

Acute carbon monoxide intoxication during pregnancy

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AUTHORS' CONTRIBUTION: (A) Study Design · (B) Data Collection · (C) Statistical Analysis · (D) Data Interpretation · (E) Manuscript Preparation · (F) Literature Search · (G) Funds Collection

SUMMARY

Carbon monoxide is the leading causal factor of deadly sporadic intoxication in adult populations. Some of intoxicated patients are women during different stages of pregnancy. One must be aware about physiological differences between mother and unborn fetus to properly deal with such case. The aim of this study is to present a case of a pregnant patient acutely intoxicated with carbon monoxide and to quickly review available literature on this topic.

Many people all over the world are intoxicated with carbon monoxide each year. The problem is not new, and many investigations were performed on this topic, but it is unpredictable what could be adverse effects on fetus or mother according to laboratory tests nor CTG examination.

Although carbon monoxide intoxication is relatively frequent little is known what to do when the pregnant woman is intoxicated. Further research is needed to evaluate treatment methods. Unfortunately, the outcome of intoxication is often unsuccessful.

Key words: pregnancy; carbon monoxide; intoxication

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INTRODUCTION

Carbon monoxide is the leading causal factor of deadly sporadic intoxication in adult populations. Some of intoxicated patients are women during different stages of pregnancy. One must be aware about physiological differences between mother and unborn fetus to properly deal with such case.

CASE REPORT

A 24-year-old obese, smoking patient was brought to the hospital around 2.30 at night due to signs of carbon monoxide poisoning after probable exposure at home. On admission the patient was conscious, but sleepy. She answered the questions asked with short, seemingly logical, but not consistent statements. She had symmetrical pupils, responsive to light. She said she was in the ninth month of pregnancy, but she did not have any documentation.

She weighted – 126 kg, being 174 cm height, BMI -41.6 kg/m². The patient denied taking medication during pregnancy, negated the occurrence of complications during pregnancy. No more interview data could be obtained.

Normobaric oxygen through the face mask was used in the treatment at a flow of 8l/h. Continuous CTG recording was used, as well as patient monitoring using a cardiomonitor. Blood and urine samples were taken for blood gasometry, morphology, electrolyte, creatinine, glucose, blood group, hepatitis B, C, and HIV tests. In addition, a toxicological test was performed to exclude the presence of other toxic factors.

Initially, blood gas parameters (already during oxygen therapy) were as follows: pH 7.440; pCO₂ 28.2mm Hg; pO₂165mmHg, SO₂: 100%; FO₂Hb 74.05; FHb 0.4%; FCOHb 24.5; FMeTHb 1.1%; cLac 8.6 mmol/L; ctCO₂ 17.4mmol/l; ABE, c -3.9mmol/L; cHCO₃⁻ 19.1mmol/L. Due to abnormal long-term oscillation in the CTG record, threatened intrauterine asphyxia, maternal carbon mono-

xide poisoning, pregnancy probably at term, no availability of treatment with hyperbaric therapy, the patient was qualified to caesarean section. Because of difficulties during spinal anesthesia the patient received Cetamine.

Newborn female was born weighting 3540g, 55 cm long, scoring on the Apgar scale during 1 minute – 7 points. During 3min.-8 points and 9 points in 5 and 10 minute. Umbilical artery blood gasometry test showed as follow: pH 7.361; pCO₂ 46.6 mmHg; pO₂ 17.0mmHg; SO₂: 51%; FO₂Hb 39.5%; FHHb 37.7%; FCOHb 20.6%; FMeTHb 2.2%; cLac 2.8 mmol/L; ctCO₂ 24.2 mmol/L; ABE, c 0.4mmol/L; cHCO₃- 26.4 mmol/L.

Further hospitalization was uncomplicated. The patient was treated with passive oxygen therapy and was monitored. She was discharged home after 3 days of hospitalization with the newborn who did not show any symptoms of pathology.

DISCUSSION

Carbon monoxide poisoning can occur also among pregnant women. The vast majority of intoxications happen accidentally at home [1]. The physiology of gas management is different in organisms of mother and fetus, which creates additional challenges for medical professionals. Carbon monoxide acts in 3 different ways - on the one hand, it binds to the mother's hemoglobin, which reduces the oxygenation of her blood, and thus causes fetal hypoxia. Secondly, it binds to fetal hemoglobin. The last mechanism is the shift of the oxygen dissociation curve from hemoglobin to the left, and probably a change in its shape [2].

Literature reports often fatal poisoning of mother and fetus. It is estimated that the mortality rate of pregnant women poisoned with carbon monoxide is 19-24%, and when it comes to fetuses 36-67% [3]. There have also been cases in which both, mother and her child survived, but the child's central nervous system was irreparably damaged [4].

Lack of agreement between the authors regarding the standard of management in a given clinical situation depending on the initial concentration of carboxyhemoglobin in the mother's blood, gestational age or the time of exposure of a pregnant woman to elevated carbon monoxide. Some postulates the superiority of hyperbaric oxygen treatment over normobaric oxygen [5]. A contraindication to the use of this method of treatment routinely is the

low availability and existing reports of an increased risk of birth defects after treatment with hyperbaric oxygen proven in animal models [6].

The time needed to release carbon monoxide from carboxyhemoglobin when breathing with 100% oxygen is longer for fetus (5-7h) than for its mother (2-3h). Therefore, normalization of the gasometric parameters of a pregnant woman without further prolonged oxygen therapy can lead to hypoxia of the fetus, especially its nervous system manifesting itself much later, which can even result in intrauterine fetal death [7].

CONCLUSION

Doctors of different specialties, such as emergency medicine, anaesthesiology, obstetrics and gynecology should be prepared to treat pregnant women acutely poisoned with carbon monoxide. Unfortunately, there are no clearly defined guidelines for a particular clinical situation. Regardless of the chosen course of action, in each case you must remember about the differences between the mother and the fetus. Rapid clinical decision-making is often required, because when delayed – the outcome can be fatal.

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