

Abnormal nocturnal behavior due to hypoglycemia

A case report

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Abstract

Rationale: Hypoglycemia, which is characterized mainly by palpitations, dizziness, and sweating, is common and easy to identify. However, some other symptoms, such as mental disorder or abnormal behavior, are atypical, which may lead to a misdiagnosis of epilepsy, sleepwalking, infarction, or mental disorder, among others.

Patient concerns: We report a case of a patient with type 2 diabetes who presented with abnormal nocturnal behavior due to hypoglycemia.

Diagnosis: Hypoglycemia was diagnosed based on a blood glucose level of 2.1 mmol/L when the patient turned up disoriented unresponsive, unable to understand what was said to him, and producing nonsensical speech. After the patient ate a piece of chocolate, his consciousness returned to normal and all mental symptoms disappeared. Polysomnography (PSG) was synchronously performed. The results of the PSG did not show any signs of abnormality during nonrapid eye movement (NREM) or rapid eye movement (REM) sleep.

Interventions: We regulated his dose of insulin.

Outcomes: No additional episodes occurred during the 3-month follow-up. Therefore, the abnormal nocturnal behavior of this patient was determined to be due to hypoglycemia, while the cause of the hypoglycemia was insulin overuse.

Lessons: For physicians, if the cause of abnormal behavior cannot be detected, hypoglycemia should be suspected. Long-term persistent hypoglycemia may cause brain dysfunction and even result in permanent brain damage.

Abbreviations: ANDFLE = autosomal dominant nocturnal frontal lobe epilepsy, EEG = electroencephalography, HbA1c = glycosylated hemoglobin, NREM = nonrapid eye movement, OSA = obstructive sleep apnea, PSG = polysomnography, RBD = rapid eye movement sleep behavior disorder, REM = rapid eye movement.

Keywords: abnormal nocturnal behavior, epilepsy, hypoglycemia, REM sleep behavior disorder, sleepwalking

1. Introduction

Hypoglycemia is a syndrome defined by a blood glucose level lower than 2.8 mmol/L. There are various clinical manifestations, including a sense of hunger, palpitations, and excessive perspiration. In some serious cases, it can cause mental disorder, abnormal behavior, and coma. Abnormal nocturnal behavior is rare in hypoglycemia and can be caused by various conditions,

including primary sleep disorder, nocturnal seizures, and underlying medical or neurological disorder. These can be differentiated by the clinical presentation, associated medical conditions, and polysomnography (PSG) with extended electroencephalography (EEG).^[1] We report the case of a patient who presented with abnormal nocturnal behavior due to hypoglycemia.

2. Report of case

A 54-year-old Chinese male public servant was admitted to hospital on June 19, 2018, with over a 1-year history of abnormal nocturnal behavior. His wife had witnessed his nocturnal behavior for about 1 year before admission. One to two hours after sleep onset, he was observed to display abnormal behavior such as shouting, nonsensical speech, violent tendencies, throwing or picking up things, walking away from the bed, hiding behind the curtains, making faces, and chasing pet dogs away from the bed. During these episodes, he could never be wakened. These behaviors usually lasted for 2 hours. However, after waking later in the morning, he could not remember these episodes. The symptoms did not improve after he was medicated with levetiracetam 1.0 g/day. In addition, the patient had been diagnosed with type 2 diabetes 5 years previously.

Laboratory studies revealed hypoglycemia with a fasting blood glucose of 3.7 mmol/L (normal range: 3.9–5.8 mmol/L), glycosylated hemoglobin (HbA1c) of 5.9% (normal range: 4–6%), fasting C-peptide of 0.37 µg/L, fasting insulin of 9 µU/L, postprandial C-peptide of 3.91 µg/L, and postprandial insulin of 40.5 µU/L. Testing for insulin antibody was positive. The

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blood glucose at 2 AM was 5.7 mmol/L. Other tests, including routine blood examination, serum electrolytes, and serum biochemistry, were all normal. Brain magnetic resonance imaging and EEG did not show any abnormal findings.

After admission, the patient did not display any abnormal behavior. Further questions about his history showed that the patient was medicated with 24 IU of insulin twice a day and used to eat an apple for lunch and a bowl of porridge for dinner to control his blood glucose. However, his dietary habits had changed from his normal routine after admission, which might explain why he did not manifest these previously seen symptoms. Therefore, we asked the patient to perform his usual routine. We measured the level of blood glucose every hour. There were no hypoglycemic episodes in the daytime. The blood sugar levels of the patient were normal during the daytime. At 10 PM, the patient appeared confused, unresponsive, and unable to understand what was said to him, and produced nonsensical speech. The blood glucose level was 2.1 mmol/L at that time. After the patient ate a piece of chocolate, his consciousness returned normal and all mental symptoms disappeared. The blood glucose was 3.9 mmol/L. When the patient's consciousness returned to normal, PSG was performed synchronously. The results of the PSG did not show any abnormalities during the nonrapid eye movement (NREM) or rapid eye movement (REM) sleep stages (Figs. 1 and 2). We then modified the dose of insulin to 18 IU twice a day. No additional episodes occurred during 3-month follow-up. Therefore, the abnormal nocturnal behavior of this patient was determined to be due to hypoglycemia, while the cause of hypoglycemia was identified as insulin overuse.

3. Discussion

There have been previous reports of abnormal nocturnal behavior due to hypoglycemia. Yang et al^[2] reported the case of a 79-year-old woman who was diagnosed with type 2 diabetes

and was admitted for abnormal nocturnal behavior manifesting as leg shaking, fumbling with bedclothes, crawling around the room with her eyes closed, and nonresponsiveness to verbal communication due to hypoglycemia. EEG and PSG investigations showed no epileptic activity. Suzuki et al^[3] reported the case of a 65-year-old man with insulinoma who initially developed stereotypical behaviors and then progressed to more complex behaviors occurring early in the morning such as sudden laughing, clapping of hands, and crossing one leg over the other in an odd and strange manner. Laboratory studies revealed hypoglycemia with a fasting blood glucose of 0.83 mmol/L (15 mg/dL). Another case reported by Lysenko et al^[4] involved a patient with type 2 diabetes diagnosed with hypoglycemia and obstructive sleep apnea (OSA). Her medication regimen consisted of 28 IU of insulin glargine once a day, 500 mg of metformin twice a day, and 4 mg of glimepiride before breakfast and 2 mg before dinner. She was seen ripping things off the ceiling and walls, such as blinds, pictures, light bulbs, and fixtures, and destroying the TV, among other erratic behaviors. The serum glucose level was 1.94 mmol/L (35 mg/dL) at that time. After adjusting her medication dosage to 14 IU of insulin glargine once a day, 500 mg of metformin twice a day, and 4 mg of glimepiride before breakfast, no additional episodes occurred during 1-year follow-up.

These cases demonstrate that hypoglycemia is one of the most important causes of abnormal nocturnal behavior. The present case was initially misdiagnosed as nighttime epilepsy or a sleep disorder, such as sleepwalking or REM sleep behavior disorder.

Abnormal nocturnal behavior can be caused by various conditions,^[5] including primary sleep disorder, nocturnal seizures, and underlying medical or neurological disorders. These can be differentiated by the clinical presentation, associated medical conditions, and PSG with extended EEG.

Autosomal dominant nocturnal frontal lobe epilepsy (AND-FLE) is an epileptic disorder that causes frequent violent seizures

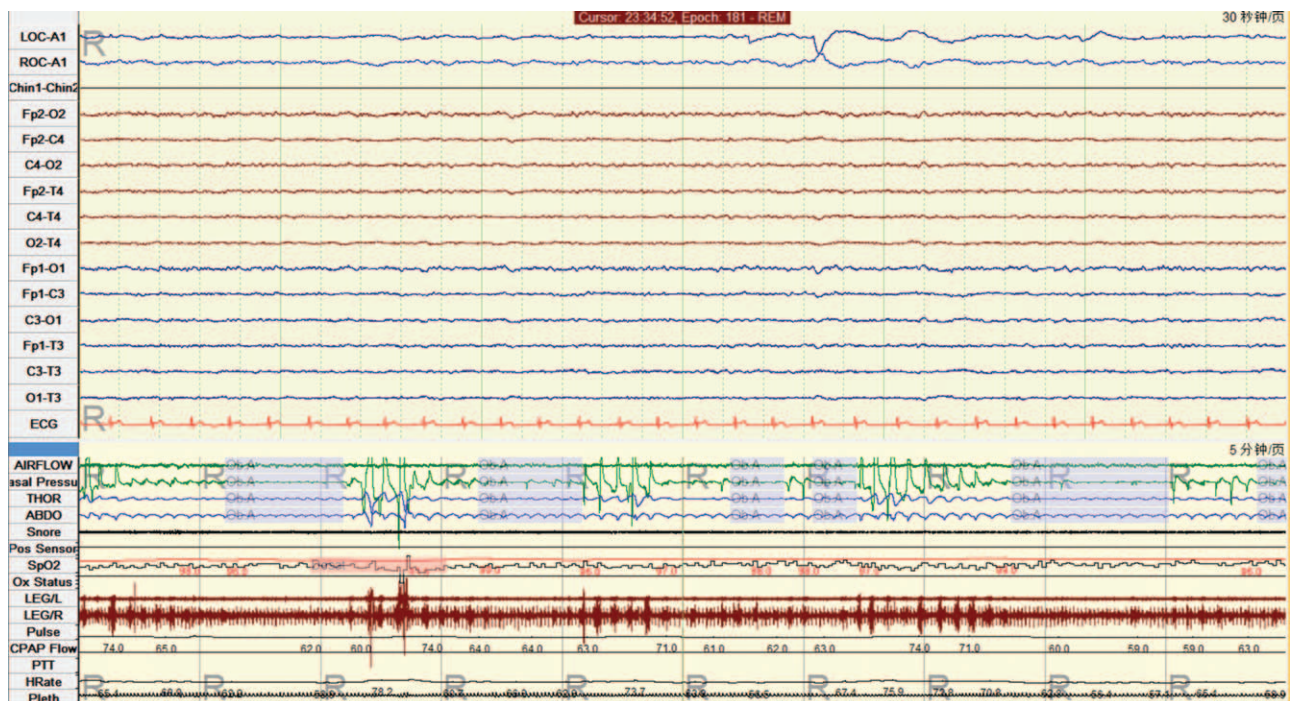


Figure 1. Polysomnogram obtained during the REM sleep stage. There were no signs of any abnormal behavior in this stage.

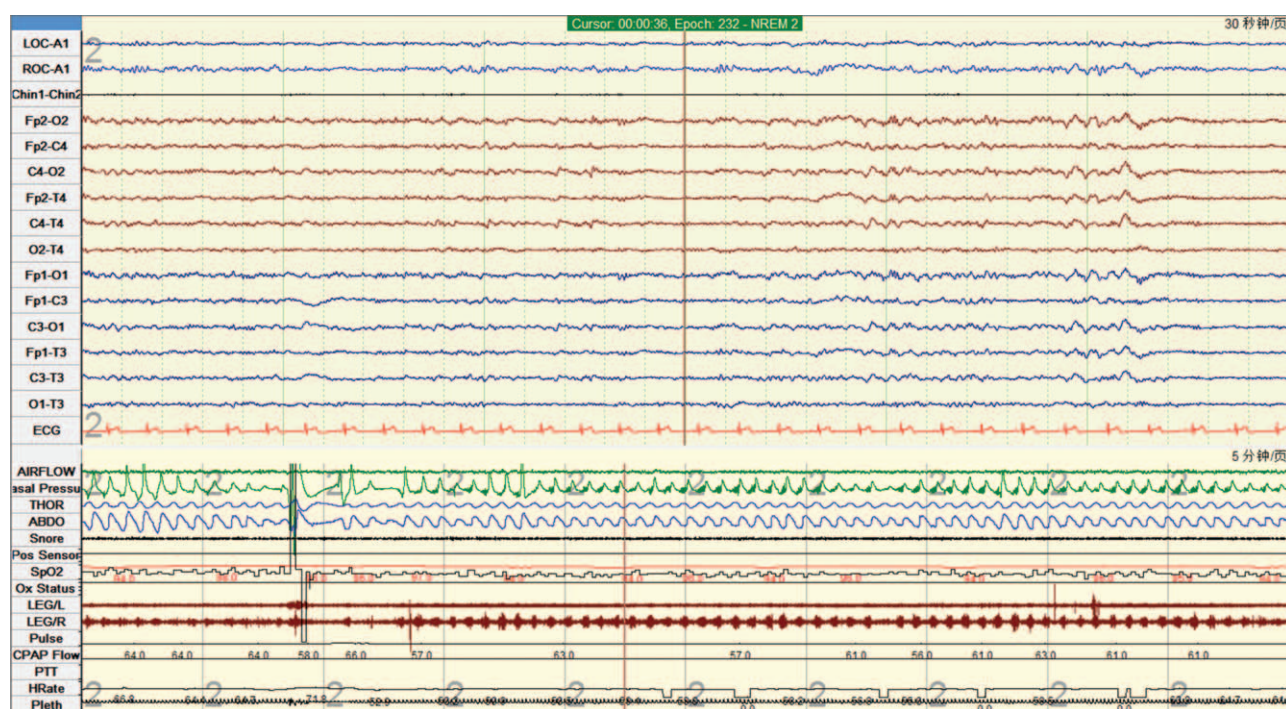


Figure 2. Polysomnogram obtained during the NREM sleep stage. There were no signs of any abnormal behavior in this stage.

during sleep.^[6] These seizures often involve complex motor movements, such as hand clenching, arm raising or lowering, and knee bending. Vocalizations, such as shouting, moaning, or crying, are also common. A diagnosis of nightmares, night terrors, parasomnias, or various other psychiatric disorders is often initially incorrectly made. EEG and PSG may show epileptic discharge in unilateral or bilateral frontal, frontal-central, frontal-temporal, or temporal area, or an increase in slow waves. ANDFLE usually occurs during NREM II sleep stage. This patient did not display typical manifestations of ANDFLE. In addition, the PSG did not show any abnormalities during NREM II sleep stage.

Sleepwalking usually occurs during the ages of 4 to 8 years. Sleepwalking episodes typically begin as confusional arousal.^[7] They can also begin with the individual immediately leaving the bed and walking or even “bolting” from the bed and running. The sleepwalking individual is disoriented in terms of both time and place, with slow speech, severely diminished mentation, and blunted responses to questions or requests. Almost all of the episodes occur during the NREM 3 sleep stage. The PSG shows high amplitude slow waves during the NREM 3 sleep stage.^[8] However, our patient did not manifest with these abnormalities.

RBD^[9] is characterized by abnormal behaviors emerging during REM sleep that may cause injury or sleep disruption. RBD is also associated with EMG abnormalities during REM sleep. The EMG demonstrates an excess of muscle tone during REM sleep, and/or an excess of phasic EMG twitch activity during REM sleep. However, the REM sleep stage of this patient was normal.

In summary, palpitations, dizziness, and cold sweats are common manifestations of hypoglycemia. Some other symptoms such as mental disorder or abnormal behavior are atypical, which may lead to a misdiagnosis of epilepsy, infarction, or mental disorder, among others.^[10] For physicians, if the cause of

abnormal behavior cannot be detected, hypoglycemia should be suspected. Long-term persistent hypoglycemia may cause brain dysfunction and even result in permanent brain damage. This study has a limitation. As nocturnal mental disorders caused by hypoglycemia are not common, we have only studied 1 case and cannot comprehensively summarize the common characteristics of this kind of disease. Therefore, we look forward to further studies with a larger sample size in the future.

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