Republic of Iraq
Ministry of Higher Education
And Scientific Research
University of Baghdad
College of Dentistry

Teeth Wear

A project
Submitted to the Council of the College of Dentistry at
the University of Baghdad, Department of Conservative Dentistry
in Partial Fulfillment of the Requirements for B.D.S degree

By:

Fahad Arshad Abdul-Jabbar

Supervised by:
Dr. Shatha Abdulkareem
B.D.S., M.Sc.
Baghdad-Iraq

2018 A.D **1439 A.H**

صدق الله العظيم سورة المجادلة/ 11

Dedication

To my mother who stands with me in every step…

To my father and his every single white hair…

To my brothers and sisters…

To my special friend who gave me power in each weakness moment…

To all my friends and colleagues…

To my supervisor for her guidance, help and endless support throughout this project…

Fahad

Acknowlegment

First of all I would like to present my thanks to **“ Allah”** for inspiring me with energy and strength to accomplish this work, and I pray upon his **great prophet Muhammad** (peace be upon him).

I would like to thank **Prof. Dr. Hussain Al- Huwaizi**, dean of college of dentistry, university of Baghdad, for supporting the undergraduate students.

Grateful thanks are expressed to **Prof. Dr. Adel F. Ibraheem** the Head of the Department of Cosevative Dentistry, for his scientific support and encouragement.

My deep thanks to my supervisor **Dr. Satha Abdulkareem** for her unlimited cooperation, scientific care and to the spirit of high morality that encourage and advise me always to right way throughout this research.

Finally I would like to express grateful thanks to **my lovely family**, my wonderful **parents**, for everything.

List of Contents

List of figures

Introduction

Tooth wear (also termed non-carious tooth substance loss) refers to loss of tooth substance by means other than dental caries or dental trauma.(1)
Tooth wear is a very common condition that occurs in approximately 97% of the population.(2)
This is a normal physiological process occurring throughout life, but accelerated tooth wear can become a problem.(3)

Tooth wear is majorly the result of three processes; attrition, abrasion and erosion.
These forms of tooth wear can further lead to a condition known as abfraction, where by tooth tissue is 'fractured' due to stress lesions caused by extrinsic forces on the enamel. Tooth wear is a complex, multi-factorial problem and there is difficulty identifying a single causative factor.(3)
However, tooth wear is often a combination of the above processes. Many clinicians, therefore, make diagnoses such as "tooth wear with a major element of attrition", or "tooth wear with a major element of erosion" to reflect this. This makes the diagnosis and management difficult.
Therefore, it is important to distinguish between these various types of tooth wear, provide an insight into diagnosis, risk factors, and causative factors, in order to implement appropriate interventions.(3)

- Although decay is the usual cause of tooth destruction necessitating operative procedures, it has been estimated that 25% of tooth destruction does not originate from a carious process.(2)

Attrition

definition

- *Dental attrition* is a type of tooth wear caused by tooth-to-tooth contact(4)
- Attrition occurs as a result of opposing tooth surfaces contacting. The contact can affect cuspal, incisal and proximal surface areas
- Tooth wear is a physiological process and is commonly seen as a normal part of aging. Advanced and excessive wear and tooth surface loss can be defined as pathological in nature, requiring intervention by a dental practitioner.(6)
- If the attrition is severe, the enamel can be completely worn away leaving underlying dentin exposed, resulting in an increased risk of dental caries and dentin hypersensitivity.
- It is best to identify pathological attrition at an early stage to prevent unnecessary loss of tooth structure as enamel does not regenerate.(5)
- attrition can cause:(5)
    1. Loss of tooth anatomy: This results in loss of tooth characteristics including rounding or sharpening of incisal edges, loss of cusps and fracturing of teeth. Enamel of molar teeth may appear thin and flat. When in occlusion the teeth may appear the same height which is particularly apparent for anterior teeth.
    2. Sensitivity or pain: Attrition may be entirely asymptomatic, or there may be dentin hypersensitivity secondary to loss of the enamel layer, or tenderness of the periodontal ligament caused by occlusal trauma.
    3. Tooth discolouration: A yellow appearance of the tooth surface may be due to the enamel being worn away, exposing the darker yellower dentin layer underneath.
    4. Altered occlusion due to decreasing vertical height, or occlusal vertical dimension.
    5. Compromised periodontal support can result in tooth mobility and drifting of teeth
    6. Loss in posterior occlusal stability
    7. Mechanical failure of restorations

Fig. 1 : dental attrition

Causes

- This can be caused by several factors, including parafunctional habits such as bruxism or clenching, developmental defects, hard or rough-textured diet, and absence of posterior teeth support. If the natural teeth oppose or occlude with porcelain restorations, then accelerated attrition of the natural teeth may result. Similarly, when an edge to edge class III incisal relationship is present dental attrition can occur.(7)
- The underlying cause of attrition may be related to the temporomandibular joint as a disruption or dysfunction of the joint can result in compromised function and complications such as bruxism and clenching of the jaw may arise.(8)
- Bruxism is the para-functional movement of the mandible, occurring during the day or night. It can be associated with presence of audible sound when clenching or grinding the teeth.(9)
- This is usually reported by parents or partners if the grinding occurs during sleep.

Prevention and Management

To manage the condition, it is important to first diagnose it, describing the type of tooth surface loss, its severity and location.(10)

Early diagnosis is essential to ensure tooth wear has not progressed past the point of restoration. (10)

The examination should include assessment of:

Temporomandibular joint function and associated musculature

Orthodontic examination

Intra oral soft tissue analysis

Hard tissue analysis

Location and severity of tooth wear

Social history, particularly diet

It is important to record severity of tooth wear for monitoring purposes, helping to differentiate between pathological and physiological tooth surface loss. It is essential to determine whether the tooth wear is ongoing or has stabilized.

However where generalised, the underlying cause can be assumed to be bruxism. In fast-progressing cases, there is commonly a coexisting erosive diet contributing to tooth surface loss. (11)

Prevention

When a diagnosis of bruxism has been confirmed, it is recommended that the patient buy a full-coverage acrylic occlusal splint, such as a Michigan Splint or Tanner appliance, to prevent further bruxism. Patients must be monitored closely, with clinical photographs 6–12 monthly to evaluate if the tooth surface loss is being prevented. (12)

Conservative Treatment

Cosmetic or functional intervention may be required if tooth surface loss is pathological or if there has been advanced loss of tooth structure.(12)

The first stage of treatment involves managing any associated conditions, such as fractured teeth or sharp cusps or incisal edges. These can be resolved by restoring and polishing sharp cusps. Then, desensitizing agents such as topical fluoride varnishes can be applied, and at home desensitising toothpastes recommended. Many restorative options have been proposed, such as direct composite restorations, bonded cast metal restorations, removable partial dentures, orthodontic treatment, crown lengthening procedures and protective splints.(13)

The decision to restore the dentition depends on the wants and needs of the patient, the severity of tooth surface loss and whether tooth surface loss is active.

The use of adhesive materials to replace lost tooth structure can be performed as a conservative and cost-effective approach before a more permanent solution of crowns or veneers is considered.(11)

Fig. 2: dental attrition into the softer dentin

ACID EROSION

definition

**Acid erosion*, also known as *dental erosion*, is a type of tooth wear. It is defined as the irreversible loss of tooth structure due to chemical dissolution by acids not of bacterial origin. Dental erosion is the most common chronic disease of children ages 5–17. (14)

* Acid erosion begins initially in the enamel, causing it to become thin, and can progress into dentin, giving the tooth a dull yellow appearance and leading to dentin hypersensitivity. (14)

Fig.3 : severe acid erosion

Causes

Extrinsic acidic sources

Extrinsic acid erosion is when the source of acid originates from outside of the body. (15)

Acidic food and drink lowers the pH level of the mouth resulting in demineralisation of the teeth. A variety of drinks contribute to dental erosion due to their low pH level. Examples include fruit juices, such as apple and orange juices, sports drinks, wine and beer. Carbonated drink, such as colas and lemonades are also very acidic and hence have significant erosive potential. Foods such as fresh fruits, ketchup and pickled food in vinegar have been implicated in causing acid erosion. (16)

Frequency rather than total intake of acidic juices is seen as the greater factor in dental erosion; infants using feeding bottles containing fruit juices (especially when used as a comforter) are therefore at greater risk of acid erosion. (17)

Saliva acts as a buffer, regulating the pH when acidic drinks are ingested. Drinks vary in their resistance to the buffering effect of saliva. Studies show that fruit juices are the most resistant to saliva's buffering effect, followed by, in order: fruit-based carbonated drinks and flavoured mineral waters, non-fruit-based carbonated drinks, sparkling mineral waters; (18)

Mineral water being the least resistant. Because of this, fruit juices in particular, may prolong the drop in pH levels. (14)

A number of medications such as chewable vitamin C, aspirin and some iron preparations are acidic and may contribute towards acid erosion.

Certain drugs can cause hypo-salivation which is considered a risk factor for acid erosion.

*Frequently consumed foods and drinks below pH 5.0–5.7 may initiate dental erosion.

Fig.4: acid erosion in upper anterior teeth

Intrinsic acidic sources

Intrinsic dental erosion, also known as perimolysis, is the process whereby gastric acid from the stomach comes into contact with the teeth.

This is often secondary to conditions such as anorexia nervosa, bulimia nervosa, gastroesophageal reflux disease and rumination syndrome.

Dental erosion can occur by non-extrinsic factors too. There is evidence linking eating disorders with a range of oral health problems including dental erosion, caries and xerostomia. Reduced salivary flow rate, a common symptom of bulimia, predisposes an individual to dental erosion due to increased vulnerability to the effects of acidic food and drinks. Self-induced vomiting increases the risk of dental erosion by a factor of 5.5 compared to healthy controls. Lesions are most commonly found on the palatal surfaces of the teeth, followed by the occlusal and then the buccal surfaces. (15)

The main cause of gastroesophageal reflux disease is increased acid production by the stomach.

This is not exclusive to adults, as gastroesophageal reflux disease and other gastrointestinal disorders may cause dental erosions in children. (16)

Diagnosis

Change in color

One of the physical changes can be the color of teeth. Dental erosion can lead to two major tooth colour change - the first being a change of color that usually happens on the cutting edge of the central incisors. This causes the cutting edge of the tooth to become transparent.

A second sign is a yellowish tint on the eroded tooth. This occurs because the white enamel has eroded away to reveal the yellowish dentin beneath.

On top of clinical examination, the dentist may take intra-oral photographs to monitor the extent and progress of erosion.

Clinical photographs lead to comparable results to a visual examination, however both may result in an underestimation of the extent of tooth wear.(17) (18)

Change in shape

A change in shape of the teeth is also a sign of dental erosion. Teeth will begin to appear with a broad rounded concavity, and the gaps between teeth will become larger. There can be evidence of wear on surfaces of teeth not expected to be in contact with one another.

If dental erosion occurs in children, a loss of enamel surface characteristics can occur. Amalgam restorations in the mouth may be clean and non-tarnished. As tooth substance around restorations erodes away, fillings may also appear to be rising out of the tooth. The teeth may form divots on the chewing surfaces when dental erosion is occurring. This mainly happens on the first, second, and third molars. To monitor the change in shape over time, dentists can create and retain accurate, serial study casts. (17)

Dentists may also employ indices to guide their diagnosis and management of the condition. A new scoring system referred to as Basic Erosive Wear Examination grades the appearance or severity of wear on the teeth by the extent of hard tissue loss. (17)

It is noted that indices are useful in monitoring the most severe clinical changes in tooth wear. However, they lack comprehensiveness as they cannot measure the rate of progression and cannot monitor all teeth affected by erosion.

There is also a lack of an index which is universally accepted and standardised.

One of the most severe signs of dental erosion is cracking, where teeth begin to crack off and become coarse.

Other signs include pain when eating hot, cold, or sweet foods. This pain is due to the enamel having been eroded away, exposing the sensitive dentin. (19)

Prevention and management

Preventive and management strategies include the following:

Reducing the frequency of acidic and sweet food and beverage intake. This decreases the sugar/acid exposure time and allows the eroded tooth surface to reharden. (20)

Modifying the pH of the food or beverage contributing to the problem, or changing lifestyle to avoid the food or beverage. (20)

Drinking through a straw to reduce contact between erosive fluids and teeth.

Likewise, drinks should not be held in the mouth or sipped for a long time.

Avoiding abrasive forces. Use a soft bristled toothbrush and brush gently. Avoid brushing immediately after consuming acidic food and drink as teeth will be softened. Leave at least half an hour of time in between. Rinsing with water is better than brushing after consuming acidic foods and drinks.

Using a remineralizing agent, such as sodium fluoride solution in the form of a fluoride mouthrinse, tablet, or lozenge, immediately before brushing teeth.

Sodium fluoride application can also help prevent further demineralisation if erosion has already occurred. (20)

Applying fluoride gels or varnishes can increase enamel hardness and increase resistance to softening.

Drinking milk and other dairy products causes increased mineral deposition on the tooth surface allowing it to reharden.

Applying dentine bonding agents to areas of exposed dentin can prevent further damage (21)

Using a neutralizing agent, such as antacid tablets in suspension, as they have the potential to reduce enamel erosion after vomiting.

Treating any underlying medical conditions or diseases which are causing regurgitation of acids. (22)

Abrasion

Definition

Dental abrasion is the non carious, mechanical wears of tooth from interaction with objects other than tooth-tooth contact. It most commonly affects the premolars and canines.(23)

Fig.5 : dental abrasion

causes

1. **interaction** of teeth with other objects such as toothbrushes, toothpicks, floss, and ill-fitting dental appliance like retainers and dentures.

2. **habits**: such as nail biting, chewing tobacco, lip or tongue piercing, and having occupation such as joiner, are subjected to higher risks of abrasion.

3. **dentifrices:** some types - being utilized as some have more abrasive qualities such as whitening toothpastes.

The aetiology of dental abrasion can be due to a single stimuli or, as in most cases, multi-factorial. The most common cause of dental abrasion, is the combination of mechanical and chemical wear

4. **Tooth brushing** is the most common cause of dental abrasion, which is found to develop along the gingival margin, due to vigorous brushing in this area.

* The type of toothbrush, the technique used and the force applied when brushing can influence the occurrence and severity of resulting abrasion.Further, brushing for extended periods of time (exceeding 2-3 min) in some cases, when combined with medium/hard bristled toothbrushes can cause abrasive lesions.

* Types of toothpastes can also damage enamel and dentine due to the abrasive properties.

Specific ingredients are used in toothpaste to target removal of the bio-film and extrinsic staining however in some cases can contribute to the pastes being abrasive.

Whitening toothpastes are found to be one of the most abrasive types of toothpastes.

In-home and clinical whitening have been proven to increase the likelihood of an individual experiencing dental abrasion. It is believed that dental abrasion due to the whitening process is caused by a combination of both mechanical and chemical irritants, for example, using whitening toothpaste and at home bleaching kits together.

However, if an individual is regimented in their after-whitening care then they can avoid loss of dentine minerals and in turn abrasion can be avoided. (that contribute to developing abrasion).

Another factor that can contribute to abrasion is alteration of pH levels in the saliva. This can be sugary/ acidic foods and liquids. The reasoning behind this is that an increase in acidity of saliva can induce demineralization and therefore compromising the tooth structure to abrasive factors such as tooth brushing or normal wear from mastication.

When the tooth structure is compromised, this is where the mineral content of the saliva can create shallow depressions in the enamel and thus, when brushed can cause irreparable damage on tooth surface.

The dental abrasion process can be further stimulated and accelerated through the effects of dental Acid erosion. (24) (25) (25) (26)

Fig.6: Abrasion occurring on the cervical margins from the effects of friction from toothbrushing and abrasive toothpastes

Relative dentin abrasivity

Relative dentin abrasivity (RDA) is a standardised measurement of the abrasive effect that the components of the toothpaste have on a tooth. (27)

The RDA scale was developed by the American Dental Association (ADA). The RDA scale compares toothpaste abrasivity to standard abrasive materials and measures the depth of cut at an average of 1 millimetre per 100,000 brush strokes onto dentine.

This comparison generates abrasive values for the dentifrices that would be safe for daily use.

In vitro dental studies showed a positive correlation between the highest RDAs and greater dentin wear.(28)

Prevention and Treatment

There are several reasons to treat abrasion lesion(s) (also known as 'Class V cavity') such as:-

Sensitivity.

Presence of carious lesion.

Aesthetically unpleasant.

Arresting the progression of the lesion.

Reducing potential onset of caries or periodontal disease as these lesions can present as a plaque retention factor.

Where there is a risk of pulpal exposure if lesion depth is severe enough.

When retention of a removable appliance is interferred. Ie. Denture

To improve denture clasp(s) retention.

Overall integrity of tooth structure is compromised.

In order for successful treatment of abrasion to occur, the aetiology first needs to be identified. The most accurate way of doing so is completing a thorough medical, dental, social and diet history. All aspects needs to be investigated as in many cases the cause of abrasion can be multi-factorial. Once a definitive diagnosis is completed the appropriate treatment can commence. Treatment for abrasion can present in varying difficulties depending on the current degree or progress caused by the abrasion. Abrasion often presents in conjunction with other dental conditions such as attrition, decay and erosion. Evidence suggest there is a decrease in the effect of dental abrasion with dental erosion when fluoride varnish is applied onto teeth.(29)

Successful treatment focuses on the prevention and progression on the condition and modifies the current habit/s instigating the condition. (29)

Removal of Causes

If the aetiology of abrasion is due to habitual behaviours, the discontinuation and change of habit is critical in the prevention of further tooth loss.

The correct brushing technique is pivotal and involves a gentle scrub technique with small horizontal movements with an extra-soft/soft bristle brush.

Excessive lateral force can be corrected by holding the toothbrush in a pen grasp or by using the non-dominant hand to brush.

If abrasion is the result of an ill-fitting dental appliance, this should be corrected or replaced by a dental practitioner and should not be attempted in a home setting. (30)

Chemical

The current selection of dentifrice should also be critically analysed and changed to include a less abrasive and gentler paste such as sensitive toothpaste as evidence suggests that a very abrasive toothpaste would lead to loss of tooth structure. (31)

A toothpaste containing increased fluoride will also help combat the increased sensitivity and risk to dental decay.

Fluoride varnish is known to alleviate hypersensitivity in teeth and can be used as a preventive measure for high risk patients of dental erosion with abrasion because fluoride varnish is reported to have an effect on the surface and subsurface of the tooth.

Treatment in the dental chair may include a fluoride application or the placement of a restoration in more severe cases. (32)

If the lesion is small and confined to enamel or cementum, a restoration is not warranted, instead the eradication of rough edges should occur to reduce plaque retentive properties.

However, in the case of dental decay, aesthetic concerns or defects close to the pulp a restoration may be completed.

Further restorative work may be required when the lesion compromises the overall strength of the tooth or when the defect contributes to a periodontal problem the lesion may be restored.

Once abrasions has been diagnosed and treated it should be closely monitored to identify further progression or potential relief of symptoms. (32)

Restoration

Ideal properties of restoration materials particularly for these lesions include:

1- Satisfactory wear resistance most commonly caused by overzealous/excessive force used during toothbrushing.
2- Low modulus of elasticity, given that teeth (anterior dentition) have been considered to flex around the cervical area (area closest to gum levels).
3- Good aesthetics.

There are other properties of restoration materials which could be considered appropriate, although not specific to Class V restorations, which includes:-

4- Small filler particles for polishability to achieve better aesthetics.
5- Sufficiently stiff consistency to hold shape but still allows easy handling for placement into a cavity.
6- Self-curing/setting or curable to any depth.
7- Dimensionally stable or low shrinkage/stress.
8- Fluoride release.
9- Self-adhesive to enamel and dentine.

Dental materials such as amalgam, glass ionomer (GI), resin-modified glass ionomer (a variant of GI) and resin composite are the types of restoration materials available when active treatment by means of restoration is appropriate.

Taking into consideration these factors and their respective dental materials' properties, evidence and studies has shown that resin-modified glass ionomer restoration material is the recommended restoration material in clinical situations as it performs optimally - provided when aesthetics is not the top priority when restoring these lesions.

The surface of such lesions should be roughened prior to its restoration- whether material is Glass ionomer-based or resin-based - with no need for bevelling of the coronal aspect of the cavity. (33) (34) (35) (36)

Abfraction

Definition

Abfraction is a form of non-carious tooth tissue loss that occurs along the gingival margin. (37)

In other words, abfraction is a mechanical loss of tooth structure that is not caused by tooth decay, located along the gum line. There is theoretical evidence to support the concept of abfraction, but little experimental evidence exists.(38)

Tooth tissue is gradually weakened causing tissue loss through fracture and chipping or successively worn away leaving a non-carious lesion on the tooth surface. These lesions occur in both the dentine and enamel of the tooth. These lesions generally occur around the cervical areas of the dentition. (39)

Fig.7 : abfraction

Signs and symptoms

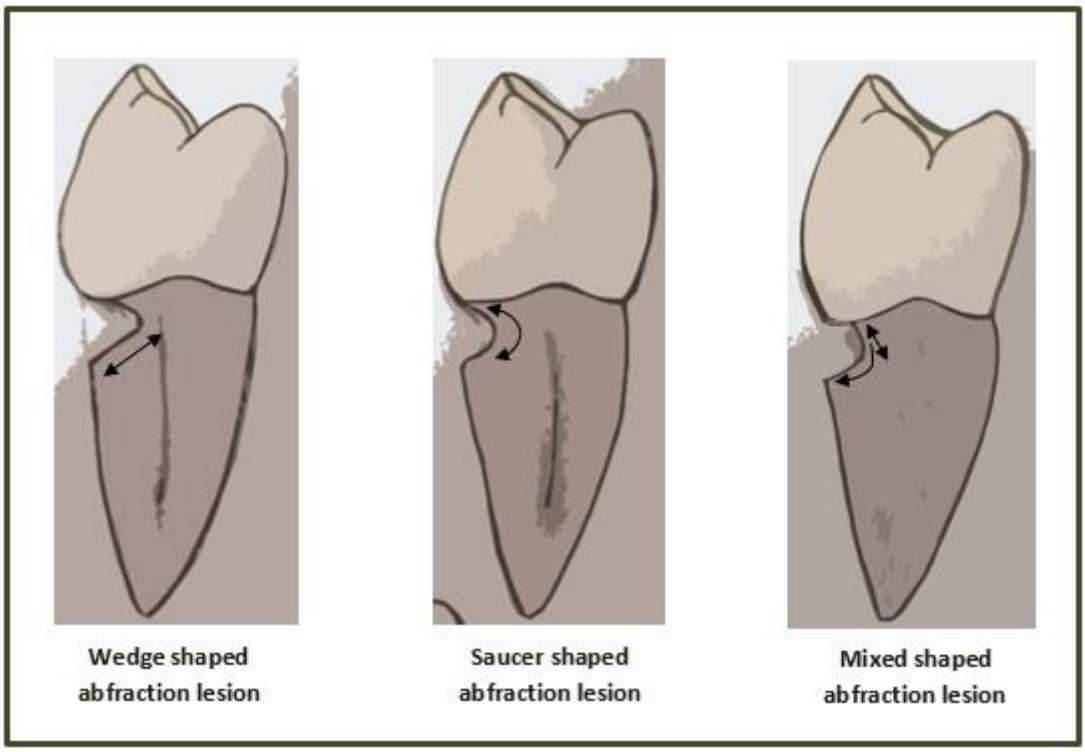

Fig. 8: shapes of abfraction

Abfraction lesions will generally occur in the region on the tooth where the greatest tensile stress is located. In statements such as these there is no comment on whether the lesions occur above or below the CEJ. One theory suggests that the abfraction lesions will only form above the CEJ.

However, it is assumed that the abfraction lesions will occur anywhere in the cervical areas of affected teeth. It is important to note that studies supporting this configuration of abfraction lesions also state that when there is more than one abnormally large tensile stress on a tooth two or more abfraction lesions can result on the one surface. (40) (41) (42) (43)

When looking at abfraction lesions there are generally three shapes in which they appear, appearing as either wedge, saucer or mixed patterns.

Wedge and saucer shaped lesions are the most common, whereas mixed lesions are less frequently identified in the oral cavity.

In reference to figure 8, wedge shaped lesions have the sharpest internal line angles and saucer/mixed shaped lesions are either smooth internally, or a variety.

Clinically, people with abfraction lesions can also present with tooth sensitivity in the associated areas. This occurs because as the abfration lesions appear, dentine/cementum is exposed.

The dentine and cementum are less dense than tooth enamel and therefore more susceptible to sensation from thermal/mechanical sources.(44)

Causes

As abfraction is still a controversial theory there are various ideas on what causes the lesions. Because of this controversy the true causes of abfraction also remain disputable. (45)

Researchers have proposed that abfraction is caused by **forces on the tooth from the teeth touching together, occlusal forces, when chewing and swallowing.**

These lead to a concentration of stress and flexion at the area where the enamel and cementum meet (CEJ).(46)

This theoretical stress concentration and flexion over time causes the bonds in the enamel of the tooth to break down and either fracture or be worn away from other stressors such as erosion or abrasion.(45) (46)

The people who initially proposed the theory of abfraction believe the occlusal forces alone cause the lesions without requiring the added abrasive components such as toothbrush and paste or erosion.(47)

If teeth come together in a non-ideal bite the researchers state that this would create further stress in areas on the teeth. (49)

Teeth that come together too soon or come under more load than they are designed for could lead to abfraction lesions.(49)

The impacts of restorations on the chewing surfaces of the teeth being the incorrect height has also been raised as another factor adding to the stress at the CEJ.(45)

Further research has shown that the normal occlusal forces from chewing and swallowing are not sufficient to cause the stress and flexion required to cause abfraction lesions.(44)

However, these studies have shown that the forces are sufficient in a person who grinds their teeth (bruxism).

Several studies have suggested that it is more common among those who grind their teeth, as the forces are greater and of longer duration.

Yet further studies have shown that these lesions do not always appear in people with bruxism and others without bruxism have these lesions.

There are other researchers who would state that occlusal forces have nothing to do with the lesions along the CEJ and that it is the result of abrasion from toothbrush with toothpaste that causes these lesions.

Being theoretical in nature there is more than one idea on how abfraction presents clinically in the mouth. One theory of its clinical features suggests that the lesions only form above the cementoenamel junction (CEJ) (which is where the enamel and cementum meet on a tooth).

If this is kept in mind, it serves as a platform for it to be distinguished from other non-carious lesions, such as tooth-brush abrasion.(46)(47)(48)(49)

Treatment

Treatment of abfraction lesions can be difficult due to the many possible causes. To provide the best treatment option the dental clinician must determine the level of activity and predict possible progression of the lesion(50)

A No.12 scalpel is carefully used by the dental clinician to make a small indentation on the lesion, this is then closely monitored for changes. Loss of a scratch mark signifies that the lesion is active and progressing.

It is usually recommended when an abfraction lesion is less than 1 millimeter, monitoring at regular intervals is a sufficient treatment option. If there are concerns around aesthetics or clinical consequences such as dentinal hypersensitivity, a dental restoration (white filling) may be a suitable treatment option.(51)

Aside from restoring the lesion, it is equally important to remove any other possible causative factors.

Adjustments to the biting surfaces of the teeth alter the way the upper and lower teeth come together, this may assist by redirecting the occlusal load.

The aim of this is to redirect the force of the load to the long axis of the tooth, therefore removing the stress on the lesion. This can also be achieved by altering the tooth surfaces such as cuspal inclines, reducing heavy contacts and removing premature contacts.

If bruxism is a deemed a contributing factor an occlusal splint can be an effective treatment for eliminating the irregular forces placed on the tooth.(51)

Refrences

1) Kaidonis JA (August 2012). "Oral diagnosis and treatment planning: part 4. Non-carious tooth surface loss and assessment of risk". British Dental Journal. 213 (4): 155–61.
2) Suchetha A (2014). "Tooth Wear - A Literature Review". Indian Journal of Dental Science. 5 (6): 116–120
3) Bhushan J, Joshi R (2011). "Tooth Wear - An Overview With Special Emphasis On Dental Erosion". Indian Journal of Dental Sciences. 5 (3): 89.
4) Darby, M., Walsh, Margaret, & EBL ebook Library. (2009). Dental Hygiene Theory and Practice. (3rd ed.). London: Elsevier Health Sciences.
5) Davies, SJ; Gray, RJM (2002). "Management of tooth surface loss". British Dental Journal 192 (1): 11-12
6) Burke FM, McKenna G. Toothwear and the older patient. Dent Update. 2011 Apr;38(3):165-8.
7) Meshramkar R, Lekha K, Nadiger R (Jan–Mar 2012). "Tooth wear, etiology, diagnosis and its management in elderly: A literature review". International Journal of Prosthodontics and Restorative Dentistry 2 (1): 38–41.
8) Brunton, P.A. (2003). Prevention in the Older Dentate Patient. British Dental Journal, 195 (5), 239.
9) Khan F, Young W G, Daley TJ. Dental erosion and bruxism. A tooth wear analysis from South East Queensland. Aust Dent J. 1998. 43 (2):117-27.
10) Mehta, SB; Banerjji, S; Millar, BJ; Suarez-Feito, JM (2014). "Current Concepts on the Management of Tooth Wear: Part 1". British Dentistry Journal. 212 (1): 17–27.
11) Myeyers, I (2012). "Attrition and Erosion: Assessment and Diagnosis". Annals of the Royal Australasian College of Dental Surgeons. 21: 94–96.
12) Sato, S; Hotta, TH; Pedrazzi, V (2000). "Removable Occlusal Overlay Splint in the Management of Tooth Wear: A Clinical Report". The Journal of Prosthetic Dentistry
13) Sameni A, Borzabadi-Farahani A, Moshaverinia A (2016). "Rehabilitation of Worn Dentition Using Adhesive and Implant Dentistry". Dentistry Today.
14) Edwards, M.; Creanor S.L.; Foye R.H.; Gilmour W.H. (December 1999). "Buffering capacities of soft drinks: the potential influence on dental erosion". Journal of Oral Rehabilitation.

15) Gandara, B.K; E.L Truelove (October 1999). "Diagnosis and management of dental erosion". Journal of Contemporary Dental Practice.
16) Davenport, Tammy (14 September 2007). "Signs and Symptoms of Tooth Erosion". About.com. Retrieved 2008-03-09.
17) Acid Attack. Academy of General Dentistry. 6 February 2008.
18) Al-Malik, M. I.; Holt, R. D.; Bedi, R.; Speight, P. M. (February 2001). "Investigation of an index to measure tooth wear in primary teeth". Journal of Dentistry. 29 (2): 103–107.
19) Davenport, Tammy (14 September 2007).
20) Magalhães, Ana Carolina; Wiegand, Annette; Rios, Daniela; Honório, Heitor Marques; Buzalaf, Marília Afonso Rabelo (April 2009). "INSIGHTS INTO PREVENTIVE MEASURES FOR DENTAL EROSION". Journal of Applied Oral Science.
21) Sorvari, R.; Meurman, J. H.; Alakuijala, P.; Frank, R. M. (1994). "Effect of fluoride varnish and solution on enamel erosion in vitro".
22) Paryag, A; Rafeek, R (2014-9)
23) López-Frías, Francisco J.; Castellanos-Cosano, Lizett; Martín-González, Jenifer; Llamas-Carreras, José M.; Segura-Egea, Juan J. (2012-02-01).
24) De Moor, R J G; Witte, A M J C De; Delmé, K I M; Bruyne, M A A De; Hommez, G M G; Goyvaerts, D (October 2005). "Dental and oral complications of lip and tongue piercings". British Dental Journal.
25) Lee A, He LH, Lyons K, Swain MV. Tooth wear and wear investigations in dentistry. Journal of oral rehabilitation.
26) Sadaf D, Ahmad Z. Role of brushing and occlusal forces in non-carious cervical lesions (NCCL). International journal of biomedical science: IJBS. 2014 Dec;10(4):265
27) Vieira GH, Nogueira MB, Gaio EJ, Rosing CK, Santiago SL, Rego RO. Effect of Whitening Toothpastes on Dentin Abrasion: An In Vitro Study. Oral health & preventive dentistry. 2016 Jun 27.
28) Macdonald E, North A, Maggio B, Sufi F, Mason S, Moore C, Addy M, West NX. Clinical study investigating abrasive effects of three toothpastes and water in an in situ model. J Dent 2010;38:509–516.
29) Sar Sancakli, H.; Austin, R. S.; Al-Saqabi, F.; Moazzez, R.; Bartlett, D. (March 2015). "The influence of varnish and high fluoride on erosion and abrasion in a laboratory investigation". Australian Dental Journal.

30) Walsh M, Darby ML. Dental hygiene: theory and practice. Elsevier Health Sciences; 2014 Apr 15.
31) Ganss, C.; Marten, J.; Hara, A. T.; Schlueter, N. (November 2016). "Toothpastes and enamel erosion/abrasion - Impact of active ingredients and the particulate fraction". Journal of Dentistry. 54: 62–67
32) White JM, Eakle WS. Rationale and treatment approach in minimally invasive dentistry. The Journal of the American Dental Association. 2000 Jun
33) Stewardson DA, Creanor S, Thornley P, Bigg T, Bromage C, Browne A, Cottam D, Dalby D, Gilmour J, Horton J, Roberts E, Westoby L, Burke T. The survival of class V restorations in general dental practice: part 3. five year survival. Br Dent J 2012; 212: E14.
34) Heintze SD, Ruffieux C, Rousson V. Clinical performance of cervical restorations − a meta-analysis. Dent Mater 2010; 26: 993−1000.
35) Van Dijken JWV. A prospective 8-year evaluation of a mild two-step self-etching adhesive and a heavily filled two-step etchand-rinse system in non-carious cervical lesions. Dent Mater 2010; 26: 940−948.
36) Gwinnett AJ, Kanca J. Interfacial morphology of resin composite and shiny erosion layers. Am J Dent 1992; 5: 316−317.
37) Bartlett, D.W.; Shah, P (April 2006). "A Critical Review of Non-carious Cervical (Wear) Lesions and the Role of Abfraction, Erosion, and Abrasion". Journal of Dental Research. 85 (4): 306–312. doi:10.1177/154405910608500405.
38) Michael, JA; Townsend, GC; Greenwood, LF; Kaidonis, JA (March 2009). "Abfraction: separating fact from fiction". Australian Dental Journal. 54 (1): 2–8. doi:10.1111/j.1834-7819.2008.01080.x.
39) Grippo, John O (January–February 1991). "Abfractions: A New Classification of Hard Tissue Lesions of Teeth". JOURNAL OF ESTHETlC DENTISTRY. 3 (1): 14–19
40) Hur, B; Kim, HC; Park, JK; Versluis, A (2011). "Characteristics of non-carious cervical lesions – an ex vivo study using micro computed tomography". Journal of Oral Rehabilitation. 38 (6): 469–74.
41) Lee, HE; Lin, CL; Wang, CH; Cheng, CH; Chang, CH. "Stresses at the cervical lesion of maxillary premolar—a finite element investigation". Journal of Dentistry. 30 (7): 283–90.

42) Dejak, B; Młotkowski, A; Romanowicz, M. "Finite element analysis of stresses in molars during clenching and mastication". Journal of Prosthetic Dentistry. 90 (6): 591–7.
43) Borcic, J; Anic, I; Smojver, I; Catic, A; Miletic, I; Ribaric, SP (2005). "3D finite element model and cervical lesion formation in normal occlusion and in malocclusion". Journal of Oral Rehabilitation. 32 (7): 504–10
44) Michael, JA; Townsend, GC; Greenwood, LF; Kaidonis, JA (March 2009). "Abfraction: separating fact from fiction". Australian Dental Journal. 54 (1): 2–8.
45) Grippo JO, Simring M, Coleman TA. Abfraction, Abrasion, Biocorrosion, and the Enigma of Noncarious Cervical Lesions: A 20-Year Perspective. J Esthet Restor Dent. 2012; 24(1):10-23
46) Hur, B; Kim, HC; Park, JK; Versluis, A (2011). "Characteristics of non-carious cervical lesions – an ex vivo study using micro computed tomography". Journal of Oral Rehabilitation. 38 (6): 469–74.
47) Lee, HE; Lin, CL; Wang, CH; Cheng, CH; Chang, CH. "Stresses at the cervical lesion of maxillary premolar—a finite element investigation". Journal of Dentistry. 30 (7): 283–90.
48) Dejak, B; Młotkowski, A; Romanowicz, M. "Finite element analysis of stresses in molars during clenching and mastication". Journal of Prosthetic Dentistry. 90 (6): 591–7.
49) Borcic, J; Anic, I; Smojver, I; Catic, A; Miletic, I; Ribaric, SP (2005). "3D finite element model and cervical lesion formation in normal occlusion and in malocclusion". Journal of Oral Rehabilitation. 32 (7): 504–10.
50) Michael, JA; Townsend, GC; Greenwood, LF; Kaidonis, JA (March 2009). "Abfraction: separating fact from fiction". Australian Dental Journal. 54 (1): 2–8.
51) Michael, JA; Townsend, GC; Greenwood, LF; Kaidonis, JA (March 2009). "Abfraction: separating fact from fiction". Australian Dental Journal. 54 (1): 2–8.