

THE IMPROVEMENT OF SPEECH AND LANGUAGE DEFICITS IN 3 APHASIC STROKE PATIENTS BY HBO THERAPY—

A Preliminary Study

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INTRODUCTION

We have previously presented a case history at this meeting on the effect of hyperbaric oxygen (HBO) in a 3 year post-stroke aphasic female patient (1). HBO treatment evaluated by the Boston Diagnostic Aphasic Examination (BDAE) showed improvements in following commands and complex ideational material of the auditory comprehension subtests and oral agility, recitation, visual confrontation naming, and oral sentence reading of the oral expression subtests. We now report on the improvement of speech and language deficits observed in 3 aphasic stroke patients by HBO treatment when evaluated by BDAE.

METHODS

The patients were long-term post-stroke and diagnosed aphasic. These patients were treated in a multiplace chamber at 1.5 ATA for 60-90 minutes for 30-40 treatments. The treatments were administered during the week with the weekends off. The BDAE was administered before and after HBO therapy by a speech-language pathologist, who was independent of Chico Hyperbaric Center. All protocols were followed according to the Declaration of Helsinki and the patients signed an informed consent form detailing the treatment and patient rights.

RESULTS

HBO increased the % proficiency levels of auditory comprehension subtests in following commands from 71.0 to 93.0 and in complex ideational materials from 52.7 to 74.3, increases in function of 31% and 41%, respectively.

HBO increased the % proficiency levels of oral expression subtests in nonverbal agility from 58.3 to 77.7 and in oral sentence reading from 63.3 to 83.3, reflecting increases in function of 33.3%, and 31.6%, respectively. HBO treatment significantly increased the proficiency levels of subtest in verbal agility from 50.0 to 79.7 in recitation, singing and rhythm from 43.0 to 76.3 in repeating phrases (high probability) from 45.7 to 70.7; and in repeating phrases (low probability) from 24.7 to 66.7, showing increases in function of 59.4%, 77.4%, 54.7% and 170%, respectively. HBO had very little effect on the % proficiency levels in understanding written language.

DISCUSSION

HBO appears to be relatively effective in improving deficits in auditory comprehension and oral expression of long-term aphasic post-stroke patients. Deficits in understanding written language were essentially not affected. It is not clear how these changes in function might have occurred. What is clear is that these changes occurred over time. This suggests that what must be involved is gene regulation of specific signaling pathway(s) which affect the various aspects of aphasia. What is also apparent is that the HBO effects observed in this report do not require continuous elevated levels of tissue O₂ to maintain the resulting changes.

One probable mechanism that might be invoked is the involvement of vascular endothelial growth factor (VEGF). HBO has been linked to increased VEGF and wound healing (2). In addition VEGF administered by intracerebroventricular injection into the brain in vivo has been shown to stimulate neurogenesis (3). And finally, VEGF applied directly into the dorsal hippocampus increased neurogenesis and facilitated learning and memory (4). Thus, it is possible that HBO increased neovascularization and neurogenesis in the brain via VEGF.

CONCLUSIONS

The results of this study show that (a) BDAE is an effective method of evaluating long-term aphasic stroke patients; (b) HBO therapy improves many aspects of speech and language deficits observed in these stroke patients; and (c) there is a need to study the HBO effect with more patients to further evaluate the effectiveness of HBO therapy on stroke-induced aphasia.

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