

CO poisoning while mechanically ventilated in our multiplace hyperbaric chamber from April 1987 through March 1997 were reviewed. In that decade, 83 intubated, mechanically ventilated patients were treated for CO poisoning at a maximum pressure of 2.8 or 3.0 atm absolute (ATA). Arterial blood gas (ABG) data were not available for three patients. Among the remaining 80 patients, arterial $PO_2 > 760$ mm Hg was documented at maximum pressure in 76 (95%). Neither CO source, COHb level, nor ABG values on 100% oxygen prior to hyperbaric exposure were predictive of failure to achieve $PaO_2 > 760$ mm Hg at hyperbaric pressure. Reasons for failing to achieve hyperbaric oxygen levels among four patients included acute lung injury from smoke inhalation in one and inadvertent ABG sampling during a period of air, rather than oxygen, administration in three.

In contrast to the previous report, we were able to achieve "hyperbaric oxygen levels" in almost all CO-poisoned patients treated with HBO while mechanically ventilated. Such patients should not automatically be precluded from HBO therapy out of concern that adequate oxygenation cannot be achieved.—NEIL B. HAMPSON, MD, *Hyperbaric Medicine, Section of Pulmonary Care and Critical Care Medicine, Virginia Mason Medical Center, Seattle, WA*

Key words. HBO; CO poisoning; mechanical ventilation; hyperbaric oxygen; carbon monoxide.

Reference

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CORRESPONDENCE

LETTERS TO THE EDITOR

Hyperbaric Oxygenation of Mechanically Ventilated Patients Poisoned with Carbon Monoxide

Patients suffering from severe carbon monoxide (CO) poisoning frequently receive hyperbaric oxygen (HBO) therapy while intubated and mechanically ventilated. It has been reported that 40% of such patients treated in one multiplace hyperbaric facility did not achieve "hyperbaric

oxygen levels," as defined by arterial $PO_2 > 760$ mm Hg at maximum pressure.¹ It has been further suggested that this may partially explain inconclusive results from some studies comparing HBO with normobaric O_2 for CO poisoning.

Records of patients treated for

In reply:—My colleagues and I thank Dr. Hampson for the thoughtful response to our abstract. We were truly surprised by our findings, but this by no means decreases our support for the use of hyperbaric oxygen (HBO) when indicated. Just as all therapies in medicine must be

evaluated in regard to their efficacy, so must HBO. We believe that future study regarding its efficacy must address whether patients are truly getting the "therapy" delivered, and in this circumstance it is HBO. To our knowledge, there has been no outcome study of the use of HBO for carbon monoxide (CO) poisoning that has verified HBO levels in either control or treatment groups. This makes previous studies questionable if they conclude that HBO therapy is not superior to surface oxygen therapy.

We were quite conservative in defining HBO levels as a $\text{PaO}_2 > 760$ mm Hg. This represents the maximum PaO_2 at 1 ATA on 100% oxygen. However, true HBO levels are $> 2,000$ mm Hg at 2.8 ATA on 100% oxygen. Although HBO is physiologically defined as a $\text{PaO}_2 > 760$ mm Hg, therapeutic studies define HBO as 100% oxygen at 1.5 ATA, which is a PaO_2 of $> 1,000$ mm Hg.¹ We would have found an even lower rate of successful titration in our patients using the latter definition. I imagine that you would find the same in your

group as well. The importance of providing adequate doses of HBO for CO poisoning is important from a pathophysiologic standpoint. In a study examining the inhibition of CO-mediated brain lipid peroxidation with HBO, treatment at 1 ATA had no benefit, 2 ATA an intermediate effect, and 3 ATA resulted in complete inhibition.²

We are not the only group who has recorded such observations.^{3,4} This has been observed in other patient populations receiving HBO with pulmonary dysfunction. The recommendation is to dive patients at lower depths (if possible) to obtain HBO levels and not to preclude patients from HBO therapy.

As clinicians and scientists, we must honestly evaluate whether placing a critically ill patient and nurse in a hyperbaric chamber is of benefit when the patient may not get any higher levels of oxygen in the chamber than would be provided at surface. Furthermore, the cost of a physician, chamber technician, nurse, and frequently long transports from other facilities must be

factored in for patients who may not be receiving the therapy intended. Such a study would be an excellent example of an outcomes-based approach to a therapy that has been much scrutinized and poorly studied for this clinical indication.—EMANUEL P. RIVERS, MD, MPH, *Departments of Emergency Medicine and Surgery, Henry Ford Hospital, Detroit, MI*

Key words. hyperbaric oxygen; carbon monoxide; poisoning.

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