



Addiction to hypoglycemia: A case report

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Abstract

We describe an interesting case of an antisocial type I diabetic with a history of polysubstance abuse who focused on intoxication by means of inducing hypoglycemia on a nearly daily basis. He modified caloric intake, exercised excessively, and abused insulin, requiring multiple psychiatric hospitalizations over the course of four years. His behavior towards hypoglycemia mimicked that seen in substance-related and addictive disorders, suggesting shared pathology. His case highlights the addictive potential of hypoglycemia, causing one to question how glucose homeostasis might affect reward pathways associated with addiction.

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Introduction

Management of type 1 diabetes is often a challenge for both patients and physicians. Patients must juggle monitoring of caloric intake and blood glucose, modification of physical activity, and changing insulin regimens. The goal of these efforts is to promote and maintain euglycemia, as both hyperglycemia and hypoglycemia may result in serious adverse effects. While reports of unpleasant symptoms of hypoglycemia are prevalent in the medical literature, scholars give less attention to the euphoria, pleasure, and out-of-body experiences that may occur during hypoglycemic episodes [1,2]. Previously, patients described these symptoms as similar to the effects of alcohol or drug intoxication [1,3]. Furthermore, studies suggest that acute insulin surges possibly lead to increased dopamine release in the ventral tegmental area, also similar to intoxication⁴. Taking into account the potentially reinforcing positive symptoms as well

as involvement with the dopamine reward pathway, one could conclude that addiction to a hypoglycemic state is conceivable. Five case reports exist in the literature describing patients seemingly addicted to hypoglycemia [1,3,5,7]. One of these case reports introduces a patient with “a pathological dependence on insulin, similar to that of drug addiction, with inability to refrain from inducing hypoglycemia” [6]. All patients had comorbid psychiatric disease, substance abuse, or both, emphasizing the importance of psychiatric evaluation in such cases [1,3,5,8]. Below, we report on a case of a patient with insulin-dependent diabetes mellitus, antisocial personality disorder, and opioid, benzodiazepine, cocaine, amphetamine, and tobacco use disorders who appeared to be addicted to hypoglycemia and who was difficult to manage due to his noncompliance with diabetic treatment.



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Case presentation

The patient was first admitted to the state hospital at the age of 25 on a forensic court order due to a charge of terroristic threatening. He had a history of self-harming and impulsive behaviors, abuse of various drugs, including opiates, cocaine, and methamphetamine, and type I diabetes mellitus diagnosed at age 12. His initial management proved difficult due to his lack of willingness to comply with standard diabetic care despite having good insight into his diabetic condition. He ate only small portions at scheduled mealtimes but often complained to staff of hunger and requested high-carbohydrate foods between meals. On several occasions, staff found him sneaking and hoarding sweets and high-carbohydrate snacks. His blood glucose levels were often elevated and difficult to control. In addition to diabetic mal-management, he also demonstrated persistent drug-seeking behaviors.

One year later, he was admitted again to the state hospital on another forensic court order for a charge of theft. During this second admission, he continued to seek out and hoard high-sugar and high-carbohydrate snacks. He exercised frequently, despite redirection. His blood sugars ranged from 40 to 400 mg/dL on an almost daily basis. During one hypoglycemic episode, he refused to receive glucose gel or drink juice.

After his second admission, he was re-hospitalized as a forensic patient multiple times due to noncompliance with treatment, such as failure to comply with diabetic management and related behavioral issues. On his third admission, outside reports stated that he obsessively minimized caloric intake and often took insulin but refused to eat, resulting in hypoglycemia. On his fourth admission, caregivers reported that he abused over-the-counter medications, ate sugar packets to inflate his blood sugar, took insulin at inappropriate times, and attempted to steal syringes. They described an episode in which his blood sugar dropped to 35 mg/dL, and he refused to eat or take prescribed medications.

During his sixth admission, he demonstrated these same behaviors under our care: he refused to finish his meals, continued to demand insulin, and over-exercised. He walked the hallways for up to fourteen hours per day. He continued his drug-seeking behaviors; he bargained with other patients for nicotine patches, chewed nicotine patches, and snorted crushed nicotine lozenges. He was skillful and tactful in his attempts to obtain various medications, often appearing sincere initially, and later becoming agitated when his immediate desires were not met. He received venlafaxine after endorsing symptoms of depression, but later attempted to snort the medication as well, leading to discontinuation. After several unsuccessful efforts to abuse multiple medications, he began to focus adamantly on inducing hypoglycemia (Table 1). In order to attain the rapid blood glucose drops seen in Table 1, the patient binged carbohydrate-laden foods stolen from peers or out of the trashcan to spike his blood glucose high enough to warrant insulin, then began to walk, run, or perform pushups or squats. When he reached his hypoglycemic goal, he appeared intoxicated. He spoke slowly, slurred words, made odd comments, and became flirtatious or overtly sexual. During one hypoglycemic episode, he told the physician that hypoglycemia felt “like being on LSD.” At times, he actively avoided finger-stick glucose measurements when he perceived his glucose to be low. He had multiple finger-stick blood glucose values below 30 mg/dL. His lowest blood glucose value was 19 mg/dL, during which he suffered a hypoglycemia-induced seizure and became unresponsive. With many of these

low values, he refused life-saving interventions: he spat out orange juice, refused to take glucose gel, and pulled his arm away while nurses attempted to administer a glucagon injection. However, the patient adamantly denied suicidal intent for these episodes or other suicidal ideation. Intramuscular glucagon injection became first-line for treating his hypoglycemia. Of note, various insulin regimens were prescribed in attempts to manage his drastically fluctuating blood glucose levels, but he continued to manipulate the values with the above-mentioned tactics. His regimen at that time included sliding scale insulin and insulin glargine.

His rigorous efforts to maintain hypoglycemia included accusations against his care team. He argued that checking his blood glucose at unscheduled times was “unfair” and frequently blamed his hypoglycemia on staff, claiming he was not being fed enough despite not eating all of his meals. He voiced understanding of his diabetic condition and even reported many negative aspects of hypoglycemia. He expressed interest in and knowledge of the mechanisms of action of his medications. His intellect showed us that he was capable of managing his own diabetic care, while his behavior proved otherwise. His impulsivity, deceitfulness, and manipulative tendencies eventually led to a diagnosis of antisocial personality disorder. The seriousness of his diabetic condition and his refusal to appropriately participate in his management made it increasingly difficult to care for him.

Discussion & conclusions

This report details the case of a young man with antisocial personality disorder, a history of abuse of various illicit substances, and type 1 diabetes mellitus whose behavior concerning hypoglycemia most closely met the DSM-V criteria for other (or unknown) substance use disorder. However, hypoglycemia is not a substance but the result of patient behavior. While insulin abuse could be classified as substance use, we do not believe this patient’s problem resulted from insulin abuse alone—he also modified his caloric intake and excessively exercised in order to achieve hypoglycemia. In addition, the effects of drastically deescalating from a very high glucose level to a very low glucose level (Table 1) were particularly reinforcing for him. As mentioned by Scaramuzza et al. [6], drastic drops in blood glucose over a short period of time can accentuate the intoxicating effects more than less extreme changes in glucose levels.

Despite numerous interventions and behavioral plans, an intelligent patient capable of understanding diabetic management, and many promises by the patient to engage in improved behaviors, he did not adhere to his diabetic care. While we must consider that his comorbid antisocial personality disorder and defiant attitude contributed to his noncompliance, his presentation is likely multifactorial. Based on our patient’s history of polysubstance abuse, his comparison of hypoglycemia to hallucinogen intoxication, his lack of suicidal intent, and years of observation and documentation, we postulate that his addiction stems from a desperate desire to alter his cognitive state. Hypoglycemia may not have been his preferred method, but after several failed attempts at more desirable options and his limitations within a controlled setting, hypoglycemia became his only means of intoxication. In conclusion, we would not only be interested in other instances of intoxication via hypoglycemia but in further research into the role of glucose homeostasis on the reward pathway as a mechanism of contributing to addiction to hypoglycemia.

Tables

Table 1: Variation in patient's finger stick blood glucose (FSBS) values during admission six

Sample Day	Time	FSBS (mg/dL)
1	06:16	581*
	09:43	568*
	10:33	470*
	11:50	338*
	12:19	284*
	14:04	87
	17:04	40
2	11:49	474*
	16:20	45
3	06:15	311*
	11:27	29**
4	11:33	350*
	14:19	36
5	11:38	346*
	12:33	295
	15:49	26**

*insulin administered

**glucagon administered

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