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The Physiological Role Of Epithalamus In The Body.

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ABSTRACT

Currently, thalamic brain formations are divided into paired formations: the thalamus (visual hillock); metatalamus (ctalamic region); epithalamus (subthalamic region); subthalamus (subthalamic region). A large biological role in it is played by epithalamus - the dorsal structure of the intermediate brain, sometimes called the "Third Eye". Epithalamus or subthalamic region is an anatomical area, including a pineal body, which by means of leashes connects to the medial surfaces of the right and left thalamuses. Great importance in the functioning of epithalamus has an epiphysis. In the postnatal period of ontogeny, the epiphysis reaches its heyday approximately at the age of 5-7 years, after which it undergoes involution, during which the amount of pinaleocytes decreases, calcifications (brain sand) are formed. However, it does not affect its function as a gland of internal secretion. Differences from the norm were noted in the ontogenesis of the epiphysis in the presence of cerebral ischemia and schizophrenia. It is believed that epithalamus has great biological significance in the integration of the human body. It regulates circadian rhythms, participates in the metabolism and formation of consciousness. In the case of dysfunctions of this gland, various disorders can develop, indicating a great functional significance of this gland in the body.

Keywords: brain, epiphysis, biorhythms, epithalamus, regulation.

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INTRODUCTION

Currently, thalamic brain formations are divided into paired formations: the thalamus (visual hillock); metatalamus (ctalamic region); epithalamus (subthalamic region); subthalamus (subthalamic region). A large biological role in it is played by epithalamus - the dorsal structure of the intermediate brain, sometimes called the "Third Eye" [1].

Epithalamus or subthalamic region is an anatomical area, including a pineal body, which by means of leashes connects to the medial surfaces of the right and left thalamuses.

The epithalamic region is located dorsally with respect to the caudal sections of the visual hillock and occupies a relatively small volume. It includes a triangle of leashes, formed as an extension of the caudal part of the thalamus brain strips and the nuclei of leashes located at its base [2,3]. The triangles are connected by a commissure of leashes, in the depth of which the rear commissure passes. On leashes - paired strands, starting from a triangle, an unpaired pineal body is suspended, or an epiphysis - a conical formation of about 6 mm in length. In the anterior part it is connected with both commissures and the subcommissioned organ lying in the posterior wall of the third ventricle [4,5].

Purpose: to consider the functional significance of epithalamus and its role in the work of endogenous clocks of the human body.

Basics of the morphology of the epiphysis

Epithalamus includes the bridle, connective fibers, posterior dilated part of the brain strip (triangle leash) and pineal body (pineal gland or epiphysis). The triangle of the leash is related to the subcortical centers of smell [6]. The pineal gland is located in the posterior part of the epithalamus, it is as if suspended on leashes that come out of the triangle of the leash.

Epiphysis is considered a gland of internal secretion (pineal gland). It consists of glial cells and special cells of pinealocytes. It is innervated by the nuclei of the leashes, fibers of the cerebral strips of the posterior commissure and the projection of the superior cervical sympathetic ganglion are also suitable. Axons entering the gland branch out among the pinealocytes, ensuring the regulation of their activity. Among the biologically active substances produced by the epiphysis are melatonin and substances that play an important role in the regulation of development processes, in particular, puberty and adrenal activity [7].

The size of the pineal gland in a man in adulthood is about 0.2 cubic centimeters. And the weight during the life varies from 7 to 430 mg and depends on the sex and age components, as well as on the place of residence.

Most of the substances pineal gland produces, when they are most needed: in childhood and adolescence. Over the years, the secretory activity of the organ decreases.

The most important substances that synthesize gland cells are indoles and peptides. The former are made from serotonin and transform into melatonin at night. The latter help maintain normal immunity, metabolism and vascular tone [8].

Hormones of the pineal gland and their functions

Hormones of the epiphysis are a product of the endocrine system of the body. Another name for the organ that produces them is the pineal gland, also called the pineal gland. It is located between the cerebral hemispheres. Its physiological and functional role has not been sufficiently studied. But it has already been proved that the pineal body ensures the regulation of the sleep and wakefulness regime, participates in the regulation of the processes of age-related changes and has an effect on carbohydrate metabolism [9].

The effect of melatonin on the body is very diverse. The hormone can be regarded as a chemical signal for all cells in the body that the time of the day has changed.

Cells perceive this signal through a system of special sensory elements (receptors). After the tissues detect melatonin in the blood, their functional activity changes [10].

Enzymes of the pineal gland can synthesize the hallucinogen - 5-methoxydimethyltripatamine, which is associated with unusual sensations and experiences of distorting the sense of time and space. Therefore, in the eastern practices, the epiphysis is called the "third eye", the "organ of intuition". The Indian researcher R. Singh developed a system of exercises that activate the functions of the epiphysis, which included psycho-physical exercises using sound, aroma, color and diet therapy. It is proved that melatonin has antioxidant properties superior to vitamin E.

Interleukins and cytokines (gamma-interferon) cause the synthesis and release of melatonin. The oncostatic activity of melatonin was also revealed, in patients with lung cancer, melatonin, when combined with chemotherapy, improved the duration and quality of life [11].

Melatonin also has a positive effect on epilepsy, since its administration is accompanied by a decrease in the frequency of seizures and optimization of the shape of the curve on electroencephalography. In some studies, the administration of high doses of melatonin together with phenobarbital led to stabilization in the case of exacerbation of myoclonic epilepsy, which had previously been unsuccessfully treated with various combinations of anticonvulsants.

A lot of scientific facts testify to the relationship between melatonin and the psychic sphere. It has been proven that melatonin levels decrease with depression. In patients with bipolar disorders, the melatonin level is lowered during periods of depression, and at the time of manic agitation, on the contrary, it rises. In addition, in individuals with suicidal risk, the night peak of melatonin in the blood is reduced.

In patients with insomnia, the melatonin level is lowered, and its administration eliminates insomnia. Melatonin is directly associated with circadian rhythms, such as sleep-wakefulness, eating - hunger, rest-physical activity. It can be said that melatonin is a marker of the work of the body's internal clock. He is compared to a conductor or synchronizer of physiological processes in the body.

Melatonin as an anesthetic is successfully used to stop pain attacks in cancer, headache and surgical operations [12].

Melatonin shows activity as: antioxidant; immunostimulant; oncostatic; anticonvulsant; antidepressant; sedatics; synchronizer; plant growth factor; analgesic; anxiolytic.

Pathology of the epiphysis

The activity of hydroxyindole-orthomethyltransferase changes significantly not only from the level of insolation, but also under the influence of various ranges of technogenic electromagnetic radiation, causing disruptions in the coordinating activity of the epiphysis with respect to the adenohypophysis. The general pathogenesis of functional epiphyseal disorders complements the synthesis disorders of unidentified peptides, which introduce disorder into the activity of the hypothalamic-pituitary secretory apparatus and other endocrine glands. Their consequences are manifested in the form of diseases of "civilization" [13].

Thus, violations of the natural diurnal light regime lead to the failure of the sleep-wake cycle and the occurrence of sleep disorders, the disease of time zone change, depressions and psychoses. Microwave radiation from household appliances suppresses the production of melatonin and the secretion of opioid neuropeptides regulated by it. In turn, the lack of opioids postulates a decrease in the activity of the cellular antioxidant system and antitumor immunity, a weakening of positive emotions. As a result, the psyche and sleep are disturbed, the risk of carcinogenesis in the dairy and prostate gland is increased. A direct correlation was established between the time spent at the computer and the frequency of juvenile (juvenile) diabetes mellitus. In this case, the lack of melatonin activates the insular apparatus and eventually depletes it [14].

The absence of the inhibitory effect of melatonin on the formation of the reproductive system manifests itself in its premature maturation (towards the end of the first decade of life, and in some cases even earlier). Mostly boys are sick (androthropism).

Hypopinesualism, as a specific pathology, usually develops at an early age almost exclusively in males. In 50% of cases, it is caused by a germinome germinating in the suburbs, a teratoma from the embryonic cells that did not migrate to the gonads. The tumor squeezes adjacent tissues, causing their atrophy and dysfunction: progressive decline in vision, diabetes insipidus, hypogonadism hydrocephalus. In a number of cases, germinoma produces chorionic gonadotropin, which causes premature puberty and growth acceleration.

In 25% of cases with hormone-forming tumors - astrocytomas and gliocytomas, a syndrome of hypergenitalism or macrogensisomia (Pelizzi syndrome) is formed. Its pathogenesis is associated with a decrease in the production of melatonin, which inhibits the activity of hypothalamic gonadoliberin-restraining centers. Macrogenitosomia is much more common in boys (95%) and is manifested by early (up to 10 years) puberty. Pathology is accompanied by accelerated growth of the musculature and skeleton, but due to the influence of androgens and early ossification, there is no high growth. Premature puberty is sometimes observed in congenital aplasia (hypoplasia) of the epiphysis [15].

Hyperpinealism develops as a result of tumors (pinealom) from hormone-producing cells secreting excess gonadostatin. As a result, a symptom complex is formed: the eunuchoid form and sexual infantilism, high growth and long limbs, obesity and insulin resistance. In addition to the epiphysis, melatonin is produced in other organs, for example, by intestinal gadolinia [16].

Also, studies were conducted, during which the following results were revealed.

It is known that in the postnatal period of ontogeny, the epiphysis reaches its heyday approximately at the age of 5-7 years, after that it undergoes involution, during which the amount of pinaleocytes decreases somewhat, calcifications (brain sand) are formed. However, on its implementation, as a gland of internal secretion, this does not affect. In the course of the study, differences were noted in the onset of epiphysis in the presence of brain ischemia and schizophrenia, which corresponds to the data of other researchers [17].

In the case of ischemia, the amount and size of calcifications in the epiphysis significantly increases, which, according to some data, indicates its more active involution in this disease [18].

In the case of schizophrenia, the calcification of the pineal gland is almost non-existent even in middle-aged people, whereas normal, brain sand can be found in children 7 to 8 years, suggesting a possible slowdown in the involution of the pineal gland. The absence of brain sand in children under 3 years old and with mental disorders can be an indirect evidence of the importance of the epiphysis in the formation of consciousness [19].

CONCLUSION

Epithalamus has great biological significance in the human body. It regulates circadian rhythms, participates in the metabolism and formation of consciousness. In the case of dysfunctions of this gland, various disorders can develop, indicating a great functional significance of this gland in the body.

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