

Rhabdomyolysis and Hypothyroidism in a Collegiate Hammer Thrower: A Disablement Model Case Study

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ABSTRACT

The purpose of this disablement model case report was to detail the case of a patient suffering from rhabdomyolysis and hypothyroidism. Despite swelling, cramping, and loss of range of motion at the wrists, hands, and fingers, the patient did not seek physician evaluation until their athletic trainer encouraged them. While hypothyroidism is a relatively common condition, there has been little literature published that associate hypothyroidism with rhabdomyolysis. In this case, the patient reported to the athletic training staff reporting swelling, cramping, and loss of range of motion at the wrists, hands, and fingers. After evaluation by the team physician and subsequent testing, the patient was diagnosed with hypothyroidism and rhabdomyolysis. The patient was hospitalized and treated with intravenous hydration and oral levothyroxine. After a 10-day hospitalization, the patient had improved enough to be discharged. As the patient remained adherent with his levothyroxine prescription, the patient continued to improve to the point of being able to resume sport-specific activities. When evaluating a patient with swelling, cramping, and loss of range of motion after intense physical activity or muscular trauma, the clinician should consider rhabdomyolysis as a potential factor. Patients presenting with these symptoms should be referred for emergency care.

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INTRODUCTION

Hypothyroidism is a relatively common pathology related to thyroid hormone deficiency.¹ Hypothyroidism is classified based on the biochemical characteristics of the patient.¹ Subclinical hypothyroidism describes patients with thyroid stimulating hormone (TSH) slightly above normal limits. Clinical primary hypothyroidism describes patients whose TSH concentrations are above normal limits and free thyroxine levels are below normal limits.¹ Diagnosing hypothyroidism is often relatively simple, with blood draws confirming TSH and free thyroxine levels.^{1,2} Common signs and symptoms indicating the need for this blood work include cold intolerance, unexplained weight gain, constipation, dry skin, bradycardia, and slow mental processing.² More rare signs and symptoms of hypothyroidism include hypothermia, congestive heart failure, blood clotting issues, depression, seizures, and pseudo-obstructions of the intestinal tract.² Once diagnosed, treating hypothyroidism is relatively straightforward, consisting of oral levothyroxine sodium.^{1,2} To ensure the patient receives the proper dose, follow-up blood work is usually required to ensure that TSH and free thyroxine levels respond appropriately.^{1,2}

While hypothyroidism is a treatable condition, unchecked hypothyroidism can lead to various complications, including life-threatening diseases such as myxedema coma.^{1,2} In rare cases, hypothyroidism can be a comorbidity of rhabdomyolysis.³⁻⁵ Rhabdomyolysis is a severe and potentially fatal condition characterized by damage to the myocyte membrane.⁶ This damage can lead to increased intracellular calcium and muscle and organ tissue destruction.⁶ To date, the available research on this correlation between hypothyroidism and rhabdomyolysis has been reported in case reports. This appears to indicate that this combination of pathologies is, in fact, rare.⁷ Therefore, the purpose of this case report is to describe a case of

rhabdomyolysis in a collegiate hammer thrower who was also suffering from hypothyroidism. This case report will detail the pathological presentation, diagnosis, treatment, patient-reported disablements, and outcomes.

PATIENT INFORMATION

Patient

The patient was a 20-year-old male, a collegiate hammer thrower. The patient reported a history of hypothyroidism, specifically his mother, maternal grandmother, and paternal aunt. The patient sought medical care from the team physician with reports of swelling, cramping, and tightness in his forearms, hands, and fingers. Approximately one month before seeking medical care, the patient moved into a new apartment. The patient reported minimal fluid intake while carrying heavy objects into his apartment. The patient noted that he initially felt muscle cramping in his legs, back, latissimus region, forearms, hands, and fingers about two days after the move. The cramping in the patient's legs and back improved, but swelling and cramping persisted in the patient's forearms, hands, and fingers.

Differential Diagnosis and Evaluation

Initial evaluation revealed strength within normal limits, mild loss of motion in all directions within the wrist and fingers, mild paresthesia extending into the right thumb, and visible swelling in the hands and fingers (**Figures 1 & 2**). Intake screening also revealed the patient's blood pressure was 140/70 Mm Hg. Although the patient did not report any muscular weakness, he did state that he had to alter his upper body exercises in the weight room due to loss of motion in his wrist and fingers. Despite needing to make these modifications, the patient did not seek medical care from the sports medicine staff until the swelling in his wrists, hands, and fingers worsened. The differential diagnosis included rhabdomyolysis, exertional compartment syndrome, forearm muscle tendinopathy, and radial nerve compression. Because symptoms did not resolve with rest or have pain, exertional compartment syndrome, forearm muscle tendinopathy, and radial nerve compression were quickly removed from the differential diagnosis list.



Figure 1 & 2. Images of the patient's swollen right hand.

Given the patient's symptoms, the team physician ordered blood and urine analysis to assess for rhabdomyolysis. These lab results revealed several abnormal findings, which are presented in **Table 1**. After reviewing the results, the team physician immediately referred the patient to the emergency department at the local hospital for admittance.

Table 1. Blood Testing Results

Value	Reading	Normal Range
WBC	7.1	4.5-13.5 $10^3/\mu\text{L}$
RBC	4.51	3.90-5.90 $10^6/\mu\text{L}$
Hemoglobin	14.5	14.0-18.0 g/dL
MCV	91.1	80.0-95.0 fL
MCH	32.2	30.0-37.0 pg
MCHC	35.3	33.0-37.0 g/dL
RDW	13.2	11.5-14.5%
Mean Platelet Volume	12.8	7.4-10.4 fL*
Neutrophils	46.5	42.4-72.6%
Lymphocytes	38.9	20.5-51.1%
Monocytes	8.5	1.7-11.7%
Eosinophils	4.9	0.0-6.3%
Basophils	0.8	0.0-1.2%
Glucose	68	74-106 mg/dL*
Creatinine	1.9	0.5-1.2 mg/dL*
Aspartate	282	0-41 U/L*
Aminotransferase		
Alanine	134	0-41 U/L*
Aminotransferase		
Creatine Kinase	15,049	80-1083 U/L*
TSH	148.1	0.27-3.20 uU/mL*
Free Thyroxine	< 0.10	0.93-1.70 ng/dL*

*Abnormal result

Body Structure and Function

Given the patient's symptoms, the primary diagnostic techniques used to determine the need for blood and urine analysis were comprehensive patient history, family history, and strength and range of motion tests. At the time of presentation, the patient presented with limited wrist and finger motion and full strength in all motions when compared bilaterally. Throughout the presentation of symptoms, the patient did not exhibit any signs or symptoms of kidney, liver, or other systemic dysfunction.

Activity and Participation

Despite experiencing symptoms for over a month, the patient did not report to the sports medicine staff until he began altering his activities. The patient stated that he had to modify how he lifted weights with his upper extremities due to his loss of range of motion. The patient had not noticed a perceived change in his ability to perform the hammer throw at that time. Additionally, the patient's measured performance had not diminished despite his decreased range of motion. After conversations with his primary athletic trainer, the patient finally agreed to seek evaluation by the team physician.

Environmental and Personal Factors

Outside of hammer-throwing-related activities, the patient stated that his swelling and decreased range of motion affected his daily living activities. Specifically, the patient expressed having to alter how he completed grooming tasks. The patient also reported that when his fingers swelled, he had difficulty typing

for school assignments. The swelling was so significant at one point that the patient said he could not use a keyboard without touching four keys at a time. This difficulty led to the patient expressing concern about completing the required schoolwork on time.

INTERVENTIONS

Upon admittance to the hospital, the patient's treatment began with intravenous hydration and oral levothyroxine 150 mcg once a day. While the patient was hospitalized, the athletic training staff worked with the institution's faculty athletics representative to communicate with the patient's professors to ensure reasonable accommodations for assignment due dates were provided. Over the next ten days, the team physician collaborated with the treating hospitalist and nephrologist to ensure optimal patient care. His blood and urine analyses improved as the patient continued his course of intravenous fluids and levothyroxine. When discharged ten days after admittance, the patient's blood pressure had improved to 104/56 Mm Hg. The patient's creatine kinase levels had also improved to 4,050 U/L. At discharge, the nephrologist instructed the patient to follow up with the team physician and an endocrinologist for further treatment. Upon consultation with the endocrinologist, it was concluded that the patient did not require any further pharmacological intervention to resolve his condition.

OUTCOMES

Body Structure and Function

Two weeks after being admitted to the hospital, the team physician reevaluated the patient. At this time, the patient reported feeling better overall. While the patient continued swelling in his hands and upper extremities, the swelling had visibly improved, and the patient reported feeling like he had more energy.

Nineteen days after being admitted to the hospital, the patient had a follow-up appointment with an endocrinologist. During this visit, the patient reported feeling much better. He noted he had gained a significant amount of weight after beginning to experience symptoms. During preparticipation physical examinations, the patient weighed 272 pounds. At one point, the patient had weighed over 300 pounds. Since the patient had begun taking levothyroxine, the patient's weight had decreased to 291 pounds. After evaluation, the endocrinologist recommended that the patient gradually increase physical activity and schedule a follow-up appointment for two months from that date.

Forty-five days after the patient had been admitted to the hospital, the patient had another follow-up appointment with the team physician. The patient's weight had decreased to 274 pounds, and he reported feeling continually improving energy levels and no recurrence of swelling in his upper extremities. The patient had begun to participate in moderate physical activity, and the team physician recommended increasing the frequency, intensity, and volume of activity provided blood work and urine analysis levels continued to improve. The blood and urine analysis revealed a creatine kinase level of 237 U/L and a TSH level of 31.87 uIU/dL. At this time, the team physician stated that he saw no reason why the patient would not be able to resume complete activities upon completion of a gradual return to activity and continued compliance with the prescribed course of levothyroxine.

Activity and Participation

After the patient's follow-up evaluation with the endocrinologist, physical activity gradually increased. Exercise began with resistance training at 50% of maximum effort. The patient started with a light cardiovascular workout on the stationary bike before progressing to short sprint drills of less than 40 yards

and ladder drills for activity. Given that hammer throwing did not exacerbate his symptoms and the anaerobic nature of the sport, the patient was then able to return to practice at this time as well. The patient's athletic trainer scheduled regular meetings with the strength and conditioning coaching staff to ensure the weightlifting restrictions were followed.

Aside from training for the hammer throw, the patient reported that his activities of daily living became easier when his swelling and range of motion improved. Had the patient not sought medical treatment, these issues would likely have continued to worsen and have an increasing effect on his activities of daily living. Fortunately, the patient has remained compliant with his levothyroxine prescription and continues to improve.

Environmental and Personal Factors

Given the patient's concern about being able to complete coursework with his limitations, the sports medicine staff and faculty athletics representative worked closely with the institution's faculty. While hospitalized, the patient's professors extended deadlines, allowing him to complete his coursework once his symptoms had resolved. Because the medical staff could work with the faculty athletics representative, institutional policies and procedures for accommodating students with temporary disabilities could be used.

DISCUSSION

This case details the diagnosis and management of a patient suffering from rhabdomyolysis exacerbated by undiagnosed hypothyroidism. While hypothyroidism is a relatively common condition, it has rarely been associated with rhabdomyolysis.³⁻⁵ Furthermore, in this case, the patient's hypothyroidism was discovered due to his rhabdomyolysis. The patient's family history of hypothyroidism gave the physician cause for suspicion. However, the signs and symptoms of hypothyroidism at the time might have been mild enough that the patient would not have noticed them if he had not experienced rhabdomyolysis.

Overall, the patient's willingness to be evaluated by the team physician led to an appropriate course of treatment that led to good outcomes. Had the patient chosen to forego physician evaluation, it is possible that his symptoms would have continued to worsen. With unchecked rhabdomyolysis and hypothyroidism, the patient may have been at risk for worse conditions.

CLINICAL BOTTOM LINE

Within the scope of clinical practice, clinicians may encounter patients with undiagnosed conditions. These conditions may be well reported in the literature but may have mild symptoms that are not relatively apparent. Sometimes, these conditions can predispose patients to other conditions with more obvious signs and symptoms. Collaboration between healthcare providers is crucial for delivering optimal patient care. When there are academic concerns at an institution of higher learning, clinicians should explore available resources for patient support, including faculty athletics representatives. Clinicians should always prioritize their patient's safety and personal concerns when determining their course of treatment. Based on these values, clinicians may need to employ available resources to advocate for their patient population.

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