Does Hyperbaric Oxygen Treatment Improve Neurophysiological Performance in Brain Tumor Patients after Neurosurgery and Radiotherapy?

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Introduction

Patient’s disorders:
• short and working memory malfunction;
• chronic fatigue;
• often motoric dysfunction.

Hypothesis

HBO induces (via neo-angiogenesis) better neuronal functionality (amplitude increase) and myelination (increase of propagation speed). As a result, brain and motor performance is expected to improve.

All patients: history and characteristics documented

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Number connection test (NCT, 1-25)
Continuous reaction time test (CRTR; button pressing)
Informant Questionnaire on Cognitive Decline in the Elderly (IQCOD)
EEG mapping (64 electrodes, averaging → evoked response maps)
- Visual odd-ball paradigm (cognition)
- Somatosensory potentials
- Button pressing (motor & somatosensory)

Methods

Quantitative mean relative change after HBOT

Test number | Test name | mean | SD | n | P-value (t-test)
--- | --- | --- | --- | --- | ---
1 | averaged log-ratio NCT | 0.047 | 0.059 | 9 | 0.0042
2 | averaged log-ratio CRTT | 0.042 | 0.122 | 9 | 0.3279
3 | averaged log-ratio P3b | 0.14 | 0.167 | 10 | 0.0200
4 | averaged fraction IQCOD | 0.03 | 0.040 | 9 | 0.0138
| grand mean 1-4 | 0.072 | 0.117 | 37 | 0.0013

Cortical somatosensory and pre-motor performance

Electrical stimulation left posterior tibial nerve

Results

Odd-ball response of patients

P3b relative amplitude change of patients

EEG mapping, NCT, CRTT and IQCOD show improved cognitive performance mediated by HBOT. This seems to be mainly based on improved functionality of neurons, reflected by the P3b-amplitude increase, not on faster processing (better myelination).

Some patients showed improved somatosensory processing and motor control; better grasping and walking

Remaining questions: what is the relevance of age, tumor type, RT-HBOT interval, …?