Carbon Monoxide(CO) Poisoning

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Enviromental Injury:

1) Frostbite and Other Localized Cold Injuries

2) Hypothermia

3) Heat Emergencies

4) Bites and Stings

5) Reptile Bites

6) Trauma and Envenomations from Marine Fauna

7) Dysbarism and Complications of Diving

8) **Drowning**

9) **Thermal Burns**

10) **Chemical Burns**

11) **Electrical Injuries**

12) **Lightning Injuries**

13) **Mushroom Poisoning**

14) **Poisonous Plants**

16) **High-Altitude Medical Problems**


CO
DANGER!
CARBON MONOXIDE

Introduction:

* one of the most common causes of fatal poisoning in the U.S

* by either intentional (suicidal) or accidental exposure

Epidemiology:

* Exact statistics for carbon monoxide poisoning are difficult to ascertain

Table 1- Sources of Carbon Monoxide

Automotive exhaust
Motorboat exhaust
Propane-fueled heaters
Wood- or coal-burning stoves or heaters
Structure fires
Gasoline-powered generators or motors
Natural gas-powered heaters/furnaces/generators
Methylene chloride
Forklifts

Pathophysiology:

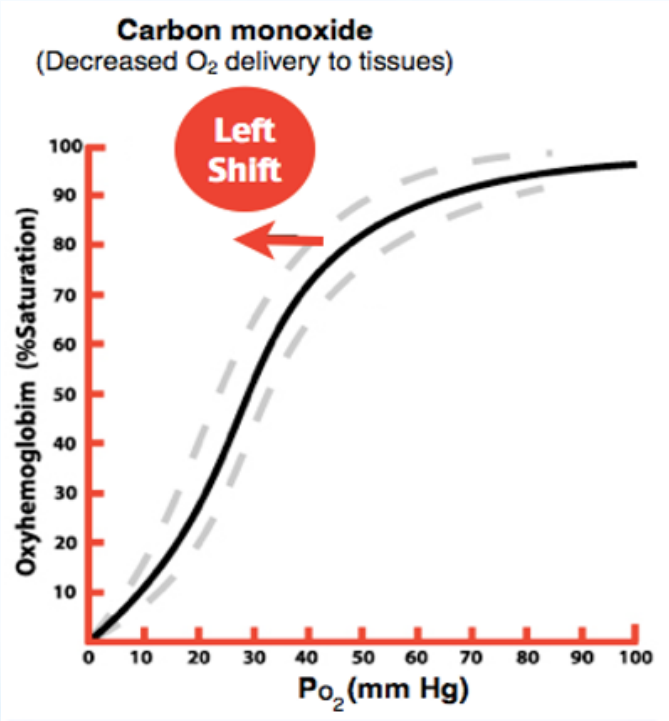
* Carbon monoxide is a colorless, odorless gas

* Half-lives of COHb on room air at normal atmospheric pressure range from 249 to 320 minutes

* On 100% oxygen at atmospheric pressure, this is reduced to an average of 74 to 80 minutes

* The exception to this is COHb generated by **methylene chloride** exposure, which can have a half-life of up to 13 hours due to ongoing metabolism

* Carboxyhemoglobin "shift to the left" reshaping of the oxyhemoglobin (HbO_2) dissociation curve



* Cells in the **basal ganglia** are particularly sensitive to this neurotoxic effect,demonstrated by the **globus pallidus** lesions sometimes seen on cranial CT imaging

Clinical Features:

Table - 2 Signs and Symptoms of Acute Carbon Monoxide Poisoning

- Headache
- Visual disturbances
- Vomiting
- Confusion
- Ataxia
- Dyspnea/tachypnea
- Seizure
- ECG changes/dysrhythmias
- Syncope
- Retinal hemorrhage
- Chest pain
- Bullous skin lesions
- Focal neurologic deficit

* Carbon monoxide poisoning should always be in the differential diagnosis for comatose patients, patients with mental status changes, as well as for patients who are noted to have an elevated anion gap metabolic acidosis or otherwise unexplained lactic acidosis

* Carbon monoxide poisoning may be obscured by other findings, such as trauma or severe burns

* The classic finding of cherry red oral mucosa is rarely seen in living patients. Mild fever, tachycardia, tachypnea, hypertension, or hypotension may be present

* Severe poisoning may lead to respiratory or cardiac arrest

Chronic Carbon Monoxide Poisoning:

* Generally from occupational sources

* Symptoms are usually more insidious, and include trouble concentrating, personality changes or memory loss

* At risk of carbon monoxide–related neurotoxicity & may have long-term neuropsychiatric problems

Diagnosis:

Table - 3 Diagnostic Study Findings Associated with Carbon Monoxide Poisoning

- Elevated carboxyhemoglobin level
- Artificially elevated oxyhemoglobin saturation using pulse oximetry
- Elevated lactate
- Elevated anion gap metabolic acidosis
- Elevated creatine phosphokinase
- Elevated troponin
- Variable ECG findings—ranges from normal to injury pattern
- Bilateral globus pallidus lesions on MRI

* **Standard pulse oximetry is unreliable in the diagnosis of carbon monoxide poisoning**

CO-oximeter

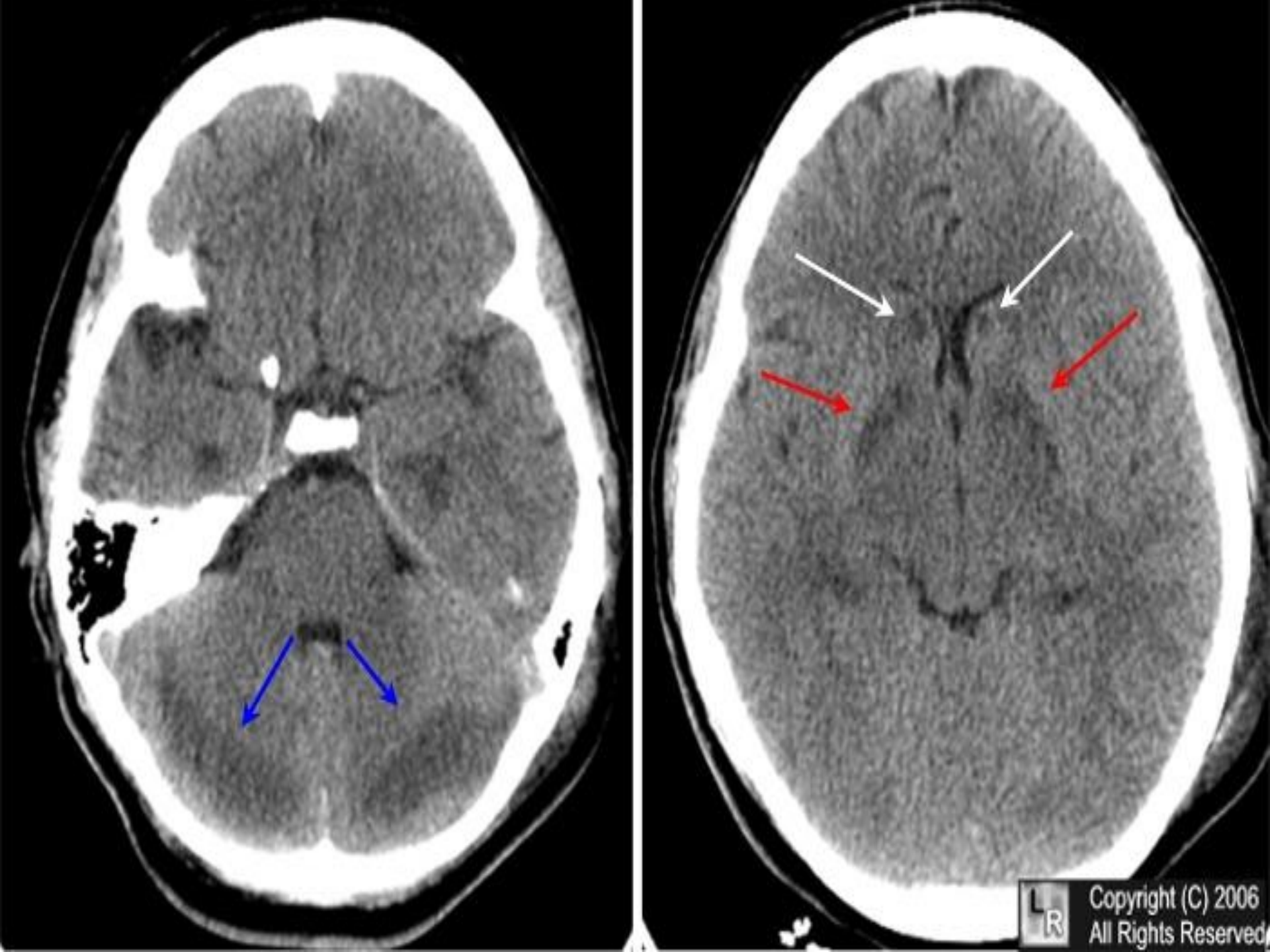
* **When the pulse oximetry values are compared with the oxygen saturation on an ABG, the oxygen saturation on the pulse oximeter will be higher than the saturation on the ABG**

Imaging:

* **CXR: NL or** Non-cardiogenic pulmonary edema(ARDS)

* **CT/MRI: NL or** may be positive within 24 hours and MRI even sooner

* Characteristic finding is **bilaterally symmetric low attenuation lesions in the globus palladi**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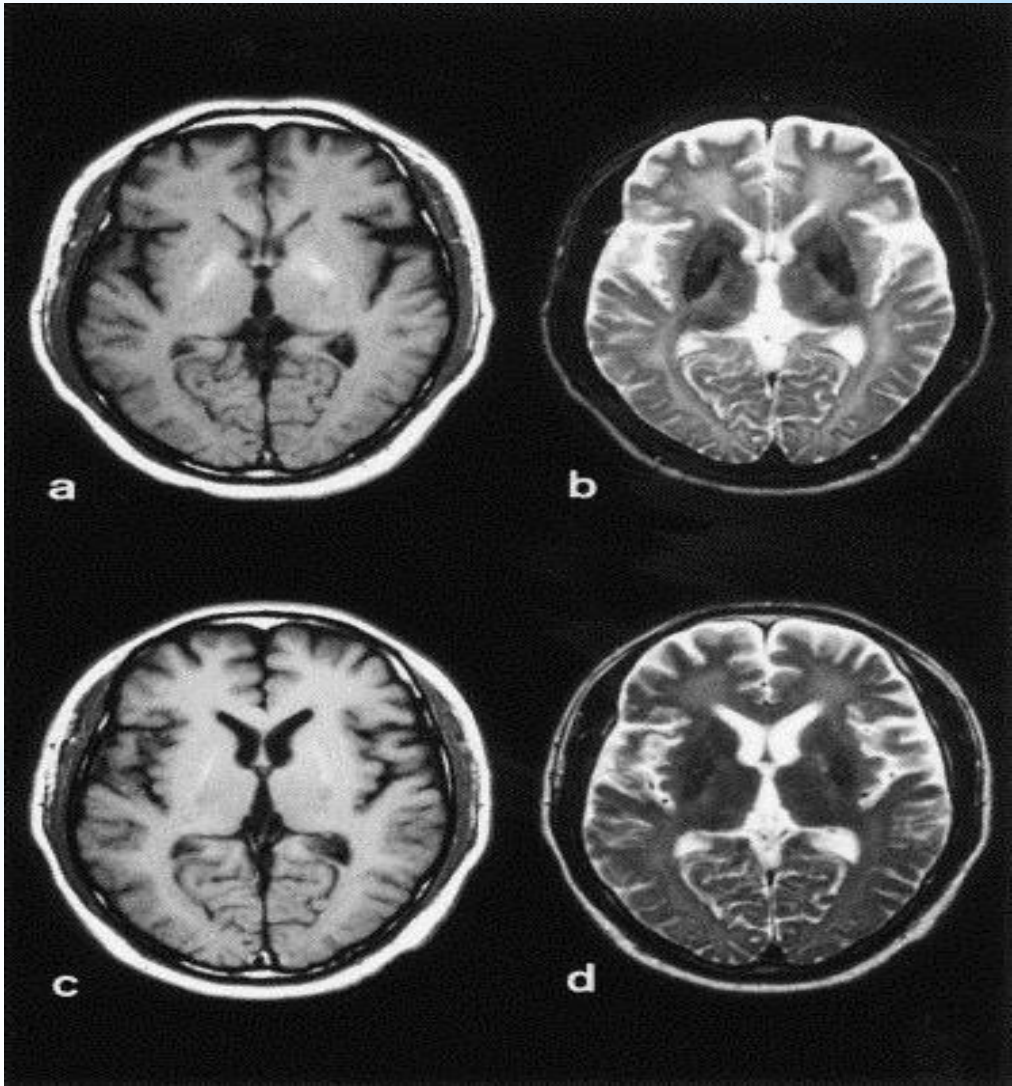
* On MRI, CO poisoning produces low or high signal intensity lesions on T1 and high intensity on T2 in the globus pallidus



Treatment:

*Initial resuscitation steps are the same as initial resuscitation of any critically ill patient

(ABC)

*If carbon monoxide poisoning is strongly suspected based on history, supplemental oxygen in the highest concentrations available should be initiated immediately

Table -4 Commonly Utilized Indications for Referral for Hyperbaric Oxygen Treatment

Syncope
Confusion/altered mental status
Seizure
Coma
Focal neurologic deficit
Pregnancy with carboxyhemoglobin level >15%
Blood level >25%
Evidence of acute myocardial ischemia

Disposition and Follow-Up:

Symptom Severity	Disposition	Comments
Minimal or no symptoms	Home	Assess safety issues
Headache, Vomiting	Home after symptom resolution	Administer 100% Oxygen in ED
Elevated co level		Observe 4 h
		Assess safety issues
Ataxia- Seizure- Syncope	Hospitalize	Co level
Chest pain- Dyspnea	Consult with	comorbid conditions:
Focal neurologic deficit	hyperbaric specialist	pregnancy—and age
ECG changes		stability of patient