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Cerebrovascular Substrates of Seizures After Cardiopulmonary Bypass

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One of the main interests for the Cerebrovascular Research Center has been to test the hypothesis that blood-brain barrier (BBB) failure is implicated in the etiology of a variety of neurological disorders. A limiting factor has been a lack of a reproducible, inexpensive, noninvasive, and easy-to-perform means to measure BBB integrity in humans. The gold standard for these studies is Gd-enhanced MRI. We have recently shown the equivalence between positive Gd-MRI scans and the BBB serum marker S100 β . This has allowed us to perform several studies investigating the BBB in patients affected by a variety of diseases, including brain metastases, epilepsy, psychosis, and a variety of surgical procedures (eg, cardiopulmonary bypass). Our

recent published experiments show that acute BBB failure can lead to focal motor seizures in patients undergoing intra-arterial chemotherapy and that blockade of inflammatory events occurring prior to seizures can abort their onset. We have also shown that in animal models of seizures, BBB failure is an important and preventable etiologic event that can lead to epilepsy. Brain injury is a major adverse event after cardiac surgery, especially when extracorporeal circuits are used. It is also well established that frequent undetected seizures contribute to poor outcome after such procedures, particularly cardiac surgery with normo- or hypothermic bypass. We collected data from 116 patients who developed EEG or behavioral seizures following cardiopulmonary bypass procedures ranging from CABG to other reconstructive procedures. Statistical analysis revealed that the highest predictor of seizure duration (but not, surprisingly, of the number of seizures) was time on pump and a preoperative history of seizures. Seizure duration and frequency also correlated with postoperative complications and mortality. Our data suggest that intra- or postoperative seizures are a potentially significant prognostic factor in cardiothoracic patients.