

Beneficial effects of mild hyperbaric oxygen exposure on microcirculation in peripheral tissues in healthy subjects: a pilot study

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Abstract

Background: Exposure to mild hyperbaric oxygen (HBO) increases blood oxygenation by dissolving oxygen into blood plasma and increased oxygen bound to hemoglobin in red blood cells. This research is an attempt to provide insight into the responses of exposure to mild HBO on microcirculation in peripheral tissues.

Methods: Fifteen healthy individuals were exposed to normobaric oxygen (1.00 ATA, 20.9% oxygen, NBO) and mild HBO (1.4 ATA, 35-39.5% oxygen) in a mild HBO chamber for 70 minutes under each condition. Peripheral oxygen saturation (SpO₂), heart rate, blood flow in skin, and hemodynamics in capillaries of finger nailfold were measured under both exposures.

Results: The value of SpO₂ was increased from 98% to 100% after mild HBO exposure although that of SpO₂ under NBO was unaltered (P=0.000; P=0.818). Heart rate was decreased after exposure to the mild HBO although that unchanged under the NBO (P=0.000; P=0.706). The mean value of high frequency power in heart rate variability increased after exposure to the mild HBO (P=0.045). Average blood velocity and flow rate in capillaries of finger nailfold were not increased under to NBO whereas those were significantly increased from 92 μm/s to 126 μm/s (P=0.040, P=0.000), and 12247 μm/s to 20926 μm/s after exposure to mild HBO (P<0.05), (P=0.002, P=0.875), respectively.

Conclusions: These results indicate that exposure to mild HBO increases blood flow in the capillaries of peripheral tissues by regulating parasympathetic nerve activities through increasing oxygen delivery, oxygen bound to hemoglobin in red blood cells and dissolved oxygen content in plasma.