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EEG and DC-Potential Level Changes in the Elderly

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Abstract : In the modern world the number of elderly people increases. Preservation of functionality of an organism in the elderly becomes very important now. During aging the higher cortical functions such as feelings, perception, attention, memory, and ideation are gradual decrease. It is expressed in the rate of information processing reduction, volume of random access memory loss, ability to training and storing of new information decrease. Perspective directions in studying of aging neurophysiological parameters are brain imaging: computer electroencephalography, neuroenergy mapping of a brain, and also methods of studying of a neurodynamic brain processes. Research aim – to study features of a brain aging in elderly people by electroencephalogram (EEG) and the DC-potential level. We examined 130 people aged 55 - 74 years that did not have psychiatric disorders and chronic states in a decompensation stage. EEG was recorded with a 128-channel GES-300 system (USA). EEG recordings are collected while the participant sits at rest with their eyes closed for 3 minutes. For a quantitative assessment of EEG we used the spectral analysis. The range was analyzed on delta (0,5–3,5 Hz), a theta - (3,5–7,0 Hz), an alpha 1-(7,0–11,0 Hz) an alpha 2-(11–13,0 Hz), beta1-(13–16,5 Hz) and beta2-(16,5–20 Hz) ranges. In each frequency range spectral power was estimated. The 12-channel hardware-software diagnostic 'Neuroenergometr-KM' complex was applied for registration, processing and the analysis of a brain constant potentials level. The DC-potential level registered in monopolar leads. It is revealed that the EEG of elderly people differ in higher rates of spectral power in the range delta ($p < 0,01$) and a theta - ($p < 0,05$) rhythms, especially in frontal areas in aging. By results of the comparative analysis it is noted that elderly people 60-64 aged differ in higher values of spectral power alfa-2 range in the left frontal and central areas ($p < 0,05$) and also higher values beta-1 range in frontal and parieto-occipital areas ($p < 0,05$). Study of a brain constant potential level distribution revealed increase of total energy consumption on the main areas of a brain. In frontal leads we registered the lowest values of constant potential level. Perhaps it indicates decrease in an energy metabolism in this area and difficulties of executive functions. The comparative analysis of a potential difference on the main assignments testifies to unevenness of a lateralization of a brain functions at elderly people. The results of a potential difference between right and left hemispheres testify to prevalence of the left hemisphere activity. Thus, higher rates of functional activity of a cerebral cortex are peculiar to people of early advanced age (60-64 years) that points to higher reserve opportunities of central nervous system. By 70 years there are age changes of a cerebral power exchange and level of electrogenesis of a brain which reflect deterioration of a condition of homeostatic mechanisms of self-control and the program of processing of the perceptual data current flow.

Keywords : brain, DC-potential level, EEG, elderly people
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