JOHNS HOPKINS
BIOMEDICAL ENGINEERING

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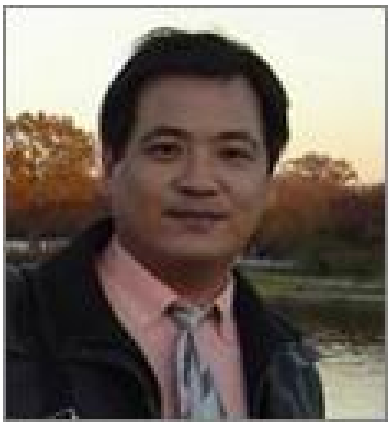

Early Electrophysiological marker predicts functional outcome after cardiac arrest

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Abstract: Cardiac arrest (CA) affects 250,000 to 400,000 people annually and remains the major cause of death in the United States. Among survivors (averaging only 5-8%), neurological complications represent the leading cause of morbidity and disability. Temperature manipulation critically influences neuro-pathological outcomes. Therapeutic hypothermia is recommended by International Liaison Committee on Resuscitation for comatose survivors of CA and significantly mitigates brain injury in animal models and clinical trials. The availability of bedside neurologic exam and neurophysiologic testing has been limited for comatose CA survivors, particularly in patients who are treated with hypothermia. The electroencephalogram (EEG) provides a measure of the continuous neurological activity but current EEG monitoring is impeded by the ability to interpret the complex EEG signals.

We developed a simple and objective electrophysiological marker, the Information Quantity, to determine the degree of brain injury in EEG. The brain's electrophysiological response to graded global ischemic brain injury was evaluated with our validated rodent model after CA using a standardized Neurological Deficit Scale. Our electrophysiological marker tracked functional outcome with therapeutic hypothermia and accurately differentiated EEG recovery between rats treated with hypothermia and normothermia after CA. Subsequent work demonstrated better recovery with immediate hypothermia compared to a delayed one. Our continued work verified the early marker of injury and neurologic recovery after CA has the ability to accurately predict the impact of temperature (hypothermia, hyperthermia, and normothermia) on recovery, including good/bad functional outcomes and mortality, soon after resuscitation when the animal was remain unresponsive.

Novel early electrophysiological marker was developed for monitoring the effect of temperature on the neurological recovery. With clinical translation, these experiments have potential to bring about a major shift in how brain recovery is monitored after CA.

Upcoming seminars:
February 2: Glenn Prestwich, The University of Utah

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