

Ketoacidosis in a Non-Diabetic Adult With Chronic EtOH Consumption

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Abstract

Although much more rare than its diabetic counterpart, ketoacidosis secondary to alcohol withdrawal in the context of fasting has its own complex pathophysiology and can easily mimic the acute insulin deficiency presentation. We present here a rare case of a non-diabetic alcoholic patient who presented in ketoacidosis after a period of reduced intake.

Keywords: Ketoacidosis; Non-diabetic ketoacidosis; Fatty acids; Re-feeding syndrome

Introduction

Ketoacidosis has been well recognized in the diabetic population as one of the most common endocrinologic emergencies. However, various other etiologies, although described in theory, are disregarded clinically as they appeared to be rare which could alter management and lead to unnecessary interventions. A few cases of non-diabetic ketoacidosis have recently been documented in lactating women with low carbohydrate diets as galactopoiesis further depletes energy stores [1]. A case of severe ketoacidosis was also reported in a pregnant woman following an asthma attack with aggravation of acidosis following beta agonist and steroids administration [2]. Low-carbohydrate diets which have regained popularity have been described as an important risk factor for ketoacidosis when combined with state of increased energy demand [3], suggesting once again that additional stressors can aggravate our physiological response to low energy intake and transform ketosis into severe ketoacidosis.

We present here a case of a 67-year-old non-diabetic wom-

an with chronic EtOH consumption who presented with alteration of consciousness secondary to a particular instance of multifactorial ketoacidosis. Etiologies including acute fasting on chronic malnutrition and alcohol withdrawal were thought to be contributory to the case.

Case Report

A 67-year-old Caucasian woman presented to our emergency room with alteration of mental status. She was found on the floor of her apartment, confused without apparent head trauma and no documented loss of consciousness. She admitted chronic alcohol consumption. Her main medical conditions included chronic obstructive lung disease, hypertension, hypothyroidism, major depressive disorder and anxiety.

On presentation, she was difficult to arouse, disoriented and showed an important decrease in attention span. She was mildly tachycardic, normotensive, and tachypneic. Her temperature was 37.5 °C rectally. Physical examination was unremarkable. Initial arterial blood gas showed a high anion gap metabolic acidosis (pH 7.23, pCO₂ 16 mm Hg, HCO₃ 7 mmol/L, anion gap 45, and lactate 1.0 mmol/L). Her serum glucose at presentation was 12.9 mmol/L and her B-hydroxybutyrate was 7.88 mmol/L. Ketones were present in the urine while glucose was not. Toxicological serum studies did not reveal any acute intoxication. Mild elevation in her liver function tests was noted initially (AST 92 U/L, ALT 56 U/L, and total bilirubin 24 µmol/L) which normalized few days later. Her pancreatic function tests remained benign. Electrolytes imbalances at presentation included hyponatremia (132 mmol/L), hypokalemia (3.0 mmol/L), hypochloremia (84 mmol/L) and hypophosphatemia (0.3 mmol/L).

The patient's presentation was suggestive of a ketoacidosis, while it was still unclear if she was an undiagnosed diabetic. Initial management included insulin and dextrose 10% perfusion (with fluid repletion, thiamine, and electrolytes replacement). Further laboratory investigation revealed an HbA1c of 5.13% and rapid normalization of glycemia, excluding a diagnosis of late-onset type 1 diabetes, idiopathic type 1b diabetes (ketosis-prone diabetes), or new type 2 diabetes. The patient's metabolic abnormalities quickly corrected and she did not require further insulin. Her 3-week stay at the hospital was complicated by a Takotsubo cardiomyopathy from which she recovered following supportive management.

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Discussion

As described in the literature, the low insulin to glucagon ratio seen in prolonged state of fasting favors catabolism of triglycerides from peripheral fat stores [4]. The fatty acid metabolites produced enter hepatocytes to be transformed into acetyl-CoA through beta-oxidation and preferably join the Krebs cycle to produce energy. When the latest is saturated, fatty acids accumulate and ketosis takes place. Furthermore, alcohol ingestion alone leads to production of acetaldehyde in liver cells as ethanol gets oxidized. Acetaldehyde is then further metabolized into acetate. The acetic acid has several possible biological fates including transformation into acetyl-CoA also contributing to a mild alcoholic ketosis. However, while alcohol increases acetaldehydes concentration, its metabolites also inhibit lipolysis which limits its effect on keto acids production [4-6].

As the acidosis progresses, the nausea, vomiting and abdominal pain preclude patients from drinking and eating. Once alcohol ingestion has subsided, lipolysis is disinhibited and fatty acids are available in larger quantities to hepatocytes for ketones bodies' production. The high levels of catecholamines and cortisol seen in response to the stress of withdrawal and volume depletion also contribute to the elevation of glucagon and encourage further lipolysis [4, 7]. This explains why alcohol withdrawal combined with fasting is associated with a more significant acidosis compared to alcohol ingestion. In fact, we think that the impressive ketogenesis observed in our patient was mainly the result of chronic low glycogen stores and high levels of insulin counter-regulatory hormones secondary to stress of withdrawal and dehydration. These counter-acting hormones (including insulin, glucagon and epinephrine) were not measured, except from an elevated morning cortisol of 873 nmol/L. In this case, the rapid clinical response to insulin and dextrose perfusion reinforced the etiology behind the high anion gap acidosis.

Dextrose and intravenous fluid repletion could be enough in patient with mild ketoacidosis as endogenous insulin is stimulated and its counter-regulatory hormones are inhibited [7]. On its own, correction of fluid depletion decreased the amount of circulatory catecholamines and glucagon, which ac-

celerates the correction of the acid-base imbalance. In more severe ketosis however, as in this severely malnourished patient, iatrogenic insulin can be necessary [5, 6].

Refeeding syndrome, being a frequent complication of fuels repletion in the malnourished population, was particularly dangerous in this alcoholic woman with chronic electrolytes deficiencies. The patient's depleted phosphate, magnesium and potassium stores were easily explained by her ketoacidosis, but could also be worsened by the rapid introduction of carbohydrates and insulin. With these electrolytes being low at presentation, our patient was at even bigger risk of refeeding syndrome and slower replacement was inappropriate given the important acid-base deficit. With decreased stores of thiamine and an albumin of 23 g/L, our patient was considered at high risk of refeeding syndrome and electrolytes were monitored closely during the first few days of replacement without significant adverse events.

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