Effects of whole-body vibration on postural control in Parkinson’s disease

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Objective: To evaluate the effects of whole-body vibration on postural control in patients with Parkinson’s disease.

Background: Apart from tremor, rigidity and bradykinesia the postural instability (PI) is regarded as one of the cardinal symptoms in Parkinson’s disease (PD). With respect to the progression of PD some authors speculate about a worse overall prognosis for subjects with a marked postural disturbance. Moreover PI is connected with a higher risk of falling and the risk of traumatic injuries or death respectively. An essential problem consists in the fact that PI can not be treated effectively by medication (Jankovic 2002, Maurer et al. 2003). In contrast it is speculated that chronic L-DOPA treatment leads even to worsen of PI and proprioception.

Methods: 40 PD patients participated in this study. They were divided in different groups depending on their HOEHN & YAHR stage and their postural disturbance. All subjects were withdrawn over night from L-DOPA to exclude the influence of the medication. Apart from motor examination done by the UPDRS motor score several biomechanical analyses were performed in order to get quantitative data. One test is based on standing on an instable platform lasting 30 seconds each series. Another test consisted of generating an abrupt and standardized ballistic anterior shift of the platform. 3 series were performed of both tests each pre and post the treatment. Platform shifts were analysed by the use of a two dimensional acceleration sensor. EMG analyses of various muscles were registered additionally. The treatment consisted of applying 5 series of whole-body-vibration (ŷ: 3 mm, f: 6 Hz) lasting 60 seconds each.

Results: The analyzed patients show spontaneous improvements in balance depending on their postural disturbance and the test procedure. The increase in postural control became evident in a less sway. The electromyographic analyses showed reduced muscular activation in the post test which seems to be connected with a quicker correction of platform shifts. This hypothesis is confirmed by the results of spectral analysis that identified a shift of the predominant peak in some patients. However, the results are characterized by a high inter individual variety. Some patients show hardly any effect others improved up to 40%.
**Discussion:** Since vibration becomes effective on various physiological levels generally different functions can be responsible for these balance improvements in PD patients. Based on the results of animal experiments one hypothesis deals with changes of neurotransmitter concentrations. Another explanation refers to the stochastic character of the generated vibration which requires a successive adaptation of the neuromuscular control by selecting relevant from irrelevant information quickly. It can be speculated that this process influences the pathologically changed information selection in PD.

**Conclusion:** Mechanical stimuli can be regarded as an additional device in PD therapy. However, earlier studies showed that improvements in motor control depend on the character of the vibration (e.g. frequency) strongly.

**References:**