Dental Erosion

Aims: To explore the causes, prevention and treatment of dental erosion, and to identify the role of dental care professional in assisting patients to minimise dental erosion.

Objectives: On completion of this verifiable CPD article the participant will be able to demonstrate, through the completion of a questionnaire, the ability to:

- Define abrasion, attrition, erosion and abfraction
- Identify the appearance of erosion on the tooth surface
- Identify some of the extrinsic and intrinsic causes of erosion
- Identify some of the key preventive measures for erosion
- Recognise some of the treatment options available for erosion

Introduction

Tooth wear is considered to be a combination of erosion, abrasion, attrition and abfraction. Abrasion can be defined as the physical wear of the tooth surface as a result of mechanical processes involving a foreign substance or object. Attrition is the physical wear of the tooth surface as a result of opposing tooth contact and with no foreign substance intervening; and, abfraction is the physical wear as a result of compressive forces from the occlusion causing the tooth to flex in the cervical region resulting in microfractures in enamel and dentine.

This article will explore the causes and prevention of dental erosion and the role the dental care professional can play in assisting patients to minimise dental erosion.

Dental erosion can be defined as the progressive loss of hard dental tissues caused by a chemical process not involving bacterial action. It has been associated with ingestion of acidic foods. It may be caused by extrinsic (outside of the body) or intrinsic (from within the body) factors. There is an increasing awareness, amongst the dental profession, of the potential for this particular form of tooth wear to occur. This is due to a distinct clinical impression among dental practitioners, particularly those who see a large number of children and young people, that there is an increasing problem that may be partly associated with the consumption of carbonated soft drinks, sports drinks, wine and fruit juices.

It is important that the dental team is vigilant and provides the patient with preventive measures before tooth tissue loss becomes clinically significant.
Appearance of Erosion

In the early stages of erosion, the tooth surface develops a loss of the lustre appearance of the enamel. As the erosion advances, changes in the morphology (shape) of the tooth can develop. On the smooth surfaces, areas of the enamel appear flattened and concavities can develop. These are usually shallow and wide across the surface of the tooth. Occlusal erosion leads to a rounding of the cusps and the fissures on the cusps. Sometimes restorations can rise above the level of the adjacent tooth surface. If a lesion develops at the gingival margin, it usually presents with an intact enamel dentinal junction. If the aetiology (cause) of the lesion is unclear, the location of the loss of the enamel may help to identify the cause. Severe cases of erosion can result in complete loss of the tooth morphology.
Aetiology of Erosion

As we have previously noted, erosion can be caused by intrinsic or extrinsic factors. The chemical process that leads to erosion is very complex and can be affected by different influences. These influences include the pH (any acid with a pH below the critical pH of dental enamel (5.5) can dissolve the hydroxyapatite crystals in enamel), titratable acidity, phosphate and calcium concentration and the fluoride level at the time the acid attack is taking place. In respect of the degree of erosion, this can, in turn, be affected by a variety of biological modifying factors, the most important being the rate and flow of saliva. Salivary flow rates and its buffering capacity at different sites also influence erosion. Where there is abundant saliva such as in the lower incisor region, there tends to be little erosion. To understand these influences further, a full article is included in the non verifiable section of the website.

Extrinsic Factors

Extrinsic factors are known to include:

- Carbonated drinks
- Fruit juices
- Acidic food, sweets
- Citric lozenges
- Some medications - including acetylsalicylic acid, ascorbic acid, liquid hydrochloric acid, iron tonics and saliva substitutes
- Recreational exposure to water in gas-chlorinated swimming pools for prolonged periods of time
Occupational exposure to corrosive agents such as battery acid fumes and industrial aerosols
Occupational wine tasters
Use of recreational drugs such as cocaine and ecstasy can lead to dehydration and then excessive consumption of acidic drinks
Excessive tooth brushing techniques with an abrasive toothpaste can render the tooth more susceptible to erosion \(^3,4,12\)

**Intrinsic Factors**

- Bulimia
- Regurgitation due to gastritis associated with chronic alcoholism
- Xerostomia
- Malabsorption Syndrome
- Chronic vomiting during pregnancy
- Gastroesophageal Reflux Disease (GERD) \(^3,4,12\)

**Prevalence of Erosion**

A review of the available literature in 2011 about the prevalence (proportion of the population found to have the condition) concluded that between 5 and 100% of children and 76 and 100% of adults had some erosive tooth wear. \(^2\) The review highlighted that the studies that had been completed to date had mainly included small groups and therefore were not representative of the whole population. In addition, a variety of different indices (measurement scales) were used across the different studies, which made it difficult to make any comparison of the studies. \(^2\)

However, many authors conclude that the prevalence and incidence of erosion is increasing.

**Prevention and Control**

The most important step towards prevention of erosion is identifying patients who are at risk or present with early signs of erosive lesions. \(^12\)

Management of dental erosion could be considered to consist of five essential components: diagnosis and assessment, monitoring of the progression of enamel loss, dietary and oral hygiene modifications, remineralisation, and restorative treatment. \(^10\)

The clinician would need to diagnose erosion as the cause of tooth wear and exclude attrition, abrasion and abfraction. \(^10\) A comprehensive medical history of a patient can help to identify patients who may be at risk from intrinsic or extrinsic factors that could lead to erosion.
Attempting to gain relevant information from the patient regarding possible sources of acid intake through careful questioning or the use of dietary analysis tools is essential. Recommendations that can be given to patients include the following:

- Patients who present with intrinsic factors such as bulimia, GERD, chronic vomiting should be referred for medical advice and monitored by the dental clinician.

- Patients who experience regular vomiting should be discouraged from brushing straight after an attack as the tooth surface is in a softened state and more susceptible.

- Patients who report a high intake of acidic drinks, juices, wine, dietary foods/sweets should be advised to reduce or eliminate the intake.

- Patients should be advised against habits such as swishing and retaining acid drinks in their mouth for prolonged periods.

- Avoid acidic substances last thing at night.

- Tooth brushing immediately after having acidic food or drinks should also be avoided as the acid attack can leave the enamel in a softened state and make it more susceptible for up to one hour after and erosive challenge.

- Use of a straw should be encouraged.

- Check the patient's medication.

- Tooth brushing immediately before having acidic foods or drinks should be avoided as it has been shown that vigorous tooth brushing can affect the ability of the teeth to withstand an erosive challenge.

- Use of fluoride mouthwashes/toothpastes, or an alkaline drink such as milk can be encouraged.

- In severe cases of erosion frequent application of high concentration fluoride has been shown to be of benefit.\textsuperscript{3,4,11}

**Treatment**

Once a diagnosis has been made, the erosion should be monitored and recorded by the clinician. Study models could also be made and clinical photographs can be taken.\textsuperscript{11} There are a variety of tooth wear indices that the clinician may decide to use to record the erosion.\textsuperscript{2} A silicone putty impression of the worst affected area can be made and stored. When the patient returns for a recall appointment the putty index can be sectioned and placed over the teeth. Any gap between the putty index and the tooth surface indicates that the erosion is still progressing.\textsuperscript{13}
It is essential to ensure that the patient understands their dental health issue and patient leaflets can be useful. A full dietary analysis should be carried out, followed by dietary advice and monitoring. The clinician should record the patients oral hygiene habits. Compliance can be checked at follow up appointments.

It may be necessary to carry out some restorative work such as adhesive restorations using composites or porcelain veneers. It may be necessary to use bonding agents e.g.: seal and protect. Fluoride mouthrinses, fluoride varnish and high fluoride toothpastes can encourage remineralisation and help the patient who is experiencing sensitivity.

The treatment for patients who have erosion as a result of GERD may include advice to elevate their head while sleeping and to avoid fatty/spicy foods. Treatment from their medical practitioner could include drug therapy.

**Conclusion**

Dental erosion, is the loss of tooth enamel and at times deeper parts of the tooth due to a myriad of causes. These can include chemicals, reflux disease, gastritis or bulimia or the prolonged oral retention of medications. Diet plays an important factor in erosion.

Erosion results in a scooped out, smooth depression on the tooth’s surface. In many cases, erosion causes sensitivity to hot and cold substances, or painful sensitivity if the enamel is worn to such a degree that the dentin is exposed.

Any acid with a pH below the critical pH of dental enamel (5.5) can dissolve the hydroxyapatite crystals in enamel.

It is essential for the clinician to identify at risk patients and monitor and provide treatment for them. The dental care professional can play a vital role in supporting the patient with relevant advice.

**pH of Some Foods and Drinks**

<table>
<thead>
<tr>
<th>Food</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple Sauce/Puree</td>
<td>3.4</td>
</tr>
<tr>
<td>Cola</td>
<td>2.6</td>
</tr>
<tr>
<td>Honey</td>
<td>3.9</td>
</tr>
<tr>
<td>Ketchup</td>
<td>3.9</td>
</tr>
<tr>
<td>Lemon Juice</td>
<td>2.3</td>
</tr>
<tr>
<td>Orange Juice</td>
<td>3.7</td>
</tr>
</tbody>
</table>
pH 4.0 - 5.9

- Banana: pH 5.1
- Carrot Sticks: pH 5.5
- Pears: pH 4.1
- Raisins: pH 4.0
- Strawberry: pH 4.1
- Yogurt: pH 4.1

What’s hidden inside a bottle of fruit juice

<table>
<thead>
<tr>
<th>Acidity (pH level)</th>
<th>Sugar (teaspoons per pint)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.8</td>
<td>13.5</td>
</tr>
<tr>
<td>3.7</td>
<td>14</td>
</tr>
<tr>
<td>3.6</td>
<td>14</td>
</tr>
<tr>
<td>3.5</td>
<td>15</td>
</tr>
<tr>
<td>3.5</td>
<td>0.8</td>
</tr>
<tr>
<td>3.5</td>
<td>13.5</td>
</tr>
<tr>
<td>3.3</td>
<td>12</td>
</tr>
<tr>
<td>3.2</td>
<td>14</td>
</tr>
<tr>
<td>Coca-Cola</td>
<td>2.5</td>
</tr>
<tr>
<td>Milk</td>
<td>6.8</td>
</tr>
<tr>
<td>White wine</td>
<td>3.3</td>
</tr>
<tr>
<td>Vinegar</td>
<td>2.9</td>
</tr>
<tr>
<td>How they compare</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 6

Portfolio tip
We recommend that you read further information on erosion by accessing the following documents from the non-verifiable CPD section of the website:

- An article that discusses the chemical and biological factors of erosion
- Advice from Colgate on how erosion affects teeth

Don’t forget to log the hours you spend reading into your non-verifiable CPD log.

© 2013 Sue Bagnall and Nicky Gough
References