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AIDS AND METHODS FOR PERSONAL ORAL HYGIENE IN PATIENTS WITH NON-REMOVABLE ORTHODONTIC APPLIANCES

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ABSTRACT — The demand for aesthetic dental rehabilitation, and respectively, for a higher quality of life, is growing each year. This entails a growth in the number of orthodontic corrections employing non-removable appliances. A high risk of developing periodontal issues while undergoing treatment reveals that orthodontist need to have all-round comprehensive knowledge of the tactics, the principles and the methods of hygiene measures. A high level of the doctor's awareness along with their ability to motivate the patient, would allow them to arrive at successful doctor-patient relationship not only when dealing with orthodontic diseases, yet also in terms of maintaining the periodontium health due to a thorough approach to the issues of preventive oral hygiene during orthodontic treatment.

KEYWORDS — orthodontics, periodontitis, oral hygiene, patient motivation.

INTRODUCTION

Orthodontic correction is gaining more and more of relevance and demand as a field of comprehensive dental rehabilitation [1–4]. The global technological progress and growing awareness entail an increase in the number of visits to dentists' offices not only to get help in treating a particular pathology, but also seeking some dental aesthetic correction thus to enjoy a higher quality of life [5–8]. A large number of research papers focusing on the relationship between individual organs and systems never fail to note the fact that the proper functioning of the dental system features a direct relation to systems like the gastrointestinal tract, cardiovascular system, respiratory system, etc. Improving a pathological occlusion and developing a proper interdental and inter-maxillary contacts can improve the patient's overall health and add to their psychological comfort [9–12].

The non-removable appliance technique, which — individually or in combination with other auxiliary elements — can help eliminate complex dental issues, still remains the most common method employed to treat adult orthodontic issues nowadays, the global prevalence of this method reaching 11.4–71.7% [13, 14]. One of the important criteria to ensure success of the respective treatment is the enamel and teeth periodontium status. Researchers have developed numerous methods and tools helping maintain the oral cavity health and prevent dental diseases [15].

Failure to comply with the doctor's recommendations during a serious long-term course of orthodontic treatment may lead to various transformations affecting the patient's oral cavity, namely, damaged periodontal tissues and tooth enamel [16]. Researchers claim that periodontal diseases are rather common observed in patients with non-removable orthodontic appliances, the said issues accounting for about 20–38% of all disorders, which reflects data offered by other authors, who, though, report a much higher occurrence rate — up to 92%, and yet there are even more data sources claiming even higher a rate — up to 99%. Speaking of patients with non-removable orthodontic appliances, the probability of caries makes up 15% to 85%. This high level of prevalence of the above-mentioned dental diseases combined with treatment approaches involving non-removable orthodontic appliances could be attributed to an unclear clinical presentation at the initial stages of the disease progress, which entails difficulties in diagnostics and, consequently, the lack of timely corrective intervention. Catarrhal and chronic hypertrophic gingivitis signs are to be observed as soon as 6 months into orthodontic treatment, whereas the entrance here is the dental grooves, accumulating a large number of microorganisms [17, 37].

The large volume taken by non-removable orthodontic elements placed for a long correction period on both the vestibular and the oral surfaces of the teeth, results in difficulty experienced by patients through daily oral cavity care procedures. Braces are most commonly located on the central part of the tooth crown, or they can be shifted towards the gum, while their design includes wings and hooks. These elements make daily hygiene even more difficult, since conventional

toothbrushes no longer allow cleaning plaque out of hard-to-reach spots. As a result, these spots turn to be the areas where plaque or biofilm accumulate in large amounts, with periodontal inflammation and demineralization taking a more intense course, getting localized around the bracket base, all this finally turning into a carious cavity [19, 31]. The oral microbiota composition undergoes certain change in the presence of abundant plaque along with a growth in the pathogenic microflora, which in turn will change the periodontium structure thus causing its inflammation [22]. Preventive hygiene measures are an important factor in an attempt to solve the issue successfully: these measures include teaching the patient the rules of routine oral and dental hygiene, individual selection of a toothbrush, a paste, a rinse aid, an irrigator, a floss as well as other hygiene products and techniques, and of course a high motivation to arrive jointly at the desired treatment outcome [18, 32].

Edema, gum hyperemia, itching and soreness when brushing the teeth, bad breath — all these are the first symptoms signifying the onset of changes affecting the periodontium in patients with non-removable orthodontic appliances. All the patients involved in the study carried out by A.V. Lopatina et al. were observed to have catarrhal gingivitis. The author also notes that the PMA index went 40% down if compared to the initial value [29]. The monograph by Soboleva T. Yu., contains the following recommendation: when positioning braces, bondage rings, it is advisable to act with extreme accuracy when filling the teeth fissures with a composite, leaving no space between them and the enamel. If done otherwise, there will be areas of orthodontic appliance loose fitting, which will accumulate plaque, all this eventually leading to the dental enamel demineralization. Also, the excessive fixing material should be removed carefully, this done to protect the periodontium against chronic injury [35].

Given high-precision, accurate and careful work performed by the doctor, an important factor is involving the patient in the treatment process, which is of a continuous course. This serves a sufficient explanation to the need of maintaining due regular daily dental care. It is important to enhance people's awareness, to motivate patients undergoing orthodontic treatment encouraging them to use permanently various preventive and medical oral care products. The relevance of this issue is obvious, due to which a clear task is to be defined here for each orthodontist, namely, taking an individual approach not only from the stance of the purely orthodontic aspect when correcting the respective major pathology pertaining to the doctor's field of practice, yet also adopting more extensive clinical thinking in view of preventing the negative effects of

the patient's negligence in matters of daily hygiene routine, as well as aiming to assume joint responsibility for the treatment outcomes [23, 26].

A proper systematic approach to hygienic and preventive procedures will reduce the risk of developing dental diseases. The abundance of individual oral hygiene means and methods available nowadays will often leave the patient confused, so the orthodontist's task is not only to select the right hygiene products for a particular patient, yet also to teach them how to use the products in question. The most popular means used in orthodontic practice when employing non-removable appliances include pastes with a therapeutic and preventive effect containing rich in fluoride and enzymes; toothbrushes with a special groove for braces; electric toothbrushes with a special orthodontic nozzle; end-tufted and interdental brushes; flosses, irrigators, tongue scrapers, rinses and elixirs [30].

71% of patients using special means can maintain personal oral hygiene at the proper level. When starting orthodontic treatment, the doctor teaches the patient the rules of brushing teeth (standard way). The authors' study reports that the hygiene index in patients through orthodontic treatment fluctuated from HI=1.0 to HI=1.5, whereas the PMA index fell within the range of 0.4 to 0.6. If compared other patients, then those using standard brushes to clean plaque out of the oral cavity had lower indicators, HI=2.0–2.5, PMA=1.0–2.0. In the authors' publication, the Parma PMA index was near zero, whereas 1 month into orthodontic treatment, it went 25.3% up, which points at mild gingivitis [28].

The main tool in terms of dental care are brushes that differ by the material their bristles are made from, the stiffness, the number of bundles, the texture, the shape of the bristles cut, etc. Besides, brushes come out as manual or electric. Authors writing about the effectiveness of toothbrushes in orthodontic patients mention an interesting fact. The author mentioned above claims that after using electric brushes for 2 months, the hygienic and gingival indices proved significantly below those ($p < 0.01$) observed in cases where manual brushes were used, which is in line with personal observations when using such self-administered gadgets with no due professional advice [21]. Ivanov V. Yu. et al., in turn, note in their article that the quality of tooth brushing does not depend on the type of the toothbrush used, while good manual skills in consistently removing plaque from all the teeth surface can ensure highly effective prevention of major dental diseases, which is also confirmed through daily practice observations [27].

Interdental thread (floss) is used to clean the interdental spaces. Fleischer G. M., in an article pub-

lished in 2019 and focusing on a specific narrow topic claims that flosses containing fluoride components contribute to a faster recovery of the dental sulcus pH after meals, bringing the said indicator's values in the dental fluid back to neutral. This fact can be well employed in clinical practice, since it is the interdental contacts that often become the starting point for the infection development, manifesting itself both as hidden carious cavities and as dental and gingival pockets, which in turn progress into extensive lesions over a long period of orthodontic treatment [24].

The selection of toothpastes for periodontal diseases and caries is to be done on a strictly individual basis [20, 38].

In the article [33], the group of authors analyzes the value of all hygiene products, as well as they analyze several ways to clean the oral cavity. The authors point at the S.B. Ulitovsky method as the most effective one, which includes several stages: preliminary irrigation of the oral cavity; cleaning the interdental spaces with a floss; repeated irrigation; cleaning the retromolar area and the teeth fissure with an end-tufted brush. Further on, the recommendation suggests using a paste and a brush with a V-shaped protrusion to clean all the dental surfaces, after which the mouth is to be rinsed again, followed with an interdental brush cleaning of the dental areas between the non-removable appliance. After that the oral cavity should be irrigated with a mouthwash. The safest products are based on natural components, so their use does not involve the risk of developing dysbiotic phenomena in the oral cavity as well as ensures a positive dynamics of the hygienic indicators along with a significant inflammation reduction in the periodontal tissues [25]. Further, it is recommended to clean the tongue with a scraper, after which an irrigation is to be carried out intermediately, then cleaning with an end-tufted brush around the bracket base, and a final irrigation of the oral cavity with a rinse for therapeutic and preventive purposes. Mouth rinses containing xylitol have proven to reduce plaque formation through impeding the activity of *Streptococcus mutans* in saliva, proof to that offered in Dr. Satygo's article [34]. Remineralizing therapy is recommended both during and following orthodontic treatment with a non-removable appliance [36, 39].

CONCLUSION

The presented reference data provides evidence to the relevance of studies focusing on comprehensive preventive measures through all stages of orthodontic treatment. Despite recent advances, oral hygiene still remains an issue of note. Poor oral hygiene leads to accumulation of dental deposits, whereas non-removable orthodontic appliances may trigger inflammation in

the periodontal tissues and the mucous membrane. This results in lower local immunity, increased pathogenic activity of the microflora, shifts in the oral homeostasis and to caries-related disorders.

The onset and progression of dental diseases in orthodontic patients requires further in-depth study of this problem with a focus on improvement of overall dental health, and enhancing preventive as well as treatment strategies.

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