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BALNEOTHERAPY IN PATIENTS WITH PARKINSON'S DISEASE

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A b s t r a c t

The study was aimed at elucidation of the reaction of basic haemodynamic parameters to water immersion of the lower part of the body in patients with Parkinson's disease (PD).

A group of 9 rehabilitating PD patients: age (mean±SD) 71±7 years, disease duration 7±3 years, Hoehn & Yahr score 2.2±0.7 were examined. All of them had absolved a 12-week group form of rehabilitation (frequency once a week, duration 60 minutes).

Systolic (SBP) and diastolic (DBP) blood pressure and heart rate (HR) were measured and the product HR x SBP (RPP) was calculated. Measurement was realised after 2 minutes of standing, immediately after water immersion (water temperature 32.5 °C), after two minutes of restful standing, and at the peak of work load.

The water immersion in PD patients led to a statistically significant decrease of HR and DBP during the whole exercise unit.

K e y w o r d s

Parkinson's disease, Rehabilitation, Cardiovascular system

INTRODUCTION

Rigidity, postural instability, bradykinesia, and tremor are well-known basic symptoms of Parkinson's disease (PD). Higher incidence of cardiovascular diseases belongs to other characteristics that are, together with respiratory complications, the most common cause of death in PD (*1, 2*).

A positive effect of exercise therapy was reported repeatedly (*3–6*). Aerobic exercise therapy in a swimming pool with warm water is also recommended. However, there is no evidence on the reaction of cardiovascular parameters to water

immersion in PD patients in scientific literature sources. We have already shown the reaction of cardiovascular parameters in patients with cardiovascular disease in our previous study (*7*).

PURPOSE

Elucidation of the reaction of cardiovascular parameters to water immersion of the lower parts of the body and the thorax in patients with PD was the aim of the present study.

METHODS

Nine patients with the diagnosis of PD were examined at the Dept. of Neurology, St. Anne's Faculty Hospital in Brno, Czech Republic. Stable medication without changes during the last month, a Hoehn and Yahr score < 3 and suitability for exercise therapy in the swimming pool were assessed as the entrance criteria of this study.

The basic statistic parameters of the group of PD patients tested are presented as mean values ± standard deviations (SD): age 71±7 years, duration of disease 7±3 years, Hoehn and Yahr score 2.2±0.7.

Exercise therapy in the swimming pool was realised with a frequency of once a week for a period of 12 weeks. Each exercise therapy unit lasted 60 minutes. It consisted of 10 minutes of outdoor warm-up phase and 30 minutes of aerobic exercise in the swimming pool aimed at balance improvement, rigidity and hypokinesia management, muscular imbalances and other gross and fine motor skills improvement. This phase was followed by 15 minutes of relaxation in supine position in a dry wrap.

Systolic (SBP) and diastolic (DBP) blood pressure and heart rate (HR) were measured. A mercury manometer was used for the measurement of blood pressure, a Polar tester for the measurement of heart rate; rate x pressure product (RPP) was calculated. The first measurement was performed 7 minutes after taking a shower (5 minutes of rest in sitting position followed by 2 minutes of still standing), the second measurement was performed immediately after water immersion (32.5 °C) up to the level of the heart, the third measurement after 2 minutes of water immersion, and the last measurement at the peak of work load during the exercise therapy in the swimming pool. Subjective perception of work load intensity was evaluated according to the Borg's Rate of Perceived Exertion (*8*).

All the data were examined in the phase of clinical improvement of patients ("on" state) without changes of regular antiparkinsonian medication.

The Kolmogorov-Smirnov test was used for normality verification, the Pair T-test for dependent samples to reveal changes caused by immersion into warm water (StatSoft, Inc., version 7).

The study was approved by the Ethical Committee of the Faculty of Medicine, Masaryk University, and all participating patients signed their written consent.

RESULTS

In comparison with the values of the initial examination (standing out of water) there was a significant decrease of heart rate and diastolic blood pressure values in the second examination performed immediately after water immersion. Systolic blood pressure did not increase significantly. The rate x pressure product did not change significantly (*Table 1*).

Table 1
Comparison of examination results before and immediately after water immersion

SBP		DBP		HR		RPP	
1st measurement	**2nd measurement**	**1st measurement**	**2nd measurement**	**1st measurement**	**2nd measurement**	**1st measurement**	**2nd measurement**
122±13	120±9	83±9	76±7	78±8	72±9	96±13	87±11
N.S.		*p≤0.05		*p≤0.05		N.S.	

Annotation: 1st measurement before water immersion
2nd measurement immediately after water immersion

The same trend was also present after 2 minutes of still standing in the swimming pool. In comparison with the initial values (standing out of water) there was a highly significant decrease of values of heart rate, diastolic blood pressure and the rate x pressure product in the third examination performed after 2 minutes of still standing in the swimming pool (*Table 2*).

Table 2
Comparison of examination results before water immersion and after 2 minutes of still standing in the swimming pool

SBP		DBP		HR		RPP	
1st measurement	**3rd measurement**	**1st measurement**	**3rd measurement**	**1st measurement**	**3rd measurement**	**1st measurement**	**3rd measurement**
122±13	119±7	83±9	73±8	78±8	67±7	96±13	80±12
N.S.		**p≤0.01		*p≤0.05		**p≤0.01	

Annotation: 1st measurement before water immersion
3rd measurement after 2 minutes of still standing in water

At the peak of the exercise therapy work load there was a significant increase of systolic blood pressure and of the rate x pressure product in comparison with the values of examination 3 performed after 2 minutes of still standing in the swimming

pool (*Table 3*). The values of diastolic blood pressure, heart rate, and the rate x pressure product approximated to the values of the initial examination in standing out of water (*Table 4*).

Table 3
Comparison of examination results after 2 minutes of water immersion and at the peak of the exercise therapy work load

SBP		DBP		HR		RPP	
3rd measurement	**4th measurement**	**3rd measurement**	**4th measurement**	**3rd measurement**	**4th measurement**	**3rd measurement**	**4th measurement**
119±7	129±7	73±8	80±7	67±7	75±12	80±12	97±18
*p≤0.05		N.S.		N.S.		*p≤0.05	

Annotation: 3rd measurement after 2 minutes of still standing in water
4th measurement at the peak of the exercise therapy work load

Table 4
Comparison of examination results before water immersion and at the peak of exercise therapy work load

SBP		DBP		HR		RPP	
1st measurement	**4th measurement**	**1st measurement**	**4th measurement**	**1st measurement**	**4th measurement**	**1st measurement**	**4th measurement**
122±13	129±7	83±9	80±7	78±8	75±12	96±13	97±18
N.S.		N.S.		N.S.		N.S.	

Annotation: 1st measurement before water immersion
4th measurement at the peak of the exercise therapy work load

The exercise therapy work load was evaluated with the use of the Borg's Rate of Perceived Exertion. The rating fluctuated between 11 and 14 from the maximum of 20 in all examined patients.

DISCUSSION

There is no agreement in opinions on the impact of water immersion on blood pressure. We found scientific sources describing a decrease of systolic and diastolic blood pressure in a thermoneutral bath of 34–35 °C (*8*) and a hypothermal bath of 32 °C (*9*) as well as sources stating a mild increase of systolic blood pressure and no changes of diastolic blood pressure in a thermoneutral (34.5 °C) bath and a decrease of diastolic blood pressure in a hypothermal bath of 30 °C (*10*). Some

studies found no changes of blood pressure during the stay in a thermoneutral bath (*11, 12*).

In our group of examined PD patients we found a statistically significant decrease of diastolic blood pressure in a thermoneutral bath of 32.5 °C. Systolic blood pressure increased only in the course of the exercise unit.

Water immersion in PD patients leads to a decrease of the resting heart rate known as diving reflex. The intensity of the sympathetic activity decrease and the vagal activity increase depends mainly on the depth and speed of immersion and on water temperature (*11*, *12*). Intensive reaction may cause extreme bradycardia and sudden death (13). The activity of the renin-angiotensin system also decreases (*14, 9*). In our group of PD patients the decrease of heart rate was present immediately after water immersion and lasted during the course of the exercise therapy unit. Similar results were described by *Fardy et al*. (*15*) in a study with healthy subjects.

No other clinically relevant negative aspects of PD exercise therapy in the swimming pool were found during the course of 12 weeks of exercise therapy.

A regular controlled group or individual rehabilitation is recommended to the majority of PD patients (*5*). Elderly patients can benefit from rehabilitation as well as younger subjects (*6*).

CONCLUSION

Thermoneutral (32.5 °C) water immersion up to the level of the heart caused a statistically significant decrease of heart rate and diastolic blood pressure in patients with Parkinson's disease. This trend lasted for the period of the exercise therapy unit in water. An increase of systolic blood pressure and heart rate was detected only at the peak of the exercise therapy work load in water when the values approximated those of the initial examination before water immersion. We have not observed any subjective inconveniences or any clinical manifestations of possible pathological changes during exercise therapy in our study.

We consider the group form of controlled hydrokinesitherapy as a suitable and safe supplement to the classic exercise therapy unit within the frame of neurorehabilitation.

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