Comment on "The Impact of Treatment with Continuous Positive Airway Pressure on Acute Carbon Monoxide Poisoning"

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Conflicts of interest: The authors declare that there is no conflict of interest.

Keywords: carbon monoxide poisoning; continuous positive airway pressure ventilation; delayed neurological sequelae

Abbreviations:
CO: carbon monoxide
COHb: carboxyhemoglobin
CPAP: continuous positive airway pressure ventilation
DNS: delayed neurological sequelae

Received: July 14, 2021
Accepted: July 24, 2021

doi:10.1017/S1049023X21001011

Loughran D, Nelson L. Comment on "The impact of treatment with continuous positive airway pressure on acute carbon monoxide poisoning." *Prehosp Disaster Med.* 2021;36(6):805–806.

We read with interest the article by Caglar and colleagues[1] and applaud their investigation into the novel use of continuous positive airway pressure ventilation (CPAP) for carbon monoxide (CO) poisoning. We agree that adjunct treatments for CO poisoning are important and relevant areas of investigation given the general scarcity of hyperbaric chambers available for emergency use.

While we appreciated the authors' acknowledgement that this study was limited by a lack of evaluation of late neurological findings, these clinical outcomes are critical to assessing the efficacy of various treatments. Aside from the relatively immediate and consequential effects of organ ischemia and impaired cellular respiration associated with extremely high carboxyhemoglobin (COHb) levels, the greatest risk from CO poisoning is from delayed neurological sequelae (DNS).[2] Therefore, assessment of this outcome is a very important endpoint for determining effectiveness of treatment.

This study utilizes decreasing COHb levels to support the efficacy of CPAP as a treatment modality. While receiving supplemental normobaric oxygen clearly reduces COHb levels more rapidly than not receiving supplemental oxygen,[3] more rapid reduction does not decrease the incidence of DNS.[4] The cause of DNS remains incompletely understood but appears to be mediated by oxidative stress and activation of inflammatory cascades, lipid peroxidation, and immune-mediated injury in the central nervous system independent of ischemia.[4,5] The development of DNS correlates poorly with COHb levels[6] and the underlying inflammatory processes appear to continue long after the COHb level is below unacceptable levels.[5,7] Given our increasingly nuanced understanding of CO poisoning, the use of serial COHb levels in this and other studies as a surrogate marker is insufficient for determining the true clinical efficacy of proposed treatments such as CPAP.

We are also concerned about the study's use of symptoms including headache, nausea, dizziness, and weakness paired with COHb levels as surrogate markers of clinically important CO poisoning. These symptoms are subjective and fraught with potential confounders, and we are unaware of any studies confirming that the presence, absence, or resolution of these symptoms serve as useful indicators of CO toxicity or successful treatment. The presence or absence of initial symptoms has been found to correlate poorly with both initial COHb levels[8] and the development of chronic sequelae.[6]

We urge the authors to continue their pursuit of this interesting and clinically relevant question in future studies, but with an approach more in-line with our current understanding of CO poisoning and pathophysiology. Inclusion of follow-up assessments for DNS and a reduction of focus on initial symptoms and COHb levels would be important changes to future investigations into determining the real efficacy and clinical impact of CPAP and other CO treatment modalities.

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https://doi.org/10.1017/S1049023X21001011 Published online by Cambridge University Press