Cognitive dysfunction's relationship with pseudobulbar affect in multiple sclerosis patients

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Introduction and Purpose

Multiple Sclerosis (MS) is a neurodegenerative disease of the central nervous system (CNS) and the optic nerves that causes demyelination. This can cause damage to the myelin covering the neurons in the spinal cord, brain and optic nerves. A manifestation of this damage can be seen through cognitive impairment.

Cognitive changes are common in individuals with MS. Approximately 40-60% of people with MS will experience some problems with cognitive function. Most commonly it involves information processing speed and memory.

Pseudobulbar affect (PBA) is a neuropsychiatric condition in which an individual's affect does not reflect their mood, and is characterized by periods of involuntary laughing or crying that may occur without any particular stimulus. In the MS population, PBA has been reported in approximately 10% of individuals.

The purpose of this study was to examine the frequency at which MS individuals with clinically proven cognitive dysfunction (CD) have PBA.

Methods

Subjects
Of the thirty two MS patients recruited, 24 had Cognitive dysfunction as measured by computerized cognitive testing using NeuroTrax Mindstream (NTM) and were therefore included in the study. Of those 24 with CD, 11 of them also had PBA. All participants were selected for this study during clinic visits. Written informed consent was signed by participants prior to any assessments.

Protocol for acquisition
MS subjects with self-reported CD underwent computerized cognitive testing NTM to verify if they could be diagnosed accurately as having CD. NTM is an advanced computerized cognitive testing system to evaluate cognitive health of patients. The test requires little orientation and is patient-friendly and the computer does all of the testing and records all the data.
Depending on the test selected, the test time ranges from 12 - 60 minutes from start to finish.

The system can measure cognitive changes for mild, moderate and severe levels of impairment. The tests for mild impairment, which was used in this study, include; memory, executive function, attention, visual spatial perception, verbal function, informs processing motor skills and motor skills. The patient's performance is precisely measured by a series of interactive tests and their cognitive accuracy and response are recorded reaction times in milliseconds. Each outcome parameter is normalized to fit a standardized scale with a mean of 100 and standard deviation of 15. This is then compared to a patient's normative peer group based on age and education.

All subjects completed a questionnaire regarding PBA (Center for Neurologic Study-Lability Scale). This is a seven-item, self-administered questionnaire that provides a quantitative measure of the perceived frequency of PBA episodes during the past week. The score ranges from 7-35 with a score of 13 or higher suggesting PBA. The CNS-LS has been validated in ALS and MS patient populations.

Data Analysis
All statistical procedures were performed using SPSS for windows version 20.0 (SPSS Inc., Chicago, IL).
Descriptive statistics (means ± standard errors) were used to analyze the clinical characteristics of subjects (Table 1). A Pearson product moment correlation coefficient was calculated to establish the correlation between PBA and each of the seven cognitive domains. The level of significance was set at p ≤0.05. Further, the group was divided into a no-PBA group and a PBA group, and a Pearson product moment correlation was done to establish if there was a relationship between the two groups and CD.

Table 1.

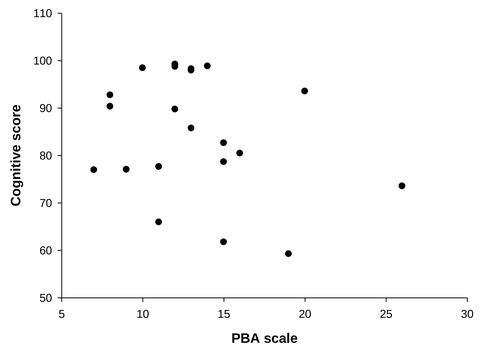
	CD (*n* =24)	PBA (*n* =11)	No PBA (*n* =13)
Age (yrs)	47 ± 2	45 ± 3	48 ± 4
MS duartion (yrs)	8 ± 2	6 ± 2	9 ± 3
PBA score	13.0 ± 0.8	16.3 ± 1.2	10.2 ± 0.5
Global CD score	82.5 ± 3.1	82.7 ± 4.2	82.4 ± 4.8
Memory	77.3 ± 5.0	73.2 ± 8.2	81.0 ± 6.0
Exec Function	81.6 ± 3.7	83.1 ± 5.3	80.5 ± 5.3
Attention	79.4 ± 5.2	81.1 ± 7.5	78.1 ± 7.4
Info Speed	81.0 ± 4.0	82.5 ± 5.5	79.6 ± 5.8
Motor Skills	79.0 ± 4.6	77.4 ± 8.3	80.2 ± 5.3
Anxiety	44.0 ± 1.8	44.9 ± 2.9	43.2 ± 2.3

CD; cognitive dysfunction, PBA; pseudobulbar affect,
MS; multiple sclerosis, Exec Function; executive function,
Info Speed; information processing speed.
Mean ± SE (standard error)

Results

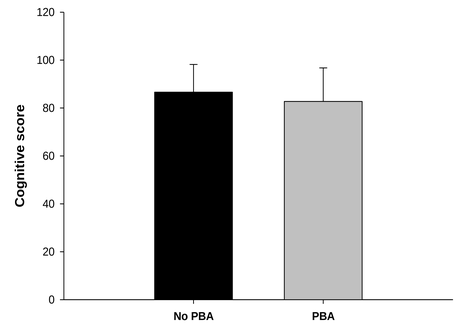
Of a total of 32 participants, 24 (75%) had CD as measured by NTM of which 11 (46%) had PBA. No correlation of significance was found for Global cognitive score and the group with PBA (p > 0.05) (Figure 1). Although, of no statistical significance (p > 0.05), patients with PBA scored lower than average on memory and motor skills. Scores on executive function, attention and information processing speed were better in the PBA group than the No PBA group. Also, no significance was seen with CD score (p > 0.05) between the two groups (Figure 2).

Figure 1



p > 0.05

Figure 2



p > 0.05

Conclusions

We documented a high incidence of PBA in MS individuals with demonstrable CD (46%), at a rate that far exceeds the reports of PBA in the overall MS population (10%).
CD in PBA individuals was not driven by any specific cognitive domain and followed a similar pattern of MS individuals with cognitive dysfunction that do not have PBA.
PBA does not modify the characteristics of cognitive dysfunction in MS individuals.
Studies to evaluate these relationships at a greater depth are warranted and might reveal common pathophysiologic mechanisms.

Disclosure

Disclosure: Dr. Husain, Dr. C. Fjeldstad, Dr. Rosencutter, MS. Lakin, Dr. A.S. Fjeldstad and Dr. Pardo, have no conflicts of interest to report.

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