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EDITORIAL

Editorial

The biological cost of the depression of consciousness☆

El costo biológico de la depresión de la conciencia

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The body when asleep has no perception; but the soul when awake has cognizance of all things, sees what is visible, what is audible, walks, touches, feels pain, ponders. In a word, all functions of the body and of soul are performed by the soul during sleep. Hippocrates, "Dreams".[1]

But what I see these days are sedated patients, lying without motion, appearing to be dead, except for the monitors that tell me otherwise... By being awake and alert...they could interact with family...feel human...sustain the zest for living which is a requirement for survival. Petty TL. Suspended Life or Extending Death?[2]

When a patient is under our care in the critical care unit or under anesthesia during surgery, we are very focused on protecting the major organ systems: the heart, lungs, kidneys and brain, as functioning units. However the more sophisticated function of the brain, the cognitive function, which is vital for a successful life, has only recently come to the forefront of our care. We are now recognizing that insults to the brain do occur both during sedation therapy in the critical care unit and during general anesthesia in the operating room. Postoperative cognitive deficits, especially with executive function, have been detected in post-anesthetic testing of surgical patients. Similarly in the intensive care wards, uncontrolled depth of sedation maybe associated with delirium, cognitive dysfunction and increased morbidity and mortality.

Natural sleep is very beneficial to our wellbeing and sleep deprivation has been shown to have an adverse effect on various aspects of human cognitive performance.[3] Natural sleep is controlled by a major pacemaker in the suprachiasmatic nucleus, located in the ventral hypothalamus, and has a circadian (*circa diem*) rhythm, that coordinates all overt rhythms in the body by humoral and neuronal outputs.[4] Disruption of the circadian timing system, as may occur in a critical care unit, can provoke serious morbidities, including cardiovascular disease, metabolic syndrome, and malignancies.[5]

The biological cost of the depression of consciousness by trauma or drug induced may be significant. Concussion injury that occurs in sport usually resolves spontaneously, but may result in progressive changes, as the inflammatory effect causes microglial activation.[6,7] At a young age when the brain is developing there are indications that anesthetic drugs may inhibit the developing neurons and cause adverse changes.[8] All ages are susceptible to postoperative delirium and cognitive decline, fortunately this is usually temporary.[9]

The proper management of sedation in the intensive care unit has always been challenging. The latest guidelines from the Society of Critical Care Medicine for Pain, Agitation and Delirium management in the critical care environment has very significantly called for changes from historical care.[10] Good analgesia comes first and this may result in lighter

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sedation being needed. The conversion to the "animated" intensive care unit where patients stay interactive was done where possible and when patients are mobile. The need for deep sedation should be the exception and not the rule as Tom Petty observed.[2] Over many decades deep sedation has been the normal care for patients on mechanical ventilation and this has been associated with multiple morbidities, including cognitive deficits, and mortality.[11]

Efforts have been made over the last 40 years to control depth of sedation, starting with the Ramsay Sedation Scale to the RASS Scale, sedation vacations and spontaneous breathing trials.[12–15] The focus is now not only on survival but also on the quality of survival especially in regard to cognitive function. Emphasis is now placed on trying to prevent delirium and if it occurs to identify it early, as delirium is associated with increased time on mechanical ventilation, time in the ICU, and increased mortality and morbidity, especially cognitive decline.[16]

Perhaps what we are learning from these measures to create the interactive animated ICU is that there is value in the cognitive mind in overcoming life-threatening illness.[17]

Another recommendation from the Society of Critical Care Medicine Guidelines was that brain function monitors should assess patients receiving neuromuscular blocking drugs or who require deep sedation, both situations where sedation scores do not function. If the raw electroencephalograph trace is observed much more information may be obtained than just from a calculated number obtained by using an algorithm. The brain is not a number but a complex organ that deserves much more attention than it has been given up to now in the ICU. The basic patterns of awake, asleep and coma are very easily identified with minimal training.[18] Non-convulsive seizure activity can be diagnosed and treated by observing the presence of epileptic spikes.[19] The EEG trace can also be a useful predictor of outcome after a cardiac arrest.[20] The point in time when the patient is transcending from consciousness into unconsciousness or the reverse may be identified by closely observing the EEG trace.[21] Even the signatures of each sedative agent may be identified from understanding the mode of action and the density spectral array of the EEG.[22]

Finally other monitoring modalities can enhance our care of brain health in the critically ill patient. The brain receives 15–20% of the cardiac output. It extracts 20% of total body oxygen and an interruption of only 10 s can result in loss of consciousness. Irreversible damage can occur after 3–8 min of hypoxia. Therefore cerebral oximetry may be a useful monitor for protecting the brain and improving outcomes.[23]

Conflicts of interest

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