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Haemodynamics in Parodontal Tissues in Women of Childbearing Age Suffering Chronic Generalized Parodontitis in Follicular Phase Of Menstrual Cycle

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Abstract.

This research is devoted to blood circulation in healthy parodontal tissues and differences in chronic generalized parodontitis in women of fertile age according to menstrual cycle. The research was performed in 87 women with CGP versus 45 healthy control in acute phase and remission conducted using ultrasound dopplerography. It was stated that microcirculation in parodontal tissues correlates strongly with the phases of menstrual cycle. In early, medium and late follicular phase of the cycle linear, volume velocity, blood vessel elasticity and peripheral resistance differ strongly both in healthy parodontal tissue and in patients with chronic generalized parodotitis.

Key words: Healthy parodontal tissue, chronic generalized parodontitis, parodontal blood supply, women of childbearing age.

INTRODUCTION

It is already well known how considerably the female body depends on menstrual cycle that usually lasts from 25 to 35 days. Although that is the reproductive system that reacts most impressively, the rest of the body reacts to a noticeable extent as well. As the hypothalamic-pituitary system influences broadly homeostasis, its wave-like change of activity during the female menstrual cycle also affects thermoregulation, the vascular system, variety of metabolic issues and so on [1]. Mentioned above gender-dependent features also influence the pathophysiology of blood vessel related conditions in women.

It is known that in any inflammatory process in parodontal tissue even in gingivitis there are changes in blood circulation. Microcirculation is important in supporting homeostasis of any kind of tissues. A key point of microcirculatory disturbance belongs to capillary bloodstream failure that begins usually with decrease in its intensity ending in complete capillary stasis in nutritive chain microcirculatory flow. Altered capillary response plays a major role in pathogenesis of chronic generalized parodontitis (CGP) [2; 3; 4]. Postcapillary resistance increases, the number of functioning capillaries decreases, so metabolic disturbance occur accompanied with further accumulation of vasoactive substances and progressing of pathological shifts in the tissue [5; 6; 7; 8; 9].

Research is devoted to blood circulation in healthy parodontal tissues and differences in chronic generalized parodontitis in women of fertile age suffering from CGP according to menstrual cycle in early, intermediate and late phases of its follicular phase.

MATERIALS AND METHODS.

In 87 women (age 20-35) with light, medium and severe forms of CGP in remission and exacerbation as well as in different stages of follicular phase of menstrual cycle microcirculation was investigated by means of ultrasound dopplerography. " Minimax-Doppler-K" device (Saint-Petersburg) was used with continuous signal at 20 MHz, that allows to evaluate haemodynamics at depth of 0-0,8 cm [10].

Blood circulation of parodontal tissues was estimated by spectral analysis of Doppler signal that allows to investigate linear and volume velocities of blood stream. The sensor was placed at the gingival fold, evaluation indexes included Vas, Vam, Vakd, Qas, Qam, Pi and Ri. As a group of control, 45 women of the same age interval (20-35 years) were used with intact parodontal tissues.

The results obtained were processed through XLSTAT -Pro plug-in for MS Excel 2000. The statistical significance used was Student's t-criterion with $p<0.05$.

RESULTS AND DISCUSSION.

In early proliferative stage of follicular phase in women of childbearing age with light forms of CGP in remission Vas(0.776±0.01 cm/s), Vakd(0.384±0.08 cm/s.) and Vam (0.402±0.04 cm/s) slightly decreased in comparison with the group of women with healthy parodontal tissue ($p>0.05$), (Table 1).

Maximal volume systolic velocity(Qas) and volume mean velocity (Qam) stayed nearly the same($p>0.05$). In medium form of CGP in remission and early stage of proliferation of follicular phase more evident decrease of linear velocities were observed in comparison with the control group of ($p<0.05$). Vas, Vakd and Vam were ranged 0.595±0.055 cm/s, 0.276±0.08 cm/s and 0.320±0.03 cm/s accordingly while Qas and Qam decreased slightly.

Qas was estimated as 0.034±0.001 ml/min. (0.038±0.01 ml/min in the control group ($p>0.05$), Qam – 0.018±0.001 ml/min, (0.024±0.002 ml/min., in control group ($p>0.05$)(Table 1).

Table 1. Haemodynamics in parodontal tissue in women of fertile age with CGP in remission and exacerbation in early stage of follicular phase of menstrual cycle

Early stage of follicular phase(proliferation)		Vas (cm/s)	Vakd (cm/s)	Vam (cm/s)	Qas (ml/min)	Qam (ml/min)	Pi	Ri
Individuals with healthy parodontal tissues		0,785±0,012	0,418±0,02	0,435±0,012	0,038±0,001	0,024±0,002	1,860±0,07	0,740±0,03
Light form of CGP	in remission	0,776±0,011	0,384±0,08	0,402±0,04	0,037±0,001	0,024±0,002	1,724±0,001	0,610±0,05*
	in denominator	0,714±0,02	0,283±0,09*	0,358±0,01	0,035±0,002	0,023±0,003	2,203±0,03*	0,869±0,05*
Medium form of CGP	in remission	0,595±0,055*	0,276±0,08*	0,320±0,03*	0,034±0,001	0,018±0,001	2,146±0,04*	0,648±0,05*
	in denominator	0,476±0,056*	0,201±0,014*	0,217±0,04*	0,020±0,001*	0,008±0,002*	2,267±0,04*	0,895±0,05*
Severe form of CGP	in remission	0,498±0,02*	0,205±0,015*	0,202±0,02*	0,022±0,002*	0,010±0,002*	1,352±0,03*	0,725±0,06
	in denominator	0,275±0,04*	0,126±0,015*	0,122±0,011*	0,011±0,001*	0,005±0,002*	1,221±0,015*	0,917±0,014*

Notice: * - statistical evidence p<0,05 in comparison with healthy control group.

Table 2. Haemodynamics of parodontal tissue in women of fertile age with CGP in remission and exacerbation in medium stage of follicular phase of menstrual cycle

Medium stage of follicular phase		Vas (cm/s)	Vakd (cm/s)	Vam (cm/s)	Qas (ml/min)	Qam (ml/min)	Pi	Ri
Individuals with healthy parodontal tissues		0,724±0,04	0,405±0,03	0,428±0,013	0,036±0,001	0,022±0,002	1,994±0,07	0,759±0,03
Light form of CGP	in remission	0,752±0,011	0,372±0,08	0,398±0,04	0,035±0,001	0,020±0,001	1,840±0,001	0,674±0,05
	in denominator	0,709±0,02	0,274±0,09*	0,347±0,01*	0,031±0,001	0,015±0,001*	2,253±0,03*	0,887±0,05*
Medium forn of CGP	in remission	0,577±0,044*	0,263±0,08*	0,279±0,03*	0,029±0,002	0,014±0,001*	2,225±0,04*	0,726±0,05
	in denominator	0,448±0,056*	0,185±0,014*	0,204±0,04*	0,022±0,001*	0,007±0,002*	2,389±0,04*	0,922±0,05*
Severe form of CGP	in remission	0,482±0,02*	0,202±0,015*	0,198±0,02*	0,021±0,001*	0,008±0,002*	1,414±0,03*	0,748±0,06
	in denominator	0,266±0,04*	0,119±0,015*	0,110±0,011*	0,012±0,001*	0,004±0,002*	1,336±0,015*	0,941±0,014*

Notice:* - statistical evidence p<0,05 in comparison with healthy control group.

Table 3. Haemodynamics of parodontal tissue in women of fertile age with CGP in remission and exacerbation in late stage of follicular phase of menstrual cycle

Late stage of follicular phase		Vas (cm/s)	Vakd (cm/s)	Vam (cm/s)	Qas (ml/min)	Qam (ml/min)	Pi	Ri
Individuals with healthy parodontal tissues		0,692±0,012	0,396±0,025	0,410±0,012	0,032±0,001	0,016±0,002	1,104±0,090	0,764±0,050
Light form of CGP	in remission	0,673±0,012	0,263±0,008*	0,326±0,001*	0,030±0,001	0,014±0,001	1,998±0,001*	0,690±0,050
	in denominator	0,629±0,020	0,204±0,009*	0,277±0,028*	0,026±0,002	0,012±0,001	2,298±0,030*	0,893±0,05*
Medium forn of CGP	in remission	0,441±0,054*	0,214±0,009*	0,201±0,03*	0,024±0,002	0,010±0,001*	2,104±0,03*	0,734±0,03
	in denominator	0,387±0,057*	0,165±0,015*	0,153±0,037*	0,014±0,001*	0,005±0,002*	2,255±0,055*	0,930±0,05*
Severe form of CGP	in remission	0,253±0,02*	0,110±0,015*	0,113±0,002*	0,018±0,001*	0,006±0,002*	1,116±0,03	0,758±0,05*
	in denominator	0,294±0,028*	0,112±0,015*	0,107±0,001*	0,010±0,002*	0,003±0,001*	1,136±0,015	0,947±0,04*

Notice: * - statistical evidence p<0,05 in comparison with healthy control group.

In severe forms of CGP at early proliferative stage of follicular phase of the cycle microcirculation in parodontal tissue was characterized by 37 % decrease of linear bloodstream velocity in comparison with control group(Vas – 0,498±0,02 cm/s.; Vakd – 0,205±0,015 cm/s.; Vam – 0,202±0,02 cm/s.; p<0,05), Maximal volume systolic velocity (Qas) decreased by 40 % and medium volume velocity(Qam) – by 60 % (Table 1).

at early stage of proliferation of follicular phase of menstrual cycle in women with degree of CGP severity indexes were also altered. In light form of CGP pulsation index(PI) slightly increased although in medium form it was increased by 25%(p<0,05) and in severe form decreased in opposite to 30%(p<0,05). Resistance index (Ri) decreased in every degree of severity of the disease and was estimated in light form as 0,610±0,05, in medium

– 0,648±0,05, and in severe form – 0,725±0,06 (control – 0,740±0,03; p<0,05), (Table 1).

At medium stage of proliferation (follicular phase) dopplerography findings were in general slightly lower than at early stage although in severe forms even lower than at medium stage. Linear and volume velocities of the bloodstream as well as Pi an Ri of all stages in remission changed in the same manner as at the early stage of proliferation of the follicular phase. For instance, at medium stage of proliferation of the follicular phase Vas, Vakd, Vam in women with healthy parodontal tissue were estimated accordingly as 0,724±0,04 cm/s.; 0,405±0,03 cm/s.; 0,428±0,013 cm/s. In light form of CGP at medium stage velocity indexes decreased slightly(p>0,05), though at medium severity form it was statistically evident difference comparing to control group (0,577±0,44 cm/s.; 0,263±0,08 cm/s.; 0,279±0,03 cm/s.; p<0,05), (Table 2).

At late stage of proliferation of follicular phase in women with healthy parodontal tissue Vas, Vakd, Vam were estimated as 0,692±0,12 cm/s., 0,396±0,025 cm/s., 0,410±0,012 cm/s accordingly, although in women with CGP in remission decreased in correlation with severity of the disease. Volume velocity indexes also decreased in comparison with control group. In severe form of CGP linear bloodstream velocity decreased more than 50%, volume velocity for more than 40% relatively to control group. Pi- index in remission decreased twice in medium severity form of CGP and only slightly in severe form. Ri also decreased in general relatively to control although in medium and severe forms in remission was still higher than in a light form (Table 3).

At all stages of follicular phase of menstrual cycle blood supply in parodontal tissues in exacerbation was characterized by statistically significant decrease of linear and volume velocities of bloodstream in medium and severe forms of CGP, increase of Pi-index in light and medium forms and decrease in severe form and also increase of Ri-index in all forms of any kind of severity. (Table 1,2,3).

CONCLUSION

In women of childbearing age blood supply of parodontal tissue correlates strongly with phases of menstrual cycle. At early stage of proliferation of follicular phase maximal linear and volume bloodstream velocities and Pi-index are observed although Ri-index decreases in opposite.

At late stage of follicular phase of menstrual cycle functional activity of blood vessels decreases, Pi-index as well as linear and volume velocities decrease accordingly .Ri-index in late stage of follicular phase increases inconsiderably. It was found that in remission of GCP microcirculation in parodontal tissues impaired always independently on the degree of severity of the disease

In remission of CGP in women linear and volume bloodstream velocities and Pi-index increase in medium severity form and decrease in severe form with statistical evidence independently of the stage of follicular phase of the menstrual cycle. Ri-index in CGP of any kind of severity decreases in general in comparison with healthy parodontal tissues, although in severe form – to slightly higher extent than in light and medium severity forms. In exacerbation period all microcirculatory changes found are similar to that in remission although just more prominent and evident.

In chronic generalized parodontitis blood circulation in tissues deteriorate considerably, especially during acute phase of the disease in comparison to remission.

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