Oxidative metabolism

see Oxidative stress.

Cerebral cytoplasmatic redox state is a sensitive indicator of cerebral oxidative metabolism and is conventionally evaluated from the extracellular Lactate to Pyruvate Ratio.

During cerebral ischemia induced by severe hemorrhagic shock, intravascular microdialysis of the draining venous blood will exhibit changes of the Lactate to Pyruvate Ratio (LP ratio) revealing the deterioration of global cerebral oxidative energy metabolism. In neurocritical care, this technique might be used to give information regarding global cerebral energy metabolism in addition to the regional information obtained from intracerebral microdialysis catheters. The technique might also be used to evaluate cerebral energy state in various critical care conditions when insertion of an intracerebral microdialysis catheter may be contraindicated, e.g., resuscitation after cardiac standstill, open-heart surgery, and multi-trauma [1)].

The disturbance of normal mechanisms of oxygen delivery and metabolism is a hallmark of severe traumatic brain injury (TBI). In the past, investigations into the status of cerebral oxygen metabolism depended on changes in the differences in oxygen content between arterial and jugular venous blood. The development of jugular venous oximetry permitted continuous monitoring of jugular venous oxygen saturation, thereby overcoming earlier limitations caused by intermittent sampling. Neuromonitoring techniques that utilize only jugular vein sampling provide information only about global cerebral metabolism, but direct measurement of brain tissue oxygen tension via intraparenchymal probes makes possible the assessment of regional cerebral oxygen metabolism. Regional and global neuromonitoring techniques are not competitive or mutually exclusive. Rather, they are best regarded as complementary, with each providing valuable information that has a direct bearing on patient outcomes.

1)
Jakobsen R, Halfeld Nielsen T, Granfeldt A, Toft P, Nordström CH. A technique for continuous bedside monitoring of global cerebral energy state. Intensive Care Med Exp. 2016 Dec;4(1):3. doi: 10.1186/s40635-016-0077-2. Epub 2016 Jan 20. PubMed PMID: 26791144.