Current Concepts in Preventive Dentistry

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Continuing Education Units: 5 hours

This course includes areas of prevention that are important for the dental professional to assess during your patients’ dental examinations. Dentistry includes many different preventive practices, such as prophylaxis, fluoride treatments, full-mouth and bite-wing radiographs, sealants and other forms of primary preventive treatments used to detect dental caries and periodontal disease early.

Overview
It is difficult to believe that preventive dentistry has only been in practice for approximately forty years. Prior to the 1960’s, dentistry entailed mostly emergency appointments and extraction of teeth. Today, dentistry includes many different preventive practices, such as prophylaxis, fluoride treatments, full-mouth and bite-wing radiographs, sealants and other forms of primary preventive treatments used to detect dental caries and periodontal disease early. This course includes areas of prevention that are important for the dental professional to assess during your patients’ dental examinations.

Learning Objectives
Upon the completion of this course, the dental professional will be able to:
• Identify the two bacteria most often associated with dental caries.
• Understand terms used in caries prediction.
• Understand the caries process.
• Explain the general approach of caries risk assessment.
• Determine the cause of each pathology.
• Identify the typical visual cues for each pathology.
• Know useful clinical information for each pathology.
• Describe treatment for each pathology.
• Understand clinical significances of each pathology.
• Explain the recommended treatment plan for cancer patients.
• Define dental plaque.
• Explain the process of plaque formation.
• Discuss manual and powered toothbrushes.
• Describe the various toothbrushing techniques.
• Identify the correct toothbrushing technique for the individual patient.
• Describe the two flossing methods.
• Identify which patients require auxiliary aids.
• Identify multiple sources of fluoride.
• Determine on an individual basis if a patient needs a professional fluoride application.
• Differentiate between pre-eruptive and post-eruptive fluoride.
• Identify the three types of professional fluoride.
• Understand the concept of fluoride uptake in enamel.
• Discuss root surface caries treatment options.
• Describe the application of fluoride.
• Discuss fluoride varnishes.
• Identify foods that are considered cariogenic.
• Identify foods that are considered to be non-or low-acidogenic.
• Discuss soda consumption in the United States.
• Identify the criteria for selecting teeth for sealant placement.
• Identify the two types of sealant material.
• List the four commandments for successful sealant retention.
• Describe the sealant procedure.
• Identify sports that should use mouthguards.
• Identify which types of jaw fractures are more common.
• Identify which type of crown and root fractures are more common.
• Describe the treatment necessary when an emergency occurs with primary teeth.
• Describe the treatment necessary when an emergency occurs with permanent teeth.
• List the types of soft tissue dental injuries that can occur with sports.
• Identify the types of mouthguards available.

Course Contents
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Glossary
acidogenic – acid producing
carcinogenic – a cancer causing agent
cariogenic – a caries causing agent
chronic – of long duration
circumscribed – to confine within boundaries
demineralize – a process by which mineral components are removed from mineralized tissues
diastema – abnormally large space between teeth
enamel – the outer surface of the crown of the tooth
etiology – the study of the cause of a disease
expectorate – to spit
localized – confined to a specific area
metastasis – transmitting from one area of the body to another
neoplasm – abnormal growth of tissue; tumor
papilla – gingiva in the interproximal spaces
papillomavirus – viruses that cause benign epithelial tumors
paresthesia – abnormal or impaired skin sensation
pathology – study of the nature of a disease; abnormal manifestations of a disease
periodontal – tissues surrounding the teeth
plaque – a soft deposit on the teeth
polysaccharides – a group of nine or more monosaccharides joined together
premalignant – precancerous
prognosis – a prediction of the outcome of a disease
remineralization – a process enhanced by the presence of fluoride whereby partially decalcified tooth surfaces become recalcified by mineral replacement
subgingival – below the gingiva
sucrose – a type of sugar
sulcus – groove or depression
systemic – affecting the entire body
supragingival – above the gingiva
ulcerated – to form an ulcer
ventral – lower surface of the tongue

Caries Risk Assessment
Dental caries is defined as a *transmissible* localized infection caused by a multi-factorial etiology. In order for dental caries to develop, four interrelated factors must occur:
1. the patient’s (host) diet must consist of repeated digestion of refined carbohydrates,
2. the host’s resistance to disease is decreased,
3. the factor of time, and
4. there must be a specific bacteria (*Streptococci* or *S. mutans*) present in the dental plaque.

The *S. mutans* play an active role in the early stages of the caries process, whereas the bacteria lactobacilli contribute to the progression of the lesion. Without bacteria, no caries can develop. Carious lesions must be diagnosed in conjunction with both a clinical examination and radiographs to verify suspicious lesions – especially interproximal lesions.

Enamel is the most highly mineralized hard tissue in the body. The enamel matrix is made up of a protein network consisting of microscopic mineralized hydroxypatite crystals arranged in rods or prisms. The protein network facilitates the diffusion of fluids, such as calcium and phosphate ions distributing these ions throughout the enamel. As carbohydrates are consumed by the host, the carbohydrates are broken down in the oral cavity by the protein enzyme amylase. This reaction causes an acid to be produced, thereby demineralizing the enamel matrix. If the demineralization of enamel is not reversed by the action of fluoride, calcium and phosphate ions, then the demineralization process continues further into the tooth structure, affecting the dentinoenamel junction (DEJ) and eventually the dentinal layer. The term “overt or frank” caries is used when it reaches the DEJ.

A carious lesion develops in three stages of demineralization. The first stage in demineralization of enamel is called the incipient lesion or “white spot” (Figure 1). This beginning carious lesion can be reversed with the daily use of fluoride, persistent oral hygiene care, and a reduction of refined carbohydrates. The second stage involves the progression of demineralization leading to the DEJ and into the dentinal layer. The third stage is the actual cavitation in the dentinal layer. Neither of the last two stages can be reversed and require mechanical removal of dental caries.

There are three levels of preventive dentistry that the dental professional should be aware of and understand when educating patients in the
In mineral content (calcium and phosphate), making them more susceptible to bacteria. By introducing antimicrobial agents, such as over-the-counter ADA-approved Listerine® or prescription chlorhexidine antimicrobials, such as Peridex® or Periogard®, the bacterial count may be significantly reduced.

**Prevention Step Three - Demineralization of Enamel**

When refined carbohydrates are introduced into the oral cavity, lactic acid production occurs, causing the saliva pH to drop from a neutral pH of approximately 7 to an acidic pH of 4.5-5.0. This metabolizing acidogenic bacteria begins to demineralize the enamel. Common reasons for the prolonged acid conditions include: increased carbohydrate intake, reduced clearance of acid due to low saliva content (hyposalivation or xerostomia), impaired saliva pH buffer capacity, and plaque accumulation due to insufficient oral hygiene care. The more acidogenic bacteria present, the more acid produced.

When saliva is released into the oral cavity via the salivary glands, the pH of the saliva returns to normal or an approximate pH of 7 and a period of remineralization (repair) occurs. This process is facilitated if fluoride or calcium and phosphate ions are present locally. The balance between demineralization and remineralization is crucial. If the balance is not maintained and demineralization occurs too frequently, then an incipient lesion will occur. This incipient or ‘white spot’ lesion may take up to approximately 9 months or more to be seen radiographically as a radiolucency or dark spot on a bite-wing radiograph.

**Carious Lesions Occur in Four General Areas of the Tooth**

- Pit and Fissure Caries (Figure 2) Includes Class I occlusal surfaces of posterior teeth, lingual pits of maxillary incisors, buccal surfaces of mandibular molars.
- Smooth Surface Caries & Interproximal Surface Caries (Figure 3) Includes Class V buccal, lingual surfaces of anterior and posterior teeth and Class II interproximal surfaces of all teeth below the interproximal contact points.
- Root Surface Caries (Figure 4) A more common lesion now found clinically, due to patients keeping their teeth longer.
• Secondary or Recurrent Caries (Figure 5)
  Includes caries seen adjacent to or beneath an existing restoration.

By definition, caries risk assessment is to predict future caries development before the clinical onset of the disease. Risk factors are the life-style and biochemical determinants that contribute to the development and progression of the disease. Examples of patients who are at risk include those with certain socioeconomic factors (low education level, social deprivation, low income, low self esteem), those with certain factors related to general health (diseases, a physically or mentally compromised individual), and those with epidemiologic factors (living in a high-caries family or having a high past-caries experience).

The key to dental caries risk assessment is to determine the possible risk factors and establish an individual treatment plan for each patient.

Each of these categories must be addressed at each annual dental examination to determine risk assessment. A written report should be placed in the patient’s chart. Oral instructions at their appointment and also written instructions are given to the patient before they leave indicating their home care instructions.

Skin, Lip & Oral Cancer

Introduction
The patient must be screened for oral cancer at the initial appointment and each routine dental examination by performing an extraoral and intraoral examination. Radiographs are normally prescribed based on an individual’s diagnoses, but suspicious areas in the oral cavity may require additional radiographs. There are various types of pathology lesions found in the oral cavity and the head and neck regions. Even though the dental assistant cannot diagnose lesions, the dental assistant should be educated in oral pathology to ‘interpret’ lesions when assisting the dentist in his or her diagnosis. Four categories are explained in this course. Each dental facility should have oral pathology books and/or online resources with color photographs available for the dental professionals to assist with diagnoses.

Four Types of Pathologies
• Candidial Leukoplakia (Chronic Hyperplastic Candidiasis) – “White Lesion”
• Erythroplakia – “Red Lesion”
• Squamous Cell Carcinoma
• Malignant Melanoma

*Candidal Leukoplakia (Chronic Hyperplastic Candidiasis) – “White Lesion”*

**Etiology** – an infection of the oral mucosa caused by fungus; candida albicans or infected epithelial tissue, which becomes hyperplastic with a formation of excess surface keratin (callused).

**Typical Visual Cues** – a circumscribed white plaque found at the site of fungal infection that will not rub off with gauze, most often found on the anterior buccal mucosa adjacent to the commissure (corner of the mouth); may occasionally be found at the lateral border of the tongue.

**Useful Clinical Information** – more common in adults, considered a painless and persistent lesion.
Treatment Recommendations -- antifungal agents for treatment of oral candidiasis, such as Mycostatin Nystatin, Mycelex clotrimazole, or Fungizone amphotericin B. Systemic antifungal agents for chronic candidiasis include: Nizoral Ketoconazole, Diflucan Fluconazole or Sporanox Itraconazole.

Clinical Significance -- oral lesions found in tobacco users should be viewed with increased suspicion

Erythroplakia -- “Red Lesion”
Etiology -- a significant risk factor to the oral mucosa is chronic exposure to carcinogenic components found in all types of tobacco. The other common risk factor is chronic alcohol exposure. Even worse is a combination of both.

Typical Visual Cues -- a circumscribed, or ill-defined, erythematous plaque that varies in size, thickness and surface configuration. It has a velvety appearance and occurs most frequently on the floor of the oral cavity, ventral area of the tongue and the soft palate.

Useful Clinical Information -- a painless and persistent lesion, found more commonly in adult males and patients who report tobacco exposure.

Treatment Recommendations -- the patient should be counseled in a tobacco cessation program if biopsies reveal that the lesion is premalignant. Then, a more extensive therapy is indicated and the patient should be re-evaluated at regular intervals for other oral mucosal changes.

Clinical Significance -- erythroplakia occurs less frequently than leukoplakia, but it is much more likely to exhibit microscopic evidence of premalignancy.

Squamous Cell Carcinoma
Etiology -- idiopathic (unknown). Risk factors include: tobacco use, alcohol use, sun radiation, genetic predisposition, nutritional deficiency, immunosuppression, and infections, such as candidal leukoplakia and human papillomavirus.

Typical Visual Cues -- a deep-seated ulcerated mass, fungating ulcerated mass, ulcer margins commonly elevated, adjacent tissues commonly firm to palpation, and may have residual leukoplakia and/or erythroplakia.

Useful Clinical Information -- more common in adult males, continuous enlargement, local pain, referred pain often to the ear, and paresthesia often of the lower lip.

Treatment Recommendations -- patient should be counseled to stop tobacco use and given a referral to a local medical treatment facility for appropriate treatment (surgery, radiation therapy, chemotherapy), and a careful periodic re-evaluation.

Clinical Significance -- early diagnosis is essential for cure, presence of lymph node metastasis greatly worsens the prognosis, approximately 50% of patients have evidence of lymph node metastasis at time of diagnosis (that is why the extraoral examination is so critical at the time of each intraoral examination), and
patients who have had one cancer are at greater risk of having a second oral cancer.

**Malignant Melanoma**

**Etiology** – a malignant neoplasm of melanin-producing cells. Chronic exposure to sun radiation and a fair complexion increases the risk for skin lesions.

**Typical Visual Cues** – larger than 0.5 cm in diameter, irregular margins, irregular pigmentation, any change in pigmentation, ulceration of the overlying mucosa, macular (superficial spreading) or elevated (nodular), and most often occurs on gingiva and the palate.

**Useful Clinical Information** – occurs most often in adult males, usually painless, rapidly enlarging.

**Treatment Recommendations** – refer to a local medical treatment facility for the appropriate surgery and chemotherapy.

**Clinical Significance** – malignant melanoma is an extremely aggressive form of cancer, early diagnosis is essential for cure, patients with oral mucosal lesions generally have a poor prognosis.

**Oral Management for the Cancer Patient**

**Bacterial Plaque Control**

Start oral hygiene instruction at first appointment and emphasize preventive infection control procedures and potential oral side effects associated with cancer therapy. Toothbrushing instructions include using a soft toothbrush; a flavored dentifrice may not be tolerated, but fluoride is essential. Mouthrinses include saline solution or baking soda throughout the day. Chlorhexidine gluconate rinsing may also be recommended for antibacterial properties. Commercial mouthrinses that contain alcohol should be avoided.

**Daily Fluoride Therapy**

Daily fluoride therapy is indicated for patients about to undergo head and neck radiation therapy, if the salivary glands are in the field of radiation. Make impressions and fabricate a custom fluoride tray, advise the patient to apply custom trays lined with prescription neutral sodium fluoride gel to the teeth for four minutes once daily or use brush-on fluoride method if trays are not feasible. Advise patient to refrain from eating, drinking, or rinsing for 30 minutes following fluoride application.

**Dietary Instructions**

Instruct the patient in the preparation of foods. Avoid highly cariogenic foods such as carbohydrates and also spicy foods. A soft, bland diet is recommended. Water is recommended throughout the day to moisten the oral cavity.

**Avoid Alcohol and Tobacco Products**

A logical step for the cancer patient is to start tobacco cessation counseling. See the ADAA continuing education course on tobacco cessation for further recommendations.

**Oral Hygiene Education**

**The Development of Dental Plaque**

Plaque is a biofilm that contributes to two oral diseases: dental caries and periodontal disease. It has a negative surface charge that attaches to
the host surface enamel or gingiva. The initial layer or formation of plaque is called the acquired pellicle. This layer will reform within two hours after removal and will also form on artificial prosthesis, such as dentures. It takes only two days for plaque to double in mass. Plaque requires the following to metabolize: Streptococci mutans and a processed carbohydrate. The end product is lactic acid, intracellular polysaccharides and extracellular polysaccharides. When plaque is not removed from the oral cavity it will mineralize and become calculus. This mineralized formation is formed by calcium and phosphates in the saliva and it has been found that tobacco use accelerates the formation of calculus.

**Manual versus Powered Toothbrushes**

Both manual and power toothbrushes can effectively remove plaque if patients use correct technique and brush for an adequate time period (Figures 10, 11). Certain toothbrush designs, however, provide more effective removal than others. Some studies show oscillating-rotating power brushes can be more effective at plaque removal than manual brushes. Power toothbrushes were shown to be as safe to use as manual toothbrushes if used properly.

There are several manual toothbrushing techniques. They include the horizontal scrub, Bass, Stillman, Charters, and Fones, to name a few. The most popular method that an uneducated patient uses is the horizontal scrub. Unfortunately, gingival and enamel damage can occur with aggressive strokes and too firm of bristles. The Stillman method is used for massage and stimulation of the gingiva with a 45 degree angle of the bristles and a vibratory/pulsing method. The Charter method also involves a 45 degree angle with the bristles and a rotary or vibratory motion forcing the bristles interproximally. The Charter’s method can be recommended for orthodontic patients to clean ortho brackets and bands.

A preferred method for adults is the Modified Bass Method (Figure 12). This method was the first to focus on the removal of plaque and debris from the gingival sulcus with the combined use of the soft toothbrush and dental floss. The method is effective for removing plaque at the gingival margins and controlling plaque that leads to periodontal disease and caries. In the Bass technique, the toothbrush is positioned in the gingival sulcus at a 45-degree angle to the tooth apices. A vibratory action, described as a back-and-forth horizontal jiggle, causes a pulsing of the bristles to clean the sulcus. The term ‘modified’ indicates a final ‘sweep’ with the toothbrush toward the occlusal surfaces to remove debris subgingivally. Ten strokes are recommended for each area.

For children, the rotary method called the Fones technique (Figure 13) is preferred since children do not have the manual dexterity for a more advanced technique. The Fones technique is a
circular method similar to the motion of the old rotary telephone. The teeth are clinched and the toothbrush is placed inside the cheeks. The toothbrush is moved in a circular method over both the maxillary and mandibular teeth. In the anterior region, the teeth are placed in an edge-to-edge position and the circular motion is continued. Children adapt to this technique rather quickly.

There are many powered toothbrushes available on the market, including the Oral-B Triumph® and the Philips Sonicare FlexCare®. There are also less expensive powered toothbrushes available from Oral-B, Colgate, Church & Dwight, and other manufacturers for patients to try. Studies have shown powered toothbrushes an excellent tool for all patients, particularly those with low manual dexterity or physical limitations. The larger handle is ideal for patients who cannot grip the smaller manual toothbrush handles, such as patients with arthritis or stroke victims. The patient should be encouraged to try both manual and powered toothbrushes and determine which is best for them.

Whichever toothbrush is used, the patient should be taught to remove plaque in a sequential order when brushing to make sure they don’t skip any surface areas of the enamel or exposed cementum. The patient should be shown in the mirror the proper technique and their instruction should also include brushing their tongue to remove debris and bacteria. The patient should show that they understand their oral hygiene instruction by demonstrating it back to the dental professional. A combination of oral and written instructions are always preferred. Studies have shown that too much instruction at one time is overwhelming for the patient and they will not adopt new habits unless they understand and believe that they have value and are important.

Auxiliary Aids

Dental Floss and Flossing Methods
There are many different types of floss or tape on the market: waxed vs. unwaxed, mint vs. cinnamon or bubblegum, floss vs. floss holders or floss threaders. Many patients will ask: “Is waxed floss or unwaxed floss better?” The answer should be simply, “I’m glad you’re flossing. It’s whatever you prefer.” Some studies indicate that waxed floss is preferred because it gets through the contact points easier. Other studies indicate that dental professionals are concerned with the amount of wax that may accumulate in the gingival sulcus.

Another question patients ask frequently is, “Do I floss before or after brushing?” Again, it doesn’t matter. As long as they are flossing properly, dental professionals are thrilled. The point of brushing and flossing is plaque removal. By removing the irritant plaque and reducing the bacterial count in the saliva, the patient is making a significant difference in preventing caries and periodontal disease.

There are two flossing methods available to teach your patients. One is the circle or loop method and the other is the spool method. The circle or loop method is preferred for children or any patient with low manual dexterity. A piece of floss approximately 18 inches long is tied at the ends to form a loop or circle. The patient uses the thumb and index finger of each hand in various combinations to guide the floss interproximally through the contacts. When inserting floss, it is gently eased between the teeth with a seesaw motion at the contact point, making sure not to snap the floss and cause trauma to the gingival papilla. Once through the contact area, gently slide the floss up and down the mesial and distal marginal ridges in a C-shape around the tooth directing the floss subgingivally to remove the debris.

The spool method (Figures 14 A-C) utilizes a piece of floss approximately 18 inches long where the majority of the floss is wound around the middle finger of one hand and a small
amount of floss around the middle finger of the opposite hand. The same procedure is followed as the loop method when positioning the floss interproximally. After each marginal ridge is cleaned, the used floss is moved or spooled to the other hand until all supragingival and subgingival areas have been cleaned, including the distal areas of the posterior teeth.

Patients with bridges or fixed prosthesis should be encouraged to use superfloss (Figures 15, 16) or other floss threaders in conjunction with dental floss to remove debris. The floss is threaded underneath the prosthesis to remove any debris caught underneath. Patients should be instructed on their use and again asked to demonstrate to the dental professional that they understand and know how to use it.

Floss holders (Figure 17) are an alternative if the patient has difficulty flossing manually or for a patient with large hands, physical limitations, a strong gag reflex, or low motivation for traditional flossing. A floss holder is a good alternative to not flossing at all and should be shown to patients as a means of removing plaque.

**Toothpicks or Wooden/Plastic Triangular Sticks**

If your patients have large diastemas or food impaction areas, they should be encouraged to utilize interproximal sticks such as stimudents. Made of balsa wood, stimudents are used to remove debris and plaque, and are preferred by dental professionals over standard toothpicks because toothpicks can splinter into the gingiva and damage the gingival tissue. If patients do not have access to floss, they can use the wooden balsa sticks to remove plaque and stimulate the gingiva (Figure 18).

**Interproximal and Uni-tufted Brushes**

These small interproximal brushes are attached to handles and are used for large spaced interproximal areas and for orthodontic patients to use between their brackets to remove debris. There are a variety of brushes available, including travel sizes for pockets and purses. The brushes are tapered for easy access to difficult areas and patients seem to adapt well to instructional use (Figure 19).
Fluorides

Introduction
Both community water fluoridation, known as systemic or pre-eruptive fluoride and topical fluoridation called post-eruptive fluoride have proven to be an important mechanism in preventing dental caries in the United States since the 1950’s. Through studies, researchers have discovered that not only has water fluoridation contributed to the decline in dental caries, but also the post-eruptive effect of fluoride has played an even more vital role in reducing dental caries.

Current Theories Regarding Fluoride Use
The current theory is that multiple sources of fluoride, especially daily use of fluoride-containing dentifrices, have significantly reduced the dental caries level in the United States. Multiple sources of fluoride include: added fluoride to city water sources; naturally occurring water fluoride in well water; fluoridated dentifrices (toothpastes); over-the-counter mouthrinses; processed food and beverages at manufacturing plants that utilize fluoridated city water; prescription rinses, gels, pastes, and tablets; professional fluoride varnish applications; and both in-office and at-home topical fluorides. Due to the various types of fluoride available, this consistent application of fluoride to enamel has reduced dental caries and has significantly changed how dentistry is practiced today.

By current convention, many dental professionals administer professional topical fluoride treatments to patients at their preventive maintenance appointments. However, is this routine procedure necessary for every patient? Although concentrated topical fluoride treatments usually are intended for annual or semiannual prophylaxis visits, a decline in caries prevalence now is bringing into question the continuing need for such treatment in individuals who are caries-free. The decision to use a professionally applied topical fluoride should be based on scientific evidence as well as practical consideration.

Some researchers note current recommendations regarding the application of professional topical fluoride gels. The decision to apply a professional fluoride treatment should be suggested on an individual basis with determining factors based on the level of fluoride in the drinking water, the patient’s age and caries activity level – regardless of living in a fluoridated or non-fluoridated community – and the exposure time of the fluoride treatment.

Since current practice is to deliver a topical fluoride system to every young patient, the dental profession is faced with an ethical quandary when dealing with this issue. If a patient does not show evidence of active caries, should the patient be given a professional fluoride treatment at the prophylaxis appointment? With exposure to so many outside sources, the patient may be receiving adequate amounts of fluoride to maintain a caries-free condition without routinely scheduled professional fluoride applications. These frequent exposures to low concentrations
of fluoride, as received from toothpastes, are more effective in the prevention of decay than infrequent exposures to high concentrations of fluoride, as received from professional treatments. Recommendations to use topical fluoride applications on your patient should be determined by whether or not the patient is exposed to multiple sources of fluoride or has other caries risk factors.

**Pre-eruptive vs. Post-eruptive Fluoride**
At the time of tooth eruption, enamel is not quite completely calcified and will undergo what is now called the *post-eruptive* period (formerly known as the topical effect) that will take approximately two years. Throughout this enamel maturation period, fluoride continues to accumulate in the outer surfaces of the enamel. This fluoride is derived from the saliva, as well as exposure to fluoride-containing products such as food and beverages. Most of the fluoride incorporated into the developing enamel occurs during what is now called the *pre-eruptive* (formally known as the systemic effect) period of enamel formation, but also occurs topically during the *post-eruptive* period of enamel maturation.

**Types of Professional Fluoride**
The three types of fluoride available for the dental professional to use to prevent or reduce caries are 2% or 5% neutral sodium fluoride (NaF), stannous fluoride (SnF₂, and 1.23% acidulated phosphate fluoride (APF). Sodium fluoride, which is available in powder, gel, foam and liquid (varnish) form, forms calcium fluoride in enamel after use. Sodium fluoride’s main benefit is not etching porcelain and ceramic restorations. Stannous fluoride is available in powder form in bulk and pre-measured capsules. Its use results in the formation of calcium fluoride and stannous fluorophosphate in enamel. Due to several disadvantages, including a bitter, metallic taste and a difficult preparation of use, stannous fluoride is typically not used for caries alone, but it does provide anti-gingivitis and anti-sensitivity benefits.

One of the most popular operator-applied professional fluoride methods is by disposable mouth trays using a 1.23 percent APF gel or foam. This procedure offers a method that is convenient to use and is tolerated well by patients. Topical fluoride can also be applied by “brushing it” on the teeth, especially with small children. However, tray use seems to be the most effective and practical method for child and adult use.

**One Minute vs. Four Minute Fluoride Applications**
Some researchers have suggested using a professional fluoride application at a decreased exposure time to minimize excess exposure to high-concentration levels of fluoride. Many “one-minute” topical fluoride gels have been introduced in recent years. Studies conducted in 1987 and 1988 by Wei proved that fluoride uptake in enamel is time-dependent due to a diffusion-controlled process and that it should be left on the teeth for the four minutes.

Upon examining current information on this topic, dental professionals need to determine if professional topical fluoride applications are appropriate for all their patients, based on caries risk factors.

**Gel Fluoride vs. Foam Fluoride Applications**
In 1988, Wei examined whether a foam-based APF agent was as effective as APF gel. It was found that the foam-based agent is lighter than gels and will fill a topical fluoride tray with much less weight, and hence, the total amount of fluoride ingested could, potentially, be decreased. Wei’s results indicated that the foam was as effective as gel in the fluoride uptake in enamel. However, since the foam-based APF agent is much lighter than the conventional gel, and only a small amount of the agent is needed for a topical application, it is cost-effective and more acceptable to the patient. The amount of conventional gel needed to treat the mouth is about four grams while foam-based APF requires less than one gram to fill a disposable upper and lower gel tray.

**Individual Patient Treatment Options**
Garcia-Godoy, et al, recommend that for patients with active and rampant caries topical fluoride applications should be done more frequently – on a quarterly basis – regardless of whether the patient ingests optimally fluoridated water. Note that a professional prophylaxis is not needed prior to the application of professional topical
fluoride products because fluoride uptake and caries inhibition are not improved by a prophylaxis. Also, the use of a fluoride prophylaxis paste does not indicate a professionally applied fluoride application. With this type of patient, Stookey and Beiswanger indicate that the teeth should be exposed to the fluoride for four minutes for maximum cariostatic benefits with caries-active patients, whether it is APF or sodium fluoride. Moreover, the patient with rampant caries should not only receive topical fluoride treatment on a quarterly basis, but will require a home fluoride-treatment program as well. The patient with active caries requires professionally applied fluoride applications at least twice a year. If a patient ingests sufficient fluoridated water and is caries free, then a topical fluoride treatment is not necessary. There is little fluoride deposition lasting more than 24 hours when fluoride is applied to sound, fully matured enamel. Therefore, there appears to be no preventive benefits from the application of fluoride to adult patients with sound enamel.

Root Surface Caries on the Rise
Root surface caries has increased due to the increased retention of teeth during adulthood thanks to various caries-preventive measures and patients living longer. About one-half of U.S. adults are affected with root surface caries by age 50, with an average of about three lesions by age 70. Fluoride is very effective in preventing root surface caries. Results of studies have demonstrated that the presence of fluoridated drinking water throughout the lifetime of an individual prevents the development of root surface caries. Furthermore, it has been observed that the use of NaF dentifrice results in a significant decrease in root surface caries of more than 65%. There has not been much data collected on professional topical applications affecting root surface caries. But in a preclinical model, all three approved topical fluorides decreased the formation of root caries by 63% to 76%.

Fluoride Application
No matter which fluoride is utilized, when applying a fluoride via tray form, the dental professional should be aware of the following:

1. use only the required amount of fluoride to perform the treatment adequately,
2. position the patient in an upright position,
3. use efficient saliva aspiration,
4. request the patient expectorate thoroughly on completion of the fluoride application,
5. ask the patient to not eat, drink or smoke anything for approximately 30 minutes. This procedure reduces the amount of inadvertent swallowing to less than 2 mg of fluoride, which has shown to be of little consequence.

Fluoride Varnishes
Although fluoride varnish has been used in Europe and Canada for many years, fluoride-containing varnishes have only become popular in the United States as an anti-caries agent and not just as a desensitizing agent. Recently, the benefit of fluoride varnish has become more apparent to dental professionals. Fluoride varnish has been used in public health settings as a much-needed concentrated-treatment of fluoride for children with high-caries rates. Dental professionals in private practices have started using it for their very young patients, as appropriate. In 2004 the ADA Resolution 37H stated “the ADA supports the use of fluoride varnishes as safe and efficacious within a caries prevention program that includes caries diagnosis, risk assessment, and regular dental care”. The resolution also encourages the FDA “to consider approving professionally applied fluoride various reducing dental caries, based on the substantial amount of available data supporting the safety and effectiveness of this indication”. Most varnishes contain 5% sodium fluoride with only .3-.5 ml of the varnish being applied. The application includes starting with clean tooth surfaces and painting the varnish on the teeth (Figure 20), after drying the tooth surface. The varnish should be left on the tooth surface for 24 to 48 hours, as the fluoride continues to be released into the enamel. The patient should be instructed not to brush the area for 48 hours. The fluoride varnish recommendations include reapplying at 4 to 6 month intervals. Fluoride varnish is an important dental therapy for class III high-risk patients.

Diet and Dental Caries
Introduction
A number of studies have shown a clear relationship between fermentable carbohydrate consumption and dental caries. The amount of sugar in the diet is not as important in caries progression as the
Carbonated soft drinks are big business in the United States. Since 2003 the market share has been decreasing slightly, despite the efforts of the industry to keep sales high. Frequent consumption of soft drinks has long been known to contribute to dental caries. Americans consume soda at an annual rate of about fifty-six gallons per person, which is about six hundred twelve-ounce cans of soda per person per year.

A non-diet soft drink is made from carbonated water, added sugar and flavors. Each can of soda contains the equivalent of about ten teaspoons, or 40 grams, of sugar. Mountain Dew® is so popular in the United States that the coined phrase “Mountain Dew Mouth” is now a recognized term used by the dental profession for patients diagnosed with rampant caries and/or erosion.

**Pit & Fissure Sealants**

**Introduction**

Sealants have been endorsed by the American Dental Association (ADA) and the United States Public Health Service as being effective in preventing pit and fissure caries. Pit and fissure caries accounts for over 80% of active caries in children; however, these surfaces make up only 15% of the total tooth surfaces. Sealants must not be overlooked as another form of preventive dentistry, along with plaque control, fluoride therapy and sugar discipline.

**The Criteria for Selecting Teeth for Sealants**

The criteria for selecting teeth for sealant placement are a deep occlusal fissure, fossa (Figure 21) or incisal lingual pit. A sealant may be contraindicated if:

1. a patient’s behavior does not permit the required dry-field to place sealants,
2. an open carious lesion exists,
3. caries exist on other surfaces of the same tooth and restoration will disrupt an intact sealant,
4. a large occlusal restoration is already present.

The disease susceptibility of the tooth should be considered when selecting teeth for sealants, not the age of the patient. Sealants appear to be equally retained on occlusal surfaces of both primary and permanent dentition. Sealants should be placed on the teeth of adult patients if there is evidence of existing or impending caries susceptibility, such as a diet excessive in carbohydrates or as a result of a drug or radiation-induced xerostomia.

**Types of Sealant Materials**

There are two types of resin-based sealants available today, filled and unfilled. Filled sealants are a combination of resins, chemicals and fillers. The purpose of the filler is to increase bonding strength and resistance to abrasion and wear. Due to the hardness and wear resistance of filled sealants, they must be checked after placement with articulating paper and adjusted with a dental handpiece and appropriate bur. Unfilled sealants have a higher ratio of resin to filler material, and do not need to be adjusted with a dental handpiece; they are in essence self-occluding. Due to high viscosity (rate of flow) of unfilled sealants, they readily flow into the pits and fissures.

Because fluoride uptake increases the enamel’s resistance to caries, the use of a fluoridated resin-based sealant may provide an additional anticariogenic effect. Fluoride-releasing sealants have shown antibacterial properties, as well as a greater artificial caries resistance compared to a non-fluoridated sealant material. The fluoride will leach out over a period of time into the adjacent enamel. Eventually the fluoride content of the sealant should be exhausted, but the content of the enamel greatly increased. Some of the sealant materials currently available that contain fluoride are: Dentsply Delton Seal-N-Glo®, Ivoclar Vivadent Helioseal F®, Ultradent UltraSeal XT Plus®, 3M ESPE Clinpro®, Harry J. Bosworth Aegis® and G C America Fuji TRIAGE®.

**The Four Commandments for Successful Sealant Retention**

For sealant retention the surface of the tooth must:

1. have a maximum surface area,
2. have deep, irregular pits & fissures,
3. be clean, and most crucial to retention
4. be absolutely dry and uncontaminated with saliva residue at the time of the sealant placement.

All of these criteria must be present for a sealant to be retained for 6 to 7 years or more. If within 3 months the sealants are lost, it is most likely due to faulty technique by the clinician.

**The Pit & Fissure Sealant Procedure**

It is highly recommended that sealant application be performed as a two-person procedure. Even when the patient is an adult, isolation and application are difficult with just one clinician.

1. Prior to the application of a tooth conditioner, the tooth surface should be cleaned by air polishing, polishing with non-fluoridated pumice paste, hydrogen peroxide, or enameloplasty. All heavy stains, deposits, debris and plaque should be removed. After cleaning the occlusal surface, dry the area thoroughly for 10 seconds.
2. Increasing the surface area requires tooth conditioner/etchant, composed of 30% to 50% concentration of phosphoric acid. Since sealants do not directly bond to the teeth, the adhesive force must be improved by tooth conditioner. If any of the tooth surfaces do not receive the tooth conditioner, the sealant will not be retained. Application usually includes a small sponge applicator or cotton pellet held with cotton pliers. Isolation of the teeth includes cotton rolls, dry-angles, or rubber dam. Follow manufacturer recommendations for time, currently many manufacturers are recommending 20 to 30 seconds. Rinse for 10 seconds. The appearance of the enamel by the tooth conditioner is white, dull and chalky. If the enamel does not appear white and chalky, tooth conditioner is reapplied for an additional 15 seconds. Dry thoroughly before sealant application.
3. The application of the sealant material requires the pits and fissures to be filled and the material brought to a knife-edge approximately halfway-up the inclined plane of the cusp ridge (Figure 22). Any bubbles must be broken before polymerization to prevent a defect. Polymerize with a curing light. Follow manufacturer directions for time.

4. Check the sealant with an explorer for proper placement and polymerization. Check occlusion with articulating paper and check interproximal contacts with floss. If sealant material is present interproximal, use a scaler to remove excess. If occlusion is high, use a slow-speed rotary bur such as a no. 4 round or no. 8 round bur. Recheck the occlusion again. Sealants should be checked at each annual dental examination for retention.

**Mouthguards & Sports Dentistry**

**Introduction**

Whether for exercise, competition or the simple enjoyment of recreational activity, increasing numbers of health-conscious Americans are involved in sporting activities. Approximately 20 million children participate in various sports programs and another 80 million are involved in unsupervised recreational sports. Dentistry plays a large role in treating oral and craniofacial injuries resulting from sporting activities.

Prior to the 1980’s, little was available in the scientific literature in terms of sports-related injury assessment. Several injury surveillance systems have been established in an attempt to track sports-related accidents and injuries. While all injury surveillance systems provide valuable information on generalized sports injuries, very little information is available regarding dental or craniofacial injuries. In terms of data collection and analysis of dental injuries due to sporting activities, the field is open for dentistry to assume a major leadership role in assessing dental injuries resulting from sporting activities. One reason for such lack of scientific studies regarding this issue is the absence of academic training in sports dentistry. A survey by Kumamoto and others was sent to 69 dental schools in the United States and Canada regarding course offerings, opinions about offering a course, construction of mouthguards, and provision of treatment for trauma. Of the 19 dental schools with sports dentistry courses, 17 taught the course in the undergraduate curriculum, 12 as a required course and the remaining 5 as an elective. Two schools offered the course on a graduate level. Data from the study also concluded that more than half of the schools that teach sports dentistry do not treat any outside athletic group on a regular basis.

**Statistics**

More than 5 million teeth are knocked out each year; many during sports activities, resulting in nearly $500 million spent on replacing these teeth each year. In an issue of the *Journal of the American Dental Association* (JADA) it was reported that 13 to 39 percent of all dental injuries are sports-related, with 2 to 18 percent of the injuries related to the maxillofacial area. Males are traumatized twice as often as females, with the maxillary central incisor being the most commonly injured tooth. Studies of orofacial injuries published over the last twenty years reflects various injury rates dependent on the sample size, the age of participants, and the specific sports. Even in football, a sport requiring protective gear, only about 75 percent of athletes are in compliance. In soccer, where rules are not uniform on wearing mouthguards, only a small percentage of the participants wear them. In baseball and softball, again only 7 percent wear mouthguards. Currently, the National Federation of State High School Association mandates mouthguards for only four sports: football, ice hockey, lacrosse, and field hockey. However, many high school and college administrators continue to support mandatory protective equipment relating to many more high school contact sports. It is clear that the need for studies, education, and regulations for mouthguard implementation is a major concern in the dental field.
In 1962, high school and collegiate football players were required to wear faceguards and mouth protectors during practice sessions and in competition. Several studies confirm that since this requirement, the percentage of orofacial injuries in football has dropped from approximately 50 percent to one-half of 1 percent.

The American Academy of Pediatric Dentistry recommends a mouthguard for all children and youth participating in any organized sports activities. The American Dental Association recommends wearing a mouthguard for the following sports:

<table>
<thead>
<tr>
<th>activity</th>
<th>role</th>
</tr>
</thead>
<tbody>
<tr>
<td>bicycling</td>
<td>boxing</td>
</tr>
<tr>
<td>extreme sports</td>
<td>field events</td>
</tr>
<tr>
<td>field hockey</td>
<td>gymnastics</td>
</tr>
<tr>
<td>handball</td>
<td>ice hockey</td>
</tr>
<tr>
<td>lacrosse</td>
<td>martial arts</td>
</tr>
<tr>
<td>rugby</td>
<td>shot putting</td>
</tr>
<tr>
<td>skiing</td>
<td>sky diving</td>
</tr>
<tr>
<td>soccer</td>
<td>squash</td>
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<tr>
<td>softball</td>
<td>water polo</td>
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<tr>
<td>wrestling</td>
<td>weight lifting</td>
</tr>
</tbody>
</table>

Another study was conducted on 3,411 athletes. The highest incidence of orofacial injury for the male athletes was noted in wrestling and basketball. For females, it was basketball and field hockey. None of the athletes who sustained an injury were wearing a mouthguard.

A study conducted on high school athletes, in which researchers interviewed 2,470 junior and senior high school football players, showed that 9 percent of all athletes sustained some form of orofacial injury with 3 percent reporting loss of consciousness. Fifty-six percent of all concussions and 75 percent of all orofacial injuries occurred while the athletes refrained from mouthguard protection. In Alabama, a study on 754 football players revealed that 52 percent of all orofacial injuries occurred in sports other than organized football. Basketball, baseball and unorganized football were a few of the sports that showed a high incidence of oral trauma and concussions when mouthguards were not used. Morrow and Kuebker conducted surveys in selected Texas high schools to determine the incidence of orofacial injuries on approximately 122,000 male and female athletes. They measured the types of mouthguards worn and dental injury experienced in football, and later indicated that soccer and basketball had higher dental injury rates than football. The number and nature of dental injuries experienced by male athletes showed that lip and tongue lacerations were the most frequently reported injuries. In addition, fourteen jaw fractures were reported with as many of these occurring in baseball and soccer as there were in football.

All athletes constitute a population that is extremely susceptible to dental trauma. Dental injuries are the most common type of orofacial injury. An athlete has a 10 percent chance of receiving an orofacial injury every season of play. In addition, athletes have a 33 to 56 percent chance of receiving an orofacial injury during their playing career. It is estimated that mouthguards prevent between 100,000 and 200,000 oral injuries per year in professional football alone.

Following is a list of types of injuries an athlete may sustain that are of particular concern to the dental professional.
• **Soft Tissue Injuries**
The face is often the most exposed part of the body in athletic competition and injuries to the soft tissues of the face are frequent. Abrasions, contusions, and lacerations are common and should be evaluated to rule out fractures or other significant underlying injury. These usually occur over a bony prominence of the facial skeleton such as the brow, cheek, and chin. Lip lacerations are also common.

• **Fractures**
Fractures of the facial bones present an even more complex problem. One of the most frequent sites of bony injury is the zygoma (cheekbone). Fractures of the zygoma, occurring as a result of direct blunt trauma from a fall, elbow or fist, account for approximately 10 percent of the maxillofacial fractures seen in sports injuries. In a study by Linn and others, of the 319 patients treated for sports-related injuries, males proved to be more prone to zygomatic fractures than females because of the powerful physical contacts during sports. Like the zygoma, the prominent shape and projection of the mandible cause it to be frequently traumatized. Approximately 10 percent of maxillofacial fractures resulting from sporting activities occur in the mandible when the athlete strikes a hard surface, another player or equipment. In a mandibular fracture, airway management is the most important aspect of immediate care. In both children and adults, the condyle is the most vulnerable part of the mandible. Fractures in this region have the potential for long-term facial deformity. Recent data suggest that condylar fractures in children can alter growth of the lower face.

• **TMJ Injuries**
Most blows to the mandible do not result in fractures, yet significant force can be transmitted to the temporomandibular disc and supporting structures that may result in permanent injury. In both mild and severe trauma, the condyle can be forced posteriorly to the extent that the retrodiscal tissue is compressed. Inflammation and edema can result, forcing the mandibular condyle forward and down in acute malocclusion. Occasionally this trauma will cause intracapsular bleeding, which could lead to ankylosis of the joint.

• **Tooth Intrusion**
Tooth intrusion occurs when the tooth has been driven into the alveolar process due to an axially directed impact. This is the most severe form of displacement injury. Pulpal necrosis occurs in 96 percent of intrusive displacements and is more likely to occur in teeth with fully formed roots. Immature root development will usually mean spontaneous re-eruption. Mature root development will require repositioning and splinting or orthodontic extrusion.

• **Crown and Root Fractures**
Crown fractures are the most common injury to the permanent dentition and may present in several different ways. The simplest form is crown infraction. This is a crazing of enamel without loss of tooth structure. It requires no treatment except adequate testing of pulpal vitality. Fractures extending into the dentin are usually very sensitive to temperature and other stimuli. The most severe crown fracture results in the pulp being fully exposed and contaminated in a closed apex tooth or a horizontal impact may result in a root fracture. The chief clinical sign of root fracture is mobility. Radiographic evaluation and examination of adjacent teeth must be performed to determine the location and severity of the fracture as well as the possibility of associated alveolar fracture. Treatment is determined by the level of injury.

• **Avulsion**
Certainly one of the most dramatic sports-related dental injuries is the complete avulsion of a tooth. Two to sixteen percent of all injuries involving the mouth result in an avulsed tooth. A tooth that is completely displaced from the socket may be replaced with varying degrees of success depending, for the most part, on the length of time it is outside the tooth socket. If the periodontal fibers attached to the root surface have not been damaged by rough handling, an avulsed tooth may have a good chance of recovering full function. After two hours, the chance for success is greatly diminished. The fibers become necrotic and the replaced tooth will undergo resorption and ultimately be lost.

See the Academy for Sports Dentistry website for specific emergency treatment instructions and the American Academy of Pediatric Dentistry website relating to avulsed teeth recommendations for dental professionals called the Decision Tree for an Avulsed Tooth.
Emergency Treatment
Due to the high incidence of sports-related dental injuries, it is vital that primary health care providers such as school nurses, athletic trainers, team physicians and emergency personnel are trained in the assessment and management of dental injuries. Interested dental professionals can assist these providers by offering to speak at schools or community functions, so that the primary health care providers who will deliver immediate treatment at sporting events understand the proper protocol for orofacial injuries, such as displaced teeth, avulsed teeth, lacerations and crown fractures. The ADA has urged its members to work together with schools, colleges, athletic trainers and coaches to develop mouthguard programs and guidelines to prevent sports injuries.

The main method for preventing orofacial injuries in sports is the wearing of mouthguards and headgear, consisting of a helmet and face protector. Yet, a study by the National Institute of Dental Research reported that children do not consistently wear mouthguards and headgear during organized sports. Even in football, a sport that requires the use of mouthguards, as earlier noted, only about 75 percent of students are in compliance.

Parental perceptions of children’s risks to injury, expenses associated with protective gear, and peer pressure may influence use of mouthguards. Interestingly, lower socioeconomic parents are reported to be more aware of threats to their children’s safety than are affluent parents. The observed patterns of mouthguards wearing by males and females can represent cultural differences, peer pressure, and/or nature of sports played, including the following:

- perceptions that females are less aggressive and thus, a reduced risk of injury may exist,
- perceptions regarding the absence of long-term commitment to a sport may result in a differential willingness to devote resources to females,
- aesthetic appeal may influence protective orofacial gear usage, and
- females may play in non-league-based sports with fewer or less stringent rules or may play less combative sports than males.

The literature indicates that the behavior of athletes is most influenced by their coaches. Coaches report that most information about mouthguards comes from sales representatives (72 percent), educational materials (33 percent), and dentists (11 percent).

In 1995, the ADA House of Delegates revised their policy, recognizing “the preventive value of orofacial protectors” and endorsed their use in sports activities with a significant risk of injury at all levels of competition.”

The Ideal Mouthguard
When considering recommendations, an ideal mouthguard:

- protects the teeth, soft tissue, bone structure, and temporomandibular joints
- diminishes the incidence of concussions and neck injuries
- exhibits protective properties that include high power absorption and power distribution throughout the expansion
- provides a high degree of comfort and fit to the maxillary arch
- remains securely and safely in place during action
- allows speaking and does not limit breathing
- is durable, resilient, tear resistant, odorless, and tasteless

The American Society for Testing and Materials and the manufacturers of mouthguards have classified the mouthguards into three types:

- **Stock Mouthguards**
  Stock mouthguards may be purchased from a sporting goods store or pharmacy. They are made of rubber, polyvinyl chloride or a polyvinyl acetate copolymer. The advantage is that this mouthguard is relatively inexpensive, but the disadvantages far outweigh the advantages. They are available only in limited sizes, do not fit very well, inhibit speech and breathing and require the jaws to be closed to hold the mouthguard in place. Because the stock mouthguards do not fit well, the player may not wear the mouthguard due to discomfort and irritation. The Academy of Sports Dentistry has stated that the stock mouthguard is unacceptable as an orofacial protective device.
• **Mouth-Formed Protectors**
  There are two types of mouth-formed protectors: the shell-liner and the thermoplastic mouthguard. The shell-liner type is made of a preformed shell with a liner of plastic acrylic or silicone rubber. The lining material is placed in the player’s mouth, molds to the teeth and then is allowed to set. The preformed thermoplastic lining (also known as “boil and bite”) is immersed in boiling water for 10 to 45 seconds, transferred to cold water and then adapted to the teeth. This mouthguard seems to be the most popular of the three types and is used by more than 90 percent of the athletic population (Figure 23).

• **Custom Made Mouth Protectors**
  This is the superior of the three types and the most expensive to the athlete. But isn’t it worth the cost to protect an athlete’s teeth from injury? Most parents will spend quite a bit of money on athletic shoes, but might not think about protecting their child’s teeth. This mouthguard is made of thermoplastic polymer and fabricated over a model of the athlete’s dentition (Figure 24). The mouthguard is made by the dentist and fits exactly to the athlete’s mouth. The advantages include: fit, ease of speech, comfort and retention. By wearing a protective mouthguard, the incidence of a concussion by a blow to the jaw is significantly reduced because the condyle is separated form the base of the skull by placing the mandible in a forward position.

**Dental Team’s Role**
Dentists need to educate patients on the need and benefits of protective devices. The American Dental Association publishes brochures that explains the different types of mouthguards and their advantages. The National Youth Sports Safety Foundation, a non-profit educational research organization working to promote the safety of youth in sports, has published a fact sheet on dental injuries that includes statistics, costs of injuries, resource information regarding standards for mouthguards, videos, and mouthpieces and dental care. A field emergency kit is a simple and inexpensive item for the dentist attending a sporting event (see Table 1).

“Fitting mouthguards is a perfect activity for a dental society,” says Robert Morrow, DDS, Professor of Prosthodontics, University of Texas-San Antonio Dental School. “You simply get a group of dentists together at the school and begin making impressions. It spreads out the costs and cuts down on the time. And it's worthwhile.” “It's a great practice builder,” says Robert Donnelly, DDS, a general practitioner in San Marcos, Texas, and dentist for the Southwest Texas State University football team. “I don't charge for my time or the materials to make a mouthguard. I do it for free. As a result, we get a lot of referrals.”

Due to the increasing participation in sporting events by children of all ages, a need for mouthguard implementation is of extreme importance. Dental professionals need to develop effective ways of conducting research to determine the prevalence of sports related injuries in their communities.

By combining research with preventive efforts, legislation can be determined. Mouthguard laws would help to reduce the number of orofacial sporting injuries and protect our children. The sports dentistry field is a challenging, yet
As dental assisting professionals your role should include:

- Good impression techniques and knowledge of mouthguard materials/manipulations in mouthguard creation.
- Communications with children and parents/guardians. Dental charting should include questions about involvement in sports and the use of mouthguards. If patients are unwilling/unable to pay for an office-made guard, the dental assistant should educate patients about affordable boil and bite-type guards for minimal protection.
- Basic instructions on emergency treatments of dental emergencies such as avulsion, fracture, extrusion and intrusion that an adult can perform immediately until dental treatment can be attained.

Sports dentistry should encompass much more than mouthguard fabrication and the treatment of fractured teeth. As dental professionals, we have a responsibility to educate ourselves and the community regarding the issues related to sports dentistry and specifically to the prevention of sports-related oral and maxillofacial trauma. Organizations such as the Academy for Sports Dentistry, which was founded in 1983, contribute to overall efforts to eliminate dental injuries in sporting activities. The Academy for Sports Dentistry conducts educational programs, publishes a biannual newsletter, offers an annual symposium for dentists and other health professionals interested in trauma and preventive therapy, and promotes legislative efforts and encourages research in all dentally related sports issues.

**Summary**

The current concepts in preventive dentistry have drastically improved since the 1960’s. Dental professionals must be aware of the current dental literature in order to educate their patients on various topics in preventive dentistry.

Although dental caries has declined considerably in the United States due to the contribution of fluoride, dental professionals will continue to see dental caries among young dental patients.
Course Test Preview
To receive Continuing Education credit for this course, you must complete the online test. Please go to www.dentalcare.com and find this course in the Continuing Education section.

1. Preventive dentistry started in the ________________.
   a. 1950’s
   b. 1960’s
   c. 1970’s
   d. 1990’s

2. Dental caries can be defined as ________________.
   a. transmissible
   b. localized
   c. circumscribed
   d. carcinogenic

3. A carious lesion is considered incipient when it is located only in the ________________.
   a. enamel
   b. DEJ
   c. dentin
   d. pulp cavity

4. __________ acid is produced in the oral cavity after the ingestion of carbohydrates.
   a. Carbonic
   b. Lactic
   c. Hydrochloric
   d. Sulfuric

5. __________ is the type of early stage bacteria that causes dental caries.
   a. Lactobacilli
   b. Streptococci mutans
   c. Porphyromonas gingivalis
   d. Prevotella

6. __________ is the nutrient required to cause dental caries.
   a. Lipids
   b. Proteins
   c. Fats
   d. Carbohydrates

7. The oral pathology lesion that is associated with fungus is ________________.
   a. candidial leukoplakia
   b. erythroplakia
   c. squamous cell carcinoma
   d. malignant melanoma

8. The pathology that is associated with sun exposure is ________________.
   a. candidial leukoplakia
   b. erythroplakia
   c. squamous cell carcinoma
   d. malignant melanoma
   e. Both C and D
9. It takes only ___________ for dental plaque to double in mass.
   a. two days
   b. twelve hours
   c. twenty four hours
   d. two weeks

10. The preferred toothbrushing method for most adults is ________________.
    a. Charters technique
    b. Modified Bass technique
    c. Stillman technique
    d. Fones technique

11. The preferred toothbrushing method for children is ________________.
    a. Charters technique
    b. Modified Bass technique
    c. Stillman technique
    d. Fones technique

12. The flossing method preferred for children is the ________________.
    a. spool technique
    b. circle or loop technique

13. When teaching your patient to floss, the floss should be approximately _________ in length.
    a. 18 inches
    b. 10 inches
    c. 13 inches
    d. 29 inches

14. If a patient has large spaces or diastemas, the recommended auxiliary aid/s are __________.
    a. wooden/plastic triangular sticks
    b. interproximal and uni-tufted brushes
    c. dental floss
    d. Both A and B

15. Professional topical fluoride applications are based upon ________________.
    a. the caries risk factors of the individual patient
    b. what type of fluoride you have on hand
    c. the number of restorations present
    d. if the patient is caries free

16. Sodium fluoride is used in a(n) _________% solution.
    a. 2
    b. 6
    c. 8
    d. 10

17. The fluoride most used by professionals is ________________.
    a. stannous fluoride
    b. sodium fluoride
    c. acidulated phosphate fluoride
    d. Both A and B
18. The preferred method for applying professional fluoride to older children and adults is the ___________.
   a. brush-on method
   b. tray method

19. Fluoride content in acidulated phosphate fluoride is approximately __________ percent.
   a. 2.03
   b. 1.23
   c. 3.04
   d. 4.12

20. Most manufacturers recommend that the phosphoric acid etching liquid/gel remain on the enamel for ____________.
   a. 10 – 15 seconds
   b. 20 – 30 seconds
   c. 30 – 40 seconds
   d. 40 – 50 seconds

21. According to studies, root surface caries has ____________ in the last 20 years.
   a. decreased
   b. increased
   c. remained constant
   d. no pattern

22. The fluoridated prescription dentifrice that professionals recommend to patients to significantly reduce root surface caries is ____________.
   a. stannous fluoride
   b. sodium fluoride
   c. acidulated phosphate fluoride
   d. sodium bicarbonate

23. The patient should not eat or drink anything for ________ minutes after a professional fluoride application.
   a. 5-10 minutes
   b. 20-30 minutes
   c. 1 hour
   d. It is not necessary to wait.

24. Contraindications for placement of a sealant is (are) ____________.
   a. an open carious lesion exists
   b. an occlusal restoration is already present
   c. the patients behavior does not permit a dry isolated field
   d. All of the above.

25. One can of regular soda contains _______ teaspoons of sugar.
   a. 2
   b. 6
   c. 8
   d. 10
26. The one commandment regarding the placement of pit & fissure sealants that is crucial to sealant retention is ________________.
   a. a minimum surface area
   b. that the tooth has irregular pits & fissures
   c. that the tooth is absolutely dry
   d. None of the above.

27. After applying tooth conditioner for sealant placement, the enamel should appear ________________.
   a. white, chalky and dull
   b. stained, chalky and dull
   c. white, smooth and dull
   d. stained, smooth and dull

28. If a sealant is placed properly, it should last approximately ________________.
   a. 3 - 4 years
   b. 6 - 7 years
   c. 10 - 12 years
   d. indefinitely

29. The most common tooth injury regarding permanent dentition sports injuries is ________________.
   a. crown fracture
   b. root fracture
   c. intrusion
   d. avulsion

30. The best success rate involving an avulsed tooth after a trauma is ________________.
   a. within 2 hours
   b. between 2-3 hours
   c. between 4-5 hours
   d. between 6-10 hours
References

About the Authors

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Dr. Connie Myers Kracher is Chair and Associate Professor of the Department of Dental Education and Director of the Dental Assisting Program at Indiana University - Purdue University Fort Wayne (IPFW). Connie is finishing her dissertation for her PhD in Global Leadership, with a minor in Corporate Management at Lynn University in Boca Raton, Florida. She holds a Master of Science in Dentistry from the Indiana University School of Dentistry in Oral Biology with a minor in Diagnostic Sciences, and a Bachelor of Science in Health Occupations Education. In addition to her CDA, she holds a Certificate in Expanded Restorative Procedures (EFDA). Ms. Kracher is a frequent contributor to the Dental Assistant Journal and is author of several ADAA courses.