



ABC of oral health: Dental damage, sequelae, and prevention

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*ABC of oral health***Dental damage, sequelae, and prevention**

Ruth Holt, Graham Roberts, Crispian Scully

Tooth damage

Teeth may be damaged by dental caries, trauma, erosion, attrition, and abrasion or lost through periodontal disease.

Disease

Caries and inflammatory periodontal disease are the most prevalent oral diseases, both a result of the activity of dental bacterial plaque. Plaque is a complex biofilm containing various microorganisms that forms mainly on teeth and particularly between them, along the gingival margin, and in fissures and pits, adhering by a variety of mechanisms. If plaque is not regularly removed the flora evolves, and plaque may calcify, forming calculus (tartar).

Fermentation of sucrose and other non-milk extrinsic sugars by plaque bacteria to lactic and other acids causes tooth decalcification and, with proteolysis, results in caries (decay). The main causal organism is *Streptococcus mutans*. Caries has been declining for some years, mainly because of the protective effect of fluoride, but it is more prevalent in disadvantaged and deprived people, especially in preschool children.

Accumulation of plaque and a change in the microflora may also cause gingival inflammation (gingivitis). If conditions are appropriate this may progress to damage the periodontal membrane (chronic periodontitis) and lead to tooth loss.

- Caries and periodontal disease are the main oral diseases, and dental bacterial plaque underlies these diseases
- Fermentation of sugars by plaque bacteria causes caries by decalcification and proteolysis of enamel and dentine
- Plaque can cause inflammation of the gingiva (gingivitis), and involvement of underlying tissues causes periodontitis

Other damage

Trauma is common in sport, road accidents, violence, and epilepsy. It occurs mainly in males and usually affects the maxillary incisors.

Tooth erosion is an increasing problem from consumption of carbonated and fruit drinks and occasionally from gastric regurgitation or repeated vomiting (as in bulimia, alcoholism, and gastro-oesophageal reflux). In most cases it results in little more than a loss of normal enamel contour, but in severe cases dentine or pulp may be damaged.

Tooth wear—Attrition, wearing of the biting (occlusal) surfaces, is usually due to tooth grinding (bruxism) or an abrasive diet. Abrasion, wearing at the tooth cervical margin, is mainly caused by brushing with a hard brush or abrasive dentifrice. It can lead to exposure of dentine and therefore sensitivity to hot and cold in particular. Desensitising toothpastes are available, but professional dental care may be needed.

- Acids readily damage teeth
- Gastric acid or acidic drinks (fruit juices or carbonated drinks) can erode teeth



Accumulation of dental plaque close to gingival margins and around the contact areas of teeth (top). Same teeth after brushing (bottom)



Calculus formed by calcification of plaque (top). Same teeth after calculus removed by scaling (bottom). Calculus cannot be removed by tooth brushing



Extensive caries in an adolescent with poor oral hygiene: upper left central incisor and lower right first premolar show obvious caries with large discoloured cavities



Extreme example of tooth erosion in patient who suffered repeated gastric regurgitation

Sequelae

Most dental pain occurs as a result of caries. Initially, caries presents as a painless white spot (decalcification of the enamel, which may be reversible), followed by cavitation and the appearance of brownish discoloration. Once caries reaches the dentine, pain may result from thermal stimulation or from sweet or sour food or drink. Pain may also occur when dentine is exposed by trauma, erosion, or abrasion; this subsides within seconds of removing the stimulus and may be poorly localised, often only to within two or three teeth of the affected tooth. The tooth should be restored (filled).

Untreated, caries can progress through the dentine to the pulp, which becomes inflamed (pulpitis). Within the rigid confines of the pulp chamber this produces severe persistent pain (toothache), and the pulp eventually undergoes necrosis, when inflammation can spread around the tooth apex (periapical periodontitis), eventually forming an abscess, granuloma, or cyst.

- Caries in enamel is painless
- Caries in dentine may be associated with pain on exposure to heat, cold, or sweet material and if it remains untreated may progress to cause pulpitis
- Pulpitis produces severe spontaneous or persistent pain and, if untreated, leads inevitably to pulp necrosis
- Pulp necrosis often leads to dental abscess

Prevention

Diet and lifestyle

Sugars, particularly non-milk sugars in items other than fresh fruits and vegetables, are the major dietary causes of caries. Frequency of intake is more important than the amount.

Dietary advice should start with recommending appropriate infant feeding and weaning practice. Drinks other than milk and water should not be given in feeding bottles and should be confined to main meals. Children should be introduced to a cup at about 6 months of age and should have ceased using bottles by about 1 year. Weaning foods should be free of or very low in sugars other than those present in fresh milk and raw fruits or vegetables.

For older children and adults, snack foods and drinks especially should be free of sugars. Because of the risk of erosion as well as of caries, frequent consumption of carbonated and cola type drinks should be discouraged. Fruit juices can also cause tooth erosion. Water and milk are the preferred options for children.

Saliva buffers may counter plaque acids, and thus chewing sugar-free gum or cheese after meals may be of value. Fresh fruit and vegetables can also confer some protection against oral cancer. However, smoking or chewing tobacco and some other habits may contribute to periodontal disease and oral malignancy, and some chewed products containing sugars may predispose to caries.

Fluorides

Fluorides protect against caries by inhibiting mineral loss, promoting remineralisation of decalcified enamel, and reducing formation of plaque acids. Water fluoridation has consistently been shown to be the most effective, safe, and equitable means of preventing caries and can reduce the prevalence of caries by about half.

Where the water supply contains less than 700 µg/l of fluoride (0.7 ppm), children aged over 6 months who are at high risk of caries may be given daily fluoride supplements as



Caries in dentine. Initially, a brown spot with surrounding white area (second molar) is the only outward sign of a large cavity extending into the dentine (top). If untreated, the decay extends to the pulp (red central area, bottom)

Four main ways to maintain oral health

Diet

- Reduce consumption and, especially, frequency of intake of food and drink containing sugar
- Food and drink containing sugar should be consumed only as part of a meal
- Snacks and drinks should be free of sugars
- Avoid frequent consumption of acidic drinks

Tooth cleansing

- Brush teeth thoroughly twice daily with a fluoride toothpaste
- Effective plaque removal is essential to prevent periodontal disease
- Tooth brushing alone cannot prevent dental caries, but fluoride toothpastes offer major benefits
- Other aids to plaque removal are a matter for professional advice

Fluoridation

- Request local water company to supply water with optimum fluoride level. Water fluoridation is a safe, equitable, and highly effective public health measure
- Consider use of fluoride supplements for children at high risk and living in areas without water fluoridation

Visiting a dentist

- Have an oral examination every year
- Children and adults at special risk from oral disease, such as those with hyposalivation, or for whom oral disease may be a particular risk to health, such as patients with heart disease, may need more frequent examinations

Modified from *The Scientific Basis of Dental Health Education*; Health Education Authority, 1996

Recommended fluoride dietary supplementation for caries prophylaxis in high risk children in relation to water fluoride content and age

Fluoride in water supply (ppm)*	Child's age			
	<6 months	6 months-3 years	3-6 years	>6 years
<0.3	0	250 µg/day	500 µg/day	1 g/day
0.3-0.7	0	0	250 µg/day	500 µg/day
>0.7	0	0	0	0

*Local district dental officer or equivalent or water company should be able to supply this information

drops or tablets. However, many toothpastes contain fluoride, which is probably largely responsible for the decline in caries in many countries. Children under about 6 years old may ingest toothpaste, so only a pea sized amount of toothpaste should be used and the brushing supervised in order to reduce the risk of fluorosis (excess fluoride in developing teeth).

Fluoride rinses or gels are useful mainly for patients with special needs or those at high risk of caries, such as people with dry mouths.

Fissure sealants

Plastic coatings placed by a dental professional in the pits and fissures of the permanent teeth can help reduce caries.

Oral hygiene

Good oral hygiene can prevent periodontal disease and oral malodour (halitosis). The most important means of maintaining oral hygiene is using a toothbrush: many types are available, and most are effective at removing plaque. Electric brushes may be useful for those with poor manual dexterity. Tooth brushing at least twice daily with a small headed, medium hardness brush will also help reduce caries if a fluoride toothpaste is used.

However, tooth brushing removes plaque only from smooth dental surfaces and not from the depths of contact areas, pits, and fissures; more effective interdental removal requires regular flossing (some flosses also contain fluoride).

Toothpastes containing triclosan (such as Colgate Total) and chlorhexidine (Corsodyl) have antiplaque activity and have been shown to protect against periodontitis without adverse reactions. Products containing phosphates and phosphonates may help prevent calculus, but some have produced adverse reactions. Many "luxury" toothpastes claim a tooth whitening effect, but few have supporting evidence; distinguishing the results of increased diligence in brushing from a genuine whitening effect of the paste is not straightforward.

Overenthusiastic brushing or an abrasive toothpaste can cause abrasion; silica based toothpastes are less abrasive than those with calcium carbonate or aluminium trihydrate bases.

Mouthwashes are a contentious issue. Many are subject to highly competitive advertising and, although legal constraints ensure that claims are never untrue, the impression gained may be optimistic. Many have only a transient antiseptic activity, some can be harmful by causing mucosal reactions, and they can be dangerous to children, who may ingest them. Most effective antiplaque mouthwashes have prolonged retention on oral surfaces by adsorption and then slow desorption with continued antiplaque activity.

Chlorhexidine helps control plaque and periodontal disease but binds tannins and can thereby cause dental staining if the user drinks coffee, tea, or red wine. This can be cleaned off by dental professionals. Listerine has an antiplaque effect from essential oils and does not stain teeth, but it contains alcohol. Triclosan also has an antiplaque effect.

Vaccination against oral disease

Acceptable, reliably successful vaccines against caries or periodontal disease are not available.

Mouth protection

Soft plastic mouth guards, or occlusal splints, may be needed to prevent damage from trauma, as in sports injuries, or bruxism. For patients with acid reflux, bulimia, or alcoholism, antacids or acid reducing agents may be given to help reduce tooth erosion.

- Caries and periodontal disease are largely preventable by lifestyle modification
- Sucrose and refined carbohydrates are the main causes of caries, and frequency of exposure to these is more important than the total amount consumed
- Fluoride reduces caries
- Most toothpastes contain fluoride
- Fluoride rinses help protect the erupted dentition
- Good oral hygiene is essential to prevent gingival and periodontal disease
- Tooth brushing twice daily is required for plaque control
- Most oral antiseptics have only transient effect
- Chlorhexidine, triclosan, and some essential oils have proved antiplaque activity

Toothpastes accredited by British Dental Association 1999

Normal fluoride

- Macleans Freshmint and Coolmint

High fluoride

- Colgate Triple Cool Stripe
- Colgate Ultra Cavity Protection
- Crest Complete

Low fluoride

- Macleans Milk Teeth
- Macleans Milk Teeth Gel

To reduce sensitivity

- Macleans Sensitive

To reduce gingival disease, caries, tartar

- Colgate Total
- Crest Complete

Whitening

- Macleans Whitening Toothpaste

Antiplaque mouthwashes of proved efficacy

Corsodyl

- Contains chlorhexidine
- May cause tooth staining

Colgate Total Plax*

- Contains triclosan with copolymer

Listerine*

- Contains thymol, eucalyptol, methyl salicylate, menthol
- Contains 26.9% alcohol

*Accredited by the British Dental Association

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