CASE REPORT

Methaemoglobinaemia in pregnancy with chronic kidney disease an uncommon case: A case report

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Abstract

The development of methaemoglobinaemia due to prilocaine, which is used for local anaesthesia, is a rare, life-threatening, but well-known side effect. The development of this side-effect in a pregnant patient with chronic kidney disease can lead to foetal distress. The case presented here is of a 21-year old pregnant female with chronic kidney disease who required haemodialysis in the 22nd week of pregnancy due to the progression to end-stage kidney disease. During haemodialysis, a right jugular tunneled double-lumen catheter was inserted using prilocaine as the local anaesthetic. Prilocaine-induced methaemoglobinaemia was diagnosed. In the 24-hour follow-up, the methaemoglobin level decreased to normal with oxygen supply of 10-15 L/min, 2 units of erythrocyte suspension and accompanying haemodialysis.

Keywords: Methemoglobinemia, Prilocaine, Pregnancy, Hemodialysis.

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Introduction

Methaemoglobinaemia is a form of haemoglobinopathy, characterized by a higher than normal level of methaemoglobin (MetHb). MetHb at a concentration of 10% - 20% can be well tolerated, whereas higher levels may often be associated with symptoms.[1]

Many chemicals and drugs known to cause acquired methaemoglobinaemia have been identified, and methaemoglobinaemia has a well-known adverse reaction to local anaesthetic agents. The condition is well understood with prilocaine use. Orthotoluidine, a metabolite, is known to be responsible for haemoglobin oxidation. It has been reported that an increased dose will increase the likelihood of developing measurable methaemoglobinaemia, whereas there are large inter-individual differences in the extent of the development of MetHb with the administration of any prilocaine dose.[2,3]

Women with significant chronic kidney disease (CKD), particularly those with advanced CKD, are much less likely to become pregnant or have an uncomplicated pregnancy compared with women with normal kidney function. Since there are no population-based studies, there is a lack of data about the frequency of pregnancy among women with non-dialysis CKD.[4]

The case documented here is of a 21-year old female patient with CKD who presented in the 22nd week of pregnancy with the need for immediate haemodialysis treatment. First, a double-lumen tunneled right jugular catheter was applied using prilocaine as the local anaesthetic. Subsequently, acquired methaemoglobinaemia developed. Although there are cases of methaemoglobinaemia during pregnancy in literature[5], the reporting of this patient can be considered of interest and value as end-stage renal failure is uncommon in these cases.

Case Report

A 21-year-old female patient presented to Nephrology out-patient-department (OPD) at Sultan Abdulhamid Han Training and Research Hospital, Istanbul in December 2019 with complaints of headaches and nausea, of one months duration. The medical history showed that an examination six months previously had determined creatinine:2.1 mg/dL (0.6-1.2 mg/dL) with Renal ultrasonography showing a reduction in both kidney sizes.

On admission, blood pressure was recorded as 170/110 mmHg. Physical examination revealed pallor of the conjunctiva and skin. The ambulatory blood pressure values of the patient were consistent with non-dipper stage II hypertension.

The biochemical examination results were as follows: Haemoglobin:9.3 g/dL (12-16 g/dL), haematocrit: 26.8% (38-52%), serum creatinine: 2.32 mg/dL (0.6-1.2 mg/dL), eGFR: 27 ml/min per 1.73 m^2 (90-120 ml/min per 1.73 m^2), blood urea: 62 mg / dL (20-44 mg/dL), 24-hour urine protein 4925 mg (0-150 mg), ferritin:338 ng/mL (30-400 ng/mL), corrected calcium: 8.6 mg / dL (8.6-10 mg/dL), parathormone:232 pg/mL (15-65 pg/mL) and 25-hydroxyvitamin D:34.1 ng/mL (30-100 ng/mL). As a result of the detection of chronic anaemia, secondary hyperparathyroidism, and long standing impaired renal

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Table: Arterial blood gas parameters in the 24-hour follow-up in the intensive care unit.

	0 hour	6th hour	12th hour	18th hour	24th hour
pH (7.35-7.45)	7.44	7.414	7.395	7.464	7.46
PCO2(35-45 mmHg)	32.6	33.4	23.1	41.4	39
SO2 (90-95%)	78	81	83	88	95
HCO3(22-26 mmol/L)	21	22	19	28	29
MetHb (0.5-3%)	17.6	17.2	13.8	9	2.3

function tests, the diagnosis of chronic renal failure was determined.

Due to menstrual delay and complaints of nausea and vomiting a pregnancy test was performed and was found to be positive. The patient was followed up by the Nephrology and Obstetrics Departments as a high-risk pregnancy with stage IV chronic kidney disease and hypertension.

At 22 weeks of gestation, it was decided to start haemodialysis due to the development of end-stage renal failure. A haemodialysis catheter was inserted with a right jugular tunnel immediately following the administration of prilocaine as a local anaesthetic. Approximately 20 to 30 minutes after the prilocaine 300 mg (Citanest® 2%, 20 mg/mL) application, the patient developed clinical symptoms. Cyanosis was seen on the lips and hands a few minutes after the insertion of the catheter, and oxygen saturation measured by using pulse oximetry was 75-80% at room air. Oxygen saturation increased to 90% with oxygen support of 5 L/min. The MetHb level in arterial blood gas was 17.6% (0.5-3%). After differential diagnosis with clinical and laboratory evaluation, methaemoglobinaemia was diagnosed which was secondary to the use of local anaesthetic (prilocaine) while inserting the catheter.

In the 24-hour follow-up, the MetHb level decreased to <3% (0.5-3%) with oxygen supply of 10-15 L/min, 2 units of erythrocyte suspension treatment and accompanying haemodialysis (Table). Oxygen saturation of >90% at room air without oxygen supplementation was obtained. In daily obstetrics consultations with bedside ultrasonography, it was determined that the foetus was not affected by methaemoglobin.

Informed consent was obtained from the patient for publishing this case report.

Discussion

Although methaemoglobinaemia is a treatable condition, it can be potentially lethal because of the hypoxic stress placed on the body. It is necessary to consider methaemoglobinaemia in all emergency patients presenting with central cyanosis, particularly those with no history of cardiovascular or pulmonary disease.

A broad spectrum of treatments are available for methaemoglobinaemia. It may be resolved by simply withdrawing the offending agent or additional therapies (Methylene blue, other antioxidants, such as vitamin C, and tocopherol acetate, etc.) may be required. Urgent therapy is necessary for symptomatic patients or those with MetHb levels >20%. As the effects of methylene blue administration in early pregnancy are potentially teratogenic and the effects in late pregnancy are unknown, there is an immediate risk to both mother and foetus of acute methaemoglobinaemia and its treatment.[6,7] Although foetus delivery can relieve the physiological stress which contributes to methaemoglobinaemia, the benefits will be dependent on gestational age and the resources available.[8,9]

The current case is unique because methaemoglobinaemia developed secondary to prilocaine administration for insertion of a dialysis catheter in a 22-week gravid CKD patient requiring emergency haemodialysis treatment. Unlike previously documented cases, this patient had almost complete recovery from methaemoglobinaemia and the foetus was not affected by the high MetHb level due to prompt treatment with oxygen administration, blood transfusion and dialysis without the need for methylene blue administration, which was not preferred primarily because of teratogenicity.[10]

Conclusion

This case highlights avoiding exposure to a large dose of anaesthetic agents which have a high risk for methaemoglobinaemia, especially in the high-risk patients. After the diagnosis of methaemoglobinaemia in a pregnant patient with chronic kidney disease as this case, the treatment option could be considered a high level of oxygen supply (5-10 L/min) plus blood transfusion combined with haemodialysis. In this group of patients, this treatment approach will be an effective and safe treatment option.

Consent Form: Consent from patient has been taken to publish her case.

Disclaimer: None to declare.

Conflict of Interest: None to declare.

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