



Article

Rationale for clinical and functional diagnosis of chronic gingivitis in children and adolescents

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Abstract: Background. Despite the great variety of etiological factors, it has been noted that periodontal tissue inflammation is manifested by a disruption of the microcirculation mechanism that provides metabolic homeostasis in tissues. Studies have investigated the processes of vascular reactivity and microcirculation of periodontal tissue in children and teenagers, and it has been noted that, disturbance of the process is a pathophysiological process that stimulates the formation of a pathological state in periodontal tissue, effective advances in treatment and prevention have not been achieved.

Materials and methods. A total of 360 children and adolescents were examined, including; - 195 (54.2%) suffering from chronic catarrhal gingivitis (CCG) and 165 (45.8%) with chronic hypertrophic gingivitis (CHG). General clinical, laboratory and dental methods of investigation were performed.

Results. According to the results of a number of functional and clinical features occurring in CCH and CGH, statistics confirmed that 98.6% of patients have local circulatory disorders in the gums, tension of vascular tone, decreased peripheral resistance to blood flow, impaired vascular elasticity and negative results in blood rheology.

Conclusion. Thus, the obtained results once again confirm that the initial condition of children and adolescents diagnosed with CCG and CHG occurs against the background of poor oral hygiene, which increases with age. The studied clinical and functional processes serve as a scientific basis for future therapeutic and preventive measures.

Keyword: Chronic gingivitis, inflammation of periodontal tissues, dentistry, bite anomalies, treatment of gingivitis.

Introduction

Studying the literature of far and near foreign countries - among children and adolescents, periodontal disease occurs at significant levels - from 65% to 100%, and another author found that 80-85% of periodontal disease among children is chronic in the form of catarrhal gingivitis (CCG); 12-15% in the form of chronic hypertrophic and atrophic gingivitis (CHG and CAG); In 3-5% of cases, it is noted that periodontitis develops among 15-year-old adolescents [1,2]. Other authors, CCG and CHG 69.6%; - 2.8% meet accordingly; also showed that the spread, intensity, severity of the inflammatory process in children and adolescents depends on somatic diseases and local negative factors - negative changes in the tooth-jaw system [3-5]. It is known that the pathogenetic mechanism of periodontal disease inflammation is based on tissue damage; including - teeth-jaw system anomalies and tooth-jaw system deformations may be related to the result of overloading of periodontal tissue support activity [6,7]. Despite the variety of etiofactors, in all of them - as a result of the stimulation of periodontal tissue inflammation, there is a disturbance in the microcirculation system, which ensures metabolic homeostasis in organs and tissues. A number of studies have shown microcirculatory status in periodontal tissue and studied periodontal tissue vascular reactivity among children and adolescents [8-10]. The authors, clinical reflection of the inflammatory process in periodontal tissue - changes in temperature in the gums as an indicator of blood circulation disorders in the tissue, using an electrothermometer (TEPM-1) to assess the temperature (t₀), as well as a

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rheoplethysmograph (RPG-2-02) to assess the microcirculation in the gum tissue mentioned the effect of use [11,12]. Informative indexes about periodontal tissue functional status - rheographic index (RI); such as vascular tone index (VTI), peripheral resistance index (PRI), and elasticity index (EI). The authors used a helium-neon laser (LGN-207 B) device with a light cable laser power of at least 0.3 MW to determine the clinical signs of periodontal tissue using laser Doppler flowmetry (LDF) and capillary blood flow [13–15]. showed the widespread use of laser analyzer LAKK-01 (NPP "Lazma"). Thus, the analysis of the opinions of the authors presented above shows that periodontal tissue inflammatory processes are widespread among children and adolescents, and at the same time, the need for the proper organization of dental care and the wide use of modern equipment and technologies to ensure an effective result, as well as the social and economic development of the country by improving human health. one of the economic indicators showed the importance of continuing research to improve the quality of life [16].

The purpose of the study. Evaluation of the benefits of effective early diagnosis of periodontal tissue clinical-functional status among children and adolescents using special physical methods.

Materials and Methods

For our study, a total of 360 children and adolescents, including: - 195 (54.2%) with CCG and 165 (45.8%) with CHG; grouped by age groups and gender. Also, CCG among boys (59%) is more than among girls (51%); On the contrary, CHG was observed in 41% of boys and 49.1% of girls (Table 1).

Table 1. Age and gender distribution of subjects in the study ($M \pm m\%$).

Diagnosis	Age Group	CCG (N=195/54.2%)	CHG (N=165/45.8%)
Total (N=360/100%)	6–9 years	44 (22.6%)	33 (20.0%)
	10–13 years	88 (45.1%)	67 (40.6%)
	14–18 years	63 (32.3%)	65 (39.4%)
Sons (N=144/40.0%)	6–9 years	18 (21.2%)	14 (23.7%)
	10–13 years	34 (40.0%)	23 (39.0%)
	14–18 years	33 (38.8%)	22 (37.3%)
Daughters (N=216/60.0%)	6–9 years	26 (23.6%)	19 (17.9%)
	10–13 years	54 (49.1%)	44 (41.5%)
	14–18 years	30 (27.3%)	43 (40.6%)

To evaluate the objective clinical condition of periodontal tissue, general clinical-laboratory and dental examinations were conducted: - caries intensity using CPE+KP and CPE indices; oral cavity hygiene status was assessed based on the results of OHI-S index, intensity and severity of gingivitis (PMA index (C.Parma, 1960)) and CPI indices.

In particular, in 90 patients diagnosed with CCG and CHG (15 from each age group), to assess the functional status of periodontal tissue: temperature of periodontal tissue (t_0); the patient's sensitivity during nasal breathing using an electrothermometer TEPM-1 using a sensor placed on the upper and lower jaw on the gingival mucosa (GM) in the area of the shovel and small food teeth, on the right and left side; microcirculation in the gums was studied by rheoparodontography (RPG) - RPG-2-02 universal multi-channel polygraph rheoplethysmograph. Based on the obtained indicators, informative indices - RI, VTI, PRI, EI were evaluated. LDF studies were performed using LAKK-01 capillary blood flow laser analyzer. The results were processed by generally accepted statistical methods: arithmetic mean, standard deviation, coefficient of variation, reliability of differences (Student's criterion) were calculated using Excel MS Office -2013.

Results and its discussion

Bleeding gums in 124 (63.6%) cases of patients with CCG; including 12 (6.1%) children during tooth brushing; bad breath and traces of blood on the pillow in 68 (34.9%) patients; The presence of dental calculus was observed in 38 (23.03%) patients.

Inflammation in the gums of 112 (67.9%) patients with CHG of our research group; Gum swelling and thickening in 55 (33.3%); 133 (80.1%) complained of pain and bleeding when brushing teeth; dental calculus was observed in 69 (35.4%). It is noteworthy that the number of injured

sextants in periodontal tissue with CCG and CHG is directly related to increasing age; dental calculus intensity increases; the process is evident in the 10-13 age group.

115 (58.9%) pricus anomalies among patients with CCG; densification of frontal teeth in 82 (42%) patients; 85 (51.5%) and 53 (32.1%) of patients with CHG were recorded, respectively. In 56 (28.7%) of the CCG group, there was an abnormality in the union of the mandible and narrowing of the border of the oral cavity; including 33 (16.9%) cases of upper labial lobe, 44 (22.5%) short tongue lobe; In 22 (11.3%) cases, the entrance margin was small. 58 (35.1%) of CHG patients have these anomalies - 14 (8.5%); - 18 (10.9%); i was observed in -16 (9.7%) matches.

The results of OHI-S, PLI indices and caries indicators of temporary and permanent teeth in the studied patients are presented in (Table2).

Table 2. OHI-S, PLI indices and caries indicators in the study group. (M±m v %)

Diagnosis	Indicator	Average OHI-S Index	Average PLI Indicator	Primary Teeth	Permanent Teeth
CCG (N=195/54.2%)	6–9 years	2.6 ± 0.5	2.74 ± 0.57	2	4 (9.09%)
	10–13 years	3.0 ± 0.1	2.97 ± 0.53	-	10 (11.36%)
	14–18 years	2.8 ± 0.5	2.85 ± 0.45	-	11 (17.46%)
	Total	2.8 ± 0.3*	2.86 ± 0.52	2	25 (12.82%)
CHG (N=165/45.8%)	6–9 years	1.5 ± 0.22	1.78 ± 0.48	2	5 (15.15%)
	10–13 years	1.42 ± 0.01	1.34 ± 0.46	-	12 (17.91%)
	14–18 years	1.3 ± 0.33	1.56 ± 0.45	-	11 (16.92%)
	Total	1.4 ± 0.40	1.57 ± 0.47	2	28 (16.96%)

Note: CCG- chronic catarrhal gingivitis; CHG - chronic hypertrophic gingivitis; * – p<0.05 compared to the average of age groups.

Among those who identified CCG and CHG in the study: on average - hypoplasia in 4 (12.2%) patients; teeth eruption disorder - 25 cases (6.9%); primary adentia - in 88 (24.4%); complete anomalies of teeth - 48 (13.3%); endemic fluorosis of teeth - 18 (5%); destruction of tooth hard tissues - 19 (5.3%); dental injuries - 32 (8.9%); enamel necrosis - 39 (10.8%); enamel erosion - observed in 12 (3.3%) patients. Also, among children and adolescents, the amount of oral fluid (OF) in a non-stimulated state - CCG (0.27±0.03 *); - up to 1.7 times less separated than CHG (0.40±0.07 *). Also, different directional interactions between oral cavity GI and OHI-S, PMA indices; for example, caries prevalence among CCG patients is 62.4±1.22; in CHG - 58.8±1.64*; where caries (C), plomb (P) and extracted (O) teeth are not correlated by groups.

During the study, tooth temperature (t0); was 33.80C to 32.60C with CCG; CHG decreased from 35.40 to 33.40; At the same time, milk t0 decreased, contrary to the increase of both age groups.

For the visual description of RPG, the statistical results confirmed that the gum t0 temperature tends to decrease by 0.2-0.8° in different zones. Quantitative index in CCG group is average: RI - 0.04±0.06; IE - 59.2±1.98; PT -11.6±1.2; IPS - 98.9±3.2, also with average RI in CHG - 0.05±0.01; IE - 57.2±2.04; PT - 12.4±1.18; and IPS - 99.4±3.2 confirmed compatibility. This condition is a sign of local blood circulation in the gums and reverses with age (Table 3).

According to the results of a number of functional and clinical features that occur with the passage of CCG and CHG, statistics show that 98.6% of patients have local blood circulation disorders, vascular tone tension, decreased peripheral blood flow resistance, and negative results in vascular elasticity and flowing blood rheology confirmed.

Table 3. RPG, LDF, t0 and blood flow regulation dynamic parameters (M±v %) in the study groups.

Diagnosis		CCG				CHG			
indicators	Age group	Average n=45	6-9 age n=15	10-13 age n=15	14-18 age n=15	Average n=45	6-9 age n=15	10-13 age n=15	14-18 age n=15
t ⁰ upper jaw	right	33,8±0,48	35,2±0,54	34,1±0,46	32,1±0,44	35,4±0,48	36,5±0,54	35,3±0,46	34,4±0,44
	centre	33,4±0,44	34,4±0,51	33,6±0,43	32,2±0,38	33,8±0,14	35,1±0,19	33,9±0,15	32,4±0,08
	left	32,6±0,28	33,9±0,35	32,5±0,29	31,4±0,20	33,4±0,31	34,7±0,39	33,3±0,32	32,2±0,22
t ⁰ lower jaw	right	33,6±0,18	35,1±0,28	33,3±0,19	32,4±0,07	33,8±0,14	35,2±0,21	33,5±0,13	32,7±0,08
	centre	32,8±0,24	34,3±0,31	32,9±0,23	31,2±0,18	33,8±0,12	35,1±0,18	33,7±0,11	32,6±0,07
	left	33,1±0,44	34,9±0,51	33,3±0,43	31,1±0,38	33,8±0,14	35,1±0,19	33,6±0,13	32,7±0,10
RI		0,04±0,006	0,06±0,08	0,05±0,06	0,01±0,04	0,05±0,01	0,07±0,01	0,04±0,01	0,04±0,01
EI (%)		59,2±1,98	67,1±2,29	60,6±1,87	50,2±1,78	57,2±2,04	66,7±2,76	56,4±2,13	48,5±1,23
PT (%)		11,6±1,24	14,3±1,98	11,7±1,19	8,8±0,55	12,4±1,18	15,8±1,54	12,1±1,11	9,3±0,89
PRI (%)		98,9±3,22	110,1±3,86	97,3±3,15	89,3±2,65	99,4±3,24	112,3±3,86	98,7±3,28	87,2±2,58
LDF	PM(pe)	10,2±0,22	13,1±0,27	10,3±0,21	7,2±0,18	12,8±0,44	14,9±0,64	12,6±0,43	10,9±0,25
	Q(pe)	1,3±0,02	1,9±0,03	1,1±0,02	0,9±0,01	1,6±0,07	2,2±0,09	1,5±0,06	1,1±0,06
	KV (%)	11,8±0,34	13,9±0,51	11,6±0,33	9,9±0,18	11,4±0,81	14,2±0,98	10,9±0,74	9,1±0,71
AFM	Vasomotion	113,4±3,1	120,7±4,9	112,3±3,2	107,2±1,2	111,0±3,1	119,7±4,3	110,5±2,9	102,8±2,1
	Vascular tone	86,8±0,7	96,7±0,9	85,6±0,6	78,1±0,6	89,9±0,2	94,7±0,3	88,6±0,2	86,4±0,1
PFM	FF	54,2±0,6	61,1±0,8	53,7±0,6	47,8±0,4	52,4±0,2	58,3±0,3	51,7±0,2	47,2±0,1
	PF	44,3±0,4	49,7±0,5	43,2±0,4	40,0±0,3	48,4±0,4	52,6±0,5	47,5±0,4	45,1±0,3
FI		1,06±0,4	1,28±0,5	1,12±0,4	0,78±0,3	0,92±0,4	1,13±0,5	0,91±0,4	0,72±0,3
VTT		3,38±0,26	4,08±0,39	3,27±0,25	2,79±0,14	3,88±0,22	4,27±0,37	3,91±0,21	3,46±0,08

Note: CCG - catarrhal gingivitis; CHG - hypertrophic gingivitis; RI - rheographic index, VTT - volumetric tonus of tissues, PMTI - peripheral muscle tone index, EI - elasticity index; LDF - laser doppler flowmetry; AFM - active fluid motion mechanisms; PFM - passive fluid motion mechanisms; FF - frequency fluctuations; PF - pulse fluctuations; FI - fluxmotion index; * - p<0.05 for optimal results.

Conclusion

Thus, timely determination of CCG and CHG, as well as the assessment of the composition of the disease based on the number of applications and the percentage in it, is very important for the correct organization of dental care for children and adolescents - that is, for making a correct and timely diagnosis. The analysis of studies shows that the information on this issue is not sufficiently scientifically based to date. It also confirms that the initial condition of children and adolescents diagnosed with CCG and CHG occurs against the background of unsatisfactory hygiene in oral cavity, which increases with age. All children with gingivitis have a moderate to severe inflammatory reaction of gum tissue, which clinical features are reflected in local hemodynamic disturbances.

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Ethics approval

Not applicable.

Consent for publication

Informed consent was obtained from all subjects involved in the study. Written informed consent has been obtained from the patients to publish this paper.

Data Availability Statement

The data presented in this study are available upon request from the corresponding author.

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Conflict of interest

The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Abbreviations

CCG	chronic catarrhal gingivitis
CHG	chronic hypertrophic gingivitis
CAG	chronic atrophic gingivitis
LDF	laser Doppler flowmetry
RI	rheographic index
VTI	vascular tone index
PRI	peripheral resistance index
EI	elasticity index

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