

FUNCTIONAL NEUROCOGNITIVE DEFICITS AND CORTICAL EVOKED POTENTIALS IN PEDIATRIC PATIENTS WITH PROLONGED POST CONCUSSIVE SYMPTOMS**Mo Mortazavi, MD¹, David Oakley PhD⁴, Jon Minor MD¹, Prem Kumar Thirunagari², Nassar Kouchehi³, Nitin Prabhaker, MD⁵**¹SPARCC Sports Medicine, AZ, USA, ²University of Arizona, AZ, USA, ³Midwestern University, AZ, USA ⁴Wavi CO, USA ⁵Stanford Medical Center, CA, USA

Background: Prolonged neurophysiological impairments have been demonstrated after brain injury utilizing tools such as auditory evoked response potentials. The objectivity and sensitivity of such tools can provide clinicians a unique perspective on patients with prolonged post concussive symptoms (PPCS), and help determine optimal management strategies. Limited research currently exists on evoked potentials and pediatric PPCS.

Purpose: Illustrate the clinical utility of abnormal evoked potentials in adolescents with PPCS.

Methods and Study Design:

The study is a retrospective cross-sectional analysis of pediatric PPCS cases from 7/2018 to 7/2019 at a private concussion clinic in Tucson AZ. Patients were included if they had prolonged symptoms beyond 30 days from date of injury date, were 13-16 years old, and diagnosed with PPCS based on SCAT5 assessment and clinical evaluation. All patients with PPCS had moderate to severe clinical symptoms with limited academic and exertional tolerance. Patients were excluded if they had a history of learning disorders, seizure disorder, or complex concussions with a skull fracture or intracranial hemorrhage. Patients were tested using the standard oddball audio P300 EEG protocol. Measures extracted included P300 latency, P300 amplitude, and coherence frequency on mapping. The PPCS cohort (n=71) was then compared to age-matched references (n=73) obtained during baseline testing of non-injured athletes using the same protocol (and hardware) from a multitude of sites.

Results:

There was a significant correlation between PPCS and reduced P300 amplitude along with an increased coherence. The PPCS group had an average P300 amplitude of 13.7uV compared to 16.9uV in the reference group ($p < 0.001$, CohD=.51). Increased coherence (in the alpha frequency) was observed where the average PPCS patient had 9.1 connected pairs (scalp sites) with coherences that were $> 2\sigma$, compared to the expected 3.1 connections in reference group $> 2\sigma$ ($p < 0.001$, CohD=.86). There was no significant difference in P300 latency between the groups.

Conclusions:

Pediatric patients with PPCS showed decreased P300 amplitude and increased coherence on average compared to the reference group. Reduced voltages and/or increased coherence likely represent ongoing primary brain dysfunction, adaptability, and recovery. These findings suggest the need for ongoing care, and should guide a conservative care approach towards return to high-risk activities.

Evoked potentials may be a critical tool to help identify primary neurologic dysfunction in PPCS and help guide management strategies. This tool may also aide in differentiating ongoing neurophysiologic recovery from commonly reported secondary psychosocial symptoms after PPCS.

FIGURE:

