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Esmolol Treatment in a Child with Severe Hypotension due to Salbutamol Intoxication: A Case Report

Salbutamol İntoksikasyonuna Bağlı Ciddi Hipotansiyonlu Bir Çocukta Esmolol Tedavisi: Bir Olgu Sunumu

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Abstract

The short-acting β_2 sympathomimetic amine salbutamol is very frequently used in the treatment of bronchospasm in patients with asthma and bronchiolitis. Tremor, hyperactivity, tachycardia, convulsion, hypomagnesemia, lactic acidosis, hyperglycemia, hypokalemia, hypotension, congestive heart failure, arrhythmia, and sudden cardiac arrest may occur in high-dose salbutamol use. Salbutamol use for suicidal purposes is very rare. In this article, an overview of salbutamol intoxication from a child who used 300 mg of salbutamol for suicide purposes and the approach to salbutamol poisoning in the accompanied by literature information were discussed.

Keywords: Salbutamol, child, intoxication, esmolol, hypotension

Öz

Kısa etkili β_2 sempatomimetik amin salbutamol, astım ve bronşiyolitli hastalarda bronkospazm tedavisinde sık kullanılmaktadır. Yüksek doz salbutamol kullanımında tremor, hiperaktivite, taşikardi, konvülziyon, hipomagnezemi, laktik asidoz, hiperglisemi, hipokalemi, hipotansiyon, konjestif kalp yetersizliği, aritmi ve ani kardiyak arrest görülebilir. Salbutamolün özkıyım amaçlı kullanımı çok nadirdir. Bu yazıda özkıyım amaçlı 300 mg salbutamol kullanan bir çocukta salbutamol zehirlenmesine genel bir bakış ve salbutamol zehirlenmesine yaklaşım literatür bilgileri eşliğinde tartışıldı.

Anahtar Kelimeler: Salbutamol, çocuk, zehirlenme, esmolol, hipotansiyon

Introduction

The short-acting β_2 sympathomimetic amine salbutamol activates the adenyl cyclase enzyme via beta-adrenergic receptors and facilitates the conversion of adenosine triphosphate (ATP) to cyclic accelerating medicines partnership (AMP). The increased cyclic AMP levels relax the bronchial smooth muscles. It also reduces the release of early hypersensitivity mediators from mast cells. These effects are widely used in the treatment of bronchospasm in patients with asthma and bronchiolitis.[1,2] It exhibits a bronchodilator effect at therapeutic doses by stimulating the bronchial smooth muscles with its β_2 adrenergic effects. Besides this effect, it increases the potassium flow into the cell by stimulating Na-K ATPase pump. Due to this effect, salbutamol inhalation is used as an option in the management of acute hyperkalemia.[3]

The symptoms of salbutamol toxicity are tremor, hyperactivity, tachycardia, convulsion, hypomagnesemia, lactic acidosis, hyperglycemia, hypokalemia, hypotension, congestive heart failure, arrhythmia and sudden cardiac arrest.[2,4-6] In this article we report a case who had ingested 75 tablets of 4 mg salbutamol in an attempt to commit suicide and, review the treatment strategy of salbutamol intoxication.

Case Report

A 16-year-old female patient was found unconscious in her bed approximately 1 hour after ingesting 75 tablets of 4 mg salbutamol (300 mg) in an attempt to commit suicide and was referred to the emergency department. On admission, her temperature 37 °C (axillary), pulse rate 165 beats/min, and

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blood pressure was 100/45 mmHg. On physical examination, she was conscious, cooperative, agitated and had a significant tremor in the extremities. Gastric lavage was performed, and 1 g/kg active charcoal was administered. The patient was admitted to the pediatric intensive care unit (PICU) for monitoring. Her respiratory, neurologic, and abdominal examinations were initially normal. The electrocardiographic (ECG) examination revealed sinus tachycardia of 160 beats per minute (bpm) and QTc prolongation (QTc: 0.48 ms). Echocardiogram showed normal ventricular function. The arterial blood gas results were: pH: 7.30, Pa_{CO2}: 37, HCO_3^-: 18, K^+: 2.3 mEq/L, lactate: 6.7, the base excess: -7 mmol/L. The laboratory tests revealed a serum glucose level of 287 mg/dL, a potassium level of 2.3 mEq/L and a magnesium level of 1.4 mg/dL. The complete blood count, the other biochemical parameters, the pro-BNP, CK-MB, and the troponin values were normal. She had one more hypotensive episode during PICU admission, blood pressure dropped to 75/30 mmHg and mean arterial pressure 45 mmHg (blood pressure <1 p, <-2,33 SDS) and heart rate 145-150/minute. The ECG examination revealed sinus tachycardia. She was treated with a 30 mL/kg fluid bolus and intravenous (IV) potassium chloride 1 mL/kg infusion for hypopotassemia. There was no change in the patient's tachycardia or hypotension. Since the excessive beta-adrenergic stimulation continued in the patient with life-threatening cardiovascular system symptoms, the beta-blocker esmolol was given as a bolus dose of 25 mcg/kg over 1 minute. It was observed that the patient's tachycardia improved and the blood pressure increased. Therefore, IV esmolol of 100 mcg/kg/min infusion was continued. Hyperglycemia and hypopotassemia resolved. Magnesium was 40 mg/kg replaced for hypomagnesemia. The patient's esmolol infusion was gradually decreased and ceased in the course of 12 hours. The patient had no symptoms afterward and was discharged on day 2 of admission.

Discussion

Salbutamol is a beta-adrenomimetic drug that acts on β_2 receptors in the bronchial smooth muscles and is widely used in the treatment of asthma and bronchiolitis.[2] The daily dose is 0.3-0.8 mg/kg/day in children and the half-life is 4-6 hours.[5,7,8] Treatment of salbutamol intoxication is symptomatic and supportive treatment. Gastric lavage and active charcoal administration may be beneficial in those presenting within 4-6 hours of intoxication.[2,5] Cardiac monitoring, serial ECG examination (especially QTc) and serum electrolyte monitoring are essential for recognized side effects.[7]

Even when used in therapeutic levels, cardiac side effects such as tachycardia may occur due to stimulation of cardiac muscle β_2 receptors.[2,5,6] When ingested at high doses, tremor, hyperactivity, convulsion, fever and, metabolic effects such as hyperglycemia, hypomagnesemia and lactic acidosis may develop. Peripheral vasodilation and hypotension with a widened pulse pressure, tachycardia, arrhythmias, heart failure and sudden cardiac arrest have reported after overdose.[4-7] The use of beta-blocker (propranolol 0.01-0.02 mg/kg IV, esmolol 25-100 mcg/kg/min IV) is recommended for severe hypotension, tachycardia and ventricular arrhythmias due to excessive beta-adrenergic stimulation.[5] In our case, IV esmolol treatment was initiated as beta-receptor for fluid-unresponsive hypotension, tachycardia and persisted lactic acidosis. The beta-blocker infusion was ceased gradually over 12 hours. The patient's tachycardia resolved, and blood pressure increased.

In the literature, a three-year-old who had accidentally ingested 53 mg of salbutamol suspension, a four-year-old who had accidentally ingested 60 mg of salbutamol suspension, and a 15-year-old who had ingested 200 mg of salbutamol tablets in an attempt to commit suicide have been reported previously.[9-11] No specific treatment was required for those patients since their symptoms were milder. A 9-year-old patient who had accidentally ingested 2.5 mg/kg oral suspension was administered 0.25 mg/kg oral propranolol twice for persisted tachycardia.[12]

In a recent study that evaluated 95 children with ingestion of high doses of salbutamol, agitation, tachycardia, and tremor were the most common symptoms. The oral salbutamol doses these patients had ingested varied between 2 to 96 mg, and the dose/weight ratios had been measured as 0.3 and 6.3 mg/kg. The patients in this series were followed up at the emergency department and did not require any treatment other than gastrointestinal decontamination.[13]

Uysal et al.[14] has reported an adult case in which IV beta-blocker was used for salbutamol intoxication. In this report, the 24-year-old patient received an infusion of metoprolol for the cardiac side effect supraventricular tachycardia that developed after ingesting 76 mg of salbutamol tablets in an attempt to commit suicide.[14] To our knowledge, our case is the first pediatric case who receive IV beta blocker therapy.

In conclusion, acute salbutamol intoxication may cause severe side effects, especially related to the cardiovascular system. In patients unresponsive to supportive and symptomatic treatment with life-threatening symptoms, IV beta-blocker using should be considered. Under close hemodynamic monitoring, IV beta-blocker is a safe treatment option in children with the life-threatening complications of salbutamol toxicity.

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Ethics

Informed Consent: Written informed consent was obtained from the parents for the publication of their personal and clinical details with any identifying images in this study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: G.K., B.K., Design: E.E.T., Data Collection or Processing: İ.E., P.Y.Ö., Analysis or Interpretation: B.K., Literature Search: E.E.T., B.K., Writing: P.Y.Ö.

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