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Postural Control and Social Well-being of Elderly Women

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Abstract

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To do this, in the course of phylogeny developed a very complex, but at the same time, an effective system of automatic fine regulation of body position - postural control system.
At the present time there is a problem quite early start weakening postural balance. Diagnosis of the level of postural stability in older people will determine what is the cause of malfunction of the postural control system, and, consequently, increasing the risk of falls.
Age-related changes in the function of equilibrium are characterized by increasing of projected area of the center of pressure and the velocity of the transference of center of pressure. The changes in peripheral blood flow have the influence on the maintenance of equilibrium affects mainly the frontal plane. Changes in the regulation of vascular tone in a part of the peripheral blood flow affect the performance of dynamic equilibrium and, as result, reduction of the integral index of balance function.

Keywords: First coordination, balance, aging, cerebral blood flow.

1. Introduction

The most important condition for the interaction of humans and the environment is the ability to maintain balance in the upright position. To do this, a very complicated but at the same time an effective system of fine position control of the body developed in the process of phylogeny- the system of postural control (aimed at preserving the balance by any way).

Postural control involves two components, is postural stability and postural orientation. Postural stability means the ability to maintain an upright posture, which is associated with the ability to maintain the body center of pressure within the boundaries of the area of support. Postural orientation

is defined as the relationship between the individual structures of the body, between the body and the surrounding space.

In addition, system performance depends on postural control, firstly, the state of musculoskeletal system, and secondly, on the condition of the nervous system. The stability of the vertical posture is largely determined by the level of expression of the degree of freedom of movement in the joints, stiffness and stability of the spine, as well as its elasticity and flexibility.

Postural Stability Control and balance of a person have a high degree of reliability and durability, but periods of life for different ages have been characterized by certain features of the functioning of this system. Thus, it is assumed that the normal postural balance is not experiencing significant changes for healthy people aged from 17 to 54 years, and children under 10 years of age and people in age-group over 60 have problems with stability (Era et al., 2006, & Borah et al., 2007).

Aging is accompanied by decreasing in the sensitivity of sensor systems and functions of the musculoskeletal system, causing some loss of coordination among people in middle and old age group. The development of postural instability and the consequent fall for people about 65 and older represent a serious challenge for health and social workers in many countries. For example, in the US it has been estimated that among all the medical expenses for people about 65 and older 6% from the consequences of falls, and 13% of all deaths in this age group are the consequence of falls (Onambele et al., 2006).

Usually, the problem of falling characteristic for the elderly people aged 65 and older, and even only one drop in this age group may indicate some decrease in the function of postural stability and increase the risk of further falls (Dotsenko, 2007 & Levin, 2006).

It is generally accepted that women about 65 and older are more likely to experience a fall than men of the same age, however, it proved that men are more likely than women to experience a fatal fall (Lebedev, & Degtyareva, 2010).

Nowadays, there is a problem early enough to start weakening postural balance. Actually, there is already some weakening function of postural stability as early as for 40 years group of age and then the deterioration is accelerated for people older than 60 years. Also, the results of the research show that age-related changes of postural balance and postural stability function occur independently from the processes associated with the pace of aging (Demin, & Frost, 2014).

According to the World Health Organization of 2008, the fall - it is an unintended shift in the position of rest on the ground, floor or other lower level, except for purposeful change in body position for relaxation on the furniture or other objects.

The International Classification of Diseases fall takes 19 points, which is a lot, 11 of them - a fall from his own height. No wonder the drop is classified as external causes of morbidity and mortality. According to the same report, the World Health oorganizatsii 30 - 50% of people older than 65 years fall at least once a year. 10 - 15% of these falls end with severe injuries, 5% result in hip fractures. However, these 10 - 15% are responsible for 5.3% of all hospital admissions and 90% of hip fractures (Demin, 2011).

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The World Health Organization identifies risk factors of the environment, which is definitely important for our country. This ill-conceived layout of the house and yard, slippery stairs, railings crumbling, ice, slippery, wet floor, poor lighting.

Social risk factors. The low level of income, social isolation of older people, lack of access to health care and prevention, unadjusted residence (not equipped apartments in a special way).

Biological factors. This is the age, gender. The older the patient, the more often they fall. Women fall more than men. But men are more likely to die from these falls. There are a number of diseases that at any age, of course, increases the risk of falls, which we as doctors need to be ruled out.

An important behavioral risk factors. Fall, for whatever reason, they caused themselves can lead to severe maladjustment of patients in everyday life. Approximately 1 out of 10 cases they are accompanied by severe injuries, including broken bones. The risk of fractures due to falls is particularly significant in patients who have mobility impairments (paresis, ataxia) after stroke (Demin, 2011).

An addition, the important role played by the displacement of the center of balance in the age-related changes in posture. Wearing individually calculated weights in special backpacks will not only straighten your posture, thereby get rid of back pain and improve gait and balance, but, in the end, just radically change the way of life of older women (Demin, 2011).

Usually the problem of falling characteristic for the elderly people aged 65 and older, and even one drop of this age may indicate a decrease in the function of postural stability and increase the risk of further falls (Tinetti et al., 2008).

Many researches are devoted to the study of the level of postural stability, depending on the calendar age (Lord et al., 2007), however, there are very few known publications addressed to the state of postural balance depending on indicators of biological age of a human. But it should be noted, any chronological age is not always a true reflection of the degree of age-related changes of physiological functions, i.e. biological age.

The full functioning of the postural control system is an important factor of an active lifestyle and social independence for an elderly (Belaya & Rozhen, 2009). The age-related changes in postural stability are becoming increasingly not only medical but also social. The easing function of postural stability are a major cause of falls and injuries for older people (Lebedev, & Degtyareva, 2006).

In recent years, the problem of elderly people to fall catches growing scientific, medical and social interests. First of all, this is due to an increase of the calendar age, but above all the biological age of the population in Russia (Abramovich, 2001).

Diagnosis of the level of postural stability in elderly and senile age will reveal the physiological differences between aging and pathology, to determine what is the cause of malfunction of the postural control system, and, consequently, increasing the risk of falls (Baranova, & Kapilevich, 2015). In recent years, age physiology and gerontology are increasingly focused on the definition of biological age and the rate of aging, as well as their relationship to the activities of the various systems of the body of an old person (Dotsenko, 2007).

Today is actively introduced a new, high-quality way to diagnose the state of human postural control system. The method is based on analysis of stabilograms largest velocity of the common center

of mass (GCM) and called indicator function equilibrium (FIU). The index is considered to be an integral function of the equilibrium expression efficiency of postural control system and provides more opportunities for researchers, allowing you to make the elements of standardization posturology (Borah et al., 2007).

It largely determines the purpose of this study.

2. Objective

Examine the role of hemodynamic factors in ensuring women's postural control in the elderly.

3. Materials and Methods

The study involved 20 women aged from 60 to 70 years. The estimation of the balance held by the Romberg test. The purpose of the test is to assess the loss of stability with some decrease in concentration at the moment of distraction to perform parallel thought operations. The two probes conducted: with open and closed eyes. The probes were carried out in sequence, one after another. In the test with open eyes, for purpose to divert the attention of the subject, the stimulation had been used by show off some form of alternating circles in different colors, it was necessary in this case to count the number of white circles. In the test with closed eyes, for the same purpose, a stimulation had been used by some sound signals, the number of which also need to be counted as well. As a result, the test examines the difference between the indices of both probes in quantitative terms, the ratio of indicators with their eyes closed to the indicators with their eyes open. The study was performed on the analyzer stabilographic Stabilan -1.

Evaluation of peripheral blood flow was performed by compression of the brachial artery pneumatic cuff at the end of the three minutes of compression measured vessel diameter ultrasonic scanner Vivid60. After decompression of the ultrasound Doppler "ANGIODIN - PC" measured blood flow in the brachial artery. Data analysis was performed using the software Statistica 6.0 for Windows firms Statsoft. For determination of the nature of the distribution of the data can be used the Kolmogorov-Smirnov test. The hypothesis of independent samples supplies compared to the same general population or populations with the same parameters checked by rank U-test Mann-Whitney. The degree of correlation was assessed using Spearman's correlation ratio.

4. Results

Analysis of stabilographic study (Table 1) showed that the increase in the area of the ellipse than normal with closed eyes to 53,9 ± 6,5% ($p<0.05$), with eyes open to 63,48 ± 5, 9%. The rate of change of the area in relation to the norm with the eyes closed increased by 68,9 ± 4,6% ($p<0.05$). The function of the equilibrium in the tests with open and closed eyes remained within the lower limit of norm. The speed of movement of the center of pressure in relation to the norm with the eyes closed increased by 12,8 ± 1,5% ($p<0.05$), with eyes open at 6,5 ± 1,2% ($p<0.05$).

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Table 1. Stabilographic performance indicators Romberg test

X_{cp}± m

Indicators	with eyes open		with eyes closed	
	norm	Result	norm	Result
ellipse area, sq.m.	50	81,74±4,8*	120	184,68±9,1*
rate of change of the area of the ellipse, mm^2/sec	8	8,7±0,7*	12	20,27±1,6*
quality of function of balance,%	80 and more	85,57±1,8	68 and more	68,85±6,6
the average velocity of the center of pressure, mm/sec	8	8,52±0,5	12	13,53±0,7*

* - Significant differences in the rate relative to the norm, p <0,05.

Measuring of the pulse wave velocity in the sample postocclusive reactive hyperemia showed (Table 2) some increase in systolic blood flow velocity to 22,7 ± 1,8% (p <0.05), diastolic to 43,2 ± 3,5% (p <0 05) and on average 31,9 ± 3,1% (p <0.05). Pulse and resistive indices decreased by 61,4 ± 5,7% (p <0.05), and 30,1 ± 3,4% (p <0.05), respectively. Ultrasound examination revealed compression of the brachial artery lumen narrowing to 32,5 ± 4,1% (p <0.05)%.

For age-related changes, stable equilibrium function it is characteristic some increasing in the area of the ellipse motion common center of gravity in mind not only the existence of neurophysiological but also anatomic prerequisites. As very particular importance of this case, there are some obvious changes in the joints, loss of mobility and elasticity of muscle, reduced coordination and speed of movements.

Register stabilograms with closed eyes to evaluate the effect of increasing the visual analyzer for elderly. If the eyes are closed in the vertical position of the equilibrium is maintained only at the expense of proprioception.

Table 2. Indicators doplerometrii brachial artery.

X_{cp}± m

Indicators	Before compression	After decompression	1 min. after decompression	2 min. after decompression
Systolic blood flow velocity, cm/s	34,33±2,8	41,88±3,9*	37,00±3,5	36,00±2,8
Diastolic blood flow velocity, cm/s	4,72±0,2	6,76±0,4*	5,28±0,3	4,00±0,2
The average flow velocity, cm/s	11,70±1,1	15,60±1,2*	12,56±0,9	10,67±1,3
Pulse index	2,71±0,1	1,06±0,1*	2,66±1,3	3,14±0,2
Resistive Index	0,86±0,4	0,61±0,6*	0,84±0,7	0,91±0,7

* - significant differences in performance in the group in relation to the figure to compression, p <0,05.

The average and systolic blood flow velocity have a positive relationship with the medium strength offset frontal (0.32 and 0.35, respectively; p <0.05) and with a range of front (0.36 and 0.35, respectively; p <0.05). Dynamic performance - the area of the ellipse (0.33; p <0.05), speed of movement of the center of pressure (0.49, p <0.05), the rate of change of the area (0.36; p <0.05) have a positive relationship medium strength with narrowing of the lumen of blood vessels. On the other hand, narrowing of the vessels has a negative relationship with the FIU (-0.49; p <0.05). Moreover, all these relationships were detected only with the eyes closed.

5. Conclusion

Thus, the age-related changes of balance function for women in age-group of 60-70 are characterized by increasing in the projected area of the center and the velocity of movement of the

center of pressure. Changes in peripheral blood flow affect the ability to maintain the balance mainly in the frontal plane. This effect is partially offset by the visual analyzer. Changes in the regulation of vascular tone in a part of the peripheral blood flow affect the performance of dynamic equilibrium, resulting some reduction of the integral index of balance function.

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