

Hyperbaric oxygen decreases infarct size and behavioral deficit after transient focal cerebral ischemia in rats

Authors: Roland Veltkamp, David S. Warner, Ferenc Domoki, Ann D. Brinkhous, James F. Toole and David W. Busija

Affiliations: A Stroke Research Center, Wake Forest University School of Medicine, Winston-Salem, NC, USA Department of Physiology and Pharmacology, Wake Forest University School of Medicine, Winston-Salem, NC, USA Department of Anesthesiology, Duke University School of Medicine, Durham, NC, USA Department of Physiology, Albert-Szent-Györgyi University, Szeged, Hungary

Accepted 19 October 1999.

Abstract

Cerebral hypoxia is a major component of immediate and secondary cell damage caused by ischemia. Hyperbaric oxygen (HBO) is a potent means to increase the amount of oxygen dissolved in blood plasma. The effectiveness of HBO in clinical and experimental cerebral ischemia, however, is controversial. We sought to determine whether treatment with HBO initiated early after focal cerebral ischemia-onset protects the brain when experimental conditions such as brain temperature are controlled. Male Wistar rats ($n=57$) underwent reversible filament occlusion of the right middle cerebral artery (MCA) for 75 min. Animals were awakened after filament introduction and assessed for presence of forelimb paresis. Rats then underwent a 60-min course of either 100% O₂ at 1.0 atmosphere absolute (ata; control group), HBO 1.5 ata, or HBO 2.5 ata in a customized HBO chamber allowing physiological monitoring and pericranial temperature control. The filament was then removed. Seven days after ischemia, rat behavior was scored from 3–18 (18=normal) and brains were removed for histological analysis of infarct volume. Rats treated with HBO 2.5 ata had better mean±standard deviation (S.D.) behavioral scores ($14±2$; $p<0.05$) than control ($10±3$) or HBO 1.5-ata-treated animals ($11±3$). Similarly, total infarct volumes (mean±S.D.) were smaller in animals receiving HBO at 2.5 ata ($76±65$ mm³; $p<0.05$) compared to control ($129±83$ mm³) and HBO 1.5-ata ($119±68$ mm³)-treated groups. Cortical infarction occurred less frequently in HBO 2.5-ata-treated than in control animals (44% vs. 71%; $p<0.05$). We conclude that HBO can improve outcome after temporary focal ischemia when treatment is started early after ischemia-onset but HBO dose appears important. Potential mechanisms include enhanced oxygen supply to marginally perfused cells.

For full document please click [here](#)