Carbon Monoxide (CO)

CO exposure causes tissue hypoxia and a multi-faceted inflammatory response, producing acute organ injury and chronic neurological dysfunction.

Toxicity / Risk Assessment

CO toxicity is more likely to occur in a poorly ventilated, enclosed space in which there is a prolonged period of CO generation

Sources: *vehicle exhaust fumes, domestic/industrial fires, cigarette (up to 10-15%) or hookah smoking (up to 30%), machinery emitting CO in an enclosed space, incomplete combustion of carbonaceous materials in an enclosed space (e.g., charcoal briquettes, faulty heating devices), exposure to methylene chloride*

Clinical features:

Vary from mild and non-specific through to life-threatening:

General - weakness, nausea, vomiting, headache

CNS - Dizziness, ataxia, confusion, coma

CVS - sinus tachycardia, atrial fibrillation, PVCs, ventricular arrhythmias, myocardial infarction, pulmonary oedema

Other complications: - rhabdomyolysis, renal failure, hepatic injury

Delayed neurological sequelae

- Appear after days-months following exposure.
  (impaired judgment / memory / concentration, dementia)
- More likely with LOC, existing cerebrovascular disease, prolonged exposures, focal neuro. deficits post exposure

Investigations

COHb percentage (co-oximetry measurement via venous blood gas sample. ABG not necessary)

- COHb percentage correlates poorly with clinical features in the ED, severity of poisoning + outcome
- A normal COHb percentage (0.5-5.0%) measured in ED does not exclude CO poisoning

ECG / troponin: measure if there has been LOC, CVS symptoms (e.g., chest pain) or CVS instability

CT / MRI brain: may detect changes in caudate nuclei, globus pallidus, basal ganglia and putamen

- Should not be ordered routinely, but may aid in cases of poor Rx response or diagnostic dilemma

Management

Patients with altered conscious state or CVS instability should be managed in a resuscitation area

Provision of high concentration oxygen (O_2) ASAP is the mainstay of management:

- Intubated patients: FiO_2 100% for at least 6 hours and COHb percentage < 5%
- Non-intubated patients: O_2 at 15L/minute via tight fitting non-rebreather mask with reservoir bag

Endpoint of O_2 Rx: at least 6 hours of oxygen therapy, COHb percentage < 5% + asymptomatic

Hyperbaric oxygen (HBO) therapy is controversial, and clear evidence of benefit is lacking

- *Discuss patients with abnormal ECG, troponin or neuroimaging and those with an altered conscious state, focal neurological deficits, CVS instability or pregnancy with a clinical toxicologist*

Disposition: altered conscious state or, CVS instability: manage in an HDU / ICU setting

Patients with normal conscious state AND COHb percentage < 5% after 6 hours of O_2 Rx can be discharged pending mental health assessment as required. *Neuropsychiatric assessment post recovery from acute exposure may be beneficial in selected cases (e.g., occupational exposures / severe toxicity)*