Cerebral Blood Flow Monitoring

- Intraoperative cerebral perfusion monitoring with ultrafast power doppler imaging
- Modulation of the human brain oxygen extraction fraction and metabolic rate in response to hyperoxia: The role of hypocapnia
- Optical Blood Flow Monitoring in Humans Using SNSPDs and High-Density SPAD Cameras
- Cerebral Autoregulation in Neonates: Physiology and Beyond
- Revealing neurovascular coupling at a high spatial and temporal resolution in the living human retina
- Characteristics and Changes of Cingulate Gyrus Function and Perfusion in Patients With Anti-N-Methyl-D-Aspartate Receptor Encephalitis
- Brain water dynamics across sleep stages measured by near-infrared spectroscopy: Implications for glymphatic function
- Femoral Vessel Occlusion Enhances Cardiac and Cerebral Perfusion in a Porcine Model of Cardiac Arrest

Cerebral blood flow measurement

see Cerebral blood flow measurement.

Cerebral blood flow velocity

see Cerebral blood flow velocity.

Pathology

Hyperemia.

Ischemia.

Medical professionals must take steps to maintain proper CBF in patients who have conditions like shock, stroke, cerebral edema, and traumatic brain injury.

Insufficient cerebral perfusion pressure (CPP) after aneurysmal subarachnoid hemorrhage can impair cerebral blood flow.

Considerable studies showed that a reduction in cerebral blood flow (CBF) might affect learning and memory processes, resulting in the development, and progression of dementia, such as vascular dementia.

Assessment

Assessment of the cerebral blood flow (CBF) is crucial in the evaluation of patients with steno-occlusive diseases of the arteries supplying the brain for prediction of stroke risk.

Quantitative phase contrast magnetic resonance angiography (PC-MRA) can be utilised for noninvasive quantification of CBF.

Arterial spin labeling (ASL)-MRI is becoming a routinely used sequence for ischemic strokes, as it quantifies cerebral blood flow (CBF) without the need for contrast injection.

A Medline search was conducted to address essential pre-specified questions related to the utility of CBF monitoring. Peer-reviewed recommendations were constructed according to the GRADE criteria based upon the available supporting literature. Transcranial Doppler ultrasonography (TCD) and transcranial color-coded duplex sonography (TCCS) are predictive of angiographic vasospasm and delayed ischemic neurological deficits after aneurysmal subarachnoid hemorrhage. TCD and TCCS may be beneficial in identifying vasospasm after traumatic brain injury. TCD and TCCS have shortcomings in identifying some secondary ischemic risks. Implantable thermal diffusion flowmetry (TDF) probes may provide real-time continuous quantitative assessment of ischemic risks. Data are lacking regarding ischemic thresholds for TDF or their correlation with ischemic injury and clinical outcomes.TCD and TCCS can be used to monitor CBF in the neurocritical care unit. Better and more developed methods of continuous CBF monitoring are needed to limit secondary ischemic injury in the neurocritical care unit. [1).

Cerebral blood flow for outcome prediction after traumatic brain injury

The aim of a study was to examine cortical cerebral blood flow (CBF) in patients with traumatic brain injury (TBI) and determine whether lobar cortical CBF is a better predictor of long-term neurological outcome assessed by the Glasgow Outcome Scale (GOS) than global cortical CBF. Ninety-eight patients with TBI had a stable xenon computed tomography scan (Xe/CT-CBF study) performed at various time points after their initial injury. Spearman's correlation coefficients and Kruskall-Wallis' test were used to examine the relationship between patient age, emergency room Glasgow Coma Scale (GCS), Injury Severity Score, prehospital hypotension, prehospital hypoxia, mechanism of injury, type of injury, side of injury, global average CBF, lobar CBF, number of lobes with CBF below normal, and GOS (discharge, 3 and 6 months). Univariate ordinal regression was performed using these same variables and in combination with principle component analysis (PCA) to determine independent variables for multi-variate ordinal regression. Significant correlation between age, GCS, prehospital hypotension, type of injury, global average CBF, lobar CBF, number of lobes below normal CBF, and GOS was found. Individual lobar CBF was highly correlated with global CBF and the number of lobes below normal CBF. PCA found one principle component among these three CBF variables; therefore, average global CBF and number of lobes with CBF below normal were each chosen as independent variables for multiple ordinal regression, which found age, GCS, and prehospital hypotension, global average CBF, and number of lobes below normal CBF significantly associated with GOS. This study found global average CBF and lobar CBF significantly correlated with GOS at follow-up. There was, however, no individual cerebral lobe that was more predictive than any other, which puts into question the value of calculating lobar CBF versus global CBF in predicting GOS [2)].

Effect of General Anesthesia on Cerebral Blood Flow

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[1]

Miller C, Armonda R; Participants in the International Multi-disciplinary Consensus Conference on Multimodality Monitoring. Monitoring of cerebral blood flow and ischemia in the critically ill. Neurocrit Care. 2014 Dec;21 Suppl 2:121-8. doi: 10.1007/s12028-014-0021-9. PubMed PMID: 25208667.

[2]

Fridley J, Robertson C, Gopinath S. Quantitative lobar cerebral blood flow for outcome prediction after traumatic brain injury. J Neurotrauma. 2015 Jan 15;32(2):75-82. doi: 10.1089/neu.2014.3350. Epub 2014 Nov 25. PubMed PMID: 25019579.