

Processed Multiparameter Electroencephalogram-Guided General Anesthesia Management Can Reduce Postoperative Delirium Following Carotid Endarterectomy: A Randomized Clinical Trial

Xu N, Li LX, Wang TL, Jiao LQ, Hua Y, Yao DX, Wu J, Ma YH, Tian T, Sun XL. *Front Neurol.* 2021 Jul 12;12:666814. doi: 10.3389/fneur.2021.666814

Background: Patients undergoing carotid endarterectomy (CEA) for severe carotid stenosis are vulnerable to postoperative delirium, a complication frequently associated with poor outcome. This study investigated the impact of processed electroencephalogram (EEG)-guided anesthesia management on the incidence of postoperative delirium in patients undergoing CEA.

Methods: This single-center, prospective, randomized clinical trial on 255 patients receiving CEA under general anesthesia compared the outcomes of patient state index (PSI) monitoring [SEDLite Brain Function Monitor (Masimo, Inc, Irvine, CA)] (standard group, n = 128) with PSI combined with density spectral array(DSA) -guided monitoring (intervention group, n = 127) to reduce the risk of intraoperative EEG burst suppression. All patients were monitored by continuous transcranial Doppler ultrasound (TCD) and near-infrared spectroscopy (NIRS) to avoid perioperative cerebral hypoperfusion or hyperperfusion. According to the surgical process, EEG suppression time was calculated separately for three stages: S1 (from anesthesia induction to carotid artery clamping), S2 (from clamping to declamping), and S3 (from declamping to the end of surgery). The primary outcome was incidence of postoperative delirium according to the Confusion Assessment Method algorithm during the first 3 days post-surgery, and secondary outcomes were other neurologic complications and length of hospital stay.

Results: There were no episodes of cerebral hypoperfusion or hyperperfusion according to TCD and NIRS monitoring in either group during surgery. The incidence of postoperative delirium within 3 days post-surgery was significantly lower in the intervention group than the standard group (7.87 vs. 28.91%, $P < 0.01$). In the intervention group, the total EEG suppression time and the EEG suppression time during S2 and S3 were shorter (Total, 0 "0" vs. 0 "1.17" min, $P = 0.04$; S2, 0 "0" vs. 0 "0.1" min, $P < 0.01$; S3, 0 "0" vs. 0 "0" min, $P = 0.02$). There were no group differences in incidence of neurologic complications and length of postoperative hospital stay.

Conclusion: Processed electroencephalogram-guided general anesthesia management, consisting of PSI combined with DSA monitoring, can significantly reduce the risk of postoperative delirium in patients undergoing CEA. Patients, especially those exhibiting hemodynamic fluctuations or receiving surgical procedures that disrupt cerebral perfusion, may benefit from the monitoring of multiple EEG parameters during surgery. Clinical Trial Registration: www.ClinicalTrials.gov, identifier: NCT03622515.