

10 Table. Dental Caries Prevention, and Treatment :

I. Background note on dental caries for patients and non-dental clinicians:

Dental caries is a destructive process caused by acid-producing bacteria that become attached to tooth surfaces, called *dental plaque*. The caries process is dependent on the presence of certain sugars from the diet (particularly sucrose), which the bacteria attached to the teeth utilize to produce acids. The acids gradually dissolve those portions of the teeth that are covered by dental plaque through a process of demineralization.

Decreased salivary function is thought to contribute to the dental decay process via diminished: intraoral buffering capacity; ability to physically wash away dental plaque and associated bacteria; levels of salivary antibacterial enzymes and proteins.

A higher risk for dental caries is seen in patients who have:

- reduced or abnormal saliva from a disease (e.g. Sjögren's syndrome),
- have had radiation to their head and neck for treatment of a malignant tumor (cancer),
- are regularly taking one or more prescription drugs that have a side-effect of reducing salivary secretion.

Caries can be prevented and the process of *remineralization* promoted by a combination of

- daily application of fluoride to the teeth (e.g. fluoride-containing tooth paste),
- daily removing the bacterial plaques from tooth surfaces (*i.e.* tooth brushing and use of dental floss) and
- reducing acid production in dental plaque by controlling the intake of dietary sugars (e.g. eliminating sugar intake between meals).

For patients at high risk of caries, the same principles are applied with greater frequency, using higher concentrations of fluoride, and ancillary procedures, as outlined below.

II. Dental Caries Prevention and Treatment:

A. Diet. Each patient needs to understand the role of dietary sugars in dental caries development. High caries risk patients must eliminate dietary sugar (e.g. sucrose, glucose, and fructose) intake between meals. When recommending or purchasing commercial products, they should be labeled "*sugar-free*" (not

“sugarless”, which usually contain “less” sugar). However, under labeling regulations, “sugar-free” products may contain a small percentage of sugar (Food and Drug Administration, 2007).

Between-meal snacks that contain non-cariogenic sweetening agents should be safe: e.g. xylitol, sorbitol, saccharin, aspartame, or sucralose. Packaged sweeteners such as Sweet n’ Low, Nutrasweet and Sucralose contain a cariogenic bulking agent (dextrose), which is added to make their physical properties similar to sugar. Xylitol has a compound anti-carries effect because it is not metabolized by cariogenic bacteria (*i.e.* do not lead to acid production) and may shift the intraoral bacterial population to one that is less cariogenic.

B. Oral hygiene. Each patient needs to learn how to effectively remove dental plaque.

This includes the use of disclosing agents (e.g. Red Cote®, 2 Tone Disclosing Tablet/Solution, Hurriview® Snap and Go®, Agent Cool Blue Tinting Rinse®) that stain dental plaque on the teeth to make it visible and focus the correct use of a toothbrush and dental floss for removing it. Twice-daily tooth brushing with a fluoride-containing toothpaste and daily use of dental floss between all adjoining teeth are necessary to adequately remove dental plaque. For patients with limited dexterity (because of arthritis or other hand disability), electric toothbrushes, irrigators or supplementary oral hygiene aids may be helpful.

C. Topical fluoride can be professionally applied and patient-applied. In addition to the patient using an over the counter fluoride-containing dentifrice (0.1% or 0.15% fluoride) twice daily, patients at high risk for developing caries should receive supplemental forms of fluoride applied to the teeth.

- At **dental office visits**, a high-concentration fluoride can be applied, such as 1.23% acidulated phosphate fluoride gel or foam (many brands are available) for 4 minutes in a tray, or 2.25% fluoride varnish (Duraphat®, Duraflor®) directly onto the teeth. These applications can be repeated every 6 months, or more frequently if necessary.
- Patients should be given specific instructions on the use of **self-applied** fluorides and their application demonstrated to the patient. The methods to be used depend on the severity of the patient's caries experience and/or the degree of salivary hypofunction:
- Patients at **low to moderate risk** of caries should use a 0.05% sodium fluoride mouth rinse (available over-the-counter) for 1-2 minutes daily, before sleep. Note that some brands contain alcohol, which may be uncomfortable to those with salivary dysfunction. The fluoride rinses developed for children tend to be alcohol-free.
- Patients at **high risk** of caries should apply 1.1% neutral (pH=7) sodium fluoride gel (available only by prescription) in custom-made trays for 5 to 10 minutes. The frequency of this application can range from weekly to daily,

depending on the frequency of recurrent caries. Immediately after tray removal, patients should floss between all teeth to carry fluoride to the adjoining dental surfaces. This is best done just before going to sleep. Alternatively, if necessary for increased compliance, a neutral sodium fluoride dentrifice may be prescribed (Prevident®5000 Plus or Prevident ®5000 Plus, Dry Mouth). The dentrifice may be less effective than tray-applied gel because the contact time with the teeth is lessened.

D. Oral pH. Because dental erosion and caries are acid-dependent process, the overall oral pH is important. Normal saliva has substantial *buffering capacity* (i.e. the ability to stabilize the salivary pH), but this is significantly decreased in those individuals who have the most severe salivary dysfunction. The critical pH has been defined for dental enamel at ~5.5 and for the root surface at ~6.3. Acids may come from endogenous sources (e.g. gastric reflux, bacterial metabolism) or exogenous (e.g. carbonated beverages, sports drinks, flavored waters, juice). Strategies to increase salivary buffering capacity include the use of bicarbonate mouth rinses (CariFree® Maintenance Rinse), toothpastes, chewing gum (Orbit® White; Anderson and Orchardson, 2003) and extended release bicarbonate lozenges (Salese®).

E. Remineralizing agents

These agents deliver calcium and phosphate to the tooth surface to begin restoration of demineralized areas (Spolsky, 2007). This approach can be effective, but only after the causes of demineralization are brought under control. There are currently four technologies available on the market:

- *Calcium phosphopeptide and amorphous calcium phosphate* (Recaldent®; GC MI Paste with Recaldent®, Trident gum with Recaldent®)
- *Calcium sodium-phosphosilicate* (Novamin®; Dr. Collins Restore and Remineralizing Toothpaste)
- *Amorphous Calcium Phosphate* (Arm and Hammer patented liquid calcium)
- *Arginine bicarbonate and calcium carbonate* (Sensistat®)

F. Dental restoration.

In individuals with chronic salivary dysfunction, the goal is to slow or stop the accelerated cycle of caries, restoration, and restoration failure. To stop this cycle, only conservative intracoronal restorations should be placed initially, with the goal of simply removing carious tooth structure followed by an esthetic restorative material.

The possibility of repairing an existing restoration, to preserve maximal tooth integrity, should be considered. Light-cured glass ionomer cements should be used where practical, because they release fluoride and are more resistant to marginal decay

G. Subgingival margins and full coronal coverage should be avoided wherever possible for initial treatment of these patients.

This is because subgingival margins are the most common location of caries in individuals with salivary hypofunction. In addition, the location is less accessible to topical fluoride and early caries is more difficult to detect and restore in these areas. Full veneer crowns, if ultimately necessary, should *not* be placed until caries is under control (*i.e.*, the patient has been free of new carious lesions for at least one year).

H. Recall examinations. At each recall visit, visual examination of dental surfaces should be supplemented with bite wing radiographs as needed, and the oral mucosa should be examined for signs of candidiasis (see below). The patient's dental plaque control should be reassessed by *in vivo* staining, and the importance of plaque control techniques should be reinforced. The amount of salivary *S. mutans* can be monitored (as noted above) and chlorhexidine rinse prescribed again as needed.