

Cerebral Oximetry via Near Infrared Spectroscopy Mirrors Desaturations of Brain Tissue Partial Pressure Of Oxygen: A Case Study

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Introduction: Near infrared spectroscopy is a non-invasive method of monitoring cerebral oxygenation. By employing time and spatial resolution of several light wavelengths, cortical blood flow, volume and oxygenation can be quantified (cerebral oximetry). We present a case utilizing cerebral oximetry in a patient with cerebral vasospasm after subarachnoid hemorrhage (SAH) with concurrent use of brain tissue partial pressure of oxygen (PbtO₂) monitoring.

Methods: A 46 year old woman developed severe diffuse vasospasm following SAH. We monitored intracranial pressure (ICP) as well as tissue oximetry (PbtO₂) via Licox (Integra) catheter placed in the distribution of the left MCA. Over a 24-hour period during the third day of vasospasm, CerOx (Ornim) monitoring was applied over the left fronto-temporal area to evaluate the relationship between PbtO₂ and non-invasive cerebral oximetry.

Results: There were 12 episodes of PbtO₂ desaturation (<20 mmHg for >5 mins) over the period of dual monitoring. Over 80% of these PbtO₂ desaturations were preceded by >20% decline in CerOx values from baseline. There were 22 episodes of cerebral oximetry desaturation (<50% for >10 mins). Less than 50% of CerOx desaturations were temporally related to a decline in PbtO₂ to less than 20 mmHg. Hemoglobin was stable at 10 mg/dL and ICP was well controlled (<15 mmHg) during the entire 24 hours.

Conclusions: In this subject, desaturations of PbtO₂ appeared to be related to desaturations by non-invasive cerebral oximetry; the converse was not the case. Perhaps cortical oxygen desaturations (CerOx) occur with increased frequency compared to subcortical oxygen desaturations (PbtO₂) in diffuse vasospasm after SAH. CerOx monitoring may provide an enhanced understanding of oxygen delivery and utilization during periods of ongoing cerebral ischemia. Further studies are required to substantiate these findings.

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