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Microbiocenosis of Oral Cavity in Patients with Dental Implants and Over-Dentures.

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ABSTRACT

It is becoming increasingly commonplace for people with dental implants and dentures to suffer from denture stomatitis. Denture stomatitis refers to the group of the most frequent inflammatory pathologies of the oral mucosa. The state of health of the patient, the level of oral hygiene and proper maintenance of dentures (D) play a significant role in the occurrence of denture stomatitis (DS). A certain role is assigned to homeostasis and biocenosis of oral cavity that accompany denture stomatitis. Indicators of homeostasis and biocenosis of oral cavity are specific indicators that instantly react to the slightest changes in the oral cavity. Change in homeostasis and biocenosis indicators along with stomatitis exacerbates a pathological process arising. This paper deals with analysis of homeostasis and biocenosis indicators arising along with denture stomatitis. Studies were carried out in 46 patients with denture stomatitis. The findings showed that the normalization and nonspecific immune resistance against the background of changes in microbiocenosis of oral cavity in patients using plate over-dentures promotes both rapid recovery of patients and prevention of this disease.

Keywords: homeostasis of oral cavity, biocenosis, prevention, dentures.

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INTRODUCTION

Patients, who constantly use over-dentures, suffer often from "prosthetic stomatitis" or denture stomatitis (DS). Nature of the pathological process of DS in these patients may be acute or chronic (remission and exacerbation). At the same time, the form of clinical manifestations ranges from erosive-ulcer to ulcero-necrotic and hyperplastic [1, 3, 6, 8]. The main reasons of DS caused largely by local factors emanating directly from the over-denture basis and the material, which it is made of. These are mechanical, thermal, toxic and allergic stimuli of the oral mucosa, showing its impact on the background of microbiocenosis disorders and immunological resistance of the oral cavity, which collectively determines the pathogenetic mechanism of this disease [4, 5, 7]. Mucosal reaction to an over-denture depends largely on the individual properties of the prosthetic bed [2].

Several researchers have attributed the occurrence of a pathological process in the area of prosthetic bed with low oral hygiene and poor care for dentures. [8] Other recommend to differentiate between true mucosal inflammation and so-called "psychological denture intolerance" or false inflammation, in which there is only a subjective sensation of burning and paresthesia [6, 9].

The main clinical manifestations of DS are catarrhal inflammation, erosion or ulceration, decubitus ulcers, and, as a result, progressive disorder of blood circulation and trophic disorders in the mucous membrane and the adjacent areas of the oral cavity.

At a biochemical level, there is an enhancement of lipid peroxidation [3-5] and change in enzyme activity of oral liquid [1, 7] in the tissues of oral cavity. Chronic inflammation and destructive changes in the tissues of the prosthetic bed affect adversely the whole body.

Low level of oral hygiene leads to disruption of homeostasis and biocenosis, activation of pathogenic oral microflora and increase in its pathological impact on the severity of the inflammation process in tissues of the prosthetic bed [6, 7, 8]. All stated above determines the appropriateness and relevance of the study aimed at investigating the homeostasis and biocenosis of oral cavity with denture stomatitis, since the restoration of basic processes occurring in the oral cavity promotes better adaptation to dentures, their fixation and stabilization, as well as prevention of denture stomatitis.

Objective of the research. Improvement of the prevention and treatment of denture stomatitis by studying homeostasis and oral biocenosis in patients constantly using dentures.

Technique

To analyze the homeostasis and biocenosis indicators of oral cavity the patients using over-dentures were grouped according to the nature, timing and duration of inflammation manifesting in the prosthetic bed. Total 46 patients with denture stomatitis of varying severity were examined. The first group (17 patients), who have shown no signs of inflammation of the mucous membrane of the prosthetic bed (intact mucosa) within 1

month from the date of dental prosthetic rehabilitation, and have adapted to the dentures after the first correction. The second group (18 patients) has shown inflammation of varying severity in the prosthetic bed during the first month, and the adaptation period was more than 1 month.

The third group of patients examined had a "true" DS. The diagnosis was made based on the following data: inflammation was not only due to mechanical trauma, did not disappear after the correction of the prosthesis, manifested in a month or more after dental rehabilitation, had typical clinical symptoms (redness, swelling, erosive and ulcerative lesions of the mucous membrane, pain, and burning).For comparing the laboratory parameters the data obtained from healthy subjects were used. At the same time, to minimize impact on the parameters of dental pathology studied, we used the indicators of people with normal mucosa and periodontal tissue and without dentures or with single crowns, or fixed prosthetic bridge for a short time period, sanitized, with pre-conducted occupational hygiene. These patients have formed a control group (15 persons).

Clinical study of patients and examination of mucous membrane of the prosthetic bed were performed before setting the prosthesis in 1 week and 1 month after dental rehabilitation.

Main Body

Results of indicators of oral homeostasis in the denture carriers are shown in Table 1.

Table 1: The number of leukocytes and epithelial cells in the oral lavages in patients when making a dental rehabilitation with over-dentures (M ± m)

Indicators studied	Control group (p=15)	Patients with over-dentures		
		Group 1 (intact mucosa) (p=17)	Group 2 (inflammation of prosthetic bed tissues) (p=18)	Group 3 (DS) (p=11)
Number of leukocytes in 1 ml oral lavage (thous.)				
Prior to denture fixation	472.5±40.6	352.5±40.4	462.5±41.8	408.5±38.7
In 1 week		386.5±37.6	515.6±50.4	482.4±44.6
In 1 month		398.1 ±33.2	488.5±42.2	512.5±47.6
Number of epithelial cells in 1 ml oral lavage (thous.)				
Prior to denture fixation	31.5±3.1	29.5±3.1	31.0±3.0	26.5±2.5
In 1 week		38.9±3.5 P_1<0.05	39.9±3.1 P_1<0.05	38.5±3.7 P_1<0.02
In 1 month		32.2±3.1	45.5±3.4 P_1<0.01 P_2<0.01	44.2±4.1 P_1<0.002 P_2<0.02

Note: Here and in the following tables of the subsection the accuracy P_1 calculated in relation to the initial data recorded before fixing the denture; P_2 - in relation to the data recorded in the control group of patients

The data in Table 1 indicate that the rate of migration of leukocytes into the oral cavity in patients requiring an over-denture was significantly lower prior to dental rehabilitation than that in people from the control group, who do not need the prosthetics. After dental rehabilitation the leukocyte count slightly increases, particularly in patients from the third group in 1 month after prosthetics. However, no significant differences, compared with both baseline and with the data of the control group, were determined. This can be explained by the fact that the people from the control group have the main source of leukocytes - periodontal pockets, and those patients, who require removable prosthetics and most of them have missing teeth, the inflammation of the mucous membrane of oral cavity is not accompanied by a significant increase in leukocyte emigration.

As for the epithelial cells, a bit different results were obtained: the number of epithelial cells in the oral lavages increased significantly in patients after prosthetics, and their number was significantly higher in groups, where inflammation was observed in the prosthetic bed, in relation to both the original data and data recorded in the control group. All this indicates that the oral mucosa responds to irritation with increased shedding of the top layers of the epithelium.

Patients with intact mucosa (Table 2) showed an increase in the rate of salivation during the first week after prosthetic, however it remained at the original level in a month. Patients from group 2, in whose prosthetic bed the inflammation of varying severity were observed during the first month, but without any sign of true DS, had a reduced secretion of saliva in a month after starting to use dentures (differences are reliable with respect to both the original level and the comparison group data).

Table 2: Indicators of functional activity of the salivary glands in patients when making a dental rehabilitation with over-dentures (M ± m)

Indicators studied	Control group (p=15)	Patients with over-dentures		
		Group 1 (intact mucosa) (p=17)	Group 2 (inflammation of prosthetic bed tissues) (p=18)	Group 3 (DS) (p=11)
Salivation rate (ml/min)				
Prior to denture fixation	0.71±0.05	0.78±0.06	0.70 ±0.07	0.65±0.05
In 1 week		0.85±0.05	0.58±0.05	0.45±0.04 P_1<0.01
In 1 month		0.72±0.05	0.50±0.06 P_1<0.05 P_2<0.01	0.42±0.05 P_1<0.02 P_2<0.001
Oral fluid pH				
Prior to denture fixation	6.77±0.02	6.75±0.02	6.77±0.03	6.81±0.03
In 1 week		6.78±0.03	6.88±0.03 P_1<0.02 P_2<0.02	6.92±0.04 P_1<0.01 P_2<0.01
In 1 month		6.72±0.06	6.75±0.06	6.82±0.05

Rate of salvation in patients with DS decreased by more than 30% in a week after

dental rehabilitation, and even more in a month (reliable data). By comparison with data from patients from control group, the denture carriers from group 3 had a significantly lower rate of salivation to the end of the 1st month after using dentures.

The pH of the oral liquid with respect to the source data was changing towards acidification in patients with inflammation of the tissues of the prosthetic bed only in a week after dental rehabilitation. Dynamics of changes in nonspecific and immune resistance of oral cavity in patients using over-dentures is shown in Table 3.

Table 3: Indicators of nonspecific and immune resistance of oral cavity in patients when making dental rehabilitation with over-dentures (M ± м)

Indicators studied	Control group (p=15)	Patients with over-dentures		
		Group 1 (intact mucosa) (p=17)	Group 2 (inflammation of prosthetic bed tissues) (p=18)	Group 3 (DS) (p=11)
Lysozyme content (μg/l)				
Prior to denture fixation	385.7±34.5	355.2±32.5	377.4±38.1	403.2±38.4
In 1 week		386.2±34.3	369.7±41.1	356.4±32.0
In 1 month		393.1±37.2	365.4±34.2	303.2±31.2 $P_1<0.05$
SIgA content (g/l)				
Prior to denture fixation	0.427±0.041	0.454±0.042	0.388 ±0.029	0.412±0.043
In 1 week		0.467±0.045	0.464±0.040	0.480±0.042
In 1 month		0.442±0.042	0.471±0.050	0.561±0.049 $P_1<0.05$, $P_2<0.05$

Lysozyme content is a humoral factor of nonspecific immunity, which decreased after prosthetic in the groups of patients with the inflammation of the prosthetic bed tissues, and in patients with DS to a greater extent. When compared data of the third group with the data of the control group, a significant decrease was shown in the concentration of lysozyme in 1 month after starting the prosthetic ($p<0.05$).

Content of secretory immunoglobulin A, which is a specific immunity humoral factor, also changes in the direction of progressive growth. After 1 month, the patients diagnosed with “denture stomatitis" have shown distinctive reliable data, in relation to both the initial level prior to prosthetics, and data from control group of patients. This fact can be evaluated as a reaction to chronic antigenic stimulation. Due to the fact that similar results were obtained earlier by other authors, it can be argued that such diverse changes in the factors of local immunity of the oral cavity (lysozyme and SIgA) are characteristic of inflammation of the oral mucosa.

MDC content, which characterizes the level of lipid peroxidation, was determined after prosthetic through its reliable enhancement in the oral fluid of patients with inflammation of prosthetic bed tissues (group 2) 1 month after dental rehabilitation. An especially expressed growth in the indicator was determined in patients with DS (group 3)

during the entire period of observation (differences reliable in relation to both the data before prosthetics and data of control group). Activity of antioxidant enzymes such as SOD, glutathione reductase and glutathione peroxidase did not change significantly a week after the prosthetic, only patients with denture stomatitis showed a significant decrease in activity of glutathione peroxidase (differences reliable in relation to baseline data).

a significant decrease in the activity of all antioxidant enzymes studied was observed a month after using over-dentures in patients from the 2nd and 3rd groups, in relation to both baseline data and indicators of control group. All the above indicates a decline in the activity of antioxidant protection along with the inflammation in the tissues of the prosthetic bed. General proteolytic activity of oral fluid increased significantly in patients with inflammation of tissue of the prosthetic bed (group 2) and with DS developed (group 3) a week after dental rehabilitation with over-dentures. GPA indicators remained significantly increased in the third group a month after dental rehabilitation. Elastase activity changed similarly to the dynamics of GPA change, increasing in patients from group 2 and 3, with changes most expressed in persons with DS (group 3). It is known, that elastase is a proteolytic enzyme that causes destruction of the basal membrane and collagen tissues and is an inflammation marker.

Patients with symptoms of inflammation of the tissues of the prosthetic bed (group 2) had a higher number of microorganisms in the oral lavages a week after prosthetic than in primary data, however, their quantity returned to original level a month later. The group of patients diagnosed with “denture stomatitis" (group 3) showed almost twofold increase in total microbial contamination of the oral cavity a week after prosthetic (differences reliable in relation to both the initial level, and the data of the control group). These patients still had a high general level of microbial contamination one month after dental rehabilitation.

CONCLUSION

Study of the species composition of the microorganisms isolated allowed us to determine deviations from the normal ratio of oral microorganisms after prosthetic in patients with DS. Thus, the frequency of isolating non-hemolytic streptococcus and non-pathogenic staphylococcus increased in oral lavages. Microorganisms, such as enterococci, E. coli and pathogenic staphylococcus, which were not isolated in any of the patient during the first study (before the prosthetic), were inoculated in 2 patients of 11 one month after wearing dentures, which was 18.8%. The frequency of isolating yeast-like fungi of Candida increased three times in oral lavages.

At the same time, patients with intact mucosa of the prosthetic bed had the microflora ratio remained almost unchanged with respect to the indicators determined prior to the dental rehabilitation. Therefore, the data obtained provide strong evidence of a change in microbiocenosis in patients using plate over-dentures.

SUMMARY

Therefore, indicators of homeostasis and biocenosis of oral cavity in patients with

denture stomatitis, who use plate over-denture, determine the immune resistance of the entire body, allow reliably and quickly assessing the situation in the oral cavity and developing effective methods of treatment and prevention of this disease.

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