

# Education and motivation in oral health — preventing disease and promoting health in patients undergoing orthodontic treatment

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## Abstract

**Introduction:** It is incumbent upon dentists to prevent disease, minimize risks and promote health. Patients also need to be made aware of their role in oral health care. Patients undergoing orthodontic treatment find it particularly difficult to maintain satisfactory oral hygiene owing to the presence of bands, wires and ligatures. It is therefore crucial to establish preventive motivation and guidance methods to ensure mechanical control of dental plaque. **Objectives:** This study investigated the effects of educational, preventive and motivational actions on the oral health of patients undergoing fixed orthodontic treatment. **Methods:** Participants received free toothpaste and toothbrushes throughout the study and instructions on oral hygiene were provided and reinforced throughout the six months of research. Physical examination was performed at baseline and after 6, 12 and 24 weeks for verification of plaque, gingival and bleeding indices. **Results:** Initially, the oral hygiene of participants was inadequate. During the study, significant improvement in oral health occurred in all indices. Preventive, educational and motivational actions undertaken in this study were statistically effective in improving the oral health of orthodontic patients. **Conclusion:** Health promotion and disease prevention should be part and parcel of the care provided by orthodontists directly to their patients whereas oral health care guidance and motivation should be provided before and during treatment.

**Keywords:** Prevention. Education. Motivation. Orthodontics. Oral health.

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## INTRODUCTION

Preventive dentistry has proved a landmark in the health care field. Oral health care has reached beyond aesthetic concerns. The new health paradigm has raised considerable awareness regarding the need to maintain satisfactory oral health, which in turn is reflected in the overall health of individuals.

Health professionals are responsible for promoting disease prevention, minimizing risks and creating favorable conditions that enable patients to achieve and maintain oral health. Moreover, patients also need to be made aware of their role in oral health care.

One of the major and most common challenges in prevention within the field of oral health is the control of plaque and, consequently, the control of dental caries and gingival inflammation.<sup>10,32,36</sup>

Mechanical methods such as the use of toothbrush and dental floss, when applied effectively, can promote proper plaque control.<sup>30,38</sup> Dentists and their staff play a key role in guiding and encouraging patients to perform proper oral hygiene frequently and effectively.

### Peculiarities of orthodontic treatment

Due to the declining prevalence of dental caries the population began to lose fewer teeth. Furthermore, racial mixing and improved preventive methods have turned crowding into a commonplace cosmetic and occlusal problem, which ultimately boosts demand for orthodontic treatment.<sup>5,28</sup>

Patients undergoing fixed orthodontic treatment are more prone to retaining dental plaque. Orthodontic accessories can lead to enamel demineralization, causing white spots, tooth decay and gingivitis.<sup>15,19,20</sup> Therefore, this group of patients is particularly compelled to take care of their oral hygiene since it is a challenging task to maintain acceptable oral hygiene in the presence of bands, wires and ligatures.<sup>27</sup>

Mechanical methods of plaque removal require time, motivation and manual skill.<sup>13</sup> Even patients who are properly trained and instructed to maintain satisfactory hygiene often see their compliance falter unless constant health education reinforcement is provided.<sup>3</sup> In light of these factors one cannot ignore that the domestic environment poses certain limitations on proper oral hygiene.<sup>31</sup>

According to Heintze<sup>20</sup> treatment with fixed appliances constitutes a substantial intervention in the oral cavity environment. Orthodontic accessories involve a high risk of dental caries and periodontitis. However, iatrogenic complications occur due to patient unpreparedness before the orthodontic appliance is placed, in addition to lack of motivation and reinforcement during treatment.

Microbiological studies have established that after a fixed orthodontic appliance has been placed the number of bacteria rises significantly, particularly lactobacilli and streptococci, subjecting the oral environment to an imbalance that predisposes to the emergence of diseases.<sup>16</sup>

Thus, successful orthodontic treatment lies in correcting occlusion in the best possible manner without, however, affecting the pre-existing health of teeth and supporting tissues. Otherwise, treatment benefits may be called into question.<sup>37</sup>

Patients wearing orthodontic appliances must be encouraged to take good care of their oral cavity as hygiene can prove difficult in these cases. While problem areas in banded teeth are located on the cervical side of the band, in teeth with bonded brackets the critical surfaces are those on the mesial and distal sides of the bracket base. These areas are located under the archwire “shadow” and are inaccessible to toothbrush bristles.<sup>20</sup>

Perfect cleaning of teeth in patients with fixed appliance takes at least ten minutes,

which requires considerable care and discipline. Preventive treatment remains the most effective weapon in the fight against dental problems. No doubt the only viable approach to address these issues is through awareness and education of patients, who will as a result be encouraged to play an active role in preventive programs.<sup>20,28</sup>

### Prevention in orthodontics

Given the potential — and not uncommon — iatrogenic effects caused by orthodontic treatment, several authors agree that preventive methods should be provided for all patients undergoing orthodontic therapy.<sup>4,14,17,18,20</sup> The type, frequency and quantity of measures adopted to implement such methods will certainly depend on the individual characteristics of both professionals and patients.<sup>4,18</sup>

Dental plaque should be monitored before setting up the appliance and if patients are motivated during the course of treatment, one can prevent the gingival index from rising.<sup>9</sup>

The importance of conducting a motivation and guidance program for the mechanical control of dental plaque is emphasized by several authors.<sup>34,35</sup> Basically, the most efficient and simple method consists in the use of toothbrush and dental floss.<sup>4,30,37</sup>

Inglehart and Tedesco<sup>22</sup> reported that the model of oral health promotion ushered in by the 21<sup>st</sup> century begins by examining the interaction between patient and oral health professional. Thus, issues related to cognitive, emotional, environmental and behavioral factors must be addressed concurrently.

In dentistry, education is related to the cognitive, affective and psychomotor realms. Systematic education varies with individuals or the target population as well as with the educational tools to be employed. It is important that teachers and learners maintain frequent contact to establish a framework of mutual trust,

ensuring a successful communication process.<sup>7</sup> The educational component is what enables people to assume their share of responsibility for their own oral health.

Motivation, in turn, is a generic term that refers to needs, motives or desires that prompt action. Although some motives are innate and others acquired, individual response is modified by learning and influenced by culture.<sup>7</sup> Dentists should develop appropriate skills to be able to persuade patients to change their behavior and thereby gain control over oral diseases. Changing habits is a complex activity and requires effort, practice and building ties with individuals.<sup>23</sup>

### OBJECTIVE

Within the context of health promotion and disease prevention, this study aimed to determine the effects of educational, preventive and motivational actions on the oral health of patients undergoing fixed orthodontic treatment.

### MATERIAL AND METHODS

#### Selection of participants

After approval by the Ethics in Human Research Committee (FOB – USP), 27 patients from the Clinic of Orthodontics, FOB-USP (master's and specialization) and from the Specialization Course in Orthodontics at Bauru-APCD agreed to participate in this research by signing a Term of Free and Informed Consent. Inclusion criteria were as follows: Being under fixed orthodontic treatment planned to last at least six months beyond the beginning of the study, permanent dentition, good general health condition, not having taken systemic antibiotics within three months before the beginning of research, not being pregnant, not being a smoker and exhibiting only minor gingivitis, verified by means of the Gingival Index.<sup>25</sup> The group had a mean age of 16.9 years (14 subjects were female and 13 male).

## Study protocol

In this longitudinal clinical study participants received, after baseline examination, a hygiene kit containing a toothbrush, dental floss, floss threader and fluoridated toothpaste (Sorriso Fresh Mint Red®, 1100 ppm F, Kolynos Brazil).

Verbal and written guidelines were provided prohibiting the use of other oral hygiene chemical products during the experiment. Patients were instructed to brush their teeth three times a day.

Toothpaste was supplied to the patients as needed and the amount of tubes that each patient used during the experiment was recorded as used tubes had to be returned upon replacement. Three months into the study patients' toothbrushes were replaced.

At the beginning of the research volunteers completed a questionnaire about their hygiene and any recommendations made by their orthodontists.

## Implementation

All volunteers received professional prophylaxis after baseline examination and were further examined at intervals of 6, 12 and 24 weeks. During this examination a new professional prophylaxis was performed.

Instructions and reinforcement on correct oral hygiene and the importance of toothbrushing and proper flossing were provided after baseline examination and after 6, 12 and 24 weeks. Issues were addressed pertaining to the prevention of diseases such as dental caries and periodontal diseases, the fact that the orthodontic appliance required special individual efforts to maintain oral hygiene, and the understanding that plaque accumulates around the brackets, which requires additional care and the proper use of dental floss and a floss threader.

To this end, when dental plaque became apparent, patients were shown in mirrors the regions of greater plaque accumulation and the

clinical characteristics of gingival tissue in the inflamed areas. Proper hygiene instructions were then provided. Floss threader use was explained with the aid of manikins. Educational and preventive activities comprised a lecture at the beginning of the research attended by all patients and their parents and subsequently verbal instructions were given to patients after each clinical examination (baseline, 6, 12 and 24 weeks).

A previously trained examiner<sup>29</sup> performed the examinations in a dental office. Examinations were made under artificial light and with compressed air, using probes recommended by the World Health Organization (WHO) and flat clinical mirrors. Two percent fuchsin was applied in order to disclose supragingival dental plaque. The tests were as follows:

1. Gingival index<sup>25</sup> to reveal the health condition of gingival tissues and degree of inflammation. Mean GI values ranging from 0.1 to 1.0 indicated mild gingivitis, from 1.1 to 2.0, moderate gingivitis and from 2.1 to 3.0, severe gingivitis.
2. Bleeding index<sup>1</sup> to assess the percentage of sites that bled and those that did not bleed on gentle probing.
3. Orthodontic plaque index<sup>21</sup> to determine the amount of plaque on the teeth. Index values ranging from 0 to 25 represented good oral hygiene, between 26 to 50 points, moderate oral hygiene, and above 50, poor oral hygiene.

## Statistical Analysis

All data were recorded in individual charts especially developed for this study. Numerical data were entered into Excel spreadsheets for index calculation. Statistical analysis was performed using the program InStat GraphPad. Data on gingival, bleeding and plaque indices were tested by analysis of variance with repeated measures, and by Tukey's test. A 5% significance level was adopted.

## RESULTS

The initial questionnaire filled out by the participants showed that 44.44% of them reported a toothbrushing frequency of 3 times a day, 22.22% more than three times a day, 29.63% twice daily and 3.70% only once a day. Only 11.11% of the volunteers reported using interdental and end-tufted brushes.

As regards the instructions provided to patients by their respective orthodontists, 88.89% of participants reported receiving some sort of guidance. The need to perform toothbrushing and flossing three times a day was the instruction most often reported (66.67%), while other instructions concerned the use of interdental and end-tufted brushes (14.81%) and the recommendation not to ingest hard foods, chewing gum, candy and soft drinks (18.52%). None of the questionnaires comprised any reference to supervised brushing or a more constant monitoring of the patients' oral health.

Table 1 presents mean values for Plaque Index (PI), Gingival Index (GI) and Bleeding Index (BI) at baseline examination, and after 6, 12 and 24 weeks of follow-up. Initially, oral hygiene conditions were less than satisfactory, which can be attested by the fact that the PI and GI mean values, in their respective scales, reflect poor oral hygiene (PI>50) and moderate gingivitis (GI = 1.0 to 2.0). During the study, the group reported significant improvement in oral health at all levels.

TABLE 1 - Mean values and standard deviation for Plaque Index (PI), Gingival Index (GI) and Bleeding Index (BI) at baseline examination, and after 6, 12 and 24 weeks of follow-up.

	PI	GI	BI
<b>Baseline</b>	83 (12.11) <sup>a</sup>	1.21 (0.31) <sup>a</sup>	33.33% (16.69) <sup>a</sup>
<b>6 weeks</b>	65 (10.61) <sup>b</sup>	0.79 (0.25) <sup>b</sup>	12.49% (8.60) <sup>b</sup>
<b>12 weeks</b>	55 (19.28) <sup>c</sup>	0.71 (0.28) <sup>b</sup>	12.39% (8.76) <sup>b</sup>
<b>24 weeks</b>	51 (13.99) <sup>c</sup>	0.55 (0.19) <sup>b</sup>	6.52% (2.79) <sup>b</sup>

The different lowercase letters in the same column indicate significant differences, as analyzed by ANOVA and Tukey's test. ( $p < 0.05$ ),  $n = 27$ .

## DISCUSSION

Being able to exercise proper control over dental plaque and periodontal health while avoiding inflammation and bleeding remains a great challenge both for the dentist, who needs to assess, guide and treat his/her patients, and for patients, who are largely responsible for maintaining their own health.<sup>3,32,36</sup> In the case of orthodontic patients, this challenge is even greater. In fixed orthodontic treatment, plaque retention surfaces are increased and, as a result, most patients are confronted with hygiene difficulties, which eventually cause elevated plaque indices.<sup>20</sup>

Frequent patient visits for orthodontic maintenance are opportunities for the dentist to teach techniques that promote oral hygiene, and to reinforce instructions that encourage healthy habits.<sup>18</sup> Orthodontist should be aware of their patients' oral hygiene problems since one of the main goals of orthodontics is to achieve dental and skeletal harmony while preserving healthy teeth and support surfaces. Berglund and Small<sup>8</sup> argue that orthodontists play a pivotal role in educating, motivating and monitoring their patients' oral health.

In order to promote and maintain satisfactory oral health, orthodontic patients should undergo a stringent program of oral hygiene and dental plaque control before and during orthodontic treatment.<sup>5,39</sup> Despite the large number of resources available for patient guidance and motivation, such as audiovisual resources, films, printed material, among others, the major tool is still direct, personal guidance.<sup>11</sup>

The vast majority of patients in this study reported having received instructions on toothbrushing and flossing. However, in view of the results obtained in the baseline tests, one can only speculate that the guidance offered by orthodontists at the start of treatment was not effective enough to ensure satisfactory oral hygiene since the mean index values showed

poor oral hygiene. This fact demonstrates that if hygiene instructions are not reinforced on a continuous basis maintaining oral health can be challenging.<sup>20,35</sup>

The instructions and encouragement offered to participants during this research were reflected in clinical and statistical improvement (Table 1). Since the most common brushing frequency was maintained, i.e., 3 times a day (according to what was reported in the initial questionnaire), it is possible to demonstrate that toothbrushing quality is the decisive factor during oral hygiene.

It is reasonable to assume that the distribution of free toothpaste throughout this 6-month study also contributed to improving the group's oral health. Davies et al.<sup>12</sup> found that the free and regular supply of fluoridated toothpaste in a program conducted in England succeeded in significantly reducing dental caries rates in 5-year-old children.

Control of plaque, gingivitis and bleeding should be ongoing and effective in orthodontic patients. Glans, Larsson, Ogaard<sup>19</sup> found that after installation of the orthodontic appliance all patients exhibited mild gingivitis, but after removal of the orthodontic appliance gingival conditions returned to normal. This fact does not justify neglecting hygiene during treatment, especially when one is engaged in a philosophy of health promotion. Moreover, in the presence of gingival inflammation, forces produced by the orthodontic appliance worsen tissue response, producing as a result increased destruction of protective and support tissues.<sup>26</sup>

Heintze<sup>20</sup> asserts that, especially in adolescents, gingival hyperplasias often emerge in response to plaque accumulation, thereby hindering oral hygiene and creating a vicious circle.

Feliu<sup>18</sup> demonstrated that patients undergo-

ing orthodontic treatment may have lower levels of plaque and gingival inflammation than patients who are not under orthodontic treatment provided that they first attend an educational-preventive program.

Silva et al.<sup>33</sup> showed that one group of orthodontic patients who received oral hygiene instructions only on the first day of treatment did not change their habits while the other group, who was given instructions every fortnight throughout the period with hygiene classes and motivation and were monitored with a plaque control chart, achieved a better oral hygiene index given the additional encouragement.

Motivation is based on understanding what is normal and what is pathological in the oral cavity. Thus, one can change patient habits and render them active participants in the control, treatment and maintenance of their own oral health.<sup>24</sup>

Well planned, evidence-based educational programs with a solid scientific background and an understandable terminology tailored to meet the needs of the target group are highly likely to achieve planned results.<sup>5,7</sup>

## CONCLUSIONS

The preventive, educational and motivational actions undertaken in this study proved statistically effective in improving the oral health of orthodontic patients.

The current health paradigm requires that patients be regarded as one single whole. Health promotion and disease prevention should be part of the philosophy adopted by orthodontists in caring for their patients. Furthermore, professionals should provide guidance and motivation to their patients regarding oral health care before and during orthodontic treatment.



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