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Mini Review

How Useful is the Electroencephalogram (EEG) as a Tool for Signaling Cognitive Decline in Parkinson's Disease?

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Short communication

Parkinson's disease (PD) is a common neurological disease. Due to its chronic and progressive character, it is marked by a slow depletion in dopaminergic transmission in the basal ganglia. Since its original description, new findings have hatched; making it, by many specialists, as a systemic disease that starts with hyposmia, changes in the REM sleep phase and intestinal constipation, years before the motor manifestations [1]. Diagnosis is not easy, it can be confused with other parkinsonian syndromes or even neurological diseases [2]. Obviously, performing an electroencephalogram in patients with Parkinson's Disease does not confirm the disease; being even little used in the clinical practice of these patients. However, reading and interpreting EEG findings in patients with PD, in association with dementia syndrome and/or bradphrenia, may be useful without further research [3-4]. Quantitative EEG measures reflecting EEG slowing, particularly decreased dominant frequency and increased θ power, correlate with cognitive impairment and predict future cognitive deterioration [5]. It can provide biomarkers for disease severity and progression, potentially promoting early diagnosis of non-motor symptoms and objective monitoring of progression. If associated with tests to assess cognitive function, such as the Montreal Assement Test (MOCA), studies can associate the findings obtained on the EEG with cognitive depletion in Parkinson's Disease. Global EEG slowing is a marker for overall cognitive impairment in PD and correlates with impairment in the domains attention, executive function, verbal fluency, and episodic long-term memory, but not with working memory and visuospatial functions [6]. Preliminary works shows that QEEG measures correlate with current PD cognitive state [7]. A research group composed by Klassen BT et al, evaluated quantitative EEG (QEEG) measures as predictive biomarkers for the development of dementia in Parkinson disease (PD). The study model performed was a cohort of patients with PD in the brain donation program used annually for research purposes involving cognition. These patients were also related to biennial evaluations aiming to characterize possible decreases in cognitive function. EEG from subjects with PD without dementia with follow-up cognitive evaluation was analyzed for EEG quantittive measures of background rhythm frequency and relative power in δ, α, and β

bands. The relationship between the time to onset of dementia and EEG quantitative and other possible predictors was assessed by using Cox regression. The results showed that the risk of dementia development was 13 times higher for those with low background rhythm frequency (lower than the grand median of 8.5 Hz) than for those with high background rhythm frequency ($p < 0.001$). The authors concluded that measures of background rhythm frequency and relative power in the band are potential predictive biomarkers for dementia incidence in PD. These QEEG biomarkers may be useful in complementing neuropsychological testing for studying PD-D incidence [8].

This scientific communication is important for health professionals, as it guides them with regard to the slowing and decreasing of cognitive function in patients with Parkinson's Disease. We reinforce the use of neuropsychological tests and cognitive screening in this study proposal, as well as the engagement with services that deal with neurocognitive testing. The MOCA test can be a useful tool if used in association with quantitative EEG measures [9-10]. Although many neurologists consider the EEG to be an assessment tool aimed almost specifically at seizures, being well understood and interpreted, it presents findings of great utility in the field of neuroscience.

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Conflict of Interest

No conflict of interest.

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