Enhancing the localizing value of ictal scalp EEG by applying the new BSS-CCA method to remove muscle artifacts.

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Purpose: The influence on the localizing value of ictal EEGs of muscle artifact suppression by blind source separation-canonical correlation analysis (BSS-CCA) was investigated.

Methods: All patients with refractory partial epilepsy having a reliably defined epileptogenic zone based on multi-modal studies were selected. One ictal EEG of all 37 patients was presented to a clinical neurophysiologist (AP) who was blind to all other clinical and localizing data. The ictal EEG was rated twice: first after applying a tunable band pass filter, then after eliminating the muscle artifacts using BSS-CCA in combination with a band-pass filter (0.3-35Hz). Assigned localizations and lateralizations were compared between the two readings and with the other localizing data.

Results: In 2 out of 37 ictal EEGs no seizure could be identified. In one case a seizure could only be determined and correctly localized after applying BSS-CCA+ filter. Of the remaining 34 EEGs 21 (62%) were lateralized correctly after band-pass filtering, 26 (76%) after applying BSS-CCA+ filter. Correct localization increased from 23 (67%) using band-pass filters to 29 (85%) using BSS-CCA+ filter. Improvements in lateralization and localization were both reached for temporal (2 out of 25 cases, resp. 3 out of 25 cases) and extratemporal cases (3 out of 9 cases, resp. 4 out of 9 cases).

Conclusions: The new BSS-CCA algorithm to eliminate muscle artifacts from scalp EEGs enhances the localizing value of ictal EEGs from 62% correct lateralizations to 76% and from 67% correct localizations to 85% compared to band-pass filtering.

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