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ANALYSIS OF MICROCIRCULATORY DISORDERS IN PATIENTS WITH LICHEN RUBER PLANUS OF ORAL MUCOSA

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ABSTRACT

At the dental appointment, there is an increasing frequency of lichen planus in the oral cavity. In this case, erosive-ulcerous form of lichen planus is one of the most common and difficult to treat. At present, issues of aetiopathogenesis of lichen ruber planus in geriatric dentistry are not yet clear. In this work, development of inflammatory-destructive diseases is dealt with from the standpoint of microcirculatory disorders in patients' oral cavity. To study microcirculatory changes in patients with erosive ulcerous form of lichen ruber planus, a comparative analysis of microcirculatory component and amplitude-frequency spectrum was carried out in patients with this pathology with respect to a group of healthy people aged 45-59.

Material and methods. Microcirculation was studied with Doppler laser flowmetry in 60 patients in comparison with healthy people (30 people).

Results. Hemocirculatory disorders were revealed in patients both on the side of pathology and in the symmetric area, which indicates systemic microcirculatory changes in the oral cavity.

Discussion. The data obtained suggest that it is advisable to perform laser Doppler flowmetry prior to and against the background of pharmacotherapy.

Conclusion. In inflammatory-destructive lesions of the oral mucosa, increased microcirculation parameters against the background of decreased average perfusion fluctuation and vasomotor activity of the vessels is observed. The amplitude-frequency spectrum, carried out by wavelet transform, showed a decrease in the amplitude of low-frequency flaws and an increase in the amplitude of pulse and respiratory waves. Endothelial oscillations decay probably occurs against the background of decreased synthesis of nitric oxide; as the frequency range of secretory activity of the endothelium and synthesis of nitric oxide coincide in the microcirculatory bed, functional relationship between these parameters can be traced. Vasomotor rhythm decline, vasoconstriction of the vessels, decrease in endothelial oscillations amplitude indicate endothelial dysfunction. Having high sensitivity to changes in the microhemodynamic situation in the vascular bed, the use of LDF makes it possible to evaluate the state of functioning of control mechanisms and is a valid method of application in gerontostomatological practice.

Keywords: microcirculation, Doppler, erosion, ulcer, regeneration, therapy.

Introduction. With a large variety of inflammatory-destructive diseases of the oral cavity, lichen ruber planus (LRP) is one of the most common in geriatric dentistry, especially its erosive-ulcerous form prone to malignization and chronic forms [1, 7, 12]. The disease can develop at any age [5, 13]. At present it is impossible to say at what age this disease is most common but there is a clear tendency towards increase of this pathology among young people [18, 16]. It may happen due to lower immunity, as well as to psychogenic factors (the pathology develops as sympathoadrenal type), microcirculatory disorders and naturally due to predicting factors in the oral cavity – chronic infections, sharp teeth edges, fillings leading to injuries of the oral mucosa, damaged integrity of the epithelium of the oral mucosa [14,15]. In this connection it is important to carry out additional methods of diagnosis, reveal a provoking factor at an early stage that can lead to development and frequently to recurrence of the pathology and, as a result, timely modern and aetiopathogenetic chemotherapy [6, 11, 13].

LRP genesis is not clearly defined so far [3]. For this reason, there is no clear approach to chemotherapy of the pathology. Existing methods and therapeutic agents are only of symptomatic character and do not affect periods of remission and exacerbation [2, 12]. With a wide range of innovative methods of diagnosis and LRP treatment, there is always a question arising in geriatric dental practice: how reasonable is to prescribe this or that medicine which is effective not only at the local but also at the systemic level. In inflammatory-destructive diseases changes in hemodynamics occur, such as vascular permeability disorders, hypoxemia, angiospasm, atony, etc. To diagnose pathophysiological condition of the microcirculatory bed one should analyze active (factors affecting microcirculation system) and passive (factors affecting blood flow from without) mechanisms regulating capillary blood flow in the oral cavity [2, 10]. For this purpose application of laser Doppler flowmeter (LDF) based on Doppler effect; short-wave probe laser radiation makes it possible to get an echoed signal of a large amplitude from individual erythrocytes forming a thin layer of about 1 mm containing elements of the hemomicrocirculatory bloodstream [6]. This method helps obtain the maximal information on disorders in regulatory blood flow mechanisms in the microcirculatory bed which require correction [4, 9].

The **objective** of this article is analysis of regulation mechanisms of microcirculation in the oral mucosa in patients with lichen ruber planus with respect to normal people with the help of laser Doppler flowmeter.

Material and methods. To achieve the purpose, 60 patients with erosive-ulcerous lichen ruber planus of the oral mucosa at the age from 45 to 59 were examined.

On clinical examination of the patients special attention was paid to the color of oral mucosa (development and blood filling of small vessels), thickness and transparency of epithelium, presence of corneal layer and cornification degree, content of mucosa pigments (endogenous – melanin, exogenous – "amalgam tattoo", etc), surface, density and OM mobility (papillae, folds, depressions)

Carrying out LDF one should consider the following factors which can affect microcirculation parameters: menstrual cycle, physical activity, psychoemotional tension, body temperature) Capillary blood flow was analyzed in all parts of the oral mucosa, doing this a transducer was placed not only on erosions and ulcers but also on intact oral mucosa without any defects of epithelium.

All patients were randomized into 3 groups: experimental group I – study of microcirculation parameters in erosive-ulcerous areas, experimental group II – oral mucosa without signs of epithelium damage, control group III группа – normal people without any accompanying pathology.

Study of LDF- images was conducted in accordance with the protocol in two

stages [3]: in the first stage basal blood flow was studied and in the second stage – blood flow oscillation by wavelet transformation. As a conclusion the forma and degree of microcirculation disorder was shown.

The obtained data were processed using variational-statistical method Statistica 6 application package (Statsoft-Russia, 1999) and Microsoft Excel Windows 2000. Statistical analysis was done with variational-statistical method by determining mean (M), its mean error (±m), evaluation of significance of differences by group with Student's test (t). Difference between compared indicators was considered to be significant with $p< 0.05$, $t\geq 2$.

Results and discussion. In the group of healthy people (III) LDF helped to reveal regulatory parameters of microcirculation in the buccal mucosa: microcirculation parameter (MP) was 22.81±0.51 perf.units; SD was equal to 5.24±0.34 perf. units. and coefficient of variation (CV) was 23.0±0.12%.

Endothelial fluctuations amplitude made 1.73±0.15 Hz, neurogenous – 1.39±0.13 Hz, myogenous – 2.66±0.2 Hz, respiratory and cardiac – 0.79±0.09 Hz and 0.17±0.05 Hz accordingly. Thus, in the group of normal people endothelial and myogenous flux motion prevail. Analysis of standardized characteristics of fluctuation rhythms, that is fluctuations amplitude contribution relative to the average blood flow modulation in the control group showed that vasomotor rhythm was dominant (VLF – oscillations – 25%; $LF_н$ – oscillations – 21%; $LF_м$ – 39%; HF – 12%; CF – 3%). Shunting value that enables to evaluate the influence of myogenous, neurogenous and endothelial components of microvessels made 0,7±0,12 Hz, that is the evidence of dominant oscillations of endothelial and myogenous rhythms. Thus, it is possible to conclude that in the oral cavity of healthy people of the III group mesoemic type prevails, characterized by average parameters of tissue blood flow and well marked aperiodicity of oscillations in LDF.

On interpreting the results of the I group, the following values were obtained characterizing marked impairment of capillary blood flow in the bloodstream. The mean value of MP was equal to 31,68±0,55; flux level - 1,87±0,03; vasomotor activity of microvessels made 5,5±0,17%. Significant decrease in CV by 4.2 times was noted in patients with LRP that is the evidence of decreased speed of the local blood flow, vasoconstriction, deterioration of microcirculation comparing with normal people. On the symmetrical side of the oral cavity in patients with LRP CV was also 3.5 times lower (6,57±0,14% and 23,0±0,12%, with $p<0,05$). Naturally, the value of average perfusion oscillation relative to the mean value of blood flow also dropped (σ – 2,06±0,04 perf. units), the value of the average blood flow made 31,37±0,1 perf. units, that is the evidence of increased blood volume in arterioles. Changes in microcirculation parameters in the basic part of the study in relation to the control group characterizes decreased vasomotor vascular activity in the oral cavity in LRP patients independent on localization of pathologic elements.

Rhythmic structure of blood flow oscillations also changed – the amplitude of low-frequency oscillations became lower due to the weaker vasomotor rhythm. So, the amplitude of endothelial oscillations in the area of erosive-ulcerous lesions was 82,1% lower comparing to the control group and was equal to 0,95±0,16 Hz, neurogenous - 39% - 0,97±0,27 Hz. Flux motion of myogenous oscillations were also lower (0,90±0,28 Гц) and the amplitude of high-frequency flux motions, the pulse wave in particular, was 82,3% higher and made 0,31±0,06 Hz, respiratory wave amplitude was equal to 0,5±0,2 Hz. By contribution correlation of active and passive flux motions the amplitude of LF – oscillations was – 35%; VLF – 26,5%; HF – and CF – oscillations – 17,5% and 21% accordingly. Shunting value made 1,32±0,2 Hz.

Study of blood flow in the patients with LRP on the symmetric side also revealed significant difference in characteristics comparing to the control group but no significant difference was revealed comparing to group I. The level of LDF- signal on the symmetrical side of the buccal mucosa underwent serious changes in relation to the control group. So, MP in group II was 31,37±0,1 Hz, that was significantly higher than in the control group - 18,32±1,02 Hz. СКО made 2,06±0,04 Hz, that was significantly lower comparing to group III, CV – 6,57±0,14%, that is twice lower than in the control group. In LRP patients contribution of passive oscillations (pulse and respiratory wave) was also noted on the symmetrical side of the cheek. On the buccal mucosa it grew 1,5 times larger comparing to the control group.

Discussion. The data obtained by laser Doppler flowmetry showed that patients with erosive-ulcerous lichen ruber planus were characterized by lower vasomotor vessel activity, lower blood flow, vasoconstriction of blood vessels, significant decrease in the amplitude of low-frequency oscillations accompanied by endothelial disfunction in the oral cavity.

Impairment of microcirculation in the oral cavity are rather uniform both in the lesion focus and on the symmetrical intact side. Local spasm of arteriolar vessels, hypoxemia in microcirculatory bloodstream, lowered intensity and speed of blood flow in the capillaries was noted in the oral cavity. It should be noted that microcirculation impairment in the oral cavity is impossible to compare to any specific form. he main tendencies of changes of LDF values correspond to the hyperemic form. Microcirculation value is above normal, flux is decreased, the amplitude of vasomotor waves is reduced and the amplitude of the respiratory and especially of the pulse wave is considerably higher, variation factor is below normal. Monotonous type of LDF-image with high perfusion (hyperemic) is characterized by a high perfusion value and monotonous fluctuations of tissue blood flow due to low flux and CV values. In this case, a considerable contribution of respiratory and pulse components alongside with a lower tone of vasomotor fluctuations is the evidence of relative weakening of sympathetic influence.

Degree of microcirculatory changes depend on the intensity of the process. Microcirculation impairment is largely expressed in the lesion foci of cheeks and lips mucosa. These changes in the rhythmic structure of flux motion become more evident as blood flow and microcirculation impairment get worse. It means that the lower is contribution of vasomotions to the active modulation of microcirculatory hemodynamics, the larger is compensatory role of other regulatory mechanisms. With inflammatory-destructive process in the oral mucosa, vascular impairment of the microcirculatory bloodstream develop early manifesting in venous congestion, slower metabolism reduced vasomotor vascular activity, slower local blood flow. A topical issue is to reveal those elements in the pathogenic mechanism of microcirculatory impairments in oral mucosa diseases; acting on them will reduce the level of microcirculatory impairments and improve trophism of oral mucosa, which in turn should be taken inti consideration treating this pathology.

Conclusions. Analysis of the data obtained showed that correlation of rhythmic components in LDF-image objectively reflects condition of hemodynamics in the microcirculatory bloodstream of LRP patients.

Against the background of general spectral narrowing of LDF-image, the patients show evident suppression of vasomotor rhythm, increased high-frequency oscillations, especially in the area of cardiac rhythm. A higher degree of manifested microcirculation impairment is observed in the lesion focus of buccal mucosa. Changes in the rhythmic structure of flux motions are expressed more clearly as blood flow and microcirculation impairment get worse. It means that the lower is contribution of vasomotions to the active modulation of microcirculatory hemodynamics; the larger is compensatory role of other regulatory mechanisms. The amplitude of endothelial oscillations decreases due to reduced synthesis of nitric oxide, as the frequency range of endothelial activity and NO synthesis coincide in the microcirculatory bloodstream. The amplitude of myogenic oscillations probably decreases due to calcium metabolism disorder that participates in muscular contraction of blood vessels. In this case, nitric oxide synthesized by endothelium diffuses to myocytes and with their deficit calcium metabolism is impaired resulting in vasoconstriction of blood vessels. Drop in amplitude of neurogenous oscillations is associated with sympathetic adrenergic influence, адренергическими влияниями and as this occurs, sympathetic vasomotor activity increases resulting in compensatory vascular constriction. Thus, it is logical to detect microcirculatory changes in inflammatory-destructive dental diseases with LDF which in combination with clinical data permits to receive a complete picture of impaired tissue condition.

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ADDITIONAL DIAGNOSTICS METHODS FOR THE PLANNING OF PREVENTION OF DENTAL CARIES AND ITS COMPLICATIONS IN CHILDREN

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ABSTRACT

Temporal teeth caries and its complications, among other unsolved global problems, are relevant in the Khabarovsk Territory. A survey of 885 children 3 and 6 years old in the Khabarovsk Territory showed a high prevalence of dental caries: at 3 years up to 70.8% ± 1.1% and at 6 years old - 89.4% ± 1.3%, with an intensity of affecting children 3 3.34 ± 0.09 years, by 6 years old 6.4 ± 0.9 teeth. Pulpitis is 61.7% ± 1.1%. Determination of the density of bacteria S. S. mutans of dental plaque from the four surfaces of the teeth, the mucous membrane of the tongue and saliva was done by the microbiological method using Dentocult SM Strip Mutans. High contamination of S. mutans of dental plaque from the lingual surface of the tooth and interdental space, with a titer of CFU / ml>106, the lowest content of S. mutans in the saliva is CFU / ml 105. We conducted a microscopic study of the native scraping from the root of the tongue, revealed signs of chronic dehydration of the oral mucous membrane, and established its direct strong correlation with the caries, filling, extracted/removed tooth (CFR) index (r = 0.723, p = 0.013). Microcrystallization of oral fluid (MOF) was assessed, in frequently ill children, type II of the MOF (subtype B and C) is found in 70% ± 2.7% and type III of the MOF in 26.4% ± 2.7%. Additional innovative microbiological and microscopic methods personify the approach to the diagnosis, prevention and treatment of caries in children of early and preschool age, have prognostic value and allow taking into account regional features.

Keywords: epidemiological, microbiological and microscopic studies, caries of temporary teeth, pulpitis, children, cariogenic bacteria, chronic dehydration.

Introduction. According to the WHO, the prevalence of infectious diseases of dental caries in different countries reaches 94%. The actual and still unsolved problem of children's dentistry is caries of temporary teeth and its complications [2, 7, 9, 12, 14]. The main factors of initiation and development of caries are known: the presence and high titer of cariogenic bacteria *Streptococcus mutans* and *Streptococcus sobrinus* [2, 10, 13], a low level of practical skills in oral hygiene [4], changes in the composition and properties of the oral fluid [1, 8], uncontrolled consumption of sugars [11], low hygienic / sanological culture of parents [6], complicated during pregnancy [6, 11], which makes it possible to identify dental caries as a multifactorial polyetiological disease and an opportunistic infectious process [2]. In Eastern European countries, the caries of the teeth of children under 6 years old is 56.9% [5], in the Asian region up to 85% [5], in Russia for children 3-6 years old it is from 36% to 87%, with an average intensity 2,8 and 4.7 teeth [4, 9], in 80% of patients complicated forms are determined [8]. Thus, the most effective correction of dental status in children is possible when identifying the leading risk factors for the development of caries and pulpitis, taking into account regional features.

Objective: to introduce additional innovative diagnostic methods for the planning of primary prevention of caries of temporary teeth in children.

Materials and research methods: