Clinical Case Report

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Clinical analysis of hyperkalemia after esophagectomy

A case report

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Abstract

Rationale: The occurrence of hyperkalemia after esophagectomy is clinically rare. Patients who underwent esophagectomy often have a serum potassium level due to perioperative reduced intake, fluids loss, consumption and other reasons. These patients often require the artificial administration of potassium. Rapid fluid loss and physiological consumption lead to the deficiency of potassium, even hypokalemia. Patients often require the addition of a large amount of potassium after operation. The occurrence of hyperkalemia after esophagectomy is never been reported.

Patient concerns: The patient presented with continuous tachycardia, palpitations, chest tightness, progressive nausea, irritability, progressive myasthenia gravis.

Diagnoses: Hyperkalemia, sepsis, acidosis, diabetes, postoperative esophageal cancer.

Interventions: Prompt anti-infection treatment and the management of blood sugar, hemodialysis was performed to correct sthe acidosis and electrolyte disorder

Outcomes: All symptoms were alleviated.

Lessons : Therefore, there is a need to regularly test electrolytes, especially in patients with diabetes, as well as better blood glucose control. Attention should be paid to the potential of infection, and to avoiding ketoacidosis and risk of sepsis.

Abbreviations: AB = the actual bicarbonate concentration, ALT = alanine aminotransferase, AST = aspartate amino transferase, BE = buffer excess, CRE = creatinine, CT = computed tomography, ECG = electrocardiogram, GGT = glutamyltransferase, GLU = glucose, KET = ketone body, M. D. = Doctor of Medicine, NIT = nitrite, PCO2 = partial pressure of carbon dioxide in artery, PH = pH value, SB = standard bicarbonate concentration, SG = specific gravity, SPO2 = blood oxygen saturation, UREA = ureophil, WBC = white blood cells.

Keywords: anti-infection treatment, blood sugar, esophageal cancer, esophagectomy, hyperkalemia, postoperative, sepsis

1. Introduction

Esophageal cancer is a common malignant tumor in China. Patients who underwent esophagectomy often have a low serum potassium level due to perioperative reduced intake, fluids loss, their consumption, and other reasons. These patients often need the artificial administration of potassium. Furthermore, there is an additional need for physiological intervention for the loss of potassium.[1–3] The occurrence of hyperkalemia after esophagectomy is rare. We present a patient with hyperkalemia after resection for esophageal carcinoma. The case is reported as follows.

2. Patient data, medical records, and history

The patient was a 70-year-old female who had progressive dysphagia for 4 months and was confirmed to have esophageal cancer 2 months ago. The patient had high blood pressure, urine sugar disease history, poor blood glucose control, and erythrocyte 6 u was given 1 month before surgery for anemia. Due to anemia, diarrhea, and colds, this patient was nursed for 1 month. Patients underwent surgery smoothly, without serious complications. Postoperative routine rehydration and intraoperative blood transfusion were performed. Postoperative control of blood pressure and sodium nitrate, and strict control of blood glucose insulin pump was performed for 7 days. After 3 days, due to poor coughing with phlegm, sputum suction was performed through a bronchoscope. For hypoalbuminemia, this patient was complemented with 400 mL of plasma. After 9 days, the patient received a liquid diet without discomfort. At the 10th morning after the emergency surgery, lower extremity weakness, progressive nausea, irritability, extending symptoms became worse, salivation occurred, weakness at the chest and legs to the upper limb that gradually progressed, no diarrhea, vomiting, tenesmus, and other symptoms. Body conscious was clear, and the physical

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examination revealed strong double eyelid closing, bilateral nasolabial symmetry, center protrusion of the tongue, upper limb muscle strength grade 4, lower limb muscle strength level 3, limb weak muscle tone and tendon reflexes (+), shallow check without exception, and double side pathological sign (–). Soft cervical auscultation, left lower lobe can be heard and moist rales. Lung breath sounds were clear, heart sound intensity, without smell and noise. Temperature was 38.5°C, blood pressure was 160/90 mmHG, heart rate was 102 times per minute, breathing was 25 times per minute, and blood sugar tendency for 20.8 mmol/L. Routine blood: the leucocyte number 24.81×10^9/L, and neutrophil number 22.33×10^9/L; routine urine: GLU was 5.5 mmol/L, SG was 1.02, KET was 0 mmol/L, NIT(–), and WBC(–). The electrolyte: K+ was 6.95 mmol/L, and Na+ was 101.0 mmol/L. Blood gas analysis: PH was 7.24, BE was –16.70 mmol/L, SPO2 was 87.4%, PCO2 was 25.00 mm Hg, AB was 10.7 mmol/L, and SB was 13.20 mmol/L. Checked the electrolyte again: K+ was 7.29 mmol/L, and Na+ was 98.3 mmol/L. Liver and kidney function: ALT was 27 U/L, AST was 21 U/L, GGT was 102 U/L, CRE was 87 μmol/L, and UREA was 9.33 mmol/L. ECG indicated the follows: (1) junctional escape rhythm; (2) T-waves of some of the leads were high and sharp, which suggested hyperkalemia; (3) ST segment changes. X-ray indicated: double lung markings increased, and increase in heart shadow. Patients diagnosed with lung infection after esophagectomy, hyperkalemia, metabolic acidosis, diabetes mellitus, and hyponatremia were given antibiotics to control the infection, and the patient underwent total rehydration, underwent temporary water fasting, and underwent blood sugar management. Furthermore, electrolyte imbalance and acid-base balance were corrected, and a stable internal environment was maintained. In addition, the patient was given mask oxygen inhalation, received treatment in the hemodialysis room, in order to correct acidosis and electrolyte disorder, and line blood cultures were conducted at the same time. After symptoms of patients were stable, chest CT was performed and the results are as follows: (1) changes after esophagectomy; (2) double lung exudation, in which infection was considered; (3) effusion in the bilateral cleft between the chest, the left lung fissures, and part of the effusion was wrapped by the lung, and fluid density shadow on the left side of the chest wall. Next, chest drainage tube placement was performed with ultrasound guidance to ensure unobstructed drainage, and patients were instructed to turn back and coughing out the phlegm, which gradually alleviated the symptoms. Blood culture results suggest gram-negative bacteria infection. Combined with patient history and test results, sepsis was considered.

This study was conducted in accordance with the Declaration of Helsinki. This study was conducted with approval from the Ethics Committee of The First Affiliated Hospital, College of Clinical Medicine of Henan University of Science and Technology and written informed consent was obtained from all participants.

3. Discussion

After esophagectomy for fast water, fluid loss and physiological needs such as due to the lack of potassium result in hypokalemia. Hence, postoperative treatment often requires the addition of a lot of potassium. Each daily dosage of approximately 4 to 6 g would correct electrolyte disorder, and avoid the incidence of arrhythmia and gastrointestinal dysfunction.[4] As is known, the causes of hyperkalemia can be divided as follows: (1) reduced renal excretion of potassium, (2) release of potassium from cells, (3) excessive intake of potassium drugs, (4) excessive administration of banked blood, and[5] digitalis poisoning. Symptoms: (1) cardiovascular symptoms: bradycardia, heart is abate, and prone to arrhythmia; (2) neuromuscular symptoms: limb and trunk numb palsy, that finally affect the respiratory muscles and even induce suffocation. The central nervous system is characterized as either irritable or delirious. Other symptoms are nausea and vomiting, and abdominal pain. The toxic effects of high potassium on the muscles can cause tetraplegia and induce the patient to stop breathing. All patients with hyperkalemias have different levels of azotemia and metabolic acidosis.[5–8]

In analyzing this case, patients with sudden double lower limbs weakness and progressive development would gradually influence breathing and the mind. Results of routine blood tests and chest x-ray, as well as temperature changes would prompt the merging of infections in patients. Electrolytes, blood gas analysis, and electrocardiogram results of patients confirmed the hyperkalemia and acidosis. Although the blood glucose level was increased, no significant changes in renal function and urine ketone was found, and not the rotten apple taste was smelled in the mouth; hence, ketoacidosis evidence was insufficient. Renal function was normal; no reduction in urine and other factors that would induce renal dysfunction was found. Furthermore, hyperkalemia is often accompanied by acidosis. The reasons for hyperkalemia can only be searched from the following aspects: solely postoperative potassium supplement, preoperative and postoperative transfusion of blood products, acidosis, and inflammation. However, approximately 4 to 5 g daily supplement of potassium was received, without excessive potassium supplement evidence. Furthermore, roughly normal renal function, urine output, no line of potassium channel disorder, a history of transfusion of blood products, a large amount of blood transfusion easy cause, bleeding tendency, and high potassium citrate salt poisoning disease were found. However, there were no hemolysis or blood transfusion reactions. In addition, a study revealed that a small amount of multiple transfusions of potassium induced a transient increase, but this would improve with the adjustment of urine output.[9] This blood routine, as well as sternum and temperature changes, prompted the merging of infection in patients; and gram-negative bacteria was found in blood cultures. Temperature was 38.5°C, heart rate was 102 beats per minute, and breathing was 25 breaths per minute. Routine blood analysis: leucocyte number was 24.81×10^9/L, and neutrophil count was 22.33×10^9/L. This prompted sepsis. Normal anti-inflammatory treatment, blood sugar management, and blood dialysis improved the symptoms. Then, the diagnosis was re-confirmed again. The consideration for diabetic patients with latent infection, blood sugar, and infection control would lead to sepsis.[10] This would cause acidosis and electrolyte disorder (hyperkalemia, low sodium chloride). After prompt anti-infection treatment, blood sugar management, and hemodialysis to correct the acidosis and electrolyte disorder, the condition of the patient was gradually improved.

Therefore, administering potassium after esophagectomy is very important. There is a need for regular testing of electrolyte, especially in patients with diabetes, as well as the need for better blood glucose management, which has great importance in preventing potential infection, as well as in avoiding ketoacidosis and the risk of sepsis.

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