Plaque control, a key element of successful orthodontics

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Introduction

Periodontal diseases are of infectious nature with a high inflammatory compound. They result from complex interactions between subgingival microbial flora (biofilm) and non-bacterial factors related to the host and the environment. In 1984, Socransky proposed the infectious model (Fig. 1), which states that, for an episode of attachment loss to occur, three conditions need to be present at the same time:

1. a number of pathogenic microorganisms that surpasses the tolerance threshold;
2. a temporarily or permanently permissive host; and
3. an adverse environment with specific local conditions at the gingival sulcus.

Today, a coherent and comprehensive approach integrating patient-reported symptoms, clinical signs and data provided by laboratory tests can identify and then reduce or control periodontal risk factors. However, if technology allows practitioners to identify disease causing bacteria (DNA probe or bacterial culture) and genetic susceptibility to periodontal disease (PST test), the key factor on which the patient must act is the bacterial component, avoiding the risk of failure to control periodontal disease.

Are orthodontic anchorage devices a plaque trap?

Removable appliances, fixed buccal or lingual orthodontic anchorage devices cause adverse changes in the bacterial composition of dental plaque, increasing the risk of caries and periodontal disease dramatically. Concerning the periodontal risk, the following changes have been reported: an increase in spirochaete and motile bacteria; an increase in anaerobes, facultative aerobes and Prevotella intermedia; and an increase in Aggregatibacter actinomycetemcomitans, present on a single patient before orthodontic treatment and on 19 of 20 patients after orthodontic treatment. Concerning the caries risk, an increase in Streptococcus mutans and Lactobacillus, the two bacteria implicated in caries, has been reported.

Periodontal cost of orthodontic treatment—A myth!

Orthodontics is involved in improving self-esteem and function. An often repeated assertion regarding orthodontics-periodontics relationships is that orthodontics has no deleterious effects when the periodontium is healthy or treated. However, a recent systematic review on the effects of orthodontic treatment on periodontal health disproves these concepts repeated for decades. Of the approximately 24,000 initial studies found by the literature search, 12 studies, including 11 non-randomised ones, showed 0.03 mm gingival recession, 0.13 mm bone loss and 0.23 mm pocket depth at minimum. The conclusions of this meta-analysis are clear: there is no reliable evidence of the benefits of orthodontic treatment for periodontal health and, at best, mildly adverse effects result. What should we do to avoid the worst?

Plaque control, key to preventing periodontal complications in orthodontics

If there is a miracle recipe for changing the behaviour of our patients concerning their oral cavity and dental plaque, every practitioner and the industry have already applied it. In our everyday practice, especially considering that the decision on therapy is typically made solely by the treating dentist, we have established protocols that work for us and thus we think it is good for our patients, especially if many of us follow the same protocols. However, the concept of evidence-based dentistry refutes these anecdotal considerations. Medicine is no longer based on beliefs. It is based, at least, on strong professional consensus and, at best, on evidences.

Our patients believe that they brush their teeth, but their efforts are insufficient, and patients may too often consider toothbrushing mere ablutions. This universal behaviour can mainly be attributed to our patients knowing little, if anything, about the oral cavity. You cannot blame them for it if nobody has given them the right information. They do not differentiate plaque from calculus and think that their electric toothbrush is homing, an irrigator or mouthwash removes plaque and the more a toothpaste foams, the cleaner the teeth are.
A meta-analysis evaluating the impact of oral health promotion on orthodontic patients found a reduction in the plaque index and inflammation in a short period, up to five months, but there is no data on longer periods. This means that a regular orthodontic and periodontal maintenance needs to be done, at every orthodontic session, every six to eight weeks, to reinforce and promote good oral hygiene.

The objective of this phase, common to all periodontal treatment and thus to any orthodontic treatment, is to develop all non-coercive means to radically change the behaviour of the patient regarding the oral cavity and dental plaque. To motivate means to move, to create conditions that lead to action. In order to reach these objectives, the patient must understand what justifies these changes.

Clinical consequences—The motivation “scenario”

Xun Kuang said, “Tell me and I forget, teach me and I may remember, involve me and I learn.” This maxim, laid down more than 2,500 years ago, can help us to understand the strategy of the motivation scenario. The patient must understand, and for this, he or she must see and be involved. Passive elements of communication, such as flyers, huge plastic jaws and a toothbrush for elephants, and videos playing in the waiting room, may be possible reinforcement elements, but at no time will cause changes in patient behaviour, because they are impersonal. The patient cannot identify with what he or she is seeing and standardised speech has very little impact.

Rozencweig states that information retention is boosted to 90% if the person receiving the information hears it, sees it, receives explanations and is involved in a demonstration at the same time (Fig. 2). It is also important for...
the patient to immediately repeat what he or she has seen because this can help to achieve this high rate of retention of the information, including how to perform the plaque control technique.

Benqué states that “allowing our patients to see and to be aware about the existence of the biofilm is an act of absolutely major motivation”. He asks of the reader whether he or she has disclosing solution in his or her oral hygiene arsenal, and if the answer is no, he (ironically) invites the reader to close his book.

Three tools are essential for patient comprehension: disclosing solution, a toothbrush and a large round mirror. The demonstration is done systematically in the patient’s mouth with disclosing solution and a large mirror with a handle to help the patient see his or her teeth directly. A simple brushing technique that aims to remove plaque from all the surfaces is used. In the absence of orthodontic attachments, the roll technique is the simplest, moving vertically from the gingivae to the teeth. In the presence of orthodontic brackets, brushing will be horizontal. However, at the end of the orthodontic treatment and after the removal of the orthodontic brackets, a new motivation scenario will be presented with a return to the roll technique. For the demonstration, toothpaste is not used. The patient needs to understand that physical effort and adapted instruments are central to toothbrushing. The demonstration employs proximal cleaning devices, mainly interdental brushes. For paediatric patients, parents are involved in the demonstration. For adult patients, the demonstration is performed without the presence of anyone accompanying the patient, to avoid any interference.

The following phrases or sentences need to be employed during motivation:

- “plaque”, a term now used in toothpaste advertisements;
- “bacteria” or “microbes”;
- “it is normal to have bacteria (or microbes) in the mouth”;
- “everyone’s mouth has dental plaque, including the practitioner”;
- “a toothbrush and an interdental brush are like a broom”;
- “to take the plaque off the tooth surfaces”;
- “to optimise the technique of brushing”; and
- “to get healthy gums”; and
- “to keep teeth lifelong”.

Some words need to be totally banned from our communication with patients because they can be misinterpreted or considered as value judgements, such as “hygiene”, “good”, “bad”, “clean” and “dirty”. Finally, we should speak in a positive manner to encourage and motivate our patients, because they alone can create the conditions for improved plaque control (Figs. 3a & b).

At this time, personalised letters, easy to achieve on computer, can be sent to the patient, summarising the origin of periodontal disease, clinical signs reported by the patient and those that were observed by the practitioner. A flyer describing the brushing technique, even with schemas, can be given to the patient, listing the instruments used for the demonstration and the brand/name of a recommended toothpaste. These documents are written to support the information that the patient has received during the appointment, allowing him or her to review the information at home.

OK! But what do I recommend?
Toothbrushes, oral irrigators, interdental devices, etc.?

The pinnacle of improvisation is evident in the recommendation of the instruments (manual or electric
toothbrushes, oral irrigators, etc.) and the products (toothpaste, mouthwash, etc.). The practitioner’s recommendations tend to be guided by either medical representatives from companies or the practitioner’s unsubstantiated personal opinion. “I prescribe only this electric toothbrush. I feel that it works well on my patients.” Unfortunately, such anecdotic feeling does not appear in the pyramid of evidence-based dentistry. It is again systematic reviews or meta-analyses that can help us in our choice because they are independent of any commercial pressure.

**Electric toothbrush**

Two recent systematic reviews\textsuperscript{13, 14} arrived at the same conclusion. They found that the use of electric toothbrushes compared with manual toothbrushes causes a modest reduction in the plaque index (amount of plaque) and the gingival index (inflammation). Among the various electric toothbrushes, the efficiency is higher for those with oscillating-rotating movement. Finally, these two reviews indicate that there is no evidence showing superior efficacy of ultrasonic brushes. A meta-analysis examining the effectiveness of electric toothbrushes among orthodontic patients\textsuperscript{15} found a lack of sufficient evidence suggesting particular efficacy. The authors state that, among the five studies included, none had a duration of longer than 60 days.

**Irrigators**

If an irrigator is effective, disclosing solution placed in the device’s water tank should leave no stain on the surfaces of crowns. A systematic review concerning the effect of irrigator use on plaque scores and gingival inflammation, based on seven articles selected from 914 publications, found no reduction in visible plaque.\textsuperscript{16} Thus, while an irrigator can help to remove food stuck in orthodontic brackets, it removes plaque only partially. A recent study on the use of a special orthodontic device showed a significant reduction in plaque scores and gingival inflammation.\textsuperscript{17} However, at four weeks, there was no statistically significant difference in proximal regions, more difficult to reach with a toothbrush.

**Dental floss**

Tooth cleaning is not complete without the use of interdental devices. The presence of a fixed orthodontic appliance is an obstacle to the effective use of dental floss. However, a systematic review, of 11 publications selected from 1,353 articles, on the effectiveness of flossing in addition to toothbrushing reported that many of the studies showed no benefit on the plaque index and the clinical parameters of gingival inflammation.\textsuperscript{18} The authors concluded that the practitioner should check whether the patient is able to achieve a high technical level of cleaning (dexterity), but the routine use of floss is not supported by scientific evidence.

**Interdental brushes**

A systematic review, of nine articles selected from 334 publications, concluded that interdental brushes remove more plaque than does brushing alone and that a statistically significant decrease is obtained on the plaque index, on the bleeding index and in proximal pocket depth.\textsuperscript{19} The plaque index is even lower than that obtained with floss. Finally, the interdental brush is not hindered by the presence of a fixed orthodontic appliance.

**Conclusion**

All progress requires change, but not all changes constitute systematic progress. Evidence-based dentistry can be helpful in our everyday practice, particularly in choosing for the patient, good devices for performing oral hygiene, during an orthodontic treatment.

**Editorial note:** A complete list of references is available from the publisher.

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**about**

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