



ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2021; 7(4): 304-305
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www.oraljournal.com
Received: 10-08-2021
Accepted: 14-09-2021

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Adverse effects of orthodontic treatment: A review

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DOI: <https://doi.org/10.22271/oral.2021.v7.i4e.1386>

Abstract

Orthodontic treatment helps to establish a balance between functional harmony and an improved esthetics, yet, rendering such treatment comes across with potential risks in terms of both hard and soft tissue damage. Such potential risks to various hard and soft tissue damages may include enamel demineralization, pulp degeneration, root resorption, gingival enlargement, lacerations, allergic reactions and temporomandibular joint disorders, apart from the fact that the treatment procedure may fail in itself. All such potential risks should be considered and addressed while making the final decision to render orthodontic treatment on an individual. The benefits achievable from the treatment should outweigh the risks involved with it. The orthodontist, thus, should have a thorough knowledge of all the risk factors to which the patient gets susceptible and preventive measures should be taken accordingly. This article reviews the various risks that may be associated with orthodontic treatment and the ways to manage them.

Keywords: Adversities, complications, Side effects

Introduction

Like any medical therapy, orthodontic treatment exposes the patient to certain risks. From an ethical standpoint, the clinician must understand how these risks relate to each patient to ensure that they will receive a net benefit from treatment. Failure to properly identify and manage the risks of orthodontic treatment cannot only give rise to patient dissatisfaction but also to litigation ^[1]. The risks of orthodontic treatment include periodontal damage, pain, root resorption, temporomandibular disorder, caries, speech problems and enamel damage. Because no two patients or orthodontic treatments can ever be identical in every respect, the question of whether a net benefit will accrue from treatment must be assessed on a case-by-case basis ^[1].

Periodontal Problems

It is well-established that orthodontic appliances can impair plaque control leading to gingivitis ^[2]. However, gingivitis during orthodontics may result in periodontal breakdown in adults with active periodontal disease ^[3]. Fixed appliances make oral hygiene difficult even for the most motivated patients, and almost all patients experience some gingival inflammation. Resolution of inflammation usually occurs a few weeks after debond, bands cause more gingival inflammation than bonds, which is not surprising since the margins of bands are often seated subgingivally. For the most part, the literature suggests that orthodontic treatment does not affect the periodontal status of patients over the long term. Patients with pre-existing periodontal disease require special attention, but bone loss during treatment does not seem to be related to previous bone loss. The need for excellent oral hygiene during treatment must be emphasised in patients with existing periodontal disease. The use of bonds rather than bands on molars and premolars may be more appropriate to eliminate unwanted stagnation areas. Plaque retention is increased with fixed appliances and plaque composition may also be altered. There is an increase in anaerobic organisms and a reduction in facultative anaerobes around bands, which are therefore periopathogenic ^[4].

Enamel Decalcification

Enamel demineralisation, usually on smooth surfaces, is unfortunately a common complication in orthodontics; figures range from 2–96% of orthodontic patients ^[5].

The teeth most commonly affected are maxillary lateral incisors, maxillary canines and mandibular premolars [6]. The presence of white spot lesions after removal of orthodontic appliances is a discouraging finding to a specialty whose goal is to improve facial and dental aesthetics. Orthodontic treatment with multi-banded appliance imposes a significant risk for development of WSL. The most common type is a diffuse opacity. The opacities covered an average of less than 1/3rd of the labial surface of the tooth.

Enamel wear and fractures

Enamel wear has been reported to occur when ceramic brackets are in contact with enamel surfaces even for very short times. Enamel fractures are the most serious problem associated with ceramic brackets and have been reported to occur during debonding or from accidental impact. Ceramic brackets because of their low fracture resistance and high bond strengths, can pose a problem when being removed, either to reposition or at the completion of treatment. The bracket/adhesive bond strength may exceed that of the enamel/adhesive bond strength, such that when the bracket is removed some enamel may be removed at the same time. Bracket breakage while removing it increases treatment time and has the potential health risk of swallowing or aspirating bracket fragments.

Pulpal reactions

Some degree of pulpitis is expected with orthodontic tooth movement which is usually reversible or transient. Rarely it leads to loss of vitality, but there may be an increase in pulpitis in previously traumatised teeth with fixed appliances. Light forces are advocated with traumatised teeth as well as baseline monitoring of vitality which should be repeated three monthly [7]. Transient pulpitis may also be seen with electro thermal debonding of ceramic bracket [8] and composite removal at debond [9].

Injuries from orthodontic appliances: The standard face bow has to be pulled out of buccal tubes while still attached to the headgear or chin cup during sleep. The elastic traction then acts like a catapult and causes the face bow to recoil, and hit the patient on the face, head or neck. Another problem is for the face bow to be dislocated during sleep and cause damage and injury to the soft tissues. Three serious eye injuries from face-bows have been reported during use of face bows. Trauma associated with the eye injuries may pose additional problems due to the presence of oral microorganisms on the face-bow at the time of injury increases the risk of infection. Despite appropriate antibiotic therapy, any resulting infection can be very difficult to treat and on several occasions has been unsuccessful, leading to the loss of the eye. With the injury to one eye, there is always the possibility of the loss of sight in the other eye because of contralateral endophthalmitis. Because the inner arms of the face-bow are the same width as the eyes, there is a greater risk of a bilateral injury to the eyes. Penetrating injuries of the eye may be relatively asymptomatic, which might delay the patient in seeking treatment.

Root resorption

Root resorption is common during orthodontic tooth movement [10].

A small percentage of patients undergoing orthodontic treatment experience a condition known as external apical root resorption (EARR) if excess forces are used or due to

loss of torque with subsequent pressure on roots by the cortical bone. As a result, the roots become shorter. EARR can be monitored by taking radiographs regularly during the treatment. Some patients experience root resorption with a symptom of slight blunting of the tips of the roots. While it will not result in long-term issues, rare situations happen at least one half of the root shortens, which can lead to significant long-term effects on tooth stability and health. Limited root resorption, involving a number of teeth, can be considered a consequence of orthodontic treatment [11].

Allergy

Allergy to orthodontic components intra-orally is exceedingly rare, however, there have been studies on the nickel release and corrosion of metals with fixed appliances. Gjerdet *et al.* [12] found a significant release of nickel and iron into the saliva of patients just after placement of fixed appliances. However, no significant difference was found in nickel or iron concentrations between controls and subjects where the appliances had been in place for a number of weeks. The clinical significance of nickel release is as yet unclear, but should be considered in nickel sensitive patients. There are a few cases with severe latex allergies who may be affected by elastomers or operators gloves.

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