

## Improvement of clinical outcome and cerebral perfusion in a patient of atherosclerotic cerebral infarction after repetitive hyperbaric oxygen treatment – A case report and literature review

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### ABSTRACT

This is a case report of hyperbaric oxygen therapy (HBO<sub>2</sub>T) for ischemic stroke. HBO<sub>2</sub>T should be the potential or additional treatment (with thrombolytic therapy) for ischemic stroke according to the pre-clinical and clinical studies. Hereby, we present a 56-year-old Chinese man with vascular risk factors. He had an acute ischemic stroke on the left corona radiata, with right hemiparesis and dysarthria resulting from atherosclerosis. The patient could not get thrombolytic treatment because the time to ER was in excess of five hours. He experienced great improvement after the general course of HBO<sub>2</sub>T; this was evaluated with standard rating scales for stroke research and cerebral perfusion images, including brain-computed tomography perfusion (CTP) and single-photon emission computed tomography (SPECT). Although few clinical trials showed a negative result, we suggest that further trials on HBO<sub>2</sub>T are still needed. Meanwhile, we emphasize the importance of HBO<sub>2</sub>T protocol and the selection of a suitable patient, which may influence the outcome.

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### INTRODUCTION

The most effective treatments for ischemic stroke – such as intravenous thrombolysis with recombinant tissue plasminogen activator (tPA) within 4.5 hours after symptom onset [1] or intra-arterial thrombolysis [2] – have a narrow time window, resulting in a restricted number of treatable patients. There is an imperative need to develop new or adjuvant treatment to improve stroke outcome. Several successful studies in animal models of both focal and global ischemia suggest hyperbaric oxygen therapy (HBO<sub>2</sub>T) may present a possible treatment for acute stroke [3,14-17].

However, there is still debate about HBO<sub>2</sub>T in clinical stroke. From the beneficial view, oxygen application leads to blood-brain barrier stabilization, reduction of excitotoxic metabolites, and inhibition of inflammatory processes [4,5]. In contrast, negative effects have been raised concerning damaging properties – oxygen-induced vasoconstriction, for example, and, more often, free oxygen radicals [6,7]. Although few clinical studies have showed these controversial effects of HBO<sub>2</sub>T in ischemic stroke – mainly attributed to improper

treatment protocol for HBO<sub>2</sub>T and lack of supportive evidence in previous studies [7-10] – we weighted the net effect of HBO<sub>2</sub>T beneficial for ischemic stroke. Herein, we present a patient with atherosclerotic cerebral infarction treated with repetitive HBO<sub>2</sub>T showing great improvement in both clinical outcome and brain perfusion studies.

### CASE PRESENTATION

A 56-year-old man had a history of hypertension and the habit of smoking for more than 20 years. He experienced an acute onset of right hemiparesis and dysarthria. His consciousness was drowsy on admission. There were no carotid bruit, heart murmur or arrhythmia. The neurological deficits included right central-type facial palsy and sensory impairment of right limbs on pinprick stimuli. The magnetic resonance imaging (MRI) revealed a recent infarction at the left corona radiata (*Figure 1A, B, Page 376*). Electrocardiogram showed no atrial fibrillation, while the carotid Doppler scan and magnetic resonance angiography (MRA) showed mild atherosclerosis at the small intra-cranial arteries (*Figure 1C, Page 376*).