

Non-Invasive Measurement of Cerebral Blood Flow in Piglets During Resuscitation Induced Physiologic Challenges

Asaph Nini, Noam Racheli, Helena Grinberg Rashi, Ilan Breskin, Moshe Kamar

Ornim Medical, Kfar Saba, Israel

Introduction: Monitoring brain blood flow and oxygenation is essential during treatment of patients in which brain perfusion may be compromised, and may serve as a future goal to direct therapy. However, there are currently no noninvasive devices that measure cerebral blood flow (CBF) and oxygenation continuously. The Cerrox monitor (Ornim Medical, Israel) is a novel device, based on Near Infra Red Spectroscopy, that enables rapid, noninvasive measurement of these parameters. The aim of this study is to examine the ability of the Cerrox to monitor CBF during different resuscitative maneuvers.

Methods: Four piglets were anesthetized and ventilated. CBF was manipulated by iv Norepinephrine (2.5µg/Kg), Hypercapnea (FiCO₂=7%), Hyperventilation (ETCO₂=25mmHg) and iv Acetazolamide (12.5mg/Kg). CBF was monitored using the Cerrox (CBF_{cer}) and a Laser Doppler Electrode (Moore Instruments, UK) (CBF_{ld}). Results are reported as percent±SE.

Results: Epinehrine injection: Average heart rate was 200±44% CBF_{cer} was 350±125%, and CBF_{ld} was 175±28%. Cerrox detected 7/8 cases of CBF rise. Hypercapnea: Average ETCO₂ was 65±3 mmHg, CBF_{cer} was 172±23%, and CBF_{ld} was 163±18%. Cerrox detected 8/8 cases of CBF rise. Hyperventilation: Average ETCO₂ was 26±0.7mmHg, CBF_{cer} was 74±5.5%, and CBF_{ld} was 74±7.5%. Cerrox detected 4/5 cases of CBF decrease. Acetazolamide: Average ETCO₂ was 23±2.7mmHg, CBF_{cer} was 80±2.1%, and CBF_{ld} was 78±6.2%. Cerrox detected 4/4 cases of CBF decrease. Total agreement between CBF_{cer} and CBF_{ld} was 23/25 cases (92%), with a Kappa=0.828.

Conclusions: In clinical scenarios such as resuscitation, where cerebral perfusion may be compromised, continuous noninvasive monitoring of CBF is feasible during treatment, may provide crucial information to caregivers, alter treatment and change neurological outcome.