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Case Report

Life-saving of a Patient with Severe Metabolic Acidosis Caused by Methanol Toxicity

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ABSTRACT

Consumption of alcoholic beverages as well as industrial alcohols, especially at the same time and after the outbreak of COVID-19, has become one of the problems of the healthcare system. Therefore, despite the provision of much education regarding the ineffectiveness of drinking alcohol to prevent diseases, including COVID-19, people continue to prepare and consume hand-made and sometimes industrial alcohol, which causes danger to themselves and others due to the presence of impurities, such as methanol. Methanol poisoning causes these individuals to go to the emergency room and can even result in death. In very rare cases, people also survive. The present study aims to introduce a 60-year-old patient who suffered from severe methanol poisoning after consuming homemade drinks, and the process of diagnosis and treatment is described.

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طب داخلی روز
فصلنامه دانشگاه علوم پزشکی و خدمات درمانی گناباد

مقاله موردی

نجات یک بیمار دچار اسیدوز متابولیک شدید ناشی از مصرف متانول

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چکیده

مصرف مشروبات الکلی و همچنین الکل‌های صنعتی بویژه همزمان و پس از دوره شیوع بیماری کووید به یکی از معضلات سیستم بهداشتی و درمانی تبدیل شده است. به گونه ای که علی رغم آموزش های فراوان در مورد عدم تأثیر شرب الکل برای پیشگیری از ابتلا به بیماریها از جمله کروناویروس باز افرادی اقدام به تهیه و مصرف الکل های دست ساز و گاهاً صنعتی نیز می نمایند که به علت وجود ناخالصی هایی همچون متانول موجب خطر آفرینی برای خود و دیگران می گردند. مسمومیت با متانول موجب انتقال این افراد به اورژانس و حتی مرگ آنان می شود. در موارد بسیار نادر افرادی نیز جان سالم به در می برند. در این مطالعه ما به معرفی بیماری ۶۰ ساله که به دنبال مصرف مشروبات دست ساز دچار مسمومیت شدید با متانول شده است پرداخته ایم و روند تشخیص و سیر درمان شرح داده شده است.

کلیدواژه‌ها:
اسیدوز متابولیک،
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Introduction

One of the problems that has occurred in the country in the last few years is alcohol and stimulant abuse, and it is one of the causes of presentation to the emergency rooms [1]. The COVID-19 pandemic caused a change in alcohol consumption patterns, an impact on alcohol production and sales policies, and also the prevalence of unforeseen poisonings, including methanol poisoning [2]. Several waves of methanol poisoning, including hand sanitizer contamination, were reported in different countries [3].

A wave of methanol poisoning occurred in Iran in the early months of the COVID-19 pandemic [4]. In Iran, one of the common motivations for alcohol consumption is to escape from problems and cope with stress [5]. The prevalence of methanol poisoning in Iran during the first phase of COVID-19 was associated with a significant increase in the hospitalization rate among children and adolescents, which included at least six deaths in children's hospitals due to poisoning [6].

In addition to ethanol, hand-made alcoholic beverages may contain impurities of methanol or methyl alcohol, the consumption of which causes people to be poisoned [7]. After entering the digestive system of people, methanol is quickly absorbed and converted into formaldehyde and formic acid in the liver by the alcohol dehydrogenase enzyme. Finally, it causes metabolic acidosis [8], which can be detected by ABG test because the clinical symptoms are non-specific in metabolic acidosis, the pH index is below 7.35, and the serum bicarbonate level is below 18 mEq/L. It should be noted that life-threatening severe acidosis and pH below 7.1 is a medical emergency due to the risk of cardiac arrhythmia, and the presence of acidosis is directly related to the increase in patient mortality [9-11].

In the present study, the authors intended to introduce a patient who suffered from severe metabolic acidosis after consuming methanol, and his treatment was successful despite a severe drop in pH.

Case Presentation

The patient was a 60-year-old man who was referred to the emergency room of Amir-al-Momenin Hospital in Maragheh, Iran, after being diagnosed with ischemic heart disease. He presented with the help of companions, with the complaint of nausea since this morning, cold, chest pain, and sweats since three hours ago. He had decreased alertness, drowsiness, and vital signs of BP: 160/95, PR: 81, RR: 15, T: 36.5, Spo2: 94% in the emergency room.

The patient was disoriented and apparently had a history of hypertension and opiate abuse. According to the companions, since the morning of the day before the presentation, the patient had restlessness, abdominal, back, and chest pain, nausea, and vomiting, and he complained of a progressive loss of vision in both eyes. After a few minutes of being on the emergency bed, the patient developed bradycardia and HR: 50-60, BP: 144/101.

The patient's breathing was abdominal and irregular, and the patient had no obvious focal neurological deficit (FND). The patient was monitored, and a blood sample was taken from him for diagnostic laboratory tests, including BS, Na, K, Cr, BUN, CBC Diff, and ABG. After obtaining the results of the tests, which demonstrated a pH<6.8, one of the companions pointed out the history of alcohol consumption; therefore, treatment measures were started for the patient regarding methanol poisoning. The results of the tests were as follows: White blood cell count: 17,500, hematocrit: 50, platelet count: 260,000, random blood sugar: 244 mg/dL, blood urea: 34 mg/dL, creatinine: 1.7 mg/dL, sodium: 143 meq/ml, potassium: 5.3 meq/ml, troponin: 0.01 ng/ml, and also ABG results as following: 525=Po2, 13=Pco2, pH < 6.8, HCo3=8. In addition, urine analysis did not show ketone or any finding favoring a particular diagnosis.

Due to the patient's progressive loss of consciousness, he was intubated using the rapid sequence intubation (RSI) method, and a nasogastric tube was inserted. Based on the history and the results of the tests, measures were immediately taken to correct metabolic acidosis, and a hemodialysis venous catheter was implanted. The patient was hydrated, and oral ethanol 80% was administered via gavage at an initial dose of 2 cc/kg of body weight, followed by 0.25 cc/kg per hour. After 90 min from admission to the hospital, and following emergency preparations and consultations, he underwent hemodialysis due to severe acidosis and blurred vision. Moreover, because of severe acidosis and blurred vision, the patient received B complex vitamins BID (3 days), IV bicarbonate 50ml/8h (2 days), 20000 IU of subcutaneous erythropoietin, and a daily dose of IV methylprednisolone.

Finally, after the stability of the patient's symptoms, he was transferred to the ICU, where he was conscious but disoriented and delirious. Two days after being hospitalized in this ward and having a partial recovery, he was transferred to the men's internal ward. After 5 days, he was discharged with an acceptable general condition and improved vision. All laboratory tests were rechecked, and the results were expected on discharge day.

Discussion

One of the main problems after the COVID-19 pandemic was the increase in high-risk behaviors, including alcohol consumption. The trend of alcohol poisoning, as well as deaths caused by it, increased in all age groups at the same time and after the COVID-19 pandemic in Iran, which indicates the urgent need to prevent high-risk alcohol consumption and also improve treatment [13, 12, 8].

Alcohol abuse has been considered one of the social harms in human societies for the past years until now, and its consumption has been associated with physical harm to people's bodies and the occurrence of a series of violent behaviors [14, 8]. The injury caused by artificial alcohols that people use is due to the presence of methanol within them, which causes methanol to be converted into formaldehyde and formic acid in the liver by the dehydrogenase enzyme, which ultimately causes metabolic acidosis and can leave many severe side effects [7,15,16]. Its symptoms include chest and abdominal pain, blurred vision, shortness of breath, and impaired consciousness, and its side effects include acidosis, irreversible visual impairment, serious cardiac and neurological complications, and in severe cases, necrosis of the basal ganglia and white matter, and severe edema of the brain and coma [14,8]. Moreover, it causes renal dysfunction and an increase in serum creatinine level [17,9], and each of these complications is associated with high mortality [13,18,19]. On the other hand, due to the variety of symptoms and mimicking the symptoms of different diseases, it may cause misdiagnosis, as in the case presented in this work [18].

Bicarbonate administration in severe methanol-induced acidosis may reverse visual defects and help reduce the rate of active formic acid production [10]. In addition, the case report presented by Ahmadi et al. refers to the significant effect of bicarbonate in the treatment process [20]. Then, methanol and its serum metabolites can be removed by hemodialysis [10, 15, 19]. Ethanol therapy is also one of the basic treatment lines for methanol poisoning and is used as an antidote. Our study confirms that timely hemodialysis, ethanol, bicarbonate, and supportive treatment can be life-saving in methanol poisoning, even in severe cases of acidosis and visual impairment, which have been associated with high mortality in various studies [21].

Conclusion

The reported case with a pH less than 6.8 is one of the rare instances that responded to treatment measures, saving the patient's life, while a pH level below 7.1 is considered a dangerous range for all patients. Therefore, quick diagnosis of methanol poisoning and immediate, appropriate actions to treat the patient play a significant role in saving lives from certain death.

It should be emphasized that taking a detailed history from the patient and companions, along with a thorough clinical examination, is essential for reaching a correct and definitive diagnosis amid potentially incorrect and unimportant information provided by companions, the patient, or even other colleagues. This misinformation can lead to delays in critical decisions or mislead the clinician in diagnosis and essential treatment. Thus, members of the treatment team must be familiar with the latest treatment methods while exercising patience and accuracy in obtaining the history and clinical profile, enabling them to participate effectively and efficiently in the treatment process.

Ethical Considerations

Compliance with ethical guidelines

The study was reviewed and approved by the Ethics Committee of Maragheh University of Medical Sciences: IR.MARAGHEHPHC.REC.1403.062. This research is based on the information in the patients' records, and the studies and findings will be completely confidential. Moreover, the authors followed the guidelines of ethical codes in research.

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Authors' contributions

Esmaeil Maghsoodi, conceptualization, methodology, writing, reviewing, and editing; Hossein Alikhah, data curation, conceptualization, writing, original draft preparation; Somayyeh Ghavipanjeh, data curation, original draft preparation, reviewing, and editing.

Conflicts of interest

The authors have no conflicts of interest to declare.

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