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Changes in Hemodynamics in the Gums of Adolescents and Young Persons With Increased Risk of Inflammatory Periodontal Diseases

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Annotation. To clarify the mechanisms of periodontal damage in adolescents and young people, microcirculation indicators in the gum tissues were determined. For this purpose, the blood flow was measured by ultrasonic dopplerography in three spaces at the tops of the interdental papillae 31-41, 35-36, 43-44, each of which makes it possible to judge the periodontal sextant as a whole. Blood supply was assessed by systolic (Vae), linear (Vat) and volumetric (C)az) velocities, pulsation indices (P1) and resistance (III). The latter determines the elastic-elastic properties of the vessels.

Keywords: Values of the resistance index, VZP.

The conducted studies revealed a change in a number of indicators in the interdental gingival papillae in young people and adolescents at risk. The results of the study are presented in Table 4.1.

The study of indicators reflecting microcirculation in the vessels of the gums made it possible to identify a violation of blood flow in all areas. This is evidenced by a significant increase in the index of peripheral resistance or Purcelo vascular resistance , both in young people and in adolescents of the studied groups. So, SH in the area of 35-36 and 43-44 in young people was 0.39 ± 0.01 and 0.37 + 0.03 ($p<0.001$), respectively, while in 31-41 it turned out to be the highest: 0 .49 + 0.02 ($p<0.001$), which is almost 2 times more than in the comparison group (Fig. 4.1).

In adolescents at risk, this indicator was also almost doubled in all areas of the study and amounted to 0.27 + 0.012 ($p<0.05$) - in the area of 35-36, 0.35 + 0.02 ($p< 0.001$) - in the region 31-41 and 0.32 + 0.02 ($p<0.005$) in the region 43-44 (Figure 4.2.)

Table 4.1. Indicators of linear (V ash), volumetric (() at), systolic (V av) blood flow velocity, pulsation indices (P1) and resistance (I!) in the vessels of the gums of young people and adolescents (M + w, p)

Interdental s gaps _	Blood flow indicators	Teenagers		Young people	
		Comparison group (p-26)	Risk group (n=25)	Comparison group (n=22)	Risk group (n=21)
35-36	Vas (cm/s)	1.29±0.03	1.3±0.04	1.57±0.06	1.39±0.05'
	Qas (ml/s)	0.0012±0.00006	0.0013 + • 0.0001	0.0012±0.00007	0.0015 ± 0.0002
	Vam (cm/s)	0.03 ± 0.003	0.14 +	0.07 ± 0.02	0.1±0.02

			0.018™		
	Pi	3.17±0.2	3.21±0.28	3.19±0.31	4.25±0.29"
	Ri	0.19±0.012	0.27 ± 0.012 *	0.19±0.01	0.39 + 0.01 ****
31-41	Wae (cm/s)	1.31±0.03	1.18±0.07	1.66±0.05	1.18 + 0.09
	Qas (ml/s)	0.0012 + 0.00006	0.001+ 0.00006	0.00014±0.0001	0.0018+ 0.0004
	Wash (cm/s)	0.07±0.01	0.06 ± 0.006	0.15±0.02	0.08 + 0.01
	P1	3.31±0.24	3.73±0.26	3.76±0.34	3.49±0.27
	W	0.16±0.008	0.35+ 0.02 ** **	0.22 ± 0.02	0.49 + 0.02 ****
43-44	Wav (cm/s)	1.28±0.02	1.27±0.03	1.58±0.06	1.42 + 0.06
	WITH? az (ml/s)	0.0012±0.00006	0.0013 + 0.00008	0.002 + 0.0007	0.0015±0.0003
	Wash (cm/s)	0.03 ± 0.003	0.05+0.006"	0.05±0.01	0.11+0.03 ***
	P	3.01±0.23	3.69±0.36	3.24 ± 0.27	3.68 ± 0.43
	W	0.12±0.004	0.32±0.02*	0.15±0.007	0.37 + 0.03 ****

Reliability indicator of the difference in results between the study and control groups (* - p < 0.05, ** - p < 0.01, *** - p < 0.02, **** - p < 0.001).

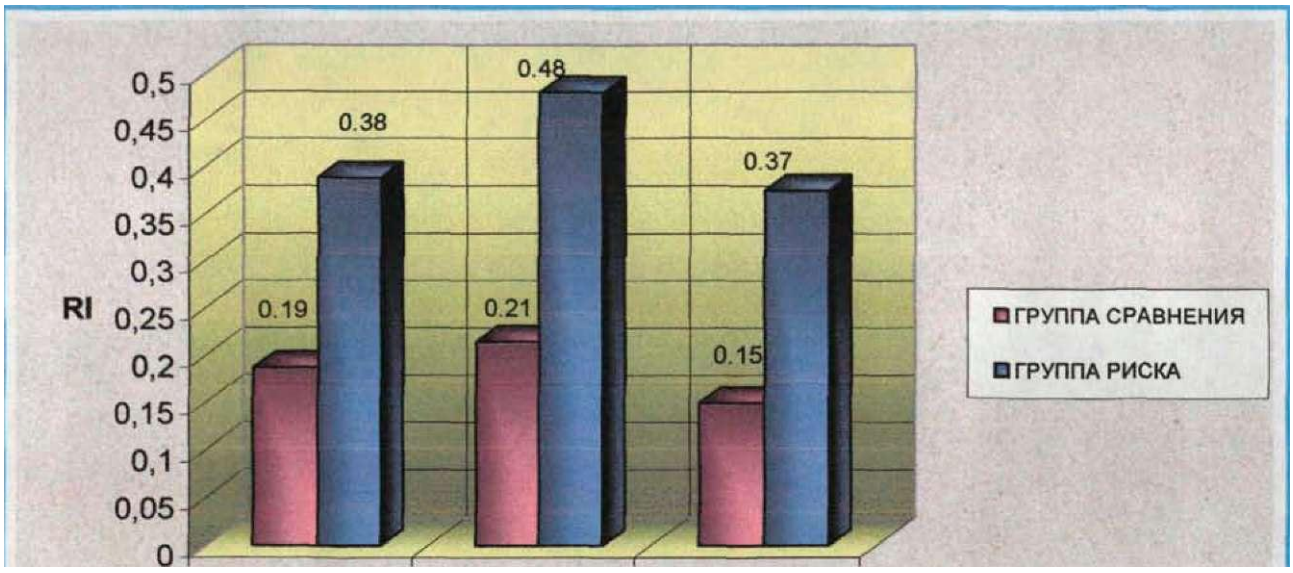
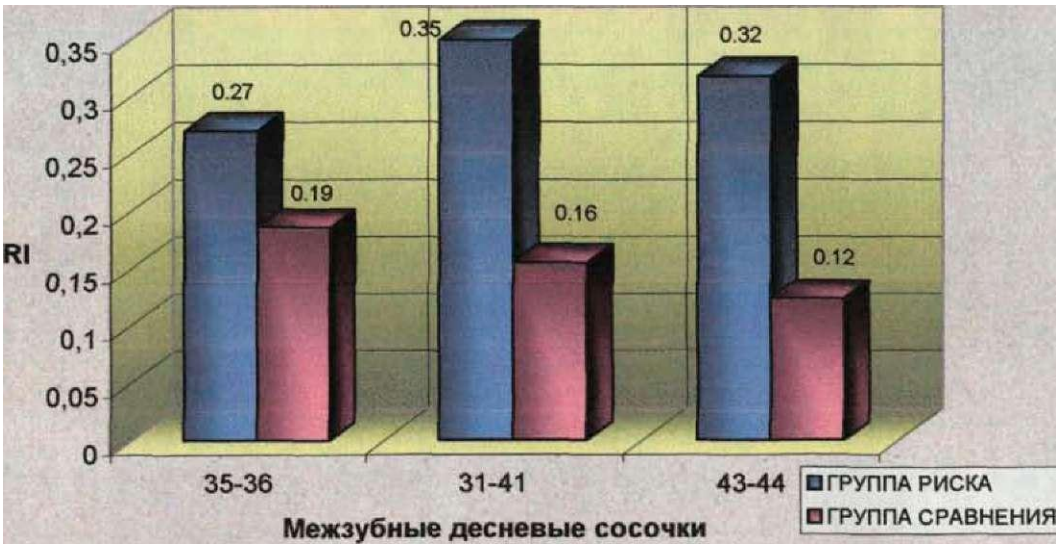


Fig. 4 L. Values of the resistance index (I1) in the Doppler study of blood flow in the gums of healthy young people (comparison groups) and risk groups.



Rice. 4.2. The values of the resistance index (¡<1) with Doppler study of blood flow in the gums of healthy adolescents (comparison groups) and at-risk groups.

Significant increase in the Gosling pulsation index (Pi) was observed in young people at risk only in the lateral parts of the dentition and amounted to 4.25 + 0.29 ($p<0.02$). It can be assumed that such a change in the index occurs in response to the loss of elasticity of the vascular wall and an increase in peripheral resistance. In other interdental papillae , the values of this index did not change (Fig. 4.3).

Pi values in the area of 35-36 interdental space up to 3.5 + 0 was found ,1 in 58% of the examined.

As for the systolic (Vas) blood flow velocity in the gingival vessels in young people, it turned out to be reduced in all the studied areas. The indicator reached the lowest values in the area of the front teeth - 1.18 + 0.09 cm/s ($p<0.001$) (Fig. 4.5). In adolescents at risk, a decrease in systolic blood flow velocity was not detected (Fig. 4.6).

The lowest systolic blood flow velocity in the gums of the anterior part of the lower jaw was found to be due to the peculiarities of the capillary network, in which the smallest vessels from the right and left lower mandibular arteries that feed the periodontium in this area intertwine. As the diameter of the vessels decreases from the aorta to the capillaries, the total cross-sectional area of the bloodstream progressively increases, intravascular pressure decreases, and the systolic blood flow velocity decreases. In VZP, the revealed violation of the elasticity of the vascular wall even more leads to a decrease in this indicator in a more distant area from the heart.

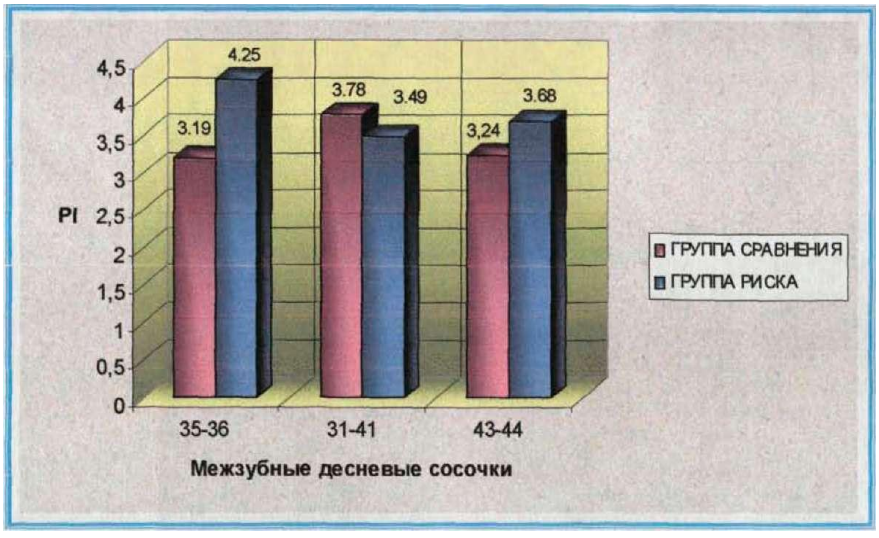


Fig. 4.3 . The values of the pulsation index (P1) in the Doppler study of blood flow in the gums of healthy young people (comparison groups) and risk groups.

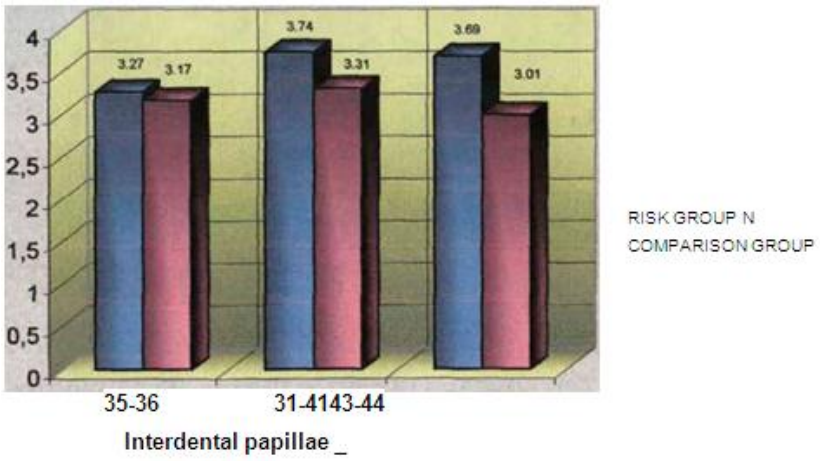


Fig.4.4. Values of the pulsation index (P1) in the Doppler study of blood flow in the gums of healthy children (comparison groups) and risk groups.

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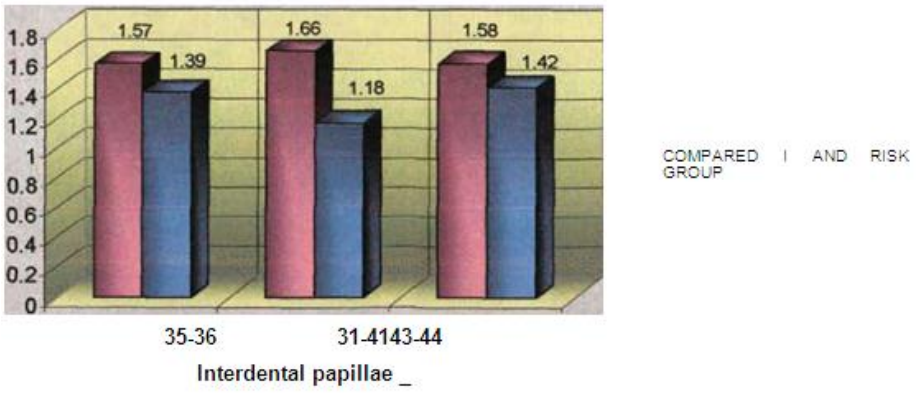

Fig.4.5. The values of systolic blood flow velocity (Vas) in the Doppler study in the gums of healthy young people (comparison groups) and risk groups.

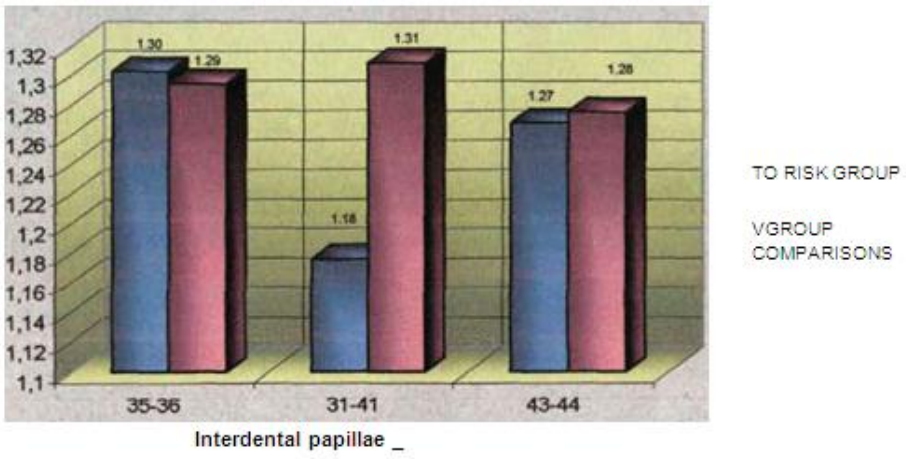

Fig.4.6. The values of systolic blood flow velocity (Vas) in the Doppler study in the gums of healthy adolescents (comparison groups) and risk groups.

The change in the linear velocity of blood flow in the vessels of the gums in young people at risk, reflecting the venular section of the vascular bed, had a multidirectional character. So, if in the area 31-41 it decreased, then in the area 43-44 its increase was noted; and in the anterior part of the jaw remained unchanged (Fig. 4.7). In children, the deviation of this indicator towards increase occurred in the region of 35-36 and amounted to 0.14 + 0.018 cm/s ($p<0.001$), in the region of 43-44 - 0.05 + 0.36 cm/s ($p<0.02$), and did not change in the area 31-41 (Fig.4.8). This mechanism can be

considered as a manifestation of the body's compensatory capabilities aimed at combating hypoxia, which was created as a result of an increase in vascular resistance.

Thus, the conducted studies have shown that changes in blood flow in the gums of young people and adolescents occur in different ways. This can be explained by the fact that the age of the examined children was 15-16 years. As you know, during this period, the development of the cardiovascular system lags behind the rapid growth of the musculoskeletal system. However, dyscirculatory changes, both in some and in others, were most pronounced in the area of 31-41, which, apparently, is associated with the peculiarities of microcirculation in this section of the periodontium.

The general pattern of the identified disorders in the surveyed risk group is an increase in peripheral vascular resistance, indicating a decrease in the elasticity of the vascular wall. Its causes can be a variety of factors: prolonged vasospasm that develops in children due to vegetative-vascular dystonia, which occupies the second place in the structure of adolescent diseases [13], as well as changes in the structure of connective tissue that occur in response to hypoxia, metabolic disorders, congenital or acquired pathology [1].

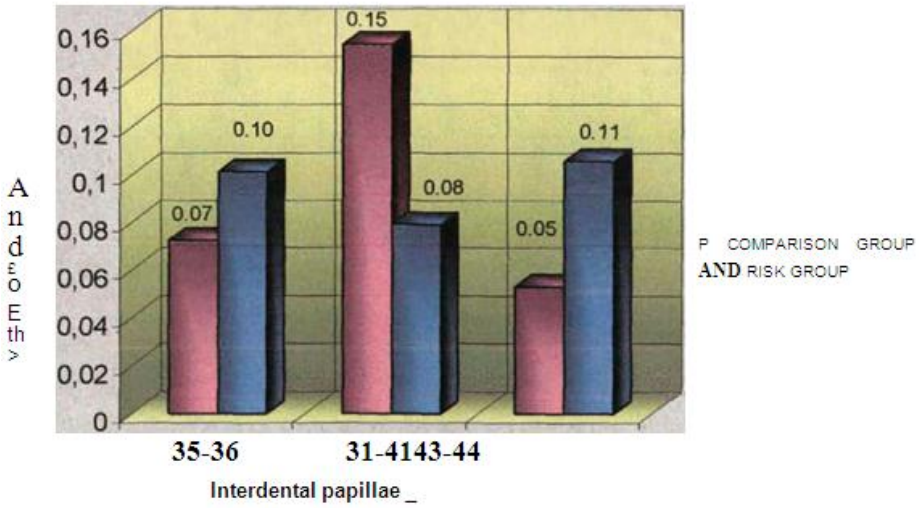

Fig. 4.7.3 values of the linear velocity of blood flow (V ash) at Doppler study in the gums in healthy young people (comparison groups) and risk groups.

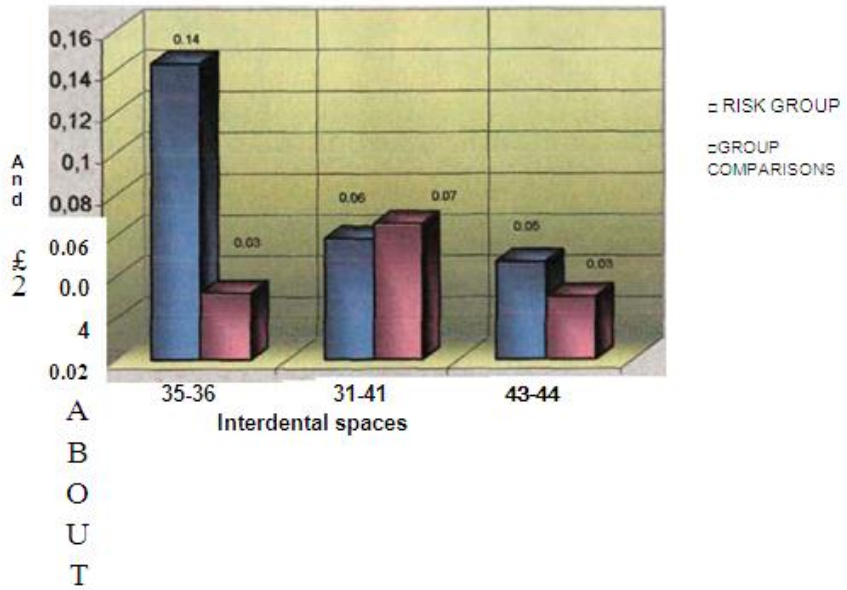

Fig.4.8. The values of the linear (Vat) blood flow velocity at Doppler study in the gums of healthy children (groups comparison) and risk groups.

Thus, there is every reason to believe that one of the important mechanisms for the development of inflammatory periodontal diseases in adolescents and young people at risk is the violation of microcirculation in the gum tissues that we have identified.

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