

## Review of HBOT for Neurotoxicity and other forms of brain injury

Although there is an absence of large randomised controlled trials evidence for the efficacy of Hyperbaric Oxygen Therapy (HBOT) in patients with chronic neurological disorders (CND), anecdotal studies have been supportive of its use in improving healing of the damaged brain.

A study by Golden et al used archival data to compare 25 older and 25 younger subjects who were given SPECT scans pre-therapy, mid-therapy, and post-therapy. ANOVAs using the SPECT scans as a within subjects variable and age as a between subjects variable confirmed the hypothesis that the cerebral measures all changed but that the cerebellar and pons measures did not. Post-hoc tests confirmed that there was improvement in blood flow from the beginning to the end of the study. An age effect was found on only two of the five measures; however, there were no interactions. Analysis by post-hoc t-tests showed that the younger group had higher blood flows, but not more improvement than the older group.

The results provided the first statistical research data to show the effectiveness of HBOT in improving blood flow in CND. These results indicate that HBOT can be an effective part of the treatment for such patients.

Neubauer et al have also reported several cases of single-photon emission computed tomographic (SPECT) brain imaging before and after HBOT for stroke, near drowning, and natural gas poisoning, with recovery of neurologic function. Subsequently, Harch et al performed the same sequence of SPECT scans/HBOT/SPECT scans for commercial divers with brain decompression sickness (DCS) and obtained results similar to those of Neubauer et al for patients with acute, subacute, or chronic carbon monoxide poisoning, patients with acute, subacute, or chronic brain DCS, and patients with chronic ischemic, hypoxic, traumatic, and/or hypoxic brain injuries. It may also be beneficial in the treatment of poisoning by cyanide and hydrogen sulfide (Tomaszewski).

Treatment of acute focal cerebral ischemia with HBOT has been reported for animals and humans. In general, the results of research in animals have suggested a promising role for HBOT. Hundreds of cases of human ischemic stroke treated with HBOT have been reported. In approximately one half of the cases, improvement in status was claimed on clinical or electroencephalographic grounds (Nighoghossian).

## References

- Golden ZL, Neubauer R, Golden CJ, Greene L, Marsh J, Mleko A. Improvement In Cerebral Metabolism In Chronic Brain Injury After Hyperbaric Oxygen Therapy. *Int J Neurosci* 2002 Feb;112(2):119-31
- Neubauer RA, Gottlieb SF, Kagan RL. Enhancing "idling" neurons. *Lancet*. 1990;335 :542
- Neubauer RA, Gottlieb SF, Miale A Jr. Identification of hypometabolic areas in the brain using brain imaging and hyperbaric oxygen. *Clin Nucl Med*. 1992;17 :477 -481
- Neubauer RA. Severe natural gas poisoning successfully treated with hyperbaric oxygen: 2 years later. In: *Proceedings of the 5th International Congress on Neurotoxicity and Occupational Neurology, Prague, Yugoslavia, September 24-27, 1990*. Vienna, Austria: European Federation of Neurological Sciences; 1990:10
- Harch PG, Gottlieb SF, Van Meter KW, Stabb P. HMPAO SPECT brain imaging of acute CO poisoning and delayed neuropsychological sequelae (DNSS). *Undersea Hyperb Med*. 1994;21(suppl) :15
- Harch PG, Gottlieb SF, Van Meter KW, Stabb P. HMPAO SPECT brain imaging and low pressure HBOT in the diagnosis and treatment of chronic traumatic, ischemic, hypoxic and anoxic encephalopathies. *Undersea Hyperb Med* 1994;21(suppl) :30
- Harch PG, Gottlieb SF, Van Meter KW, Stabb P. The effect of HBOT tailing treatment on neurological residual and SPECT brain images in type II (cerebral) DCI/CAGE. *Undersea Hyperb Med*. 1994;21(suppl) :22
- Nighoghossian N, Trouillas P. Hyperbaric oxygen in the treatment of acute ischemic stroke: an unsettled issue. *J Neurol Sci*. 1997;150 :27 -31
- Tomaszewski CA, Thom SR. Use of hyperbaric oxygen in toxicology. *Emerg Med Clin North Am* 1994;12:437-459