and neonate. Affected patients may present for the first time with symptoms of hyperammonemia during pregnancy, especially in the postpartum period. Patients must be monitored and treated early as indicated. Neuraxial anesthesia may be useful for attenuating the catabolism associated with labor and delivery.

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# Perioperative management of a parturient with hyponatraemia due to carbamazepine therapy

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**ABSTRACT**
We describe the perioperative management of an epileptic parturient who developed hyponatraemia due to carbamazepine therapy. Caesarean delivery was performed under combined spinal-epidural anaesthesia with a good outcome for both mother and neonate. The diagnostic and therapeutic approach, anaesthetic implications and maternal and neonatal risks for a patient with hyponatraemia complicating carbamazepine therapy are discussed.


***Keywords***: Hyponatraemia; Epilepsy; Carbamazepine; Pregnancy; Caesarean delivery; Perioperative management

## Introduction

Hyponatraemia is an electrolyte disorder often encountered in clinical practice. Low serum sodium is associated

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with a high risk of perioperative complications such as agitation, confusion, lethargy, seizures or even mortality due to cerebral oedema.[1] Patients, particularly parturients, with hyponatraemia due to antiepileptic treatment pose a challenge to the anaesthetist during the perioperative period. We present the perioperative management of a parturient with carbamazepine-induced hyponatraemia scheduled for elective caesarean delivery.

## Case report

A 32-year-old term nulliparous woman at 39 weeks of gestation with a history of epilepsy presented to our hospital for preoperative evaluation for elective caesarean delivery due to maternal request. Epilepsy had been diagnosed 12 years earlier and consisted of refractory absence seizures. She had been symptom-free for three years whilst receiving carbamazepine. Her plasma carbamazepine level five days previously was low and the dose had been increased from 800 to 1000 mg/day. The patient reported marginally low plasma sodium concentrations during pregnancy but without clinical symptoms. Her physical examination was unremarkable. On admission, laboratory tests were normal, except for a serum sodium concentration of 128 mmol/L (normal range 136–150 mmol/L). The results after a 24-h urine collection demonstrated a urinary sodium concentration of 61 mmol/L (excreted sodium: 463.6 mmol/24 h, laboratory reference interval: 40–220 mmol/24 h) with a serum sodium of 124 mmol/L. At that time, serum and urine osmolalities were 261 and 422 mOsm/kg, respectively (reference intervals: 275–300 and 300–900 mOsm/kg), and renal function was normal; blood urea was 3.57 mmol/L, creatinine 44.2 μmol/L and creatinine clearance 169 mL/min. The patient reported normal drinking habits and was clinically euvolaemic; she had no signs of oedema, her blood pressure was 123/77 mmHg with a heart rate of 82 beats/min, without orthostatic changes.

Based on the medical history, clinical and biochemical findings (serum osmolality <280 mOsm/kg, urine osmolality >100 mOsm/kg and urine sodium >40 mmol/L) hyponatraemia was attributed to carbamazepine therapy. On the second day after admission, the patient's serum sodium levels were 126 mmol/L and carbamazepine plasma levels were 8.2 μg/mL, within the therapeutic range of 8–12 μg/mL. According to her neurologist, continuation of carbamazepine therapy was necessary, especially during the peripartum period, since the drug controlled her refractory epileptic attacks. Therefore, the parturient was instructed to limit fluid intake to 1 L/day. Serum sodium concentration two days later was 115 mmol/L and the patient was still asymptomatic.

In order to proceed safely with the caesarean delivery, the patient was scheduled to receive intravenous 1.5% saline, targeted to slowly raise the serum sodium by 0.5 mmol/L/h over the next 30 h. After completion of the saline infusion, serum sodium levels increased to 130 mmol/L.

Five days after admission, the woman underwent combined spinal-epidural anaesthesia for caesarean delivery. Intravenous ranitidine 50 mg was given for acid aspiration prophylaxis and routine monitors including electrocardiogram, non-invasive blood pressure and pulse oximeter, were applied. The patient received intrathecal 0.75% ropivacaine 1.8 mL and epidural fentanyl 100 μg. She remained haemodynamically stable without the need for vasoconstrictors. Hydroxyethyl starch (130/0.4) 300 mL and lactated Ringer's solution 500 mL were infused for co-loading until delivery. A 3 IU bolus of oxytocin was followed by an infusion of lactated Ringer's solution 500 mL containing oxytocin 15 IU given over the next 3 h produced adequate uterine tone. Antibiotic prophylaxis consisted of intravenous cefoxitin 2 g. Serum sodium in umbilical cord blood was 130 mmol/L. Apgar scores were 8 and 9 at 1 and 5 min, respectively. The surgical procedure was completed uneventfully with an estimated blood loss of 400 mL. Postoperatively maternal serum sodium was 131 mmol/L and fluctuated between 128 and 132 mmol/L over the following four days under mild fluid restriction (1–1.5 L/day). Postoperative analgesia consisted of epidural ropivacaine 0.2% and morphine (64 mg/24 h and 4 mg/24 h, respectively), intravenous diclofenac 75 mg/12 h and paracetamol 1 g as rescue analgesia. Tinzaparin sodium 3500 IU/24 h subcutaneously was used for thromboprophylaxis. There were no maternal or neonatal complications and mother and baby were discharged home on the fourth postoperative day.

## Discussion

Women with epilepsy are at an increased risk of seizures and complications during pregnancy, labour and the peripartum period.[2] Infants exposed to antiepileptic drugs in utero, have an increased risk of congenital malformations.[2–5] Thus, the minimum effective dose of a single antiepileptic is recommended, especially during the first trimester.[2] The risk of major malformations such as cardiac, neural tube defects, orofacial cleft and hypospadias,[3–5] and the concentration of antiepileptic drugs in breast milk,[6] are presented in Table 1.

The pharmacokinetic changes of pregnancy result in a decreased serum concentration of most antiepileptic drugs,[2] as seen in our case. Factors involved include increased hepatic metabolism and renal elimination, while decreased protein binding may enhance drug clearance.[2] Impaired gastrointestinal absorption and haemodilution may further reduce drug plasma concentration with subsequent risk of seizure precipitation.[2] After delivery, plasma drug concentrations rise increasing the risk of toxicity.[7] Regular measurement of plasma concentration