

Relationships between indices of cerebral circulation, liquorodynamics, cranial biomechanics and prognostic ability of human brain.

Moskalenko Yu., Weinstein G., Ryabchikova N., Kravchenko T., Samus N., Feilding A., Halvorson P., Semernia V.

Sechenov Institute of evolutionary physiology and biochemistry RAS, St.Petersburg, Russia; Moscow State University, Moscow, Russia; Beckley Foundation, Oxford, UK.

It was recently shown that circulatory- metabolic supply of a brain is provided by the complex mechanism, which includes, besides cerebrovascular system, also liquorodynamics and cranial biomechanics.

Therefore one should expect that the activity of the brain as a whole, one of final indices of which is its prognostic activity, must in depend on the state of each of the indices indicated, that most the expression must affect the results of the comparative- age-qualification studies, whose generalization was the purpose of present communication.

Methods.

The estimation of the state of intracranial hemo –liquorodynamics and of biomechanics of cranium was based on the simultaneous recording on PS “Macintosh G -4, OS - 10.4.2” through AP “PowerLab-4” with software “Chart-5.1.”, transcranial dopplerography of middle cerebral artery TCDG MCA –by instrument “MultiDop-P” and rheoencephalography (REG) with fronto-mastoidal position of electrodes – by instrument “RG4-02”.

The patten, phase and spectral forms of analysis were directed toward the development of the special features of relationship TCDG-REG to the different phases of heart cycle, which were connected with liquorodynamic processes and biomechanics of cranium.

The estimation of the prognostic activity of the brain was accomplished by the method “Prognoz-1”. The persons of young (15-25 years) middle age (35-50 years) and elderly age (70-85 years) were investigated.

Results.

The average blood velocity in middle cerebral artery (MCA) (TCDG-recordings) decreased gradually with ageing, while biomechanical cranial tensility stabilized at 25-30 years. On the contrary, the activity of liquorodynamic processes increased with ageing being most expressed after age of 50.

This liquorodynamic activation is able to compensate, in a considerable extent, the reduction in cerebral blood flow dependent on age. However, at the middle age the activation of liquorodynamics is not always sufficient, which manifested in the reduction of prognostic activity of the brain. In the persons of elder age the pulse tensibility of cranium decreased, which results in reduction in the oxygen supply of brain tissue and leads to serious disturbances in prognostic brain activity.

Conclusion.

The adequacy of the circulatory-metabolic support of brain activity is determined by interaction of the systems of intracranial hemo-liquorodynamics and pulse tensibility of cranium. The age manifestation of cerebrovascular insufficiency can be regarded as the consequence of disbalance of these relationships.