

# Accidental Periodontitis Induced by Orthodontic Treatment: A Review

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## Abstract

This article aims to encapsulate the effect of appliances on the periodontal health of patients undergoing orthodontic treatment. While orthodontic treatment provides benefits to a wide range of intra-oral and extra-oral issues starting from aesthetics to mastication, there are some major setbacks in terms of relapse if the treatment is not carried out with a proper plan. Therefore, with limitations in maintaining a desired oral hygiene, which breeds various periodontal problems, iatrogenic causes further narrow down a good prognosis which is desired at the end of an orthodontic treatment or in fact, any medical procedure. This is a review of the unnatural and natural impact of orthodontic treatment on the tissues periodontium and the treatments associated with it.

**Keywords:** *Orthodontics, Chronic Periodontitis, Iatrogenic effects, Periodontal Health.*

## Introduction

The earliest evidence-based history of dental practice can be found in the era of Indus Valley Civilisation which dates back to 7000 BC.<sup>1</sup> The journey from a 6500-year-old jawbone with a cavity within the dentin layer with beeswax as a filling, to the first dental journal being published in 1839 and now, the use of advanced and efficient techniques for diagnosis and treatment has been remarkable. But the emergence and evolution of orthodontic treatment has been one of the most significant breakthroughs in this field as it fulfills the requirements and comprehends with both, the occlusal and facial abnormalities both at the same time to a fairly acceptable state.<sup>2</sup>

The earliest attempt to the correction of a teeth irregularity was done by Pliny the Elder by mechanical filing of elongated teeth to bring them to proper

alignment in the period of 23-79 AD.<sup>2</sup> In the year 1619, Fabricius<sup>3</sup> suggested the extraction of tooth for correction of crowding. It was the introduction of 'brace' the 'bandeau' by Pierre Fauchard<sup>4</sup> also known as the father of modern dentistry, that increased the pace of orthodontics exponentially as it paved the way for all the appliances and their appendages invented later with his discovery that 'the malalignment of teeth can be corrected as teeth would follow the pattern of the brace'<sup>5</sup>. With time, the advancement in orthodontics have made adaptations which brought changes in function and esthetics, function being its prime priority.

However, the most significant part of an orthodontic treatment still is to keep the integrity of the entire dentition intact in the best way possible to make sure that there is no ailment to the patient in the infinite future. Orthodontic treatment involves the movement of the entire tooth from one location to another which is why the periodontium, along with the tooth, plays a crucial role in the beginning, during, and end of the treatment. This also suggests that the standard appliances used, which include orthodontic braces, archwires, and elastic bands should be used befittingly to obtain the desired results.<sup>4,5</sup>

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Therefore, to accommodate with the changing

concepts of function and esthetics with a varying range of patients having their oral hygiene practices, this kind of treatment has its risks and complications amongst all the benefits, some of which are unwanted side effects, which include decalcification of enamel and discoloration of teeth and some are extensive conditions like periodontitis, pseudo pockets, root resorption and bone loss due to iatrogenic causes.<sup>6</sup>

**Potential upshots of orthodontic wires on the tissues of the periodontium:** It was in the 1980s when the earliest cases of periodontal destruction due to orthodontic wires were given attention.<sup>7</sup> The diverse use of elastics ranges from correction of Angle's Class II and Class III malocclusion, correction of malposed tooth, crossbite, and midline diastema to the non-surgical removal of tooth in case of hematological diseases like Haemophilia. The main cause of elastics being used so widely among dentists for the patients is its cost-effective nature and ease of placement and removal.

While plaque is considered to be the most important factor determining the periodontal health of the patient, placement of elastic bands and the archwires play a key role in the same during an ongoing treatment. Experimental studies on animals have shown that orthodontic forces & tooth movements do not induce gingivitis in the absence of plaque.<sup>8</sup> However similar forces can induce angular bone defects in the presence of plaque. Orthodontic tooth movements like tipping & intrusion can cause attachment loss in the presence of plaque.<sup>9</sup> Any neglect from either the practitioner or the patient during this treatment can be a cause of various periodontal problems with periodontitis being one of the complicated ones. Hence at the beginning of an orthodontic treatment, a patient must be made aware of the maintenance of oral hygiene throughout and after the treatment concludes to avoid long term diseases like chronic periodontitis and a probability of relapse.



**Figure 1: Gingival Inflammation and plaque accumulation during orthodontic treatment.**  
Source.<sup>17</sup>

**Incorrect placement of orthodontic brackets:** When an orthodontic treatment is carried out sufficing the periodontal needs, the results are excellent but it's the iatrogenic nature of the use of elastics along with the hygiene which causes undesired outcomes, periodontitis being a common one. What most of the practitioners fail to understand is that the errors start to occur with the placement of the braces itself. A wrong placement of molar bands, mainly on a subgingival level, besides with accumulation of food particles has the potential to intrude the alveolar bone<sup>10</sup>, which further aids in the characteristic osseous defects caused by extensive inflammation and gingival recession.<sup>11</sup> The magnitude of forces also plays a key role in the relationship between periodontal tissues and orthodontic forces as it is seen that the extent in magnitude of orthodontic forces affects the rate of root resorption.

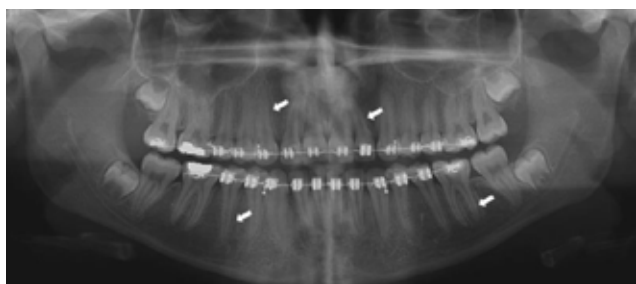
**Attachment Loss:** Elastic bands, due to their shape memory tend to retain back to their original place, and hence there is a dire need of thorough inspection of their position when they are placed in a patient's mouth especially when there is no specific placement mechanism. This is why the bands tend to creep down the narrower end of the crown of the tooth.<sup>12</sup> and move thereby apically creating an expected periodontal ligament destruction resulting in bone loss due to periodontitis and subsequently, the extrusive movement of the tooth. This happens because the elastic bands act as foreign material causing an inflammatory reaction of the soft tissues leading to the weakening of periodontal attachment. Incidentally, the apical extension of the band is, however, independent of microbial colonies present in plaque.

**Effects on gingival embrasures:** One of the main criteria that decide the esthetics of a patient is the gingival embrasures, which are the V-shaped spaces present inter proximally around the proximal contact present in between the adjacent teeth<sup>13</sup>, the embrasures present on the anterior teeth playing the important role. The treatment of patients with already existing periodontitis is a cause of concern as such patients are at risk of further bone loss and loss of tooth with due course of time. Prevention of black triangles on esthetic zones and preservation of interdental papilla are to be taken into consideration as a priority during the treatment. The gingival recession associated are not dependent on the orthodontic treatment but are dependent on the type of forces applied for tooth movement. Some factors like thickness or cortical plates, type of load distribution,

type of forces, tipping in general, and morphology of teeth like lower incisors also contribute to the formation of gingival recession as an adjunct to the treatment.

**Tooth Mobility:** The biology of movement follows the sequential pattern of bone resorption and bone deposition in the pressure side and tension side respectively. This process shows the widening of periodontal ligament space in radiographic examination.<sup>14</sup> Hence this phase is a result of temporary mobility of the tooth. But extensive bone loss or an extended long term treatment with ill-maintained oral hygiene may cause exfoliation if it is not given attention by the practitioner. When the forces applied are extremely large in magnitude, it causes greater undermining resorption and hence the mobility of the tooth is to a greater extent. This could be avoided by the forces and changes associated with it are monitored and if there is mobility.<sup>15</sup>

All movements should be temporarily discontinued until the movement reduces to a moderate level.



**Figure 2: Radiograph demonstrating widening of PDL due to excessive orthodontic forces<sup>18</sup>**

The image shown above represents a panoramic radiograph representing the increase of periodontal ligament space on the application of orthodontic forces during an orthodontic treatment. As the strain on the periodontal ligaments increase, the PDL space widens leading to the gradual mobility of tooth and associated periodontal issues.

**Iatrogenic Damage:** This is one of the rare causes of chronic illness which is very significant as its existence might be unknown for a long time and the diagnosis and treatment are hence delayed, with outcomes sometimes beyond repair. There are not many cases regarding a specific error but the unknown persistence of discarded or broken elastic wire inside the periodontium is a leading cause of chronic periodontitis, abscess, and mobility on a long term basis.<sup>16</sup> Another cause may be the apical migration of an elastic band which later on gets covered

by the surrounding gingiva without the knowledge of the patient and later leads to periodontal destruction inside the root of the tooth giving the clinical manifestations years later. The timing of diagnosis of such conditions is crucial as the treatment plan is solely dependent on it and the intensity of the diseases associated with this becomes severe with time. The diagnostic time may vary from months to years, but it the practitioner's call to manage it as soon as it is diagnosed and confirmed.

**Treatments for periodontitis in orthodontic treatment:** The first and foremost thing after such a condition is suspected there is a temporary discontinuation of the orthodontic treatment and involving a periodontist for creating a detailed treatment plan with a proper case history describing the duration of the ongoing treatment and the incidence of the disease. This helps the practitioner decide the extent and severity of the disease and eases the route of the treatment plan. After there is a confirmed diagnosis of such condition, the treatment depends on the prognosis of the tooth which is predicted by radiographic images and gingival examination. For cases with moderated recession careful scaling and root planing is done to ensure the absence of any foreign substance to aid the healing for the treatment to be carried out smoothly. The treatment plan follows that of the usual periodontal problems, from recession to mobility with its varying grades and hence the treatment modalities include scaling, root planing, splinting, gingival surgeries which include flap surgery which is done in cases where furcation is involved which is followed by subsequent repositioning of the tooth. All of this done along with a post-surgical antibiotic therapy which includes drugs like Amoxicillin and a prophylactic dose of Chlorhexidine mouthwash for maintenance of oral hygiene.<sup>16</sup> All of this is performed on adults with consent and due information about the success rate of the surgery and the prognosis of the tooth and the same procedure is followed when a minor is getting treatment but here, the parents of the patient are informed accordingly. The success of this type of situation is purely based on the maintenance and thorough monitoring of the patient with regular intervals of recall. During every appointment during the revisits, oral prophylaxis and reinforcement of oral hygiene instructions are the building bricks for a good prognosis. All the clinical parameters like periodontal pocket depth, bleeding on probing, mobility is regularly checked. If there is a relatively low mobility or the loss of attachment reduces significantly with time, reduction in

erythema can be observed with increased firmness. After the periodontal health improves to a satisfactory state, the orthodontist is now ready to move further along with the desired treatment plan for the orthodontic correction only after consulting with the concerned periodontist.

### Conclusion

An orthodontist must always ensure the state of a periodontal condition of the patient before heading for a treatment as the treatment as such provides a good boost to patients by providing a better functioning dentition and desired profiles for the individual who needs it and by this it also ensures self-confidence, lifestyle and a good self-esteem. But amongst this, the risks associated are a reality that cannot be ignored. The complications of such treatments possess a multifactorial process including the practitioner, patient, the treatment procedure itself, and the appliances associated with it. An orthodontic treatment of an individual goes hand in hand with the periodontal health. Therefore it's the role of the practitioner to be keenly involved in the treatment procedure and detect any source of error, if at all that exists, as early as possible to achieve the expected results. The improper use of any appliance or its appendage can cause periodontitis and can enhance bone loss in the long run during or even after the treatment is finished. For such cases, a detailed clinical examination and a meticulous treatment plan is necessary because it is the correct diagnosis and treatment which practically decided the fate of the defect caused. If done timely, a patient can be benefitted from early diagnosis as well as the correct management. Not everything is the responsibility of the practitioner, especially when the treatment is for a long duration and requires compliance from the patients themselves. Therefore, the importance of the treatment should be informed by the practitioner so that it is taken seriously. It is often considered that the orthodontist should explain the need and function of the appliance being used for the treatment because it helps the patients understand the need of keeping the integrity of the nature of the management by being vigilant themselves and also be informed about their treatment status. If children are the patients, the parents should actively participate in getting educated about the need of maintaining good hygiene while the treatment goes on while the orthodontist handles the rest.

As there is always a scope of marginal error, it is required that the practitioner informs their patients to report any unusual activity in their oral cavity as this

could be the sign of the problem which lies underneath. Lastly, a good coordination among fellow practitioners is highly required which benefits both the patients and the practitioners by making them aware about such problems which may or may not have an iatrogenic cause just so that when the time comes, a practitioner is ready to diagnose it on time, deal with the situation and most probably manages it on time.

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