

Orthodontic Treatment in Patients with Periodontal Disease: A Literature Review

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Abstract

Periodontal disease (PD) is highly prevalent, in some countries reaching up to 50% of the population. Chronic periodontitis has been listed as the sixth most prevalent disease in the global burden of oral conditions. Periodontal inflammation is initiated as a consequence of the imbalance of dysbiotic periodontal microbiota and the host, which is followed by periodontal tissue destruction. Moderate and severe PD often leads to posterior occlusion reduction, teeth malpositioning and occlusal trauma, causing malocclusions with progressive attachment loss. In these conditions, orthodontic treatment is a basic component of the patient's aesthetics and function. Orthodontic treatment is highly recommended to be done after subsiding of inflammation in periodontal conditions. A healing period (up to 6 months) is recommended following periodontal treatment before the initiation of orthodontic tooth movement. A combination of periodontal and orthodontic treatments should be considered in the planned treatment strategy and rehabilitation of the occlusion in patients with PD.

Keywords: Periodontal Disease (PD); Chronic Periodontitis; Periodontal Inflammation

Introduction

Periodontal disease (PD) is a chronic, biofilm-induced inflammation, mainly caused by changes in the balance of oral microbacteria and associated host response [1]. The biofilm is a main component of the pathogenesis of the disease; however, it is not sufficient alone to start the disease [2]. The inflammatory response to microbial changes, initiated by the host, is the complementary component to initiate periodontium destruction [1]. The chronic form of PD is more common in adults (still can occur in children), where the destruction is caused by longstanding and local predisposing factors [3]. Although this chronic type of PD is usually associated with slow progression,

faster forms with exacerbation could also happen [3]. The PD may have two forms; localized form and generalized form, depending on whether <30% or > 30% of sites are affected, respectively [4]. The next step of the disease progression would be the gradual spread of the inflammation toward the apical part of the periodontium, causing a loss of the alveolar bone and a periodontal attachment destruction. The clinical presentation of the PD includes; changes in color and texture, probing-induced bleeding, probing attachment level loss, periodontal pockets' formation, apical migration of junctional epithelium, exposure of root furcation, gingival recession, and teeth exfoliation [3,5].

A periodontal treatment (PT) mainly aims to eliminate inflammation, relieve symptoms, stop further progression, and restore the destructed periodontium (whenever possible) [6]. The key to the PT success is mostly dependent on the patient's compliance to the instructed oral hygiene routine, to reverse the imbalance in periodontal microbiota prior to initiating the treatment [7,8]. Another necessary element the PT success is the prior elimination of any periodontal pockets [9]. Despite the advances in the PT protocols, a non-surgical treatment, to eliminate the aforementioned factors, is the best option for many patients [6,10]. However, a probing depth ≥ 6 mm, unresponsive severe inflammation, and major bony defects; are all indications of surgical treatment [9,11].

In the same context, moderate and severe forms of PD can have major consequences on oral health. This includes losing dental arches integrity, attachment loss with subsequent migration of the teeth, posterior occlusion reduction, malpositioning and malocclusion of the teeth. The most effective management for these problems would be orthodontic therapy, with a possible restoration of the patient's aesthetics and normal function [3,12].

Aim of the Study

The aim of this study is to provide an overview of the orthodontic treatment in the special case of PD.

Methods

We performed an extensive literature search of the Medline, Cochrane, and EMBASE databases on 20 September 2019 using the medical subject headings (MeSH) terms "Periodontitis" AND "Orthodontic Appliances" (MeSH). Papers discussing orthodontic treatment in patients with PD. There were no limits on date, language, age of participants or publication type.

Pathogenesis of PD

An imbalance between the periodontal microbiota and the host response is the spark for initiating the inflammatory process of the PD [2]. A consequent series of biological reactions, as a result of this inflammatory process, occurs between the cells and associated extracellular matrix [3]. A failure of the polymorphonuclear neutrophils, in gingival crevice, to stop the pathological spread of microorganisms is the first step in the invasion process. These microorganisms, after invasion of the connective tissue, will interact with different immune cells, which will initiate production of inflammatory cytokines (including; interleukins, tumor necrosis factor, and prostaglandins [2,13]. These factors have a bone-resorptive effect; resulting in subsequent destruction of the connective tissue attachment, periodontal pocket formation, and apical migration of the junctional epithelium [14,15]. This continuous production and progressive up-regulation of the inflammatory process is done through mechanisms mediated by receptor activator of nuclear factor kappa-B ligand (RANKL), in the cells of the compression sites [3,16-18].

Orthodontic treatment for PD

As previously mentioned, the more severe forms of the PD necessitates orthodontic intervention to restore the patient's aesthetics and function [3,12,19]. A prior PT is required to alleviate the inflammation before initiation of the orthodontic treatment [3,20]. This includes prior elimination of any plaques, calculi and periodontal pockets [21-23]. The recommended duration estimated for the full healing of the periodontium is full six months. No orthodontic tooth movement is recommended before that time [3,23,24].

Meticulous care of personal oral hygiene is needed during the orthodontic of patients with PD. A regular follow up visit, every six weeks to six months is recommended for continuous evaluation of the periodontal status [25,26]. This evaluation has a significant value due to the risk of pathological repopulation of microbiota, six to eight weeks following periodontal treatment [27-30]. Additionally, Different approaches of orthodontic treatment are required (according to severity of bone loss) regarding force systems, anchorage, and retention [12,31].

Force systems

In the diseased periodontium, the resistance center is displaced apically. Accordingly, greater moments of force are applied with orthodontic movements, which carries a high risk of tipping rather than moving the body [3,32].

It is advisable to use the simplest orthodontic mechanics to reduce plaque accumulation in order to facilitate personal oral hygiene. The self-ligation concept introduced in recent years was claimed to have numerous advantages such as secure archwire engagement, better rotational and torque control, decreased total treatment time, decrease in friction and decreased plaque accumulation [20,33-36]. However, recent research has contradicted these claims [37-40]. Despite that, self-ligating systems are advised for more simple oral hygiene [3,20].

Anchorage

Orthodontic anchorage in patients with marginal bone destruction is quite challenging. The conventional anchorage methods will be almost impossible with the poor status of the periodontium and periodontal support loss [41]. During the skeletal anchorage with insertion of micro screws, different mechanics can be used for better results work [42]. The best approach for orthodontic treatment in patients with PD, maxillary dentition retraction can be reliably performed using bony anchorage with a micro screw or mini plate [43].

A stable bony anchorage can be achieved using mini-implants with avoiding problems caused by traditional anchorage techniques This will prevent the issue of anchorage loss during closure of extraction space [3,44]. Noteworthy, only few case reports have been found in the literature discussing the benefits of mini-implants as orthodontic anchorage in PD patients with diseased periodontium [45-47].

Retention

Permanent retention following successful orthodontic treatment is usually required. The recommended retention period may extend many years in patients with healthy periodontium [48,49]. Nevertheless, patients with PD may need retention for more extended time that could not be limited to specific duration [12].

Radiographic evaluation of orthodontic treatment outcome

An evaluation of orthodontic treatment, as recommended by The American Board of Orthodontics, should be done using six periapical radiographs. This includes mandibular and maxillary views, a full-mouth series of radiographs or bitewing films. Assessment of changes in root length and alveolar bone status can be achieved by this panoramic radiography [50].

Risks of orthodontic treatment in patients with PD

The orthodontic treatment carries some risks, like any other treatment procedure. Wishney has provided a conceptual framework for evaluating these risks [51]. According to this framework, orthodontic treatment considered a biological challenge to the stomatognathic system [51]. The outcome of this challenge is mainly dependent on both patient and treatment-related factors [51].

The risks of orthodontic treatment are the same in both patients with healthy periodontium and those with PD. These risks include; alveolar bone destruction, soft tissue attachment loss, and resorption of external root. These risks are significant and can produce a

reduction in the root amount in the preserved alveolar bone, permanent tooth instability, disturbed crown-to-root ratio, and risk of losing teeth [52-54].

Conclusion

Many adult patients with periodontal disease have aesthetic and functional consequences caused by malocclusions due to migration of teeth, some of them need rehabilitation of occlusion, including orthodontic treatment. Combined periodontal-orthodontic treatment may be included in the overall treatment plan of rehabilitation of the occlusion, provided periodontal health is obtained during the course of the treatment and maintained throughout the treatment.

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Conflicts of Interest

No conflicts related to this work.

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