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Life-Threatening Cardiac Arrhythmias in a Case of Undetected Myxedema Coma: Importance of Early Detection and Medication Adherence

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

BCDEF Brittani N. Jones
BCDEF Besham Kumar
ABCDEFG Kristopher Pfirman

Internal Medicine Residency Program, Camden Clark Medical Center, Parkersburg, WV, USA

Corresponding Author: Kristopher Pfirman, e-mail: kpfirman19@gmail.com
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Patient: Female, 59-year-old
Final Diagnosis: Myxedema coma
Symptoms: Altered mental status • lethargy • right sided weakness • syncope • urinary incontinence
Clinical Procedure: —
Specialty: Cardiology • Endocrinology and Metabolic

Objective: Unusual clinical course

Background: Myxedema coma is a rare, life-threatening condition caused by a severe form of hypothyroidism. The dangerously low levels of circulating thyroid hormone can lead to progressive mental status changes and numerous organ dysfunctions, including serious cardiac abnormalities.

Case Report: We present a case of a 59-year-old woman who presented with altered mental status and fall who was originally thought to have a cerebrovascular accident but was later diagnosed with myxedema coma, after multiple cardiac arrests. It was discovered that the patient had not been taking any of her medications for the last several weeks, after her primary care provider retired from practice. Initial laboratory evaluation was significant for a TSH level of 159.419 mIU/L and an undetectable free T4 level. Complications of the myxedema coma resulted in QTC interval prolongation, causing torsades de pointes and sustained polymorphic ventricular tachycardia, requiring cardioversion.

Conclusions: This case demonstrates the importance of early detection and treatment of myxedema coma, as it can cause life-threatening cardiac arrhythmias. It also emphasizes the need to ensure proper medication adherence in patients with chronic medical conditions, as non-compliance can result in dire consequences.

Keywords: Myxedema • Torsades de Pointes

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/941414

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Background

Myxedema coma is a severe form of hypothyroidism that is rare and life-threatening [1]. Patients with myxedema coma will typically have a longstanding history of hypothyroidism, although some cases are undiagnosed, and it most often occurs in women and persons over the age of 60 years. There are many provoking factors, with the most common being infections, medications, and medication non-compliance [2]. Myxedema coma is characterized by 3 key features: altered mental status, defective thermoregulation, and a precipitating event. Altered mental status can range from lethargy to a comatose state. Classic physical examination findings include hypothermia, hypotension, bradycardia, dry/coarse skin, and delayed deep tendon reflexes [1]. Significant laboratory findings include low serum levels of thyroxine (T4) and triiodothyronine (T3) and a high thyroid stimulating hormone (TSH) level; however, many other laboratory abnormalities can also be seen, including hyponatremia, hypoglycemia, elevated creatinine kinase, mild leukopenia, and normocytic anemia [2]. Treatment of myxedema coma is a controversial topic, as the optimal route of thyroid hormone replacement and dosages have not been identified owing to the rarity of the condition; however, the basis of treatment is rapid thyroid hormone replacement therapy [3]. Stress-dose glucocorticoids are administered prior to thyroid hormone replacement, as patients can also have underlying adrenal insufficiency [1]. Cardiac manifestations commonly include hypotension, shock, arrhythmias, including torsades de pointes, secondary to QTC interval prolongation, and heart block [4]. Myxedema coma has an estimated yearly occurrence of 0.22 per million [5]. According to a retrospective study in Japan conducted from 2010 through 2013, its overall in-hospital mortality was 29.5% [6].

Case Report

Our patient was a 59-year-old woman with a past medical history of a prior cerebral vascular accident with residual right-sided weakness, multiple endocrine pathologies, including hypothyroidism secondary to Hashimoto thyroiditis, uncontrolled diabetes mellitus type II, and hyperlipidemia, as well as an unknown family history. She presented to the Emergency Department (ED) with altered mental status and an unwitnessed fall. Per Emergency Medical Services, the patient was found to have right-sided weakness, bladder incontinence, and facial drooping on their arrival to her home. Further history was gathered from the patient's family, who stated that her symptom onset was sudden the afternoon on the day of presentation. While en route to the hospital, the patient became verbal and was at her baseline. A stroke alert was called on the patient on arrival to the ED, and she was evaluated by a neurologist. A computed tomography scan of the brain showed no signs of acute ischemia or intracranial hemorrhage; however, there was a chronic infarction noted in the right thalamus and left pons. Computed tomography angiography of the head/neck showed no stenosis or large vessel occlusion of the vasculature.

The patient continued to experience intermittent episodes of altered mentation and lethargy but was able to maintain her oxygen saturation on room air. She had underlying sinus bradycardia with a first-degree AV block, with a heart rate in the 40 to 50s. She went into sustained polymorphic ventricular tachycardiac with loss of consciousness, for which she was cardioverted twice and started on amiodarone. It was at this time that a cardiologist was consulted. During evaluation of the patient, she was intermittently in and out of consciousness, which seemed to be associated with episodes of torsades de pointes. At that time, she required repeat cardioversion, and she was subsequently given a loading dose of magnesium to stabilize the cardiac membrane. Only 1 telemetry strip was available, which showed non-sustained polymorphic ventricular tachycardia while the patient was in the ED (**Figure 1**). There were no other electrocardiograms (EKGs) or telemetry strips available to show the sustained polymorphic ventricular tachycardia or torsades de pointes; however, these were seen on the telemetry monitor in the patient's room. Defibrillator pads were left on for emergency transcutaneous pacing, should that have been required.

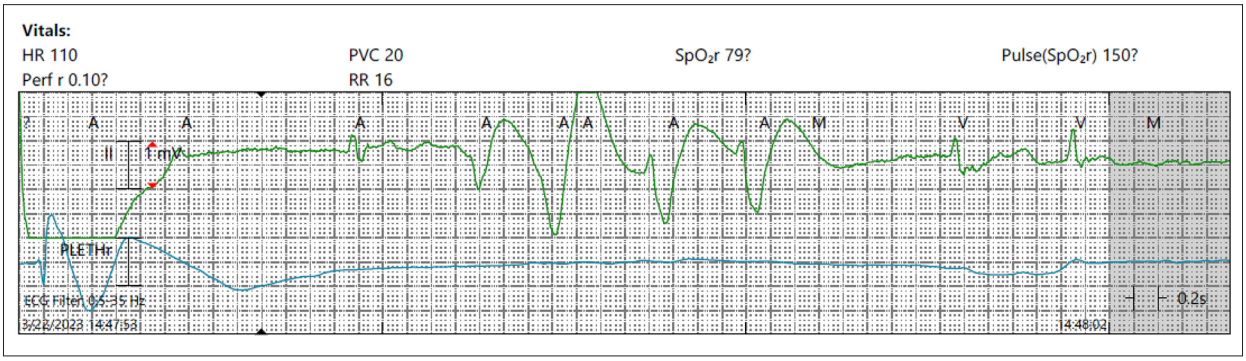

Figure 1. Patient's telemetry strip depicting a non-sustained polymorphic ventricular tachycardia prior to her undergoing cardioversion.

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Upon further questioning of the patient and family, it was discovered that the patient had not been taking any of her medications for the past few weeks, after her primary care physician retired from practice, and she had a known history of hypothyroidism, secondary to Hashimoto's thyroiditis, for the last 10 years. We suspected myxedema at this time because the patient had intermittently altered mentation and medication non-compliance as a precipitating event. She was empirically given intravenous (i.v.) SoluCortef followed by i.v. levothyroxine, and oral (p.o.) liothyronine for suspected myxedema coma was administered during concomitant administration of amiodarone. Amiodarone was converted to isoproterenol, and she was admitted to the Intensive Care Unit (ICU) for further evaluation and management.

Initial pertinent laboratory test results revealed a white blood cell count of 3.1 (3.7-11.0×10^3/uL), hemoglobin level of 14.3 (11.5-16.0 g/dL), sodium level of 135 (136-145 mmol/L), glucose level of 312 (65-125 mg/dL), TSH level of 159.419 (0.350-4.940 uIU/mL), and undetectable free T4 (0.78-2.19 ng/dL). Troponins were negative. The initial EKG showed a nonspecific intraventricular block, with a QTC of 528; however, the QTC increased up to 702 on subsequent EKGs. The ICU staff started the patient on 224 mcg p.o. levothyroxine on admission, which was the patient's home regimen, after she received 200 mcg of i.v. levothyroxine in the ED. An endocrinologist was consulted, who recommended changing the p.o. levothyroxine to 200 mcg i.v. for better absorption. The patient's free T4 levels were followed over the next 3 days and were 0.65, 0.69, and 0.74, respectively. EKGs were also trended over the first several days to monitor the QTC interval, which improved to 474, and the patient returned to normal sinus rhythm. She experienced no further arrhythmias after admission to the ICU and was able to be weaned off isoproterenol. Most importantly, the patient's mental status improved to her baseline with the swift action of administering thyroid hormone supplementation. She remained on i.v. levothyroxine and i.v. SoluCortef for the remainder of her admission.

An echocardiogram was completed, which showed a normal left ventricular ejection fraction of 70% to 75% and normal diastolic function, and no pericardial effusion was noted. The patient's hospital course was complicated by hyperglycemia, as her type II diabetes was uncontrolled, with a HgbA1c level of 13.7 on admission, and she briefly required an insulin drip before being converted to a basal/bolus regimen.

Unfortunately, the day after the patient was suitable for downgrade to the medical floors, she left the hospital against medical advice, despite being explained that the risks of leaving included worsening of her medical conditions, cardiac arrythmias, and even death. It is unknown if the patient is taking levothyroxine as an outpatient, as she has not followed up with a primary care physician, endocrinologist, or cardiologist to the best of our knowledge. This places the patient at an increased risk for treatment non-compliance, with potential consequences of having recurring myxedema coma leading to fatal arrhythmias and death. It is vital to have appropriate follow-up care in place and educate patients about their medical history to promote adequate treatment compliance.

Discussion

Myxedema coma is characterized as an extreme form of hypothyroidism that results in a decline in mental function, hypothermia, and various symptoms associated with decreased organ function. Diagnosis is based on clinical suspicion with correlating clinical features; however, there have been tools developed to aid in diagnosis, such as the diagnostic scoring system for myxedema coma, in which a score of 60 points has a sensitivity of 100% and specificity of 85% for diagnosis of myxedema coma. This score is based solely on clinical manifestations; therefore, diagnosis can be made prior to laboratory results being obtained, leading to earlier detection. Other screening tools have been made that consider laboratory findings but are less sensitive and specific for diagnosis of myxedema coma [7].

The mortality of this disease remains 20% to 50% even with early intervention [1]. The major cardiovascular changes that occur include a decrease in cardiac output and cardiac contractility, a reduction in heart rate, and an increase in peripheral vascular resistance. An analysis of an inpatient national database in Japan showed that cardiovascular complications remain the most common comorbidity (40.3%) in myxedema coma [6]. Our patient was found to have underlying sinus bradycardia with a first-degree AV block, which progressed to sustained polymorphic ventricular tachycardia and torsade de pointes. Torsades de pointes is found only in 6.5% cases of hypothyroidism [8] and usually correlates with high levels of TSH, typically in the 90s [9] (**Figure 2**). The prolonged QTC interval observed in our patient is a known complication of myxedema coma and can lead to life-threatening arrhythmias (**Figure 3**). Significant hypothyroidism and severely low levels of T3 in cardiac cells can cause decreased cardiac contractility and slowing of ventricular electrical stimuli, which could lead to prolongation of the QTC interval, placing an individual at higher risk of life-threatening arrhythmias, such as torsades de Pointes [10]. It is also imperative to frequently monitor electrolytes, such as potassium, magnesium, and calcium, as electrolyte imbalances can also increase the risk of QTC interval prolongation [11].

Although this patient had chronic bilateral lower extremity edema, she did not exhibit prominent myxedema features, such as puffiness of the hands and face, a thickened nose, swollen

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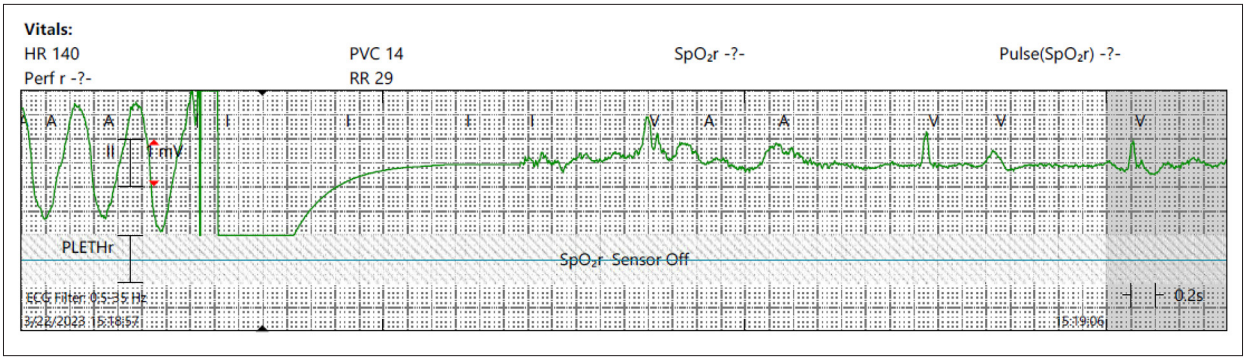

Figure 2. Patient's telemetry strip depicting ventricular tachycardia, with subsequent cardioversion.

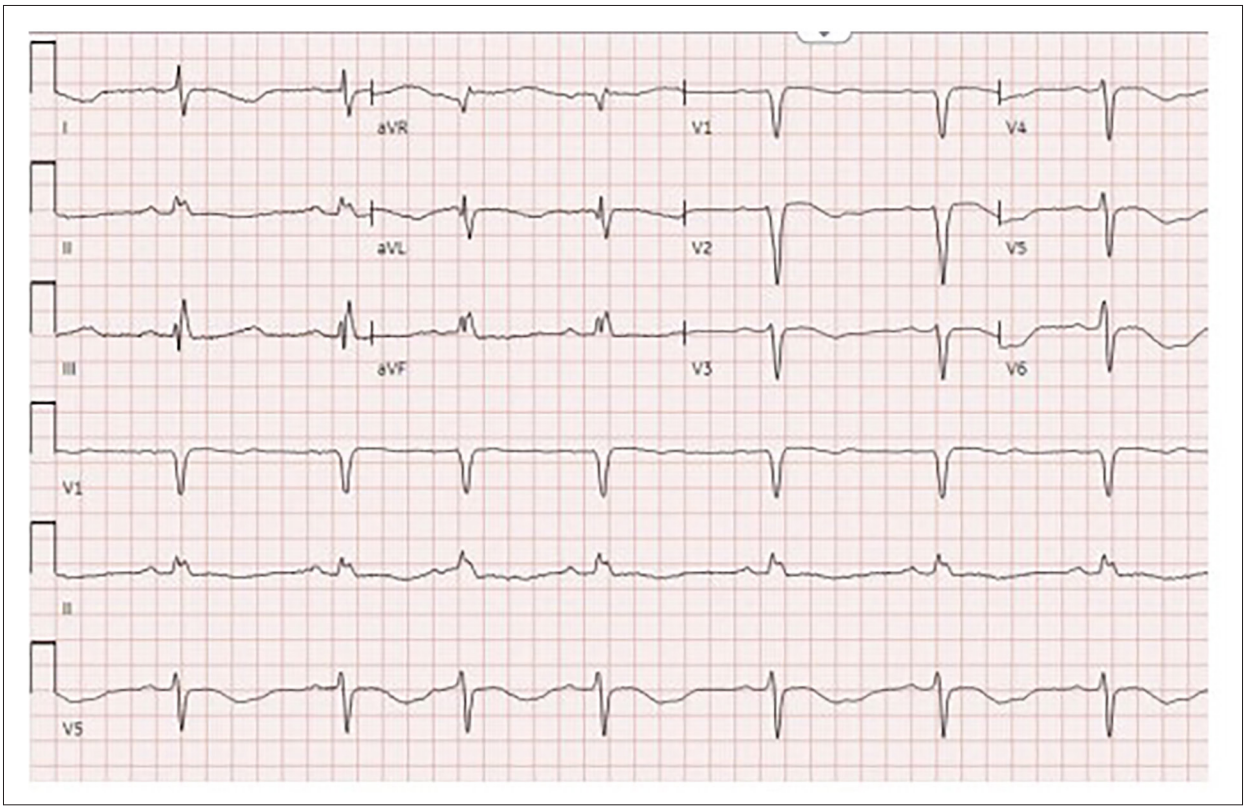

Figure 3. Electrocardiogram showing prolonged QTC interval.

lips, or an enlarged tongue. These myxedema characteristics are typically caused by abnormal deposits of albumin and mucin in the skin and other tissues. To ensure that coexisting adrenal insufficiency is not present, it is essential to administer glucocorticoids at stress dosages. This is particularly relevant because patients with central hypothyroidism can have associated hypopituitarism and secondary adrenal insufficiency. Furthermore, individuals with autoimmune-mediated primary hypothyroidism can concurrently experience primary adrenal insufficiency. Additionally, severe hypothyroidism can lead to diminished pituitary corticotropin (ACTH) secretion, resulting in an inadequate cortisol response to stress. Therefore, administering stress doses of glucocorticoids is crucial until the possibility of coexisting adrenal insufficiency is ruled out [12]. Some sources suggest administering a combination therapy of levothyroxine and liothyronine rather than levothyroxine alone. The rationale behind this preference lies in the fact that T3, one of the active thyroid hormones, has higher biological activity and a faster onset of action than does T4, and by including both hormones in the treatment regimen, a more rapid and effective response can be achieved [13]. However, it is important to note that the use of T3 remains controversial, and one must exercise caution when administering higher doses of LT3 therapy to patients with underlying heart disease or a history of cardiac arrhythmia. A case series has demonstrated an association between increased cardiac arrythmias and higher

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doses of LT3 therapy in such patients. Therefore, close monitoring and individualized treatment decisions should be made, considering the patient's specific cardiovascular condition and history to minimize the risk of potential complications [14].

After appropriate treatment with i.v. SoluCortef followed by i.v. levothyroxine and p.o. liothyronine, our patient's mental status and QTC interval improved. Amiodarone was switched to isoproterenol while the patient was in the ED. Amiodarone is a class III antiarrhythmic agent used to treat ventricular arrhythmias; however, it is often associated with thyroid dysfunction, as the medication demonstrates similar structure to T3 and tetraiodothyronine (T4) and can cause thyroid hypo- or hyperfunction [15]. Thus, making isoproterenol, a non-selective beta agonist, a more suitable option for management for her persistent bradycardia. Of note, it is important to discontinue any beta blockade agents in a patient with myxedema coma, as propranolol is a preferred agent in the management of thyroid storm because it treats anxiety, agitation, and aids in blocking the peripheral conversion of inactive T4 to the active form T3 [16]. Our patient was successfully weaned off isoproterenol and did not experience further arrhythmias after starting levothyroxine. Her hospital course was complicated by uncontrolled diabetes mellitus type II, which required insulin therapy.

This case illustrates the need for early recognition and management of myxedema coma in patients with hypothyroidism. It also highlights the importance of proper medication adherence, particularly in patients with chronic medical conditions. Further follow-up with the patient is essential to ensure appropriate management of hypothyroidism and diabetes mellitus type II, as well as to monitor for any potential long-term complications.

Conclusions

Myxedema coma is a rare form of severe hypothyroidism that is characterized by high TSH levels and low T4 and T3 levels, which results in altered mentation, hypothermia, and decreased organ function, including cardiovascular complications. This case demonstrates a patient with myxedema coma resulting in life-threatening cardiac arrhythmias, including sustained polymorphic ventricular tachycardia and torsades de pointes, requiring immediate cardioversion, illustrating the importance of physicians having a high suspicion of myxedema coma, detecting cases early, and administering appropriate treatment promptly.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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