Oxygen Therapy—Use and Abuse

Conti CR. *Clin Cardiol.* 2009;32(9):480–481

Letter to Editor:

We read with interest your Commentary entitled “Oxygen Therapy—Use and Abuse in Acute Myocardial Infarction Patients.”¹ We totally concur with your opinion that the use of supplemental oxygen in patients with acute myocardial infarction should not be “routine” but rather limited to only those patients with oxygen saturation <90%.

As you pointed out, supplemental oxygen can have detrimental effects by causing coronary artery vasoconstriction. In addition, supplemental oxygen can also be detrimental because of its ability to cause oxidative injury. The assessment of oxygen-induced oxidative injury was recently facilitated by the discovery of products of free radical mediated lipid peroxidation, termed isofurans, whose formation becomes favored with increasing oxygen tension.² Measurement of isofurans has clearly facilitated the quantitative assessment of hyperoxia-induced lung injury.

In addition, we recently reported a finding associated with the use of supplemental oxygen that has potentially alarming ramifications.³ A transgenic mouse model of Alzheimer’s disease and normal mice were exposed to 100% oxygen for a period of just 3 hours. This was associated with increased levels of isofurans in the hippocampus and neocortex in the brain in the Alzheimer’s transgenic mice, but not the normal mice. Moreover, this was accompanied by measurable cognitive dysfunction in the transgenic mice that was not observed in normal mice. With the caveat that this was a study in Alzheimer’s transgenic mice, this may have relevance to what has been referred to as “pump brain” in which a high percentage of patients undergoing cardiopulmonary bypass surgery, during which

the blood is “hyperoxygenated” by the cardiopulmonary bypass machine, exhibit postoperative cognitive deficits which can be permanent.⁴

The perception by most physicians is that supplemental oxygen is not harmful. We think this perception is not well founded and mounting experimental evidence would suggest the opposite, which strongly implies that supplemental oxygen should only be used in patients with diminished oxygen saturation. Oxygen should be considered a drug and like all drugs when used in excess, it can be harmful. Myocardial damage in myocardial infarction and acute coronary syndrome is thought to be in part mediated by ischemia reperfusion injury. Therefore, the injudicious use of a therapy that might have the potential to exacerbate that injury, that is, unnecessary supplemental oxygen, might be ill-advised.

L. Jackson Roberts II, MD; JP Fessel, MD, PhD;
Gary Arendash, PhD

Departments of Pharmacology and Medicine,
Vanderbilt University, Nashville,
Tennessee (Roberts, Fessel); Florida Alzheimer’s Disease
Research Center, Department of Cell Biology,
Microbiology, and Molecular Biology,
University of South Florida, Tampa,
Florida (Arendash)

References

1. Conti CR. Oxygen therapy—use and abuse in acute myocardial infarction patients. *Clin Cardiol.* 2009;32:480–481.
2. Fessel JP, Porter NA, Moore KP, et al. Discovery of lipid peroxidation products formed in vivo with a substituted tetrahydrofuran ring (isofurans) that are favored by increased oxygen tension. *PNAS.* 2002;16713–16718.
3. Arendash GW, Cox AA, Mori T, et al. Oxygen treatment triggers cognitive impairment in Alzheimer’s transgenic mice. *NeuroReport.* 2009;1086–1092.
4. Newman M, Kirchner J, Jones R, et al. Longitudinal assessment of neurocognitive function after coronary-artery bypass surgery. *N Engl J Med.* 2001;395–402.