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Editorial
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The Importance of Cerebral Oximetry in Perioperative Surgery

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Cerebral Oximetry

The goals of optimum anaesthetic management during surgery are to provide a clear operative field for the surgeon, to prevent the perception of pain and discomfort for the patient, and to preserve and optimise organ function perioperatively. Cerebral oximetry is a modality that is increasingly being embraced by physicians for use as an early warning end organ dysfunction monitor [1].

In the last few years cerebral oximetry based on near infra-red spectroscopy is increasingly being used in aortic and valvular heart surgery procedures as an end-organ desaturation monitor. In addition it is finding a home in the setting of critical care to evaluate periods of desaturation that may occur in the ICU during emergence and sedation [2].

The principles of NIRS oximetry are that a change in oxygenation of haemoglobin causes a change in its absorption spectra and that the Beer-Lambert law can be used to deduce the saturation of haemoglobin from its change in absorption. NIRS uses the frontal bone to allow reflectance to be measured from within the first few cm of the brain tissue in a non-invasive manner. Other sites have been used for detection of flow such as the tenor eminence and forearm, whilst in neonates renal or gastrointestinal flow detection is possible as well as muscle bed flow [3].

It is however open to interference from extracranial and venous blood flow and the devices on the market use proprietary algorithms to minimize the misinterpretation of the signal received by reflectance [4]. Other limitations include interference from electrical diathermy and that other areas of the brain remain unmonitored – only the frontal area saturation is measured.

Interpretation of cerebral oximetry results has led to the development of clinical intervention algorithms to allow an improvement in end organ perfusion. Along with these has come the realisation that the concept of flow is equally important as pressure to maintain perfusion. The use of oximeters has also allowed the personalisation of therapeutic interventions as each patient has a different cerebral auto regulation curve and for the first time it is possible to tailor cardiopulmonary bypass flow as well as pressure to obtain optimum cerebral perfusion [5].

The value of these devices lies in cardiac surgery, deep hypothermic circulatory arrest, carotid surgery and aortic surgery where the ability to detect desaturation and intervene early is beneficial to the patient. They may have a developing use in monitoring effectiveness of CPR and out of hospital cardiac arrest resuscitation.

It remains to be seen whether interventions in brain perfusion lead to meaningful changes in cerebrovascular outcomes and changes in length of stay in the hospital and quality of life improvement upon discharge and these should be the subject of further randomized controlled trials.

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