Hypoglycemia Caused by Endogenous Hyperinsulinism: A Case Study

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ABSTRACT

Hypoglycemia in the absence of diabetes mellitus in a healthy individual needs' evaluation. We report a case of 45 years old female who presented with restlessness, anxiety, palpitations, excessive sweating followed by dizziness, and tremors in her hand. Eating sugar or consuming glucose water alleviated symptoms. During one such episode, the patient was taken to a nearby clinic and her capillary blood glucose was 43 mg/dl. The patient was admitted for the 72 hours supervised fast after ruling out other systemic causes of hypoglycemia. Evaluation of critical sample showed elevated levels of insulin, c-peptide, proinsulin, as well as a decreased value of beta-hydroxybutyrate and a negative urine screen for oral anti-diabetic agents, a diagnosis of endogenous hyperinsulinism, was made.

Keywords: Endogenous hyperinsulinism, Hypoglycemia, Non-diabetic, 72-hour supervised fast.

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I. INTRODUCTION

Hypoglycemia (glucose < 55 mg/dl) is rare in otherwise healthy adults, as well as in people who are not being treated for diabetes. Before beginning a hypoglycemia assessment, the Whipple's triad, which includes low plasma glucose concentration, clinical signs or symptoms associated with hypoglycemia, and resolution of signs and symptoms as plasma glucose concentration rises, should be recorded [1]-[3]. When signs appear, testing should be performed as soon as possible, aided by blood tests at the time of hypoglycemia to determine the etiology in cases where there is no illness or medication as a cause. A prolonged supervised fast test or mixed meal test can be performed to determine etiology. Hypoglycemia treatment should be specific to the underlying cause and may include nutritional, medical, and/or surgical interventions.

We report a case of hypoglycemia due to endogenous hyperinsulinism in a patient with no other systemic illness or medications as a known cause of hypoglycemia.

II. CASE REPORT

A 45 year old female non-alcoholic, non-diabetic presented with restlessness, anxiety, palpitations, excessive sweating followed by dizziness, and tremors in hand. Eating sugar or consuming glucose water alleviated symptoms. On further questioning patient experiences similar episodes one or two times per day for 1 month. During one such episode, the patient had a history of slurred speech followed by altered sensorium. She was taken to a nearby clinic and her capillary blood glucose was 43 mg/dl recorded on a glucometer. She was administered 25% intravenous glucose. She regained consciousness and her slurring of speech disappeared. Most of the episodes have occurred early morning 8-9 hours after the last meal and 3 episodes in the evening 8 hours after the last meal. No history was suggestive of chronic liver disease, renal disease, or any other systemic illness. She was not on any medications and had no history of any surgery. There is no history of pain in the abdomen, vomiting, or increased pigmentation of skin or mucosa. No history of acral enlargement, coarsening of facial features, galactorrhea,

menstrual irregularities. No history of recurrent renal stones or fragility fractures. No family history of similar complaints. No social or psychiatric issues. She has a body mass index of 25.2 kg/m². She was normotensive and did not have acanthosis nigricans. Her routine blood parameters were within the normal range for liver and renal function tests. Her 8.00 am serum cortisol was 14 mcg/dL. The patient underwent a 72-hour fasting test. She had an episode of hypoglycemia at the 9th hour of fasting, blood glucose measured by glucometer was 42 mg/dL. Critical sample was taken and sent for analysis (Table I).

TABLE I: CRITICAL SAMPLE RESULTS

Parameter	Patient 72-hour fasting test result	Endogenous Hyperinsulinism
Blood glucose mg/dL	38	< 55
Insulin (μU/mL)	6.5	≥ 3
Proinsulin (pmol/L)	5.7	≥ 5
C-peptide (ng/mL)	3	≥ 0.2
Beta hydroxybutyrate (mmol/L)	0.5	≤ 2.7
Urine screen for oral antidiabetic drugs	Negative	Negative

Plasma glucose increased to 87 mg/dL 30 minutes after glucagon administration, an increase of more than 25 mg/dL. Anti-insulin antibodies were negative. Insulinoma was suspected, so imaging tests for localization were ordered. Imaging tests, such as abdominal computed tomography, and magnetic resonance imaging, however, failed to detect pancreatic lesions. Our being a charitable tertiary hospital octreotide scintigraphy could not be afforded. Our patient was apprehensive about undergoing invasive procedures like endoscopic ultrasonography, selective arterial calcium stimulation tests. She chose conservative medical treatment in conjunction with dietary changes. She was started on tablet diazoxide 150 mg per day. The patient maintained fasting blood glucose values of 79-92 mg/dL and a postprandial glycemia of 108-135 mg/dL. The patient's blood pressure remains normal, and no diazoxide-related side effects were reported.

III. DISCUSSION

Endogenous hyperinsulinism induced hypoglycemia is a category of clinically, genetically, and histologically diverse disorders marked by improper insulin secretion from pancreatic cells in the presence of low blood glucose levels [4]. Hypoglycemia in a non-diabetic healthy patient is normally caused by various etiologies. Endogenous hyperinsulinism caused by insulinoma, functional beta-cell disorders, or insulin autoimmune conditions are all possibilities in these individuals. Drugs, such as glucose-lowering agents like sulphonylureas, insulin, and meglitinides, are the most common cause of hypoglycemia. Hypoglycemia has been linked to nonselective beta-blockers, pentamidine, quinolones, gatifloxacin, and even ACE inhibitors [5], [6]. Our patient was not on any medications. Hypoglycemia can result from a lack of counter-regulatory hormones. Hypoglycemia can be caused by any condition that causes ACTH deficiency or directly interferes with cortisol secretion. Cortisol levels greater than 18 mcg/dL in the morning predict a normal response, and no further testing is

required. Cortisol levels below 5 mcg/dL, on the other hand, are indicative of adrenal insufficiency [7]. Our patient had a basal cortisol value of 14 mcg/dL. Hypoglycemia is common in the setting of critical illness, sepsis, and organ failure, and it is associated with excess glucose utilization that exceeds production in the absence of exogenous insulin treatment [8], [9]. Hepatic, renal, and cardiac failure can result in hypoglycemia because of rapid and massive hepatic destruction, decreased renal gluconeogenesis, decreased clearance of insulin, and decreased calorie intake respectively [10]-[12]. Our patient did not have any of the above clinical conditions. Malnutrition can result in hypoglycemia due to a lack of substrates for gluconeogenesis and glycogenolysis [13]. Our patient was not malnourished and had not undergone any bariatric surgery for obesity [14]. Reactive hypoglycemia is primarily due to abnormal transport of food to the small intestine [15]. Insulin autoimmune syndrome, also known as Hirata's disease, is distinguished by the presence of antibodies to insulin and/or proinsulin or insulin receptor [16]. Endogenous hyperinsulinemia is a rare cause of hypoglycemia that can be caused by insulinoma or pancreatic islet nesidioblastosis. Insulinoma primarily causes hypoglycemia while fasting, but it can also cause symptoms in the fed state. Insulin, c-peptide, and proinsulin levels are elevated during hypoglycemia, while beta-hydroxybutyrate levels are low. Our patient had similar outcomes when evaluated using gold standard the 72-hour fast test. Nesidioblastosis, which is characterized by islet hypertrophy, hyperplasia, and enlarged and hyperchromatic beta-cell nuclei, causes postprandial hypoglycemia [17]. Hypoglycemia is linked to decreased endogenous insulin secretion and increased glucose consumption by tumors in patients with non-islet cell tumors [18]. The emphasis of immediate care should be on reversing hypoglycemia. Dietary changes, medical management with alpha-glucosidase inhibitors, calcium-channel blockers, diazoxide, or somatostatin analogs, and eventually surgical resection of the cause should all be adapted to the particular hypoglycemia condition. The patient's normoglycemia was re-established and sustained with diazoxide and dietary advice.

IV. CONCLUSION

Hypoglycemia in healthy people is uncommon, and it should be investigated thoroughly. There are only a few cases of adults receiving medical attention for endogenous hyperinsulinism. This clinical case demonstrates that diazoxide can successfully treat adult endogenous hyperinsulinism with few side effects, making it a viable alternative to pancreatic surgery.

CONFLICT OF INTEREST

All authors declare there is no conflict of interest.

CONSENT

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.