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Case Report

Sudden death because of thyroid storm after hip fracture

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ABSTRACT

Thyroid storm is a rare, life-threatening medical emergency that often occurs after acute illness or surgery. The clinical manifestations usually are typically nonspecific symptoms that can include hyperpyrexia, tachyarrhythmia, nausea/vomiting, diarrhea, or altered consciousness. We herein report the case of a 64-year-old woman, who sustained a left hip fracture after a fall. She was found to have altered consciousness during the preoperative anesthetic evaluation, and surgery was postponed. Thyroid storm was confirmed after the patient expired. Prompt diagnosis and immediate treatment are necessary for patients with thyroid storm. In this article, we present the case and review the diagnosis and management of the thyroid storm to remind the clinicians of this potentially lethal medical emergency.
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1. Introduction

Thyroid storm is an uncommon medical emergency, and the typical clinical features are exacerbated symptoms of hyperthyroidism as well as fever, tachycardia or tachyarrhythmia, delirium, and coma. Death can occur in severe cases. This disorder is often precipitated by interruption of thyroid medicine use, acute medical illness, trauma, or surgery. The nonspecific clinical features usually lead to a delay in the diagnosis and management of thyroid storm.

We herein present a patient who sustained a left hip fracture after falling down injury. She died of thyroid storm on the third day after admission. Because tests of thyroid function are not rapidly available, the initial diagnosis is primarily based on the clinical manifestations, which are often not recognized initially. Early recognition and proper intervention are vitally important for patients with thyroid storm. In this article, we present the case and review the diagnosis and management of the thyroid storm to remind clinicians of this potentially lethal medical emergency.

2. Case report

A 64-year-old woman was admitted for pain in the left hip region after falling down injury from a bicycle. Her medical history was significant for diabetes mellitus and hypertension of 10 years duration under control with oral medications. She denied any history of thyroid disorders, taking steroids, or iodine exposure. In the emergency department, she appeared acutely ill looking and her consciousness was clear. Vitals signs were: blood pressure 155/101 mmHg, heart rate 140 beats/min and regular, respiratory rate 20/min, and temperature 36.8°C. Physical examinations revealed local pain and swelling over the left hip region. Laboratory studies revealed a white blood count of 13,620/μL with predominantly neutrophils, potassium 2.8 meq/L, and blood glucose level 418 mg/dL. Renal and liver function tests were within normal limits. Electrocardiogram showed sinus tachycardia and chest radiograph revealed mild enlargement of the cardiac silhouette. The X-ray films of left hip revealed left intertrochanteric fracture.

She was then admitted with the diagnosis of the left intertrochanteric fracture, diabetes mellitus, hypertension, and hypokalemia. Insulin and potassium were administered and she was prepared for the surgical intervention on the second day after admission. During the preoperative evaluation, she was noted to be disoriented and restless. Her body temperature was 38.5°C and blood glucose value was 351 mg/dL. Surgery was postponed and after transfer back to the ward, she developed increasing hyperthermia, tachycardia, and fluctuating blood glucose level. An endocrinologist was consulted, and he recommended further laboratory examinations, including tests of thyroid function.

The level of her consciousness deteriorated on the third day of admission, and she developed upward gazing with generalized tonic posture. Emergent computed tomography of head did not reveal any abnormalities, and because cerebrovascular infarction

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over the posterior fossa could not be excluded, the neurologist who had been consulted recommended magnetic resonance imaging studies. Because our hospital does not have magnetic resonance imaging instrument, she was arranged to another hospital for this examination. During transfer to another medical center, the patient lost all vital signs and expired despite cardiopulmonary resuscitation. On the next day, results of the previously sent laboratory examinations revealed a thyroid stimulating hormone level lower than 0.012 uIU/mL (normal, 0.47–4.64 uIU/mL) and free thyroxine (T4) level higher than 6 ng/dL (normal, 0.8–2.0 ng/dL). Based on the clinical features and the laboratory studies, a diagnosis of thyroid storm was confirmed.

3. Discussion

Thyroid storm represents an exacerbation of thyrotoxicosis, accompanied by hyperthermia, tachycardia, disturbance of consciousness, nausea, vomiting, diarrhea, or abdominal pain. The precipitating factors include infection, trauma, surgery, cerebrovascular accident, or radioiodine treatment of a patient with untreated or partially treated hyperthyroidism. We believe that trauma was the likely trigger factor for our patient. Thyroid storm often manifests with nonspecific symptoms and is sometimes masked by the precipitating medical conditions, which often results in a delay in diagnosis and treatment, especially in patients without any known history of thyroid disorders. The mortality rate varies from 30% to as high as 75%, even with prompt treatment.[1–3]

Our patient, whose medical history was significant for diabetes mellitus and hypertension under control with oral medications, presented to our emergency department with hip pain and clear consciousness. There was no hyperthermia, restlessness, or abdominal dysfunction, but tachycardia, hyperglycemia, and hypokalemia were found. On the second day of admission, altered consciousness, fever, and a markedly elevated blood glucose level were detected during the preoperative anesthetic evaluation. The differential diagnosis included fat embolism syndrome (FES), central nervous system disorders, infectious disorders, endocrine or metabolic dysfunction, neuroleptic malignant syndrome (NMS), malignant hyperthermia (MH), and steroid withdrawal syndrome.

FES should always be considered in patients with long bone fractures. Gurd[4] defined the major and minor criteria: the major criteria include petechial rash, respiratory symptoms, and cerebral signs; the minor criteria include tachycardia, pyrexia, retinal changes, urinary changes, sudden thrombocytopenia, high erythrocyte sedimentation rate, and fat globules in the sputum. The diagnosis is confirmed in the presence of at least one major and four minor criteria. Schonfeld et al[5] designed a scoring system in which seven symptoms were variably scored. These symptoms and scores relationships are petechiae (Score 5), diffuse alveolar infiltrates (Score 4), hypoxia (Score 3), confusion (Score 1), fever (Score 1), tachycardia (Score 1), and tachypnea (Score 1). A summation score of more than five is necessary to establish the diagnosis. Our patient did not meet these two criteria, and the clinical presentation was not suggestive of FES, thus the diagnosis of FES was excluded.

Although no focal neurological deficits were present in our patient, intracranial hemorrhage was initially considered, which was then excluded by the negative findings in the computed tomography scan of the head. No infectious symptoms of the upper respiratory tract, cerebrovascular, or urinary tract were present, and no related abnormalities of the laboratory tests excluded the possibility of a major infectious illness. The elevated blood glucose level and electrolyte imbalance alone would not account for the severity of her altered consciousness.

NMS is usually caused by the use of dopamine-blocking medications, especially antipsychotic or neuroleptic drugs. The common clinical symptoms are hyperthermia, muscle rigidity, altered mental status, and autonomic dysfunction with heavy sweating, labile blood pressure, or tremor.[6] Our patient did not have any related medical history or was taking any medications that could act as a dopaminergic antagonist, thus the possibility of NMS was excluded.

The classic signs of thyroid storm, such as tachycardia, tachyarrhythmia and hyperthermia, are quite similar to the presentation of MH during the administration of general anesthesia; the anesthesiologist must make the diagnosis immediately.[7] Masseter spasm, generalized muscle rigidity, and elevated serum creatine kinase are the common signs in patients with MH but are not present in patients with thyroid storm. In contrast, patients with thyroid storm exhibit hypokalemia and a normal end-tidal CO_2.

Steroid abuse often occurs in elderly patients with chronic pain disorders in our country, and steroid withdrawal presents with varied clinical features, which can mimic many medical conditions. The common manifestations are weakness, anorexia, fatigue, nausea, vomiting, ill-defined abdominal pain, weight loss, hypotension, and occasionally hypoglycemia. Arthralgias, generalized body aches, skin desquamation, personality changes, and fever are sometimes mentioned.[8] Tapering steroid use may prevent steroid withdrawal syndrome, but corticosteroid supplementation may be needed during periods of stress, such as surgery. Our patient had no history of steroid use or chronic pain syndrome, and she did not have a clinical appearance seen with prolonged steroid use, for example, moon face, truncal obesity, or buffalo hump.

The diagnosis of thyroid storm mainly depends on the clinical presentation and thyroid function test results. The thyroid stimulating hormone level will be abnormally low or even undetectable, and the levels of T3 and T4 will be elevated. However, the results of thyroid function tests are typically not available rapidly so that a diagnosis can be made by clinical diagnosis and treatment begun immediately. Early recognition and prompt intervention are the keys to the management of patients with thyroid storm.[3] Burch and Wartofsky[9] developed a scoring system for the diagnosis of thyroid storm. The items include pyrexia (Score 5–30), central nervous system symptoms (Score 10–30), gastrointestinal-hepatic dysfunction (Score 10–20), tachycardia (Score 5–25), congestive heart failure (Score 5–10), and precipitant history (Score 0–10). A score of 45 or more is highly suggestive of thyroid storm. The score of our patient was 60 (body temperature 15, tachycardia 25, and delirium 20), and her medical course was so fulminant that the duration from the onset of thyroid storm to death was less than 24 hours.

A prior report presented the case of a 22-year-old woman with a past history of hyperthyroidism who experienced abdominal pain, nausea, and diarrhea for 2 days while traveling in Southeast Asia and then developed a fever on the third day and infective gastroenteritis was initially diagnosed.[2] Dyspnea and altered consciousness followed, and thyroid storm was confirmed. Intravenous hydrocortisone and oral propylthiouracil and propranolol were given immediately, and the level of her consciousness normalized and gastrointestinal symptoms resolved within days.

Another article reported a case in which H1N1 infection triggered a thyroid storm.[10] A 31-year-old woman without any significant medical history presented with 3 days of fever, vomiting, productive cough, and deteriorating respiratory capacity and was diagnosed with diabetic ketoacidosis and community-acquired bronchopneumonia with possible influenza A (H1N1) viral pneumonia. She received empiric antibiotic therapy, oseltamivir (Tamiflu), and insulin infusion and intravenous hydration but required intubation 48 hours later because of tachypnea, hypoxia, and restlessness. Thyroid function tests were performed on the third day of admission because of unexplained tachycardia. Propylthiouracil and esmolol infusion were begun when the diagnosis

of thyroid storm was considered. However, this patient progressed to multiple organ failures and died on the ninth day of admission.

Once thyroid storm is clinically diagnosed, medical interventions must be started promptly. There are three objectives in its management: (1) reducing the secretion and production of thyroid hormones; (2) diminishing the metabolic effects of thyroid hormones; and (3) general supportive measures.[1,11] Propylthiouracil is the first choice of antithyroid agent and inhibits the conversion of T4 to T3. Large doses of propylthiouracil (600 mg loading dose and 200–300 mg every 6 hours) should be administered orally or per rectum. A saturated solution of potassium iodide (also called SSKI, 5 drops every 6 hours) can be given to inhibit the release of thyroid hormone. Propranolol can be administered to reduce tachycardia and other adrenergic manifestations (40–60 mg orally every 4 hours or 2 mg intravenously every 4 hours). The administration of intravenous glucocorticoids (e.g. dexamethasone 2 mg every 6 hours) can reduce peripheral conversion of T4 to T3 and may have a direct effect on the underlying autoimmune process. Hyperthermia is treated by ice packs, cooling blankets, and acetaminophen.

All elective surgeries should be postponed if thyroid storm is suspected. If emergent surgery is necessary, the use of invasive monitoring (e.g. arterial line, central venous catheter, or Swan-Ganz catheter) and administration of medications to treat thyroid storm (i.e. propylthiouracil and beta-adrenergic blocker) should be started as soon as possible. After the surgical procedure is finished, the patient should be transferred to the intensive care unit for further medical management.[12]

4. Conclusion

Thyroid storm is a rare medical emergency with substantial mortality. Early recognition and immediate treatment are the keys to good outcomes. Physicians should be familiar with the clinical features of thyroid storm and consider the diagnosis in patients with unexplained alterations of consciousness, tachyarrhythmia, and hypermetabolic status. Use of the thyroid storm scoring system may assist in making an early clinical diagnosis.

References

1. L. Jameson, A. Weetman. Disorders of the thyroid gland, Chapter 335. In: E. Braunwald, A. Fauci, D. Kasper (Eds.). Harrison's principles of internal medicine. 15th ed. McGraw-Hill, New York; 2001, pp. 2060–2084.
2. P.-W. Yang, H.-F. Wang, S.-Y. Hsiao, S.-T. Tsai, H.-D. Lin. Thyroid storm: a case report. J Emerg Crit Care Med 19 (2008) 18–22.
3. P. Kanth, B.E. Tendler, F.A. Forouhar. A case of thyroid storm with underlying thyroid carcinoma. Endocrinologist 18 (2008) 62–64.
4. A.R. Gurd. Fat embolism: an aid to diagnosis. J Bone Joint Surg Br 52 (1970) 732–737.
5. S.A. Schonfeld, Y. Ploysongsang, R. DiLisio, J.D. Crissman, E. Miller, D.E. Hammerschmidt, H.S. Jacob. Fat embolism prophylaxis with corticosteroids. a prospective study in high-risk patients. Ann Intern Med 99 (1983) 438–443.
6. J.R. Strawn, P.E. Keck Jr., S.N. Caroff. Neuroleptic malignant syndrome. Am J Psychiatry 164 (2007) 870–876.
7. C.M. Grimes, H. Muniz, W.H. Montgomery, Y.S. Goh. Intraoperative thyroid storm: a case report. AANA J 75 (2004) 53–55.
8. L. Margolin, D.K. Cope, R. Bakst-Sisser, J. Greenspan. The steroid withdrawal syndrome: a review of the implications, etiology, and treatments. J Pain Symptom Manage 33 (2007) 224–228.
9. H.B. Burch, L. Wartofsky. Life-threatening thyrotoxicosis. Thyroid storm. Endocrinol Metab Clin North Am 22 (1993) 263–277.
10. S.A. Baharoon. H1N1 infection-induced thyroid storm. Ann Thorac Med 5 (2010) 110–112.
11. B. Nayak, K. Burman. Thyrotoxicosis and thyroid storm. Endocrinol Metab Clin North Am 35 (2006) 663–686.
12. R. Sharma, R. Anand, B.V.R. Shastri, P. Motiani. An unusual presentation of intraoperative thyroid storm—a case report. Indian J Anaesth 47 (2003) 137–139.