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MORPHOLOGICAL CHARACTERISTICS OF THE ORGANIZATIONAL STRUCTURE OF LOCAL IMMUNE PROTECTION IN THE HUMAN MAXILLARY SINUS MUCOSA

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Introduction. Currently, the problem of odontogenic maxillary sinusitis continues to be important, especially in dental and ENT practice. In this regard, the profound investigations of the maxillary sinus remain relevant nowadays.

The aim of the study was the morphological investigation of the local immune protection structure in the human maxillary sinus mucosa.

Objects and methods. The maxillary sinus mucosa of 52 people aged 30–87 years of both genders was taken as the material for research. The mucosa fragments were fixed in 2.5% solution of glutaraldehyde; semi-thin sections were stained with 1% solution of toluidine blue.

Results. The studies conducted, made it possible to determine that intraepithelial lymphocytes, as a part of the wall epithelium of the terminal parts in the glands of the maxillary sinus mucosa, provided local immune protection. In the connective tissue surrounding the terminal parts of the glands, cells of the leukocyte type, namely, macrophages, mast cells, less often lymphocytes were constantly determined periductally and perivascularly. Plasma cells were located mainly around the excretory ducts of the mucosa glands, since their functions included IgA production, which was excreted with secretion on the epithelial layer surface.

Conclusion. Since the maxillary sinus mucosa is significantly affected by various adverse exogenous and endogenous factors, it has a powerful local immune system.

Keywords: maxillary sinus; local immunity; mucosa.

МОРФОЛОГИЧЕСКАЯ ХАРАКТЕРИСТИКА ОРГАНИЗАЦИИ МЕСТНОЙ ИММУННОЙ ЗАЩИТЫ В СЛИЗИСТОЙ ОБОЛОЧКЕ ВЕРХНЕЧЕЛЮСТНОЙ ПАЗУХИ ЧЕЛОВЕКА

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Введение. На сегодня проблема одонтогенного верхнечелюстного синусита продолжает оставаться важной, особенно, для стоматоло-

гической и оториноларингологической практике. В связи с этим, разносторонние исследования верхнечелюстной пазухи не теряют своей актуальности и в наше время.

Целью работы – исследование на морфологическом уровне организации местной иммунной защиты в слизистой оболочке верхнечелюстного синуса человека.

Объекты и методы. Объектом исследования – слизистая оболочка верхнечелюстных пазух 52 человек обоего пола, в возрасте 30–87 лет. Фрагменты слизистой оболочки фиксировали в 2,5% растворе глутаральдегида, полутонкие срезы окрашивали 1% раствором толуидинового синего.

Результаты свидетельствовали, что в составе эпителия стенок конечных отделов желез слизистой оболочки верхнечелюстной пазухи местную иммунную защиту осуществляют интраэпителиальные лимфоциты. В соединительной ткани, окружающей конечные отделы желез, перипротоково и периваскулярно постоянно определяются клетки лейкоцитарного ряда: макрофаги, мастоциты, реже – лимфоциты. Плазматические клетки располагаются преимущественно вокруг выводных протоков желез слизистой оболочки, поскольку в их функции входит продукция IgA, который с секретом выходит на поверхность эпителиального слоя.

Заключение. Поскольку слизистая оболочка верхнечелюстной пазухи пазух испытывает существенное влияние различных неблагоприятных экзо- и эндогенных факторов, она имеет мощную систему местной иммунной защиты.

Ключевые слова: верхнечелюстная пазуха; местный иммунитет; слизистая оболочка.

Introduction. The issues on prevention, diagnosis and treatment of odontogenic maxillary sinusitis have always been of interest to the dental and ENT specialists. Numerous scientific investigations dealing with the etiological and pathogenetic mechanisms, clinical manifestations as well as new methods of treatment for the pathology mentioned have been carried out in recent years. However, the number of patients with odontogenic chronic maxillary sinusitis does not tend to decrease. The disease can easily develop a chronic course, which often accompanied by local and general complications. Only 40–60% of patients with this pathology recover after the treatment. Therefore, further profound morphological investigations of the maxillary sinus remain relevant for the present-day medical science [2].

The maxillary sinus is topographoanatomically and functionally related to the nasal and oral cavities, the orbit and deep structures of the face. It should be considered while performing surgery, which involves this area [1,

3]. A large number of scientific studies investigated the topographoanatomical, physiological and pathophysiological aspects of the maxillary sinus morphogenesis at different stages of its development. The morphological and functional features of the maxillary sinus mucosa and its structural elements were less well studied, which is a significant disadvantage, since it is primarily involved in the pathological process in case of inflammatory diseases [2].

The aim. The study was aimed at morphological investigation of the local immune structural organization of the human maxillary sinus mucosa.

Objects and methods. The study was carried out according to the International standards on biomedical research. The maxillary sinus mucosa of 52 persons aged from 30 to 87 of both genders died from causes non-related to the paranasal sinus pathology was taken as the material for research. The mucosa fragments were fixed in 2.5% glutaraldehyde solution and embedded in Epon-812 according to the standard technique. The semi-thin sections were obtained applying ultramicrotome “Selmi” UMTP-7 (Ukraine, Sumy) and stained with 1% toluidine blue solution.

Results. Histological examination of semi-thin sections of the maxillary sinus mucosa determined that on the outside it was covered with pseudostratified epithelium consisting of ciliated, goblet, as well as short and long intercalated epithelial cells. The ratio of ciliated cells to goblet ones is 5:1.

The basement membrane consisting of fibrous connective tissue is located directly beneath the epithelium. It contacts with a layer of smooth muscle fibers and passes through the submucosal layer to the periosteum. The lamina propria mucosae contains a large number of nerve fibers, blood and lymph vessels.

The compound branched tubuloalveolar glands consisted of the terminal parts and excretory ducts are located in the human maxillary sinus mucosa.

The wall of the terminal parts of glands consisted of low-prismatic cells. The study has determined that the apical cytoplasm of epithelial cells contained small visually dense secretory granules. While examining the terminal parts of the glands of the anterior frontal sinus, we revealed the cells at different stages of the secretion process as well as cambial cells, which were small in size and located on the basement membrane between the basal parts of neighboring epithelial cells. The epithelium of the terminal part walls contained single intraepithelial lymphocytes, which indicated the presence of local immune protective system in the secretory glandular epithelium of the human maxillary sinus mucosa. Moreover, the localization of leukocyte type cells, namely, macrophages, mast cells, and in some cases, lymphocytes in the connective tissue surrounding the terminal parts and the ducts proved the

data above. Mastocytes with centrally located nuclei were determined quite often in the state of degranulation.

The walls of the excretory ducts of the mucosa glands were formed by the low-prismatic epithelial cells. Nuclei containing the significant amount of decondensed chromatin were rounded in shape and could be revealed in the basal parts of the weakly basophilic cytoplasm with a small amount of organelles and single secretory granules. They were mainly located in one layer. The surrounding connective tissue contained local immune elements, namely, leukocytes and mast cells in addition to fibroblasts and collagen fibers.

Examination of the connective tissue determined capillary vessels at close proximity to the basement membrane of the terminal areas. Arterioles and venules were localized in the periductal connective tissue. The structure of their wall corresponded to the classical scheme – a layer of endothelial cells was placed on the basement membrane and surrounded by a layer of fibroblasts and collagen fibers. Adventitious cells forming a non-continuous layer were placed outwardly. The local protective barrier was formed by periacinal and periductal diffusely localized lymphocytes, macrophages and plasmocytes, which provided cellular and humoral immunity.

Mast cells with predominantly centrally located nuclei and sufficiently large number of secretory granules in the cytoplasm were determined in periductal area.

The connective tissue of human maxillary sinus mucosa also contained the mixed glands with the terminal parts large in size and consisting of mucous and serous cells.

The wall of the excretory ducts was formed by a single layer of low-prismatic cells with basophilic cytoplasm. The nuclei were localized in the basal parts of the epithelial cells and contained mainly condensed chromatin. The cytoplasm was reticulated. Individual cells showed increased visual density of the cytoplasm. In some cases, the intraepithelial lymphocytes were determined in the duct wall.

Vessels of the hemomicrocirculatory bed were located in the connective tissue at close proximity to the epithelial complexes of these glands. Capillaries forming plexuses around the terminal parts, were determined in the periacinar tissue.

Cells of leukocyte type were constantly visualized in the stroma of mixed glands of the human maxillary sinus mucosa. In the periacinar connective tissue, macrophages and plasmocytes were determined; in the periductal stroma – macrophages, plasmocytes and lymphocytes. Also, mastocytes were localized on the periphery of the glands in loose connective tissue.

The terminal parts of serous glands in maxillary sinus mucosa were formed by cube-shaped cells. Their cytoplasm was basophilic; visually dense

polymorphic secretory granules were determined in the apical parts. The nuclei were localized in the central parts of the cells, the nucleoli were eccentric. Intraepithelial lymphocytes were visualized in the wall of the terminal parts.

Intralobular ducts of serous glands were formed by one, in some cases, two rows of epithelial nuclei. Prismatic cells formed the lining of the ducts; their nuclei formed the inner row. The nuclei of the outer row belonged to the small cambial epithelial cells.

Intraepithelial lymphocytes were detected in the secretory epithelium. The periductal stroma contained insignificant number of leukocytes; mast cells in degranulation state according to the holocrine type were also determined.

Conclusion. Since the maxillary sinus mucosa is affected by various adverse exogenous and endogenous factors, namely, odontogenic, it has a powerful local immune system.

Intraepithelial lymphocytes, as a part of the walls epithelium of the terminal parts in the glands of the maxillary sinus mucosa, provide local immune protection. In the connective tissue surrounding the terminal parts of the glands, the cells of the leukocyte type, namely, macrophages, mast cells, less often lymphocytes are constantly determined periductal and perivascularly in the mucosa. Plasma cells are located mainly around the excretory ducts of the mucosa glands, since their functions include the production of IgA, which is excreted with secretion on the epithelial layer surface.

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