Congenital Hypoaldosteronism

VANATHI SETHUPATHI,
VIJAYAKUMAR M
LALITHA JANAKIRAMAN*
NAMMALWAR BR

ABSTRACT

Congenital hypoaldosteronism due to an isolated aldosterone biosynthesis defect is rare. We report a 4 month old female infant who presented with failure to thrive, persistent hyponatremia and hyperkalemia. Investigations revealed normal serum 17 hydroxy progesterone and cortisol. A decreased serum aldosterone and serum 18 hydroxy corticosterone levels with a low 18 hydroxy corticosterone: aldosterone ratio was suggestive of corticosterone methyl oxidase type I deficiency. She was started on fludrocortisone replacement therapy with a subsequent normalization of electrolytes. Further molecular analysis is needed to ascertain the precise nature of the mutation.

Key words: *Congenital hypoaldosteronism, CMO I deficiency, Mineralocorticoid replacement.*

INTRODUCTION

Disorders of isolated aldosterone biosynthesis are important in the differential diagnosis of salt-wasting syndromes of infancy and childhood. We present a child with isolated hypoaldosteronism (corticosterone methyl oxidase Type I deficiency).

CASE REPORT

A female infant born of third degree consanguineous parents with a birthweight 3.75 kg, presented at 4 months of age with failure to thrive and developmental delay. She had an episode of generalized seizures at 3 months of age. At presentation she weighed 4 kg with a head circumference of 35 cm and was severely dehydrated. Blood pressure was in the normal range for the age. She had partial head control with no grasp or social smile. Fundoscopy was normal. Liver was enlarged. External genitalia were normal. Initial hematological and biochemical values are shown in ***Table* I**. Urine metabolic screen, blood ammonia, serum lactate, thyroid function, immunoglobulin, complement levels and chest *X*-ray were normal. Blood and urine cultures were negative. Ultrasonogram of the abdomen showed mild hepatomegaly with normal echotexture.

Hyponatremia, hypercalemia and low serum bicarbonate was treated with intravenous calcium gluconate, sodium bicarbonate and oral sodium polystyrene sulfonate. During follow-up, serum sodium continued to remain at around 125 mEq/L, potassium varied between 6.2 and 7.2 mEq/L with bicarbonate around 18 mEq/L. The child was hospitalized twice subsequently for dehydration, hyponatremia and hyperkalemia. The results of the hormone profile were as shown in ***Table* I**. In view of the normal serum cortisol, 17 hyroxy-progestrone and low serum aldosterone level, congenital hypoaldosteronism was considered. Further evaluation indicated the corticosterone methyl oxidase type I (CMO I) deficiency. With 2 months of fludrocortisone, serum sodium was 132 mEq/L, potassium 5.7 mEq/L and bicarbonates 20 mEq/L. Plasma renin levels done while on fludrocortisone was 5.4 ng/mL/hr. There were no further episodes of dehydration and she continues to gain weight and developmental milestones.

DISCUSSION

The terminal steps in synthesis of aldosterone includes 11 beta-hydroxylation of 11-deoxycorticosterone to form corticosterone (B), hydroxylation at position C-18 to form 18-hydroxycorticosterone (18-OHB) and finally oxidation at position C-18 to form aldosterone. There is a single mitochondrial cytochrome P450 enzyme (P450aldo) catalyzing all three reactions. The gene encoding this enzyme is termed CYP11B2

*From the *Departments of Pediatrics and Nephrology, Kanchi Kamakoti CHILDS Trust Hospital, Chennai 600 034, India.*

Correspondence to: Dr. BR Nammalwar, 2, Seetha Nagar, Mail Road, Chennai 600 034, India

Email: brnammalwar@yahoo.co.in

Manuscript received: May 21, 2007;
Initial review completed: July 19, 2007;
Revision accepted: February 8, 2008.

TABLE I INITIAL HEMATOLOGICAL, BIOCHEMICAL AND HORMONE PROFILE

Hemoglobin	11.9 g/dL
Total WBC count	31,200/cu mm
Differential count	N41 BF20 L32 E3 M3 B1
Platelet count	8,60,000/cu.mm
C-reactive protein	24 mg/dL
Blood urea	52 mg/dL
S.creatinine	0.8 mg/dL
S.sodium	118 mEq/L
S.potassium	8.2 mEq/L
S.chloride	89 mEq/L
S.bicarbonate	15 mEq/L
S.total proteins	6.9 g/dL
S.albumin	4.1 g/dL
Urine spot sodium	128 mEq/L
Urine spot potassium	10 mEq/L
Trans-tubular potassium gradient (TTKG)	5.34
S.cortisol - 4.4-22.4 microgram/dL	27.72 microgram/dL
S.17 hydoxy progesterone – < 2 ng/mL	3.76 ng/mL
S.testosterone – 0 12-0.21 ng/dL	0.02 ng/mL
S.aldosterone – 12-21 ng/dL	2.5 ng/dL
S.18 hydroxy corticosterone – 5-310 ng/dL	16 ng/dL
Plasma renin activity – 2.4-37 ng/mL/hr	5.4 ng/mL/hr

and is on chromosome 8q24. Mutations in CYP11B2 result in aldosterone synthase deficiency, an isolated defect in aldosterone biosynthesis(1).

Inborn errors of isolated aldosterone biosynthesis have been classified as CMO I and corticosterone methyl oxidase type II (CMO II). CMO-I is characterized by decreased production of 18-OHB, an elevated ratio of corticosterone to 18-OHB and a low plasma ratio of 18-OHB to aldosterone. CMO-II is characterized by overproduction of 18-OHB, a decreased ratio of corticosterone to 18-OHB and an elevated plasma ratio of 18-OHB to aldosterone. Plasma renin activity and corticosterone are elevated in both cases while aldosterone is decreased(2). The clinical picture in both is similar. CAH, pseudohypoaldosteronism and familial hyporeninemic hypoaldosteronism present with similar clinical and biochemical features. Diagnosis is through multisteroid analysis(2). Fludrocortisone is the mainstay of treatment and it has been shown to normalize plasma renin activity (PRA), 18-OHB and aldosterone levels and improve linear growth in patients with CMO-II(3,4). Severity of the disease decreases with age(5).

Our patient presented with severe failure to thrive, dehydration, hyponatremia and hyperkalemia. The dyselectrolytemia persisted even after the infection and dehydration were treated. We therefore investigated further and began by ruling out the commonest cause of salt-wasting in infants *viz*. congenital adrenal hyperplasia. Serum cortisol and 17 OH-progesterone were within normal limits. Hence serum aldosterone and PRA were measured in order to differentiate between pseudohypo-aldosteronism, hyporeninemic hypoaldosteronism and isolated aldosterone deficiency. A low aldosterone level was seen despite concurrent hyponatremia. PRA could not be determined due to technical difficulties. The possibility of aldosterone synthase defect was therefore considered and simultaneous aldosterone and 18-OHB levels were estimated. Corticosterone levels were not done due to financial constraints. Aldosterone and 18-OHB were decreased with an 18-OHB/aldosterone ratio of 6:4. Peter, *et al*.(2) studied 16 infants with congenital hypoaldosteronism and concluded that decreased aldosterone with low 18-OHB and 18-OHB/aldosterone <10 was confirmatory of CMO-I deficiency. In classical CMO I deficiency, the serum aldosterone is undetectable(4). In our case, the low serum aldostrerone levels could be due to the presence of one inactivating mutation and another mutation which leads to some residual activity of the enzyme.

Contributors: All authors contributed to the case management. VS, MVK and BRN reviewed the literature and drafted the article. BRN will act as a guarantor.

Funding: None.

Competing interest: None stated.

REFERENCES

1. Peter M, Sippell WG. Congenital hypoaldosteronism: the Visser-Cost syndrome revisited. Pediatr Res 1996; 39: 554-560.
2. Peter M, Partsch CJ, Sippell WG. Multisteroid analysis in children with terminal aldosterone biosynthesis defects. J Clin Endocrinol Metab 1995; 80: 1622-1627.
3. Lee PD, Patterson BD, Hintz RL, Rosenfeld RG. Biochemical diagnosis and management of corticosterone methyl oxidase type II deficiency. J Clin Endocrinol Metab 1986; 62: 225-229.
4. Picco P, Garibaldi L, Cotellessa M, DiRocco M, Borrone C. Corticosterone methyl oxidase type II deficiency: a cause of failure to thrive and recurrent dehydration in early infancy. Eur J Pediatr 1992; 151: 170-173.
5. Portrat-Doyen S, Tourniaire J, Richard O, Mulatero P, Aupetit-Faisant B, Curnow KM, *et al*. Isolated aldosterone syntase deficiency caused by a simultaneous E198D and V386A mutations in the CYP11B2 gene. J Clin Endocrinol Metab 1998; 83: 4156-4161.

Scarabiasis

G KARTHIKEYAN
RAMASWAMY GANESH
MALATHI SATHIASEKERAN

ABSTRACT

Scarabiasis is a condition where beetles temporarily infest the digestive tract and the scarabes are identified in the "fly away" from the anus at the time of the defecation. This article highlights this rare problem of scarabiasis in a 4 year old girl that responded to bowel cleansing and personal hygienic measures.

Key words: *Dung beetles, Scarabiasis.*

INTRODUCTION

Scarabiasis is a condition where beetles temporarily infest the digestive tract and this disease is seen in children living in tropical countries but is rarely reported. We herewith report a case of scarabiasis in a 4 year old girl.

CASE REPORT

A 4 year-old girl was referred from a village with a history of passing live beetles per rectum. The beetles were black in color and about 0.5 to 0.75 cm in size. The child had passed about 8 beetles during 3 episodes spread out over a 3 month period. She had mild periumblical abdominal pain associated with occasional loose stools, vomiting and poor appetite. There was no history of bleeding per rectum or mucorrhea, no fecal incontinence or fecal soiling, no perianal ulcers or itch and no fever, abdominal distension, rash or wheeze. She was given a course of metronidazole for her symptoms and since the presentation was unusual, she was referred to our center.

The family lived in a small house with cemented flooring and the child slept on bed and at times on the floor. She was an active child and often played without her underclothes in the portico of her house which was facing the road. Occasionally during the daytime she slept on the elevated cement slab in the portico. In the neighborhood, cows and cow dung was a common sight as the neighbors residing opposite her house raised cattle for domestic purposes.

From the Kanchi Kamakoti CHILDS Trust Hospital, 12-A, Nageswara road, Nungambakkam, Chennai 600 034, Tamil Nadu, India.

Correspondence to: Dr. Ramaswamy Ganesh, Registrar in Pediatrics, Kanchi Kamakoti CHILDS Trust Hospital, 12- A, Nageswara Road, Nungambakkam, Chennai 600 034, TamilNadu, India.
E-mail: ganeped79@rediffmail.com

Manuscript received: October 11, 2007;
Initial review completed: December 20, 2007;
Revision accepted: February 11, 2008.