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Innovative neuroprotection strategist in acute brain injury

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Resumen

Acute brain injury is associated with high morbidity and mortality, and represents a burden to the health care system due to its high cost in management, rehabilitation, and investment in long term supportive care. The main goal of neuro-critical care is the application of neuroprotective strategies that limit secondary tissue damage and improve functional outcomes in the acutely injured brain, including those during the immediate post-operative period. Current strategies to improve neuroprotection mainly include new recommendations in already stablished therapies, but there are also new innovative options still in research. Some available strategies to discuss include:

-Early reperfusion therapy in ischemic stroke which include administration of intravenous thrombolytic agents, intra-arterial thrombolysis, mechanical thromboembolectomy, enhanced oxygen delivery, hemodilution and systemic central hemodynamic augmentation therapy. The innovative approach herein involves selectively treating patients who have a mismatch between brain tissue that is hypoperfused on neuroimaging but deemed salvageable and tissue that has or is predicted to infarct to increase favorable outcomes; and expanding reperfusion strategies to patients with ischemic stroke symptom onset of > 4.5 hours or those for whom systemic intravenous thrombolysis is contraindicated.

-Preventing or minimizing secondary brain insults with early removal of large intracranial hematomas and decompressive craniectomy in patient with raised intracranial pressure (ICP).

- Active monitoring of cerebrovascular autoregulation with ICP monitors, transcranial Doppler, brain tissue oxygenation and near-infrared spectroscopy.

- Therapeutic hypothermia which may mitigate ischemia–reperfusion injury and reduce brain edema in different setting; however benefits and adverse effects need to be analyzed in specific clinical context.

- Use of infusion of mesenchymal stromal cells (MSCs) in the injured brain may improve structural and functional outcomes. Current work is in progress to evaluate in vivo potency, application in clinical environment, and safety.

- Volatile anesthetic agents may have neuroprotective properties. Pretreatment with isoflurane may improve long-term neurological outcomes after experimental hypoxic/ischemic bran injury or focal brain ischemia but it still needs to be translated into clinical studies.

-Use of alternative sources of energy for the brain: Sodium lactate infusion (present in hypertonic solutions) and Acetyl-L-carnitine have been shown to be neuroprotective in several brain injury models, both in vitro

and in vivo.

- Even hyperoxia has been associated with increased mortality in patients with various acute neurological disease processes; it can increase PbtO2, restore mitochondrial redox potential, decrease ICP, restore aerobic metabolism and improve pressure autoregulation probably at a narrow effective dose. Hyperbaric oxygen has been shown to reduce infarct volume, blood–brain barrier disruption, edema and neurologic deficits in animal models.