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Excess oxygen in blood after cardiac resuscitation may increase risk of in-hospital death

Patients who have excessive oxygen levels in arterial blood (hyperoxia) following resuscitation from cardiac arrest have a higher rate of death in the hospital than similar patients without arterial hyperoxia, according to a study in the June 2 issue of *JAMA*.

The most common lethal consequence of cardiovascular disease is sudden cardiac arrest. Even if return of spontaneous circulation (ROSC) from cardiac arrest is achieved, approximately 60 percent of patients will not survive to hospital discharge, according to background information in the article. "In the search for modifiable post-ROSC factors, the role of supplemental oxygen, which is often administered in high concentrations to patients after cardiac arrest has come into controversy," the authors write. "Laboratory investigations suggest that exposure to hyperoxia after resuscitation from cardiac arrest may worsen anoxic brain injury; however, clinical data are lacking."

J. Hope Kilgannon, M.D., of Cooper University Hospital, Camden, N.J., and colleagues conducted a study to determine whether hyperoxia after ROSC from cardiac arrest was associated with poor clinical outcome. The study included information from a critical care database of intensive care units (ICUs) at 120 U.S. hospitals, from between 2001 and 2005. Patient inclusion criteria included older than 17 years of age, nontraumatic cardiac arrest, cardiopulmonary resuscitation within 24 hours prior to ICU arrival, and arterial blood gas analysis performed within 24 hours following ICU arrival. Patients were divided into 3 groups based on a measurement of oxygen in arterial blood.

Of 6,326 patients, 1,156 had hyperoxia (18 percent), 3,999 had hypoxia (63 percent; deficiency of oxygen in the blood), and 1,171 had normoxia (19 percent; normal level of oxygen in the blood). The researchers found that mortality was highest in the hyperoxia group (63 percent) compared with the hypoxia group (57 percent) and the normoxia group (45 percent). The hyperoxia group had significantly higher

in-hospital mortality compared with the normoxia group (proportion difference, 18 percent). Mortality also was significantly higher in the hyperoxia group compared with the hypoxia group (proportion difference, 6 percent). "Exposure to hyperoxia was found to be a significant predictor of in-hospital death," the authors write.

The researchers also found that among hospital survivors, hyperoxia was associated with a lower likelihood of independent functional status at hospital discharge compared with normoxia.

"While we acknowledge that association does not necessarily imply causation, these data support the hypothesis that high oxygen delivery in the postcardiac arrest setting may have adverse effects," they write.

(*JAMA*. 2010;303[21]:2165-2171. Available pre-embargo to the media at www.jamamedia.org)

Editor's Note: Please see the article for additional information, including other authors, author contributions and affiliations, financial disclosures, funding and support, etc.

Editorial: Titrating Oxygen During and After Cardiopulmonary Resuscitation

Patrick M. Kochanek, M.D., and Hulya Bayir, M.D., of the University of Pittsburgh School of Medicine, comment on the findings of this study.

"Experimental evidence suggests that the risk of oxidative injury may be greatest early in resuscitation, possibly related to the initial burst of reperfusion. Accordingly, unconventional resuscitation strategies that were considered but heretofore unproven (such as intermittent, controlled, or even delayed reperfusion) are being explored in the laboratory with promising results in some cases. Such an approach might be particularly important in the setting of prolonged cardiac arrest. With the upcoming 50th anniversary of the birth of cardiopulmonary resuscitation, the work of Kilgannon et al provides an impetus for better defining the use of oxygen in all settings of cerebral resuscitation, in further exploring these revolutionary approaches to resuscitation, and in examining other strategies such as the combination of 100 percent oxygen with antioxidant therapy ..."

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