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Carbon Monoxide Poisoning as a Result of an Open-Air Barbecue Activity

Abstract

Introduction: Carbon monoxide (CO) is a colorless, odorless and non-irritant gas created from improperly burning carbon-containing fuels. In this article, we present a case of CO poisoning as a result of exposure to smoke during an open-air barbecue activity.

Case report: A 22-year-old male patient was admitted to the emergency department with complaints of headache, nausea, and fatigue for five hours after barbecuing eight hours ago in the open air at the seashore. A COHb level was 4.5% in arterial blood gas. The patient was treated with 100% oxygen by mask. He did not have any complaints after oxygen therapy. Following treatment, his COHb level was 2.3%. The patient was discharged with suggestions from emergency department.

Discussion and Conclusion: In our country, CO poisoning is caused by CO gas inhalation from burning of coal improperly in indoor coal-burning stoves, especially in the winter months. However, CO poisoning should also be kept in mind during the summer months when we meet a patient with a history of barbecue grilling, particularly associated with headache, nausea, fatigue and symptoms suggestive of acute viral syndrome.

Keywords: Carbon monoxide poisoning; Open-air; Barbecuing; Emergency department

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Introduction

Carbon monoxide (CO) is a colorless, odorless and non-irritant gas created from improperly burning carbon-containing fuels. Low levels of CO are present in the human body as a result of hemoglobin catabolism (0.5-1.5%). Increased levels are seen in the blood of neonates and smokers. CO is toxic because it binds to hemoglobin, converting it to carboxyhemoglobin (COHb) and reducing oxygen delivery and oxygen carrying capacity. Due to tissue hypoxia, it affects many organs and causes various symptoms. Mild to moderate CO poisoning can be confused with acute viral syndromes. Fatigue, headache, dizziness, nausea and vomiting are the most common symptoms. It can cause arrhythmia and ischemia leading to cardiac toxicity. Increased CO levels can also result in altered mental status, including coma. Signs and symptoms can be seen in the early period as well as weeks after. CO poisoning can occur after burning of carbon-containing fuels in poorly ventilated indoor areas. Other causes of CO poisoning

may include accidental exposure as well as attempted suicide. Some accidental poisonings have been reported in the literature such as home and work accidents, and unintentional poisonings associated with social activity. In suicidal cases, most frequently reported cases are exposure to automobile exhaust smoke, kitchen/water heater gas and deliberate burning of fuel in closed environments [1,2].

In our country, especially in the summer months, cooking on an outdoor grill is common in picnic areas. Barbecue equipment has no chimney and coal is used as a fuel. Barbecue coal is obtained by quickly heating of dry oak wood in oxygen-free environment. The coal is ignited conveniently with a kindling wood obtained from resinous trees such as pine tree. The coal is expected to become core after the combustion process and meat or vegetables are cooked on the grill. In this article, we present a case of CO poisoning as a result of exposure to smoke during an open-air barbecue activity.

Case Report

A 22-year-old male patient was admitted to the emergency department with complaints of headache, nausea, and fatigue for five hours after barbecuing eight hours ago in the open air at the seashore. The patient was in close proximity to the grill during burning and then started to have complaints. The patient's past medical and family history were unremarkable. He does not smoke or use narghile and denies use of any medication. When admitted to emergency department, the patient had a blood pressure of 120/80mmHg, heart rate of 80/min, respiratory rate of 18/min, temperature of 36.5 °C and oxygen saturation of 99%. Physical and neurological examination was normal and he did not have a stiff neck. The patient's electrocardiogram and laboratory tests were within normal limits. A COHb level was 14.5% in arterial blood gas (normal value 0.5-2.5%). Other blood gas parameters were normal. The patient was treated with 100% oxygen by mask. He did not have any complaints after oxygen therapy. Following treatment, his COHb level was 2.3%. The patient was discharged with suggestions from emergency department.

Discussion

CO poisoning is an important cause of morbidity and mortality in our country, mostly during the winter season. Accidental poisoning develops due to incorrect use of gas-powered heating and illumination devices, mechanical errors, inhalation of automobile exhaust smoke or burning stoves and barbecues in closed areas. In this case, cause of intoxication is different from the format in the literature. There is another example to outdoor CO poisoning, in the same manner as, our case in the literature. It is reported that two children were poisoned during skiing because of fuel smoke leaking from back of the ski boat [3]. In Scotland, three suicide cases by means of inhalation of burning charcoal have been reported. Suicide cases took place, outside the building, in the car and in the bedroom, respectively. Toxicological examination of blood samples from the femoral artery, COHb levels were higher than the known fatal level (70%, 85% and 80%) [4]. The similarity of this presentation to our case is that one of the patients poisoned after burning coal in the outdoors. However, It is different from our case due to the form of the event is voluntary smoke inhalation. In our case, smoke inhalation took place involuntarily during social activity.

Narghile smoking is another type of CO poisoning that occurs during social activity. Charcoal is used as Narghile coal. There is a case reports about Narghile are from Italy. Patients presented with syncope and their COHb levels were determined to be 24%. They were treated with hyperbaric oxygen therapy [5]. A case report from Switzerland has been reported that narghile smoking may cause serious and permanent neurological sequelael that

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result from CO poisoning [6]. Two case reports from Turkey report patients admitted to the emergency room with episodes of syncope after smoking narghile [7,8].

Another social activity that can cause CO poisoning is barbecue. However, there is no CO poisoning notification post outdoor barbecue in the literature. There are notifications about poisonings in semi-closed and closed environments. In Denmark, a family of six people was poisoned with CO after the burning of barbecue in the home [9]. Also in Germany there is a retrospective review of CO poisoning after use of a barbecue grill in the house [10]. Two studies in Turkey report chronic CO poisoning in kebab chefs and the effect of CO poisoning on ECG is reported [11,12]. Another reported CO poisoning case that left neurologic sequel takes place in camp related to a burning barbecue in the caravan [13].

As in our case, in mild CO poisoning, because of non-specific symptoms such as fatigue, headache, dizziness, nausea and vomiting, these patients may easily be misdiagnosed as gastroenteritis, influenza or food poisoning. Therefore the importance of taking a detailed history of each patient is obvious for making the correct diagnosis. Normally, COHb levels in adults, newborns and smokers are 0.5-1.5%, 3-7% and 4-9%, respectively. Clinical signs of poisoning begin at 10% COHb level in blood. While the toxic level is 20-50% and lethal level is over 50%. However, there is no correlation between clinical findings, particularly neurological symptoms, and COHb levels. It has been reported that cognitive impairment was detected in some patients with COHb levels of 4-5%.

Blood COHb levels should be measured as soon as possible. Although there are differences from person to person, even those with slightly elevated levels of CO in the blood may show obvious signs of intoxication. If a long time has passed since exposure or supplemental oxygen therapy has been applied, blood CO levels will be low. The COHb half-life is 320 min and our patient was admitted to emergency room 480 min after the poisoning. For that reason it can be thought that the measured COHb level is lower than the COHb level at the time of poisoning. When the calculation is made taking into account the half-life of COHb, at the time of intoxication COHb level was expected to be 13.5% [14].

Conclusion

In our country, CO poisoning is caused by CO gas inhalation from burning of coal improperly in indoor coal-burning stoves, especially in the winter months. However, CO poisoning should also be kept in mind during the summer months when we meet a patient with a history of barbecue grilling, particularly associated with headache, nausea, fatigue and symptoms suggestive of acute viral syndrome.

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