Maintenance of periodontal health during adult orthodontic treatment

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Abstract

In dental medicine, preventive measures combined with both classic and aesthetic orthodontics appliances resulted in an increase of adult patients seeking orthodontic treatment to improve their appearance and social acceptance as well as function and oral health. Adult patients bring distinctive characteristics like tooth mobility and periodontal disease that might interfere with the treatment and call for a multidisciplinary approach. This observational study aimed to evaluate the degree of collaboration with periodontologists and the approach implemented by orthodontists in periodontal affected patients. Material and methods: A questionnaire was designed and electronically submitted to orthodontic specialists and postgraduates in orthodontics from Romania. The answers gathered were compared to current literature on the topic. Conclusion: An interdisciplinary treatment of orthodontic and periodontal therapies is effective for adult patients with periodontal disease as long as the periodontium is healthy, and hygiene well maintained throughout treatment with orthodontic appliances.

Keywords: orthodontic treatment, adult patients, periodontal health

INTRODUCTION

For many adult patients undergoing orthodontic treatment, a stable and aesthetically acceptable outcome cannot be achieved without adjunctive periodontal procedures. Any orthodontic intervention must take into consideration the periodontal status of the patient because the biomechanics used to change the position of the teeth are determined by periodontal aspects like alveolar bone height and width, length of roots, gingival health and biotype.

In the absence of adequate oral hygiene, plaque accumulates around the orthodontic appliance inducing gingivitis and potentially further progress to chronic periodontitis. The literature (1) underlines the importance of patient's oral hygiene as a must for the success of orthodontic therapy along with other factors such as genetics, age, correct diagnostic, treatment plan and execution (2).

To prevent such cases, the orthodontist has the responsibility to examine the periodontium of the patient before placing appliances (3) and to offer advice regarding methods of plaque prevention.

Orthodontic and periodontic disciplines are intricately linked through the dynamic processes of bone remodelling and periodontal health maintenance (3). Orthodontic tooth movement is facilitated by the alveolar bone's capacity for remodelling, a delicate balance of bone resorption and deposition influenced by mechanical forces during orthodontic treatment (4,5). Central to this process is the periodontal ligament (PDL), which transmits these forces to the alveolar bone. Through orthodontic teeth movement, the alveolar bone goes through significant resorption and apposition, directly proportional to the duration, volume and direction of the applied forces (6–8).

The theories regarding orthodontic tooth movement have changed from tissue / cell levels to the molecular one. Remodelling of the bone is controlled by the osteoblasts/osteoclasts including interactions between cells, mediated by hormones, growth factors and cytokines. Research on signalling pathways showed that the first response of the cells to mechanical stress is the production of prostaglandins and secondary messengers cyclic adenosine monophosphate (9,10) and inositol phosphates (11). Changes have also been observed in calcium levels after stretching of the ion channels (12,13).

Existing evidence shows that that cytokines (inflammation mediators) and neurotransmitters are implicated in bone remodelling, suggesting that teeth movements are inflammatory processes (14). Mechanical stress causes in cells inflammatory responses resembling the ones caused by inflammatory factors (15).

Patient age has a significant impact on the proprieties of the PDL's structure and according to research studies it greatly influences the rate of tooth movement during orthodontic treatment (6,16). Research indicates that older patients experience decreased cellular proliferation and differentiation, affecting the efficiency of orthodontic treatments. Understanding these age-related changes is crucial for optimizing orthodontic care across different age groups.

The role of microbial colonization on teeth and orthodontic appliances further complicates the orthodontic-periodontic interface (17). Biofilms forming on dental and artificial surfaces can disrupt oral health, leading to enamel demineralization, caries, and gingival inflammation. The changes in oral microbiota during orthodontic treatment underscore the importance of rigorous oral hygiene practices to mitigate these risks. Oral bacteria have the predisposition to adhere to hard dental tissues and to form polymicrobial biofilms communities called biofilms (18). The bacteria also attaches to artificial hard surfaces such as restorative materials, implants and orthodontic appliances (19).

Periodontal examination and management in orthodontic patients are essential for ensuring comprehensive care (20). Identifying signs of periodontitis, such as gingival inflammation and bone loss, and implementing a structured treatment plan that includes systemic management, initial therapy, and maintenance, are critical for maintaining periodontal health throughout orthodontic treatment. Regular follow-ups are necessary to monitor and sustain oral health, highlighting the need for an integrated approach to orthodontic and periodontal care.

Aim and objectives

The aim of this observational study is to assess the approach that orthodontists have in periodontal affected patients, as well as to evaluate the degree of collaboration with periodontologists.

MATERIAL AND METHODS

A questionnaire was designed and electronically submitted to orthodontic specialists and postgraduates in orthodontics from Romania.

The answers gathered were compared to current literature on the topic.

The inclusion criteria for the participants were:

- orthodontic specialists
- orthodontic residents
- general dentists providing clear aligners treatment were also accepted.
- full questionnaire had to be completed.

Exclusion criteria: specialties that do not perform any orthodontic treatment or orthodontists that did not fill in the whole questionnaire.

The questionnaire consisted of 15 questions divided into 5 categories. The participation in the study was voluntary and anonymous. The design of the questions was dichotomous (yes/no), open questions and/or single/multiple choice.

After the collection of the data ended, the answers were reviewed, evaluated and presented either as percentages or means of the answers.

RESULTS

The questionnaire was web-based and an invitation to answer the questions was sent to orthodontists, orthodontic residents and general dentists providing clear aligner treatment from Romania. Seventy-six participants completed survey were obtained.

All the questions and the resulted outcomes can be found in Table 1.

Among the outcomes, it resulted a general consensus for periodontal health as an influencing factor for successful teeth movement and retention, orthodontic treatment improving periodontal health, the need for the examination of periodontal status during initial orthodontic appointment and for referral to a periodontologist before orthodontic treatment if periodontal disease is suspected and that instructions need to be provided on the management of oral health during orthodontic treatment. The questions that generated answers distributed in more categories con be found in Figure 1.

Table 1. Survey questions and outcome

Survey Questions	**Outcome**
Gender of participants	Men - 42.1% (n=32) Women - 57.9% (n=44)
Age of participants	<30 years old - 18.4% (n=14) 30 - 40 years old - 40.8% (n=31),

Survey Questions	Outcome
	40 - 50 years old - 31.6% (n=24) >50 years old - 9.2% (n=7)
Dental speciality	Orthodontic specialists - 55.3% (n=42) Orthodontic residents - 30.3% (n=23) General dentists providing clear aligner treatment - 14.5% (n=11)
Experience in dentistry	<5 years - 32.9% (n=25) 5 - 10 years - 11.8% (n=9) 10 - 20 years - 17.1% (n=13) >20 years - 38.16% (n=29)
Periodontal health as influencing factor for successful teeth movement and result maintenance	All participants agree
Does orthodontic treatment improve periodontal health?	All participants agree
Examination of periodontal status during initial orthodontic appointment	All participants perform a basic periodontal examination
Referral to periodontologist before orthodontic treatment if periodontal disease is suspected	All clinicians refer the patient to the periodontal specialist
Time between completion of periodontal treatment and placing orthodontic appliance	Immediately - 5,2% (n=4) 3 - 6 months - 17.1% (n=13) 6 months - 64.5% (n=49) 6 - 12 months - 13.2% (n=10)
Orthodontic treatment for patients with clinical health on a reduced periodontium	65 out of 76 clinicians offer treatment (85.5%)
Orthodontic appliance used influenced by periodontal status of the patient	38 clinicians consider periodontal status when choosing the orthotodontic appliance (50%)
Frequency of assessing periodontal status during orthodontic treatment	Every 4 weeks - 56.5% (n=43) Every 8 weeks - 2.63% (n=2) Every 12 weeks - 15.7% (n=12) 4 - 12 weeks depending on the clinical status - 25.0% (n=19)
Are instructions provided on management of oral health during orthodontic treatment?	All participants provide instructions
Frequency of hygiene appointments during treatment	Every 3 months - 40.8% (n=31) Every 4 months - 31.5% (n=24) Every 6 months - 19.4% (n=15) 4 - 6 months - 1.3% (n=1) Case-dependent (4 weeks to 4 months) - 6.6% (n=5)
Who performs the professional cleaning?	52.6% perform cleaning themselves (n=40) 47.4% refer to general dentist or periodontologist (n=36)

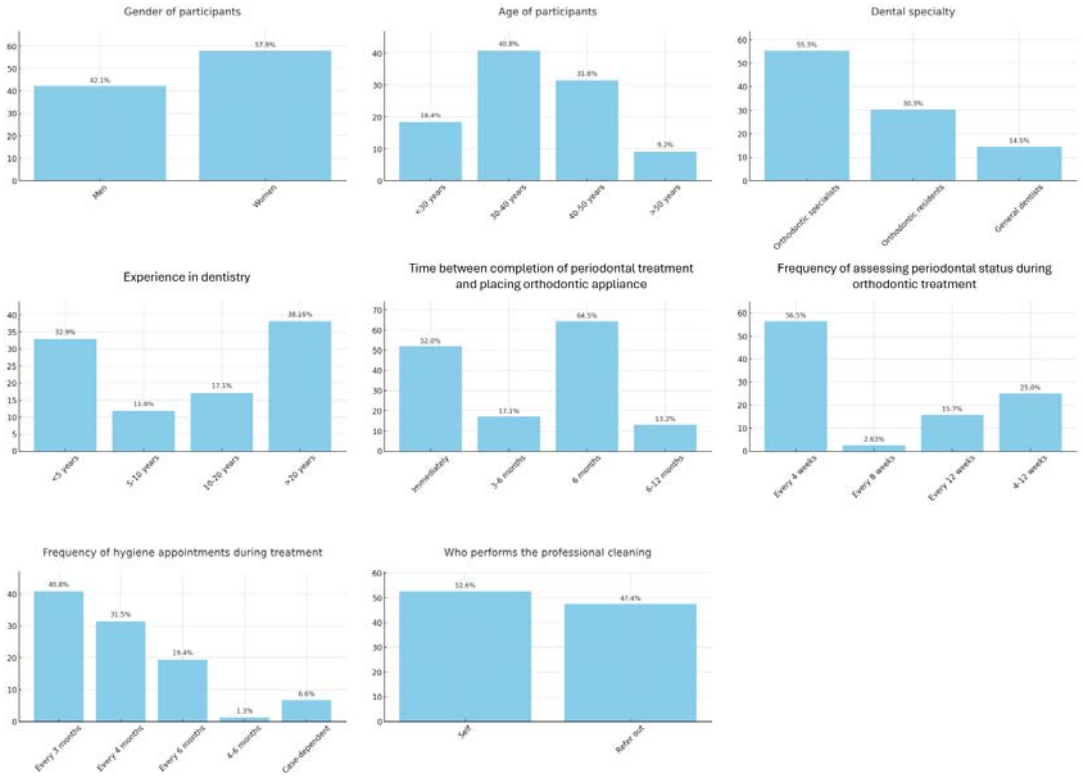

Figure 1. Graphical representation of outcomes distribution

DISCUSSIONS

The study investigates participants' approaches to maintaining periodontal health during orthodontic treatment. The main objective of conducting a periodontal examination prior to treating adult patients with periodontal disease is to diminish and prevent the buildup of plaque and the resulting inflammation (21,22). This highlights the importance of educating patients about oral hygiene, selecting suitable dental tools, and scheduling regular check-up visits (23). The gender distribution of survey participants corresponds to the demographics of orthodontic practitioners, as literature indicates that 60% are female and 40% are male (24). Out of the total number of participants, 45 were below the age of 40. Recent updates to dental curricula may have resulted in younger dentists receiving more extensive training in periodontology. However, further research needs to be conducted to verify this hypothesis (25). All participants agree with the value of periodontal health in orthodontic planning, conducting initial periodontal examinations, and perceiving orthodontic therapy as beneficial for periodontal health. Orthodontic treatment improves periodontal health by correcting teeth malposition, which may interfere with proper oral hygiene (26). The majority of the participants (81.6%%) follow the literature's suggestion to wait 3-6 months or even 6 months after periodontal therapy before beginning orthodontic treatment.

Approximately 85.5% of clinicians provide treatment to patients who have a periodontium that is clinically healthy but reduced. Extensive research shows that having previously received treatment for periodontitis does not prevent or discourage orthodontic treatment. In fact, it may even enhance the chances of preserving and restoring the dentition. 50% of clinicians are influenced by the condition of the periodontal status when selecting orthodontic appliances, with preferences for vestibular fixed appliances and clear aligners. Four orthodontic specialists noted that self-ligating brackets aid in the removal of plaque. According to literature, orthodontic appliances should aim to reduce plaque buildup by

employing uncomplicated mechanics and avoiding components that are prone to attracting plaque (27–29). Clear aligners are preferred as are removable and easier to clean, and by doing so they promote optimal oral hygiene (30). A randomized controlled trial provides evidence in favour of utilizing aligners for periodontal health. However, further research is necessary to establish conclusive findings (31). Most participants (91.7%) follow guidelines to reassess the periodontal status every 3 months or less (4, 8 or 12 weeks), with some increasing the frequency if risk factors are present (32). All participants provide oral hygiene instructions during orthodontic treatment, with various suggestions regarding the frequency of professional cleaning. According to literature, it is recommended to have professional cleaning done every 1-3 months, particularly if there are additional risk factors like smoking or diabetes (33,34). Fifty percent of the participants perform professional cleanings themselves, while the remaining fifty percent direct patients to general dentists.

Adjunctive tools such as electric toothbrushes and interdental brushes are recommended during professional cleaning appointments (32,35). Eighteen participants advocate the use of electric toothbrushes, while 17 endorse fluoride mouthwash, aligning with literature evidence that electric toothbrushes are more effective in promoting gingival health (36). Nevertheless, a mere four participants advocate for the use of chlorhexidine mouthwash, highlighting the necessity for increased knowledge regarding its advantages. 94.7% of participants identified gingival recession as the most prevalent periodontal side effect of orthodontic treatment, followed by bone dehiscence at 73.7%. However, evidence indicates that these alterations are typically temporary (37) and that tissues recover to their initial condition after treatment (19). Only a small fraction of patients may experience persistent clinical attachment loss (21).

Upon completion of orthodontic treatment, 84.2% of the participants opt for lingual bonded wires as a means of retention, which aligns with the recommendations found in existing literature. Patients with severe periodontal disease require continued maintenance following orthodontic treatment (23). The preferred method of long-term retention for adults is a flexible wire bonded on the lingual surfaces of anterior teeth, acting as a periodontal splint while allowing physiological mobility (38,39).

We consider that the study offers a perspective into the interaction between periodontal health and orthodontic treatment, showing the importance of preserving periodontal health when seeking successful orthodontic results. It acts as a starting point to develop consistent periodontal care protocols in orthodontic treatment, resulting in more reliable and efficient patient care across various practitioners and settings. These results can provide helpful information for the development or improvement of clinical guidelines, as they help identify commonly used practices and their related outcomes, with the aim of improving patient care and increasing treatment success rates. The importance of patient awareness and engagement has been highlighted, indicating the necessity for clinicians to actively communicate with patients regarding oral hygiene and regular check-ups in order to prevent complications from occurring. Other measures that need to be taken based on the resulted data from this observational study may include carrying out longitudinal investigations to track the long-term effects of integrating periodontal and orthodontic care, designing tailored education initiatives for existing specialists and dental students, creating comprehensive care protocols that integrate periodontal assessments and treatments into the orthodontic treatment plan, promoting interdisciplinary cooperation among orthodontists, periodontists, and general dentists, and improving patient educational materials that explain the importance of periodontal health during orthodontic treatment.

CONCLUSIONS

The results of our study suggests the importance of incorporating periodontal health management into orthodontic treatment protocols for adults. The consensus among practitioners is to postpone orthodontic treatment for 3-6 months after periodontal therapy, following recommended guidelines that prioritize a healthy periodontium before beginning the active phase of orthodontic treatment. Clear aligners and self-ligating brackets are preferred due to their ability to reduce plaque accumulation and simplify oral hygiene practices. However, the study identifies an educational gap in the use of antibacterial mouthwashes such as chlorhexidine, which are underutilized despite their potential benefits in maintaining periodontal health during orthodontic treatment. Gingival recession and alveolar dehiscence, while common, are usually transitory and manageable with proper care. The results also indicate how a proactive approach to periodontal evaluation and maintenance can improve orthodontic results and patient satisfaction. Interdisciplinary collaboration between orthodontists and periodontists plays an essential role for achieving desired outcomes, especially in adult patients presenting with periodontal issues. Effective communication and collaboration are essential for designing treatment plans to each patient's specific periodontal needs, preventing further complications and ensuring long-term oral health.

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