

# EVALUATION OF MUCOUS MEMBRANE OF THE ORAL CAVITY MICROCIRCULATION IN PATIENTS WITH MAXILLARY DEFECTS AFTER RESECTION SURGERY DUE TO COVID-19 DISEASE

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## Abstract

The article deals with changes in the microcirculation of the oral mucosa in patients with maxillary defects that have occurred after resection due to complications caused by COVID-19. The relevance of the study is due to the increased number of patients who underwent surgery against the background of complications of coronavirus infection, which requires an assessment of the state of the microcirculatory bed for the development of effective rehabilitation methods. Special attention is paid to the analysis of the effect of complex treatment, including local and general therapeutic approaches, on the state of microcirculation. The results of the study showed a significant improvement in blood flow parameters in patients who received complex treatment, which confirms its effectiveness in the recovery period. The obtained data emphasize the importance of monitoring the microcirculation of the mucous membrane of oral cavity and individual approach to the treatment of patients with maxillary defects, which contributes to improving clinical results and speeding up rehabilitation.

**Keywords:** COVID-19, removable denture, jaw defect.

## Introduction

Coronavirus disease is caused by the SARS-CoV-2 virus. This coronavirus, like most other members of this family, consists of an envelope, a lipid layer, and RNA. [1,2,2] The microcirculation disorders play a key role in the pathogenesis, clinical manifestations, and progression of many oral diseases. Up to 30% of patients with COVID-19 in critical condition have signs of dangerous thrombosis, including sinus node thrombosis. This is also evidenced by an increase in the number of cases of acute purulent-inflammatory diseases of the maxillofacial region, an increase in complications and mortality associated with COVID-19. The frequency of complications in this area is associated with the difference in the anatomical structure of the upper and lower jaws, as well as with the topographic and anatomical proximity of the maxillary focus of inflammation to the carotid-cavernous sinus and brain.

Surgical removal of the consequences of acute purulent-inflammatory diseases due to the transferred Covid-19, leads to a significant loss of bone and soft tissue fragments of the



maxillofacial region. The lack of anatomical integrity of the jaws is complicated by violations of breathing, speech formation, swallowing, and aesthetic norms.

To effectively restore the lost functions after performing surgery on the jaws, it is necessary to perform high-quality prosthetics of the resulting defect. Taking into account the integrated approach for rehabilitation of patients with maxillary defects and interaction of surgeons with orthopedic dentists creates conditions for eliminating undesirable consequences of surgery, such as: uneven jaw atrophy, uncontrolled scar deformation of the defect edges, the formation of complex anatomical and morphological clinical conditions of the prosthetic bed.

The study of the quality of the microcirculation of the mucous membrane of the operating area of patients allows us to characterize the state of blood circulation and adjust further treatment to optimize the condition of the prosthetic bed. These factors make it possible to predict and improve the choice of treatment approach and increase the effectiveness and reduce the duration of the rehabilitation period in patients. The aim of the study is to study the microcirculation parameters of patients with complicated osteomyelitis and upper jaw resection after COVID-19, before and after treatment

#### **MATERIALS AND METHODS OF RESEARCH**

This study was conducted at the Department of Faculty of Prosthetic Dentistry of the Tashkent State Dental Institute in the period 2019-2024. In total, prosthetic treatment was performed in 40 patients with deformities and defects of the maxillofacial region caused by osteomyelitis of the upper jaw, which developed against the background of Covid-19 virus infection, who needed dental prosthetic rehabilitation after surgery, including 24 men and 16 women aged 40 to 65 years. The patients' diagnosis of SARS-CoV-2 S-RDB (Covid-19) virus infection was confirmed by clinical and laboratory methods (ELISA and IHL).

In this study, we studied the dynamics of tissue microcirculation indicators against the background of local and general proposed drug treatment at various times before and after prosthetics with removable obturating prostheses in patients with defects and deformities of the upper jaw after total resection due Covid-19 disease.

The amplitude-frequency spectrum of the Laser Doppler flowmetry was used to estimate the contribution of the most physiologically significant blood flow fluctuations.

Patients were divided into two groups: the first group (A/A) – patients of this group did not receive additional treatment, the second group (PVA/K) - in this group, patients were treated with the drug tivortin.

20 patients with complete secondary adentia (40-65 years old) were selected for the control group without pathology of the cardiovascular and dentoalveolar systems.

Patients with the drug "tivortin" solution for oral administration were recommended to take 5 ml (1 measuring spoon— 1 g of the drug) 4 times a day orally with meals. The duration of treatment is 14 days.

According to pharmacological data, the drug "tivortin" has detoxification and anti-radical activity on the human body, which contributes to the active regulation of metabolism in the body, the hormonal balance is maintained.



**RESULTS OBTAINED**

The Laser Doppler flowmetry patients was performed in a sitting position before the start of treatment and 1 month after the proposed drug treatment. (Tab. 1)

Table.1 Indicators of signal amplitudes before treatment.

Indicators	M, perf. units	$\sigma$ , perf. units	Kv,%
Control group	26.51 $\pm$ 1.88	2.60 $\pm$ 0.40	12.44 $\pm$ 0.80
I Group I (A/A)	32,57 $\pm$ 1,98	1,85 $\pm$ 0,16	6,60 $\pm$ 1,05
II Group II (PVA/K)	32,29 $\pm$ 0,67*	2,98 $\pm$ 0,77*	6,93 $\pm$ 1,43

In the group of individuals with secondary maxillary adentia, revealed the Laser Doppler flowmetry normative parameters of microcirculation in the oral mucosa (Table 1). Thus, in the group of healthy individuals, the value of capillary blood flow according to the microcirculation parameter (PM) was 26.51  $\pm$  1.88 perf. units. The value of the average square deviation of blood flow fluctuations (SKR) was 2.60  $\pm$  0.40 perf. units, and the values of the coefficient of variation (KvKv) were 12.44  $\pm$  0.80 %.

It follows from the table that the Laser Doppler flowmetry values are increased in the group with the most pronounced inflammatory reaction of the oral mucosa (aphthous ulcers, erosion, focal infection) compared to the control group. This is evidenced by an increase in the microcirculation index in group I by 48-53%, which reflects stagnant phenomena in the study area. A marked decrease in the level of indicators and the coefficient of variation indicates violations of the rhythmic structure of tissue blood flow fluctuations, which is associated with a deterioration in tissue perfusion with blood.

In the first group of patients who underwent total jaw resection, significant microcirculatory disorders of capillary blood flow of the mucous membrane were observed before treatment: microcirculation index was 32.57  $\pm$  1.98, RMSE-1.85  $\pm$  0.16, coefficient of variation-6.60  $\pm$  1.05 %. . These data indicate a complex series of changes associated with pronounced difficulty in blood outflow, structural abnormalities of micro vessels and violation of the barrier function of their walls. Statistical analysis of the data using of Laser Doppler flowmetry did not reveal significant differences between the first and second groups ( $p > 0.05$ ). In the second group of patients, the average values of capillary blood flow were: PM-32.29  $\pm$  0.67, RMSE-2.98  $\pm$  0.77, and Kv-6.93  $\pm$  1.43%. These results show that the intensity of blood flow in both groups significantly differs from the control group (Table 2).

Table. 2 Indicators of Laser Doppler flowmetry signal amplitudes one month after the start of treatment.

Indicators	M, perf. units	$\sigma$ , perf. units	Kv,%
Control rroup	29.57 $\pm$ 1.38	2.80 $\pm$ 0.46	14.41 $\pm$ 0.35
I Group I (A/A)	31,97 $\pm$ 1,65	2,15 $\pm$ 0,11	6,58 $\pm$ 1,43
II Group II (PVA/K)	34,50 $\pm$ 0,13*	3,01 $\pm$ 0,14*	8,98 $\pm$ 1,62

Statistical analysis of Laser Doppler flowmetry data after one month in patients with total resection showed the following values (Table 2).



One month after the examination of patients in the group without additional treatment, the average values of the PM index in the area of prosthetic bed tissues were  $31.97 \pm 1.65$  perf. units,  $\sigma - 2.15 \pm 0.11$  perf. units and  $Kv - 6.58 \pm 1.43\%$ . In the group of patients who received the drug "Tivartin" as part of a complex treatment, the average values of Laser Doppler flowmetry indicators were:  $PM - 34.50 \pm 0.13$ ,  $RMS - 3.01 \pm 0.14$  and  $Kv - 8.98 \pm 1.62\%$ .

Minor changes in Laser Doppler flowmetry parameters were noted in the first group of patients who did not receive additional treatment, and in the second group during the study period, an improvement in the level of microcirculation was detected, which is confirmed by the obtained in Laser Doppler flowmetry data. In comparison with the initial data, an increase in the standard deviation by 7.4% was observed, which indicates a decrease in the elasticity of the vascular wall, increased arterial blood flow into the microcirculatory bed, a decrease in microcirculatory pressure, impaired blood outflow, and persistent signs of blood stagnation in the microcirculatory system.

The study revealed a statistically significant difference between the indicators of the first and second groups of patients studied, which indicates the active effect of the drug proposed by us to improve regional microcirculation. In the group of patients using the drug tivartin h, an increase in the coefficient of variation was observed by 1.3 times compared to the data obtained before treatment. These data indicate a possible launch of compensatory mechanisms of the body, due to arginine, which is part of the proposed drug for the normalization of microcirculation. In the first group of patients who did not receive additional treatment, there was a slight statistically significant deterioration in Laser Doppler flowmetry data, which indicates the possible presence of inflammatory phenomena.

Based on the obtained results of **Laser Doppler flowmetry** performed in patients of the first and second groups, it can be concluded that the obtained data contribute to the optimization of existing treatment regimens for this category of patients in combination with different pharmacotherapy. Laser Doppler flowmetry can be used both for monitoring the state of microcirculation and for monitoring drug exposure.

### Conclusions

Assessment of oral microcirculation in patients after prosthetic treatment in terms of 1.3 and 6 months is not only of diagnostic value, but can also be used to prevent postoperative complications. In the presence of low indicators in the results obtained, below the norm in postoperative period indicates the presence of a pathological process in the patient's oral cavity and requires postoperative correction of drug treatment.

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