

Scientific Paper:

Adv Exp Med Biol, 2009, 645, 167-73

Non-invasive measurement of the superficial cortical oxygen partial pressure

Chris Woertgen¹, Jan Warnat¹, Alexander Brawanski¹, and Gregor Liebsch²

¹Department of Neurosurgery, University of Regensburg, Germany

²Biocam GmbH, Regensburg, Germany

Abstract:

We present a non invasive fluorescein based method to measure and visualise the partial oxygen pressure of the rat cortex in a 2D picture. We studied 10 Wistar rats. A trepanation was done over the hemisphere and the dura was opened. A PMMA cylinder with a calibrated optical membrane was fixed over the surface of the brain. The CCD camera with the light source is placed over the cylinder. This allows the generation of two-dimensional maps of the pO_2 pressure. Using the white light picture we defined regions of interest (ROI) in an artery, vein, parenchyma and an overall ROI. For every ROI a mean emission value was calculated. We increased, stepwise, the FiO_2 from 30 % up to 100 %. Thereafter we established ventilation with a FiO_2 of 30 % and induced a stepwise hypo- and hyperventilation. The ROI's showed significantly different pO_2 values. The apO_2 showed a good correlation to the pO_2 in the ROIs. This new set up seems to give reliable absolute pO_2 values of the brain surface. This method seems to be able for the first time to give a non invasive pO_2 map of the brain surface reflecting oxygenation and ventilation effects.

Key-words: Partial oxygen pressure, rat cortex, pO_2 maps, hypo- and hyperventilation, brain oxygen