Burst suppression and postoperative delirium

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Video Abstract

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Abstract

Delirium, or a confused or disoriented state that can affect attention, awareness and cognition, is common in elderly patients following surgery -- and is a leading cause of postoperative complications among elderly hospitalized patients. But it's not clear why this happens or which patients are at especially high risk. In particular, certain electroencephalogram (E-E-G) patterns during anesthesia known as burst-suppression have been associated with postoperative delirium. These patterns are characterized by spikes in electrical activity, or bursts, alternating with longer periods of no activity. But whether burst-suppression plays a causal role in delirium isn't known. A study, now published in the journal Anesthesiology by researchers in Boston, finds that in elderly patients undergoing cardiopulmonary bypass, burst-suppression is associated with delirium. The project was a sub-study of the ongoing MINDDS trial, and retrospectively looked at the outcomes of 159 patients over the age of 60. Among the participants, 25% with burst-suppression developed delirium, compared with around 5% of those who did not experience burst-suppression. To get at causality, the researchers assessed a variety of potential predictors, including age, physical status, scores on the abbreviated Montreal Cognitive Assessment, and EEG and bypass measures. The team hypothesized that each of these could directly contribute to delirium directly, and/or mediate indirectly via burst-suppression. Using multivariable logistic regression models, the group found that after backward elimination, only alpha power, lowest temperature during bypass, and physical status were significant predictors of burst-suppression. Meanwhile, only age and burst-suppression were significant predictors of delirium. This leads to an estimated causal model in which increased age directly increases the chance of delirium, while increased EEG alpha power, better physical function and higher lowest bypass temperature negatively and indirectly impact delirium through burst-suppression. Further analysis revealed that patients with low physical function scores had decreased power on their EEGs compared to age-matched patients with high physical function scores. The same was true for patients with delirium relative to those without delirium. The results suggest that burst-suppression may mediate postoperative delirium, and that physical function may be a modifiable risk factor for the condition. Fewer than half of patients with burst-suppression, however, developed delirium, suggesting it should not be used as the sole indicator for high-risk patients. Additional studies may be able to show whether other EEG dynamics, such as burst amplitude, can improve delirium prediction models. Subsequent work can also confirm these findings in a larger group of subjects.