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CLINICAL AND FUNCTIONAL RATIONALE FOR THE USE OF ISPRING DENTAL GEL BASED ON GANODERMA LUTSIDUM FOR THE TREATMENT OF CHRONIC CATARRHAL GINGIVITIS IN CHILDREN

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**CLINICAL AND FUNCTIONAL RATIONALE FOR THE USE OF
ISPRING DENTAL GEL BASED ON GANODERMA LUTSIDUM FOR
THE TREATMENT OF CHRONIC CATARRHAL GINGIVITIS IN
CHILDREN**

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ABSTRACT

This article provides data on the clinical and functional rationale for the use of Ganoderma Lutsidum in the treatment of chronic catarrhal gingivitis in children. It is known that due to the widespread, insufficiently accurate clinical and instrumental diagnosis and treatment tactics, this disease leads to the loss of a significant part of the teeth already at a young age, the presence of foci of chronic infection, impaired function of the masticatory-speech apparatus, which allows us to consider this pathology not only a serious medical, but also an important social problem. This article used a complex of clinical and functional research methods, in which, in addition to traditional methods, laser Doppler flowmetry was used. The presented results indicate a high therapeutic activity of the Ganoderma Lucidum, which is proved by a complex of clinical and functional studies. The corresponding conclusions are made, practical recommendations are offered.

Key words: laser Doppler flowmetry; chronic catarrhal gingivitis; Ganoderma Lucidum; children.

Relevance. Currently, the problem of prevention and treatment of inflammatory periodontal diseases in children does not lose its relevance due to the widespread prevalence of this pathology. According to a report by the WHO scientific team (2017) based on a population survey of 53 countries, the world has a high percentage of prevalence of periodontal disease. By the age of 5 years, the frequency of gingivitis in certain regions can reach 30–40%, in people aged 15–19 years, periodontal diseases occur in 55–89%, and at the age of 35–44 years, in 65–98% [1,2].

The loss of a significant part of teeth at a young age, the presence of foci of chronic infection, a violation of the basic functions of the masticatory and speech apparatus, a decrease in the quality of life of patients is not an exhaustive list of the

consequences of periodontal diseases, which allow us to consider this pathology not only as a serious medical, but also an important social problem [3].

According to most authors, the inflammatory process in the oral cavity is activated under the influence of resistant microaerophilic and obligate anaerobic microflora.

About 1000 species of microbial communities that seed the epithelium of the mucous membrane and tooth surface were isolated. Period onto pathogenetic properties were revealed in anaerobic microorganisms Porphyromonas gingivalis, Aggregatibacter actinomycetemcomitans, Prevotella Intermedia, Treponema denticola, Tanerella forsythia, which accumulate in places with minimal oxygen and [4] increased tooth formation due to their high adhesive properties.

Despite the fact that numerous data have now been accumulated regarding the diagnosis, prevention and treatment of periodontal diseases, many key aspects of the formation of chronic catarrhal gingivitis remain poorly understood. In particular, studies on the etiology of gingivitis and periodontitis, as well as the pathogenesis of the initial stages of these diseases, should be considered relevant.

The development of the initial stages of inflammatory periodontal disease (IPD) is associated with the presence and rate of bacterial plaque formation.

Functional and morphological immaturity of periodontal structures in children is a factor that determines the course of the inflammatory process.

According to some researchers, the basis of the pathogenesis of periodontal diseases are microcirculation disorders.

In pediatric dentistry, the search, development and implementation of new methods for the prevention and treatment of inflammatory periodontal diseases, as well as the impact on the main links of its etiology and pathogenesis, is relevant. In childhood, conservative treatments include antibacterial and non-steroidal anti-inflammatory drugs. This approach helps to reduce microbial contamination, increasing the duration of clinical remission [5].

At the same time, it is not always possible to stop the inflammatory process in periodontal tissues with traditional drugs, so biologically active substances can also be used in complex therapy. These biologically active substances include Ganoderma Lutsidum [6-15]. Since there is no information on the treatment of inflammatory periodontal diseases in children with the use of this substance, we consider it relevant to conduct a similar study.

Purpose of the study. To conduct a comparative randomized study of the influence of Ganoderma Lucidum on the course and outcome of chronic catarrhal gingivitis in children.

Materials and research methods. To achieve these goals, the treatment results of 78 children with chronic catarrhal gingivitis were analyzed. The age of the children was 12.0 ± 3.5 years. All children were divided into 2 groups: group 1 - the main group, 41 children, where Ganoderma Lutsidum was used as a treatment for chronic catarrhal gingivitis in the form of an ISPRING dental gel, group 2 - the comparison group consisted of 37 children, who used traditional drugs as treatment

(Metrogil Denta, Parodium). All children had a complete comprehensive clinical and functional examination, including traditional examination methods.

Functional research methods included laser Doppler flowmetry to assess the state of microcirculation of periodontal tissues and optical tissue oximetry to assess the oxygenation of periodontal tissues. Comparison of indicators of the hygienic condition of the oral cavity and functional research methods were carried out in all groups before treatment; two weeks, 3 and 12 months after the start of treatment, in groups 1 and 2.

Parents of all children gave written consent to participate in the experiment.

Statistical processing of the material was carried out using the Student-Fisher test and the non-parametric Mann-Whitney criterion.

The results of the study. The study of the prevalence and intensity of inflammatory periodontal diseases, conducted by us among 12 and 15 year old schoolchildren of school No. 263 in Tashkent on CSD (carious, sealed, distant) index data, revealed a high degree of prevalence of inflammatory periodontal diseases in 12 year old children - 36.1% at an intensity of 0.75 ± 0.23 . The pathology increases with age: by the age of 15, these indicators are respectively 52.7% and 1.08 ± 0.24 . A study of the dental status of children with catarrhal gingivitis of the first and second groups showed that 45% of patients had complaints of recurrent bleeding of the gums during eating or when brushing your teeth, and 13% had bad breath; 42% - no complaints at all. On examination, edema, hyperemia of the gingival margin and interdental papillae, bleeding from the tops of the dental papillae, and the presence of dental plaque were noted. According to the results of a clinical examination in patients with chronic catarrhal gingivitis, the level of OHI-S hygiene index was high and amounted to: in the first group, 2.64 ± 0.03 ; in the second, 2.57 ± 0.03 ($p = 0.249$), which is an indicator of poor oral hygiene. The CSD values also turned out to be high - 1.66 ± 0.03 and 1.59 ± 0.03 ($p = 0.149$) in the first and second groups, respectively. Poor oral hygiene in the adolescent children examined by us is accompanied by severe gum inflammation (PMA index - 41.5 ± 0.3 and 42.8 ± 0.5 ($p = 0.081$)). When comparing the CSD index, there were no statistically significant differences between the groups ($p = 0.593$). The average values of this indicator in the first group were 4.33 ± 0.19 , in the second 4.24 ± 0.18 .

Assessment of treatment results for patients of the first and second groups was performed at three stages of observation: 14 days, 3 months and 1 year after the start of treatment. Clinical evaluation of the results of treatment of patients of the first and second groups showed that after 14 days there is a significantly lower number of complaints of bleeding gums when brushing your teeth; there is an improvement in the hygienic state of the oral cavity, a decrease in edema and hyperemia of the mucous membrane of the gums.

At the same time, a decrease in the level of the Green-Vermilion index is noted: when Lutsidum is used in the treatment regimen of the Ganoderma, to 1.56 ± 0.04 , with standard treatment, to 1.65 ± 0.05 . After 3 months from the start of

treatment, the indicators in both groups assumed normal values, amounting to 0.54 ± 0.01 and 0.50 ± 0.03 . Despite the fact that patients of both groups were under

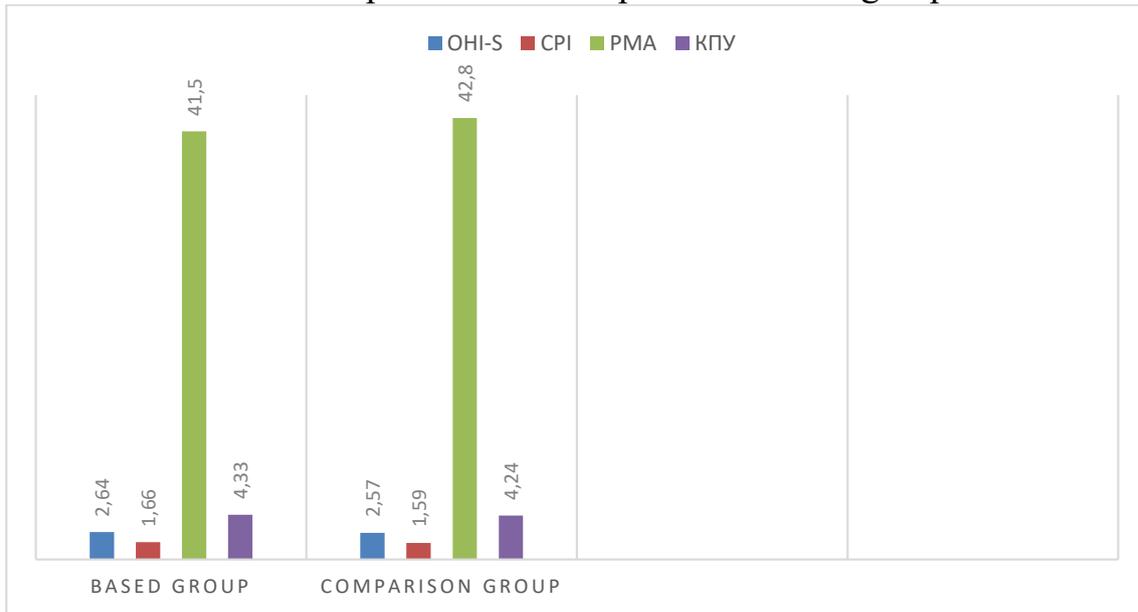


Fig. 1. The prevalence of chronic catarrhal gingivitis according to clinical and functional examination.

follow-up observation and had professional oral hygiene every six months, after 1 year from the start of treatment, an increase in the hygienic Green-Vermillion index was noted in the first group to 0.69 ± 0.04 in the comparison group, while in the main group the data remained the same (0.50 ± 0.03). There was an improvement in the condition of periodontal tissues according to the studied periodontal indices in the studied groups. Moreover, a decrease in the CPI index after a year of treatment occurred in the first group by 67.2%, in the second group - by 30.7% (Fig. 2).



Fig. 2. The dynamics of the indices in the main group and the comparison group

Additionally, the CPI index structure was assessed by the average number of sextants with signs of periodontal tissue damage in dynamics, depending on the treatment algorithm used. At the follow-up stages after treatment, among the children receiving Ganoderma Lutsidum, a significantly lower number of sextants with bleeding and a greater number of healthy sextants were noted than in patients of the first group (Fig. 3).

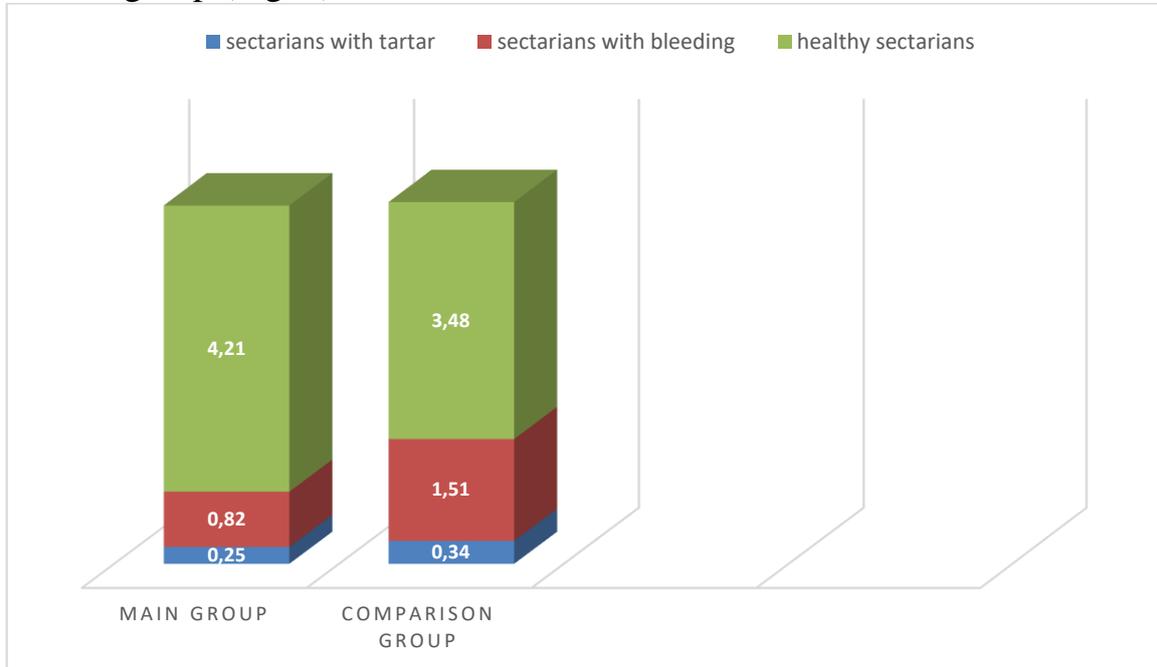


Figure 3. The structure of sextarians by the presence of signs of periodontal tissue damage in the compared group 1 year after treatment.

The PMA index in the treatment process also decreased. Moreover, in the case of the use of the Ganoderma Lutsidum as part of the complex treatment of chronic catarrhal gingivitis, the decrease in the PMA index after 14 days was more pronounced. The values of the RMA index in this group decreased on average by 56.3%, in the comparison group - by 40.5%. After 1 year, there was a slight uniform increase in PMA in both groups to 18.8 ± 0.7 and 19.9 ± 0.6 , respectively. Thus, the use of Ganoderma Lucidum for chronic catarrhal gingivitis in adolescent children allowed to achieve a significant improvement in periodontal tissues, which was confirmed by the absence of complaints in patients, an improvement in the clinical picture of the oral cavity and a significant decrease in the rate of periodontal indices of PMA and CPI. Moreover, changes in PMA and CPI were more pronounced and occurred in a shorter time compared with patients receiving standard treatment. When assessing long-term results in the first group, an increase in the value of the periodontal CPI index was established, which could indicate a high risk of relapse 1 year after the treatment. The use of the Ganoderma Lucidum was characterized by significantly smaller changes in the indicators of periodontal indices upward, which serves as the basis for the conclusion about a more pronounced anti-relapse effect of this therapeutic algorithm.

When comparing the statistical indicators of microcirculation according to laser Doppler flowmetry (LDF), corresponding to the studied groups, the following results were obtained (table 1).

Table 1. Comparison of the basic indicators of microcirculation according to laser Doppler flowmetry (LDF)

Index	Main group		Comparison group		p
MI (п.е.)	43,3±1,9	42,0-44,2	42,0±2,8	36,4-47,5	≤0,001
σ (п.е.)	4,4±0,3	4,0-4,7	3,9±0,2	3,4-4,3	≤0,01
K _v %	11,2±0,8	10,0-12,0	15,7±2,2	11,4-20,0	≤0,002

When comparing the microcirculation index (MI) in accordance with Table 1, information was obtained on higher values in the first and second groups of patients with chronic catarrhal gingivitis, which amounted, respectively, to 43.3 ± 1.9 and 42.0 ± 2.8 perfusion units (p. e), which indicates congestion and inflammation in periodontal tissues. In the group of patients with a healthy periodontium, high standard deviations ($\sigma = 5.1 \pm 0.4$ p.u) and coefficient of variation (19.6 ± 1.4) were obtained when compared with patients with chronic catarrhal gingivitis ($\sigma = 4, 4 \pm 0.3$ and 3.9 ± 0.2 bp, $K_v = 15.7 \pm 2.2\%$ and $11.2 \pm 0.8\%$), which indicates a decrease in the fluctuation of the flow of red blood cells and vasomotor activity microvessels. According to the analysis of the amplitude-frequency spectrum of blood flow fluctuations, we studied the effect of endothelial, neurogenic, myogenic, respiratory and cardiac components of the microvascular tone. As a result of the analysis, a statistically significant difference was found in the amplitude indices of endothelial and neurogenic microcirculation fluctuations in the studied groups ($p \leq 0.001$ and $p = 0.009$, respectively). Among patients with chronic catarrhal gingivitis, the amplitude of endothelial oscillations of the microblood flow of periodontal tissues was higher, amounting to 1.69 ± 0.08 in the first group and 1.74 ± 0.06 in the second group, while among children with a healthy periodontal period amounted to 1.3 ± 0.08 . The values of the amplitude of the neurogenic fluctuations in the microcirculation of periodontal tissues also turned out to be increased in patients with chronic catarrhal gingivitis compared with the third group. So, in the first group, the indicator was 1.55 ± 0.09 , in the second - 1.50 ± 0.08 , in the third - 1.21 ± 0.07 . Analyzing the results obtained, increased values of the amplitude of endothelial and neurogenic fluctuations indicate a violation of vascular tone, leading to prolonged vasodilation with possible neurogenic spasms.

Our analysis of changes in microcirculation indices at different stages of treatment of chronic catarrhal gingivitis depending on the therapy algorithm used showed a significant decrease in microcirculation (MI) in both groups ($p \leq 0.001$). At the late stage of observation, in the group of patients who received standard treatment, there was a slight increase in the average perfusion rate to 32.2 ± 1.4 p.u., while in the second group, the indicator remained reduced to 26.5 ± 1.6 p.u. Graphically, the dynamics of the indicator is shown in Figure 4.

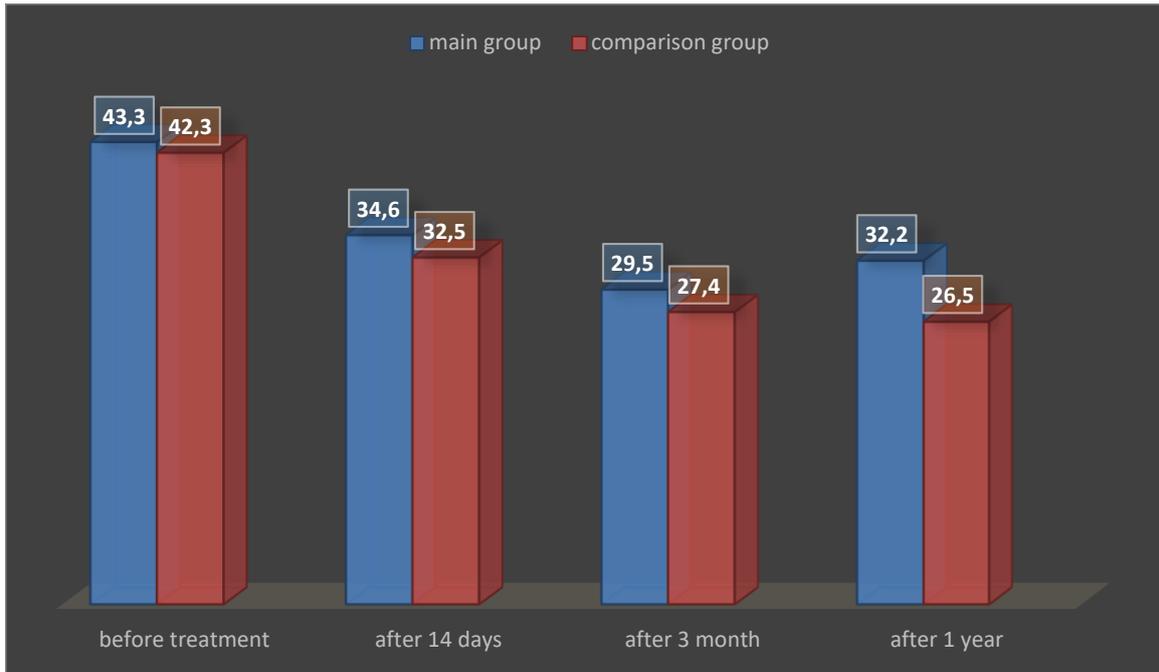


Fig. 4. The dynamics of the average perfusion rate (p.u.) depending on the treatment used.

Changes in the standard deviation (σ) as a result of treatment in the compared groups are presented in Figure 5.

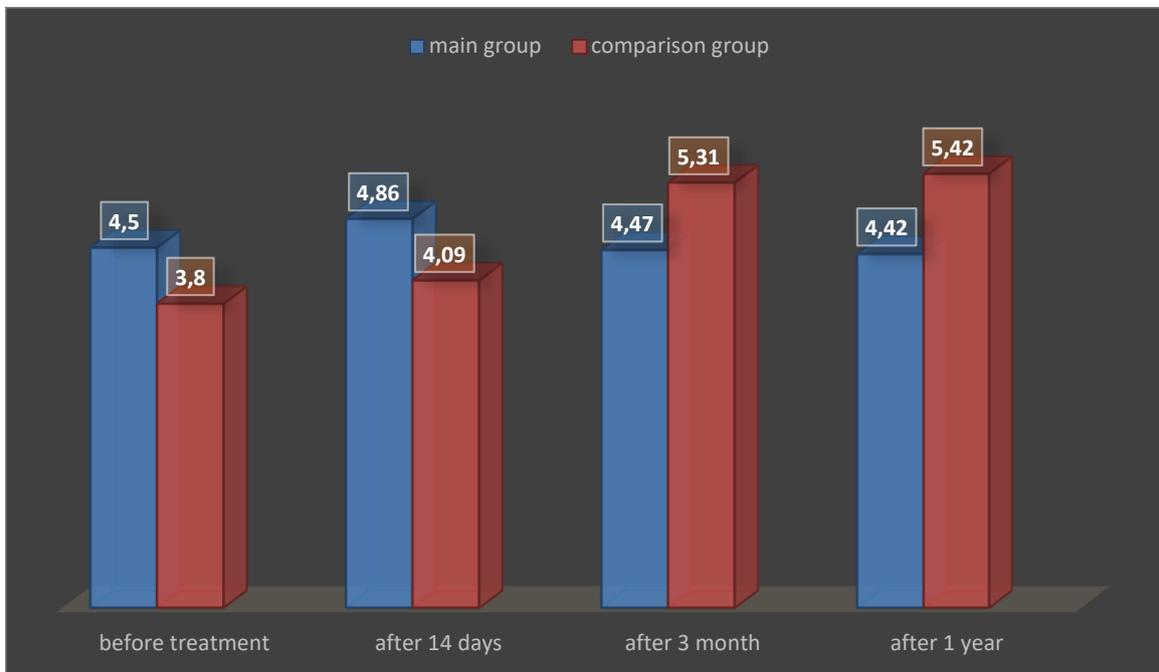


Fig. 5. The dynamics of the mean values of the standard deviation (SD) depending on the treatment used.

Based on the data obtained, the values of the standard deviation in the second group were slightly lower at the initial stage and after 14 days from the start

of treatment, while the differences were not statistically significant ($p = 0.096$ and $p = 0.069$). Late follow-up indices, on the contrary, had higher values in the second group, reaching 5.31 ± 0.33 bp after 3 months of treatment, and 5.42 ± 0.28 bp after 1 year. The results indicated an increase in the velocity of blood flow in the microvasculature when applying Ganoderma Lutsidum to a greater extent than with standard treatment. An increase in the coefficient of variation (Kv) from $15.1 \pm 1.9\%$ to $28.5 \pm 2.9\%$ in the second group and from $13.8 \pm 1.6\%$ to $17.7 \pm 1.9\%$ in the first group characterized normalization of vasomotor vascular activity, also more pronounced when using Ganoderma Lutsidum as part of the treatment of gingivitis.

Conclusions:

1. It was revealed that adolescent children had high prevalence and intensity of periodontal disease. According to the CPI index, the prevalence of periodontal disease at 12 years old was 36.1% with an intensity of 0.75 ± 0.23 . By age 15, the prevalence increases to 52.7%, the intensity to 1.08 ± 0.24 .

2. The data of laser Doppler flowmetry and optical tissue oximetry reveal significant differences in patients aged 12-15 years with healthy periodontal disease and chronic catarrhal gingivitis. In patients with chronic catarrhal gingivitis, the value of the microcirculation index increases by 1.6 times, while the temporal variability of the fluctuation of the erythrocyte flow decreases by 1.2 - 1.3 times ($\sigma = 4.4 \pm 0.3$ and 3.9 ± 0 , 2 c.u.) and, accordingly, the vasomotor activity of blood vessels 1.2-1.7 times ($Kv = 15.7 \pm 2.2\%$ and $11.2 \pm 0.8\%$).

Practical recommendations:

1. In the treatment of inflammatory periodontal diseases in children, it is recommended to assess the hygienic status and severity of inflammatory periodontal diseases (according to OHI-S, PMA, CPI) as part of the examination.

2. Children with inflammatory periodontal diseases should be under medical supervision at the dentist with a frequency of visits four times a year. To increase the effectiveness of treatment of inflammatory periodontal diseases in children, complex treatment is recommended, which should include: - professional oral hygiene, selection of individual hygiene products; - to increase the effectiveness of the treatment of inflammatory periodontal diseases in children, along with drugs that have antibacterial and anti-inflammatory effects, Ganoderma Lucidum should be included.

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