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Practical biomarkers for obstructive apnea in potential sudden death in epilepsy (SUDEP) cases

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The MORTality in Epilepsy Monitoring Unit Study (MORTEMUS) identified a consistent sequence of events in epilepsy patients beginning with a generalized tonic clonic seizure and ending in death. Ten (10) cases were used to establish that the end of the seizure was followed within minutes by terminal apnea and ultimately cardiac arrest. The MORTEMUS study used artifacts in EEG recordings as evidence of respiration. A critical finding in our experiments was that attempts to breathe during obstruction generated artifacts in EEG and ECG recordings that resembled artifacts associated with actual breaths. We demonstrate that the electrical artifacts of attempts to inspire during airway obstruction can be used as a practical biomarker of obstructive apnea. We show artifacts related to respiration on ECG and EEG recordings. Artifact size was highly correlated with peak inspiratory pressure. The specific biomarker is the upward trend in artifact size as a marker for increasing effort during airway obstruction. Bradyarrhythmia is present in most SUDEP patients and our animals. Our data show an abrupt change in RR interval variability and that the normal lengthening of the RR interval during inspiration could be reversed during the late occlusion period. This pattern represents a second biomarker for airway obstruction. These biomarkers can be applied to past cases and used to monitor patients to improve outcomes.

Biography

Rena Orman, PhD is a Research Assistant Professor in the Department of Physiology & Pharmacology at the State University of New York Downstate Medical Center in Brooklyn. Her research is focused on neurophysiological and neuroanatomical evidence for regional and long-range circuit properties. Specific attention has been paid to evidence for laterality of circuit activity in subcortical structures such as amygdala and the properties of hippocampal formation circuits for the generation and spread of seizure activity.

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