

Acute Renal Insufficiency Caused by Lithium Carbonate Poisoning During Pregnancy: A

Case Report

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1. Abstract

Pregnancy combined with lithium carbonate poisoning is a great threat to pregnant women, and there is no specific antidote. A woman in the third trimester of pregnancy with fatigue, polydipsia, anorexia, tremor in both hands, acute renal insufficiency, and multiple organ dysfunction was admitted to our hospital. The possibility of poisoning was considered, and fluid rehydration and diuresis were given. Then the family members provided that the patient had a history of schizophrenia and took lithium carbonate sustained release tablets orally for a long time during pregnancy. Laboratory tests showed that the blood concentration of lithium was 1.46mmol/L, which exceeded the normal range, and confirmed lithium poisoning. On the second day of drug withdrawal, the blood concentration of lithium was normal, and the discomfort symptoms and abnormal signs disappeared. This case suggests that lithium poisoning may occur after long-term use of lithium carbonate in pregnancy complicated with psychosis. After symptomatic treatment, the maternal and infant outcomes are good after timely termination of pregnancy.

2. Background

Lithium carbonate has the effect of significantly inhibiting mania, and can also improve the affective disorder of schizophrenia. Clinically, it is a common drug for the treatment of hypomania and schizoaffective psychosis, the effect is obviously. However, because the toxic amount is close to the therapeutic amount, long-term use or improper use can lead to acute lithium poisoning [1, 2]. Lithium carbonate poisoning may cause gastrointestinal symp-

toms, hypotension, renal failure, hypothyroidism, acute encephalopathy syndrome, etc. [3-7]. Therefore, blood lithium concentration should be monitored regularly during medication. To prevent lithium poisoning. One case of clinical pregnancy complicated with lithium poisoning is reported as follows.

3. Case Presentation

A 28-year-old female patient was admitted to our hospital on 2022-04-24 due to 33+3 weeks of menopause, 23 days of hyperglycemia and 4 days of fatigue. 2022-04-01 Glucose tolerance: fasting blood glucose 4.58 mmol/L, 1 hour blood glucose 8.86 mmol/L, 2 hours blood glucose 9.57mmol/L (↑). 2022-4-20 Color Doppler ultrasound: single live fetus, head position, amniotic fluid, left lower abdomen with 3.9cm anteroposterior diameter liquid dark area, right lower abdomen with 4.4cm anteroposterior diameter liquid dark area. The NST responded poorly. Preterm labor, head position, polyhydramnios, gestational diabetes mellitus, peritoneal effusion, fetal distress? , the cause of fatigue pending investigation was admitted to the hospital. In recent four days, the spirit, sleep is not good, anorexia, polydipsia, urine is not abnormal, stool is not solved. Physical examination: body temperature: 36.4°C, pulse: 90 beats/min, regular, breathing: 22 beats/min, shallow and rapid, blood pressure: 137/89 mmHg, clear consciousness, unclear pronunciation, no obvious abnormalities in cardiopulmonary auscultation, abdominal uplift, liver, spleen and underrib, no percussion pain in both kidneys, edema of both lower limbs (-). Obstetric examination: uterine height 39cm, abdominal circumference 97cm, fetal heart rate 140 times/min, first

outcropping, fixed, irregular contractions can be reached; Vaginal examination: the uterine orifice was widened 2cm without vaginal bleeding or running water. 2022-04-24 Blood gas Analysis: PH 7.26 (↓), partial pressure of carbon dioxide 13.10 mmHg (↓), partial pressure of oxygen (T) 130.60 mmHg (↑), residual base -18.00 mmol/L (↓), standard bicarbonate 11.20 mmol/L (↓), real bicarbonate 5.90(mmol/L) (↓); Blood routine +CRP+ blood type: white blood cell count $17.571 \times 10^9/L$ (↑), erythrocyte ratio 32.80% (↓), hemoglobin concentration 110 g/L (↓); Renal function: Glomerular filtration rate (MDRD calculation) 11.92 ml/min (↓), urea 16.67 mmol/L (↑), uric acid 690 umol/L (↑), creatinine 413 umol/L (↑), cystatin C 1.64 mg/L (↑); Thyroid function: thyrotropin 5.186 $\mu IU/mL$, free triiodothyronine 1.81 pmol/L, free thyroxine 6.27 pmol/L; Liver function, coagulation function, myocardial zymogram, electrolytes, brain natriuretic peptide, blood amylase, blood ammonia and urine routine were normal. Random blood glucose 5.3 mmol/L. Color Doppler ultrasound of bilateral ureters showed enlargement of both kidneys, hydronephrosis of both kidneys and dilatation of bilateral ureters.

Based on the comprehensive analysis of the above examination results, the preliminary diagnosis of gestational diabetes mellitus, abdominal effusion, pregnancy complicated with polyhydramnios, preterm labor at 1 labor 0 gestational 33+3 weeks, fetal distress? Acute renal insufficiency, metabolic acidosis, hypothyroidism. Differential diagnosis: The patient had no severe dehydration and blood loss, no urinary calculi and tumors, and the cause of acute renal impairment was likely renal. Acute kidney injury is often caused by some toxicants, drugs or other causes of bodily damage. Symptomatic and supportive treatment including oral eucarole, anti-infection therapy, acid correction, electrolyte correction, and massive fluid replacement were given. Blood gas analysis pH was normal, renal function: glomerular filtration rate (MDRD calculation) 14.87 ml/min (↓), urea 16.02 mmol/L (↑), uric acid 668 umol/L (↑), creatinine 344 umol/L (↑), cystatin C 1.56 mg/L (↑). The patient's family was asked for her medical history again, and the patient's husband came to the hospital complaining that the patient had been diagnosed with a history of schizophrenia before pregnancy. She had been taking lithium carbonate sustained-release tablets for a long time during pregnancy (0.6g/ time, twice a day) and clozapine tablets (4 tablets in the morning and 8 tablets in the evening). Serum lithium was further measured at 1.47 mmol/L. Diagnosis of lithium carbonate poisoning (thyroid, brain, kidney). Stop oral administration of lithium carbonate, continue fluid replacement to accelerate lithium excretion and other symptomatic support treatment. The patient had fatigue, tremors in extremities, and dysarthria improved. A baby girl was delivered at 09:38 AM on 2022-04-25. The newborn was transferred to neonatology department because of high risk. On the first day after delivery, her symptoms returned to normal and her renal function was normal. Serum lithium of neonates was normal.

4. The Literature Review

Poisoning mechanism and reason: Lithium carbonate is a common treatment of mania, lithium ion into the cell, and intracellular sodium ion exchange, reduce the excitability of the cell and cause poisoning. The causes of lithium poisoning are various, such as self-overdose, decreased sodium intake, decreased glomerular filtration rate, influence of kidney related diseases and improper control of blood lithium concentration [7].

Diagnosis of lithium poisoning: Clinical manifestations: muscle fibrillation, ataxia, limb motor coordination disorders, dysarthria and consciousness disorders. Laboratory tests: blood lithium concentration $\geq 1.4 \text{ mmol/L}$, but when serum lithium exceeds 0.5 mmol/L in elderly, frail, poor diet or susceptible patients, lithium poisoning can also occur [8]. Due to certain individual differences, clinical diagnosis should be combined.

Adverse reactions caused by lithium carbonate poisoning: It is mainly manifested as damage to the nervous system [3]. The early manifestations of lithium carbonate poisoning generally show gastrointestinal symptoms, such as nausea, vomiting, diarrhea, anorexia and so on. Subsequently, acute encephalopathy syndrome such as dysarthria, confusion, hyperreflexia, ataxia, tremor of limbs, muscle spasm and so on may occur. Common clinical doses of lithium carbonate can also lead to quiescent tremor and other adverse reactions, and in severe cases, irreversible damage to the cerebellum and even death [9-11]. Secondly, the relative molecular weight of lithium is small, which is similar to the water distribution volume of the human body, almost does not bind to proteins, and does not require liver metabolism. Lithium ions are mainly excluded from the kidney, with a low renal clearance rate (10-40 ml/min). Overdose, dehydration, malnutrition, combined use of diuretics and tricyclic antidepressants can all affect the metabolism of lithium and prone to acute renal insufficiency [12, 13]. Other studies have shown that lithium poisoning can cause liver damage [14].

Treatment principle of lithium carbonate poisoning: There is no special antidote for lithium poisoning, the treatment principle is to stop the drug immediately and remove excessive lithium salt, give a large amount of normal saline or hypertonic sodium salt to accelerate the excretion of lithium salt, or intravenous injection of aminophylline and mannitol, artificial hemodialysis is needed for severe cases, and other symptomatic support treatment is provided [5, 9].

5. Discussion and Conclusion

In this case, renal function was significantly impaired. Lithium carbonate can also prevent iodide from entering the thyroid gland and cause secondary hypothyroidism. The incidence of hypothyroidism in patients with long-term medication is significantly increased. In addition, thyroid function TSH was increased and free T3 and T4 were decreased, suggesting the existence of drug-in-

duced hypothyroidism without obvious clinical symptoms. In addition, the treatment amount of lithium carbonate has a certain effect on the heart and brain, which can cause ECG changes, common T wave low level, QRS prolongation, QT prolongation of U wave. Eeg changes refer to the increase of diffuse slow waves. The results confirmed that the incidence of abnormal ECG and EEG was positively correlated with the dose and blood lithium concentration. Therefore, clinicians should pay attention to cardiac and EEG examination. Once abnormal findings are found, the dose of lithium carbonate should be adjusted in time. Most patients can return to normal after drug withdrawal or reduction.

In the case described herein, the pregnant woman concealed her medical history at admission, which made the diagnosis difficult. Fortunately, timely treatment to maintain the stability of the internal environment. At present, it is not possible to use laboratory toxicological analysis to diagnose all poisons quickly and clearly in clinical practice, and it is very easy to be misdiagnosed as other diseases that can cause systemic multiple organ dysfunction in clinical practice [11, 13, 15]. Therefore, the concept of poisoning should be established in the process of diagnosis, and the possibility of poisoning should be considered if it cannot be explained by common diseases. Thorough history taking is the key to a definite diagnosis, but symptomatic and supportive treatment for organ function is also crucial when the history is unknown and specific antidotes are not available. So as not to miss the rescue opportunity and delay treatment. In addition, it is suggested that clinicians should introduce the characteristics of drug therapy, possible adverse reactions, warning symptoms and prevention methods to patients and their families who take lithium tablets outside the hospital, and inform them of the importance of regular review of blood lithium concentration, so as to find and deal with it in time. The treatment of lithium carbonate is easy to occur poisoning, but in the treatment of hypomania, schizoaffective psychosis has a unique effect, so it is still a common psychiatric drug, as long as closely observe the condition, grasp the dose, strict monitoring, careful care, lithium salt poisoning can be prevented.

In summary, the patient was in labor on admission, and the pregnancy was terminated in time, and a good perinatal outcome was achieved. The newborn was sent to the neonatology department for observation at the first time, and the normal range of serum lithium was detected. After 2 months of birth, neonates were followed up and tested. Feeding, sleeping, urination, jaundice and umbilical cord were inquired and observed. The neonatal feeding, sleep, urine and urine, jaundice and other conditions were mainly inquired and observed, and their weight, length and development were measured. Nothing abnormal.

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