Clinical outcome and brain MRI four years after carbon monoxide intoxication


Brain damage from carbon monoxide intoxication has not been extensively studied with magnetic resonance imaging. We report the clinical outcome and brain magnetic resonance imaging in three individuals simultaneously exposed to toxic levels of carbon monoxide four years previously. Lesions are seen in multiple locations and do not correlate well with the clinical condition.

Carbon monoxide (CO) is a very toxic gas. The first symptom is usually headache which can occur after exposure to 0.05% ambient CO concentration for one hour. Exposure to >0.1% ambient CO concentration for a few hours is usually fatal. Hypoxic brain damage is the most serious consequence of CO intoxication in survivors. Carbon monoxide displaces oxygen from hemoglobin and interferes with oxygen delivery to tissues. However, this effect alone seems insufficient to produce the observed neurologic damage (1). Inhibition of mitochondrial oxidative respiration (1) and cardiomyopathy due to displacement of oxygen from myoglobin by CO, with associated hypotension and systemic acidosis (2), have been proposed as additional important mechanisms of CO toxicity.

Approximately 3500 people die annually from accidental or suicidal CO intoxication in the United States. Additional patients remain permanently neurologically disabled. Common sources of intoxicating CO gas include fires, faulty combustion heating systems, exhaust from internal combustion engines, and heating gases other than natural gas. Excessive CO forms during combustion of carbon compounds when the oxygen supply is limited.

Carbon monoxide intoxication is usually immediately suspected in victims of fires or suicidal exposure. However, in other circumstances CO intoxication is not obvious, partly because of the nonspecific symptoms it produces. The colorless, odorless, tasteless, and nonirritating properties of CO delay recognition of gas intoxication by the victim. Initial symptoms of headache, nausea, and dizziness can be mistaken for a “flu-like” illness. More serious exposure results in decreased consciousness and reduces the victims’ ability to recognize the danger.

Magnetic resonance imaging (MRI) has not yet been extensively utilized to study brain damage caused by CO (3–11). We report the clinical outcome and brain MRI findings in three individuals simultaneously intoxicated with CO four years previously.

Case reports

The following three patients were found together, lethargic in their home. The house was being heated with a natural gas wall heater. A relative who found the patients, estimated that they were in the house for 36 h before being rescued. The patients were taken by ambulance to a local emergency room.

Case 1. A 43-year-old man was brought to the emergency room breathing oxygen at 10 L/min through a non-rebreathing mask. Blood pressure was 120/80 mmHg and stable, pulse 94, and the respiratory rate 36. He was somnolent without focal neurologic deficits. He smoked two-to-three packs of cigarettes.