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Invited Editorial

Entropy—The Need of an Ally for Depth of Anesthesia Monitoring in Emergency Surgery

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Anesthetic practice for emergency surgery has continuously developed since its beginnings. The various types of anesthetic techniques and the techniques for ventilation and protection of the airway, induction and maintenance of anesthesia, and patient monitoring are core topics in emergency anesthesia. Despite that, patients monitoring principles in emergency surgery are not yet standardized [1,2]. Apart from monitoring vital signs via customary, essential devices, several additional monitors may influence management decisions in emergency anesthesia [3]. The main concerns remain hemodynamic disturbances and the risk of awareness during emergency situations [3,4]. A challenging event that can frequently occur during emergency surgery is the aggravation of hemodynamic instability caused by an excessive dose of anesthetic agents in a hemodynamically unstable patient. In order to evaluate the depth of anesthesia, multiple monitoring devices have been approved, but none of them is ideal in emergency settings [5]. The customary monitors of depth of anesthesia currently approved in day-to-day practice include those using evoked potentials (auditory, visual, somatosensory) and those deriving information from the electrical activity of the brain (EEG). Among the monitors deriving parameters from spontaneous EEG, the entropy monitor can be used successfully to assess the depth of anesthesia [6–8]. This device is able to measure the irregularity of the processed EEG signals and display it as a numerical value, denoting the level of anesthesia. The basic principle relies on the fact that increased anesthetic depth leads to an increase in EEG signal regularity and to a simultaneous decrease in its entropy. The monitor divides the signal into State Entropy (EEG data in a range of 0.8–32 Hz) and Response Entropy (EEG data in a range of 0.8–47 Hz and frontal EMG signals) [9–11]. State Entropy (SE) and Response Entropy (RE) are indices of anesthetic depth whose values can be between 0 and 91 and 0 and 100, respectively, corresponding to states ranging from complete suppression of cortical neuronal activity to awake-state EEG [12]. Hor et al. conducted a randomized controlled trial in order to assess Sevoflurane uptake in patients undergoing major abdominal surgery and reported a significant reduction in Sevoflurane uptake as determined by an entropy monitor [13]. Another randomized study performed by Wu et al. investigated the consumption of Sevoflurane, as the sole anesthetic administered, and hemodynamic stability in patients undergoing orthopedic surgery. The results obtained were favorable for the entropy study group [14]. Jiahai et al. concluded that entropy monitoring reduced Propofol and Sufentanil dosage for patients undergoing cardiovascular surgery [7]. In a controlled randomized trial, Gruenwald et al. compared entropy guidance versus standard practice during Propofol-Remifentanil anesthesia. As a result, guidance using entropy monitoring resulted in the administration of lower doses of Propofol throughout anesthesia and in a reduced incidence of unwanted events such as hypertension or tachycardia throughout anesthesia [15]. Another main issue in emergency surgery is represented by postoperative delirium or cognitive dysfunction. A recent published meta-analysis demonstrated that the use of intraoperative processed electroencephalogram monitoring is associated with a decreased risk of postoperative delirium in patients undergoing major surgery [16]. In conclusion, optimizing general anesthesia and tailoring anesthetic depth monitoring are fundamental principles for emergency patients' management.

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