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FEATURES OF THE TOBACCO SMOKING-RELATED RESTRUCTURING OF THE CELLULAR COMPOSITION OF THE ORAL MUCOSA

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The paper presents the findings of the comprehensive morphological study of the oral mucosa in tobacco smokers, obtained during comprehensive and statistic cytological study. The findings specify the described changes as “dyskeratose” or “proliferative” ones, containing cytological criteria for dyskeratosis expressed by impaired keratinization of the epithelium of the anatomic site.

The analysis of the proposed patterns of pathogenesis and the existence of common components at its levels, allows to consider the resulted cytological restructuring, namely, “inflammatory” type of the cytograms and “dyskeratose” as two autonomous processes in the oral mucosa induced by tobacco smoking, as well as the levels of the pathogenic mechanism at the stage of pre-tumor transformation.

Key words: mucous membrane, epithelium, cells, nucleus, cytoplasm.

Recent publications have reported on the increased risk of malignant proliferative processes of the oral mucosa in patients with bad habit of tobacco smoking, which combines the effect of physical and chemical factors [9].

Particular relevance of the study of oral mucosa in smokers is due to medical and social importance of this problem. Currently, smoking is the global social and psychoemotional problem, common among both men and women. Therefore, active measures against smoking have been carried out globally within the framework of the World Health Organization’s project [3].

To date, publications present detailed description of smoking-related changes in the hard tooth tissues, salivary glands, parodentium [5, 8].

However, the oral mucosa, due to its topographic-anatomical features, is the first site affected by smoking. Different components presented in tobacco smoke impact its structure, functions and are considered by a number of authors [1, 10] as the important etiological factors for early aging and pre-tumor states of mucosa with subsequent malignancy [4, 6].

In addition, the initial morphological and functional disturbances that subsequently trigger the disease have not been studied to date.

In particular, no data regarding the features of differentiation and keratinization of various types of mucosal epithelium, its functional disorders, and the essence of the pathological process, caused by smoking, have been found to date.

The awareness of the above parameters will be beneficial in evaluation of early changes, detection of the reserve capabilities and compensatory mechanisms of the oral mucosa to the influence of tobacco smoking. Apparently, it will be valuable in solving the problems regarding the primary prevention of diseases in this anatomical localization, the relevance of which is caused by an extremely low percentage of people who refuse to quit smoking even after personal information about the unsatisfactory state of the oral mucosa [12, 13, 14].

Purpose. The paper is aimed at identification of the pathogenetic patterns of restructuring of the cellular composition of the oral mucosa and cytological criteria for predicting the occurrence of pre-tumor changes in conditions of nicotine intoxication.

Materials and Methods. Buccal epithelium, taken from 25 men of the young age has been studied. The main selection criterion among the subjects was the presence of bad habit, namely, tobacco smoking, the duration of which did not exceed the term of 3 years, and the absence of concomitant somatic pathology. Epithelium was collected with a spatula with the subsequent transfer onto a glass slide and drying in the open air within 3-5 minutes. The Giemsa-Romanowsky stained samples were analyzed microscopically and morphologically, considering the ratio of various forms of epithelial cells in norm.

Parametric methods of statistical processing of the obtained data were used for indicators, distribution of which meets the requirements of normality. To evaluate the nature of distribution, the skewness and kurtosis was determined. The normality check was conducted using the Shapiro-Wilk test. The reliability of differences of the results, obtained for different groups was determined using the Student’s t-test.

The differences were considered reliable according to error probability, generally accepted in the biomedical research ($p<0,05$). The error probability was estimated by Student's tables considering the size of

experimental groups. In cases, where the distribution statistically significantly differed from the normal one, nonparametric Mann–Whitney U test was calculated as a nonparametric analogue to the Student's t-test.

Results and discussion. The Giemsa-Romanowsky stained cellular composition of the cytograms is represented by the parabasal (4,30 ± 0,21), intermediate (76,10±1,61), surface cells (9,10 ±0,42) and horny scales (10,50±0,38).

At the same time, we have noticed a significant decrease in the number of intermediate cells along with increased amount of the surface epitheliocytes and horny scales compared with the identical values in cytograms in norm.

Parabasal and part of intermediate epithelial cells are characterized by the identical cytological organization and correspond to normal cytospecificity of this type of cells. However, their quantitative composition has significantly increased.

Among intermediate epithelial cells, cells with signs of cytopathology in the form of vacuolation of the cytoplasm are visualized. At the same time it should be noted that the vacuoles are predominantly located on the perinuclear surface and do not extend to the poles of the cell. In addition, some of the cytograms reveal the cells with the cytoplasm, changing its tinctorial properties in Giemsa-Romanowsky stain and acquiring different shades of blue color. These changes can be explained by the intensification of accumulated excess of keratohyalinum as a response to chronic irritation of cells, in particular, by the nicotine, in the subjects, resulting in hyperkeratose changes in the cytoplasm of intermediate cells, which creates the preconditions for pathological keratinization. Cells are located mainly in clusters.

Among the hematogenic cells, leukocytes of various functional states are visualized. Noteworthy, the number of leukocytes in the cytograms is less in comparison to the cytograms of the described inflammatory type. The cytoplasm of some of them is well contoured, though degenerative changes in nuclei are detected. Lysed leukocytes are almost absent.

Surface cells contain hyperchromatic pyknotic nuclei, the cytoplasm is not clearly defined, and somewhere is eroded. The peculiarity of demonstrated cytograms is the presence of macrophages that are in a state of functional rest, which, in addition to participation in reactions of non-specific immunity, exhibit themselves in responses of specific host defense to bacterial agents as antigen-presenting cells.

The recent studies assert that macrophages, activated by cytokines, have antitumor activity. It can be related both to the phenomenon of the phagocytic reaction itself and to the process, mediated by TNFα, which is synthesized by the cells of the host defense [11].

In this case, a significant increase in the number of superficial cells with pyknotic nuclei is detected. Fragments of the cytoplasm of these epitheliocytes have the ability to form common spaces between themselves that undergo spiral-shaped folding. The number of horny scales dramatically increases, though their cytological organization remains stereotyped for the final stage of differentiation of epithelial cells. The findings of our study enable to establish the ratio of various types of epithelial cells in the examined subjects (4,30 ±0,42:76,10 ± 1,86:9,10 ±0,67:10,50 ± 0,92). The resulting data significantly differ from the ratio of normal buccal epithelium [2], and from the suggested determined criteria for the examined subjects, considering the age and gender.

A detailed analysis of the presented type of cytograms corresponds to the cytomorphological picture, which reflects a steady tendency towards the development of dyskeratosis, i.e., impaired keratinization of the epithelium.

Qualitative changes in the cells are manifested by a cytospecific organization, which is characteristic for the variety of protein degeneration, namely, the keratin, which is characterized by superfluous formation of keratin substance in the stratum corneum, i.e., hyperkeratosis on the oral mucosa. The presented changes of cellular composition create the preconditions for development on mucosal leukoplakia, which is considered as the pre-tumor states [6, 7].

Quantitative changes are manifested by the percentage reduction of different classes of cells in comparison with the control group, and the appearance of parabasal epithelial cells. Qualitative changes, in turn, are manifested by the change in the tinctorial properties of the components of the cytoplasm, which, in Giemsa-Romanowsky stain, are characterized by a change in the coloration of the cytoplasm in various shades of blue due to increased synthesis and accumulation of keratohyalinum. Numerous epithelial cells have signs of cytopathology in the form of cytoplasmic vacuolization and erosion of the plasmolemic contours. A detailed analysis of the cytograms presents the suggested pattern for dyskeratosis changes in the stratified squamous epithelium induced by nicotine.

Conclusion

The findings of the study have defined the described changes as “dyskeratosis” or “proliferative” one, containing the cytological markers of dyskeratosis in the form of disorders in epithelial keratinization of this anatomical site. The analysis of the suggested patterns of pathogenesis in its sections, as well as the presence of common components, enable to consider the presented cytological restructuring (“inflammatory”

type of cytograms and “dyskeratosis”) as two autonomous processes, occurred on the oral mucosa under the influence of nicotine, and sections of the same pathogenetic mechanism at the stage of pre-tumor transformation.

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Реферати

ОСОБЛИВОСТІ ПЕРЕБУДОВИ КЛІТИННОГО СКЛАДУ СЛИЗОВОЇ ОБОЛОНКИ ПОРОЖНИНИ РОТА НА ТЛІ ТЮТЮНОПАЛІННЯ

Гасюк Н.В., Єрошенко Г.А., Майструк П.О.

В статті приведені результати комплексного морфологічного дослідження слизової оболонки порожнини рота у курців, отримані шляхом комплексного цитологічного та статистичного вивчення. Приведені результати, дають можливість характеризувати описані зміни, як «дискератозні» або «проліферативні», які в собі несуть цитологічні ознаки дискератозу у вигляді порушення зроговіння епітелію даної анатомічної ділянки. Аналіз запропонованих нами схем патогенезу,і наявність спільних складових, в його ланках, дає можливість розглядати приведену цитологічну перебудову – «запальний» тип цитограм та «дискератозний» як два автономних процеси, які виникли на слизовій оболонці порожнини рота за умов впливу нікотину, так і ланки одного і того ж патогенетичного механізму на етапі передпухлинної трансформації.

Ключові слова: слизова оболонки, епітелій, клітини, ядро, цитоплазма.

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ОСОБЕННОСТИ ПЕРЕСТРОЙКИ КЛЕТОЧНОГО СОСТАВА СЛИЗИСТОЙ ОБОЛОЧКИ ПОЛОСТИ РТА НА ФОНЕ ТАБАКОКУРЕНИЯ

Гасюк Н.В., Ерошенко Г.А., Майструк П.О.

В статье приведены результаты комплексного морфологического исследования слизистой оболочки полости рта у курильщиков, полученные путем комплексного цитологического и статистического изучения. Данные результаты, дают возможность характеризовать описаные изменения, как «дискератозные» или «пролиферативные», которые в себе несут цитологические критерии дискератоза в виде нарушения ороговения эпителия данной анатомической области.

Анализ предложенных нами схем патогенеза, и наличие общих составляющих, в его звеньях, дает возможность рассматривать приведенную цитологическую перестройку – «воспалительный» тип цитограм и «дискератозный» в виде двух автономных процессов, которые возникли на слизистой оболочке полости рта в условиях курения, так и звенья патогенетического механизма на этапе предопухолевой трансформации.

Ключевые слова: слизистая оболочки, эпителий, клетки, ядро, цитоплазма.

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