Журнал клінічних та експериментальних
JC&EMR
медичних досліджень

УДК 316.314.-2

Abstract

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CHARACTERISTICS OF CHANGES IN THE CELLULAR COMPOSITION OF GUMS IN CLINICAL OBSERVATIONS WITH TIME DEPENDING ON THE TYPE OF ODONTOPREPARATION FOR CERMET STRUCTURES

Introduction. The study of the effect of odontopreparation under the cermet structures on the morphofunctional changes in the tooth tissues makes it possible to characterize the features of the preparation of the teeth for this type of structures in order to maintain the viability and functioning of the pulp. The issues of reactive changes in the gums depending on the type of odontopreparation and the predictability of the long-term results of prosthetics, taking into account the individualized approach in the age aspect, remain insufficiently studied.

Purpose. Optimize approaches to odontopreparation under full cermet structures with the creation of a ledge and without it, proceeding from the patterns of morphological changes in the cellular composition of the gums in conditions of various types of odontopreparation.

Materials and Methods. The material was collected from patients from the surface of the marginal part of the gum by scraping, using a crescent trowel on day 45 of clinical observations. The collected material was applied to a sterile objective glass, fixed by dry fixation at room temperature, under open-air conditions, followed by Romanovsky-Gimsa staining.

Discussion. The study of cellular gum composition in the area of the prepared teeth of patients of both clinical groups of observations on the 45th day after odontopreparation, based on scientific data on the renewal of the epithelium of the oral mucosa, which for gums is 41–57 days, according to V. L. Bykov.

In the cellular composition of the gums of patients of the first group, intermediate epithelial cells predominated, if surface cells and horny scales are present. Intermediate cells had a centrally located rounded nucleus, an azure-positive cytoplasm and an elongated form, implanted plasmolemma. Intermediate cells with the phenomena of cytopathology. Segmented nucleated leukocytes with clearly segmented nuclei and their individual young forms. The heterogeneity of myeloid cells, as a response to the high activity of the inflammatory process, indicates the differentiation of leukocytes. A powerful microbial composition subsequently initiates necrobiotic processes in epithelial cells, and segmented neutrophils. Along with this, due to phagocytosis, the cytoplasm of segmented neutrophilic leukocytes is destroyed, the so-called incomplete phagocytosis.

Cellular gum composition in the region of the prepared vital teeth of patients of the second group, represented by multilayered flat epithelium. Interim epithelial cells predominated, provided that surface cells and horny scales were present. Available single representatives of rod-like flora and intermediate basophilic epithelial cells are predominantly cubic

or polygonal, with azur-positive granules in the cytoplasm. The nucleus is round, sometimes oval.

Cellular gum composition in the region of the prepared endodontically treated teeth in the patients of both groups is represented by multilayered flat epithelium with intermediate surface cells and horny scales. Single lymphocytes and segmental leukocytes were visualized. One of the definite differences in the qualitative rearrangement of the cells of both groups' individuals was the appearance of epithelial cells in the cellular structure, with signs of irritation in the form of a sharp basophilia, homogenization and vacuolization of the cytoplasm as a manifestation of a dystrophic process. Taking into account the fact that in the scraping cells of the inflammatory reaction are rare gingival changes in this term of observations should be stated as those that arose because of epithelium differentiation violation accordingly as a compensatory adaptive response to periodontal fibrosis and, to a lesser extent, as a response to odontopreparation.

Conclusions. The results of a complex cytological study indicate that the above tinctorial features of gingival epitheliocytes in the cellular composition of patients in both groups of clinical observations reflect the functioning of the protective mechanisms of gum tissue in norm and provide their homeostasis.

Keywords: morphological changes in the cellular composition of gums, cermet structures, intermediate epitheliocytes, segmented leukocytes, cytoplasmic vacuolization, compensatory adaptive response, periodontal fibrosis.

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Резюме

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ХАРАКТЕРИСТИКА ЗМІН КЛІТИННОГО СКЛАДУ ЯСЕН В ДИНАМІЦІ КЛІНІЧНИХ СПОСТЕРЕЖЕНЬ ЗАЛЕЖНО ВІД ВИДУ ОДОНТОПРЕПАРУВАННЯ ПІД МЕТАЛОКЕРАМІЧНІ КОНСТРУКЦІЇ

Вступ. Вивчення впливу одонтопрепарування під металокерамічні конструкції на морфофункціональні зміни тканин зуба дає можливість характеризувати особливості препарування зубів під даний вид конструкцій з метою збереження життєздатності та функціонування їх пульпи. Недостатньо вивченими залишаються питання реактивних змін ясен залежно від виду одонтопрепарування та прогнозованості віддалених результатів протезування з урахуванням індивідуалізованого підходу у віковому аспекті.

Мета дослідження. Оптимізувати підходи до одонтопрепарування під повні металокерамічні конструкції із створенням уступу та без нього, виходячи із закономірностей морфологічних змін клітинного складу ясен за умов різних видів одонтопрепарування.

Матеріали та методи. Забір матеріалу у пацієнтів проводили з поверхні маргінальної частини ясен шляхом зішкрябу, за допомогою серпоподібної гладилки на 45 добу клінічних спостережень. Забраний матеріал наносили на стерильне предметне скло, фіксували методом сухої фіксації при кімнатній температурі, за умов відкритого доступу повітря, з подальшим забарвленням за методикою Романовського-Гімзи.

Результати досліджень та їх обговорення. Проведено вивчення клітинного складу ясен в ділянці відпрепарованих зубів пацієн-

https://doi.org/10.21272/jcemr.2018.6(4):389–395

тів обох клінічних груп спостережень на 45 добу після одонтопрепарування, беручи за основу наукові дані стосовно оновлення епітелію слизової оболонки порожнини рота, який для ясен складає 41–57 діб, за даними В. Л. Бикова.

У клітинному складі ясен пацієнтів першої групи переважали проміжні епітеліоцити, за умови наявності поверхневих клітин та рогових лусочок. Проміжні клітини мали центрально розташоване округлої форми ядро, азур-позитивну цитоплазму та видовжену форму, плазмолема узурована. Проміжні клітини з явищами цитопатології. Сегментоядерні лейкоцити із чітко сегментованими ядрами та їх поодинокими юними формами. Гетерогенність клітин мієлоїдного ряду, як реакція на високу активність запального процесу, вказує на диференціювання лейкоцитів. Потужний мікробний склад в подальшому ініціює некробіотичні процеси в епітеліоцитах, та сегментоядерних нейтрофілах. Поряд з цим, за рахунок фагоцитозу, відбувається руйнування цитоплазми сегментоядерних нейтрофільних лейкоцитів, так званий незавершений фагоцитоз. Клітинний склад ясен в ділянці препарованих вітальних зубів пацієнтів другої групи, представлений багатошаровим плоским епітелієм. Переважали проміжні епітеліоцити, за умови наявності поверхневих клітин та рогових лусочок. Наявні поодинокі представники паличкової флори, та проміжні базофільні епітеліоцити переважно кубічної або полігональної форми, із азур-позитивними гранулами в цитоплазмі. Ядро округле, іноді овальне. Клітинний склад ясен в ділянці препарованих депульпованих зубів у пацієнтів обох груп представлений багатошаровим плоским епітелієм із проміжними, поверхневими клітинами та роговими лусочками. Візуалізувалися поодинокі лімфоцити та сегментоядерні лейкоцити. Однією із визначених відмінностей якісної перебудови клітин осіб обох груп була поява в клітинному складі епітеліоцитів, із ознаки подразнення у вигляді різкої базофілії, гомогенізації і вакуолізації цитоплазми як прояв дистрофічного процесу. Із урахуванням того, що в зішкрябі клітини запальної реакції поодинокі, то зміни ясен в даний термін спостережень слід констатувати як ті, які виникли внаслідок порушення диференціації епітелію, відповідно як компенсаторно-адаптативна відповідь на фіброз періодонту та в меншій мірі як реакція на одонтопрепарування.

Висновки. Результати комплексного цитологічного дослідження вказують, що вищенаведені тинкторіальні особливості ясенних епітеліоцитів у клітинному складі пацієнтів обох груп клінічних спостережень відображають функціонування захисних механізмів тканин ясен в нормі та забезпечують їх гомеостаз.

Ключові слова: морфологічні зміни клітинного складу ясен, металокерамічні конструкції, проміжні епітеліоцити, сегментоядерні лейкоцити, компенсаторно-адаптативна відповідь, фіброз періодонту.

https://doi.org/10.21272/jcemr.2018.6(4):389–395

Резюме

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ХАРАКТЕРИСТИКА ИЗМЕНЕНИЙ КЛЕТОЧНОГО СОСТАВА ДЕСНЫ В ДИНАМИКЕ КЛИНИЧЕСКИХ НАБЛЮДЕНИЙ В ЗАВИСИМОСТИ ОТ ВИДА ОДОНТОПРЕПАРИРОВАНИЯ ПОД МЕТАЛЛОКЕРАМИЧЕСКИЕ КОНСТРУКЦИИ

Изучение влияния одонтопрепарирования под металлокерамические конструкции на морфофункциональные изменения тканей зуба и окружающих тканей дает возможность характеризовать реактивные изменения десен в зависимости от вида одонтопрепарирования и прогнозировать отдаленные результаты протезирования с учетом индивидуализированного подхода в возрастном аспекте. Целью исследования есть оптимизация подходов к одонтопрепарированию под полные металлокерамические конструкции, исходя из морфологических изменений клеточного состава десен. Забор материала у пациентов проводили с поверхности маргинальной части десны путем соскобов с помощью серповидной гладилки на 45 сутки клинических наблюдений с последующей окраской по методике Романовского-Гимза. Проведено изучение клеточного состава десны в области отпрепарированных зубов пациентов обеих клинических группах наблюдений на 45 сутки после одонтопрепарирования, основываясь на научных даннх по обновлению эпителия слизистой оболочки полости рта, который для десен составляет 41–57 суток. Результаты комплексного цитологического исследования указывают, что вышеприведенные тинкториальные особенности десневых эпителиоцитов в клеточном составе пациентов обеих групп клинических наблюдений отражают функционирование защитных механизмов тканей десны в норме и обеспечивают их гомеостаз.

Ключевые слова: морфологические изменения клеточного состава десен, металлокерамические конструкции, промежуточные эпителиоциты, сегментоядерные лейкоциты, вакуолизация цитоплазмы, компенсаторно-адаптативного ответ, фиброз периодонта.

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Introduction

The rapid development of modern dentistry, in particular orthopedic, focuses on the introduction of new technologies, materials and algorithms into clinical practice, in order to improve the quality of treatment and to prevent possible both local and remote complications [1]. Currently, metal-free ceramic structures and their automated manufacturing systems are being actively used. However, along with this, actual ceramic-metal dentures and single crowns remain in connection with affordability in the price aspect in comparison with all-ceramic constructions [2]. The clarification of odontopreparation influence on morphofunctional changes in the tooth tissues makes it possible to affirm about the features of teeth preparation for this type of non-removable orthopedic structures in order to preserve the viability and functioning of their pulp. However, insufficiently studied remain questions about the issues of reactive changes in the gums depending on the type of odontopreparation and the predictability of the long-term results of prosthetics, taking into account the individualized approach in the age aspect. Thus, the question of optimizing the approaches of odontopreparation for full cermet structures, based on the patterns of morphological changes in the cellular composition of the surrounding gums, is an actual and promising scientific direction [3].

The work is part of "I. Horbachevsky Ternopil State Medical University" Therapeutic Dentistry Department scientific research work «Development of new individualized approaches to the diagnosis, treatment and prevention of dental diseases in patients with primary and secondary lesions of oral tissues based on the study of pathogenetic mecha-

https://doi.org/10.21272/jcemr.2018.6(4):389–395

nisms» State registration number 0117U003024 and of "I. Horbachevsky Ternopil State Medical University" Orthopedic Dentistry Department scientific research work "Pathogenetic approaches to the treatment of major dental diseases on the basis of the study of the mechanisms of damage to the tissues of the oral cavity on the background of concomitant somatic pathology." State registration number 0116U4005076.

The purpose of the study. Optimize approaches to odontopreparation under full cermet structures with the creation of a ledge and without it, proceeding from the patterns of morphological changes in the cellular composition of the gums in conditions of various types of odontopreparation.

Material and methods. Causal relationships between various types of odontopreparation and the course of the process of gums cellular composition differentiation on the 45th day of clinical observations that arise because of orthopedic treatment with full metal-ceramic structures.

To solve the tasks, a clinical dental examination of male patients was conducted. According to the age aspect, randomization was carried out according to the Age Classification of the World Health Organization, namely the young people surveyed from 25 to 44 years old. After the initial dental examination, patients were randomized to two main groups of observations, depending on the type of odontopreparation, the state of the tooth pulp and the complex of planned morphological studies. In patients at the time of the examination, analyzing the history, excluded diseases of the digestive tract, ENT-organs, cardiovascular system and endocrine system, purulent-septic states, specific inflammatory processes, alcohol and acute food abuse, smoking. Clinical criteria that were taken into account when forming the groups of clinical observation objects were the young age of patients; anamnestic data of patients (heredity) and term of premature loss of teeth not more than 2 years; data of objective examination (absence of diseases of periodontal tissues and oral mucosa). The first group of clinical observations included cases where odontopreparation for metal-ceramic structures was carried out with the creation of a classic rounded beveled ledge in the cervical area, and in the second group – cases in which odontopreparation was performed with maximum preservation of the cervical part of the crown – a symbol of the ledge. To standardize the examination and minimize the trauma of the gingival margin, preparations for the cermet constructions were performed at the level of the marginal part of the gum. In order to unify further results, the collection of gingival epithelium material was carried out at the same time of day under the conditions of the previous appropriate preparation, immediately after preparation and 45 days after preparation. As the control group, the average statistical values of the percentage of different classes of epithelial gum cells were taken, taking into account age and sex [4, 5]. The material was collected using a crescent trowel followed by applying to a sterile objective glass, fixed by dry fixation at room temperature, under open-air conditions and stained by Romanovsky-Gimza.

Research and discussion. The study of cellular gum composition in the area of the prepared teeth of patients of both clinical groups of observations on the 45th day after odontopreparation, based on scientific data on the renewal of the epithelium of the oral mucosa, which for gums is 41–57 days, according to V. L. Bykov was conducted [6].

The cellular gum composition in the region of the prepared vital teeth of patients of the first group is represented by multilayered flat epithelium. It should be noted heterogeneous heterogeneity of epithelial cells and as a consequence of the epithelial gingiva. Compared to the cellular composition recorded at the time of the initial examination, on the 45th day it underwent significant qualitative changes. In the cellular composition of the gums for this period of observation, intermediate epithelial cells predominated, provided that surface cells and horny scales are present. Intermediate cells had a centrally located rounded nucleus, an azure-positive cytoplasm, and an elongated shape. It should be noted that plasmolysis is inserted into this class of cells and their predominantly accumulated location. In this case, in the part of intermediate cells, at this time of observation the phenomena of cytopathology were determined. In the cytoplasm of part of the intermediate epitheliocytes of the examined contingent individuals, there is glycogen in the form of azur-positive granules, confirming the results of the study of the precursors regarding the ability of multilayered planar epithelium to synthesize and accumulate a large amount of this metabolite under the conditions of the inflammatory process in the gums [7, 8].

Along with the above epithelial cells, segmented white blood cells with a clear segmentation of nuclei and their separate juvenile forms were visualized in the cell composition. The above facts reflect the amplification of the phagocytic reaction of segmented neutrophils, while in the process of phagocytosis, leukocytes experience specific

https://doi.org/10.21272/jcemr.2018.6(4):389–395

changes in the form of restructuring of the nuclear apparatus, while in the epithelial cells of the gums there are necrobiotic processes, primarily in the cytoplasm and then in the nucleus. The heterogeneity of myeloid cells, as a response to the high activity of the inflammatory process, indicates the differentiation of leukocytes. The intensive microbial composition subsequently initiates necrobiotic processes in both epithelial cells and segment neutrophils. In parallel with this, due to phagocytosis, the cytoplasm of segmented neutrophilic leukocytes is destroyed.

The coccal microflora is contained and adheres not only on the surface of epithelial cells, but also on the surface of segmented neutrophilic leukocytes. It should be noted the intensification of the microbial composition represented by cocci, which adheres to the surface of epithelial cells.

Cellular gum composition in the region of prepared vital teeth of patients of the second group is stereotypic, represented by multilayered flat epithelium. In comparison with the qualitative characteristics at the time of the initial examination, it also underwent changes on the 45th day of observations. In the cellular composition of the gums for this period of observation, intermediate epithelial cells also prevailed, provided that surface cells and horny scales are present. There are individual representatives of rod-like flora, and intermediate basophilic epitheliocytes predominate. These cells were predominantly cubic or polygonal in shape, provided the azur-positive granules are present in the cytoplasm. The nucleus is round, sometimes oval. The formation of clusters of cells of this class is also noted. At the same time, intermediate cells are found in norm and basically without elements of cytopathology [9].

It should be noted that the cellular composition of the gum in the region of the prepared endodontically treated teeth in patients of both groups was quite stereotyped, and represented by multilayered flat epithelium with the presence of intermediate, surface cells and horny scales. Compared with the indicators at the time of primary examination and day, 45 suffered mainly qualitative changes. Among the cells of the hematogenous series, isolated lymphocytes and segmental leukocytes were visualized. Microflora is contained and adheres not only on the surface of epithelial cells, but also on the surface of segmented neutrophilic leukocytes, forming semi-ring and chain figures [10].

One of the definite differences in the qualitative rearrangement of the cellular composition of both group faces was the appearance of epithelial cells, which had signs of irritation in the form of sharp basophilia, homogenization and vacuolization of the cytoplasm, as a manifestation of the dystrophic process in our opinion, the primarily initiated periodontal fibrosis of the dead teeth, and, accordingly, the intrinsic plate of the gingival epithelium. These compensatory mechanisms initiated adaptive changes in the epithelium. The nucleus of these cells, small in size, dense, pycnotic changed, hyperchromic in coloring. The shape of the cells is irregular, with numerous plasmolemal usuras. Taking into account the fact that in the scrapings the cells of the inflammatory reaction are rare the changes in the gum in this term of observations should be stated as those, that arose as a result of a disturbance in the differentiation of the epithelium respectively as a compensatory adaptive response to periodontal fibrosis and to a lesser extent as a response to odontopreparation [11].

The qualitative cellular composition of the cytograms depends on the clinical course and intensity of the inflammatory-dystrophic processes in the periodontal tissues. The obtained data significantly differ from the stereotyped percentage ratio of differentiation of epitheliocytes of multilayered flat epithelium of the gum and the ratio determined for the persons of the surveyed contingent. These changes are characterized by a violation of keratinization, as evidenced by the presence in the cytograms of all the components of the epithelial cell differentiation [12].

Conclusions

The results of a complex cytological study indicate that the above tinctorial features of gingival epitheliocytes in the cellular composition of patients in both groups of clinical observations reflect the functioning of the protective mechanisms of gum tissue in norm and provide their homeostasis.

The complex approach, with the analysis of the results of clinical observations and the comprehensive morphological justification, allowing objectifying changes in periodontal tissue initiated by odontopreparation is applied, which will increase the effectiveness of providing orthopedic assistance to the population.

https://doi.org/10.21272/jcemr.2018.6(4):389–395

Prospects for further study

The obtained data make it possible to predict the development of gum changes initiated by odonto-preparation and determine possible ways to increase the effectiveness of orthopedic interventions with a minimal encumbrance of periodontal pathology.

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(received 18.09.2018, published online 25.12.2018)

(одержано 18.09.2018, опубліковано 25.12.2018)

https://doi.org/10.21272/jcemr.2018.6(4):389–395