



Clinical Pharmacology & Toxicology Pearl of the Week

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

Case

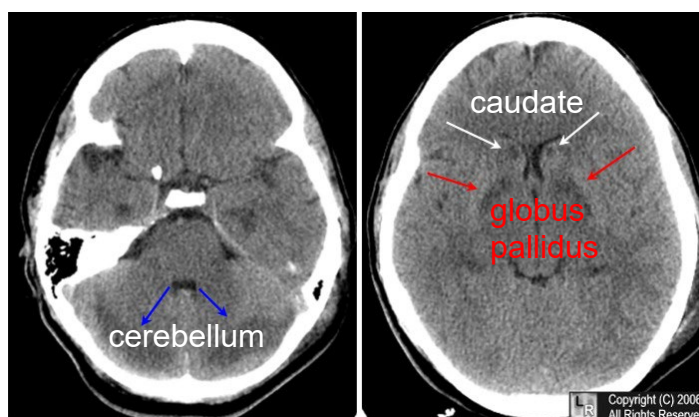
- ✓ A 33 year-old male has a several-month history of fatigue, headache, and memory lapse.
 - ✓ Multiple specialists have performed evaluations, but no diagnosis has been established.
 - ✓ During a period of feeling worse than usual, he called a friend, who arrived at the residence to find him semicomatose 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?
-

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 outcome

Imaging Features

- ✓ Abnormalities may be seen within 12 hours of CO exposure causing LOC
- ✓ Basal ganglia are most 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.
- Consultation with a hyperbaric physician is recommended for any patients who meet criteria in both A and B below:

A. Clear evidence of CO exposure, as evidenced by:

1. COHb concentration greater than 10%
- OR
2. COHb concentration less than 10% with reliable history of exposure (e.g. found in running car in enclosed space) and a sufficient time lag until COHb testing to explain a concentration of less than 10%

B. Has at least two or more of the following risk factors:

1. Clear history of loss of consciousness during CO exposure
2. Decreased level of consciousness (LOC) on presentation to the ED (not accounted for by exposure to ethanol or other drugs)
3. Age greater than 36 years
4. Prolonged duration of CO exposure (greater than 24 hours, even if intermittent)
5. Presence of cerebellar dysfunction on exam (e.g., ataxia, dysmetria (abnormal finger to nose, heel to knee, or rapid alternating movement tests))
6. COHb greater than 25% on presentation to the ED
7. Pregnancy, with or without features of fetal distress
8. Evidence of cardiac dysfunction (e.g. troponin elevation, ECG ischemic changes)

- ✓ Research suggests that outcomes of patients who have experienced a cardiac arrest as part of their CO poisoning are extremely 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

1. Buckley N et al. Hyperbaric oxygen for carbon monoxide poisoning (Review). Cochrane Database of Systematic Reviews 2011, Issue 4. Art. No.: CD002041. DOI: 10.1002/14651858.CD002041.pub3.
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 Resp Crit Care Med 2007; 176:491-7.
4. Weaver et al. Hyperbaric oxygen for acute carbon monoxide poisoning. N Engl J Med 2002; 347:1057-67.
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.
6. Scheinkestel et al. Hyperbaric or normobaric oxygen for acute carbon monoxide poisoning: a randomized controlled clinical trial. Med J Aust 1999; 170: 203-210.
7. Thom et al. Delayed Neuropsychologic sequelae after carbon monoxide poisoning: prevention by treatment with hyperbaric oxygen. Ann Emerg Med 1995; 25:474-80.

8. Raphael et al. Trial of Normobaric and Hyperbaric oxygen for acute carbon monoxide intoxication. Lancet 1989; 2:414-9.
9. Thom et al. J Appl Physiol 1990;68(3):997.
10. Choi et al. Arch Neurol. 1983 Jul;40(7):433-5.

The Clinical Pharmacology (CP) physician consultation service is available Mon-Fri, 8am-5pm. The on-call physician is listed in ROCA on the AHS Insite page. CP consultations are also available through Netcare e-referral and Specialist Link. You can also find us in the [Alberta Referral Directory](#) (ARD) by searching “Pharmacology” from the ARD home page. Click [HERE](#) for more details about the service.

The Poison and Drug Information Service (PADIS) is available 24/7 for questions related to poisonings. Please call 1-800-332-1414 (AB and NWT) or 1-866-454-1212 (SK). Information about our outpatient Medical Toxicology Clinic can be found in [Alberta Referral Directory](#) (ARD) by searching “Toxicology” from the ARD home page.

More CPT Pearls of the Week can be found [HERE](#).

Created: October 18, 2021

Reviewed: March 6, 2025