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Case Report

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Arrhythmia secondary to CO poisoning after hookah smoking

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ABSTRACT

Our case study highlights the importance of considering CO poisoning in young adults, particularly after hookah smoking. Ongoing monitoring and suspicion of hookah use are emphasized in such cases. A 28-year-old male non-smoker without a medical history of chronic illness was brought to the Emergency Medicine department complaining of nausea, dizziness, palpitation, and falling. His ECG still atrial fibrillation (AF). According to blood gas values, CO-Hb level was 21.6%. The patient was diagnosed with CO poisoning and was administered high-flow oxygen with a non-rebreather mask. The patient underwent cardioversion. It should not be forgotten that cardiac rhythm problems may occur after smoke hookah.

Keywords: Emergency, CO poisoning, hookah, atrial fibrillation

INTRODUCTION

Carbon monoxide (CO) poisoning, known as the silent killer, is a global health threat responsible for numerous fatal poisonings. The condition, whether acute or chronic, presents with symptoms ranging from mild to severe, including headache, dizziness, and weakness. Acute poisoning leads to critical effects such as myocardial and brain damage, pulmonary edema, and shock. CO's mechanism involves its high affinity for hemoglobin, causing hypoxia and tissue damage. It also induces vascular changes contributing to myocardial damage and arrhythmias. Management requires a comprehensive approach, including thorough medical assessment and continuous monitoring of vital signs. Normobaric oxygen therapy is the primary treatment, with targets for carboxyhemoglobin levels. The efficacy of hyperbaric oxygen therapy (HBO) is debated, and its use lacks clear indications. Our case study highlights the importance of considering CO poisoning in young adults, particularly after hookah smoking. Ongoing monitoring and suspicion of hookah use are emphasized in such cases.

CASE REPORT

A 28-year-old male non-smoker without a medical history of chronic illness was brought to the emergency medicine department complaining of nausea, dizziness, palpitation, and falling. After the detailed medical history taking, it was learned that these complaints started after smoking hookah, and the patient also had minor head trauma. Upon arrival at the emergency department, his vital signs were as follows: blood pressure 106/73, heart rate: 96/minute, respiratory rate: 12/minute, temperature: 36.6°C, and oxygen saturation 95% in room air. There wasn't any pathological sign on physical examination.

According to blood gas values, pH was 7.38 (normal: 7.35 to 7.45), the pressure of carbon dioxide (pCO_2): 44.4 mmHg (normal: 35-45 mmHg), bicarbonate (HCO_3) 24.1 mmol/L (normal: 22-26 mmol/L) and the CO-Hb level was 21.6% (normal: up to 3% in non-smokers and up to 10% heavy smokers. The patient was diagnosed with CO poisoning and was administered high-flow oxygen with a non-rebreather mask. Almost one and half hours into oxygen therapy, the patient's complaints regressed, and the CO-Hb level was decreased to 12%. The patient who continued on oxygen therapy did not report chest pain, and his ECG still showed atrial fibrillation (AF) (**Figure 1**). Serial troponin results came within the normal range. Therefore, the patient was consulted with cardiology and hospitalized with a medical cardioversion plan. Transthoracic echocardiography (ECHO) was performed by cardiology team and showed a preserved left ventricular systolic function with a left ventricle ejection fraction of 60%, no wall motion abnormalities, and non-significant trace mitral regurgitation with normal pulmonary artery systolic pressure. The patient was administered metoprolol 100 mg twice daily and enoxaparin 60 mg twice daily. Thrombus was not observed after TEE (transesophageal ECHO) and medical cardioversion was performed. The patient was discharged after sinus rhythm (**Figure 2**) was observed on ECG, hemodynamics remained stable, and his complaints regressed.

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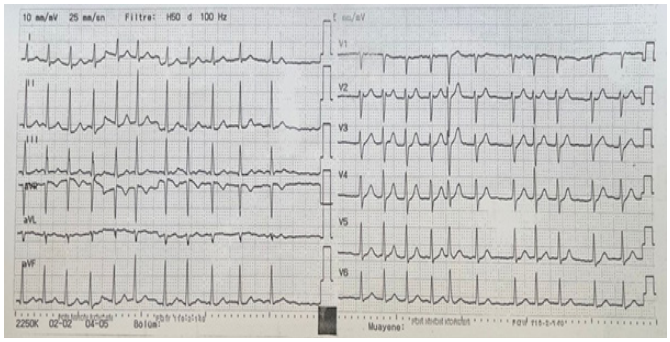


Figure 1. An electrocardiogram showed atrial fibrillation

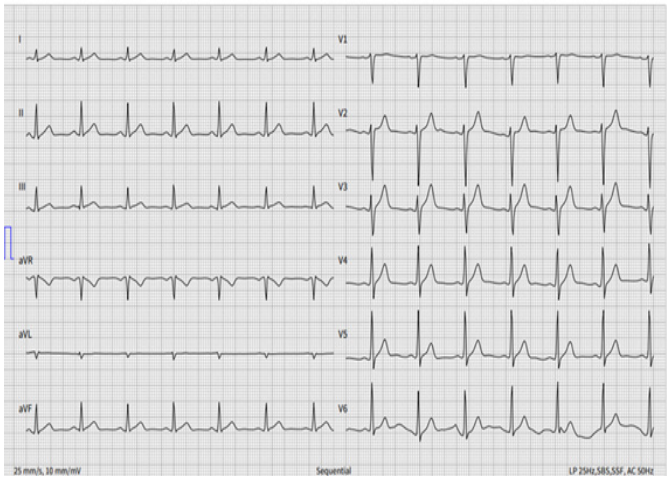


Figure 2. An electrocardiogram showed sinus rhythm after treatment

DISCUSSION

CO poisoning is a common emergency known as the silent killer. It is odorless, colorless, and tasteless, which may be responsible for more than half of all fatal poisonings in the world.[1] CO poisoning may be acute or chronic and can cause a range of acute effects from mild symptoms to critical illness. It is also reported that headache (91% of patients), dizziness (77%), and weakness (53%) are the most common symptoms.[2,3] Acute CO poisoning causes severe myocardial damage as well as brain edema, pulmonary edema, and shock since myocardial oxygen demand is higher than in peripheral tissues at rest.[4] ACOP can result in myocardial ischemia, infarction, dysrhythmia, cardiomyopathy, heart failure, cardiogenic shock, and sudden death. The mechanism of CO poisoning is related to the higher affinity of CO for hemoglobin than oxygen, and hypoxia is the main cause of tissue damage it causes.[4,5] Moreover, CO can increase vascular permeability, accelerate platelet aggregation, and induce coronary artery spasm. All these factors lead to myocardial damage.[4] Cardiac arrhythmias, including premature atrial and ventricular contractions, atrial and ventricular fibrillation, have been reported in CO poisoning, although not as common as ST-T wave changes and ischemic changes. CO exposure lowers the threshold for malignant ventricular arrhythmias and may cause premature death.[6] Several mechanisms have been demonstrated in the development of dysrhythmia, including hypoxia-induced altered calcium gradients, increased diastolic intracellular calcium, increased calcium sensitivity of myofilaments, and a hyperadrenergic state. CO also plays a pro-dysrhythmic role through early depolarization and prolonged action potential by increasing nitric oxide levels.[1,6] Because of the broad spectrum of symptoms, critical management of CO poisonings, including a detailed medical history and physical examination, is recommended. In addition, vital parameters such as heart rate, blood pressure, oxygen saturation, and blood gas analysis should be constantly monitored.[7] Treatment of CO poisoning begins with normobaric oxygen through a non-rebreathing mask and aggressive supportive care. It is the cornerstone of therapy as it accelerates the dissociation of CO from the mitochondrial cytochrome system.[6] Also, Akdemir et al.[8] showed that the rhythm returned to sinus rhythm under normobaric oxygen therapy in a patient with AF rhythm on ECG caused by CO poisoning. For the treatment of CO poisoning, Henry et al.[9] recommended that the patient breathe 100% oxygen until the symptoms disappeared. Treatment should be continued until the symptoms disappear and the carboxyhemoglobin level drops to 5% to 10%. If the cardiovascular system is affected by poisoning, it is recommended that the carboxyhemoglobin level fall below 2%.

The benefit of hyperbaric oxygen therapy is still debated. Some patients may benefit from HBO, but the indications for this treatment are uncertain.[3,7]

In our case, the management of the treatment, serial electrocardiography, vital and blood gas follow-ups of a young male patient presenting with palpitations and syncope, which may be an indication of cardiac involvement after hookah smoking, are discussed. Studies have shown that hookah use should be suspected in cases of CO poisoning, especially in adolescents and young adults.[10,11]

CONCLUSION

It should not be forgotten that cardiac rhythm problems may occur after smoke hookah.

ETHICAL DECLARATIONS

Informed Consent

Written informed consent was obtained from the patient included in this report. Signed consent forms are retained by the authors and are available upon request.

Peer Review Process

This report underwent external peer review.

Conflict of Interest

The authors declare no conflicts of interest.

Financial Disclosure

This case report did not receive any financial support.

Author Contributions

Concept: MBE, CK; Design: CK, GK; Control: CK; Resources: FY, MBE; Materials: MBE; Data Collection and/or Processing: MBE, CK; Analysis and/or Interpretation: CK, GK; Literature Review: GK; Writing the Article: MBE, CK, FY, GK; Critical Review: CK, GK, MBE.

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