ischemic necrosis. Therefore, necrotic bowel resection was performed followed by reconstruction with end-to-end anastomosis. Two hours after the surgery, she presented with fever, tachycardia, and restlessness. Laboratory results revealed the presence of jaundice and thyrotoxicosis (free triiodothyronine was 6.16 pg/mL; free thyroxine, 3.83 ng/dL; and thyroid-stimulating hormone, 0.02  $\mu$ IU/mL). We diagnosed her condition as postoperative thyroid storm, and treatment with thiamazole and potassium iodide was immediately initiated. Owing to this treatment, the following clinical course was uneventful, and she was discharged on the 13<sup>th</sup> hospital day.

For postoperative patients presenting with unexplained high fever and serious tachycardia, occurrence of thyroid storm should be considered, and if the presence of thyrotoxicosis is identified, aggressive treatment for thyroid storm should be immediately initiated without hesitation.

**Keywords:** Thyroid storm; Thyrotoxicosis; Strangulated small bowel obstruction; Emergency surgery

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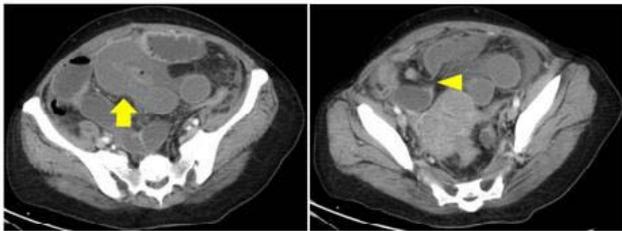
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### Introduction

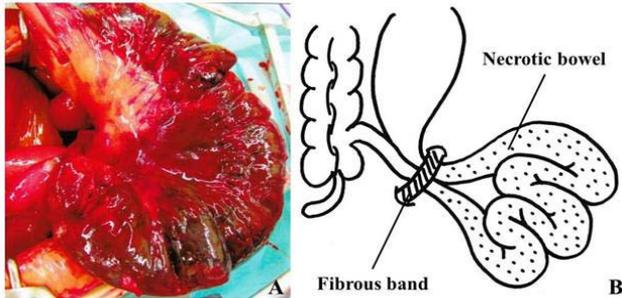
Thyroid storm/crisis, a life-threatening endocrine emergency requiring acute and intensive cares, is defined as multi-organ dysfunction as a result of the failure of compensatory mechanisms for thyroid hormonal hyperactivity. Thyroid Storm (TS) arises abruptly in the patients with underlying thyrotoxicosis when they are exposed to severe physical or mental stress; however, its incidence is rare, accounting for 0.22% of total thyrotoxic patients [1]. The mortality rate of TS is reported as 10.7%, and the major causes of death are multiple organ failure and congestive heart failure [1]. Here, we report a case of postoperative TS which may have been triggered by emergency surgery for a strangulated Small Bowel Obstruction (SBO). We also review the relevant literature and discuss an optimal strategy for managing postoperative TS.

### Case Presentation

A 42-year-old woman was transferred to our hospital because of abdominal pain and vomiting that started 72 h prior to admission. She had a history of laparotomy for enucleation of uterine myoma 10 years ago and was suffering from Graves' Disease (GD) for 4 years; however, her thyroid function had been well-controlled with medication, and she had not been prescribed any drugs for the last 1 year. On admission, she appeared anguished. Body Temperature (BT) was 38.7°C; Heart Rate (HR), 150 b.p.m.; and Blood Pressure (BP), 145/91 mmHg. On physical examination, her abdomen was severely distended with diffuse tenderness. Laboratory results revealed leukocytosis (21,400/mm<sup>3</sup>) and elevated levels of lactate dehydrogenase (330 IU), creatinine phosphokinase (245 IU), and C-reactive protein (27.9 mg/dL). Enhanced Computed Tomography (CT) revealed dilated and fluid-filled small bowel loops with reduced bowel wall enhancement, a beak sign, and a small



**Figure 1:** Enhanced computed tomography on admission revealed dilated and fluid-filled small bowel loops with reduced bowel wall enhancement (arrow) and a beak sign (arrow head) in the right lower abdomen.

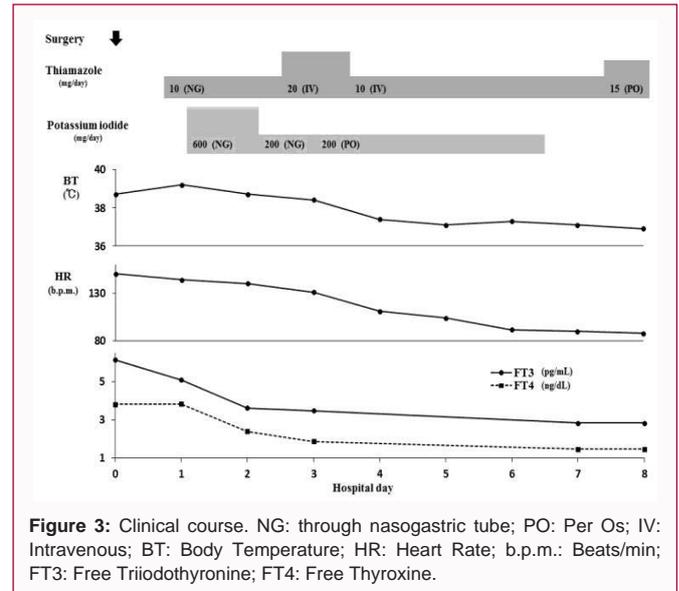


**Figure 2:** Intra operative photograph (A) and schema (B).

amount of ascites (Figure 1). She was diagnosed with a strangulated SBO, and 5 h after admission, emergency surgery was performed under general anesthesia. Upon laparotomy, bloody ascites was encountered, and 45 cm of the ileum was strangulated by a fibrous band possibly resulting from her prior laparotomy and had developed ischemic necrosis (Figure 2). Therefore, necrotic bowel resection was performed followed by reconstruction with end-to-end anastomosis. The intra operative course was uneventful. However, 2 h after the surgery, she was all of a sweat and appeared restless; her Glasgow Coma Scale score was 12 (E3V4M5). BT was 39.2°C; HR, 144 b.p.m.; respiratory rate, 25 breaths/min; BP, 101/54 mmHg; and peripheral arterial oxygen saturation, 94% (under 8 L/min of O<sub>2</sub> administration via facial mask). On physical examination, there was no sign of surgical or anesthetic complication. Laboratory results revealed the presence of jaundice (total bilirubin was 3.8 mg/dL) and thyrotoxicosis (Free Triiodothyronine [FT3] was 6.16 pg/mL; Free Thyroxine [FT4], 3.83 ng/dL; and thyroid-stimulating hormone, 0.02 μIU/mL). According to the Japan Thyroid Association Definition and Diagnostic Criteria for Thyroid Storm [1], we diagnosed her condition as postoperative TS, and treatment with thiamazole (MMI) and potassium iodide was immediately initiated. Owing to this treatment, FT3 and FT4 levels decreased steadily, and following their normalization, BT and HR improved gradually and normalized on the 4<sup>th</sup> hospital day (Figure 3). The following clinical course was uneventful. She was discharged on the 13<sup>th</sup> hospital day and continued oral administration of MMI (15 mg/day) and followed-up with an endocrinologist. At 2-year follow-up, she was doing well with euthyroid state.

### Discussion

In the past, TS most commonly occurred after thyroidectomy for the patients with GD; however, the advances in radioactive iodine therapy and Antithyroid Drugs (ATD) led to a marked decrease in such cases [1]. Recently, the majority of TS arises in the patients with poorly controlled or undiagnosed/overlooked hyperthyroidism (primarily due to GD) when triggered by some precipitating event



**Figure 3:** Clinical course. NG: through nasogastric tube; PO: Per Os; IV: Intravenous; BT: Body Temperature; HR: Heart Rate; b.p.m.: Beats/min; FT3: Free Triiodothyronine; FT4: Free Thyroxine.

including infection, surgery, trauma, pregnancy/delivery, and other acute illness [2-6]. In our case, although her GD had been well-controlled, occurrence of strangulated SBO might have induced the excessive synthesis and release of thyroid hormone, causing the development of thyrotoxicosis. The subsequent emergency surgery may have then played a role in triggering TS.

Since surgery (both thyroid and non-thyroid) is an apparent trigger of TS, any type of surgery in patients with hyperthyroid state should be avoided. Therefore, a planned surgery for the patients with poorly controlled hyperthyroidism should be delayed until the thyroid function is corrected to euthyroid state with medication. However, for the patients requiring emergency surgery, even when thyrotoxicosis has been identified, there is no time to control thyroid function. For such cases, high doses of ATD and inorganic iodide should be administered prior to surgery [2,3]. In addition, surgery should be performed under general anesthesia to avoid excessive mental stress to the patients, and drugs that may activate the sympathetic nervous system or promote histamine release, such as ketamine or atracurium, should not be used [4]. After surgery, the patient must be closely observed to detect an occurrence of TS, and once its symptoms are recognized, treatment for TS should be promptly initiated. Interestingly, Akamizu [1] reported that the mortality rates of definite and suspected TS were not significantly different (11.0% and 9.5%, respectively). Therefore, treatment for TS should be initiated as soon as possible, even at the stage of suspicion.

The clinical features of TS, i.e., fever, tachycardia, and Central Nervous System (CNS) manifestations are similar to those of more common postoperative disorders including systemic inflammatory response syndrome, postoperative adverse events (such as bleeding, infection, pulmonary embolism, or malignant hyperthermia), and primary disease itself. Therefore, it might be difficult to distinguish them clinically in postoperative patients with undiagnosed/overlooked hyperthyroidism when preoperative thyroid function was not examined [2,4-6]. For postoperative patients presenting with unexplained high fever (≥ 38°C) and serious tachycardia (≥ 130 b.p.m.), especially with concomitant CNS symptoms, thyroid function should be quickly examined, and if thyrotoxicosis is identified, aggressive treatment for TS should be immediately initiated. Indeed, it might be safer and more desirable to screen

preoperative thyroid function for all patients requiring emergency surgery, and if thyrotoxicosis is identified, attempt to manage the patient using the aforementioned strategy. In our case, we regrettably overlooked her thyrotoxicosis before surgery, and as a result, invited the occurrence of postoperative TS. Fortunately, it is possible that iodine contained in the contrast media used for the preoperative CT might have decreased the severity of TS [2].

Treatment for TS is based on blocking thyroid hormone synthesis, preventing release of hormone from thyroid stores, and alleviating peripheral effects of hormone excess [5]. For these purposes, ATD (MMI or propylthiouracil), inorganic iodide, corticosteroids,  $\beta$ -blockers, and antipyretics are used [1,4,7]. Use of these drugs should be decided by an endocrinologist; however, oral administration is generally difficult for patients with gastrointestinal disease. In addition, intravenous ATD and iodide are not easily available in many hospitals [2,3], including our own. Yeung et al. [3] reported that rectal administration of ATD and iodide showed satisfactory effects as compared with intravenous administration in a patient with TS associated with SBO. Although we did not attempt it, rectal administration of ATD and iodide might be useful for treating TS associated with gastrointestinal disease.

## Conclusion

For postoperative patients presenting with unexplained high fever and serious tachycardia, occurrence of TS should be considered, and if the presence of thyrotoxicosis is identified, aggressive treatment for TS should be immediately initiated without hesitation.

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