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First-Aid Treatment of Hyperkalemia by Nebulised Salbutamol: An Experience in Pseudohypoaldosteronism

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Abstract In the present case with primary pseudohypoaldosteronism, severe hypekalemia was treated with salbutamol inhalation in acute phase. Transcellular hypokalemic effect of salbutamol is related to the activation of Na-K pump on the cell membrane. Although use of salbutamol inhalation in hyperkalemia was previously described, it has not been widely used. The administration of salbutamol by inhalation is a simple, safe and reasonably effective method for treatment of hyperkalemia even in children.

Keywords: *hyperkalemia, pseudohypoaldosteronism, treatment*

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1. Introduction

Hyperkalemia is a frequent complication in children with endocrine diseases and renal failure. It is a medical emergency because of its potentially lethal complication of cardiac arrhythmias. Although use of salbutamol inhalation in hyperkalemia was previously described, it has not been widely used particularly in children.

2. Case Presentation

A six-month-old boy was referred to us with vomiting and failure to thrive. The patient was born at full-term pregnancy and was delivered by a spontaneous vaginal delivery, with a birth weight of 3,424 g. He had met all developmental motor milestones. The patient had been well until one month earlier when his mother noticed his occasional vomiting.

He presented with a weight of 6,360 g (-1.8 S.D. for his age, 7.8% weight loss during one month), and a length of 62.4 cm (-2.0 S.D. for his age). The physical examination including level of consciousness revealed no abnormal findings. The pulse rate was 148 beats per minute and the blood pressure was 92/40 mmHg. Initial laboratory examination showed severe hyponatremia (108 mmol/liter) and severe hyperkalemia (7.3 mmol/liter) with metabolic acidosis (serum bicarbonate 16 mEq/L and base excess –7.5). While plasma levels of ACTH, 17-hydroxyprogesterone, and cortisol were normal, those of aldosterone (1,682 ng/L: normal reference range for age, 8-26 ng/L) and PRA (111 ng/ml/hr, normal range for age, 1.2-4.0 ng/ml/hr) were elevated. Other data in blood chemistry, such as creatinine and urea nitrogen were in the normal ranges. He had no findings of urinary tract infection and that ultrasonography detected no hydronephrosis or no obstructive uropathy.

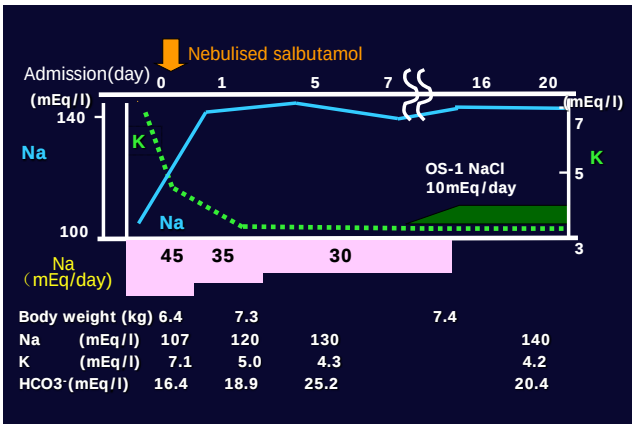

Figure 1. Clinical course of the patient

Na: sodium, K: potassium, OS-1[R]: oral rehydration solution (erlectrolyte constituent: 50% saline)

Based on these findings, he was diagnosed as having the pseudohypoaldosteronism type 1 (PHA1). The electrolyte disturbance quickly resolved with salt supplementation (2.65 g/day: 7 mmol/kg/day). Nebulized β2-adrenergic agonist (salbutamol) was administerd as the first -aid treatment for severe hyperkalemia. As a result, serum potassium level was controlled with salbutamol in nebulized form, 0.5 mg in 2 ml normal saline, inhaled over 10 minutes: the plasma potassium level was reduced by a further 0.50 mmol/L. The treatment with salbutamol produced slight increase in heart rate, but not in blood pressure. No major side effects were observed. The weight gain was restored to normal (Figure 1). Three weeks after admission, the baby was discharged on sodium

supplemented (OS-1®) jerry (50% saline) with normal levels of serum electrolytes. At 12 months of age salt supplement was withheld, and he remains well and is growing normally since then.

3. Discussion

PHA is a heterogeneous group of disorders in electrolyte metabolism, characterized by renal tubular unresponsiveness to aldosterone [1]. Recent observation has suggested that the underlying abnormality is a disorder in maturation of aldosterone receptors either in number or in function. Mode of inheritance may be autosomal dominant or sporadic, and the clinical expression is highly variable even in the members of the family with the same gene defect [2]. A diagnosis of primary PHA can be made when the secondary causes of aldosterone end organ resistance like obstructive uropathy and urinary tract infections are excluded [3].

In the present case with primary PHA, severe hypekalemia was treated with salbutamol inhalation in acute phase. Transcellular hypokalemic effect of salbutamol is related to the activation of Na-K pump on the cell membrane.

4. Conclusion

Although use of salbutamol inhalation in hyperkalemia was previously described [4,5], it has not been widely used. From our experience, it seems that nebulised salbutamol can be first-aid treatment of severe hyperkalemia.

List of Abbreviarions

PHA1; pseudohypoaldosteronism type 1, PRA; plasma renin activity

Acknowledgement

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Competent Interests

The authors declare that they have no competing interests.

Consent

Written informed consent was obtained from the parents of the patients for publication of this case report.

Authors' Contributions

YI performed the medical treatment. KK participated in the design of the study. JT conceived of the study. All authors read and approved the final manuscript.

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