



Clinical Pharmacology & Toxicology Pearl of the Week

Carbon Monoxide (CO) ~ Part 2: Testing and Treatment

Case

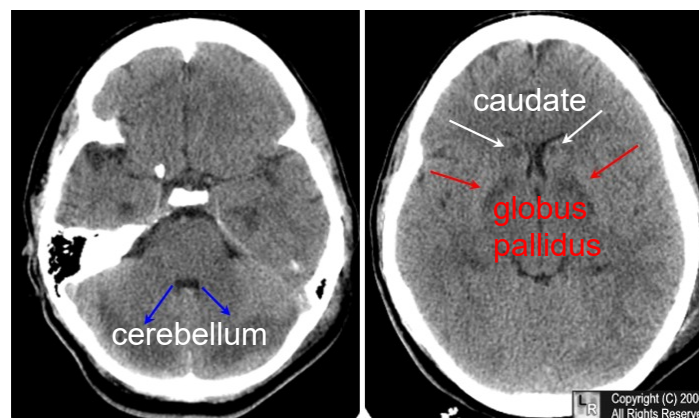
- ✓ A 33 year-old male has a several-month history of fatigue, headache, and memory lapse.
 - ✓ Multiple specialists have performed evaluations, but no diagnosis has been established.
 - ✓ During a period of feeling worse than usual, he called a friend, who arrived at the residence to find him semicomatose and called 911.
 - ✓ The patient was given supplemental oxygen and transported to the emergency department, where he is alert and has nonfocal findings on examination.
 - ✓ His carboxyhemoglobin level is 22%. How should he be treated?
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Laboratory testing

- ✓ COHb concentrations
 - Measured with co-oximeter
 - Venous blood as accurate as arterial
 - Normal levels 0.5-2.5%, up to 10% in smokers
 - Wide variation in clinical manifestations with identical levels
 - Inaccurate predictor of peak levels
 - Variations in half lives
 - Effect of O₂ given prior to sampling
 - Not predictive of symptoms or final outcome

Imaging Features

- ✓ Abnormalities may be seen within 12 hours of CO exposure causing LOC
- ✓ Basal ganglia most commonly affected because of higher metabolic rate in these areas
 - Caudate
 - Putamen
 - Globus pallidus



Treatment

- ✓ ABC's
- ✓ O₂ via nonrebreather
 - Alters $t_{1/2}$ of COHb
 - 5-6 hours at room air
 - 40-90 minutes on O₂ via NRB
- ✓ Hyperbaric oxygen
 - It is acknowledged that current published evidence regarding the effectiveness of HBO therapy is imperfect and not definitive.

- Despite these limitations, the consensus is that HBO therapy can reduce the occurrence of persistent or delayed neurological sequelae in patients with clinically important CO exposure.
- Clinical evaluation of patients with CO exposure should focus on determining whether they have any of the criteria described below which increase their likelihood of neurological sequelae.
- Consider consultation with an HBO physician in a patient with a clear history of CO exposure with at least two or more of the following criteria:
 - Decreased level of consciousness (LOC) on presentation to the Emergency Department (not accounted for by exposure to ethanol or other drugs)
 - Clear history of loss of consciousness during CO exposure (not accounted for by exposure to ethanol or other drugs)
 - Age > 36 years
 - Prolonged (i.e. > 24 hours) duration of CO exposure (even if intermittent)
 - COHb > 25% on presentation to the Emergency Department
 - Presence of cerebellar dysfunction on exam (e.g. ataxia, dysmetria)
 - Pregnancy with or without features of fetal distress
 - Evidence of cardiac dysfunction (e.g. increased troponins, ischemic changes on ECG)
- ✓ Research suggests that outcomes of patients who have experienced a cardiac arrest as part of their CO poisoning are very poor. The hyperbaric physician may decline to accept such patients, especially if a long transport is required in a patient with low likelihood of survival.

References

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2. Annane et al. Hyperbaric oxygen therapy for acute domestic carbon monoxide poisoning: two randomized controlled trials. *Intensive Care Med* 2011 Mar; 37(3):486-92
3. Weaver et al. Carbon Monoxide Poisoning: Risk Factors for Cognitive Sequelae and the Role of Hyperbaric Oxygen. *Am J Respi Crit Care Med* 2007; 176:491-7.
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5. Hampson N. Outcomes of Patients Experiencing Cardiac Arrest With Carbon Monoxide Poisoning Treated With Hyperbaric Oxygen. *Ann Emerg Med*. July 2001; 38:36-41.
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8. Raphael et al. Trial of Normobaric and Hyperbaric oxygen for acute carbon monoxide intoxication. *Lancet* 1989; 2:414-9.
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The Calgary Clinical Pharmacology physician consultation service is available Mon-Fri, 8am-5pm. The on-call physician is listed in ROCA. Click [HERE](#) for more details.



The Poison and Drug Information Service (PADIS) is available 24/7 for questions related to poisonings. Please call 1-800-332-1414, and select option 1.

