

Functional Changes in Microcirculation During Hyperbaric and Normobaric Oxygen Therapy

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Purpose of the study:

To assess differences in regulatory mechanisms of functional parameters of microcirculation (oxygen saturation –SO₂-, blood flow-BF- and flow velocity - FV-) during hyperbaric (HBO) and normobaric (NBO) oxygen therapy.

Methods: Seven healthy volunteers (age: , Sex-ratio M/W: 6/1) were investigated using tissue spectrophotometry and laser Doppler flowmetry (LEA-Medizintechnik, Gießen). SO₂, BF and FV were recorded simultaneously at tenar and distal latero-tibial site during HBO and NBO. SO₂ was measured in 2 mm, BF and FV in 2 and 4 mm dept.

Protocol of the measurements :

- HBO:** Basal: 20 min; compression: 10 min; isopression (2.4 bar) and oxygen breathing: 15 min; decompression: 14 min.
- **NBO:** Basal 20 min; oxygen breathing: 15 min

Results: At baseline SO₂ (p<0.001), FV (p<0.01) and BF (p<0.05) measured at laterotibial site, were lower than the corresponding parameters assessed at tenar site.

We found no statistically significant decrease in BF and FV during HBO at any site. During NBO, BF and FV decreased nonsignificantly in 2 mm dept at all sites, whereas we were able to detect a statistically significant decrease in BF (p< 0.05) and FV (p< 0.05) in 4 mm dept at laterotibial site.

At tenar site an increase in SO₂ from 45.58 ± 2.33% at baseline to 50.78 ± 2.80% (p<0.001) during HBO become detectable, but there was no significant change in SO₂ during NBO: 43.92 ± 3.34% at baseline and 47.03 ± 4.26% during NBO. At laterotibial site, SO₂ increased during HBO from 21.22 ± 5.06% at baseline to 25.54 ± 5.89% (p<0.001) and from 21.16 ± 4.73% at baseline to 22.57 ± 5.29% (p<0.01) during NBO

Discussion:

The HBO-therapy had in our study little effect on BF and FV, whereas NBO determined a significant vasoconstriction at laterotibial site in 4 mm but not in 2 mm and no significant decrease in BF and FV at tenar site. Significant increases in SO₂ were detectable at tenar site only during HBO. At laterotibial site, the increases in SO₂ reached statistical significance during NBO as well as during HBO. These changes, together with the already at baseline determined differences between tenar and laterotibial site, are consistent with different regulatory mechanisms at the two measurement sites and during NBO and HBO respectively.