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Case Report

METFORMIN INDUCED LACTIC ACIDOSIS AND ACUTE RENAL FAILURE

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Abstract
Metformin is a biguanide agent and oral antihyperglycemic agent used in the treatment of type 2 diabetes mellitus. Metformin-associated lactic acidosis and acute renal failure is a very rare but life-threatening side effect of metformin. We present the case of a nondiabetic 41 years old woman, who attempted to commit suicide by ingesting more than 20 grams of metformin. She presented with lactic acidosis and acute renal failure to the emergency department. She was successfully treated by hemodialysis. The main treatment method is hemodialysis who presents with lactic acidosis and acute renal failure in metformin intoxication.

Keywords: metformin, lactic acidosis, acute renal failure, intoxication

Introduction

Metformin is a biguanide oral antihyperglycemic agent. According to the American Diabetic Association and the European Association for the Study of Diabetes, it has been recommended as the first choice drug in patients diagnosed with type 2 diabetes[1]. Its mechanism is increasing the peripheral utilization of glucose, insulin sensitivity and decreasing gluconeogenesis in the liver. Metformin is cleared by tubular secretion and excreted unchanged in the urine. Renal dysfunction can result in an increased plasma concentration of the drug. Accumulation of this drug can increase serum lactate concentrations by decreasing gluconeogenesis. Lactic acidosis is a rare, but fatal side effect of metformin. Renal failure and acute overdose can facilitate lactate accumulation. The incidence of lactic acidosis is 3 per 100,000 patient-years [2]. We report a case of metformin-associated lactic acidosis due to metformin overdose in a nondiabetic patient who was successfully treated with hemodialysis.

Case

A 41-year-old woman admitted to emergency department with vomiting. She had attempted suicide by ingesting at least

20 g of metformin. On examination the patient was conscious and oriented, body temperature was 37,8°C.Her blood pressure was 120/80 mmHg, pulse rate was 90 beats/minute. Initial investigations revealed metabolic acidosis with hyperlactatemia and hypoglycemia (60 mg/dL) (Table 1). Sodium bicarbonate and dextrose were administered intravenously. Laboratory tests showed blood urea nitrogen (BUN) 15 mg/dL, serum creatinine 2.2 mg/dL, potassium 5.9 mg/dl, arterial blood pH 7.0, bicarbonate 8 mmol/L, lactate 9.7 mEq/L. Activated charcoal was administrated via a nasogastric tube. The patient received hemodialysis for 3.5 h in a bicarbonate bath of 35 mEq/L. Hemodialysis was continued until the serum bicarbonate, the lactic acid level was improved. Laboratory tests returned to normal values and no further dialysis treatment was required. The patients were discharged from the hospital. Psychiatric outpatient control was recommended.

Table 1. Laboratory parameters of patient

Parameters	Before Hemodialysis	After Hemodialysis
urea (mg/dl)	38	16
creatinine (mg/dl)	2.2	0.6
potassium (mEq/L)	5.9	4
pH	7.18	7.40
bicarbonate (mmol/L)	11	26
lactate (mEq/L)	9	0.8

Discussion

It was the most common used antidiabetic medication in the treatment of type 2 diabetes. Lactic acidosis is rare, but a life-threatening side effect of metformin. Metformin-associated lactic acidosis presents nonspecific symptoms such as somnolence, anorexia, nausea, vomiting and abdominal pain [3]. Hypotension, hypothermia, respiratory failure, and cardiac arrhythmia.can be also observed. Its mechanism is increasing the peripheral utilization of glucose and decreasing gluconeogenesis in the liver. Lactate, pyruvate, amino acid amounts increase due to suppression of gluconeogenesis. Metformin is cleared by tubular secretion and excreted unchanged in the urine. Plasma concentration of the drug increases in renal failure. Renal failure and acute overdose can cause lactate accumulation [4]. Lactic acidosis is classified into type A (anaerobic) and type B (aerobic). Type A is far more common and associated with hypoperfusion and hypoxia. Type B is secondary to increased lactate production or decreased lactate clearance [5]. Metformin has typically associated with type B lactic acidosis. Because metformin increases production of lactate and decreases the clearance of lactate so that lactic acid accumulates in the circulatory system.

Sodium bicarbonate may be considered in the treatment of acidosis. But it can increase intracellular acidosis and disrupt metabolic parameters. Hemodialysis has been used for clearing metformin from the body and correcting acidosis. Metformin binds high degree to proteins. That's why plasmapheresis can be used in certain intoxication cases. In conclusion, metformin intoxication should be considered in patients who have metabolic acidosis secondary to drug overdose for suicide. Hemodialysis is an effective method for the treatment of metformin-associated lactic acidosis.

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