

INFLUENCE OF PARAVERTEBRALS MIORELAXATION ON CEREBRAL HEMODYNAMICS OF SPORTSMEN

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Annotation: *Purpose:* Paravertebrals miorelaxation was the complex of exercises in a water environment directed on the decline of tone of paravertebral muscles. *Material:* Before and after it was used of paravertebrals miorelaxation registered the indexes of reontsefalografics at the sportsmen engaged in the Greek-Roman fight (n=22) by football (n=24) and heavy athletics (n=25). *Results:* The changes, that have been determined at the wrestlers, was in the form of increasing tone of large (increase TRF, TGRP, decreased ADR) and medium (decreased T1, T2) arteries of the brain, decreased tone of the small arteries. Paravertebral myorelaxation of weightlifters caused them changes in the form of increasing tone of the great vessels (increase T3), decreased tone of large and medium-sized arteries of the brain (increase ADR, T2), increasing the tone of the small arteries (increase AI, DI). Reliable changes in cerebral hemodynamics have not been established at football players. *Conclusions:* The obtained data indicate that there are different mechanisms of adaptation in the brain blood vessels under conditions of the paravertebral miorelaxation. These differences are predetermined by two main factors: the functional state of the cardiovascular system in general and the functional states of the system of regulation of cerebral hemodynamics.

Keywords: miorelaxation, rheoencephalography, athletes, tone of cerebral blood vessels.

Introduction

The influences of different physical exertion, to central circulation of the blood and work of the heart, are known [2; 15]. However, there is only common notion about reactivity of cerebral vessels, associated with the physical exertion, until now. Thereby, researching of the influence of different nature physical exertion to the function of cerebrum blood circulation make up an interest. The researching of the changes of cerebral vessels condition, associated with using of the recovery procedure aimed on decreasing of the paravertebral muscles tone in the area of segments S3-Th8, attract special interest [5]. Many authors specify on links between paravertebral muscles condition in this area and cerebral blood circulation condition [6; 7; 9; 13]. Many authors have studied correlations of cerebral blood circulation and blood pressure [10; 12]. There are few specific data about that correlation, because of very difficult regulation mechanisms and conservatism of the rheoencephalographic indexes.

The research was conducted in accordance to the researching work plans of the department named "The theory and methods of physical education of the Taurida National V. I. Vernadsky University", state registration number is 0111U000919 «Pedagogical and physiological substantiation of physical education and sport system of the students».

Purpose, tasks of the work, material and methods

The aim of the research is to define the influence of paravertebral miorelaxation in the water environment conditions on cerebral blood circulation of the sportsmen.

The tasks of the research:

1. To study the paravertebral miorelaxation influence on the function of cerebral blood circulation of sportsmen.
2. To expose the features of cerebral hemodynamics of the sportsmen at different types of sport.

The sportsmen, who have taken part in the research, have been engaged in the Greek-Roman fight (n=22), football (n=24) and weight lifting (n=25). The necessity of the correction influence has been stipulated by the high tone of the paravertebral muscles of athletes, registered by the myometrium. The age of sportsmen was from 18 to 25 years. The training experience of the athletes was from 5 to 8 years. The using period of the swimming exercises complex with "noodles" have taken 6 weeks in the transitional period of the one year training cycle, the numbers of training sessions were 3 times a week. With afterwards registered eight key REG-indicators were registered by the rheograph RA5-01 device: 1. TRF (s) (rapid filling time) – the time of rapid filling reflects the potential of the large brain arteries for tension, during the systole blood inflow; the rise of the index reflects the increasing of the flexibility and vascular tone reducing; 2. TGR (s) (getting up time of the rheogram) - getting up time of the rheogram, duration period of an ascending part of the graph; 3. ADR (Om/s) (differentiated rheogram amplitude) - differentiated rheogram amplitude in the point M characterizes the maximum speed of blood filling - higher amplitude reflects lower tone of the large arteries; 4. T1 (ms) – the running time of the impulse between point P and I at the reontsefalogramma, it reflects the tonus of small vessels in the studied zone, the increasing of index testifies lowering of the tone of the small and middle arteries; 5. T2 (ms) - Comparing diastole wave location to a basic wave; increasing index testifies lowering of the tonus of small arteries; 6. T3 (ms) -the delay time of a pulse wave, characterizes the movement speed of a pulse wave through the main vessels; its increasing reflects lowering vessels tone; 7. AI (Om) (low wave amplitude) - low wave amplitude, peripheral resistance index in the small arteries zone; increasing index reflects increasing resistance and vessels tone; 8. DI (%) (dikrotics index) - characterizes the peripheral resistance in small arteries zone; increasing index reflects the higher tone of arteries.

Results of the researches

Research of the cerebral blood stream of weight lifters before paravertebral miorelaxation showed, that all indexes were in the normal zone.

The changes in REG have been observed under the influence of the paravertebral miorelaxation. These changes were not reliable, however, considering relative conservatism of the cerebral blood circulation parameters; that changes were regarded as a tendency. After paravertebral miorelaxation, the increasing tendency of the temporal passing characteristics of the pulse wave in the small, middle and main cerebrum blood vessels (left and right hemisphere) of weight lifters have been registered (figure 1). Researching of the cerebral blood stream of the Greek-Roman wrestlers, that have make before paravertebral miorelaxation, showed absence of the expressed deviations from a norm for the REG – indexes at rest (figure 2).

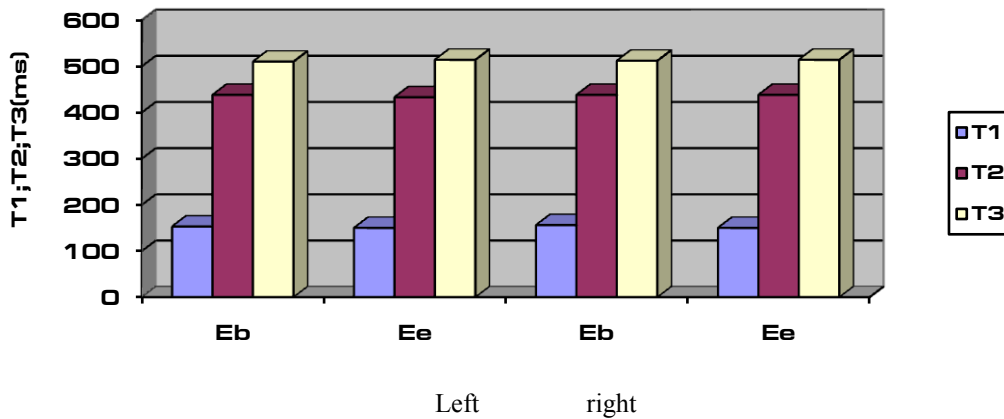
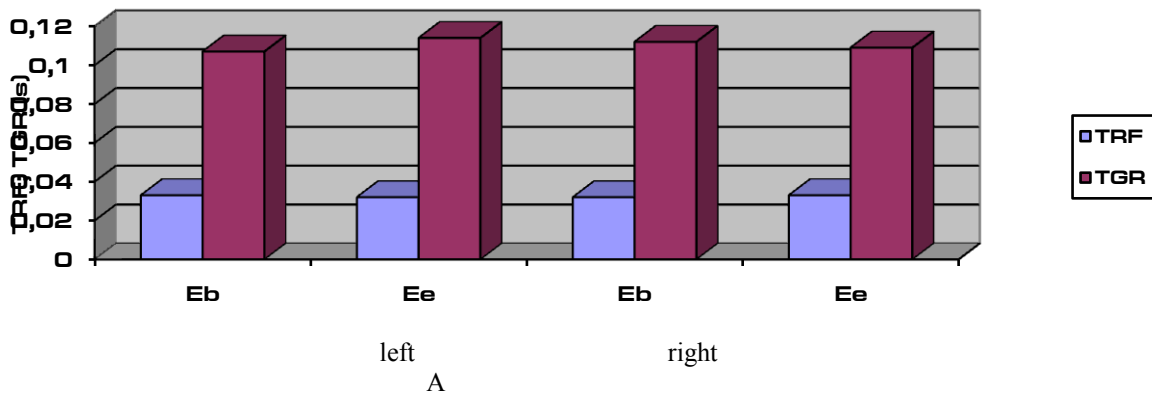


Figure 1. Temporal descriptions of passing of pulse wave for the shallow, middle and main blood vessels of cerebrum (left and right hemisphere).

Heavy athletics (before and after paravertebral miorelaxation): T1; T2; T3 - time of passing of pulse wave between the RE; RI; RL on rheoencephalography; Eb - beginning of experiment; Ee - end of experiment.

The changes of the REG indexes have been determined under influence of the paravertebral miorelaxation. Increasing of TRF and TGR, also as decreasing of ADR, T1, T2, AI and DI, were mostly peculiar.

Based on modern interpretation of the REG values, all its indexes can be divided by the type of the link with the cerebrum vessels function [1; 8; 11]. So, we can suggest, that weight lifters have following results after the paravertebral miorelaxation: main vessels tone have increased (increasing T3), tone of the cerebral main and middle arteries have decreased (decreasing of ADR and T2), small arteries tone have increased (Increasing of AI and DI) (figure. 3). The results of the wrestlers revealed, that tone of the main (increasing of TRF, TGR, decreasing of ADR) and middle (decreasing of T1, T2) cerebral arteries have increased, tone of the small arteries have fallen (decreasing of AI and DI) (figure. 3).



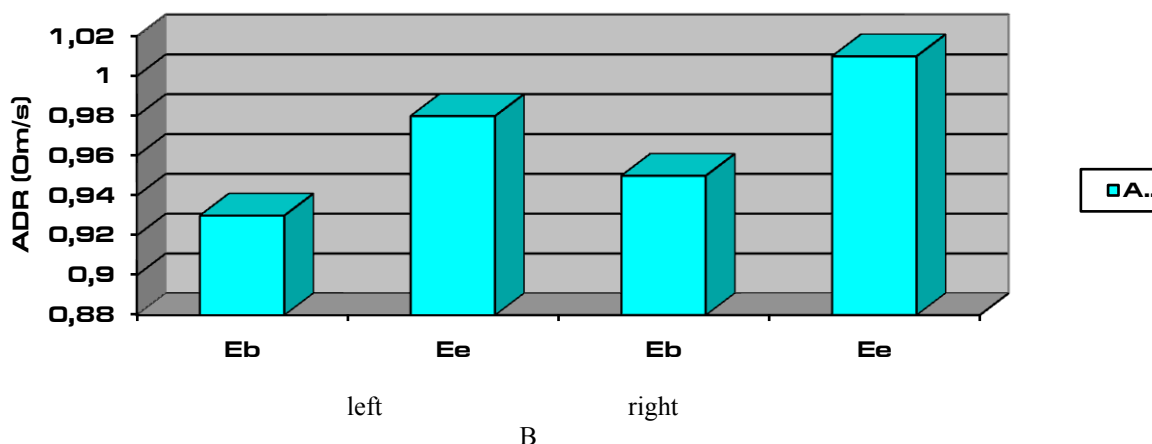


Figure 2. Indexes of filling by the blood of vessels of cerebrum (left and right hemisphere) with athletes (heavy athletics) before and after paravertebral miorelaxation (A - temporal indexes, B - amplitude-temporal indexes): TRF - time of the rapid filling, TGR - time of getting up of rheogram, Eb - beginning of experiment; Ee - end of experiment, ADR - amplitude differentiated rheogram

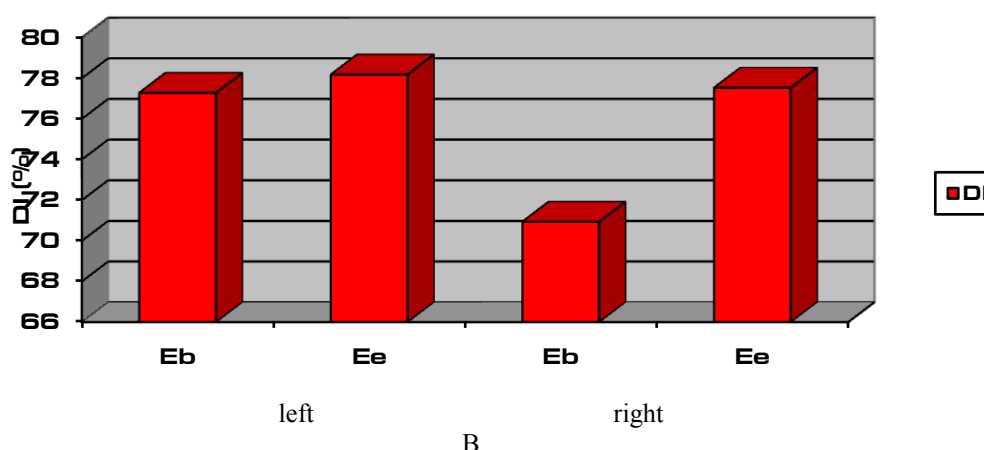
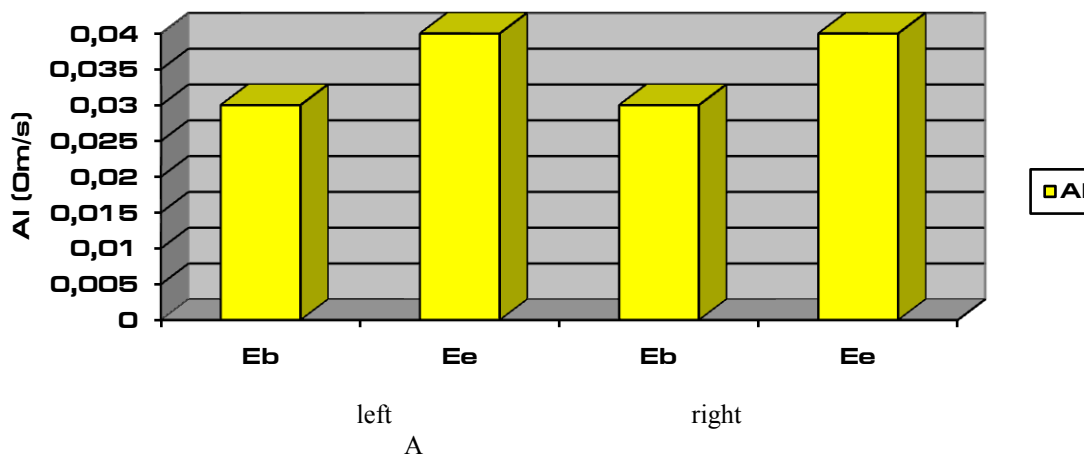


Figure 3. Indexes of peripheral vascular resistance in area of shallow arteries of cerebrum with athletes (heavy athletics) before and after paravertebral miorelaxation (A - amplitude (absolute) indexes, B - amplitude (relative)): AI - amplitude of low wave; DI – dikrotic index; Eb - beginning of experiment; Ee - end of experiment.

The indexes of cerebral blood circulation of football players authentically haven't changed. The reactions of cerebral vessels was various enough, so, it is possible to note, that paravertebral miorelaxation have an ambiguous influence and cause modulation in the work of simpatico and parasimpatico nervous system. Sequence and exponent of these changes are various and depends not only from the method of action, but also from the type of sport in which object of the research is engaged.

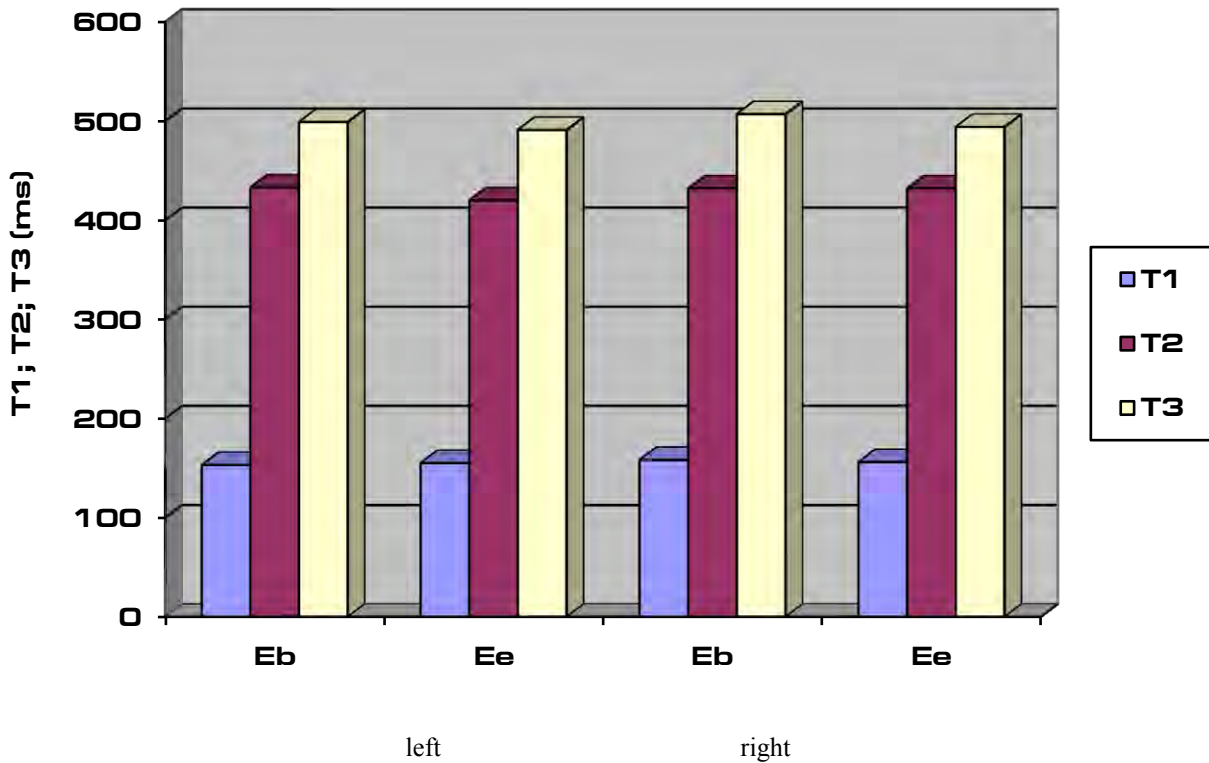
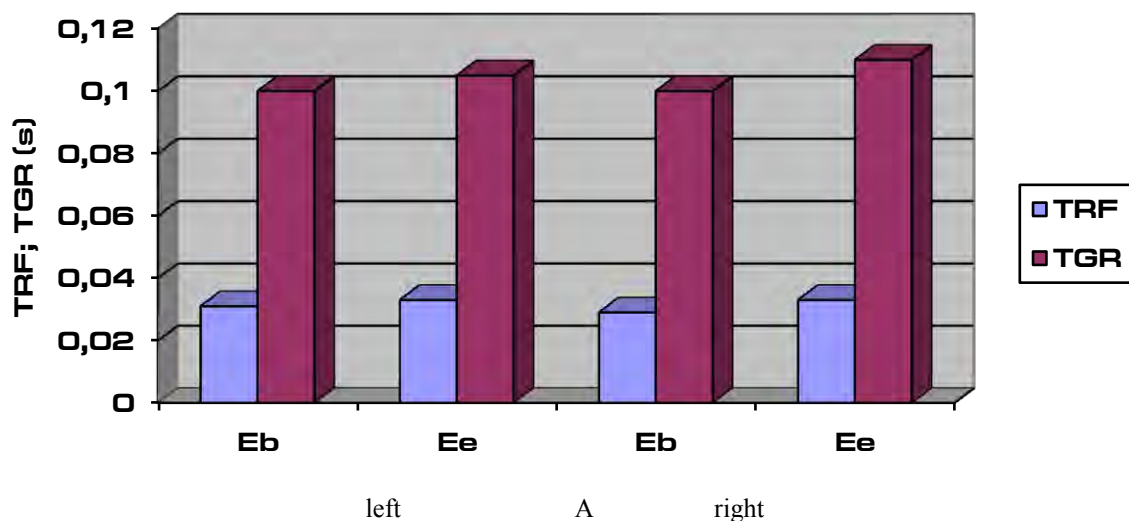


Figure 4. Temporal descriptions of passing of pulse wave on the shallow, middle and main blood vessels of cerebrum (left and right hemisphere) at sportsmen's (Greek-Roman fight) before and after paravertebral miorelaxation: T1; T2; T3 - time of passing of pulse wave between the RE points; RI; RL on rheoencephalography; Eb - beginning of experiment; Ee - end of experiment.

Therefore, most perspective in our view is an individual analysis of the cerebral vessels reaction of different people. This is confirmed by the researches of many researches [7; 14].

It is very difficult to speak about practical value, advantages and adequacy of changes in case of cerebral arteries paravertebral miorelaxation of the weight lifters and wrestlers, because interpretation of the vessels reaction ambiguous.

It is possible to suppose, that advantage of the reaction on to paravertebral miorelaxation of the wrestlers based on the improvement of cerebral blood circulation (expansion of small cerebral vessels) [3; 4; 13]. However, we need to do further researches to make reliable conclusions about advantage of one or another type of cerebral vessels reactions on to paravertebral miorelaxation.



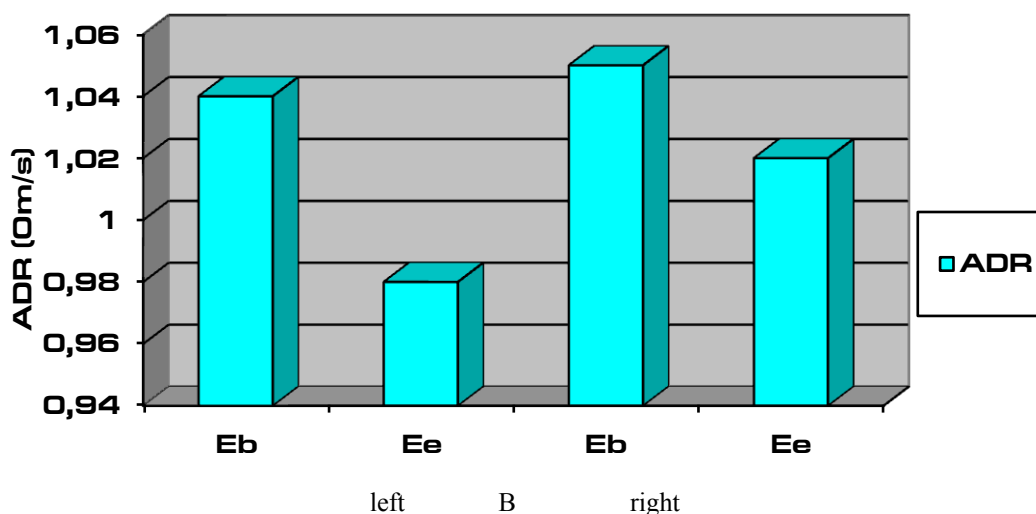


Figure 5. Indexes of peripheral vascular resistance in area of shallow arteries of cerebrum at sportsmen's (Greek-Roman fight) before and after paravertebral miorelaxation (A - amplitude (absolute) indexes, B - amplitude (relative)): AI - amplitude of low wave; DI - dikrotic index; Eb - beginning of experiment; Ee - end of experiment.

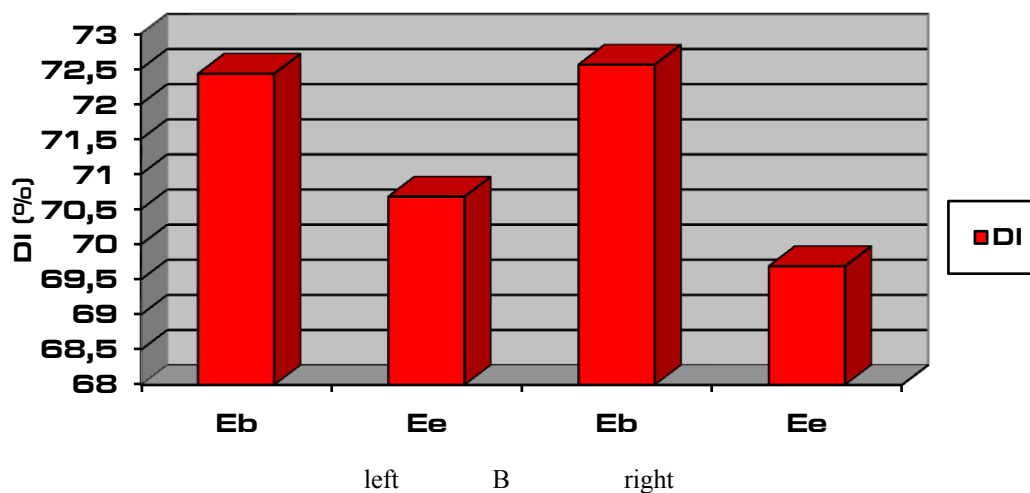
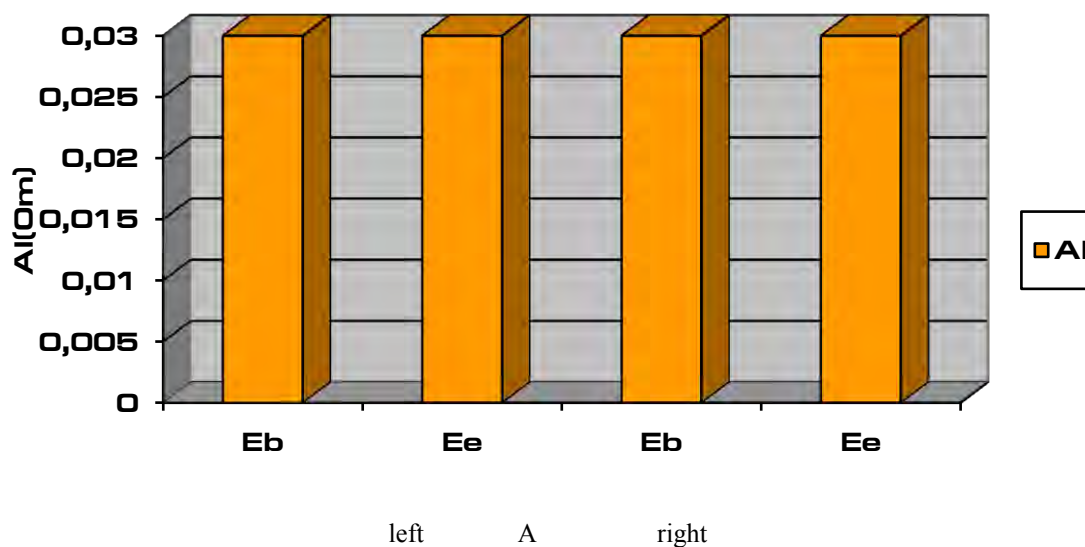


Figure 6. Indexes of peripheral vascular resistance in area of shallow arteries of cerebrum at sportsmen's (Greek-Roman fight) before and after paravertebral miorelaxation (A - amplitude (absolute) indexes, B - amplitude (relative)): AI - amplitude of low wave; DI - dikrotic index; Eb - beginning of experiment; Ee - end of experiment.

Conclusions

1. Paravertebral muscles of the athletes that work in the modes of glycolytic capacity and aerobic power are in hyper tone, and it is necessary to use paravertebral miorelaxation in the conditions of water environment, with the aim to decrease the hyper tone of muscles and optimize the condition of cerebral vessels.
2. We have determined that weight lifters have following results after the paravertebral miorelaxation: main vessels tone have increased (increasing T3), tone of the cerebral main and middle arteries have decreased (decreasing of ADR and T2), small arteries tone have increased (Increasing of AI and DI).
3. We have determined, that results of the wrestlers have following results after the paravertebral miorelaxation: tone of the main (increasing of TRF, TGR, decreasing of ADR) and middle (decreasing of T1, T2) cerebral arteries have increased, tone of the small arteries have fallen (decreasing of AI and DI).

REG cerebral blood circulation indexes of the left and right hemisphere of the athletes have changed almost synchronically after paravertebral miorelaxation.

The theme of future scientific interest is to determine the links between tone of the paravertebral muscles and filling character by the blood, blood flow in the cerebral vessels, and also features of the peripheral vascular resistance.

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