Editorial

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TREATMENT OF TRAUMATIC BRAIN INJURY IN NEURO INTENSIVE CARE

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Introduction

Traumatic brain injury (TBI) is one of the leading causes of death and disability in young adults. Acute TBI is characterized by a primary and a secondary injury. Primary brain injury is the direct injury to the brain parenchyma at the time of the initial impact, which can be both focal and diffuse depending on the biomechanics of the impact. Multimodality monitoring using focal and global methods provides valuable information but has its limitations. Imaging of the brain may add important information.

Positron Emission Tomography

Positron emission tomography (PET) is an imaging technique that provides quantitative measurement of cerebral perfusion and metabolism (78, 79). Positron emitting radionuclides are used either after incorporation into chemical compounds (e.g., C15O, C15O2, and H2150) or as molecular tracers (e.g., 15O2)..

Single-Photon Emission Computed Tomography

The principal of single-photon emission computed tomography (SPECT) is similar to PET in using radioactive material to detect gamma rays. SPECT is a semi-quantitative CBF measurement technique that is based on the calculation of tracer uptake ratios and an estimation of the relative regional CBF (rCBF) distribution within the brain

Stable Xenon Computed Tomography

Xenon computed tomography (Xenon-CT) utilizes inhalation of a gas mixture containing 28% (30–35% in older studies) non-radioactive xenon (131Xe) and oxygen. The Xenon gas is a radio opaque, highly lipid soluble and capable of crossing the BBB. It provides primarily measurements of rCBF in the cortex and has been used under a variety of clinical conditions to study the pathophysiology and guide therapy regarding blood pressure and ventilation management.

Brain Perfusion Imaging

Cerebral perfusion is defined as the steady-state delivery of blood to brain tissue per unit volume, measured in milliliters per 100 g of tissue per minute. Perfusion imaging uses intravascular tracers most commonly iodine or gadolinium contrasts depending on imaging method.

Perfusion-Weighted MRI

The most common technique for measuring perfusion parameters with MRI is dynamic susceptibility contrast (DSC). We chose PW-MRI throughout this review. In PW-MRI, a time series of fast T2-weighted images are acquired when gadolinium contrast agent is injected.

Computed Tomography Perfusion Scan

In computed tomography perfusion (CTP), a native (unenhanced) CT is obtained followed by infusion of iodinated contrast. Post processing of the data allows the generation of color-coded maps and quantification of various perfusion parameters, including CBF, CBV, MTT, and TTP.

Conclusion

Cerebral hypo perfusion and other CBF disturbances are common after TBI and play an important role in the development of secondary brain injury. It has been difficult to integrate methods for quantitative rCBF measurements in neurointensive care, which relies mainly on uni-focal or global monitoring methods to detect cerebral ischemia or to evaluate different treatments aimed at increasing CBF. There is a need of a rapid assessment of CBF in the NIC unit without transportation of the patient. All other methods discussed above require transfer of TBI patients to the radiological department. However, Xenon-CT can only provide quantitative measurements of CBF.