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CASE REPORT

Baby bottle and the risk of water intoxication

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Abstract:

Acute hyponatremia is a state of emergency with high morbidity and mortality. Severe hyponatremia is accompanied by a particular brain edema. As a child, with hyponatremia normally encountered while dehydrated during heavier gastroenteritis. Hyponatremia may also be caused due to oral intake more free water or hypotonic fluids. The authors present two cases of infants (aged 15 months and 12, respectively), which was accompanied by severe hyponatremia (118.2 mmol/L and 120.2, respectively) impaired consciousness, in one of the cases have required temporary artificial ventilation. Cause of severe hyponatremia in both infants was excessive intake of fluids, especially sweetened, which were administered to children for their soothing. For this condition is used term „compulsive water drinking“ or „normal children who just like to drink a lot“. Parents of children and pediatricians should be informed of the possibility of water intoxication in an uncontrolled water intake well informed.

Keywords: hyponatremia, water intoxication, polydipsia

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Introduction

Hyponatremia is by definition a plasma sodium (P_{Na}) of less than 130 mmol/L and reflects a deficiency of sodium relative to water. When the P_{Na} falls acutely to < 130 mmol/L, brain cell swelling may develop and be sufficient to lead to a devastating neurologic outcome. Usually were described the two principal mechanisms that result in hyponatremia, loss of sodium in excess of water and gain of water in excess of sodium. Hyponatremia secondary to excessive oral water intake is rare in the presence of normal renal function. It is occasionally described in psychotic adolescents/adults in whom there may also be a defect of central water regulation associated with the primary disease [1, 2]. A few

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cases have been described where fatal hyponatremia was caused by very high water intake as a form of child abuse [3]. With respect to some peculiarities of childhood, we would like present our observation.

Case 1

At the age of 7-months was white boy treated for non-infectious diarrhoea. He was product of a 39-week pregnancy, delivered without complications (birth weight 3550 g, length 51 cm). Short breast-feeding was followed by milk formula. After this diarrhoeal episode the boy used to drink a large amount of sweetened water (daily intake exceeded 1500 ml of fluids, mainly of fruit tea or water flavored with fruit juices).

At the age of 15 months he was admitted to our hospital because vomiting and drowsiness. Physical examination revealed disturbed consciousness (Glasgow coma scale 3), generalized convulsions and prolonged pupil's reaction to light. His heart rate was 130/minute, respiratory rate 21/minute, blood pressure (BP) 105/55 mmHg and body temperature 37.8 °C. Abnormal laboratory investigations showed hyponatremia (118.2 mmol/L), mild hypokalemia (3.3 mmol/L), plasma and urine hypoosmolality (260 mOsm/kg H₂O and 100 mOsm/kg H₂O, respectively). By fundoscopy was not found papilledema. The cerebrospinal fluid showed no abnormalities. A brain computed tomography (CT) showed diffuse edema. Therapy was started by infusion of 0.9% saline. The patient required artificial ventilation for 38 hours. During next days was boy in good clinical condition but he needed to drink a large amount of tea (2500 – 2800 ml/24 hours). Under the restriction of fluid intake corresponding to his age, the patient's diuresis became adequate (600 ml/24 hours) and all abnormal laboratory parameters were in normal range (serum sodium 141.7 mmol/L, serum potassium 4.1 mmol/L, osmolality of first morning urine sample 780 mOsm/kg H₂O). The boy was discharged 10 days after admission with normal neurological examination and without abnormalities on

electroencephalography and repeated CT of brain.

Case 2

The child was born at 37 weeks of gestational age (birth weight 2750 g, length 49 cm) without perinatal complications. The boy was breast-fed for one month only, then milk formula was administered. Mixed infant diet was introduced since 6 months of age. Approximately since that time, the baby started to reject milk and preferred fruit tea or water sweetened with juices. A higher intake of fluids was required mainly at night (750 – 1000 ml per night, 500 – 700 ml per day).

In the morning at age of 12 months he was sleepy with anorexia, just drank tea. At about 9.00 a.m. he turned up his eyes and did not respond to parents. During transport to hospital appeared generalized seizures. On admission the infant was somnolent (Glasgow coma scale 10) with spontaneous breathing (heart and breath rate 105/minute and 32, respectively) and BP 90/55 mmHg. Initial abnormal laboratory values showed hyponatraemia (120.2 mmol/L) with plasma and urine hypoosmolality (268 mOsm/kg H₂O and 78 mOsm/kg H₂O, respectively). Intravenous fluid therapy was started with 0.9% saline. During next 51 hours the patient was fully stabilized and fluids could be administered per os. The fluid intake was limited to amount corresponding with infant's age. With this regimen patient's diuresis was 400 – 600 ml/24 hours and urine osmolality ranged between 278 – 738 mOsm/kg H₂O. Laboratory parameters were in normal range (serum sodium 138.5 mmol/L, serum osmolality 287 mOsm/kg H₂O). The boy was discharged one week after admission and further follow-up showed no changes of his clinical status.

Discussion

In routine pediatric practice, children with convulsions caused by hyponatraemia may be divided into three categories. A group of patients affected most involves the youngest infants,

usually at the age less than 6 months, who are given incorrectly prepared hypotonic feeding [4]. Another group are infants who require and are really administered high intake of diluted fluids. These subjects are mostly older infants and toddlers. Such behaviour of an infant may be caused by a feeling of hunger, habit/bad habit, or it is a form of infant's self-stimulation in the case of deprivation from your parents/family. Unfamiliarity and inexperience of parents, as well as difficult socioeconomic situation of the family are factors participating most often in the rise of these forms of hyponatremia. Sometimes is applied to this group the term „compulsive water drinking“ or „normal children who just like to drink a lot“. However, even insufficient child's care must be considered in some situations. Water intoxication is then a form of the child's maltreatment. The third group of infants with hyponatremia is formed by those who have the normal diet and fluid intake but who drink a large amount of water in the period of intercurrent disease accompanied with dehydration/loss of salt.

Unifying data from our patients presented here was the fact that they were not given milk since about 6 months of their age and their families preferred the supply of fruit tea or sugary drinks or sorbitol-sweetened water. That led to malnutrition, chronic over-hydration, polydipsia and slow development of hyponatremia. This development was silent and culminated in convulsions in both cases. Hyponatremic encephalopathy can be difficult to recognize in infants/toddlers, as the symptoms can be variable and do not correlate with either P_{Na} or the rapidity of development of hyponatremia. The most frequently symptoms of hyponatremia are nausea, headache, vomiting, and weakness. Following symptoms are signs of cerebral herniation with seizures, dilated pupils, pulmonary edema, respiratory arrest, and decorticate posturing.

In conclusion, water intoxication accompanied by hyponatremia can cause serious and life-

threatening condition. The aim of our two case-reports mentioned above was to draw attention to the fact that some patients with hyponatremic convulsions represent a group of children, who require and have from their families secured excessive supply of water and diluted juices. Therefore, parents should be informed about potential danger of taking in a large amount of hypotonic fluids in early childhood as well as about the importance of rational diet. Pediatrician ought to be aware of possible development of hyponatremic convulsions complicating imbalanced diet with a high intake of water, particularly in children on milk-free diet [5, 6, 7].

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