Orthodontic Scars

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ABSTRACT
Orthodontic therapy apart from its benefits also has potential risks and limitations in terms of tissue damage. Fortunately, in orthodontics, risks are minimal and infrequent. However, all potential risks and limitations should be considered and addressed when making the decision to undergo orthodontic treatment. Orthodontic treatment carries with it the risk of various types of soft and hard tissue damages (e.g. decalcification of enamel, lacerations, ulcerations, temporomandibular joint disorders, etc.), apart from treatment failure in itself. If correcting a malocclusion is to be of benefit, the advantages offered should outweigh any possible damage. All preventive procedures should be considered during and after orthodontic treatment to restore the normal health of soft and hard tissues. Hence, the orthodontist should be vigilant and prudent enough in assessing and monitoring every aspect of these tissues at any given stage and time in order to achieve a healthy and successful final result.

Keywords: Orthodontic scars, Enamel decalcification, Enamel fracture.

INTRODUCTION
Malalignment, crowding, spacing and proclination of teeth have been perennial esthetic problems since ages. Orthodontic treatment has thus become an integral part of the esthetic dentistry in the quest for a perfect smile. Apart from esthetics it also helps some patients by significantly improving mastication, speech, appearance, overall dental health, comfort and self-esteem. However, orthodontic appliances at times can cause harm to the related hard and soft tissues during and after treatment if the orthodontist is not vigilant. This potential risk need to be identified early and managed appropriately to avoid such adverse problems. Such damage to the soft and hard tissues that are expressed clinically either intra and/or extra orally are called orthodontic scars.

Orthodontic scars may be present during and after treatment and are seldom severe to offset the advantages of treatment. Most of them are reversible damages and are transient in nature on soft tissues. However, the hard tissue damage can be irreversible, resulting in further treatment following the completion of orthodontic therapy as seen in the case of enamel decalcification. Hence, it is imperative that the patient should be addressed about such possibilities prior to orthodontic treatment. Orthodontic scars can be broadly classified as follows:

1. Lesions of enamel
   - Enamel decalcification/white spot lesions
   - Physical damages on enamel (enamel wear/enamel fractures)

2. Periodontal tissues
   - Gingivitis/gingival enlargement
   - Gingival recession
   - Dark triangles

3. Soft tissues
   - Direct damage caused by components of removable and/or fixed appliance components:
     - Removable appliances
     - Fixed appliances and components causing impingements, ulcerations and lacerations resulting from
       - Archwires, brackets, bands, etc.
       - Headgear and face bow, etc.
       - Loops and utility arches, etc.
   - Indirect damage by allergic reaction to:
     - Nickel
     - Latex
   - Soft tissue complications related to implants
     - Ulceration of overlying soft tissue
     - Peri-implantitis
     - Fracture during removal

LESIONS OF ENAMEL
Enamel Decalcification/White Spot Lesions
White spot lesions around orthodontic attachments (Fig. 1) is one the most common problem during and after fixed orthodontic treatment. Plaque accumulation around the appliance components and bonding materials results in subsequent production of acid by the bacterial plaque resulting in demineralization and alteration in the appearance of the enamel surface. Early lesions appear as opaque, white spots that may progress to caries if demineralization continues without intervention with preventive measures, such as fluoride application and other oral hygiene maintenance protocols. Clinically, they may be clinically detected as early as 1 to 2 months into treatment and their prevalence among orthodontic patients ranges from 2 to 96%. The labiogingival area of the central and
lateral incisors is the most common site for the white spot lesions while the maxillary posterior segments are the least common sites for their formation. They are more common among male patients due to poorer oral hygiene maintenance than females.

The most important means of preventing demineralization is to ensure that the patient’s maintain a high standard of oral hygiene throughout treatment. Fluoride is a well-established anticariogenic agent. Topical fluoride applications like 0.05% sodium fluoride, 1.2% acidulated phosphate fluoride mouth rinse (weekly), 0.4% stannous fluoride gel and fluoride varnish can be used to maintain such high standards. For noncompliant patients, fluoride-containing cements/bonding agents and fluoride-releasing elastomeric ligatures can be used for the same.

**Physical Damages on Enamel (Enamel Wear/Enamel Fractures)**

Enamel damage most commonly occurs during debonding of orthodontic brackets. It is more common during debonding of ceramic brackets. The frequently affected areas are incisal edges of the upper anterior teeth, buccal cusps of upper posterior teeth and upper canine tips during debonding. Most commonly, careless use of an orthodontic band seater or band remover or debonding pliers results in enamel fracture (Fig. 1). Care is required especially when large restorations (composite build-up) are present, since these can result in fracture of unsupported cusps and incisal edges. Debonning can also result in enamel cracks that provide stagnation areas for the development of caries. Zachrisson found that the prevalence of pronounced cracks in relation to the total number of cracks was 6% for debonded/banded teeth and 4% for untreated teeth. However, there were appreciably more cracks with chemically bonded ceramic brackets.

Peeling off stroke at the bracket-resin interface is the advocated method of removing brackets and residual bonding agents so as to minimize the risk of enamel fracture. Appropriate dietary advice should be given to minimize tooth substance loss. Carbonated beverages and pure citrus fruit juices are the most common causes of erosion and should be avoided in patients with fixed appliances.

**PERIODONTAL TISSUES**

**Gingivitis/Gingival Enlargement**

Gingival inflammation is the first and foremost immediate clinical tissue response that can be appreciated in almost all orthodontic patients (Fig. 2). It is transient and does not lead to any further complications, such as loss of gingival attachment, etc. The interproximal areas are usually more affected than the facial areas and posterior teeth more than anterior teeth. Gingival hyperplasia/enlargement is generally observed around orthodontic bands, leading to pseudo-pocketing and giving the illusion of attachment loss (Fig. 2); however, even this condition is transient in nature and usually resolves within weeks of debanding. Adult patients usually are at higher risk of periodontal problems. Light orthodontics forces are recommended for adult orthodontics. Utmost care should be taken particularly in patients with systemic diseases, such as epilepsy as they may be on phenytoin that causes gingival hyperplasia.

**Gingival Recession**

Alveolar bone loss and gingival recession in adult orthodontic patients is more common than in normal individuals (Fig. 3). Banding induces more gingival inflammation than bonding with composite resins, since they are more plaque retentive and their margins are often placed subgingivally. Gingival recession and loss of alveolar bone have been reported as a result of teeth moving in the presence of inflammation.
Dark Triangles

Dark triangles may be seen as an unesthetic open gingival embrasure usually between incisors (Fig. 4) during the course of orthodontic treatment due to loss of gingival attachment as a result of periodontal disease or while correcting rotated or crowded anterior teeth.23 Thus, care should be taken to avoid any attachment loss. If such unesthetic areas are observed, they can be treated by removing enamel at the contact point so that the teeth can be moved closer to minimize the space between them. However, care should be taken not to distort the proportional relationships of the teeth to each other in terms of their connector heights. Both, actual and potential black triangles should be noted during examination and the patient should be informed about reshaping the teeth later to minimize the esthetic problem.

SOFT TISSUE

Intraoral and extraoral soft tissue damage may be discussed under the following headings:

Direct Damage caused by Removable and/or Fixed Appliance Components

Removable Appliances

Retainers given after completion of orthodontic treatment form the bulk of removable appliances. Occasionally the Hawley’s retainer may also be used to correct minor anterior corrections, such as mild spacing or single tooth rotations, crossbite, etc. The acrylic component and wires (retentive clasps, springs, canine retractors, etc.) at times may cause tissue impingement due to sharp edges. Though rare, cases of allergy and toxicity due to the unpolymerzed material of acrylic resin have also been reported.24

To avoid such problems patients should be recalled after 2 weeks to round off any sharp edges or impingements.

Fixed Appliance and Its Components

Archwire, Brackets, Bands, Transpalatal Arch

Lacerations and ulcerations of the gingiva and oral mucosa occurs often during the initial phase of treatment—insertion of bands, brackets, wires and other auxiliaries (Fig. 5). Keratinization of tissues takes about 2 weeks. Use of dental wax over the brackets and rubber tubing of unsupported wires help reduce pain and discomfort due to trauma caused during this phase.2

Headgear

Headgear appliance can cause injury if it is displaced either during sleep or rough play. Most commonly facial skin damage is a result of headgear strap. However, risk of damage and infection of the eye due to headgear have been reported.25

Samuels and Jones26 classified the types of headgear injuries based of percentage occurrences:
1. Accidental disengagement of head strap while playing (27%)
2. Incorrect handling (27%)
3. Disengagement by another child (19%)
4. Disengagement while asleep (27%)

To reduce the risk of injury, headgears now come with a variety of safety features, which prevent them from causing damage to the face or the eyes. The use of safety bows, rigid necks straps and snap release products are mandatory.

Fig. 3: Gingival recession on labial aspect of lower left central incisor

Fig. 4: Dark triangle between the central incisors

Fig. 5: Ulceration of lip mucosa due to rubbing against lower right canine bracket
to prevent the bow from disengaging from the molar tubes. Patients should be given both verbal and written safety instructions after fitting the headgear and advised not to wear the appliance while playing outdoor sports.

**Loops, Utility Arches**

These are archwires that are often used during orthodontic treatment for space closure, space maintenance or intrusion. Utmost care must be taken during their fabrication as they extend into the vestibular area, which may cause tissue impingement, ulcerations and other types of tissue damage (Fig. 6). Even minor amounts of continuous tissue impingement, if disregarded, may lead to more serious problems like ulceration or tissue hyperplasia around the loop. In extreme situations, the loop may become completely embedded in the hyperplastic tissue requiring surgical excision for removal. Thus, careful fabrication and monitoring of such wire components are essential to avoid such problems.

**Indirect Damage by Allergic Reactions**

**Nickel Allergy**

Nickel hypersensitivity affects three in 10 of the general population. Nickel content is found in orthodontic wires, bands, brackets and headgears. However, Intraoral signs and symptoms of nickel hypersensitivity are rare because the concentrations of nickel required to provoke a reaction in the mouth are higher than those needed on the skin as in the case of jewellery and ear piercing. Intraoral signs are highly variable and difficult to diagnose. These include loss of taste or metallic taste, numbness, burning sensation, soreness at the side of the tongue, angular cheilitis (Fig. 7) and erythematous areas or severe gingivitis in the absence of plaque. Since such signs and symptoms are difficult to identify, nickel allergy in response to orthodontic appliances may be underdiagnosed.

**Latex Allergy**

Latex sensitivity may occur in response to contact with latex gloves, elastomeric ligatures or intra- and extraoral elastics. The commonest sites affected are the gingivae and tongue, (Fig. 8) but the perioral region may also be affected. In latex-sensitive patients, steel ligatures or self-ligating brackets may be used instead of the conventional straight wire brackets and elastic modules and chains.

**Soft Tissue Complications related to Implants**

The introduction of microimplants to orthodontics as a skeletal anchorage option has led to their use in critical anchorage situations. Their simple design and ease in implantation makes them comfortable for the patients. However, potential problems and soft tissue complications are common.

The following type of complications can occur with miniscrews:

**Impingements and Trauma to Soft Tissue Overlying the Implant**

Implant head being sharp may cause soft tissue damage to the buccal mucosa and/or attached gingiva related to the confined area. Care should be taken by during the implant
placement for its own stability as well as use of auxiliaries with its support, to avoid trauma and subsequent ulceration (Fig. 9).30

**Peri-implantitis**

Peri-implantitis (inflammation of the gingiva around the implant) is as a result of improper oral hygiene maintenance. Patients should be counseled to maintain high level of oral hygiene throughout treatment.

**Screw Fracture during Removal**

Applying lateral forces during implant removal can cause fracture. It is important not to wiggle the screwdriver when removing it from the screw head. It is rare if taken out straight. If the micro-implant is left for a very long time, this also could lead to fracture on removal as a result of partial or full osseointegration.

Implant failure (mobility/fracture) can also occur if the screw is too narrow or the neck area is not strong enough to withstand the stress of removal.31 The solution is to choose a conical screw with a solid neck and a diameter appropriate to the quality of bone.

**SUMMARY**

Most orthodontic scars are transient and self-correcting in nature. One exception to this rule strongly, is enamel decalcification and fractures, which require post-treatment rehabilitation. However, during the course of treatment if these scars are unobserved or untreated, they may cause complications in the form of infections resulting in pain and discomfort. Patient’s oral hygiene maintenance and orthodontist keen observation during recall/review visits is the key to minimize the chances of such scars.

**REFERENCES**


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