Electroencephalogram dynamics during general anesthesia predict the later incidence and duration of burst-suppression during cardiopulmonary bypass.

OBJECTIVE: Electroencephalogram burst-suppression during general anesthesia is associated with post-operative delirium (POD). Whether burst-suppression causes POD or merely reflects susceptibility to POD is unclear. We hypothesized decreased intraoperative alpha (8-12 Hz) and beta (13-33 Hz) power prior to the occurrence of burst-suppression in susceptible patients.

METHODS: We analyzed intraoperative electroencephalogram data of cardiac surgical patients undergoing cardiopulmonary bypass (CPB). We detected the incidence and duration of CPB burst-suppression with an automated burst-suppression detection algorithm. We analyzed EEG data with multitaper spectral estimation methods. We assessed associations between patient characteristics and burst-suppression using Binomial and Zero-inflated Poisson Regression Models.

RESULTS: We found significantly decreased alpha and beta power (7.8-22.95 Hz) in the CPB burst-suppression cohort. The odds ratio for the association between point estimates for alpha and beta power (7.8-22.95 Hz) and the incidence of burst-suppression was 0.88 (95% CI: 0.79-0.98). The incidence rate ratio for the association between point estimates for power between the alpha and beta range and the duration of burst-suppression was 0.89 (95% CI: 0.84-0.93).

CONCLUSION: Decreased intra-operative power within the alpha and beta range was associated with susceptibility to burst-suppression during CPB.

SIGNIFICANCE: This dynamic may be used to develop principled neurophysiological-based approaches to aid the preemptive identification and targeted care of POD vulnerable patients.