



Comparative analysis of the functional state of the microcirculation of the prosthetic bed in patients with complete adentia after Covid-19 disease

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ABSTRACT

The outbreak of the new coronavirus infection SARS- CoV-19 has become a serious test for the global health system. Within a short time, research began on the etiology, pathogenesis and treatment possibilities of a new viral disease.

Current definitions of Covid-19 cases depend solely on typical pulmonary symptoms [1-7, 11-14] common with other respiratory diseases. Meanwhile, from a laboratory point of view, leukopenia with lymphopenia, thrombocytopenia, high values of C-reactive proteins and low levels of procalcitonin are well-established diagnostic indicators [23]. In addition, many symptoms manifest themselves in the oral cavity [26-28]. The most frequent lesions in descending order were tongue (38%), lip mucosa (26%), palate (22%), gum (8%), cheek mucosa (5%), oropharynx (4%) and tonsils. (1%). The proposed diagnoses of lesions included aphthous stomatitis, herpetiform lesions, candidiasis, vasculitis, Kawasaki type, mucositis, and drug rash, necrotizing periodontal disease, angular cheilitis, atypical Sweet syndrome and Melkerson-Rosenthal syndrome. Lesions of the oral cavity were symptomatic (soreness, burning or itching) in 68% of cases. Oral lesions were almost the same in both sexes (49% of women, 51% of men). The delay time between the appearance of systemic symptoms and oral cavity lesions ranged from 4 days before and up to 12 weeks after the appearance of systemic symptoms. In 3% of cases, oral lesions preceded systemic symptoms, and in 4% of cases, oral and systemic symptoms were simultaneously manifested. The longest latency period was for lesions like Kawasaki syndrome. Oral lesions healed from three to 28 days after their appearance. Various types of therapy were prescribed for oral lesions, including chlorhexidine mouthwash, nystatin, oral fluconazole, local or systemic corticosteroids, systemic antibiotics, systemic acyclovir, artificial saliva and photobiomodulation therapy, depending on the etiology [16-19, 20-22, 24, 26].

According to researchers, patients with Covid-19 often have thrombotic complications with the detection of large blood clots and signs of thrombosis at the microcirculatory level. This is due to several pathogenetic mechanisms at once. A sharp decrease in the ability of red blood cells to change their shape during the passage of vessels of the microcirculatory bed with a diameter smaller than the diameter of the red blood cell was also revealed [15, 22].

But in dentistry, there is still no clear data on whether Covid-19 is the direct cause of microcirculation disorders in the tissues of the oral mucosa that lead to inflammatory periodontal diseases. The screening capabilities of the method of high-frequency ultrasound Dopplerography in the study of microcirculation of the oral mucosa in Covid-19 disease are also unclear.

Keywords:

SARS- CoV-19, Covid-19, dentistry, oral cavity, microcirculation, coronavirus, infection, prosthesis.

The aim of the study was to identify changes in the microcirculation of the oral mucosa after orthopedic prosthetics in patients who underwent Covid-19.

Clinical studies were conducted at the Department of Hospital Orthopedic Dentistry of the Tashkent State Dental Institute. The study of the microcirculation of the oral mucosa was performed in two groups of patients aged 45 to 75 years with complete secondary adentia. The 1st group included 30 people whose prosthetics used standard acrylic prostheses, the 2nd group included 30 patients whose prosthetics used prostheses with a soft pad, who had a coronavirus infection. Voluntary informed consent for clinical and functional examination was obtained from all the people who became the objects of the study. In the course of the study, we studied the microcirculation of the prosthetic bed in the examined patients using the LDF method.

Research results

Indications from patients were taken in a dental chair, in a sitting position before the start of prosthetics and 10 days, 1.3 and 6 months after prosthetics.

In the group of persons with complete

secondary adentia, the readings of the LDF apparatus revealed the normative parameters of microcirculation in the oral mucosa (Table 1). The readings in the control group of the examined patients showed the following values of capillary blood flow according to the microcirculation parameter was equal to 24.51 ± 1.88 perf. Units. The value of the mean square deviation of blood flow fluctuations showed 2.45 ± 0.55 perf. Units. Moreover, the value of the coefficient of variation (Cv) was equal to $12.09 \pm 0.33\%$.

According to Table 1, there is a noticeable increase in indicators in all groups due to a pronounced inflammatory reaction of the oral mucosa such as aphthae, erosions, foci of inflammation compared with the control group. As a result, as can be seen from the table, there is an increase in the microcirculation index in-group I by 48-53%, which reflects stagnation in the study area. A marked decrease in the level of indicators such as "flux" and the coefficient of variation indicates violations of the rhythmic structure of fluctuations in tissue blood flow, which is associated with a deterioration in tissue perfusion with blood.

Table 1

№ Group	Значения	До протезирования	Через 10 дней	Через месяц
1 Group	М, перф. ед	$28,57 \pm 1,98$	$27,57 \pm 1,98$	$26,65 \pm 1,98$
	σ , перф. ед	$1,8 \pm 0,16$	$1,89 \pm 0,16$	$1,82 \pm 0,16$
	Kv,%	$8,84 \pm 1,05$	$9,01 \pm 1,05$	$9,52 \pm 1,05$
2 Group	М, перф. ед	$27,29 \pm 0,67$	$26,29 \pm 0,67$	$25,45 \pm 0,67$
	σ , перф. ед	$1,7 \pm 0,77$	$1,91 \pm 0,77$	$1,99 \pm 0,77$
	Kv,%	$8,79 \pm 1,43$	$9,35 \pm 1,43$	$9,87 \pm 1,43$
Control Group	М, перф. ед	$24,28 \pm 1,88$	$24,51 \pm 0,54$	$24,23 \pm 1,88$
	σ , перф. ед	$2,33 \pm 0,41$	$2,45 \pm 0,55$	$2,33 \pm 0,41$
	Kv,%	$11,89 \pm 0,80$	$12,09 \pm 0,33$	$12,45 \pm 0,80$

In the first group of patients, with the use of complete removable prostheses made in the traditional way, before the start of treatment, when studying the capillary blood flow of the mucous membrane, pronounced microcirculatory disorders were noted: the microcirculation index was 28.57 ± 0.98 , the COE was 1.8 ± 0.16 ; the coefficient of variation

was $8.84 \pm 1.05\%$, in which a complex of changes associated with a sharp difficulty occurs outflow of blood, violations of the structure of microvessels and the barrier function of their walls. In the second group of patients, we obtained the following average values of capillary blood flow: PM — 27.29 ± 0.67 ; COD — 1.7 ± 0.77 ; Cv — $7.79 \pm 1.43\%$.

Table 2

Group №	Значения	Через 3 месяца	Через 6 месяцев
1 Group	M, перф. ед	25,77 ± 1,98	25,33 ± 1,98
	σ, перф. ед	2,05 ± 0,16	2,12 ± 0,16
	Kv,%	10,19± 1,05	10,23± 1,05
2 Group	M, перф. ед	24,57 ± 0,47	24,69 ± 0,67
	σ, перф. ед	2,11 ± 0,77	2,23 ± 0,77
	Kv,%	10,72 ± 1,43	11,25 ± 1,43
Control Group	M, перф. ед	23,89 ± 1,88	23,65 ± 1,38
	σ, перф. ед	2,33 ± 0,41	2,52 ± 0,46
	Kv,%	11,89 ± 0,80	12,41 ± 0,35

The obtained data show that the intensity of blood flow in the two comparison groups significantly differs from the values of the control group.

When examined a month later in patients of the group using complete removable prostheses made in the traditional way, the arithmetic mean values of the M index in the area of examination of prosthetic bed tissues were 26.65 ± 1.98 perf. Units, σ — 1.82 ± 0.11 perf. Units and Kv — $9.52 \pm 1.43\%$. In the group of patients using full removable prostheses with soft padding, the average values of LDF-metric indicators were M — 25.45 ± 0.13 ; COD — 1.99 ± 0.14 ; Cv — $9.87 \pm 1.62\%$.

In the second group of patients using full removable dentures with a soft pad, there is an improvement in the value of the coefficient of variation compared to patients who used traditional dentures during orthopedic treatment, which indicates an improvement in the state of microcirculation. In comparison with the initial values in this group, the coefficient of variation increased by 1.3 times, which indicates a decrease in stagnation in the oral cavity, and this, indicates the launch of compensatory adaptive mechanisms. Perhaps this is due to a reduction in the load on the prosthetic bed.

There were minor changes in LDF metrics in the first and second main groups, compared with the control group. During this period, there was an increase in the COEX index by 7.4% compared to the previous study, which indicates low elasticity of the vascular wall, increased inflow of arterial blood into the microcirculatory bed, and reduced microcirculatory pressure, deterioration of

blood outflow, residual manifestations of blood stagnation in the microcirculatory bed.

Despite the recovery of patients after undergoing coronavirus infection, the readings of the device, namely the values of the coefficient of variation, indicate a decrease in the elasticity of the vascular wall, impaired outflow in the microcirculatory bed, resulting in an increase in blood volume in the microcirculatory link, which leads to stagnation in the oral cavity in the examined patients.

In the dynamics of the study for 3 months after prosthetics, indications indicate an improvement in microcirculation in the prosthetic bed, and by the end of the sixth month, normalization of parameters that remained within the normal limits was noted. The values of LDF-metric changed slightly, without going beyond the statistical error, which indicates the stability of microcirculation around the prosthetic bed.

Thus, the use of LDF-metry in patients who have undergone Covid-19 makes it possible to optimize existing prosthetics schemes. Laser Doppler flowmetry can be used to monitor the state of microcirculation of the prosthetic bed in patients who have undergone Covid-19.

Conclusion: in patients who have had a new coronavirus infection, there is an increase in the Purselo and Gosling indices, reflecting the elastic-elastic properties and peripheral resistance of the arteries of the microcirculatory bed of the oral mucosa. The reason for these changes may be a change in the rheological properties of blood that persists for a long time after a coronavirus infection. There were no significant differences in the change in blood flow velocity, which indicates the work of

compensatory mechanisms of the cardiovascular system. The data obtained as a result of our work speak in favor of the high possibility and potential of the laser Doppler flowmetry method for detecting microcirculation disorders of the oral mucosa in Covid-19 not only in mature patients without concomitant pathology.

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