

Traumas caused by orthodontic treatment: A retrospective review

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Citation: Sam G. Traumas caused by orthodontic treatment: A retrospective review. *Int J Eth Trauma Victimology* 2017; 3(2):37-41. doi: 10.18099/ijetv.v

Article history

Received: Nov 17, 2017
Received in revised form: Dec 12, 2017
Accepted: Dec 18, 2017
Available online: Jan 5, 2018

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Abstract

Even though orthodontic treatment is indispensable for nearly 16-20% of the whole world population with functional efficiency, structural balance and aesthetic harmony as its main advantages and rationale, the treatment particularly with a range of removable, fixed, functional and extraoral orthopaedic appliances can cause various deleterious hard tissue and soft tissue injuries in particular, intraorally. These intraoral and extra oral hard and soft tissue injuries can be iatrogenic, self-induced, caused by bad patient compliance or just by accidents intervened by the patient while wearing the appliance. These traumas/injuries are not uncommon since an orthodontic treatment are mainly done with stainless steel [metal] and the treatment usually continues for a long period of time ranging from 6- 36 months in the majority of the cases. The high pervasiveness of individuals with dental trauma preceding to orthodontic treatment justify the safety measures that should be followed before and during treatment while bearing in mind all the possible effects of orthodontic movement on traumatized teeth. Among the major traumatic dental injuries, avulsion with subsequent tooth reimplantation entails a higher than average risk of complications, such as pulp necrosis, root resorption, and ankyloses. Therefore, it gives orthodontists numerous reasons for apprehension during orthodontic treatment.

Keywords: trauma; injury; burn; orthodontic treatment.

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Introduction

If orthodontic treatment is to be of benefit to a patient, the advantages it offers should outweigh any possible damage it may cause (1). It is important to assess the risks of treatment as well as the potential gain and balance these aspects of treatment before deciding to treat a malocclusion. Limited information is available in the current literature about the management of dental trauma during orthodontic treatment (2) (3). Most available information in the management of traumatized teeth during orthodontic treatment is based on case reports, expert opinion, and individual clinical experiences (2) (3) (4) (5). Local tissue damage is one of the intraoral risks during orthodontic treatment (6). Ulcerations, pain, and

discomfort are frequent side effects, which result from irritation caused mainly by fixed orthodontic appliances (6) (7). Although painful and unpleasant, lesions heal quickly because of the fast metabolism of oral mucosa in young and healthy orthodontic patients (8).

However, oral lesions may result from interactions of dental cast alloys and oral tissues as well. These interactions result from bacterial adherence, toxic, subtoxic, and allergy effects caused by metal ions and allergy (9) Direct interactions between orthodontic appliances and periodontal tissues may present a considerable challenge (10). Besides, during orthodontic treatment with fixed appliances, challenging oral hygiene situation

because of trapped food and oral debris around brackets could contribute to the development of gingival inflammation (11). Recent literature reports quite a small number of studies dealing with frequency and type of oral mucosal lesions during orthodontic treatment. Conversely, clinical experience shows that lesions of oral mucosa in wearers of orthodontic appliances are pretty common findings in everyday practice, thus affecting the motivation and duration of orthodontic therapy.

The various Traumatic Injuries of Head and Neck caused by Orthodontic Braces are as follows;

A. Intra-Oral Risks/Traumas

1. Enamel demineralization/caries

Enamel demineralization usually occurs on smooth surfaces, is, unfortunately, a common complication in orthodontics; figures range from 2–96% of orthodontic patients (12). This large variation probably arises as a result of the variety of methods used to assess and score the presence of decalcification. There is also inconsistency on whether idiopathic lucencies are included or excluded in the study design (13). The teeth most commonly affected are maxillary lateral incisors, maxillary canines and mandibular premolars (14). However, any tooth in the mouth can be affected, and often a number of anterior teeth show decalcification (15). In a study on white spot formation in children treated with fixed appliances, found that half of their patients had at least one white spot after treatment, most commonly on maxillary lateral incisors. The length of treatment did not affect the incidence or number of white spot formations, although O'Reilly and Featherstone (16) (17), found that demineralization can occur rapidly, within the first month of fixed appliance treatment. Whilst good oral hygiene is vital, dietary control of sugar intake is also needed in order to minimize the risk of decalcification. Fluoride mouthwashes used throughout treatment can prevent white spot formation (14) surprisingly, compliance with this is low (13%). Other fluoride release mechanisms include fluoride releasing bonding agents, elastic ligatures containing fluoride, and depot devices on upper molar bands (18) Where demineralisation is present post-treatment, fluoride application either via toothpaste, or by adjunct fluoride mouthwash (0.05% sodium fluoride daily rinse or 0.2% sodium fluoride weekly rinse), can be helpful in remineralising the lesion and reducing the unsightliness of the decalcification (19) Acid/pumice micro-abrasion has also been

advocated to improve the aesthetics of stabilized lesions (20) (21). This procedure should be delayed at least 3 months following debond to allow for spontaneous improvement of the lesions and remineralization with fluoride applications (22).

2. Enamel trauma

When placing appliances careless use of a band seater can result in enamel fracture. Care is required when large restorations are present since these can result in fracture of unsupported cusps (23). Debonding can also result in enamel fracture, both with metal and ceramic brackets (24) (25).

3. Enamel wear

Wear of enamel against both metal and ceramic brackets may occur. It is common for upper canine tips during retraction as the cusp tip hits the lower canine brackets. It may also be seen on the incisal edges of upper anterior teeth where ceramic brackets are placed on lower incisors (26).

4. 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 traumatized teeth with fixed appliances. Light forces are advocated with traumatized teeth as well as baseline monitoring of vitality which should be repeated three monthly (4) (28). Transient pulpitis may also be seen with electrothermal debonding of ceramic brackets(29)and composite removal at debond (27).

5. Root resorption

Some degree of external root resorption is inevitably associated with fixed appliance treatment, although the extent is unpredictable (28). Resorption may occur on the apical and lateral surface of the roots, but radiographs only show apical resorption to a certain degree. Many cases will not show any clinically significant resorption but, microscopic changes are likely to have occurred on surfaces which are not visualized with routine radiographs. Resorption however rarely compromises the longevity of the teeth (29). The use of thyroxine to minimize root resorption has been advocated by some authors, but this is not routinely used (30) (31).

6. Injury or trauma to Periodontal Tissues

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 debonding, bands cause more gingival inflammation than bonds, which is not surprising since the margins of bands are often seated subgingivally. 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 (32).

7. Allergy as an injury

Allergy to orthodontic components intraorally is exceedingly rare, however, there have been studies on the nickel release and corrosion of metals with fixed appliances (33).

8. Trauma

Laceration to the gingivae, and mucosa was seen as areas of ulceration or hyperplasia, often occur during treatment or between treatment sessions from the archwire and bonds, especially where long unsupported stretches of wire rest against the lips. The use of dental wax over the bracket may help to reduce trauma and discomfort, as may rubber bumper sleeving on the unsupported archwire.

B. Extra-Oral Injuries/Traumas

1. Allergy

Allergy to nickel is more common in extra-oral settings, most usually the headgear face bow or head strap. Over 1% of patients have some form of contact dermatitis to zips and buttons/studs on clothing. Of these patients, 3% claim to have experienced a similar rash with orthodontic appliances.

2. Trauma

Following a well-publicized case of eye trauma in a patient wearing headgear (34) (35) a number of safety headgear products have been designed and explicit guidelines are now available. These measures include safety bows, rigid neck straps and snap release products to prevent the bow from disengaging from the molar tubes or acting as a projectile. A survey among British orthodontists found a 4% incidence of facial injury with headgear. Of these injuries, 40% were extra-oral and 50% of these were in the midface. Two patients were blind as a result of headgear trauma. Eye injury is uncommon, but a serious risk and all available methods of reducing the risk of penetrating eye injury must be used.

3. Burn as an accidental injury

Burns, either thermal or chemical are possible both intra- and extra-orally with inadvertent use of chemicals or instruments. Acid etch, electrothermal debonding instruments and sterilized instruments which have not cooled down all have the potential to burn and care should be taken in their use

4. Temporomandibular dysfunction (TMD)

Much attention in the literature has been focused on the relationship between TMD and orthodontic treatment. Whilst TMD is common in the orthodontic aged population whether orthodontic treatment is carried out or not, there is no evidence to support the theory that orthodontic treatment causes TMD or cures it (36). I have not reviewed this area in detail in this section as it is dealt with under facts and fantasy in the next, but an excellent overview of the relation between orthodontics and occlusal relation has been published (37).

Conclusion

Obviously, there is a numeral source of potential iatrogenic and patient induced trauma to the patient throughout orthodontic treatment. However, severe damage is uncommon. Severe malocclusions of the patients as their chief complaint eventually have more benefits and positive results from orthodontic treatment than the traumas and injuries I had mentioned above. All the patients ought to be assessed by the doctor prior to every treatment for risk factors for all aspects of care. Lack of treatment can cause damage, physical or psychosocial to the patient during the usual long period of orthodontic treatment. If the doctor and/or the patient eventually decide to discontinue the treatment without full correction of the malocclusion as the last resort, may leave the patient worse off than before treatment. Excellent clinical practice, cautious patient selection and information on a patient's responsibility are highly indispensable to curtail hard and soft tissue Trauma and damage. On top of all, primary importance must be given to get the informed consent of every patient, duly signed by the patient, his or her parents preceding every orthodontic treatment, mentioning all the above-mentioned risks and traumas that might arise during the treatment.

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