



A comment on the article: Rabrenović M, Trešnjčić S, Rabrenović V, Čikiriz N, Mašić S, Matunović R. Neurotoxic effects of oxygen in hyperbaric environment. Vojnosanit Pregl 2015; 72(9): 827–30.

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To the Editor:

Personally, I felt obligated to write this comment on the alleged case report published by the respected and well-known Serbian Military Medical and Pharmaceutical Journal:

1. In the introduction, the authors write: "... if not controlled, inhalation of oxygen under increased pressure in condition of hyperbaric oxygen therapy can lead to serious damage (to human health?) and even death".

As specialists of underwater and hyperbaric medicine in my 35 years of practice I met no case in personal experience, nor data in the literature that oxygen used as a medicine in hyperbaric chambers has led to serious health damage or death in human.

2. Therapeutic partial pressures of O₂ allow comfortable use, but the duration of stay in hyperbaric chambers is strictly limited. To demonstrate toxic effects of oxygen it is necessary that the partial pressure of oxygen is above 3 ATA (atmospheres absolute) and that the length of exposure is prolonged to several hours. The toxic effect on primarily the lung tissue, and after that on the CNS has been noticed. Toxic events on the CNS are called "oxygen epilepsy" as is clinically manifested as seizures without further or permanent consequences. In the test for oxygen sensitivity for divers partial pressure of 2.8 ATA and exposure time of 60 min is implemented. This test is or was implemented only in military or police divers who dive with closed circuit diving equipment, where the breathing medium is 100% oxygen. Military divers exercises done at the pressure of 2.0 ATA can last for several hours.

In divers career the test is done once in the early stage of career. The use of this test is questionable because a diver can experience oxygen epilepsy even if the oxygen hypersensitivity is not detected by the test. The question is why? Because increased sensitivity to oxygen usually develops as a cause of some other medical problems in the background (infection of bacterial or viral commonly, fever or other medical problem that is not detected in the process of selection, or possible, because individual predisposition which is rarely detected by EEG). That's why the test is being used less and less, and my opinion is that it should be removed from service completely.

3. Epileptic seizures induced by oxygen leads to a powerful tonic-clonic convulsions and seizures, and each seizure brings higher possibility of injuries, muscle aches, increase muscle creatine kinase, ... but biochemical changes that indicate damage of parenchymal organs are not present.

What is a possible background hypersensitivity to oxygen? I repeat that there is no late or permanent consequence, because, theoretically, the seizure is caused by rapid metabolic consumption of enzymes and decrease of GABA (gamma-amino butyric acid), that causes metabolic block in the CNS and epileptic seizures.

4. In the process of selection for Special Forces divers, individuals who are sensitive to oxygen are immediately eliminated from the group that dives using 100% oxygen. In these cases it is necessary to pay special attention to the application of hyperbaric oxygenation or completely exclude application of HBO therapy at pressures greater than 1.5 ATA (5 m deep, 100% oxygen), which is normally recommended for the safe treatment of CNS.

It is considered to be a medical error if a person with oxygen hypersensitivity is treated with oxygen under high pressure.

Especially when it comes as a medical treatment recommendation as it is by the authors of this article!

Recommendations provided by the doctors of Military Medical Academy and published in Military Medical and Pharmaceutical Journal of Serbia has a special significance because of the importance of Military Medical Academy and Military Medical and Pharmaceutical Journal of Serbia in our medical practice.

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Authors' reply:

In our practice, we had several cases of patient reaction to 100% oxygen in hyperbaric conditions, which were manifested

as oxygen epilepsy, normally without any sequelae, except that the therapy was interrupted. In this particular case, it was associated with skin manifestations, pain in the joints and muscles, as well as suffusion of the eye, which is why it drew our attention as the literature does not list these changes as a companion to the neurotoxic effects of hyperbaric oxygen conditions. Therefore, we decided to present this case, thinking it will be interesting and unusual.

We are glad that it drew the attention of a honorable colleague, so we would like to provide additional explanations and our observations.

Our conclusion that uncontrolled inhalation of oxygen within hyperbaric therapy can lead to organ damage, including coma and death, is supported by the harmful effects of high partial pressure of oxygen above 3 ATA. We wanted to draw attention to the need for caution and not as something that happens every day. This is the reason that today's modern hyperbaric chambers are programmed so that if the human factor fails, computer automatically cuts off oxygen in the event of uncontrolled increase or exceeding programmed depth.

Oxygen sensitivity tests are performed to this day both in our, as well as in other militaries, but with different oxygen inhalation time at the aforementioned pressure and depth.

In our case presentation, we were not dealing with damage to the CNS, but rather with the neurotoxic effects of oxygen which does not lead to any effects on the CNS, except that as a result, the person did not pass the selection process.

As is visible in photographs, the individual had changes in the neck and chest in the form of erythematous stains, as well as suffusion in the eye and pain in joints and muscles, which lasted several hours and was therefore treated in a hyperbaric chamber. Treatment profile included safe depth where he breathed 100% oxygen intermittently with air, and resulted in the changes dissipating within 30 minutes.

We found the biochemical results interesting, and thus we listed them, because they are all improved after that single treatment.

We wanted to present this case in order to describe our experience to other colleagues who deal with hyperbaric oxygen treatment.

On behalf of the authors:
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