

Calm before the Storm: Contrast-induced Thyroid Storm

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Abstract Hyperthyroidism is a state of excess circulating thyroid hormone. These hormones control many of the body's most important functions such as breathing, heart rate, weight, digestion, and moods. The extreme manifestation of thyrotoxicosis is referred to as thyroid storm. Thyroid storm manifests as an acute, severe, life-threatening hypermetabolic state caused by either excess release of thyroid hormones or an altered peripheral response to thyroid hormone following the presence of one or more precipitants. Thyroid storm is an uncommon but potentially fatal endocrine emergency. Mortality reaching between 80 – 100% without treatment in thyroid storm with multiple organ failure as the most common cause of death. During thyroid storm, precipitants multiply the effect of thyroid hormones by freeing thyroid hormones from binding sites, increased sensitivity in tissue receptors, or post-receptor modifications in signaling pathways. The most common precipitating factor is infection along with a host of other causes. Of interest, iodinated contrast is an important precipitating factor to consider as it is commonly used in the hospital setting through imaging modalities. Elderly patients are at higher risk due to the increased prevalence of nodular thyroid disease. Care must be taken to quickly recognize and treat this potentially fatal illness.

Keywords: *thyroid storm, contrast, thyrotoxicosis*

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1. Introduction

The aim is to illustrate the clinical significance of iodinated contrast-induced thyrotoxicosis and the agility necessary to recognize this clinical diagnosis in order to expediate treatment. Recognize precipitating factors such as routine imaging modalities utilized in inpatient settings that provoke thyroid storm given increasing use of iodinated contrast studies over the past decade.

2. Case Presentation

A 78-year-old male with past medical history of hypertension, paroxysmal atrial fibrillation, coronary artery disease, restless leg syndrome, narcolepsy, and history of prostate cancer post prostatectomy with no active disease was admitted after a mechanical fall (patient was noted to have fallen down the stairs by family) with subsequent slurred speech and left sided weakness noted by EMS. In the emergency department, patient was alert and oriented to person, place, time, and situation with no aphasia, following commands, although notable for dysarthria. Vitals notable for tachycardia. Due to presenting symptoms concerning for stroke, patient was

initially evaluated by neurology and had stroke protocol work up unrevealing for cerebrovascular accident. Patient received contrast load with a CT of chest, abdomen, pelvis with IV contrast and CT angiogram of head/neck with IV contrast. The CT of chest, abdomen, pelvis was notable for soft tissue contusion of the left anterior chest wall with nondisplaced fractures. The CT angiogram of the head/neck was notable for an enlarged thyroid gland with thyroid nodules. Patient had no known history of thyroid dysfunction with normal thyroid function checked one year prior (screening thyroid stimulating hormone in normal range 2.46 when checked in primary care office one year prior). Less than 24 hours after the contrast load, patient became more agitated and not directable to following commands. Patient became tachycardic with heart rate ranging 160 – 170 beats per minute. Thyroid stimulating hormone was checked revealing to be low (<0.01), elevated T4 (14.9), and elevated free T3 (10.56). Patient's Burch-Wartofsky score was elevated, which was highly suggestive of thyroid storm. Patient's clinical signs and symptoms along with lab findings were diagnostically agreeable. Hydrocortisone and propylthiouracil was initiated. Patient was placed on esmolol drip for atrial tachycardia and transferred to the ICU for closer monitoring. Patient gradually improved and was discharged on methimazole with follow up primary care in the outpatient setting.

3. Discussion

Thyroid storm is a diagnosis that can be challenging to make but has grave consequences if missed. The Burch-Wartofsky score can be used to determine likelihood of thyroid storm as in our patient. It is imperative to recognize symptomology of thyrotoxicosis and awareness of precipitants of thyroid storm. In patients with impaired auto-regulatory mechanisms and exposure to excess amounts of iodine poses a great risk with common, everyday imaging modalities that use iodinated contrast [1]. Our case illustrates the short time interval between iodinated contrast administration and onset of symptoms. This is of clinical significance as it may impact the imaging recommendations in certain at-risk populations such as elderly patients with nodular thyroid. As the utilization of CT scans increases, there will likely be a correlating increasing risk of contrast-induced thyroid dysfunction [2]. Patients that are at risk of developing iodine-induced thyroid dysfunction should be monitored more closely after receiving a contrast load to help facilitate rapid initiation of treatment if showing severe clinical

symptoms in the presence of biochemical evidence of hyperthyroidism [3]. It remains crucial to consider potential precipitants in patients with suspicion of thyrotoxicosis as untreated patients can rapidly deteriorate.

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