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MDPI

Case Report

Insulin-Related Suicide Attempt in Non-Diabetic Pediatric Patient

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Abstract: Insulin analogs are basic drugs that are widely used in the treatment of diabetes around the world. Suicides with their use are described as rare, occurring mainly in the population of diabetic patients due to their easy access to the drug and knowledge of its properties. Among non-diabetic people, insulin is used for suicidal purposes mainly by adults with medical education. A case of a 15-year-old girl found unconscious by her mother at night was described. The patient was immediately transported to the hospital, where she was diagnosed with her first severe hypoglycemic episode of unknown origin. Once conscious and in a better state, the patient admitted to having taken insulin, which she had stolen from her diabetic mother, for suicidal purposes. The patient had no history of mental illness or self-destructive behavior. The patient was referred to psychiatric care. Suicides and suicide attempts involving insulin are usually observed among people with chronic diabetes. Moreover, such attempts are made by adults who know the mechanism of action of the drug. In the pediatric group without diabetes, such cases are extremely rare. Additionally, the issue of similar behaviors becomes very important due to the increasing popularity and availability of insulin therapy and the possibilities of obtaining information about using it to commit suicide from the Internet. Particular vigilance is required in pediatric emergency departments when a patient is identified as having a first episode of severe hypoglycemia of unknown origin.

Keywords: insulin; suicide attempt; overdose; non-diabetic

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1. Introduction

Insulin is one of the fundamental hormones in the body that regulates carbohydrate metabolism [1]. Its isolation and a laboratory synthesis of its analogs along with their introduction to the pharmaceutical market were groundbreaking moments in the treatment of diabetes [2]. Already, just a few years after the introduction of insulin preparations into therapy, first cases of its effective application for suicidal purposes were reported [3]. Insulin intake exceeding the recommended therapeutic dose calculated on the basis of needs will cause hypoglycemia, which, depending on the severity, may lead to coma, neurological deficits or, in extreme cases, death [4]. However, among people not suffering from diabetes, suicide attempts with the use of insulin are rare, due to its restricted availability and the requirement of medical knowledge of insulin mode of action [5].

2. Case Report

In September, a non-diabetic 15-year-old girl was found unconscious by her mother at night with 'wheezing' breath. The examination performed by an emergency medical team declared no pupil reaction to light, while a portable glucometer assessed the glucose concentration to be 14 mg/dL. The patient, in serious condition, was transported to the diabetology ward, where an infusion of 10% glucose was administered. In the hospital, a thorough physical examination revealed minor bruises, petechiae and puncture marks on the skin of the abdomen, and swelling of the lower limbs. Apart from hypoglycemia,

laboratory tests found severe electrolyte disturbances: hyponatremia (93 mmol/L), hypokalemia (2.71 mmol/L), hypocalcemia (1.26 mmol/L), hypermagnesemia (10.4 mmol/L), and the concentration of insulin exceeding the measurement scale (>300 IU/mL), with C-peptide undeterminable. An intravenous infusion of 10% glucose was maintained, while intravenous antibiotic therapy, dexamethasone and acyclovir, was added to prevent neuroinfections, which should also be included in the differential diagnosis due to similar symptoms, including impaired consciousness and neurological symptoms, occurring especially in the acute phase. Control CT of the head and USG of the abdominal cavity were performed. On the following day, the patient regained consciousness; she was oriented auto- and allopsychically. In further interview, the patient admitted to having deliberately taken an excessive dose of insulin for suicidal purposes, which she had taken from her mother, who suffers from type 1 diabetes. On the third day, after normalization of her general condition, the patient, who had no mental illness in her medical history, was transferred to the psychiatry ward for children and adolescents. A thorough psychiatric examination revealed depressed mood and fading, poorly modulated emotions. In the ward, the patient avoided talking about the suicide attempt; she denied having suicidal thoughts and intentions. During the interviews, the patient did not admit where she obtained the information regarding the use of insulin for suicide purposes or why she decided to use this exact drug. The basic information about the drug probably came from a family member taking it on a daily basis. It cannot also be ruled out that the information regarding its use for suicide purposes came from the Internet. She disclaimed hallucinations and did not utter delusional sentences. She reported having a depressed mood for several months, as well as sleep problems, anhedonia, difficulty in concentrating, and thoughts of death. Sertraline treatment was applied, which was later successfully changed to venlafaxine, which lacks the troublesome hand tremor side effect. During the 104-day hospitalization, the patient received psychological support as part of crisis interventions and family consultations were conducted. After 14 weeks, the patient was discharged from the hospital in good general condition, with a consistent mood, denying suicidal thoughts and intentions. The venlafaxine treatment continued at home at 75 mg twice a day. Additionally, the patient remained under the care of a psychiatrist on an outpatient basis. Individual and family psychotherapy was also recommended.

3. Discussion

A decrease in plasma glucose below 70 mg/dL is called hypoglycemia [6]. In the pediatric population, normal blood glucose levels and thus levels that define hypoglycemia may vary with age [7]. Clinically significant hypoglycemia is diagnosed when glucose levels fall below 54 mg/dL [8]. Its most common causes include, among others, a decrease in endogenous glucose production after alcohol consumption, taking an excessive dose of a hypoglycemic drug, excessive ectopic insulin production, or a disorder of mechanisms controlling its secretion [9]. The typical symptoms of hypoglycemia (weakness, tachycardia, confusion, etc.) are the result of the release of glucagon and adrenaline, as well as too little glucose supply to the brain [8,10]. The patient's glucose level of 14 md/dL, in combination with alarming clinical symptoms and loss of consciousness requiring assistance from another person and parenteral glucose administration, is classified as severe hypoglycemia, which is a life-threatening emergency [8,9]. In such a situation, an immediate treatment with glucose infusion is necessary [6,9]. The first episode of hypoglycemia of unknown origin, especially in people with undiagnosed diabetes, requires detailed diagnostics in order to determine the cause. Hypoglycemic endocrinopathies work by two main mechanisms—by excessive insulin production (e.g., insulinoma, nesidioblastoma, congenital hyperinsulinism) or by reducing the amount of counterregulatory hormones released in case of hypoglycemia (e.g., adrenal cortex or pituitary insufficiency) [8]. Insulin retention associated with renal failure is also significant [8]. Moreover, the differential diagnosis should also exclude other emergencies involving loss of consciousness and neurological symptoms that hypoglycemia may mimic. These may include, e.g., stroke or

neuroinfections. Severe hypoglycemia can also be triggered by intentionally overdosing on insulin [11–14]. It is not common among children to choose poisoning as a suicide method, and using such methods for suicide requires special knowledge and action planning [15]. This is usually explained by the lack of necessary knowledge about the action of drugs and related substances. In the general population, suicides related to insulin overdose are rare [16,17]. They usually concern diabetic patients, who take insulin on a regular basis, or people with medical education and easier access to the drug [16,18,19]. Suicide attempts are much more common among the diabetic population due to the higher risk of depression caused by a chronic disease, access to the drug, and awareness of its properties and the potential aftermath of taking an excessive dose [5,17,20]. In rare cases of suicide attempts by non-diabetic people, the drug is usually obtained from a medically associated workplace, or by stealing it from a relative [11,17]. In the described case, the source of insulin was the patient's diabetic mother; however, it is unclear how the unqualified child learnt that the drug can be used for suicidal purposes, and why they chose to do so. It is possible that it is a result of incorrectly conducted education by the mother regarding her disease. Moreover, another source where information about suicide methods is easily available is the Internet, which is regularly used by young people. Furthermore, in the case of insulin, information on the mechanism of action and dose is important, as well as information on the route of administration for the drug to develop its effect. In the case of suspected suicidal insulin ingestion, it is crucial to inspect the scene for syringes, needles, or other devices allowing one to administer the insulin [16,17]. Research conducted on the pediatric population in Poland has shown that in the 15–19-year age group, boys commit suicide more than five times more often. Additionally, seasonal variability is observed, with a slight increase in the frequency of suicides in this group in spring. Among girls aged up to 19, the most common suicide method is hanging, accounting for over 60% of suicides. The next two commonly used means are poisoning and falling from a height, which account for approximately 15% and 10% of cases, respectively [15]. Additionally, studies conducted in the United States have shown that girls are significantly more likely to choose poisoning or overdose as a suicide method than boys [21]. Moreover, in the pediatric population, suicide attempts usually occur in the home or apartment [15]. The physical examination may reveal an exceptionally pronounced puncture mark, which could occur as a result of inexperienced self-administration performance [16,22]. The places where insulin is most often injected subcutaneously are the abdomen and the skin of the thigh. Determining the concentration of insulin and C-peptide in the blood also plays an important role [4,5,16]. Physiologically, proinsulin breaks down into one molecule of insulin and one molecule of C-peptide; however, due to the longer half-life of C-peptide, the ratio of C-peptide to insulin in the blood exceeds 1, ranging from 3:1 to 10:1 [5,23]. Taking exogenous insulin causes an increase in its concentration in the blood and a decrease in its secretion, which leads to a decrease in the concentration of C-peptide; therefore, its ratio to insulin falls below 1 [5]. Determining and evaluating the C-peptide/insulin ratio is the primary method of differentiating an exogenous insulin overdose from an oversecretion of insulin by the body [5]. Additionally, there are reports indicating the possibility of determining insulin analogs in blood collected postmortem [14,24]. Electrolyte disturbances also require careful analysis. The patient's hypokalemia, hyponatremia, hypophosphatemia, and hypomagnesemia are typical electrolyte shifts in hyperinsulinemia [10]. In addition, taking too much insulin may lead to thromboembolic complications resulting from insulin crystallization in the vessels and the activation of coagulation cascades [10]. The time of onset of symptoms and their duration are closely connected to the type of the analog taken [5]. It should also be considered that insulin may be administered by a third party in an attempt of murder [25–28]. The literature also describes cases of insulin administration to relatives by people suffering from Munchausen by proxy syndrome [4,29].

4. Conclusions

In cases of severe hypoglycemia of unknown origin, the suspicion of intentional insulin overdose should always be considered, even in patients not taking insulin routinely for diabetes therapy. In order to confirm the diagnosis, apart from a thorough physical examination and assessment of the basic parameters of carbohydrate and electrolyte metabolism, it is also important to determine the concentrations of insulin and C-peptide in a patient's blood. Another important aspect is checking the patient's detailed medical history in order to obtain information on potential mental disorders and previous suicide attempts. A lack of information on previous suicide attempts, like in the described case, should not rule out intentional insulin overdose. In many cases, however, information about the event can be obtained during an interview with the patient after regaining consciousness. During medical reconnaissance, it should be assessed whether the patient had the opportunity to obtain insulin from their environment, e.g., from diabetic relatives. Severe hypoglycemia is an acute condition that requires immediate intervention; however, if it is induced intentionally, it also calls for referral to a psychiatric consultation after normalization of the patient's metabolic status.

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