сосудов, которые обеспечивают активизацию процесса остеогенеза, остается тонкий слой. Внешне наблюдаются вновь образованные костные фрагменты, которые вглубь канала сливаются и увеличиваются в размерах. Таким образом, можно утверждать, что процесс формирования кости начинается со дна канала, постепенно распространяясь к поверхности.

Ключевые слова: дентальная имплантация, структурные особенности, костная ткань.

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the activation of the process of osteogenesis, a thin layer remains. Externally, newly formed bone fragments are observed, which merge deep into the channel and increase in size. Thus, it can be argued that the process of bone formation begins from the bottom of the channel, gradually spreading to the surface.

Key words: dental implantation, structural features, bone tissue.

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HISTOMORPHOMETRIC STUDY OF EPITHELIAL LAYER OF HUMAN SPHENOIDAL SINUS MUCOSA

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The peculiarities of the morphological structure of the mucous membrane of the nasal cavity and paranasal sinuses should be considered while performing functional endoscopic interventions on the paranasal sinuses. To avoid the majority of pathomorphological errors, a diagnostician must be an expert in the morphological features of the study material. Therefore, a qualitative biopsy diagnostics requires detailing on the structure of the mucous membrane of different walls of the human normal sphenoidal sinus mucosa. The present study histomorphologically evaluated the homogeneity of the cellular composition of the pseudostratified ciliated columnar epithelium of the mucous membrane, lining the different walls of the human sphenoidal sinus mucosa. It has been found that each wall has its cytological picture, which in our opinion depends on certain functional purpose.

Keywords: sphenoidal sinus, mucous membrane, ciliated epithelium.

The work is a fragment of the research project "Consistent patterns of morphogenesis of organs, tissue and vascular nerves in health, disease and under the influence of external factors", state registration No. 0118U004457.

The peculiarities of the morphological structure of the mucous membrane of the nasal cavity and paranasal sinuses should be considered while performing functional endoscopic interventions on the paranasal sinuses [7, 9, 13]. Morphological inflammatory substrate is an alteration of the ciliated epithelium, which resulted in its desquamation and is a morphological substrate for the retardation of mucociliary transport and recurrence of the disease [6, 8, 11, 14]. Increased number of the goblet cells, squamous cell metaplasia of the respiratory epithelium, pronounced sclerotic changes in the lamina propria, deficiency of the regenerative process also indicates about irreversible changes in the epithelial lining of the paranasal sinuses [3, 5]. Therefore, a qualitative biopsy diagnostics requires detailing on the structure of the mucous membrane of different walls of the human normal sphenoidal sinus mucosa [8, 13]. Publications report about histological features that were found on different walls of the maxillary sinus, cellular cavities of the ethmoidal labyrinth [4, 12]. In this regard, we conducted a thorough study of different regions of the sphenoidal sinus mucosa.

The purpose of the work was to perform a histological and morphometric study of the pseudostratified ciliated columnar epithelium of the mucous membrane, lining the different walls of the human sphenoidal sinus mucosa.

Materials and methods. Histological study of the mucous membrane of the human sphenoidal sinus of 25 individuals (20 men and 5 women), died for the reasons not associated with the ENT-pathology, have been carried out. The sphenoidal sinus was studied at Poltava Regional Bureau of Autopsy and Department of Morbid Anatomy at Poltava Regional Clinical Hospital.

To obtain the mucous membrane samples the access to sphenoidal sinus was made using the method suggested by Abrikosov A.I [1]. In this way, 2 ml 10% formalin solution was administered into the suinus with a syringe for 1-2 minutes for fixation and compression of the mucous membrane to obtain the sample. A compressed structure of the tissue enabled obtaining the mucous membrane from each separate wall of the sphenoidal sinus (except the superior one) for the spot study of the morphofunctional features of its structural elements.

After fixation in 10% formalin solution, histological material was embedded into paraffin according to conventional technique [10].

Sections were obtained by the microtome equipped with the section receiving tray (Microm HM-340) to prepare serial sections and carry out histological studies. Paraffin sections of 4-6 μm thick were

stained with hematoxylin and eosin according to conventional technique, followed up with microscopic and morphometric study.

Morphometric measurements were performed in typical histostructural regions of the mucous membrane of human sphenoidal sinus. Not less than 200 cellular elements, previously magnified after microimaging by 2000 times, have been studied.

On the images, the large (D) and small (d) diameters of nuclei of cellular elements were measured, and two-dimensional empirical distributions were made up. The logarithm of the nuclei volume taken for the ellipsoid of rotation was calculated by formula 1:

$$\mathbf{lgV=lgd^2Dk^3}; \quad (1)$$

where D – large diameter of the nucleus, d – small diameter of the nucleus, k – magnification factor.

Histograms of the logarithm of the nucleus volume (karyogram) were made up for each observation and polymorphism of the nuclei in the presence of the peaks of nuclear classes was studied; the distance of the center of the nucleus from the basal membrane was also measured.

Mathematical data processing was carried out at the Department of Pathological Anatomy with Autopsy of Ukrainian Medical Stomatological Academy according to conventional methods adopted in morphology [2].

Results of the study and their discussion. Histomorphometric evaluation of pseudostratified ciliated columnar epithelium, lining different walls of the sphenoidal sinus has been made. The findings of the research have established a certain cellular heterogeneity of the ciliated epithelium of the mucous membrane of the sinus.

Individual regions of the mucous membrane are covered with pseudostratified ciliated columnar epithelium containing numerous ciliated cells. The latter contain a large number of cilia on the apical surface, ensuring evacuation of dust particles due to its contractile properties. The nuclei of these cells are oblong or orbicular and are located near the apical surface. Goblet cells are arranged sporadically and contain a secretion that pushes off the nucleus slightly to the basal membrane. Microvillous cells occupy the middle location of the nuclei, and short or long intercalated cells adhere directly to the basal membrane.

Submucous layer, containing microvessels without clearly defined lumen and surrounded by mesenchymal cells with elongated nuclei, is located beneath the basal membrane. This type of ciliated epithelium is found on the lateral walls of the sphenoidal sinus (fig. 1).

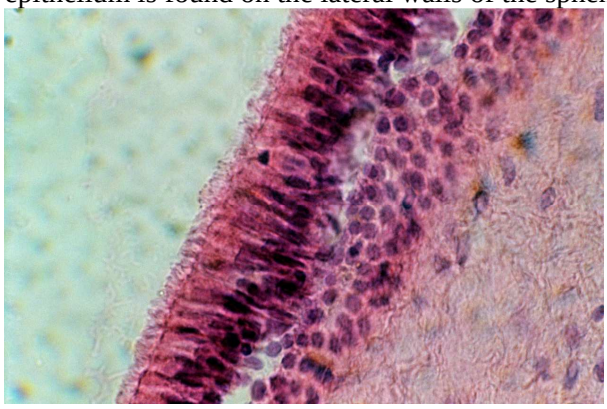

Fig 1. Structure of the pseudostratified ciliated columnar epithelium of the lateral wall of the sphenoidal sinus mucosa. H&E stain. 20×10 magnification.

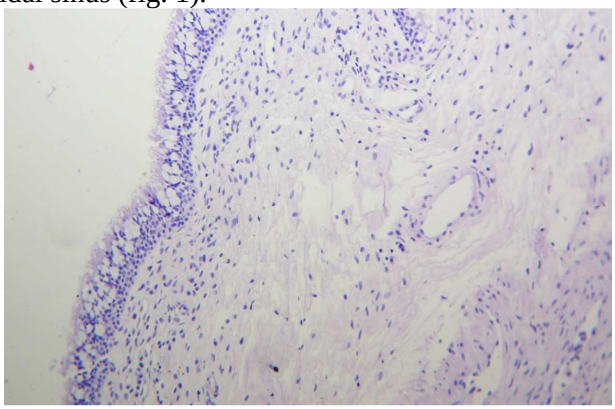

Fig 2. Mucous membrane of the anterior wall of the sphenoidal sinus. H&E stain. 10×10 magnification.

Regions of the sphenoidal sinus mucosa where mainly goblet cells are located, in contrast to lateral walls, have been found. This type of epithelium is presented in fig. 2. Thin sections stained with hematoxylin and eosin have shown that epithelium of the mucous membrane is comprised with goblet and intercalated cells. On their apical surface goblet cells have no cilia and are with bulb-shaped appearance. Depending on the phases of the secretory cycle, their nuclei are located either near the apical surface, or, due to the accumulation of secretion, the nuclei of the goblet cells are pushed off to the basal membrane. Intercalated cells are located directly on the basal membrane. They have a two-row structure due to the different location of the nucleus in relation to the basal membrane. The submucosal layer of the sphenoidal sinus mucosa is represented by a loose connective tissue, which consists of numerous microvessels, as well as fibroblasts and fibrocytes. It has been found that the regions are located on the anterior and inferior walls of the sphenoidal sinus.

The findings of the study of serial histological sections showed that in the mucous membrane of the sphenoidal sinus posterior wall the growth zones of predominantly ciliated epithelium were found.

The latter, unlike the multilayered ciliated epithelium of the previous walls, are characterized by the epithelial vegetations into underlying loose connective tissue.

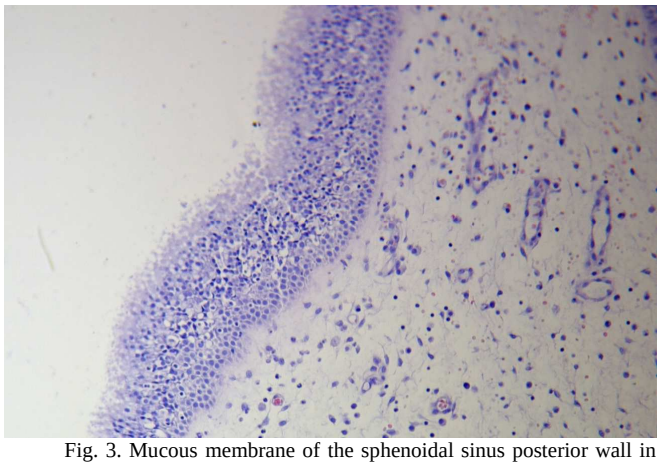

Fig. 3. Mucous membrane of the sphenoidal sinus posterior wall in the growth zone. H&E stain. 20×10 magnification.

The connective tissue is separated from the epithelium by a blurred basal membrane due to the different location of short and long intercalated cells. It should be noted that the growth zones are mostly represented by microvillous cells that have a chaotic location and different shape of nuclei. Along with the microvillous cells, goblet cells with different secretion content in the cytoplasm are constantly found, whilst the ciliated cells are sporadic. Submucous layer located in the growth zone consists of a loose connective tissue with a high content of microvessels (fig. 3).

In order to create a morphometric model of the localization of the pseudostratified ciliated columnar epithelium of different walls of the mucous membrane of the sphenoidal sinus, we carried out their karyometric studies with the measurement of the distance of the center of the nucleus of individual cells to the basal membrane and the measurement of the nucleus volume in a common logarithm. The results are shown in Table 1.

Table 1

Morphometric indices of the pseudostratified ciliated columnar epithelium of the mucous membrane of different walls of the human sphenoidal sinus

Type of cell	Distance of the nucleus center from b/m, µm			Large diameter of the nucleus, µm			Small diameter of the nucleus, µm			Logarithm of the volume of nucleus		
	Medial and lateral walls	Anterior and inferior walls	Posterior wall	Medial and lateral walls	Anterior and inferior walls	Posterior walls	Medial and lateral walls	Anterior and inferior walls	Posterior wall	Medial and lateral walls	Anterior and inferior walls	Posterior wall
Short intercalated	4,43± 0,11	4,67±0, 30	4,10±0, 20	6,48± 0,10	8,80±0, 30	7,20±0, 30	4,13± 0,01	5,40±0, 15	5,26±0, 34	1,42± 0,15	2,14±0, 03	2,07±0, 04
Long intercalated	8,10± 0,20	7,00±0, 43	8,07±0, 11	7,40± 0,01	8,70±0, 30	7,16±0, 27	4,00± 0,06	5,30±0, 13	5,68±0, 23	1,52± 0,30	2,09±0, 02	2,06±0, 05
Goblet	16,00 ±0,25	*14,03 ±0,14 **18,0 ±0,1	*14,07 ±0,06 **17,9 ±0,1	6,90± 0,44	*8,80± 0,20 **8,94 ±0,30	*7,01± 0,37 **7,08 ±0,30	3,40± 0.12	*5,20± 0,17 **5,50 ±0,60	*4,79± 0,25 **5,50 ±0,60	1,23± 0,30	*2,08± 0,03 **2,19 ±0,07	*1,92± 0,05 **2,19 ±0,07
Microvillous	26,30 ±0,30	-	20,28± 0,09	8,55± 0,34	-	7,18±0, 33	4,15± 0,23	-		1,29± 0,50	-	2,00±0, 08
Ciliated	39,79 ±0,15	-	-	9,29± 0,44	-	-	4,00± 0,12	-	-	1,42± 0,20	-	-

*- Goblet cell at the phase of excretion;

**- Goblet cell at the phase of secretion.

The results of our morphometric studies indicate that short intercalated cells are located directly on the basal membrane, whose nuclei are at a distance of 4,43 ± 0,11 µm from it and have lgV 1,43 ± 0,15, and the center of nuclei of long intercalated cells is located at a distance of 8.1 ± 0.2 µm from the basal membrane and lgV 1.52 ± 0.3. It should be noted that between the lgV of the nuclei of short and long intercalated cells statistical reliability has not been found, which evidently testifies to their histogenetic affinity [7, 13]. In isolated goblet cells, the nucleus center distance from the basal membrane is 16.0 ± 0.25 µm and lgV 1.23 ± 0.3. Microvillous cells are at a distance of 26.3 ± 0.3 µm and lgV 1.2 ± 0.5. Finally, ciliated cells are most distant, their distance from the core center from the basal membrane is 39.79 ± 0.15 µm and lgV is 1.42 ± 0.2. The difference between lgV of the ciliated and microvillous cells is about 0.2, which, according to the Benninghoff caryometric law, indicates an integrative increase in the nuclei. Consequently, the medial and lateral walls of the mucous membrane of the sphenoidal sinus are

represented by a pseudo-layered, circular, cylindrical epithelium, and, in our opinion, consists of two different histogenetic components [9, 14]. The first of them is represented by short and long intercalated cells, and the other is represented by different in function goblet, microvillous and ciliated cells.

When conducting morphometric studies regarding the composition of the cellular elements of the pseudo-layered ciliated epithelium of the anterior and the inferior walls, we found that the nuclei of short intercalated cells are at a distance of 4.67 ± 0.3 μm from the basal membrane, IgV 2.14 ± 0.03, nuclei of long intercalated cells are located at a distance of 7.0 ± 0.43 μm, lgV 2.09 ± 0.2, the centre of the nuclei of goblet cells in the phase of secretion is removed from the basal membrane by 14.03 ± 0.14 μm, lgV is 2.08 ± 0, 03, and the nuclei of the goblet cells in the phase of secretion are removed from the basal membrane by 18,4 ± 0,11 μm, lgV - 2.19 ± 0.07.

In this work we carried out cariometric studies of pseudo-multilayer, ciliated, cylindrical epithelium of the mucous membrane of the posterior wall of the sphenoidal sinus. The centre of the nuclei of short intercalated cells is at a distance of 4.10 ± 0.2 μm from the basal membrane, and long intercalated cells - at a distance of 8.07 ± 0.11 μm, lgV nuclei of these cells are not significantly different and are 2.07 ± 0.04 and 2, 06 ± 0.05, respectively. Microvillous cells have a logarithm of the volume of nuclei 2,0 ± 0,08, centres of their nuclei are at a distance of 20,08 ± 0,09 μm from the basal membrane. The nuclei of the goblet cells, depending on the secretion phase, are located either at a distance of 14.07 ± 0.6 μm or 17.94 ± 0.11 μm and lgV varies from 1.92 ± 0.05 to 2.19 ± 0.07.

Thus, the result of the morphometric studies of the posterior wall of the mucous membrane of the sphenoidal sinus with the predominant position of the zones of growth indicates that it is in these zones, in contrast to the previous types of epithelium, the microvillous cells, which are histogenetically linked both with the goblet and with ciliated cells, are located next to the intercalated cells [7, 8, 9, 13].

Conclusion

It has been established that different walls of the human sphenoidal sinus mucosa have their cytological features. Thus, the findings of our research have found that the lateral walls are covered with pseudostratified ciliated columnar epithelium with predominant content of the ciliated cells, the anterior and inferior walls of the sphenoidal sinus mucosa are represented mainly by the goblet cells, and on the posterior wall, which contains a large number of growth zones, microvillous cells are located alongside the intercalated cells.

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Реферати

ГІСТОМОРФОМЕТРИЧНЕ ДОСЛІДЖЕННЯ ЕПІТЕЛІАЛЬНОГО ШАРУ СЛИЗОВОЇ ОБОЛОНКИ КЛИНОПОДІБНОЇ ПАЗУХИ ЛЮДИНИ

Совгиря С.М.

При виконанні функціональних ендоскопічних втручань на приносових пазухах необхідно враховувати особливості морфологічної будови слизової оболонки

ГИСТОМОРФОМЕТРИЧЕСКОЕ ИССЛЕДОВАНИЕ ЭПИТЕЛИАЛЬНОГО СЛОЯ СЛИЗИСТОЙ ОБОЛОЧКИ КЛИНОВИДНОЙ ПАЗУХИ ЧЕЛОВЕКА

Совгиря С.Н.

При выполнении функциональных эндоскопических вмешательств на околоносовых пазухах необходимо учитывать особенности морфологического строения

порожнини носа і приносових пазух. Щоб уникнути більшості патоморфологічних помилок, лікар-діагност повинен чітко розумітися на морфологічних особливостях матеріалу дослідження. Тому для якісної біопсійної діагностики необхідна деталізація будови слизової оболонки різних стінок клиноподібної пазухи людини в нормі. В даному дослідженні гістоморфологічними методами оцінювались однорідність клітинного складу псевдобагатошарового війчастого циліндричного епітелію слизової оболонки, що вистилає різні стінки клиноподібної пазухи людини. Було встановлено, що кожна стінка має свою цитологічну картину, яка, на нашу думку, залежить від певних функціональних обов'язків.

Ключові слова: клиноподібна пазуха, слизова оболонка, війчастий епітелій.

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слизистой оболочки полости носа и околоносовых пазух. Чтобы избежать большинства патоморфологических ошибок, врач-диагност должен четко разбираться в морфологических особенностях материала исследования. Поэтому для качественной биопсийной диагностики необходима детализация строения слизистой оболочки различных стенок клиновидной пазухи человека в норме. В данном исследовании морфологическими методами оценивались однородность клеточного состава псевдомногорядного мерцательного цилиндрического эпителия слизистой оболочки, которая выстилает разные стенки клиновидной пазухи человека. Было установлено, что каждая стенка имеет свою цитологическую картину, которая, по нашему мнению, зависит от определенных функциональных обязанностей.

Ключевые слова: клиновидная пазуха, слизистая оболочка, мерцательный эпителий.

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INFLUENCE OF NANOPARTICLES OF LEAD ON THE ORGANIZM OF SUSPICIOUS ANIMALS WHEN USING WATER WITH CONTENT OF SODIUM AND SUNPATE STEARATES

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In our time, the important and urgent problem is the influence of heavy metals on the organism of an animal and people. It is known that their presence in nature is a normal phenomenon. However, due to the active human activity, the concentration of various xenobiotics increases rapidly. Particular danger is lead compounds, which have a high ability to move on tropic chains and accumulate in different organs. At present, special attention is being given among scientists to questions about the impact on the body of nanomaterials of heavy metals and, including, of lead. In modern conditions, in various sources of water of economic, drinking and cultural and household water use, in addition to heavy metals, there are also significant amounts of surface-active substances, which include sodium stearates and potassium. The purpose of the study was to investigate the effect of lead nanoparticles on the background of water use of animals with sodium stearate and potassium stearate on the bone marrow and peripheral blood of white rats. Thus, with the combined effect of lead nanoparticles in a dose of 70 mg / kg and sodium and potassium stearates on the body of the experimental rats, there was a more significant increase in the bone marrow of the number of pro-myelocytes, rodenuclear and segmental neutrophils, lymphocytes, normo-cytes, and a more significant decrease in myelocytes and meta-mylocytes than with a separate effect of nanoparticles of lead. Lead nanoparticles against the background of drinking water of various compositions caused an increase in the number of rodenuclear neutrophils, eosinophils, monocytes, lymphocytes and a decrease in the number of segmental neutrophils in the blood of experimental animals. When introducing nanoparticles, there were phenomena of anisocytosis, pocillocytosis and hypochromia of red blood cells. In animals that consumed water with sodium stearate followed by oral administration of lead nanoparticles, the amount of leukocyte blood cells was significantly higher compared to animals that consumed water with potassium stearate.

Key words: lead nanoparticles, drinking water, sodium stearate, potassium stearate, bone marrow, peripheral blood.

The work is a fragment of the research project "Biochemical mechanisms of toxicity of nanoparticles of different nature and other anthropogenic and biogenic toxicants in biological systems", State registration No. 0112U000542.

During the last decades, lead and its compounds have become frequent causes of ecologically determined and occupational pathology of chemical genesis. Lead and its compounds are widely used in the industry: machinery and instrumentation, radio electronics, battery, cable, printing, non-ferrous metal smelting, ferrous metallurgy, crystal production, paints and enamels for the porcelain industry, and others. [2, 10]. It enters the body by inhalation in the form of dust, aerosol, and vapors and through the gastrointestinal tract [3, 5, 6, 9, 12, 13].

In modern conditions, industrial pollution of the environment is quite significant and has a negative impact on the body. It has pronounced cumulative properties and accumulates in the bones. However, under the influence of certain conditions, its reserves in the bones become mobile; it transits into the bloodstream and can cause acute poisoning [11]. A powerful source of lead in the human body is drinking water, which, as a rule, causes an increase in its concentration in the blood [1, 4, 7, 8].

Recently, scientists are interested in the influence of nanoparticles (NP) lead on biological objects, because they are characterized by small size and a large total surface area. NP possesses a complex of physical, chemical properties and biological action, often radically different from the properties of the same element in the form of macroscopic dispersions [1, 4].