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Rhabdomyolysis in a patient complicated with hypopituitarism and multiple organ dysfunction syndrome and the literature review

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ABSTRACT

Introduction: Muscular symptoms, including stiffness, myalgia, cramps, and fatigue, are present in the majority of the patients with hypopituitarism, adrenal insufficiency and hypothyroidism, but rhabdomyolysis, the rapid breakdown of skeletal muscle, is a rare manifestation. In most patients who develop rhabdomyolysis, precipitating factors, such as strenuous exercise or use of lipid-lowering drugs, can be identified.
Case report: We report the case of a 23-year-old male with primary hypopituitarism who developed acute renal impairment (AKI) with rhabdomyolysis after strenuous physical activity (push-ups). His blood test confirmed marked hypopituitarism. Severe elevation of serum CK consistent with rhabdomyolysis was noted and an elevated creatinine indicated AKI and multiple organ dysfunction syndrome (MODS). Patient's condition improved significantly after continuous renal replacement therapy (CRRT), glucocorticoid hormone replacement therapy and aggressive hydration. MODS with rhabdomyolysis in patients with hypothyroidism is quite rare and we expect that this case report adds to the existing literature on this subject. We also emphasize that thyroid and adrenal gland status should be evaluated in patients with unexplained AKI, MODS and presenting with the symptoms of muscle involvement.
Literature review: We respectively reviewed 23 patients with hypopituitarism, adrenal Insufficiency and hypothyroidism induced rhabdomyolysis who were involved in the past 40 years relevant literatures.
Conclusion: We report a successfully treated case of rhabdomyolysis, which is a rare but potentially serious complication of hypopituitarism. Screening for endocrine abnormality in patients with elevated muscle enzymes should be considered, since an early diagnosis and prompt treatment is essential to prevent rhabdomyolysis and its consequences.

1. Introduction

Rhabdomyolysis is a clinical condition, characterized by severe acute muscle injury, muscle necrosis, resulting in muscle pain, weakness, and/or swelling with release of myofibril contents into the bloodstream muscle cell constituents into the systemic circulation [1, 2]. A greater number of patients who suffer from hypopituitarism or hypothyroidism who go on to develop rhabdomyolysis, have had strenuous exercise or used of lipid-lowering drugs identified as precipitating factors. Rhabdomyolysis due to hypothyroidism, without any obvious precipitating factor, has been previously reported in the literature, but is very rare. We report the case of a patient with Pituitary hypofunction whilst exhibiting multiple organ failure. The study was approved by the Ethics Committee of West China Hospital, Sichuan University.

1.1. Case report

A 22-year-old young man was transferred to our hospital's emergency ward presenting systemic and limb edema, oliguria, and weakness in limbs all of which were consistent for a period of not >1 month. Urine output was <400 ml/24 h. The patient had no significant past medical history other than asthma and was not known to be on any medication.

The patient exhibited bilateral lower extremity edema accompanied by generalized muscle weakness and cramps. These symptoms were present for one month prior to the admission, with the patient having also complained of Lower extremity muscle stiffness with edema two months prior to the admission. Patient had also not been sleeping well at night with heart palpitations. Resting heart rate was measured at 120 beats/min. He also had a history of excessive physical exercise

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Table 1
Main laboratory results on admission and during follow-up.

Laboratory investigations	1 day	4 days	14 days	18 days	30 days	40 days
AST (<40 IU/L)	1697	773	76	39	28	22
ALT (<50 IU/L)	763	763	184	124	38	50
HBDH (72–182 IU/L)	1143	1006	525	426	214	150
LDH (110–220 IU/L)	2159	1657	616	497	264	190
TBil (5–28 μmol/L)	96.8	73.5	15.3	16.1	10.8	11.3
DBil (<8.8 μmol/L)	43.1	39.8	8.2	9.5	5.0	4.5
IBIL (<20 μmol/L)	53.7	33.7	7.1	6.6	5.8	6.8
CK (19–226 IU/L)	5898	9574	534	216	161	108
CK-MB (<4.94 ng/ml)	24.77	41.71	14.86	–	–	–
CREA (53.0–140 μmol/L)	167.0	170	42.0	51.0	48.0	36.0
GFR (56–122 ml/min/1.732m^2)	48.95	47.90	155.98	144.02	147.65	166.19
BUN (3.20–7.79 mmol/L)	31.99	34.90	7.3	5.6	6.4	3.9
K^+ (3.5–5.3 mmol/L)	5.4	5.31	3.82	3.52	3.87	–
Na^+ (137-147 mmol/L)	126.1	124.4	126.8	131.1	136.2	137.5
Ca^{2+} (2.1–2.7 mmol/L)	1.99	2.42	2.39	2.42	–	–
Cl^- (99–110 mmol/L)	88.7	96.5	95.4	103.7	102.7	95.2
Mb (<72.0 ng/ml)	>3000	>3000	339.2	276.0	–	–
pro-BNP (0–88 pg/ml)	10,162	5889	872	–	–	–
Tn-T (0–14 ng/L)	58.5	58.0	163.7	–	–	–
GLU (3.9–6.1 mmol/L)	7.22	7.47	10.9/7.1/6.7	9.63	6.11	6.03

AST, aspartate aminotransferase; ALT, alanine aminotransferase; HBDH, hydroxybutyrate dehydrogenase; LDH, lactate dehydrogenase; TBil, total bilirubin; DBil, direct bilirubin; IBIL, indirect bilirubin; CK, creatine kinase; CK-MB, creatine kinase-MB; CREA, creatinine; GFR, glomerular filtration rate; BUN, blood urea nitrogen; K+, serum potassium; Na+, serum natrium; Ca2+, serum calcium; Cl-, serum chlorine; Mb, Myoglobin;, pro-brain natriuretic peptide; Tn-T, cardiac troponin-T; GLU, blood glucose.

doing 700 push-ups and 500 squats every day. There was not any history of seizure, trauma, or any record of recent falls. The patient also complained Loss of appetite and frequent vomiting without hematemesis.

Results of the above laboratory tests (Table 1 and Table 2), provided evidence of hypopituitarism. Subsequently, skull magnetic resonance imaging (MRI) and ultrasound of the thyroid indicated that there was no organic lesion in the patient.

Computer Tomography (CT) of the chest and the inferior vena cava indicated an increase in vascular diameter of the inferior vena cava and its collateral vessels. The patient's heart ultrasound also showed an enlarged heart. The inferior vena cava increased by 26 mm, with the respiratory collapse rate <50% along with presenting tricuspid regurgitation with pulmonary hypertension. Moreover, abdominal ultrasonography also indicated that hepatic vein blood flow signal filling, diameter increased by 60%. Bilateral pleural effusion also reached 5.0 cm.

The patient was diagnosed with acute renal impairment, right heart failure, abnormal liver function and electrolyte balance disorder. In the initial stage of emergency resuscitation, the patient's circulatory function was severely impaired. In addition to proper fluid resuscitation, myocardial protection, liver protection, and urinary alkalization with sodium bicarbonate, it was necessary for norepinephrine and hydrocortisone maintenance making the basic vital signs stable. After the above treatment measures and after multiple continuous renal replacement therapies (CRRT) and thoracentesis one time, the patient's creatine kinase and creatinine gradually decreased from 9000 IU/L to 534 IU/L and 170 μmol/L to 42 μmol/L respectively (Table 1), and the oxygen partial pressure increased to 80 mmHg in the absence of oxygen.

Three weeks later, His average heart rate was 70 beats/min, blood pressure returned to 126/88 mmHg, oxygen saturation was 98%, systemic skin pigmentation was back to normal, edema of both lower extremities subsided, and daily urine output returned to 1200 ml. His organ function gradually recovered and all laboratory tests returned to normal, except sex hormones and cortisol which were still low (Table 2). In addition, patients still presented hyponatremia under normal diet conditions. Echocardiography re-examination and enhanced three-dimensional reconstruction of pulmonary artery vessels CT scan, showed a return to normal size of right heart and inferior vena cava blood vessel diameter. The patient was discharged from the hospital with instructions to continue his clinical follow-up with his primary care physician every two weeks.

Table 2
Basical hormone.

Laboratory investigations	Day 1	Day 14	Day 18	Day 30
TSH mU/L (0.27–4.2)	7.94	10.85	5.26	7.37
T3 nmol/L (1.3–3.1)	0.32	/	1.4	1.3
FT4 pmol/L (12.0–22.0)	8.39	19.62	19.23	14.28
FT3 pmol/L (3.60–7.50)	1.93	/	5.13	4.1
T4 nmol/L (62–164)	36.74	69.19	87.79	68.52
TgAb IU/ml (<115)	/	/	10.1	<10.10
TPOAb IU/ml (<34)	/	/	9.6	8.39
LH mIU/ml (1.7–8.6)	<0.1	1	0.6	1.2
TT g/ml (2.49–8.36)	0.46	0.44	0.74	2.4
FSH mIU/ml (1.5–12.4)	0.3	1.6	1.2	2.1
PRL ng/ml (4.6–21.4)	/	31.08	22.6	27.8
ACTH ng/L (8:00 am: 5–50)	3.42	12.92	22.02	7.11
PTC nmol/L (8:00 am: 140–690)	/	33.43	35.03	30.26

TSH, thyroid stimulating hormone; T3, triiodothyronine; FT3, free triiodothyronine; FT4, free tetraiodothyronine; T4, tetraiodothyronine; TgAb, anti-thyroglobulin antibodies; TPOAb, thyroid peroxidase antibody; LH, luteinizing hormone; FSH, Follicl Stimulating Hormone; TT, testosteronen; PRL, prolactin; ACTH, adreno-cortico-tropic-hormone; PTC, plasma total cortisol.

2. Discussion

2.1. Disease progression and mechanism discussion

Rhabdomyolysis is a syndrome that causes the breakdown and release of skeletal muscle cell contents into the systemic blood circulation, resulting in clinical manifestations such as muscle pain, weakness, and/or swelling. Muscle tissue components such as electrolytes, purines, enzymes (e.g. creatinine kinase) and myoglobin [1-3]. This syndrome is associated with many diseases, drugs, medications, toxins and injuries [4]. In this paper, we mainly discuss MODS due to Rhabdomyolysis caused by excessive muscular activity and hypopituitarism.

Strenuous exercise may lead to one suffering from acute severe Rhabdomyolysis due to the occurrence of an ATP supply-demand discordance. This imbalance in energy supply to the muscle gives rise to an inability of membrane homeostasis maintenance. The more strenuous or prolonged the exercise is, the more severe the damage incurred [5].

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