



## ■ PERIODONTOLOGY

# Nonsurgical periodontal therapy based on the principles of cause-related therapy: rationale and case series

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Cause-related therapy is key in the management and resolution of the two most common oral diseases: dental caries and periodontal disease. This is the first phase of treatment for those diseases. The aim is to remove, reduce, or eliminate the main causes of the disease. When referring to caries and periodontal disease, the primary etiology is bacterial plaque so the cause-related therapy phase should include plaque control as a major component. This can be achieved by constantly and continuously educating patients about the pathophysiology of the diseases and by help-

ing them develop proper daily plaque removal techniques. Furthermore, various professional therapeutic interventions are delivered as necessary to eliminate or suppress other etiologic or risk factors. In this case series, the principles of proper cause-related therapy are demonstrated through three cases that were successfully managed by nonsurgical periodontal therapy. Biologic and clinical rationales are also discussed. (*Quintessence Int* 2019;50:370–376; doi: 10.3290/j.qi.a42292)

**Key words:** dental plaque, gingivitis, nonsurgical periodontal therapy, oral hygiene, periodontitis

Guidelines and protocols on managing and treating the two most common chronic oral diseases, dental caries and periodontal diseases, were previously suggested and documented.<sup>1</sup> Based on the principles of cause-related therapy, the primary etiologic factor, dental plaque, is specifically targeted for elimination.<sup>1</sup> This might be primarily achieved by continuously educating patients about the pathophysiology of the diseases as well as by helping patients develop proper daily plaque removal techniques.<sup>1</sup> Clinicians may provide additional professional therapy to further remove dental plaque, which may not be accessible for the patients (ie dental prophylaxis, periodontal scaling and root planing), to repair any irreversible damage (ie removal of caries followed by repair with a restorative material), to eliminate any factor contributing to pronounced plaque retention (ie removal of overhanging dental restoration), or to create an environment that is hygienic and accessible to plaque removal (ie periodontal pocket reduction surgery, supragingival placement of restorative margins in nonesthetic areas).<sup>1</sup> In periodontal therapy, the goal of cause-related therapy is to reduce the number of putative pathogens, which will shift the microbial flora to help establish a stable periodontal environment.<sup>2</sup>

To further emphasize the importance of nonsurgical intervention, a recent study reported a greater reduction in probing

depths in the group receiving a combination of scaling and root planing followed by periodontal surgery when compared to the group only receiving periodontal surgery.<sup>2</sup>

The principle of maintaining good oral hygiene during treatment and maintenance is not a new concept but is often overlooked for various reasons. Historically, the literature clearly favored diminished plaque and good oral hygiene in obtaining stable periodontal attachment levels in the long term.<sup>3,4</sup> On the other hand, patients with poor oral hygiene exhibited increased attachment loss regardless if they received surgical or nonsurgical therapy.<sup>3,4</sup>

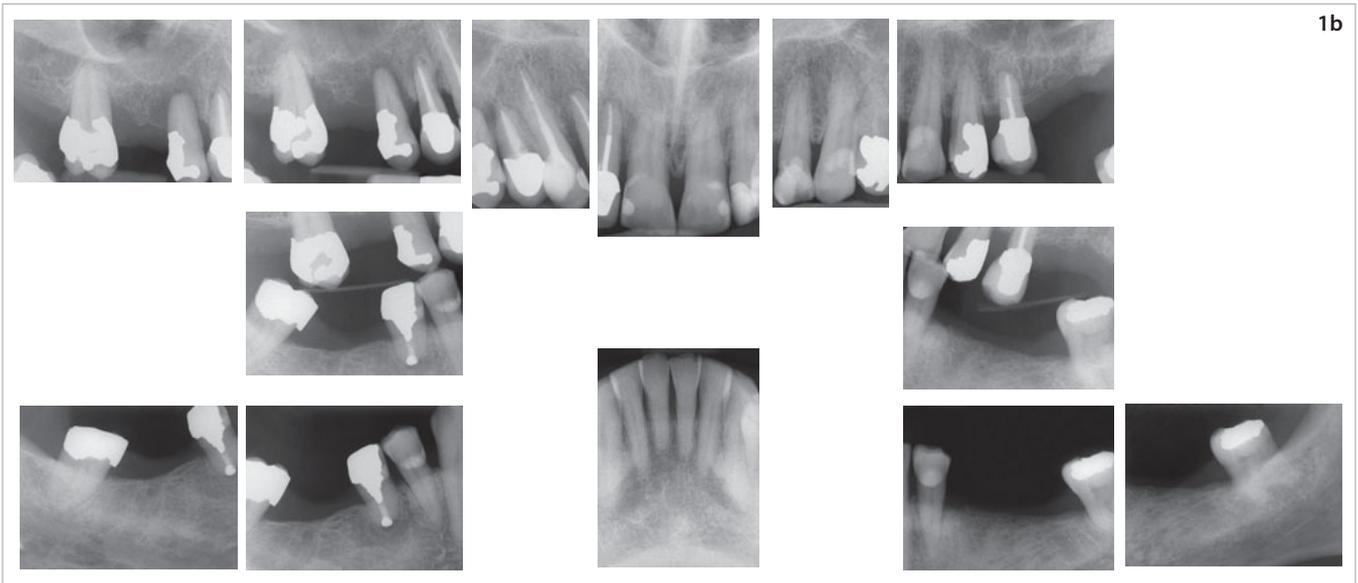
In the present case series, three patients who successfully received nonsurgical periodontal therapy based on the principles of cause-related therapy are described in order to demonstrate the proper delivery of this phase of treatment. Biologic and clinical rationales are also discussed.

### Case 1

A 67-year-old male patient presented with the chief concern “My front tooth has been moving down. I experience severe bleeding when I brush.” Medical history revealed hypertension, which had been well controlled with amlodipine, a calcium



**Figs 1a and 1b** Case 1: Generalized gingival edema and erythema were noted. There was evidence of pathologic migration and extrusion of the maxillary right lateral incisor, which resulted in diastema formation between the maxillary right central and the lateral incisors as well as occlusal trauma on the maxillary right lateral incisor.



**Fig 1c** Case 1: The most severe gingival edema and erythema were found on the maxillary right anterior sextant.

**Fig 1d** Case 1: After 1 week of home care therapy, a partial resolution of gingival erythema and edema was already noted. Note the pronounced gingival healing on the maxillary right anterior sextant with reduction in gingival edema and erythema. Afterwards, scaling and root planing was initiated over several visits. Occlusal adjustment was also performed on the maxillary right lateral incisor.

**Fig 1e** Case 1: After completion of cause-related periodontal therapy, complete resolution of gingival edema as well as erythema was evident. Gingival recession was noted interproximally, buccally, and lingually as a result of resolution of gingival edema. Diastema between the maxillary right lateral and central incisor was also resolved. All sites exhibited probing depths of less than 5 mm.

channel blocker. A complete periodontal evaluation revealed generalized gingival edema, gingival erythema, moderate horizontal bone loss, and periodontal probing depth of 5 to 9 mm with the exception of the maxillary right second premolar, which showed evidence of root fracture (Figs 1a to 1c). The

patient was diagnosed with Stage 4 Grade B periodontitis. There was evidence of pathologic migration and extrusion of the maxillary right lateral incisor, which resulted in an acquired diastema between the maxillary right central and the lateral incisors as well as occlusal trauma on the maxillary right lateral



**Table 1** Suggested ways to deliver the message to patients regarding different treatment outcomes of cause-related periodontal therapy

Results of successful cause-related periodontal therapy	How to explain to patients
Soft tissue recession (interproximal, buccal, and lingual)	“Your gum tissues are like your skin tissues. When diseased, they would swell up. On the other hand, successful treatment would resolve the swelling of the diseased gum tissue, leading to gum shrinkage or recession. This recession is a good sign of healing and resolution of the inflammation.”
Dentinal/root sensitivity	“Your root portion of teeth, which were previously surrounded by the swollen diseased gum tissue, would be exposed to the oral cavity as the swelling resolves with successful treatment. This is usually reversible but can be treated with simple methods , such as using anti-sensitivity toothpastes.”
Interproximal food impaction	“In the past when you had deep periodontal pockets, dental plaque was present inside these pockets and you were not able to mechanically remove it, as the pockets were simply too deep to access. Now, after successful resolution of the periodontal pockets, there are some new gaps between your teeth, where the inflamed tissue was before. However, you are not only more aware of food particles and dental plaque being present, but also can easily and effectively remove them using a toothbrush, floss, toothpick or other interdental cleaning devices.”

incisor. Based on the principles of cause-related therapy, home oral hygiene therapy in combination with several sessions of scaling and root planing were suggested. On his initial consultation visit, intensive home care instructions were provided and thoroughly reviewed. The intensive home care instructions included twice daily gingival line tooth brushing with modified Bass technique, daily interproximal flossing, and three times a day interproximal rubber tipping. While providing home care instructions, a disclosing tablet was utilized in order to visualize residual dental plaque. Additional disclosing tablets were provided to the patient to use while performing his oral hygiene therapy at home. After 1 week of the home care therapy, the patient returned and received scaling and root planing over several visits. Prior to initiating scaling and root planing preoperatively, partial resolution of gingival erythema and edema was already noted from his excellent compliance with suggested home care therapy (Fig 1d). Home oral care therapy was continuously reviewed during each session. The root fractured maxillary right second premolar was extracted during the first scaling and root planing session. The occlusal trauma on the maxillary right lateral incisor was reduced by incisal edge reduction.

Four weeks following the completion of scaling and root planing, the patient presented for periodontal reevaluation. The patient’s compliance with the home care therapy was still excellent, with Plaque Index < 15%.<sup>5</sup> Complete resolution of gingival edema as well as erythema was evident (Fig 1e). Gingival recession was noted interproximally, buccally, and lingually as a result of resolution of severe gingival edema. In other words, generalized gingival shrinkage was noted. The patient complained about root sensitivity as well as interproximal food impaction. It was explained to the patient clearly why soft tissue

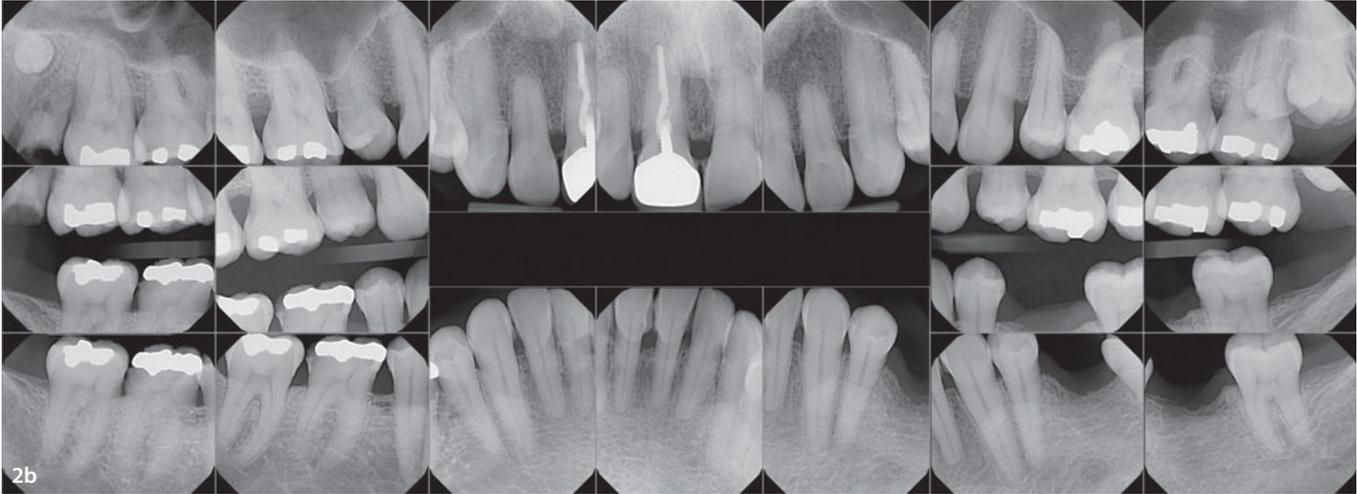
recession, interproximal food impaction, and dentinal sensitivity were expected as a result of successful cause-related therapy (Table 1). Nonsurgical treatment for tooth hypersensitivity was suggested.<sup>6</sup> Furthermore, all sites exhibited probing depths of less than 5 mm. The diastema between the maxillary right lateral and central incisors was completely and spontaneously resolved. No further periodontal therapy was necessary and the patient was encouraged to continue with his home care therapy while receiving periodontal maintenance therapy every 3 months. The patient was also referred back to his general dental practitioner for initiation of a restorative treatment plan.

**Case 2**

A 38-year-old male patient presented with the chief concern “My gums are bleeding heavily when I brush.” He was systemically healthy without any known illness or diseases. A complete periodontal evaluation revealed generalized gingival edema, gingival erythema, heavy deposits of subgingival and supragingival calculus, mild horizontal bone loss, and periodontal probing depth of 5 to 7 mm. These findings were more pronounced in his mandibular arch (Figs 2a and 2b). The patient was diagnosed with Stage 3 Grade B periodontitis. Based on the principles of cause-related therapy, home oral hygiene therapy in combination with several sessions of scaling and root planing were executed in a similar fashion as described in Case 1. The retained root on the maxillary right third molar site was extracted during his first scaling and root planing visit. Throughout the treatment, the patient’s compliance with suggested home care was continuously monitored and improved. Four weeks following the completion of scaling and root planing, the patient presented for periodontal reevaluation (Fig 2c).



**Figs 2a and 2b** Case 2: Generalized gingival edema, gingival erythema, and heavy deposits of subgingival and supragingival calculus were noted, all of which were more pronounced in the mandibular anterior sextant.



**Fig 2c** Case 2: After completion of cause-related periodontal therapy, complete resolution of gingival erythema and edema were noted with significant gingival shrinkage and recession. All sites exhibited probing depths of less than 5 mm.

Complete resolution of gingival erythema and edema were noted with significant gingival shrinkage and recession. All sites exhibited probing depths of less than 5 mm. No further periodontal therapy was necessary and the patient was encouraged to continue with his home care therapy while receiving periodontal maintenance therapy every 3 months. The patient was referred back to his general dental practitioner.

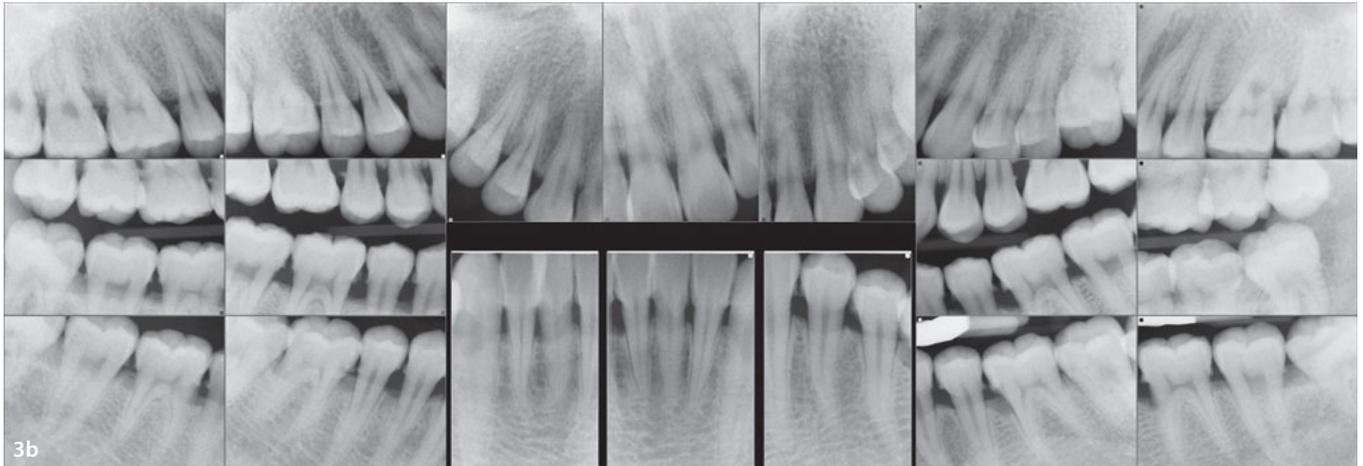
**Case 3**

A 31-year-old male patient was referred by his general dental practitioner due to periodontal disease. The patient was an active smoker. Otherwise, the patient was systemically healthy without any known diseases or illness. A complete periodontal

evaluation revealed generalized gingival edema, gingival erythema, heavy deposits of subgingival and supragingival calculus, moderate horizontal bone loss, and periodontal probing depth of 3 to 8 mm. The maxillary left first molar exhibited advanced grade II buccal furcation, which was evident clinically and radiographically (Figs 3a and 3b). The patient was diagnosed with Stage 3 Grade B periodontitis. Based on the principles of cause-related therapy, home oral hygiene therapy in combination with four sessions of scaling and root planing were executed, as described in Case 1. Throughout the treatment, the patient's compliance with suggested home care was continuously monitored and reinforced. The patient was also educated about the detrimental effect of smoking on his periodontal diseases. Four weeks following the completion of scal-



**Figs 3a and 3b** Case 3: Generalized gingival edema, gingival erythema, heavy deposits of subgingival and supragingival calculus, and moderate horizontal bone loss were noted. The maxillary left first molar exhibited advanced grade II buccal furcation, which was evident clinically and radiographically.



**Fig 3c** Case 3: After completion of cause-related periodontal therapy, complete resolution of gingival erythema and edema were noted with significant gingival shrinkage and recession. All sites exhibited probing depths of less than 5 mm except the maxillary left first molar with advanced furcation.

ing and root planing, the patient presented for periodontal reevaluation (Fig 3c). The patient was extremely motivated towards smoking cessation and was able to completely quit the smoking habit by the periodontal reevaluation visit. Complete resolution of gingival erythema and edema were noted with significant gingival shrinkage and recession. All sites exhibited probing depths of less than 5 mm except the maxillary left first molar with advanced grade II furcation involvement. A persistent deep periodontal probing depth of 8 mm was noted on the buccal aspect of the maxillary left first molar.

The maxillary left first molar was further treated during a periodontal surgical phase based on the principles of guided tissue regeneration. A midbuccal 5-mm probing depth with grade I furcation was noted postsurgically, after which the patient entered the periodontal maintenance phase.

## Discussion

Periodontal diseases are primarily caused by dental plaque containing, predominantly, so-called red complex periodontal pathogens.<sup>7-9</sup> In a susceptible host, as a response to these pathogens, the early form of periodontal diseases, gingivitis, may progress further into advanced periodontal diseases, (ie periodontitis).<sup>10</sup> Periodontitis is characterized by irreversible destruction of periodontal attachment apparatus including periodontal ligament, alveolar bone, as well as radical cementum.<sup>11-14</sup> According to a national survey, approximately 47.2% of adults in the United States who are 30 years old or more suffer from periodontitis.<sup>15</sup> In the above-reported cases, periodontal diseases were effectively managed and treated by eliminating their primary etiologic factor, dental plaque, based on the principles of

cause-related therapy. In both Case 1 and Case 2, there was no need for further periodontal therapy (ie periodontal resective or regenerative surgical therapy) as there was complete resolution of the periodontal inflammation following the initial phase of the treatment. Furthermore, all sites exhibited periodontal probing depth less 5 mm, which can be effectively maintained nonsurgically by means of repeated professional debridement at regular intervals in combination with home care therapy.<sup>16</sup> However, it must be noted that a patient's meticulous plaque control is indispensable to prevent further periodontal breakdown, and is the most important aspect contributing to the success of the cause-related therapy.<sup>17</sup> Thus it is highly important to invest time and effort in modifying this important habit and risk factor.<sup>18</sup> In the event of any recurrence of disease, characterized by bleeding on probing, gingival erythema, gingival edema, or increase in measured probing depth, a patient's compliance with plaque control should be reevaluated and, if necessary, improved based on the principles of cause-related therapy. Only after this is achieved, periodontal resective or regenerative therapy may be considered.

Note that periodontal surgery should only be planned after successful completion of cause-related therapy with a patient's excellent compliance with suggested home care therapy as well as smoking cessation. This is particularly important considering the outcome of periodontal therapy is substantially dependent on a patient's plaque control as well as smoking status.<sup>17,19</sup>

In Case 1, the preexisting diastema associated with pathologic migration of the right maxillary lateral incisor was completely resolved after the cause-related therapy. Thakur and Baburaj<sup>20</sup> investigated diastema sites secondary to pathologic migration involving maxillary incisors. After successful periodontal therapy, complete diastema closure was observed in 34.61% while partial closure was observed in 53.8% of the sites, which supports the present findings in Case 1.<sup>20</sup>

Moreover, in Case 1, the patient was taking a calcium channel blocker to control his hypertension. Patients taking a calcium channel blocker, similar to other medications such as ciclosporin

and phenytoin, may present with drug-influenced gingival enlargements.<sup>21,22</sup> It is noteworthy that drug-induced gingival overgrowths are still primarily dental plaque-related gingival diseases, which are modified by medications.<sup>23</sup> Thus, the principles of the cause-related therapy of targeting and eliminating dental plaque should be first utilized in managing these patients' periodontal diseases. Switching to a different anti-hypertensive medication may help reduce the incidence or recurrence of gingival enlargements;<sup>22,23</sup> however, this requires consultation with the patient's physician. In order to reduce the chance of potential recurrence of gingival enlargement, the importance of maintaining excellent plaque control should be emphasized.<sup>22,23</sup>

All three patients experienced and complained about post-therapy dentinal sensitivity, interproximal soft tissue recession, and interproximal food impaction. It must be noted that these findings are often expected as a result of successful resolution of gingival edema, gingival shrinkage, and deep probing depths, which may alarm uninformed patients. Thus, clinicians should clearly communicate these potential post-therapy changes with patients prior to commencing the therapy and explain why they are expected as a result of successful treatment (Table 1).

In this case series, periodontal disease was successfully resolved based on the principles of cause-related therapy. The aim is to remove, reduce, or eliminate the main causes of the disease. This can be achieved by constantly improving patients' oral hygiene, and by various professional therapeutic interventions that eliminate or suppress other etiologic or risk factors. This principle is pivotal in periodontal therapy; although it is not a new concept, it is often overlooked for various reasons. ■■

## Declaration

The authors declare that there are no conflicts of interest related to this study. There was no funding available for this study.



## References

1. Kwon T, Levin L. Cause-related therapy: a review and suggested guidelines. *Quintessence Int* 2014;45:585–591.
2. Aljateeli M, Koticha T, Bashutski J, et al. Surgical periodontal therapy with and without initial scaling and root planing in the management of chronic periodontitis: a randomized clinical trial. *J Clin Periodontol* 2014;41:693–700.
3. Axelsson P, Lindhe J. The significance of maintenance care in the treatment of periodontal disease. *J Clin Periodontol* 1981;8:281–294.
4. Lindhe J, Westfelt E, Nyman S, Socransky SS, Haffajee AD. Long-term effect of surgical/non-surgical treatment of periodontal disease. *J Clin Periodontol* 1984;11:448–458.
5. O’Leary TJ, Drake RB, Naylor JE. The plaque control record. *J Periodontol* 1972;43:38.
6. Clark D, Levin L. Non-surgical management of tooth hypersensitivity. *Int Dent J* 2016;66:249–256.
7. Socransky SS, Haffajee AD, Cugini MA, Smith C, Kent RL. Microbial complexes in subgingival plaque. *J Clin Periodontol* 1998;25:134–144.
8. Löe H, Theilade E, Jensen SB. Experimental gingivitis in man. *J Periodontol* 1965;36:177–187.
9. Feres M, Louzoun Y, Haber S, Faveri M, Figueiredo LC, Levin L. Support vector machine-based differentiation between aggressive and chronic periodontitis using microbial profiles. *Int Dent J* 2018;68:39–46.
10. Page RC. The role of inflammatory mediators in the pathogenesis of periodontal disease. *J Periodont Res* 1991;26:230–242.
11. Taubman MA, Valverde P, Han X, Kawai T. Immune response: the key to bone resorption in periodontal disease. *J Periodontol* 2005;76:2033–2041.
12. Taubman MA, Kawai T. Involvement of T-lymphocytes in periodontal disease and in direct and indirect induction of bone resorption. *Crit Rev Oral Biol Med* 2001;12:125–135.
13. Kawai T, Matsuyama T, Hosokawa Y, et al. B and T Lymphocytes are the primary sources of RANKL in the bone resorptive lesion of periodontal disease. *Am J Pathol* 2006;169:987–998.
14. Flemmig TF. Periodontitis. *Ann Periodontol* 1999;4:32–38.
15. Eke PI, Dye BA, Wei L, et al. Prevalence of periodontitis in adults in the United States: 2009 and 2010 *J Dent Res* 2012;91:914–920.
16. Stambaugh RV, Dragoo M, Smith DM, Carasali L. The limits of subgingival scaling. *Int J Periodontics Restorative Dent* 1981;1:30–41.
17. Lindhe J, Nyman S. The effect of plaque control and surgical pocket elimination on the establishment and maintenance of periodontal health. A longitudinal study of periodontal therapy in cases of advanced disease. *J Clin Periodontol* 1975;2:67–79.
18. Clark D, Levin L. Modifying risk factors: the next step. *Oral Health Prev Dent* 2018;16:5.
19. Chambrone L, Preshaw PM, Rosa EF, et al. Effects of smoking cessation on the outcomes of non-surgical periodontal therapy: a systematic review and individual patient data meta-analysis. *J Clin Periodontol* 2013;40:607–615.
20. Thakur AM, Baburaj MD. Analysis of spontaneous repositioning of pathologically migrated teeth: a clinical and radiographic study. *Quintessence Int* 2014;45:733–741.
21. Chapple ILC, Mealey BL, Van Dyke TE, et al. Periodontal health and gingival diseases and conditions on an intact and a reduced periodontium: Consensus report of workgroup 1 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. *J Clin Periodontol* 2018;45(Suppl 20):S68–S77.
22. Mavrogiannis M, Ellis JS, Thomason JM, Seymour RA. The management of drug-induced gingival overgrowth. *J Clin Periodontol* 2006;33:434–439.
23. Fardal Ø, Lygre H. Management of periodontal disease in patients using calcium channel blockers: gingival overgrowth, prescribed medications, treatment responses and added treatment costs. *J Clin Periodontol* 2015;42:640–646.



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