CORRESPONDENCE

The Diagnosis and Treatment of Carbon Monoxide Poisoning

by Dr. med. Lars Eichhorn, Dr. med. Marcus Thudium, and Prof. Dr. med. Björn Jüttner in issue 51–52/2018

Unclear Information About a Treatment Recommendation

In Table 2, Eichhorn et al. (1) state for the American College of Emergency Physicians (fourth line) “no recommendation” which is regrettably misleading. According to the evidence-based transparent recommendations of this professional society, patients with carbon monoxide poisoning should either receive hyperbaric oxygen therapy (HBOT) or normobaric treatment with high oxygen flow (normobaric oxygen therapy, NBOT) (2). Likewise, the authors of a comprehensive Cochrane review are opposed to regular use of HBOT (3). HBOT offers no proven advantages for patients with carbon monoxide poisoning compared to NBOT. Thus, it is at least ambiguously worded when the review states at various points that HBOT is recommended for certain patient populations, even though this statement lacks supporting evidence.

From the perspective of clinical emergency medicine, we can confirm that it is challenging to diagnose carbon monoxide poisoning based on unspecific signs and symptoms, especially if carbon monoxide exposure is not obvious. In particular in patients complaining, for example, only about nausea or vomiting, and who were not brought to an emergency department by emergency medical services, carbon monoxide poisoning can easily be overlooked. Therefore, adequate emergency care and reducing the risk of potential long-term complications require a high level of awareness of a possible carbon monoxide poisoning at first patient contact.

At the latest in the emergency department, the source of exposure has to be identified to prevent further cases of carbon monoxide poisoning from unsecured sources. The fire department should be alerted to take urgent hazard prevention action, if necessary.

Case reports have indicated that non-invasive mechanical ventilation could be a useful alternative to HBOT (4).

All in all, the randomized studies that have been published so far have not shown the superiority of HBOT over NBOT. Therefore, we welcome and support the recommendation that the decision to initiate hyperbaric oxygen therapy to treat carbon monoxide poisoning should always be critically reviewed and made on a case-by-case basis. DOI: 10.3238/arztebl.2019.0296a

References

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Conflict of interest statement

The authors declare that no conflict of interest exists.

Supplementary Clinical Aspects

Carbon monoxide poisoning is still the most common type of poisoning in everyday life and in the workplace. Therefore, it can be expected from a review that it will discuss all available insights about the characteristic features of this condition. This applies to both the diagnostic evaluation and the pathogenesis of this poisoning. The headache of patients with acute poisoning is typically a ring headache (“as if there were an iron ring around the head”). However, in the scientific literature the headache is only described as “frontal and temporal headache” and thus seldom precisely characterized.

The authors mention that by the binding of carbon monoxide to hemoglobin not only the affected hemoglobin portion is no longer available for transporting oxygen, but in addition oxygen binding to the remaining functional hemoglobin is altered—i.e. the oxygen dissociation curve is shifted to the left (1). However, the Haldane effect, which describes this phenomenon, is not mentioned in the article. It was described in detail by Petry (2).

In addition, the article did not mention that victims of carbon monoxide poisoning cannot escape from the place they are because of failing muscle activity. While it was mentioned that carbon monoxide also binds to skeletal myoglobin, the impressive consequence was

not discussed that for this reason, self-rescue attempts fail—for example, in a closed garage with a car engine running: the person poisoned by carbon monoxide may reach the garage door, but may no longer be able to get up to open it.

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In Reply:

We would like to thank the authors and the scientific societies for their constructive letters and the legitimate objection to an entry in Table 2 in our review (1). Our wording “NBOT or HBOT (no recommendation)” should be replaced by the more precise statement “either NBOT or HBOT—no clear recommendation of the expert panel” to prevent any misunderstanding.

In general, our article is meant to be a review of existing decisions of expert panels on the treatment of carbon monoxide poisoning. However, it also evaluates the current and partly not yet reviewed literature itself. Therefore, contrary to the opinion of the American

College of Emergency Physicians, we regard the cheap indicative measurement of the carbon monoxide fraction using pulse oximetry as useful in the rescue service setting. Likewise, we think that HBOT is indicated in pregnant women. This view is based on the considerations regarding the oxygen binding curve and the case reports mentioned. Nevertheless, when we created this article, we considered it crucial to take an objective and individualized approach.

We would like to thank the authors and the scientific societies for their discussion of our article. We are also grateful for the supporting case report on the use of non-invasive mechanical ventilation. The case report mentioned also supports treatment with CPAP, which we recommended in the “Preclinical phase” section to effectively administer 100% oxygen after carbon monoxide poisoning.

Last but not least, we would like to thank Prof. Straube for her letter which highlights important and impressive clinical aspects.

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Conflict of interest statement

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