

## USAGE OF QUERCETIN IN TREATMENT OF PATIENTS WITH GENERALIZED PERIODONTITIS

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**Summary.** Shallow vestibule of the mouth and connective tissue bands in the region of vestibule of the mouth are one of the etiological factors in the development of generalized periodontitis. One of the modern methods of complex treatment of periodontal tissue with shallow vestibule of mouth is the use of surgical correction of pathological structure of the vestibule of the mouth. There are a number of operations for mucogingival plastic, but not always the use of these techniques of vestibule plastic gives the desired therapeutic effect. The study aims to improve the efficiency of complex treatment of patients with generalized periodontitis with the shallow vestibule of the mouth by vestibule plastic and using the means of the healing quercetin and solcoseryl in the postoperative period. 60 patients with generalized periodontitis with shallow vestibule of the mouth were examined and treated. All patients had their vestibule plastic done developed by us in which a number of technological moments were improved. As an important element of intervention is the placement and fixation by stitches of free mucous grafts taken from the palate, and inserted into the area of horizontal sections near the premolars. All patients were divided into 2 groups. Patients of the first group (30 people) in the postoperative period were prescribed the healing quercetin. Patients of the second group (30 people) in the postoperative period were prescribed the healing solcoseryl. The most important outcome of our vestibule plastic operations are the reproduction of normal depth of the vestibule of the mouth, elimination of the chronic injury in the vestibule area of the mouth, normalization of blood supply to the periodontal tissues, restore the structure of mucosa of periodontal tissues at the cellular level. Application of the healing quercetin and solcoseryl showed normalization of morpho-functional state of the epithelium in the surface layer of cells found desquamation. In the lamina propria of mucosa of gingival connective tissue represented by thin bundles of collagen fibers, capillaries of normal structure, areas of moderate lymph infiltration, and most cell populations were mature, active fibroblasts. The structure of the mucosa of the gums using the healing quercetin and vestibule plastic developed by us in papilla increased the number of newly microvessels, turned thin collagen fibers of the longitudinal direction. Among the cellular components distinguished young, poorly differentiated and active fibroblasts – collagen blasts of type II. Our data have confirmed the feasibility and high efficiency of vestibule plastic developed by us together with the use the means of the healing quercetin in patients with generalized periodontitis and shallow vestibule of the mouth. Complex treatment of patients with generalized periodontitis with shallow vestibule of the mouth when applying vestibule plastic using free mucous grafts and the means of healing quercetin in postoperative demonstrates significantly higher treatment efficiency compared to means of healing solcoseryl in clinical and laboratory parameters, cytological, morphological features vestibule mucous membrane of the mouth and radiographic, ultrasound characteristics of jaw bones in the early and late periods after treatment.

**Key words:** generalized periodontitis, shallow vestibule of the mouth, complex treatment, quercetin, solcoseryl.

Shallow vestibule of the mouth (SVM) is a quite frequent pathology-affected structure of the mucosa of the mouth vestibule (VM) [1, 2, 5, 6, 9]. SVM is a major etiological factors in the development of periodontal diseases, due to the influence of the depth of the vestibule of the mouth (DVM) on the formation of gum recessions, the development of inflammation with subsequent breach of the tooth-gingival attachment, the advent of mobility of teeth and premature loss of them [1, 2, 3, 6, 10].

### Objective

To improve the efficiency of vestibule plastic among the patients with GP with SVM by surgical and pharmacological effects on periodontal tissues.

### Materials and methods

The study enrolled 60 patients with GP with SVM. To assess periodontal status and for diagnosis, we used the classification of periodontal diseases, as proposed by Danylevskyy M.F. (2008) [3]. The DVM was determined according to our validated standard methods. All patients were divided into 2 groups. Patients in both groups had their vestibule plastic done developed by us in which a number of technological moments were improved. As an important element of intervention was the placement and fixation by stitches of mucous free grafts taken from the palate, and inserted into the area of horizontal sections near the premolars [4]. Patients of the first group (n=30) in the postoperative period were prescribed treatment with quercetin [7, 8, 9] (registration certificate №UA / 0119/01/01) 1 g, once daily gel application, which is previously applied to individual teeth-gingival sealed end, for 5 days [4]. Patients of the second group (n=30) were treated with solcoseryl in the postoperative period (registration certificate №UA / №013615/02-2002 02.04.02) 5 g, 1 time a day gel application, which is previously applied, to individual teeth-gingival sealed end, for 5 days [4].

For the purpose of comparative characteristics of performed methods of surgical correction of DVM the assessment of DVM was carried out for the presence of scar deformities in the mucosa of the VM, the assessment of periodontal tissues (index of bleeding by Mulleman-San (BI), index of the hygiene by Green-Vermilyon (HI), periodontal-alveolo-marginal index (PAM)). These end-point characteristics were assessed before the treatment, at 3 months, 6 months and 12 months; ultrasound examination of jaw bone tissues before the treatment, after 6 months, 12 months after surgery and status of regional blood

flow among patients with GP with SVM (assessment of qualitative and quantitative characteristics of rheographic curves of alveolar jaw bone) before vestibule plastic, after 1 month, 3 months, 6 months, 12 months after vestibule plastic. For the purpose of histopathological analysis 17 patients with GP were subject to biopsy samples collection from the mucosa of the vestibule of the mouth in projection of premolars – before treatment, after 3, 6 months after complex treatment, followed by the preparation of histological sections and staining them with hematoxylin and eosin. Parallel biopsy material was prepared for electron microscopy evaluation, according to conventional methods. Thin sections were analyzed by means of a PEM-125K electron microscope, and documented at 4,800 to 12,000-fold magnitude.

### Results

The results of the presented study revealed that patients with GP with SVM were characterized by marked changes in periodontal tissues, whose deterioration was associated with the progression of the disease. The main sets of symptoms of GP with DVM were the DVM less than 5 mm, connective tissue bands in the area of canines and premolars were identified in 78.3% of patients; symptomatic gingivitis - in 71.7% of patients; in 83.6% of patients with GP of II stage of development with SVM found traumatic occlusion in the area of the front group of teeth; 74.2% of patients diagnosed with teeth-clusters. Clinical demonstrations of GP with SVM were relevant to the extent of the disease. Depending on the degree of GP the indexed assessment of the state of periodontal tissues deteriorated according the results of oral hygiene indices, periodontal index, bleeding index. PMA index among the patients with SVM and GP unreliably differed on the extent of development of the disease ( $p > 0.05$ ). X-ray picture and results of ultrasound examination within the both groups of patients before the surgery showed the presence of pathological changes in periodontal tissues, lowering the compact plate alveolar bone and jaw bone demineralization. The results of investigation of regional circulation of the tissues of the mouth vestibule showed the presence of blood circulation deficit and reduce the trophy tissue, which was indicated by the increase in vascular tone index (VTI), peripheral resistance index (PRI) and reduce of extensive blood flow index (IEC) rheographic index (RI) ( $p < 0.05$ ).

Before the surgery, in biopsy material of the patients with GP with SVM was seen degenerative processes in the epithelium and in lamina propria of

the mucous membrane of the gums against the background of general conservation plan of the structure of the mucosa (fig.1). Electron microscope examination showed vacuolization of the cytoplasm of epithelial cells, swelling, small amounts of organelles, single lipid vacuoles. Intercellular contacts were saved. We found in the epithelium of the mucous membrane of the gums the signs of regenerative plastic deficiency, which is typical for this part of the epithelium under the influence of various damaging factors. In the lamina propria of the mucosa of the gums were observed swelling, plethora of the vascular microcirculation, at some places stasis. Around the microhemovessels, especially in the areas of papillae, there were identified loose connective tissue cells (small number of macrophages and lymphocytes, fibroblasts), fragments of cells and collagen fibers. Fibroblasts had mainly round and oval nucleus. Under the loosened basal membrane of the epithelium contained convoluted thick bundles of collagen fibers, among which were determined a small number of cells in a background of extended plethoric blood vessels and small hemorrhages. The cells of fibroblastic row are presented here by the spindle or star-shaped cells, which characterize them as fibrocytes. Deeper one can observe the areas of polymorphocellular infiltration (fig.2). Plasmocytes characterized by a core, which is rich in chromatin, and developed granular endoplasmic reticulum (fig.3).

According to the results of clinical studies patients with GP with SVM of both groups for 6 months after treatment showed the positive dynamic of index estimation periodontal tissues. However, compared to the indicators of periodontal tissues among patients with GP before the treatment the index values among I group patients were better compared to the patients of the II group ( $p < 0.05$ ). 3 months after the surgery there was no significant difference between the states of the patients in the two groups of comparison. After 6 months 97.0% patients of I group and 87.0% patients of II group had their DVM 5-10 mm, 4 patients 13.0% of II group were observed and found scar deformation of soft tissues in the mouth vestibule of the section of premolars. After 12 months the index characteristics of periodontal tissue worsened, but still were significantly better among the patients of I<sup>st</sup> group than among the patients of II<sup>nd</sup> group ( $p < 0.05$ ).

A comparative analysis of the results of morphological study between the patients of both groups, patients of the first group on the final observation period, showed clearly defined gingival epithelium basal cells, some of them had mitotic nucleus.3 and

6 months after the surgery the structure of the mucosa of the patients with GP of I group came to normal. Epithelial plate structure showed normal basal epithelial cells, epitheliocytes of the spinal layer became more active; nucleoli are clearly identified in the cells. The cells of the surface layer showed no signs of desquamation. In papillae of the lamina propria of the mucosa increased the number of newly microhemovessels (fig. 4). Collagen fibers appeared thin and had the longitudinal direction. Among the cellular components of the loose connective tissue were distinguished young, poorly differentiated and active fibroblasts. Macrophages were rare. Evidence of infiltration of other cells was not found. Fibroblasts by electron microscopic signs belong to collagenous blasts of the second type. Characteristic of their structure is the presence in the cytoplasm of a large number of tanks granular endoplasmic reticulum, which is responsible for the synthesis of protein compounds, particularly collagen. We observed their close contact with plasmolemma (fig. 5).

In patients of II group after 3 months in the epithelium the basal cell layer stand out clearly. Its cells have a large round nucleus, basophilic cytoplasm. In some cells there were mitotic nucleuses. Neural epithelial layer had deviations from normal microscopic structure. In epitheliocytes surface layer keratinization symptoms are minimal, and at the end of the 6th month of the surface layer was thin, sometimes identified cells with enough keratinized pellets and elongated nuclei (parakeratosis). In the lamina propria of the mucous membrane of connective tissue represented by thin, delicate bundles of collagen fibers. The capillaries in the papilla had normal structure, sometimes with extended clearance. Under basal membrane of epithelial papillae were observed outside thin bundles of collagen fiber bundles were thick enough. Between the bundles of collagen fibers were detected areas with moderate lymph infiltration (fig. 6). Among fibroblastic cell population is among the most mature, actively synthesizing collagen fibroblasts occur in a much smaller number of young fibroblasts and fibrocytes (fig.7). We distinguish between the study of appearance in the electron microscope cells showed signs of structural organization fibroblasts and contained more than the number of fibroblasts lysosomes. The presence of lysosomes in cells provides a greater presence of active enzymes, including collagenase, which may explain resorption thick bundles of collagen fibers and replacing them with thin tumors. In this opinion we pushed towards the orderly arrangement of collagen fibers, mainly

along the long axis of the fibroblasts. Using long processes, we witnessed probably fibroblast regulates the relative three-dimensional collagen fibers in the lamina propria of the mucosa. It is important that fibroblasts resorption of collagen occurs by partial or complete involution of connective tissue or during its remodeling that occurs without inflammation. That is, using the proposed method vestibule plastic and application means of the healing solkoseryl achieved a certain level of renewal of collagen, but attention-preserved signs of inflammatory reaction - moderate lymph infiltration, which prevents the complete renewal of collagen replacing thick, partially destroyed bundles of fibers in the newly formed with better mechanistic, structure forming and reparative properties.

Holding vestibule plastic, developed by us and complemented by means of the healing quercetin in the postoperative period, contributed to a significant positive dynamics of rheographic indicators, both in early and in the long term after treatment, compared with results in other groups of patients, which indicates a steady improvement of regional blood flow in the periodontal tissues. 97.0% patients of the first group and 91.0% patients of the second in a month after vestibule plastic noted a gradual increase in amplitude rheogram, they acquired the right forms. All patients of I group after 6 months - showed almost normalized blood circulation ( $p < 0.05$ ). In the dynamics 12 months later, there were recorded the increase of amplitude of the rheographic curves, the top of the wave was more pointed, anacrotic curve faster rose to the top, dictrotic peak was more pronounced and was closer to the middle third of dictrotic phase of the waves.

According to the results of ultrasound examination in 6 months after the surgery 97.0% patients of the first group and 89.0% patients of the second showed the decreased the mean transit time of ultrasound, indicating the positive processes of bone mineralization. 12 months after vestibule plastic time of the ultrasonic waves has not changed, indicating the stabilization of processes of bone mineralization and active processes of jaw bone mineralization of the patients of second group. When X-ray, 6 months after the surgery among 87.0% patients of the II group and all patients of the I group showed a stabilization process that was manifested in increasing height, compression and clear definition of compact plate of alveolar bone of the jaw.

## Discussion.

According to different authors, SVM among the patients with GP is found in 8-62.6% of cases and is one of the etiological factors in the development of pathological changes in periodontal tissues [1, 2, 3, 4]. A clinical examination of 85 patients with GP with SVM showed that patients with GP with SVM of I-II stages of development were characterized by marked changes in periodontal tissues, which grew with an increasing degree of the disease. All patients had the DVM less than 5 mm. After the treatment, most patients showed positive dynamics of the index characteristics of the periodontal tissues, but the results were significantly better among the patients of the second group. In the second group of patients were seen the most significant changes in rheographic curves and indices of ultrasound and X-ray examination. We assume that between indicators of the rheographic research of mucosa of VM and X-ray, ultrasound characteristics of the bone tissue are directly proportional relationship, after normalization of blood supply in the area of VM the trophic of jaw bone tissue is improved. Our results are confirmed by the research work of other researchers [1, 6]. We believe that the combined use of modified tunnel vestibule plastic and quercetin in the postoperative period provide the desired therapeutic effect and prolonged remission. We have developed vestibule plastic which provides maximum reduction of the tension of mucosa of VM, and quercetin - stimulates the formation of various forms of fibroblasts and in its turn, the small blood vessels around these cells. As active fibroblast differentiation is impossible without sufficient blood supply [7, 8, 9, 10].

## Conclusions.

1. On the basis of the study it was found that developed surgical technique using free mucous grafts is the optimal method for the pathology of the tissue of the vestibule of the mouth. After vestibule plastic surgeries using free mucous grafts improves the blood flow in the area of newly vestibule and gums, prevents the development of destructive processes in periodontal.
2. Positive dynamics of osteometric and radiologic parameters caused by improving the microcirculation of periodontal soft tissues and metabolism of jaw bone tissue.
3. Structure of the mucosa of the gums was normal after using means the healing quercetin and vestibule plastic operation developed by us. There were showed no signs of desquamation in its

surface layer, the papilla increased the number of newly microvessels, collagen fibers are thin and have proved longitudinal direction. Among cellular loose connective tissue component of distinguished young, poorly differentiated and active fibroblasts – collagen fibers of type II, synthesizing collagen. No evidence for infiltration of other cells was found there. The morphological structure of the mucosa of the gums have confirmed the feasibility and high efficiency of our proposed method of vestibule plastic together with the use of means of the healing quercetin in patients with GP shallow vestibule of mouth.

### Prospects for further researches.

The prospective results of the proposed method of complex treatment of patients with generalized periodontal and shallow mouth vestibule will be subject to thorough evaluation and follow-up.

### Literature

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