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Evaluation of the Efficiency of Remineralizing Agents in Treatment with Removable and Fixed Orthodontic Technique in Children

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Abstract The development of the closest possible approach to the diagnosis and treatment of caries during orthodontic treatment in the early stages will help to obtain a stable aesthetic outcome in the treatment of orthodontic patients, and to avoid relapses. In modem orthodontic dentistry acute problem of prevention of dental caries and periodontal diseases, especially in children and adolescents who have not yet completed the process of mineralization of hard tissues: soon after teething create a situation of increased risk of tooth decay. The purpose of this paper is to analyze complex information about methods of prevention of dental caries in patients with removable and non-removable orthodontic appliances.

Keywords Orthodontics, Dental caries, Pediatric oral cavity, Enamel, Stomatitis

1. Introduction

Given the expressed correlation between the hygienic condition of the oral cavity and the development of dental caries and periodontal disease, the level of hygienic knowledge and skills was determined by questioning and assessing manual skills in all patients prior to orthodontic treatment. The analysis of the data obtained showed that the level of knowledge and manual skills in dental disease prevention was low.

Some authors suggest that primary carious lesions can be seen at a depth of less than 300 μm. Recent studies confirm that clinical retention can be achieved within 15 s with a small loss of enamel, but this depends on the individual resistance of the enamel. 15 sec treatment is sufficient in patients. For the teeth of patients with high resistance, 30 sec. acid exposure is sufficient. Adults with high resistance need 60 sec, and at low - exposure of the drug agent - 30 sec. [5,8,9].

In addition, the area of treatment should be limited to reduce the area of the treated enamel and to prevent the enamel from contact with the neck and contact surface of the tooth, where maximum solubility is observed. The enamel treatment zone should be the size of the fixing element, and the adhesive or silane used should retain the active compound of fluoride, which will create a buffer zone around the bracket for some time.

It is very important to remove the excess adhesive to reduce the accumulation of dental plaque around the bracket due to the roughness and micro-porosity of the adhesive after the bracket is installed using a roller or scalar.

Removal of the unfilled activator after fixation of the braces is an important procedure, as over time it becomes a stroma to form a rash. This can be done by using a cotton swab soaked in 70% ethyl alcohol (dental acetone) and rinsing several times with water. This is not necessary when using fluoride-containing orthodontic silanes (e.g., Ortho-Solo Ormco) [7,10].

After fixing the equipment, remineralization of the treated areas of the enamel around the brackets (excluding the use of fluorine-containing adhesives and cements) was considered an important measure, which is carried out immediately after installation, then repeated every 3-6 months. The risk of developing furnace demineralization reduces the maximum elimination of the developing furnace [1,5].

After all the measures listed above, the bow is tied. The orthodontic bow is placed in the bracket groove and fixed using a metal or elastic ligature. As shown in the figure, elastic ligatures accumulate dental plaque, so metal ligatures should be preferred [11].

The metal ligature is twisted by the occlusion or gum surface, then cut with a ligature cutter, leaving 2-3mm from the end, it is transferred from the cutting edge to the gum edge under the arc. Sharp ligature cutters should be used because the blunt tool breaks the twisted ends of the ligature. The same thing happens if the ends of the ligature are twisted under the bow from the edge of the gum to the cutting edge [12-14].

During active orthodontic treatment, it is most important that the patient adheres to the rules of hygiene, eating habits

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and a rational diet.

Removal of the device is the final procedure of orthodontic treatment. This procedure is very simple and safe when certain rules and sequence of actions are followed. The use of a driving force that causes the adhesive layer to collapse is a prerequisite for removing the brackets. At the same time, violation of the technique of removing braces can lead to fracture of tooth enamel, cracking of enamel, dislocation of the tooth and fracture of the depulpated tooth crown. Particular attention should be paid to the removal of adhesive residues and polishing of enamel. Rough application of polishing and grinding, as a result of overheating during grinding, the appearance of scratches, leads to traumatic pulpitis, hyperesthesia occurs [8,9,12-15].

The purpose of the study: to develop and implement a set of diagnostic and prophylactic measures aimed at preventing the development of caries and its complications in the orthodontic treatment of patients.

2. Materials and Research Methods

Knowledge and skills in oral hygiene were identified through a survey of children participating in the study. The quality of oral care skills was assessed according to a specially developed method. All patients underwent oral sanitation for 1-2 months before starting orthodontic treatment, diet was corrected, oral hygiene was taught, and regular hygienic care was provided using the recommended set of hygiene items. aroused interest. Dental examinations were performed for 18 months at the following intervals: primary examination, 1, 3, 6, 9, 12, 15, and 18 months after the installation of the fixed orthodontic equipment.

3. Research Results

Before braces fixation, after professional oral hygiene, training in individual hygiene procedures, it was noted that the values of OHI-S and PHP indices significantly decreased in all subgroups. If the state of oral hygiene according to the OHI-S index was determined as good and did not exceed the value of 0.7, then according to the PHR hygiene index - as satisfactory, being within the value of 1.6.

One month after the installation of the equipment, a significant increase in the OHI-S and PHR hygiene index was found in all patients of the 1st and 2nd groups compared to the previous examination, which indicated a deterioration in the hygienic state of the oral cavity.

So, in the control subgroup A1 and B1, the indicators of the hygiene index according to the OHI-S index were 2.28 and 3.27 times higher, respectively, and according to the PHR index - 2.49 and 2.54 times, which characterized the hygiene state as unsatisfactory. ... In group A2 and B2, the values of the hygiene indices did not exceed the initial data, which were assessed by the OHI-S index as a satisfactory level, and by the PHR hygiene index - as unsatisfactory.

Further observation revealed small fluctuations in the values of hygiene indices, which slightly differed from those in the prophylactic subgroups, remaining until the end of the study at a satisfactory level according to the OHI-S index and at an unsatisfactory level according to the PHR index, but were significantly better than the values of the initial examination.

In the control subgroups, the state of oral hygiene at the final examination according to the OHI-S and PHR hygiene indices according to the evaluation criteria was unsatisfactory and exceeded the initial data. The lower values of hygiene indices in the prophylactic subgroups compared to the control ones are explained by professional oral hygiene and the use of therapeutic and prophylactic agents, which confirms the need for regular training, monitoring and monthly motivational education of patients in the process of orthodontic treatment.

The assessment of the development of inflammatory phenomena in the periodontal tissues during orthodontic treatment was carried out by determining the PMA index. Analyzing the data obtained, we can conclude that throughout the treatment, the state of periodontal tissues in all subgroups was less than 30%, which corresponded to the assessment criterion of mild gingivitis.

With further observation, the inflammatory phenomena in the periodontal tissues persisted, but with a tendency to decrease (Fig. 1).

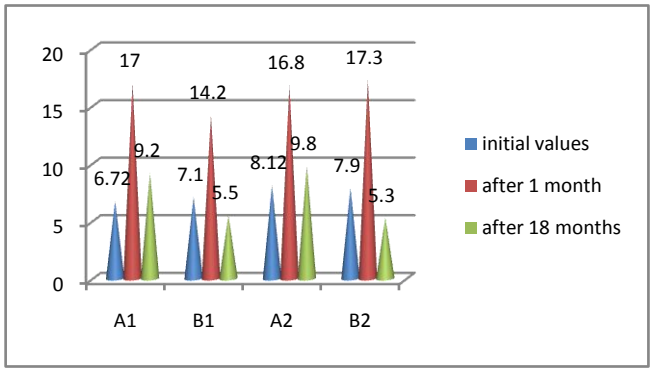

Figure 1. Dynamics of the state of periodontal tissues (PMA) in the oral cavity during treatment

At the end of treatment, the PMA index values significantly differed in the prophylactic subgroups from the initial data, but were significantly worse in the control subgroups A1 and B1, by 103.1% and 128.3%, respectively.

According to the WHO criteria, indicators of the intensity of dental caries varied from low to high - in the range of 1.96 - 4.67. Before the study, all patients underwent oral hygiene, after which only the P component was present in the index structure.

A change in the indicators of the intensity of caries was revealed in all examined patients. So, in children of the A1 subgroup in the complex of preventive measures, the increase in carious cavities was, respectively, 00.17, while in the subgroup A2 - 0.09. In patients of the B1 subgroup, an increase in caries was found both on the chewing and on the

contact surfaces of the teeth. In the control subgroups A1 and B1, where no preventive measures were taken, the increase in carious cavities in patients was 0.17 to 1.57, respectively (Table 1).

Table 1. Indicators of intensity and reduction of dental caries in patients in the dynamics of treatment

Subgroups	Number of patients	КПУ	KPU structure			Reduction of caries (%)
A1	26	4,84±0,13	0,17±0,01	4,67±0,39	0	
A2	20	2,53±0,21*	0,09±0,007	2,44±0,11*	0	90,2
B1	77	5,82±0,09	1,57±0,06	4,25±0,18	0	
B2	78	2,25±0,19*	0,29±0,03	1,96±0,07*	0	68,5

Note: * - reliability of data between treatment groups A and B (p <0.05)

Reduction of caries after application of the drug "R.O.C.S. MedicalMinerals" accounted for 90.2% and 68.5%. The compliance of the tooth enamel to the action of acid (TER test) during the initial examination in patients with removable and non-removable orthodontic technologies was within the range of medium and high values, being within 58.32 ± 1.37 - 68.13 ± 1.32% (Table 1).

To increase the acid resistance of the enamel in the prophylactic subgroups of the 2nd group, a course of therapeutic and prophylactic measures was carried out using R.O.C.S. MedicalMinerals" and kapp. So, after using the drug "R.O.C.S. Medical Minerals", the greatest tendency towards a decrease in the indicators of the TER test in relation to the initial examination was noted - by 27.8%. This was due to an increase in the acid resistance of the enamel before the fixation of removable and non-removable orthodontic appliances, which confirms the importance of this procedure.

4. Conclusions

Thus, carrying out sanitary and educational work, individual and professional oral hygiene, along with the use of "R.O.C.S. Medical Minerals" and aligners allowed after 18 months of orthodontic treatment to increase the resistance of hard tissues of teeth, to stabilize the development of initial caries, as evidenced by clinical assessment using the method of light-induced fluorescence.

The developed and tested complex of preventive measures, including the local use of various therapeutic and prophylactic drugs and mouth guards, improves the hygienic state of the oral cavity, stabilizes the condition of the periodontal tissues and provides a decrease in the growth rates of dental caries, which makes it possible to prevent the development of complicated forms of major dental diseases and contributes to an increase quality of orthodontic care for children.

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