CASE REPORT

Nocturnal lagophthalmos: never seen before in hypernatraemic dehydration

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SUMMARY

We present two cases in which a 10-month-old male infant and another 15-month-old female child presented with symptoms of sleeping with their eyes wide open (lagophthalmos) with features of gastroenteritis (GE) and dehydration. The first child had been seen and discharged the previous day from the paediatric emergency department (ED) with a diagnosis of GE. He presented the following day with sleeping discomfort with his eyes wide open and ongoing symptoms of GE. The second child presented to the ED with features of GE. She was found to be sleeping in the ED with her eyes wide open. Investigations of both children revealed hypernatraemic dehydration. Correction of the electrolyte imbalance in both cases over a period of 48 h led to the resolution of symptoms.

BACKGROUND

Dehydration in a child presenting with features of acute gastroenteritis is a common presentation to the paediatric emergency department (ED). Hypernatraemic dehydration does not usually present with obvious clinical signs. In comparison to hyponatraemic and eunatraemic dehydration, children with hypernatraemic dehydration are usually alert except for a few classic signs such as doughy feel of the abdominal skin. Both cases described below presented to the ED with features of gastroenteritis and were found to be sleeping with their eyes wide open. Investigations revealed hypernatraemic dehydration and management of the same led to resolution of their symptoms. Blood tests are not routinely performed in children presenting with gastroenteritis as it usually does not modify management. The exception to this is hypernatraemic dehydration. Nocturnal lagophthalmos is a clinical sign which has never been reported in the medical literature with hypernatraemia and if brought to the attention of clinicians, may add to the early recognition of hypernatraemic dehydration. This would allow the cautious and tailored administration of intravenous fluids, particularly in rural and peripheral healthcare settings where facilities for blood tests could be limited.

CASE PRESENTATION**Case 1**

A 10-month-old male child presented in the ED at night with a 4-day history of ongoing vomiting and diarrhoea. He had been seen in the ED the previous night and discharged home with advice regarding oral rehydration. On second presentation to the ED, his mother was distressed stating that she had noticed her son sleeping with his eyes wide open

on the day of presentation. He had an episode of ongoing chesty cough few days prior to presentation. There were no sick contacts. His vaccinations were up to date. Further questioning revealed that the mother was not using adequate amount of water to dilute the oral rehydration salt as he was not keen to drink fluids. Examination revealed a moderately dehydrated child. Lagophthalmos was noted while sleeping in the ED. No seizure activity was noted. Neurological examination was within normal limits.

Case 2

A 15-month-old female child, accompanied by her mother, attended the paediatric ED with history of vomiting and diarrhoea of few days duration along with mild fever. Her older sibling had had gastroenteritis 2 weeks previously. Her vaccinations were up to date and there were no known allergies. Examination revealed moderate dehydration. Bloods were taken to analyse electrolytes. She was also noted to be sleeping with her eyes wide open displaying the clinical sign of lagophthalmos. Similar to the child in case 1, her neurological examination was also within normal limits.

INVESTIGATIONS**Case 1**

Investigations revealed raised sodium 169 mmol/L, chloride 128 mmol/L and normal potassium. Urea was 7.42 mmol/L, with slightly raised creatinine at 37 mmol/L (17–31). C reactive protein was 1.30 mg/dL (normal <0.06). Full blood count was within normal limits. Stool was positive for adenovirus.

Case 2

Investigations revealed haemoglobin 16.7 gm/dL, platelet $693 \times 10^9/L$, white cell count $13.87 \times 10^9/L$ with left shift. Urea was raised to 19.35 mmol/L (normal range 1.8–7.5) on day of admission with creatinine 80 mmol/L (17–31), sodium 167, chloride 125 and potassium 4.5 mmol/L. Venous blood gas analysis revealed metabolic acidosis with pH 7.09 with base excess of –21.1. Stool was positive for rota virus. Urea and electrolytes were repeated every 4–6 hours, and it normalised after 48 h of correction with intravenous fluids.

DIFFERENTIAL DIAGNOSIS

- Hypernatraemic dehydration
- Adenovirus infection
- Viral gastroenteritis
- Bacterial gastroenteritis

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TREATMENT

Both patients were treated with an intravenous fluid therapy. In both cases, their fluid deficits were clinically assumed as approximately 5%. This deficit along with 48 h maintenance fluid was replaced over 48 h. Normal saline infusion was started and continued as maintenance fluid. After 24 h of fluid replacement both children's symptoms of sleeping with eyes wide open had resolved and sleeping pattern had normalised. We chose not to start a more hyponatraemic solution as maintenance fluid to prevent complications associated with rapid correction of electrolyte imbalance. Rapid correction may cause cerebral oedema and recent studies are in favour of giving normal saline as maintenance fluid if sodium level is not significantly high.^{1 2}

OUTCOME AND FOLLOW-UP

Both patients are doing well at 10 months follow-up.

DISCUSSION

Gastroenteritis is a very common presentation in paediatric ED. It is often associated with dehydration due to poor oral intake along with loss of fluids and electrolytes from ongoing vomiting and diarrhoea. Eunatraemic dehydration is the most common presentation as water and electrolytes are lost in proportionate amount. Sometimes the body compensates by retaining free water which leads to a state of hyponatraemic dehydration due to ongoing electrolyte loss. In rare instances, either due to only free water loss or improper mixing of oral rehydration powder with less amount of water by caregivers, diarrhoea can lead to hypernatraemic state.^{3 4} Hypernatraemia creates a hyperosmolar intravascular environment leading to indrawing of water from extravascular spaces, and thus children with this kind of dehydration appear normovolaemic. Therefore, they do not usually present with florid signs of dehydration, except few characteristic signs such as doughy feel of the abdominal skin. Neurological signs like irritability, coma may be present at presentation. A study by Chouchane *et al*⁵ has reported neurological alteration in about 77% of children with hypernatraemic dehydration.

Nocturnal lagophthalmos is used to describe incomplete closure of eyelids during sleep. Various causes of lagophthalmos have been described in the past with facial nerve palsy being the most common. Nocturnal lagophthalmos can be seen in transient facial nerve involvement but we could not find any evidence linking facial palsy to hypernatraemia.^{6 7} Besides this, neurological examinations were normal in both the infants. Similarly, enophthalmic eye can have widened palpebral fissure but this mostly occurs in association with injury to the orbital area. Athanasiov *et al*⁸ described lid retraction as a cause of enophthalmos but this is not relevant to our case. Both children had one finding in common and it was quite characteristic, and it caused parental anxiety. We could not find any reported association of sleep disorder with hypernatraemia. Although rapid eye movement (REM) stage of sleep can have some rapid eye

movement,⁹ we could not see any such movements in our patients. Lagophthalmos has never been reported as a finding in hypernatraemic dehydration. It could be that loss of intracellular volume of water caused total mass of eyelid tissue to shrink and inability of the dehydrated child to put extra pressure to keep it shut while sleeping led to the impression of open eyes during sleep. It is however an important finding which if brought to the attention of healthcare professionals could lead to further investigations into this clinical sign. Extensive review of the literature did not reveal any similar reported cases.

Learning points

- ▶ Hypernatraemic dehydration does not always present with florid signs. Therefore, cautious evaluation is important.
- ▶ Blood testing is not always possible and often not undertaken in cases of gastroenteritis.
- ▶ Keeping this finding in mind may help screen children with hypernatraemic dehydration, as vigorous fluid replacement in these children may lead to cerebral oedema precipitating seizures.
- ▶ More research is needed to validate this finding as a clinically significant sign in hypernatraemic dehydration.

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Competing interests None.

Patient consent Obtained.

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