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ABSTRACT

The morphometric changes in cortical formations of the limbic system of the human brain in postnatal ontogenesis were studied for the first time. The cortex of the entorhinal region and the human hippocampus, which is part of the limbic system, undergo natural changes in the age aspect. The most intense changes occur in the first seven years of life.

The relevance of the problem. The development of age-related neuromorphology as well as clinical neurosurgery requires more and more detailed data on the anatomy and localization of intracerebral structures, taking into account their individual variability (4, 11, and 14). English biophysicist and geneticist Francis Crick wrote: “There is no area of science more important to a person than the study of his own brain. All our idea of the Universe depends on it.” The limbic system of the brain plays a significant role in the formation of complex integrative functions of the body [6,16,19]. The limbic system of the brain, receiving afferent impulses from the corresponding structures of the brain stem of the new cortex, is actively “included” in the implementation of numerous reactions of the body, allowing the latter to more finely adapt to environmental conditions. With the limbic system, the manifestation of such body reactions as hunger, thirst, fear, rage, sexual arousal is associated. The entorhinal cortex related to the structures of the human limbic system takes an active part in the formation of long-term and short-term human memory [5,13,17].

The entorhinal cortex is distinguished by a peculiar development, heterogeneous structure, and a wealth of connections with the cortex of other parts of the cerebral hemispheres [10,15,19]. Despite the huge amount of research in the field of studying the cytoarchitectonics of the cerebral cortex, unfortunately, there is very little literature on the study of this most important anatomical and physiological substrate [2,7,18]. Until now, the cytoarchitectonics of only certain areas of the cortex have been described. As for the study of cytoarchitectonics of the entorhinal cortex in the age aspect, such works are single. The data available on the study of the structural organization of the entorhinal cortex are contradictory, in addition, scientific works covering all periods of postnatal ontogenesis are sporadic [3,9,12,20]. In connection with the above, the study of the cytoarchitectonics problem of the entorhinal cortex of the human brain is very relevant and modern, has not been developed much, yet its theoretical and practical significance is very large, since the study of intracortical and cortical-subcortical connections is an important section of the study of the localization of brain functions.

Objective: To study the age-related characteristics of morphometric parameters and cytoarchitectonics by the layers of the entorhinal cortex epr[1] of the human brain in postnatal ontogenesis.

Materials and research methods. The study material was 144 pieces of brain tissue taken from the corresponding part of the brain from corpses whose death was not related to brain pathology. We used the following research methods: anatomical preparation, neurohistological methods (Nissl stain and hematoxylin-eosin), cytometry (Avtandilov G.G., 1990), calculation of the volume of neuron bodies (according to Bogolepova I.N., 1977), microphotography, variation - statistical (according to Merkov A.M., Polyakov L.E., 1974).The results of the study showed that the thickness of the outer layer of the properentorhinal cortex erp[1] of the brain of a newborn baby in the left hemisphere averages 140±4.6 μm (see table No. 2), the minimum thickness of this layer is 136 μm, and the maximum is 143 μm (see table No. 3). In the right hemisphere, the thickness of the outer layer of the intrinsic entorhinal cortex epr[1] is slightly larger than in the left hemisphere and averages 156 ± 5.7 μm.The minimum thickness of the outer layer of the properentorhinal cortex epr[1] in the right hemisphere is larger than the minimum value of the same layer in the left hemisphere of the brain of a newborn baby, and the maximum value of the outer layer of the properentorhinal cortex epr[1] in the right hemisphere is significantly higher than the maximum thickness of the same layer in the left hemispheres and reaches up to 162 microns. In infancy, there is an intensive growth of the outer layer of its properentorhinal cortex epr[1] and a sharp increase in its thickness. In the left hemisphere, the thickness of the outer layer of the properentorhinal cortex epr[1] reaches 246 ± 6.5 μm, in the right hemisphere the width of the outer layer increases to 261 ± 4.9 μm. Reliable ($p < 0.05$) differences between newborns and infants in the left and right hemispheres were established.So, during infancy, the thickness of the outer layer of its properentorhinal cortex epr[1] in the left hemisphere increases by 1.76, in the right hemisphere of the brain increases by 1.67. The thickness of the outer layer of the intrinsic entorhinal cortex epr[1] in the right hemisphere exceeds the average thickness of the outer layer of the same field in the left hemisphere. In early childhood, the entorhinal cortex continues to develop intensively, and the thickness of the outer layer of the intrinsic entorhinal cortex epr[1] intensively increases in size. In the left hemisphere of the brain of a child in early childhood, the thickness of the outer layer of its properentorhinal cortex epr[1] reaches an average of 287 ± 5.8 μm. The minimum thickness of the outer layer of the intrinsic entorhinal cortex epr[1] in early childhood in the left hemisphere is 274 μm, and the maximum is 294 μm. In the right hemisphere, the thickness of the outer layer of the intrinsic entorhinal cortex epr[1] increases to 294 ± 4.4 μm. The minimum size of this layer in the right hemisphere of the brain in early childhood is 279 microns, and the maximum is 304 microns. Thus, it can be seen that during early childhood, the thickness of the outer layer of its own entorhinal cortex epr[1] increases on the left by 2.05 and on the right by 1.88 compared with the thickness of the same layer of the brain of a newborn child. Significant ($p<0.05$) differences were established between infancy and early childhood in the left and right hemispheres.

By the end of early childhood, the thickness of the outer layer of its own entorhinal cortex epr[1] in the left hemisphere also differs in magnitude from the thickness of the same layer in the right hemisphere, as was revealed in infancy and in the brain of a newborn baby. During the first childhood, the thickness of the outer layer of its own entorhinal cortex epr[1] also continues to increase, but at a much lower rate than in early childhood and in infancy. The thickness of the outer layer of the intrinsic entorhinal cortex epr[1] in the left hemisphere averages 331 ± 4.8 µm, and in the right hemisphere 335 ± 5.7 µm. Reliable ($p < 0.05$) differences between early and first childhood in the left and right hemispheres were established. Thus, during the first childhood, the thickness of the outer layer of its properentorhinal cortex epr[1] increases in the left hemisphere by 2.36, in the right hemisphere by 2.15 compared with the thickness of the outer layer of its properentorhinal cortex epr[1] in the brain of a newborn baby. These data indicate that during early childhood and first childhood, the thickness of the outer layer of its properentorhinal cortex epr[1] in the left hemisphere of the child's brain develops more rapidly than in the right hemisphere. It should also be noted that in early childhood, the minimum thickness, as well as the maximum thickness of the outer layer of its properentorhinal cortex epr[1] in the left and right hemispheres are different from each other.In the first childhood, the minimum size of the outer layer of the properentorhinal cortex epr[1] in the left hemisphere is 319 microns, and in the right hemisphere - 324 microns. The maximum thickness of the outer layer of the intrinsic entorhinal cortex epr[1] in the left hemisphere in this period is 342 µm, and in the right hemisphere - 348 µm.In the second childhood, the thickness of the outer layer of the intrinsic entorhinal cortex epr[1] slightly increases compared to the first childhood. In the left hemisphere, this value reaches 339 ± 5.2 µm, and in the right hemisphere - 344 ± 5.8 µm. During adolescence and youth, an increase in the thickness of the outer layer of its own entorhinal cortex epr[1] was not observed, however, during these periods, a certain variability in the thickness of the outer layer of its properentorhinal cortex epr[1] was noted. By the end of the adolescent period, the average thickness of the outer layer of the intrinsic entorhinal cortex epr[1] in the left hemisphere is 339 ± 7.2 µm, and in the right 345 ± 9.7 µm.In the I period of adulthood and in the II period of adulthood, there is also a large variability in the thickness of the outer layer of the own entorhinal cortex epr[1] in the left and right hemispheres of the brain. In old age, the size of the outer layer of the intrinsic entorhinal cortex epr[1] decreases slightly, moreover, this is expressed both in the left and right hemispheres. In the left hemisphere, the average value of the outer layer of its properentorhinal cortex epr[1] decreases to 331 ± 4.5 µm, and in the right to 338 ± 4.3 µm.In old age, a decrease in the thickness of the outer layer of the intrinsic entorhinal cortex epr[1] continues. The outer layer of the intrinsic entorhinal cortex epr[1] in the left hemisphere has a thickness of 318 ± 4.2 µm, and in the right hemisphere 329 ± 4.0 µm. The results of our studies showed that the thickness of the middle layer of the intrinsic entorhinal cortex epr[1] of the brain of a newborn baby in the right hemisphere is significantly greater than the thickness of the outer layer of the same field in the left hemisphere at this age. In the left hemisphere, the thickness of the middle layer of the intrinsic entorhinal cortex epr[1] is 671 ± 11.5 µm.

The minimum thickness of the middle layer of the intrinsic entorhinal cortex epr[1] in the left hemisphere of the brain averages 664 µm, and the maximum value of the middle layer of the same field is 679 µm.

The thickness of the middle layer of the intrinsic entorhinal cortex epr[1] in the right hemisphere is greater than the thickness of the same layer in the left hemisphere and reaches 692 ± 14.2 µm.

In infancy, there is a sharp increase in the thickness of the middle layer of its properentorhinal cortex epr[1]. In the left hemisphere, this indicator is 1248 ± 13.6 µm, increasing by 1.86 compared with the brain of a newborn child. In the right hemisphere, this indicator is 1251 ± 12.3 μm, increasing by 1.81 compared with the brain of a newborn. Reliable ($p < 0.05$) differences between the newborn and infancy in the left and right hemispheres were established.

In early childhood, there is a certain jump in the development of the entorhinal cortex of the child and a further increase in the thickness of the middle layer of its properentorhinal cortex epr^1. The thickness of the middle layer of its properentorhinal cortex epr^1 in the left hemisphere reaches 1547 ± 13.8 μm, in the right hemisphere 1589 ± 14.0 μm. Significant ($p < 0.05$) differences were established between infancy and early childhood in the left and right hemispheres. In early childhood, the thickness of the middle layer of its properentorhinal cortex epr^1 increases in the left hemisphere by 2.31, in the right hemisphere 2.30 compared with the thickness of the midbrain of its properentorhinal cortex epr^1 in the brain of a newborn baby. The values of the minimum and maximum thickness of the middle layer of the intrinsic entorhinal cortex epr^1 in both hemispheres sharply change.In the first and second childhood, the rate of development of the entorhinal cortex changes, and the thickness of the middle layer of the properentorhinal cortex epr^1 increases to a lesser extent than in infancy and early childhood. Reliable ($p < 0.05$) differences were established between early childhood and first childhood and between first childhood and second childhood in the left and right hemispheres. The thickness of the middle layer of the intrinsic entorhinal cortex epr^1 in the left hemisphere of the brain in the first childhood is 1652 ± 14.6 μm, that is, it increases only 1.07 compared to the previous age. In the right hemisphere, the thickness of the middle layer of the intrinsic entorhinal cortex erp^1 reaches 1658 ± 17.3 μm, that is, it increases by 1.04 compared with the previous age.

In I and II periods of adulthood, a certain individual variability of the structure of the entorhinalcortex and the thickness of the middle layer of the intrinsic entorhinal cortex epr^1 is observed. So in the I period of adulthood, differences in the minimum, average, maximum thickness of the middle layer of the intrinsic entorhinal cortex epr^1 are revealed, especially in the left hemisphere. So, the minimum size of the middle layer of the properentorhinal cortex epr^1 in the left hemisphere of the brain in the 1st period of adulthood is 1714 μm, and the maximum - 1728 μm.

In old age, there is a decrease in the middle layer of the properentorhinal cortex epr^1 in the left and right hemispheres. The average size of the middle layer of the intrinsic entorhinal cortex epr^1 in the left hemisphere in old age is 1684 ± 16.3 μm, and in the right hemisphere - 1695 ± 15.9 μm.

In old age, this decrease in the middle layer of the intrinsic entorhinal cortex epr^1 becomes even brighter, reaching 1664 ± 18.7 μm in the left hemisphere, and 1679 ± 18.1 μm in the right hemisphere.

Because of the studies, it was found that the inner layer of the intrinsic entorhinal cortex epr^1 of the brain of a newborn baby is significantly narrower than the middle layer of the same cortex. In a newborn child, the thickness of the inner layer of its properentorhinal cortex epr^1 is 282 ± 11.1 μm in the left hemisphere of the brain, and 321 ± 13.3 μm in the right hemisphere.

The minimum value of the inner layer of the intrinsic entorhinal cortex epr^1 in the left hemisphere is 275 μm and in the right hemisphere is 305 μm. The maximum thickness of the inner layer of the intrinsic entorhinal cortex epr^1 in the left hemisphere of the brain of the newborn is 309 μm, and in the right hemisphere - 332 μm.

In infancy, an increase in the inner layer of the intrinsic entorhinal cortex epr[1] was found: in the left hemisphere to 374 ± 12.4 μm, and in the right hemisphere to 385 ± 14.1 μm.

Reliable ($p < 0.05$) differences between the newborn and infancy in the left and right hemispheres were established. Thus, an increase in the thickness of the inner layer of its properentorhinal cortex ep1 in infancy compared with the brain of a newborn baby is observed at 1.33 - 1.20.

By the end of early age, the average thickness of the inner layer of the intrinsic entorhinal cortex epr[1] reaches 391 ± 14.6 μm in the left hemisphere and up to 398 ± 14.7 μm in the right hemisphere. The data obtained show that in early childhood the thickness of the inner layer of its properentorhinal cortex epr[1] increases compared to the same layer of the brain of a newborn child on the left - 1.39, and on the right - 1.24.

A comparison of the growth rates of the outer, middle, and inner layers of the epr[1]properentorhinal cortex in infancy and early childhood shows that by the end of early childhood, compared to the newborn, the thickness of the outer layer of the entorhinal cortexepr[1]in the left hemisphere increases by 2.05, the middle layer - at 2.31, the inner layer at 1.39.

When studying the structure and thickness of the inner layer of the intrinsic entorhinal cortex epr[1] in the first childhood, it was found that the thickness of this layer continues to increase, reaching 411± 13.8 μm in the left hemisphere and 424 ± 15.2 μm in the right hemisphere.

In the second childhood, adolescence, I period and II period of adulthood, the thickness of the inner layer of its properentorhinal cortex epr[1] slightly differs from age to age.

In old age, a decrease in the thickness of the inner layer of the intrinsic entorhinal cortex epr[1] is observed: in the left hemisphere - up to 418 ± 15.3 microns, in the right hemisphere - up to 420 ± 14.5 microns.

In senile age, a more significant decrease in the thickness of the inner layer of the intrinsic entorhinal cortex epr[1]is observed: in the left hemisphere to 396 ± 11.8 μm, and in the right hemisphere to 403 ± 15.1 μm.

Nerve cells of the outer layer of the intrinsic entorhinal cortex epr[1] of a newborn baby are well stained, have a diverse shape, triangular and polygonal.

The height of nerve cells in the outer layer of the properentorhinal cortex epr[1] in the left hemisphere of the brain of a newborn baby is on average 14.4 ± 0.6 μm. Among these cells, nerve cells with a lower height of 12.8 μm and larger nerve cells with a height of up to 14.9 μm are found.

It should be noted that in the right hemisphere of the brain of a newborn child in the outer layer of its properentorhinal cortex epr[1] there are cells somewhat larger compared to the same cells in the left hemisphere of the brain. The height of nerve cells in the outer layer of the properentorhinal cortex epr[1] in the right hemisphere of the brain of a newborn baby is on average 14.6 ± 0.9 μm. Among these cells, there are lower cells, 12.9 microns high and larger, up to 15.3 microns high.

The width of the nerve cells of the outer layer of the properentorhinal cortex epr[1] in the left hemisphere of the brain of a newborn baby is on average 16.8 ± 0.8 μm. The outer layer is characterized by the presence of triangular and polygonal nerve cells, but at this age there are also more elongated cells, whose width is 16.0 μm and wider trapezoidal nerve cells, up to 17.6 μm wide. In the right hemisphere of the brain of a newborn child, polygonal cells are also localized in the outer layer of their

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properentorhinal cortex epr[1], the width of which is on average equal to 17.0 ± 0.7 μm. Along with these cells are cells up to 16.1 microns wide and wider up to 17.8 microns. Nerve cells in the middle layer of the intrinsic entorhinal cortex epr[1] of the newborn baby are slightly smaller of the nerve cells of the outer layer of the same field of the entorhinal cortex of the newborn baby. The height of nerve cells in the left hemisphere of the brain of a newborn baby in the middle layer of its properentorhinal cortex ep1 is on average 12.0 ± 1.1 μm. A certain diversity of nerve cells is noted, and smaller cells, up to 11.5 microns high and more elongated triangular cells, up to 12.6 microns high, are found. In the right hemisphere of the brain of a newborn baby, nerve cells in the middle layer of the epr[1] intrinsic entorhinal cortex are insignificant, but still there are more similar cells of the same layer of the epr1 intrinsic entorhinal cortex, their height reaches 12.2 ± 0.9 μm. Among these cells of the middle layer of the properentorhinal cortex epr[1] in the right hemisphere of the brain of a newborn, there are cells with a lower height of up to 11.7 μm and larger ones with a height of up to 12.9 μm.

Nerve cells in the middle layer of the properentorhinal cortex epr[1] in the left hemisphere of the brain of a newborn baby differ in width. Most of the cells in the middle layer of the intrinsic entorhinal cortexepr[1]in the left hemisphere of the brain of a newborn baby are 14.4 ± 0.9μm wide, and nerve cells are 13.6μm wide and 15.2 μm wide. In the right hemisphere of the brain of a newborn baby, in the middle layer of its properentorhinal cortex epr[1], nerve cells are somewhat wider, their width is on average 14.7 ± 0.7 μm, although there are also cells whose minimum width is 13.7 μm and the maximum cell width reaches up to 15.5 microns. The cells that form the inner layer of the properentorhinal cortex epr[1] in the left hemisphere of the brain of a newborn baby are more monotonous than the cells of the outer and middle layers of the same field at this age. The average height of nerve cells of the inner layer of the intrinsic entorhinal cortexepr[1] in the left hemisphere at this age is 12.0 ± 0.9 μm, but there are cells with a shorter height - 11.5 μm and more elongated triangular high cells - 12.6 μm. The average value of their width reaches 12.0 ± 0.5 μm. In the right hemisphere, the cellular composition of the inner layer of the intrinsic entorhinal cortex epr[1] of the brain of a newborn baby is similar to the cellular composition of the inner layer of the same field in the left hemisphere, and nerve cells are generally 12.3±0.7 μm wide and 12.2±0.7 cm high microns. In the thoracic period, nerve cells of the outer layer of the proper entorhinal cortex epr[1] are intensively colored, their shape is triangular and polygonal, and their sizes have significantly increased compared to the same brain cells of a newborn baby. In the left hemisphere, the height of nerve cells in the outer layer of its properentorhinal cortex epr[1] already increases to 17.8±0.7 μm. Reliable ($p < 0.05$) differences between the newborn and infancy in the left hemisphere were found. The minimum height of nerve cells in the outer layer of its own entorhinal cortex epr[1] in the left hemisphere of the brain by the end of infancy is 16.2 μm, and the maximum height of nerve cells increases to 18.6 μm. In the right hemisphere, the height of nerve cells in the outer layer of its properentorhinal cortex epr[1] also increases intensively and the average height of nerve cells in the outer layer of its properentorhinal cortex epr[1] is on average 18.0 ± 0.8 μm, and the minimum height of nerve cells in the outer layer of its properentorhinal cortex epr[1] is 16.3 microns, and the maximum height is 18.9 microns. The width of the nerve cells in the chest period changes sharply. In the outer layer of its properentorhinal cortex epr[1] in the left hemisphere of the child's brain, the width of nerve cells increases to 21.0 ± 0.7 μm, and in the right hemisphere to 21.5 ± 0.7 μm. Reliable ($p < 0.05$) differences between the newborn and infancy in the left and right hemispheres were established.The minimum width of nerve cells in the left hemisphere of its properentorhinal cortex epr[1] is 18.8 μm, and the maximum width of nerve cells is 22.3 μm. In the right hemisphere, the minimum width of nerve cells in the outer layer of the intrinsic entorhinal cortex epr[1]is found to be 20.2 μm, and the maximum width is 22.6 μm.

Nerve cells of the middle layer of the native entorhinal cortex epr[1] grow in infancy, the height of nerve cells in this layer in the left hemisphere of the brain reaches 16.0 ± 0.9 μm, the minimum height is 15.2 μm, and the maximum height of nerve cells is 16, 9 microns.In the right hemisphere, the height of the pyramidal neurons in the middle layer of the properentorhinal cortex epr[1] in the chest period also increases and averages 16.4 ± 1.2 μm. The minimum height of nerve cells in the intrinsic entorhinal cortex epr[1] in the right hemisphere is 15.5 μm, and the maximum is 17.3 μm. The widths of nerve cells in the middle layer of the properentorhinal cortex epr[1] vary intensively, the average width of nerve cells in the left hemisphere of the brain in infancy is 16.9 ± 1.1 μm, and in the right hemisphere 17.1 ± 0.9 μm. The minimum value of the width of nerve cells in the middle layer of the intrinsic entorhinal cortex epr[1] in the left hemisphere is 15.6 microns, in the right hemisphere 15.9 microns. The maximum width of nerve cells in the middle layer of the properentorhinal cortex epr[1] in the left hemisphere is 18.4 microns, in the right hemisphere 18.8 microns. In infancy, the height of the pyramidal neurons of the inner layer of the intrinsic entorhinal cortex epr[1] in the left hemisphere increases to 14.4 ± 0.5 μm. In the right hemisphere, the height of the nerve cells of the inner layer of the intrinsic entorhinal cortex epr[1] increases on average to 14.7 ± 0.7 μm. Nerve cells also vary in width. Thus, the width of the cells of the inner layer of the intrinsic entorhinal cortex epr[1] in the left hemisphere increases to 14.1 ± 0.6 μm, and in the right hemisphere to 14.3 ± 0.9 μm. Certain fluctuations in the width of nerve cells are observed in connection with the very diverse shape of triangular and polygonal cells in the inner layer of the intrinsic entorhinal cortex epr[1] of the brain in infancy, both in the left and right hemispheres. Thus, by the end of infancy, the height of nerve cells in the outer layer of the properentorhinal cortex epr[1] in the left hemisphere increases compared to the same cells of the properentorhinal cortex epr[1] of a newborn baby in 1.24, in the middle layer - 1.33, in the inner layer - in 1.2. In the right hemisphere, the height of the nerve cells of the intrinsic enteric field epr[1] in the outer layer increases compared to the same cells of the entorhinal cortex of the newborn baby in 1.23, the average layer in 1.34, and in the inner layer 1.2. In early childhood, intensive growth of nerve cells continues. Compared to the previous age, the presence of a large number of pyramidal cells is noted in the outer layer of the properentorhinal cortex epr[1], apical dendrites are clearly detected. Along with the pyramidal cells there are cells of a peculiar shape - club-shaped, corkscrew-shaped and with the shape of strongly elongated spindles. The height of nerve cells in the outer layer of the properentorhinal cortex epr[1] in the left hemisphere in early childhood increases to 19.0 ± 0.4 μm. The minimum height of nerve cells in the outer layer of its properentorhinal cortex epr[1] in the left hemisphere is 18.1 μm, and the maximum value is 20.3 μm.

In the right hemisphere, in the outer layer of the properentorhinal cortex epr[1] at this age, there are also many pyramidal cells, moreover, as in previous ages, they are slightly larger in size than the same cells in the left hemisphere.

The average height of nerve cells in the outer layer of its properentorhinal cortex epr[1] in the right hemisphere increases in early childhood to 19.2±0.5 μm, the minimum height is 18.1 μm, and the maximum height is 20.5 μm. The average width of neurons of nerve cells in the outer layer of the intrinsic entorhinal cortex epr[1] reaches 21.6±0.6 μm, and in the right hemisphere - 24.9±0.6 μm. Reliable ($p<0.05$) differences between the chest period and early childhood in the right hemisphere were established. During early childhood, interhemispheric asymmetry in the size of the outer layer neurons was revealed, and significant ($p <0.05$) differences between the width of the outer layer neurons in the left and right hemispheres were established.

In the middle layer of the intrinsic entorhinal cortex epr[1] at this age in the left hemisphere, the height of neurons reaches 18.8 ± 0.6 μm, the minimum height of nerve cells is 17.8 μm, and the maximum is 19.7 μm. In the right hemisphere, nerve cells in this layer have a height of 19.1 ± 0.8 μm, a minimum height of 18.3 μm, and a maximum height of 20.3 μm. The width of nerve cells in early childhood increases in the left hemisphere to 18.8 ± 0.6 μm and in the right hemisphere to 19.1 ± 0.7 μm.In early childhood, the inner layer of the epr[1] intrinsic field contains cells that are slightly smaller than nerve cells lying in the outer and middle layer of the epr[1] intrinsic field, and this is most noticeable in the left hemisphere. The height of the pyramidal neurons in the inner layer of the properentorhinal cortex epr[1] in the left hemisphere in early childhood is mainly 15.6 ± 0.5 μm, although there are smaller nerve cells with a height of 14.8 μm and larger nerve cells with a height of up to 16.3 μm. In the right hemisphere, nerve cells 15.9 ± 0.8 μm high are localized in the inner layer of the properentorhinal cortex of epr[1], the minimum height of nerve cells in this layer is 14.9 μm, and the maximum is 16.6 μm.

Thus, during early childhood, the height of nerve cells in their properentorhinal cortex epr[1] in the left hemisphere of the brain in the outer layer increases compared with the height of the same cells of the entorhinal region of the cortex of the newborn baby in 1.32, in the middle layer - in 1.57, and in the inner layer - 1.3. In the right hemisphere, the height of nerve cells in the outer layer of its properentorhinal cortexepr[1] increases compared with the same brain cells of the newborn baby by 1.32, in the middle layer by 1.57, in the inner layer by 1.3.

During the first childhood, a further increase in the height and width of nerve cells is observed. By the end of the first childhood, the height of the nerve cells of the outer layer of the properentorhinal cortex epr[1] in the left hemisphere reaches its peak and is on average 20.0 ± 0.7 μm, and in the right hemisphere - 20.1 ± 0.6 μm. The minimum height of nerve cells increases at this age, in the left hemisphere it reaches 18.4 microns, and in the right hemisphere - 18.5 microns. The maximum height of the pyramidal neurons in the outer layer of the intrinsic entorhinal cortex epr[1] in the left hemisphere increases to 21.2 μm, in the right hemisphere to 21.4 μm. The width of the outer layer neurons in the brain during the first childhood in the left hemisphere is 25.1 ± 0.7 microns, and in the right hemisphere 25.5 ± 0.4 microns. Reliable ($p <0.05$) differences between the period of early childhood and first childhood in the left hemisphere were established.At the age of the first childhood, nerve cells in the middle layer of their properentorhinal cortex epr[1] have a height different from the height of the nerve cells of the outer layer. In the left hemisphere, the height of nerve cells in the middle layer is 19.2 ± 1.2 μm, and in the right hemisphere - 19.3 ± 0.7 μm. The width of nerve cells in the middle layer of the properentorhinal cortex epr[1] in the left hemisphere reaches 19.8 ± 0.9 μm, in the right hemisphere - 20.2 ± 0.8 μm.

In the inner layer of the intrinsic entorhinal cortex epr[1], the height of nerve cells in the left hemisphere is 16.8±0.9 μm, and the width is 16.6±0.9 μm. In the right hemisphere, the height of nerve cells in this layer is 17.0±0.5 μm, and the width is ¬ 16.8±0.9 μm.

The results of our studies showed that the height of neurons in the outer layer of the properentorhinal cortex epr[1] increases by the end of the first childhood compared to the same cells of the entorhinal cortex of the newborn in the left hemisphere by 1.39 and in the right hemisphere by 1.38.

In the middle layer, the height of neurons by the end of the first childhood increases compared to similar neurons in the entorhinal region of a newborn in the left hemisphere by 1.6, in the right - by 1.58, and in the inner layer in the left hemisphere by 1.4, and in the right hemispheres at 1.39.

The width of the pyramidal neurons of the outer layer of its properentorhinal cortex epr[1] by the end of the first childhood in the left hemisphere increases by 1.49, and in the right hemisphere - by 1.5. By the end of the first childhood, the width of neurons in the middle layer of the native entorhinal cortex ep1 increases in comparison with the same cells of the entorhinal region of the cerebral cortex of the newborn in the left hemisphere by 1.38 and in the right hemisphere by 1.37. In the inner layer, respectively, in the left hemisphere at 1.38, in the right hemisphere at 1.37.

During the second childhood and adolescence and the I and II periods of adulthood, the height and width of neurons in the outer, middle and inner layers of the properentorinal cortex epr[1] is small, which differ from the same indicators of neurons of the properentorinal cortex epr[1] at the age of the first childhood. The data obtained indicate that the height and width of neurons in all studied layers of the intrinsic entorhinal cortex epr[1] reaches its maximum development by the end of the first childhood. There is a large variability of individual indicators in different individuals.

In old and senile age, a decrease in the height of neurons in the outer layer of the intrinsic entorhinal cortex epr[1] was established. In the left hemisphere, the height of neurons decreases in old age to 18.9 ± 0.9 μm, in senile age to 17.2 ± 0.8 μm. The same pattern was revealed in the right hemisphere, in which the height of neurons decreases in old age to 19.2 ± 0.7 μm, in old age to 17.4 ± 0.6 μm.

It should be noted that the width of neurons in the outer layer of the intrinsic entorhinal cortex epr[1] also decreases, it becomes smallest by senile age (in the left hemisphere to 23.7 ± 0.9 μm, and in the right hemisphere to 21.9 ± 0.6 μm).

Our research data showed that from the second childhood to the second period of adulthood, the height of the pyramidal neurons in the middle layer of the intrinsic cortex epr[1] remains approximately the same. In old and senile age, the height of neurons in the middle layer of their proper entorhinal cortex epr[1] decreases in the left hemisphere to 17.8 ± 0.9 μm, and in the right hemisphere to 17.9 ± 0.7 μm.

Studies have shown that the width of neurons in the middle layer of the intrinsic entorhinal cortex epr[1] also decreases, especially during senile age (on the left - to 18.6 ± 0.8 μm, on the right - to 18.9 ± 0.5 μm).

The height of neurons in the inner layer of the intrinsic entorhinal cortex epr[1] in both hemispheres shows some fluctuations during adolescence, adolescence and adulthood and decreases in old and senile age (to the left to 14.8 ± 0.9 μm, to the right to $15.1 \pm 0, 7$ μm).

A similar pattern was established when studying the width of neurons in the inner layer of the intrinsic entorhinal cortex epr[1], where the width of neurons in old age in the left hemisphere decreases to 15.6 ± 0.6 μm, and in the right hemisphere to 15.9 ± 0.8 μm, and at senile age in the left hemisphere - up to 14.9 ± 0.7 microns and in the right hemisphere - up to 15.0 ± 0.9 microns.

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We noted that in old age, the height of neurons in the outer layer of the intrinsic entorhinal cortex epr[1] decreases compared to previous ages in the left hemisphere by 1.06, in the right hemisphere - by 1.05, and in senile age by 1 on the left and right, sixteen.

The data of our studies showed that in the middle layer of the proper entorhinal cortex epr[1], the height of neurons in old age in the left hemisphere decreases by 1.03, in the right hemisphere also by 1.04, and in senile age by 1.08 on the left and right. The width of the neurons in the middle layer in the studied cortical field in old age decreases to 1.04 on the left, to 1.03 on the right, to 1.08 on the left, and to 1.06 on the right, on the right.

We have revealed a decrease in the size of neurons in the inner layer of the properentorhinal cortex epr[1] in old and old age. The height of neurons in old age compared with the previous studied ages decreases in the left hemisphere by 1.09, in the right hemisphere by 1.04, in senile age on the left - by 1.14, on the right by 1.13.

The width of neurons in the inner layer of the properentorhinal cortex epr[1] compared to adolescence and adulthood in old age decreases to 1.06 on the left, to 1.05 on the right, to 1.11 on the left and to 1.11 on the right.

The results of the study showed that the density of neurons in the outer layer of the intrinsic entorhinal cortex epr[1] is the highest during the neonatal period and in the first postnatal ontogenesis ages. It was noted that the most intense decrease in the density of neurons in the outer layer of the properentorhinal cortex epr[1] occurs in infancy and early childhood. As can be seen from tables No. 26, 27, the density index of neurons in the outer layer of the properentorhinal cortex ep1 in a newborn in the left hemisphere is 89.4 ± 1.1, then in infancy this indicator decreases to 62.5 ± 0.8, and in early childhood, up to 41.9 ± 0.6, i.e. in relation to the newborn, the density of neurons in infancy decreases by 1.43, and in early childhood decreases by 2.14.

In the right hemisphere, the same pattern of an intensive decrease in the density of neurons in the outer layer of the intrinsic entorhinal cortex epr[1] is noted. In a newborn, this indicator is 91.2 ± 0.9, in infancy 63.1 ± 0.9, in early childhood - 42.6 ± 0.7. Reliable ($p < 0.05$) differences were established between the newborn and the chest period, as well as between the chest period and early childhood in the left and right hemispheres.

Compared with the brain of a newborn, the density of neurons in the outer layer of the intrinsic epr[1] intrinsic field decreases by 1.45 in infancy and 2.14 in early childhood.

Our data showed that the density of neurons in the outer layer in the first childhood also decreases intensively, and this indicator on the left is 30.1 ± 0.6, on the right is 31.9 ± 0.4. The data obtained show that during the period of the first childhood, the density of neurons in the outer layer of the intrinsic entorhinal cortex epr[1] decreases on the left at 2.97, on the right at 2.86. Reliable ($p < 0.05$) differences were established between early childhood and first childhood in the left and right hemispheres, as well as between first childhood and second childhood in the left and right hemispheres.

It is noted that in the studied age periods after the first childhood, namely, in the second childhood, adolescence, and adulthood, the density of neurons in the outer layer of the intrinsic entorhinalcortex epr[1] changes little, and slight fluctuations of this indicator are observed, apparently related to individual variability of the structure of the entorhinal cortex of the human brain.

In old and senile age, there is a slight decrease in the density of neurons in the outer layer (left to 26.9 ± 0.4, right to 27.4 ± 0.6).

The data obtained show that in elderly and senile age, the density of neurons in the outer layer of the intrinsic entorhinal cortexepr[1] decreases in the left hemisphere by 1.08, in the right hemisphere by 1.07.

The density of neurons in the middle layer of the properentorhinal cortex epr[1] decreases mainly during infancy, early childhood and first childhood. So, during infancy, the density of neurons in the middle layer of the properentorhinal cortex epr[1] compared to the brain of a newborn decreases to 1.36 on the left, 1.37 on the right, 2.31 on the left and 2.32 on the right. Reliable ($p < 0.05$) differences were established between the newborn and the chest period, as well as between the chest period and early childhood in the left and right hemispheres. Large changes in the density of neurons in the middle layer occur during the period of the first childhood, and compared with the neonatal period, this indicator decreases on the left at 2.4, on the right at 2.37.

In the period of the second childhood, there is also a slight decrease in the density of neurons in the middle layer of the properentorhinal cortex epr[1], and by the end of the second childhood, the density of neurons decreases compared to the neonatal period on the left at 3.15, on the right at 3.13. Reliable ($p < 0.05$) differences between the first and second childhood in the left and right hemispheres were established.

In old age and in old age, the density of neurons also decreases, although slightly. So, in the left hemisphere in old age, the density of neurons decreases by 1.07, in the right hemisphere - by 1.07. In senile age, the density of neurons in comparison with adulthood decreases on the left at 1.12, on the right at 1.14.

As the results of our studies show, the density of neurons in the inner layer of the intrinsic entorhinal cortex epr[1] in the brain of a newborn baby is quite high (80.4 ± 0.5 on the left and 79.6 ± 0.7 on the right).

The study of changes in the density of neurons in the inner layer showed the same pattern that was established when studying the outer and middle layer, namely, during infancy, early childhood and first childhood, the most intense change in the density of neurons occurs. By the end of the chest period, the density of neurons in the inner layer in the left hemisphere decreases by 1.44, in the right hemisphere by 1.4. In early childhood, compared with a newborn, the density of neurons in the inner layer on the left decreases by 2.51, on the right by 2.42.

By the end of the first childhood, this indicator on the left decreases by 2.87, on the right by 2.75. Significant ($p < 0.05$) differences were established between the newborn and the thoracic period in the left and right hemispheres, as well as between the thoracic period and early childhood in the left and right hemispheres. Reliable ($p < 0.05$) differences were established between early childhood and first childhood in the left and right hemispheres.

The decrease in the density of neurons continues until adolescence. This indicator decreases compared to the brain of a newborn child on the left at 3.13, on the right at 3.03.

During adolescence and I and II periods of adulthood, slight fluctuations of this indicator in both hemispheres are noted.

In old and senile age, we noted a decrease in the density of neurons in the inner layer: in old age, left 1.11, right 1.13, senile left 1.19, right 1.07.

The results of the study showed that the indicators of the volume of the bodies of the pyramidal neurons in the left and right hemispheres are slightly different. Thus, the body volume of pyramidal neurons in the outer layer of the intrinsic entorhinal cortex

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epr[1] of a newborn baby is 336.7 ± 14.7 μm^3, and in the right hemisphere - 354.0 ± 12.4 μm3.

The most intensive body volume of neurons in the outer layer of its properentorhinal cortex epr[1]is observed in infancy and early childhood. Thus, during infancy in the left hemisphere, the volume of the bodies of pyramidal neurons in the outer layer of the intrinsic entorhinal cortex epr[1] increases to 650.5±12.9 μm^3, and in the right hemisphere to 693.4±13.1 μm^3, i.e. increasing to the left at 1.94, and to the right at 1.96. Reliable ($p<0.05$) differences between the newborn and the chest period in the left and right hemispheres were established.

During an early age, the body volume index of neurons in the outer layer of the intrinsic entorhinal cortex epr[1] in the left hemisphere increases to 953.1 ± 16.1 μm^3, and in the right hemisphere to 992.1 ± 12.7 μm^3, increasing as compared with the body volume of those the neurons of the brain of a newborn baby in the left hemisphere at 2.83, and in the right hemisphere at 2.81. Reliable ($p <0.05$) differences were established between the chest period and early childhood in the left and right hemispheres.

The main development of neurons reaches the end of the first childhood, when the body volume of neurons reaches approximately the same size as neurons in older ages and in adults. So, in the left hemisphere, the volume of neuron bodies in the outer layer of the intrinsic entorhinal cortex epr[1] is 1057.3 ± 15.7 μm^3, and in the right hemisphere 1089.2 ± 16.1 μm^3. Reliable ($p <0.05$) differences were established between early childhood and first childhood in the left and right hemispheres.

Our studies showed that by the end of the first childhood, the body volume of neurons in the outer layer increases on the left compared with the body volume of the same neurons in the brain of a newborn baby by 3.14, and on the right by 3.08.

During old and senile age, as our data showed, a decrease in the volume of neuron bodies in the outer layer of the intrinsic entorhinal cortex epr[1] is noted. The studied volume becomes the smallest by senile age (in the left hemisphere - up to 800.5 ± 14.3 μm^3, and in the right hemisphere - up to 825.5 ± 13.8 μm^3, i.e. decreases on the left by 1.35, and on the right - at 1.31). Reliable ($p <0.05$) differences were established between the second period of adulthood and advanced age in the left and right hemispheres. There were also significant ($p <0.05$) differences between the elderly and senile age in the left hemisphere.

Our data showed that in the middle layer of the intrinsic entorhinal cortex epr[1] of the brain of a newborn child, as well as in the outer layer of the intrinsic entorhinal cortex epr[1], the volume of the bodies of pyramidal neurons differs in the left and right hemispheres (on the left - 207.4 ± 5.9 μm^3, on the right - 221.5 ± 6.1 μm^3).

In infancy, the body volume of pyramidal neurons increases in the left hemisphere by 1.83, and in the right hemisphere - by 1.82 (on the left, the body volume of neurons reaches 378.5 ± 6.7 μm^3, and on the right - 402.1 ± 5.8 μm^3). Reliable ($p <0.05$) differences between the newborn and infancy in the left and right hemispheres were established.

We found that in early childhood, neurons continue to grow rapidly, and the volume of neurons in the left hemisphere increases by 2.69, reaching 556.7 ± 9.1 μm^3, and in the right hemisphere by 2.64, reaching 583.0 ± 4.9 μm^3). Significant ($p <0.05$) differences were established between infancy and early childhood in the left and right hemispheres.

By the end of the first childhood, the volume of neuron bodies in the middle layer becomes similar to the volume of the same bodies of neurons in the adult brain, reaching 627.3 ± 8.3 μm^3 in the left hemisphere and 652.9 ± 6.7 μm^3 in the right hemisphere.

Reliable ($p < 0.05$) differences were established between early childhood and first childhood in the left and right hemispheres. Thus, by the end of the first childhood, the volume of neuron bodies in the middle layer increases compared to the volume of the bodies of pyramidal neurons in the brain of a newborn child on the left at 3.02, and on the right - at 2.95. Our data showed that in all studied ages there are some fluctuations and differences in the volume of neuron bodies, which is one of the signs of individual variability of the cytoarchitectonics of the entorhinal cortex of the human cerebral cortex.

In old and senile age, the indicator of the volume of neuron bodies in the middle layer decreases and becomes at senile age - 510.3 ± 7.4 μm^3 on the left, 539.9 ± 5.7 μm^3 on the right, decreasing at 1.26 on the left, and 1 at the right, 24. Reliable ($p < 0.05$) differences were established between the second period of adulthood and advanced age, as well as advanced age and senile age in the left and right hemispheres.

The body volume of the pyramidal neurons of the inner layer of the intrinsic entorhinal cortex epr^1 increases markedly in infancy and early childhood. The body volume of the neurons of the inner layer in the left hemisphere of the brain of a newborn baby is 140.0 ± 10.8 μm^3 (see table No. 38, 39), in infancy - 238.6 ± 9.6 μm^3, in early childhood 292.5 ± 12.9 μm^3. Reliable ($p < 0.05$) differences between the newborn and infancy in the left and right hemispheres were established.

In the right hemisphere, the volume of the bodies of the pyramidal neurons in the inner layer of the properentorhinal cortex epr^1 in a newborn is equal to 155.1 ± 11.5 μm^3, in infancy - 250.5 ± 13.1 μm^3, in early childhood 306.1 ± 12, 4 μm^3. Neurons of the inner layer complete their main development in the first childhood, reaching 385.8 ± 15.1 μm^3 on the left, 402.2 ± 11.7 μm^3 on the right. Significant ($p<0.05$) differences were established between infancy and early childhood in the left and right hemispheres, as well as between early childhood and first childhood in the left and right hemispheres.

The body volume of neurons decreases in old and senile age on the left - to 272.0 ± 12.3 μm^3, on the right - to 286.9 ± 10.6 μm^3. Reliable ($p < 0.05$) differences were established between the second period of adulthood and advanced age in the left hemisphere, as well as between advanced age and senile age only in the right hemisphere.

Conclusions: Cortical fields of the entorhinal cortex develop most intensively during infancy, early and first childhood, when the width of the outer layer of the intrinsic entorhinal cortex epr^1 increases compared to the same layer of the newborn in 2.36, the middle layer in 2.46, the inner layer at 1.46.

Intensive growth of a neuron in the intrinsic epr^1entorhinal cortex is observed during infancy, early childhood and first childhood, when there is a significant increase in the width and height of neurons and the volume of neurons in the outer layer of the epr^1 entorhinal cortex. In the left hemisphere in the outer layer, the volume of neurons increases by 3.14 times, in the middle layer by 3.02 times, in the inner layer by 2.68 times.

The main cytoarchitectonic development of the cortical fields of the entorhinal cortex of the human brain ends in the second childhood, when the studied structures in the width of the layers, the size of the cells are mainly formed and in qualitative and quantitative indicators approach a definitive state.

In old and senile age, changes in the structure of the intrinsic entorhinal cortex $epr^1$are observed, which is manifested in a decrease in the width of individual cortical layers, a decrease in the volume of neuron bodies, their height and width. A decrease in the density of neurons in the studied structures is also revealed.

The cytoarchitectonic organization of the intrinsic entorhinal cortex epr[1] of the brain reveals certain individual differences in the width of individual cytoarchitectonic layers, the density of neurons, the width, height and volume of neurons.

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