EVALUATION OF POSTURAL STABILITY IN MULTIPLE SCLEROSIS PATIENTS USING COMPUTERIZED DYNAMIC POSTUROGRAPHY

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INTRODUCTION

Multiple sclerosis (MS) is a chronic immune mediated disease of the central nervous system characterized by damage to the myelin sheath covering nerve cells, axonal degeneration and inflammation, this leads to a slowing of neural transmission and results in a wide range of impairments affecting sensory, motor, and cognitive functions.

The severity of these impairments is often assessed using the Expanded Disability Status Scale (EDSS), which provides an overall measure of clinical disability and specific scores for different functional systems.

Balance deficits are often observed as an early sign of MS, which has significant clinical implications due to the associated loss of mobility and increased risk of falls.

Computerized Dynamic Posturography (CDP) is a useful tool that can provide objective measurements and detect even minimal balance abnormalities in MS patients; as it allows the assessment of both static and dynamic aspects of balance.

AIM OF THE WORK

The aim of the study was to assess postural stability in people with MS compared to healthy controls using Computerized Dynamic Posturography.

SUBJECTS AND METHODS

The study included 40 subjects, 20 MS patients, 15 females and 5 males, aging from 23 to 46 years without any musculoskeletal anomalies or history of previous visual or otological disease. In addition to 20 healthy controls,10 females and 10 males, aging from 21 to 53 years without a history of neurological disease.

Complete Sensory Organization Test (SOT) was carried out on **Synapsys Posturography System (SPS, SYNAPSYS, Marseille, France).**

SOT Scores were obtained as participants were asked to stand still on the Platform while being exposed to six different conditions, Static Eyes Open (EO), Static Eyes Closed (EC), Static Servocontrolled, Foam Eyes Open, Foam Eyes Closed, and Foam Servocontrolled, respectively. Each condition was done for two successive trials (20 secs each).

SOT scores were calculated reflecting patients' ability to use somatosensory, visual and vestibular afferences to keep static balance. Additionally, Romberg Quotient and Statokinesigram (SKG) area were calculated which indicate patients' center of pressure displacement during trials and patients' visual dependance, respectively.

RESULTS

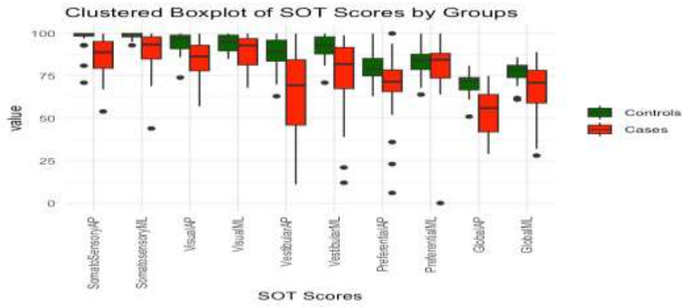

Figure: Comparison between mean SOT scores in MS Cases and healthy Controls
a: Independent samples t- test b: Mann-Whitney U *:Statistically significant

Table 1: Comparison Between SKG Surface Area in Cases and controls

Variables (mm^2)	Cases (N=20)	Controls (N=20)	Test of Significance	P
Static				
EO SKG **Min. – Max.** **Median (Q1- Q3)**	71.2 – 1598.4 374.1(223.9–652.2)	120.8 – 21002.6 269.1(193.1-462.5)	168.5	0.394
EC SKG **Min. – Max.** **Median (Q1- Q3)**	143.6 – 5223.6 659.3(425.8 – 1875.4)	101.4 – 21657.7 239.4(193.9-343.3)	89.5	0.003*
Servo Control SKG **Min. – Max.** **Median (Q1- Q3)**	119.9 – 5323.9 544.8(238.6 – 739.1)	105.9 – 12116.8 217.7(160.6 – 367.6)	117.5	0.026*
Foam				
EO SKG **Min. – Max.** **Median (Q1- Q3)**	199.9 – 5435.9 848.7(557.9 – 2017.9)	187.5 – 2054.0 485.1(380.2 – 588.9)	115.0	0.021*
EC SKG **Min. – Max.** **Median (Q1- Q3)**	408.52 – 8255.6 1618.1(818.9- 3537.2)	242.3 – 4311.9 720.5(429.3 – 991.4)	88.5	0.004*
Servo Control SKG **Min. – Max.** **Median (Q1- Q3)**	259.6 – 9799.5 1034.7(525.9 –1736.4)	232.3 – 2069.5 423.9(357.8–675.64)	110.0	0.015*

Table 2: Comparison between Romberg Quotient in Cases and Controls

Variables	Cases (N=20)	Controls (N=20)	Test of Significance	P
Romberg quotient **Min. – Max.** **Median (Q1- Q3)**	57 – 713 211.5	20 – 298 102.5	59.5	<0.001*

Mann-Whitney U *: Statistically significant

CONCLUSION

- All SOT scores were lower in MS patients compared to healthy controls. However, the differences in Visual and Preferential scores in the mediolateral planes were not significant. This decrease in sensory scores could be attributed to the deficient integration of the neural pathways; caused by widespread demyelination, axonal damage and inflammatory process in patients with Multiple Sclerosis.
- Romberg Quotient was significantly higher in patients with Multiple Sclerosis revealing an increased visual dependance that is meant to compensate for the deficit in other postural balance mechanisms.
- SKG surface area was significantly larger in Multiple Sclerosis patients compared to healthy controls, except for Static Eyes Open condition, indicating abnormally increased postural sway and ineffective balance control in MS patients, especially when exposed to highly challenging sensory conditions.