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## **A new semi-invasive method for two dimensional pO<sub>2</sub> measurements of cortical structures**

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### **Abstract:**

*Background* Measuring brain oxygenation in patients with TBI or SAH is of major interest. We present a new semi-invasive method for two dimensional measurements of cortical pO<sub>2</sub>.

*Methods* For this feasibility study, a porphyrin containing sensor foil was placed directly on the cortex of intubated and variably ventilated Wistar rats. The sensor was excited with a light pulse and pictures of the foil's pO<sub>2</sub> dependant emissions were captured with a CCD camera. After online data processing, two-dimensional maps of cortex oxygenation were displayed and analyzed using ROIs (here: arteriolar, vein, parenchyma) with a display rate of 7 Hz. The size of one single measurement pixel was 0.03 x 0.03 mm<sup>2</sup>.

*Findings* The mean pO<sub>2</sub> over cortex arterioles was 20.3 ± 0.69, over veins 17.1 ± 0.5 and over parenchyma 9.1 ± 0.6 (mmHg ± SD). The arterial pO<sub>2</sub> showed a good correlation to the pO<sub>2</sub> in the ROIs (r=0.46 – 0.72, p < 0.0001, n=198). Comparing groups with different p<sub>a</sub>O<sub>2</sub> and p<sub>a</sub>CO<sub>2</sub> we found significantly different pO<sub>2</sub> values in the ROIs of the cortex.

*Conclusions* This prototype is capable of obtaining cortical pO<sub>2</sub> maps with excellent temporal and spatial resolution and provides simultaneous imaging of the cortex structures.

Key-words: Brain oxygen, partial oxygen pressure, time-resolved luminescence imaging, neuromonitoring