Managing severe peripartum hyponatraemia: A case report

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Abstract

We present a case of severe peripartum hyponatraemia that occurred following a major obstetric haemorrhage causing both an ischaemic stroke and Sheehan's syndrome and outline the investigations and management strategy required.

Keywords

Hyponatraemia, hypopituitarism, pregnancy, peripartum stroke

Case

A 39-year-old para 1, gravid 3 presented for an elective caesarean section (C-section) at 37⁺₃ weeks due to placenta praevia. Her antenatal period had been uneventful with screening ultrasounds indicating a low fetal weight with normal growth velocity. Her medical history included thalassaemia trait and she had no regular medicines.

She underwent C-section under spinal anaesthesia delivering a healthy 2.61 kg baby boy. However, an undiagnosed placenta accreta was found requiring piecemeal removal with very active bleeding. The major obstetric haemorrhage protocol was activated and despite attempted uterine salvage with a Bakri balloon, hysterectomy under general anaesthetic was performed. Blood loss was estimated at 8500 ml and she received peri-operatively 14 units of packed blood cells, 4 units of fresh frozen plasma, 8 units of cryoprecipitate and 2 units of platelets to correct her blood loss and clotting abnormality.

Over the next 24 h, she was successfully extubated, started on a patient-controlled analgesia infusion and commenced Dalteparin 5000 units daily for thromboprophylaxis as per protocol. She was discharged after 72 h to the obstetric high-dependency unit. At that time, her haemoglobin was 8.9 g/dl, platelets $78 \times 10^9/l$ with normal clotting and electrolytes.

The following morning on waking, she alerted staff to right arm and leg weakness. On examination, she had a right-sided flaccid paralysis with brisk reflexes and an up-going plantar with slurred speech but normal cranial nerve and sensory examination. A computerised tomography (CT) head angiogram showed non-specific left internal capsule and thalamic attenuation but no acute ischaemia or haemorrhage with normal cranial arteries. The stroke team commenced 300 mg of aspirin, and a magnetic resonance imaging (MRI) head was performed (Figure 1) which confirmed an acute infarct in the left internal capsule and thalamic area with widespread microangiopathic disease.

Throughout the day, the patient's weakness improved; however, later that evening she developed left-sided weakness with normal tone, power 2–3/5, normal reflexes but an up-going plantar. She also had a left facial droop sparing the forehead with normal sensation. A further CT head demonstrated no new changes and she was transferred back to intensive care unit (ICU) for observation. Upon review of her blood results it was noted that her serum sodium was 120 mmol/l (normal range 135–145 mmol/l), and hence 0.9% saline was commenced.

Over the next three days, she had no further strokes and her weakness and slurring resolved. Investigations for a thromboembolic cause were normal. Her sodium improved to 129 mmol/l; therefore,

intravenous (IV) fluids were stopped. She had difficulty lactating; therefore, dopamine was started and a hormone panel sent which showed that prolactin levels had failed to rise suggestive of panhypopituitarism (Table 1). A repeat MRI at day 14 showed enlargement of the pituitary gland with only peripheral enhancement and a central area of non-enhancing tissue consistent with Sheehan's syndrome. It was felt her stroke was a consequence of both her pro-coagulant peripartum state and due to the coagulation factors she had received as part of the management of her obstetric haemorrhage. This hypercoagulopathy accounts for the widespread changes seen on her MRI and would be consistent with the stroke occurring a couple of days following the haemorrhage. Had the stroke been caused by hypotension during her haemorrhage, we would have expected to see a watershed appearance of the infarct on her MRI and her symptoms to have presented sooner in her clinical course. Her proposed long-term pharmacological management was aspirin alone.

Following IV fluid cessation, her sodium had dropped again to 116 mmol/l and 4 h later to 113 mmol/l. Her serum and urine paired osmolalities (Table 2) were consistent with the syndrome of inappropriate anti-diuretic hormone secretion (SIADH); therefore, a fluid restriction was started. Her sodium on hourly arterial blood gas analysis fell further and at 108 mmol/l she became confused with an irrational desire for water whilst clinical examination showed she was inappropriately retaining water. She was started on IV hypertonic saline (2.7% saline) at 30 ml/h; however, despite increasing this over the next 12 h to 50 ml/h, her sodium increased by 3 mmol/l only. In view of this inadequate response to standard therapy, she was given a stat dose of oral tolvaptan 15 mg. This caused an increase in her sodium levels over the next 24 h (days 8–9 in Figure 2) and her fluid restriction was lifted. IV fluid and sodium intake were adjusted to control the rate of change in serum sodium to prevent central pontine myelinolysis. Her sodium levels started to drop again after day 16 and she was restarted on a fluid restriction. Her sodium had stabilised at 130 mmol/l by discharge.

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Figure 1. T2 weighted MRI head showing multiple signal changes consistent with microangiopathic disease.

Table 1. Blood hormone panel on day 5 of admission.

Hormone	Results	Normal range
Luteinising hormone (IU/l)	<0.1	Follicular: 2.4–12.6 Mid-cycle: 14–95.6 Luteal: 1–11.4
Follicle stimulating hormone (IU/l)	0.2	Post-menopause: 7.7–58.6 Follicular: 3.5–12.5 Mid-cycle: 4.7–21.5 Luteal: 1.7–7.7 Post-menopause: 25.8–134.8
Prolactin (mIU/l)	110	102–496
Thyroid stimulating hormone (mIU/l)	1.6	0.27–4.2
Free T4 (pmol/l)	11.5	12–22

Table 2. Paired osmolarities.

Day of admission	Serum		Urine	
	Sodium (mmol/l)	Osmolarity (mosmol/l)	Sodium (mmol/l)	Osmolarity (mosmol/l)
5	116	234	193	615
8	113	228	188	546

Discussion

A rare consequence of massive post-partum haemorrhage is Sheehan's syndrome which presents as panhypopituitarism. Its course is variable

and often evolves slowly following the insult¹; however, in isolated cases its presentation can be more acute.² Common features include menstrual cycle dysregulation and poor lactation; however, sodium balance can be affected.

There are three postulated mechanisms. The first is central diabetes insipidus as a consequence of failed anti-diuretic hormone secretion due to posterior pituitary infarction.^{3,4} This presents with thirst and polyuria with normal serum sodium; if water intake falls behind urinary excretion then sodium levels rise with dehydration. The second is disruption of the hypothalamic thirst centres following an ischaemic insult although no significant hyponatraemia was seen in the study.⁵ Third, hyponatraemia can occur as a consequence of secondary adrenal insufficiency from the absence of adrenocorticotrophin hormone production from the anterior pituitary.⁶ Whilst our patient had Sheehan's syndrome, there was no history of excess water intake, and her fluid balance remained neutral whilst on the unit; thus, her sodium levels are too low to be explained by thirst centre disruption and her presentation was too acute to have been caused by secondary adrenal insufficiency.⁷

There are, however, isolated reports of early onset hyponatraemia after Sheehan's syndrome⁸ and SIADH has been reported as a potential cause.⁹ Postulated mechanisms involve adrenocorticotrophin deficiency and abnormally high vasopressin secretion in response to mild dehydration.

The risk of stroke during the peripartum period is well documented. Risk factors are related to the pro-thrombotic circulation, placental expulsion and normalization of the pregnancy physiology.¹⁰ Electrolyte abnormality including hyponatraemia itself is a risk factor for stroke¹¹; however, intracranial injury including stroke is known to cause SIADH.¹² Our patient's sodium levels were already low by the time of her stroke; thus, the electrolyte disturbance was likely a risk factor rather than a consequence of the stroke.

The main stay of treatment for SIADH is fluid restriction with careful monitoring of sodium levels to prevent too rapid a rise which can cause central pontine myelinolysis.¹³ In the acute setting, hypertonic saline can be used to increase sodium levels if neurological complications occur; however, it is of limited use in maintenance of sodium levels. Other agents such as demeclocycline or lithium can be used to induce a nephrogenic diabetes insipidus; however, the response is slow and the drugs are secreted in breast milk.

Tolvaptan (SamscaTM, Otsuka America Pharmaceutical Inc) is a vasopressin-2 receptor antagonist used in the management of SIADH,¹⁴ including severe SIADH with neurological symptoms.¹⁵ The advantage of this agent is its oral form, lack of fluid restriction requirement and it can be continued in the outpatient setting, shortening hospital stay.¹⁶ This is of particular importance for new mothers keen to be at home. The safety of the drug whilst breast feeding is unknown. Whilst the drug is not recommended by the manufacturer in the treatment of acute hyponatraemia, our patient was not responding to hypertonic saline, and in our ICU setting we were able to strictly monitor sodium levels and fluid balance and were able to respond to her rapid sodium rise with hypotonic fluids. Whilst her rise was above that recommended over a 24 h period, there were no clinical sequelae and high rates of change have previously been seen without development of central pontine myelinolysis.¹³ Indeed, this emphasises the complex management of these scenarios, mandating a critical care environment.

Conclusion

Hyponatraemia during the peripartum period can have serious consequences for both mother and infant. Whilst methods for controlling symptoms have previously been difficult, vasopressin-2 receptor antagonists such as Tolvaptan offer clinicians a new oral therapy to improve sodium control in severe cases.

Figure 2. Graph of fluid and sodium balance during admission.

Declaration of conflicting interests

None declared

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Ethical approval

Written consent was obtained from the patient for publication.

Guarantor

Timothy AC Snow

Contributorship

TACS was responsible for the first draft. JL, CML, NSM and DAB were responsible for manuscript review and editing.

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