Topical Fluoride Applications

Available Forms

Sodium Fluoride (NaF)

This material is available in powder, gel, and liquid form. The compound is recommended for use in a 2% concentration.

Stannous Fluoride (SnF_2)

This compound is available in powder form either in bulk containers or preweighed capsules. The recommended and approved concentration is *8%*.

Acidulated Phosphate Fluoride (APF)

This treatment system is available in *solution, gel*, and foam. This compound is stable and ready to use. These forms contain 1.23% fluoride.

Application Procedure

In essence, two procedures are available for administering topical fluoride treatments. One procedure, in brief, involves the isolation of teeth and continuously painting the solution onto the tooth surfaces. The second, and *currently* more popular, procedure involves the use of fluoride gels applied with a *disposable tray*.

Many different types of trays are available; selection of a tray adequate for the individual patient is an important part of the technique. Most manufacturers of trays offer sizes to fit patients of different ages. An adequate tray should *cover all the patient's dentition*; it should also have enough depth to reach beyond the neck of the teeth and contact the alveolar mucosa to prevent saliva from diluting the fluoride gel. Currently, disposable *soft styrofoam trays* are available and seem to be adequate. These trays can be bent to insert in the mouth and are soft enough to produce no discomfort when they reach the soft tissues.

If a prophylaxis is given, the patient is permitted to rinse, and the teeth of the arch to be treated are dried with compressed air. A ribbon of gel is placed in the trough portion of the tray and the tray seated over the entire arch. The method used must ensure that the gel reaches *all* of the teeth and flows interproximally. If, for instance, a soft pliable tray is used, the tray is pressed or molded against the tooth surfaces, and the patient may also be instructed to bite gently against the tray.

It should be stressed that various precautions should be routinely taken to *minimize* the amount of fluoride that is inadvertently swallowed by the patient during the application procedure., It has been suggested that the ingestion of these quantities of fluoride by young children may contribute to the development of dental fluorosis in those teeth that are unerupted and in the developmental stage. Precautions that should be undertaken include (1) using only the *required* amount of the fluoride solution or gel to perform the treatment adequately; (2) positioning the patient in an *upright* position;

(3) using efficient *saliva aspiration* or suctioning apparatus; and (4) requiring the patient *to expectorate thoroughly on completion* of the fluoride application. The use of these procedures has been shown to reduce the amount of inadvertently swallowed fluoride to *less than 2 mg*, which may be expected to be of little consequence.

After the topical application is completed, the patient is advised not to rinse, drink, or eat for *30* minutes.

Recommendations—Topical Fluoride Treatments

- Accepting the relative inefficiency of single, topical applications of fluoride solutions, patients with existing evidence of caries activity, whatever their age, should be given an *initial series of topical fluoride treatments followed by quarterly, semiannual, or annual treatments* as required to maintain cariostasis. The initial series of treatments should consist of four applications administered during a 2- to 4-week period, with the first treatment preceded by a thorough prophylaxis if indicated. Patients with *little* evidence of existing or anticipated caries should be given single applications every 12 months as a preventive measure.

- Whatever fluoride system is selected, the application period (i.e., the time the teeth are kept in contact with the fluoride system) should be 4 minutes in all patients with existing caries activity. Shorter treatment periods may be permissible in the performance of treatments to *maintain* cariostasis.

- Special effort should be made by the dentist to schedule topical fluoride applications so as to provide the treatment to newly erupted teeth within 12 months after eruption, and preferably *as close to eruption as possible*.

Fluoride Varnishes

Most varnishes contain *5.0% sodium fluoride* (2.26% fluoride) and a typical application requires only 0.3 to 0.5 mL of the varnish, which contains 3 to 6 mg of fluoride. The application procedure involves cleaning the tooth surfaces by toothbrushing, painting the varnish on the teeth, and drying. The *varnish is retained for 24 to 48 hours* during which time fluoride is released for reaction with the underlying enamel. It is recommended that the applications be repeated at 4- to 6-month intervals.

Initiation of Therapy

Topical fluoride therapy should be initiated *when the child reaches about 2 years of age,* when most of the deciduous dentition should have erupted. The treatment regimen should be maintained at least on a *semiannual* basis throughout the period of increased caries susceptibility.

Problems and Disadvantages

The use of stannous fluoride may be contraindicated for aesthetic reasons in specific instances. The reaction of tin ions with enamel, particularly carious enamel, results in the formation of *tin phosphates*, some of which are brown in color. Thus, the use of this agent produces a temporary brownish pigmentation of carious tooth structure.

Another problem frequently raised concerns the strong, unpleasant, metallic taste of stannous fluoride. APF preparations are much *better accepted by children.*

Acidulated phosphate fluoride systems have the disadvantage of possibly etching ceramic or porcelain surfaces. As a result, porcelain veneer facings and similar restorations should be *protected with cocoa butter, vaseline, or isolation* prior to applying APF. Alternatively, sodium fluoride may be used instead of APF.

Dentifrices

They have been prepared in a variety of forms, including pastes, powders, and liquids.
The original level of fluoride in OTC dentifrices and gels was restricted to 1,000 to 1,100 ppm fluoride and a total of no more than 120 mg of fluoride in the tube, with a requirement that the package include a safety closure. Therapeutic toothpastes, dispensed on prescription, could contain up to 260 mg of fluoride in a tube.

The following fluorides are generally recognized as effective and safe for OTC sales: 0.22% sodium fluoride (NaF) at a level of 1,100 ppm, 0.76% sodium monofluorophosphate (MFP) at a level of 1,000 ppm, and 0.4% stannous fluoride (SnF_2) at a level of 1,000 ppm.

The risk of toothpaste ingestion is increased in younger children, and some studies have shown that very young children may ingest enough toothpaste to be at risk of dental fluorosis.[138] In fact, one study found that children who brush with a fluoride toothpaste *before 2 years of age have an elevenfold greater risk of developing fluorosis than children who begin brushing later.* These considerations have prompted the ADA to recommend that *children under age 3 should be advised to use only a "pea-sized" quantity of a fluoride dentifrice for brushing and that this quantity be gradually increased with age so that not until age 6 is the child using a "full-strip" of dentifrice on the brush head*. In making recommendations, the practitioner must consider what other sources of fluoride the child may be ingesting, such as fluoride or fluoride-vitamin supplements, fluoridated communal-water supplies.

In general, the use of approved fluoride dentifrices results in a significant decrease in the incidence of dental caries (20 to 45%). *Not all fluoride-containing dentifrices have demonstrated anticaries activity.* The level of active fluoride must be adequate and must be maintained over the shelf-life of the dentifrice.

Fluoride Rinses

Fluoride rinses were approved as safe and effective by the FDA in *1974*.

These are available as

1. *over-the-counter (OTC)* daily rinses (0.05% NaF, 230ppm F; 0.02% NaF, 200ppm; 0.02% APF, 200 ppm F).

2. *prescription* weekly rinses (0.2% NaF, 910ppm F or 0.4% SnF_2, 970ppm F).

The dose directions are *10 ml* of product to be used *for 1 minute*. These restrictions included the distribution of quantities containing *no more than 300 mg fluoride in a single container, a cautionary*

label to avoid swallowing, and an indication that the preparations should not be used by children younger than 6 years of age.

As a general rule, *daily rinses* should be recommended rather than a weekly regimen; not only does the daily procedure appear to be slightly more effective.

For children living in nonfluoridated areas, the prescription of fluoride supplements may also be considered (Table 5-1).

AGE	F in drinking water		
	<0.3ppm	0.3-0.6ppm	>0.6ppm
6m-3y	0.25	0	0
3-6y	0.5	0.25	0
6-16y	1.0	0.5	0

Table 5-1 Dietary Fluoride Supplementation Schedule
1ppm=1mg/l

Fluoride Gels for Home Use

These procedures contain 0.4% stannous fluoride *(1,000 ppm fluoride*) or 1.0% sodium fluoride *(5,000 ppm*) and are formulated in a nonaqueous gel base that *does not contain an abrasive system*. Their recommended manner of usage involves toothbrushing with gel (similar to using a dentifrice), allowing the gel to remain in the oral cavity for 1 minute, and then expectorating thoroughly.

Fluoride-Releasing Dental Restorative Materials

Fluoride-releasing dental restorative materials may provide an additional benefit in preventive dentistry. (i.e., *glass ionomer cements*, and fluoride-releasing *resin composites*).

Toxicology of Fluoride

The Probable toxic dose (PTD) is 5 mg F/kg body weight. Sub-lethal toxic symptoms are manifested quickly after the dose and consists of vomiting, excessive salivation, tearing and mucous discharge, cold wet skin and convulsions with higher doses. Counter measures which should be administered immediately are emetics, 1% calcium chloride, calcium gluconate or milk.

Fluorosis:

Fluorosis occurs when teeth are developing. The most critical ages are from 0 to 6 years. After 8 years, risk of fluorosis is essentially past.It is a condition caused by an excessive intake of fluoride.

The effects of Fluorosis are mainly aesthetic. Mild Fluorosis results in lacy markings on the tooth s enamel surface; in moderate Fluorosis, a white opacity is easy to see over 50% of the tooth; and severe Fluorosis results in pitted, brittle enamel.

Caries

Approximately 90% of all the carious lesions in the mouth occur on the occlusal surfaces of the posterior teeth. These surfaces represent only 12% of the total number of tooth surfaces, so that occlusal surfaces with their deep pits and fissures are approximately eight times as vulnerable as all the other smooth surfaces.

The interest in caries formation in pits and fissures, attempts have been made to provide an elaborate classification system for pits and fissures.

Two main types of pits and fissures are usually described:

1. shallow, wide V-shaped fissures that tend to be self-cleaning and somewhat caries resistant.
2. deep, narrow 1-shapyed fissures that are quite constricted and may resemble a bottleneck in that the fissure may have an extremely narrow slit-like opening with a larger base as it extends toward the dentinoenamel junction. These caries-susceptible, 1-shaped fissures may also have a number of different branches extending toward or into the underlying dentin. The typical fissure usually contains an organic plug composed of reduced enamel epithelium, microorganisms forming dental plaque , and oral debris.

The methods of diagnosing at these different sites include:

1. Thorough , careful clinical examination, using :
   - Direct vision of clean and dry teeth.
   - Gentle probing .
   - Transillumination.
2. Radiographic examination.

Clinical hint: The traditional use of a probe or explorer in pits and fissures and on demineralized smooth surfaces may damage demineralized enamel and transfer cariogenic bacteria from one site to another, increasing the likelihood of restorative intervention. The diagnostic value of an explorer examination of the occlusal surfaces *decreases* as the "stickiness" of the fissure increases—this at a time when *the need for validity increases.* For instance, the sensitivity of an explorer examination can decrease from 80% for wide fissures to 52% for those that are narrow. Therefore, the diagnostic criterion of "sticky fissure" should be eliminated.

In the past tow decades, laser and light-induced fluorescence methods have been developed to detect and quantify enamel mineral content. These methods rely on the different fluorescence characteristics (loss of fluorescence) of demineralized enamel due to the scattering of light in the carious lesion. There is a strong correlation between mineral loss and fluorescence in white spot (demineralized) lesions of enamel.

Early childhood caries (ECC)

One of the most severe forms of caries occurs in infants. Inappropriate feeding practices may result in progressive dental caries on the buccal and lingual surfaces of newly erupted primary maxillary anterior teeth of infants and toddlers. The overall prevalence of early childhood caries (also called *baby bottle tooth* decay or *nursing caries*) is estimated to be 5%. Primary risk factors for early

childhood caries include putting a child to sleep at naptime or bedtime with a bottle containing a liquid *other than plain water,* allowing an infant to breast-feed at will during the night, and extended use of the nursing bottle or sippy cup beyond 1 year of age.

children with the highest number of MS for deciduous teeth usually experience a higher attack rate for the later permanent teeth.

Mutans streptcoccoi require a *solid surface*—the tooth surface—for successful colonization. During the first year of life *before* eruption of the primary teeth, very few MS are found in the mouth. When teething begins at approximately 8 months, MS often rapidly colonizes the plaque of newly erupting teeth. It has been shown that an important source of infection of infants by MS is from the *caregivers (usually the mother)* by the mouth-to-mouth transmission, such as via kissing, or by sharing a spoon during feeding. Mothers with the highest MS counts often have infants with similarly high caries lesion counts.

Measurements of Caries

An important tool used in examinations of a population group is a *dental index,* a numeric score that quantifies the magnitude of the disease measured.

- The most common index for measuring dental caries in the *primary dentition* in the world is dmft index. This index is based on detection of dentinal caries in the past and present including the present untreated decay (dt) and evidence of past disease as teeth with filling (ft), or missing due to caries (mt).
- deft is used to record decayed (dt), extracted (et) and filled teeth (ft) in the *primary dentition*
- defs is used to record decayed(ds), extracted (es) and filled Surfaces (fs) in the *primary dentition*.
- DMFT is used to record Decayed(DT), Missing (MT) and Filled Teeth (FT) in *permanent dentition.*
- DMFS is used to record Decayed (DS), Missing (MS) and Filled Surfaces (FS) in *permanent dentition*.

Recommendations of American Academy of Pediatrics for prevention of ECC

- Reducing the mother's/primary caregiver's/sibling(s) MS levels (ideally during the prenatal period) to decrease transmission of cariogenic bacteria.
- Minimizing saliva-sharing activities (eg, sharing utensils) between an infant or toddler and his family/cohorts.
- Implementing oral hygiene measures no later than the time of eruption of the first primary Tooth.
- Establishing a dental home within 6 months of eruption of the first tooth and no later than 12 months of age
- Avoiding caries-promoting feeding behaviors.

First dental visit

Dentist will:

- Check:
  - Face and Jaws
  - Gums, Tongue, Tissues
  - Teeth and Bite
- Ask questions
- Give information.

Dental visit is an opportunity to:

- assess caries risk and potential problems
- supply anticipatory guidance to parents
- Provide appropriate counseling on feeding/diet management, tooth cleaning, and fluoride management for parents of infants and toddlers.

Determining patients at risk of dental caries

The development of a treatment strategy for patient that is based on risk factors pertinent to that individual is the gold standard of minimally invasive treatment. That is, before deciding the appropriate methods and preventive products to advice, the patient,s caries risk should be determined. This may be achieved by considering several aspects such as presence of white spot lesions, individual and familial caries history, socioeconomic status, ethnicity, diet, fluoride exposure, salivary flow and quality, oral hygiene, medical history, and presence of development defects of enamel (table 10-1).

TABLE 10-1 American Academy of Pediatrics Dentistry Caries-Risk Assessment Tool

CARIES RISK INDICATORS	LOW RISK	MODERATE RISK	HIGH RISK
CLINICAL CONDITIONS	• No carious teeth in past 24 months	• Carious teeth in the past 24 months	• Carious teeth in the past 12 months
	• No enamel demineralization (enamel caries "white spot lesions")	• One area of enamel demineralization (enamel caries "white spot lesions")	• More than one area of enamel demineralization (enamel caries "white spot lesions")
			• Radiographic enamel caries
	• No visible plaque; no gingivitis	• Gingivitis[a]	• Visible plaque on anterior (front) teeth
			• High titers of mutans streptococci
			• Wearing dental of Orthodontic appliances[b]
			• Enamel hypoplasia[c]
ENVIRONMENTAL CHARACTERSTICS	• Optimal systemic and topical fluoride exposure[d]	• Suboptimal systemic fluoride exposure with optimal topical exposure[d]	• Suboptimal topical fluoride expsure[d]
	• Consumption of simple sugars or foods strongly associated with caries initiation[e] primarily at mealtimes	• Occasional (e.g., one or two) between-meal exposures to simple sugars or foods strongly associated with caries	• Frequent (e.g., three or more) between-meal exposures to simple sugars or foods strongly associated with caries
	• High caregiver socioeconimic status[f]	• Midlevel caregiver socioeconomic status (e.g., eligible for school lunch program or SCHIP)	• Low-level caregiver socioeconomic status (e.g., eligible for Mediacid)
	• Regular use of dental care in an established dental home	• Irregular use of dental services	• No usual source of dental care
			• Active caries present in the mother
GENERAL HEALTH CONDITIONS			• Children with special health care needs[g]
			• Conditions impairing saliva composition/flow[h]

Pits-and-Fissures Sealants

DEFINITION

"A fissure sealant is a material that is placed in the pits and fissures of teeth in order to prevent or arrest the development of dental caries".

As long as the sealants are retained, no bacteria or bacterial acids can affect the sealed areas. If they are not retained, no damage to the teeth results from a retreatment. The lost sealant can be easily replaced. One 10-year study demonstrated a 57% retention of the original sealants.51 In another study, approximately 95% retention occurred over 2 years.52 With these performances, the average life of the sealant approximates the 10 years projected for an amalgam.53 It should be emphasized that sealant placement should be followed by a topical fluoride application to the teeth, because fluorides are most effective in protecting the smooth surfaces and least effective on the occlusal surfaces, a situation that is the reverse of the results expected of the sealants.

TYPES OF PIT AND FISSURE SEALANTS

Resins

Resin sealants are bonded to the underlying enamel by the use of the acid etch technique. Their caries preventive property is based on the establishment of a tight seal which prevents leakage of nutrients to the microflora in the deeper parts of the fissure. The resin sealants may be either pure resin, composites (All the commercial sealants are of the same Bis-GMA chemical family) or compomers, and their polymerisation may be initiated chemically or by light, Filled or unfilled, With or without fluoride, and Clear, opaque or tinted.

Glass Ionomer Cement (GIC)

One of the main clinical advantages of GIC is their ability to bond chemically to dentin and enamel without the use of the acid-etch technique, which makes them less vulnerable to moisture. This, in conjunction with active fluoride release into the surround enamel, has led to the development and evaluation of GIC as an alternative fissure sealant system, particularly in cases where moisture control is difficult to achieve. This pattern of fluoride release is common for all the conventional and resin modified GIC's.

Studies of the use of GIC, and resin modified glass ionomers as fissure sealants indicate significantly lower retention rates than resin-based pit and fissure sealants. The use of GIC has been suggested for erupting teeth where isolation is a problem, especially in the high caries risk individuals.

Compomers

Since the amount of fluoride released in distilled water is considerably less than GIC, and that three year clinical results show comparability with resin sealants, their properties should be estimated as comparable to the resins.

SEALING OF CARIOUS FISSURES

Several studies have shown that resin sealants are able to stop further progression of carious lesions in pits and fissures, even dentin lesions. The rationale for this approach is that the placement of a sealant isolates the carious lesion from the surface biofilm. This suggests a therapeutic use for sealants in addition to a preventive one. However, it seems to be a general convention that the use

should be limited to fissures where the lesion seems to be confined to the enamel, and that dentin lesions should be restored, preferably by the use of minimal intervention techniques, like the preventive resin restoration.

TECHNIQUE FOR RESIN SEALANTS

i) Surface Cleaning

It is concluded therefore that there is a need for removal of most organic substance in order to obtain sufficient bonding fissure. cleansing with a rotating bristle brush and pumice may be beneficial.

iii) Isolation

The isolation procedure may frequently be extremely challenging, particularly in the partially erupted teeth or in those children with poor co-operation.

A dry field can be maintained in several ways, including use of a *rubber dam,* employment of *cotton rolls,* and the placement of *bibulous pads* over the opening of the parotid duct. The rubber dam provides an ideal way to maintain dryness for an extended time.

iv) Etchants and Conditioners

The goal of etching is to produce an uncontaminated, dry, frosted surface. The most frequently used etchant is orthophosphoric acid, provided that its concentration lies between 30 and 50% by weight (gel or solution). Small variations in the concentration do not appear to affect the quality of the etched surface.

The etchant is placed for only 20 seconds on the enamel of both primary and permanent teeth (range is 15-60). Another 15 seconds of etching is indicated for fluorosed teeth to compensate for the greater acid resistance of the enamel. The etching period should be timed with a clock.

v) Washing and Drying

The tooth is usually irrigated vigorously with air and water for about 30 seconds and then dried with uncontaminated compressed air for 15 seconds(until chalky appearence). If the tooth is contamination it should be re-etched for 15 seconds.

vi) Application of the Sealant

Apply a thin coat of sealant to the pits and fissures, making sure to include the buccal extension on lower molars and the palatal groove in upper molar teeth. Apply the polymerization light for 20 seconds.

Following polymerization, the sealants should be examined carefully *before* discontinuing the dry field. If any voids are evident, additional sealant can be added *without* the need for any additional etching. If a sealant requires repair at any time after the dry field is discontinued, it is prudent to repeat the same etching and drying procedures as initially used.

vii) Remove the rubber dam and check the occlusion.

At times an excess of sealant may be inadvertently flowed into a fossa or into the adjoining interproximal spaces. To remedy the first problem, the occlusion should be checked visually or, if indicated, with articulating paper. If the premature contact of the occlusal contact is unacceptable the occlusion should be modified by burs. The integrity of the interproximal spaces can be checked with

the use of dental floss. If any sealant is present, the use of scalers may be required to accomplish removal.

viii) Evaluating Retention of Sealants

The finished sealant should be checked for retention without using undue force. In the event that the sealant does not adhere, the placement procedures should be repeated, with only about 15 seconds of etching needed to remove the residual saliva before again flushing, drying, and applying the sealant. If two attempts are unsuccessful, the sealant application should be postponed until remineralization occurs.

Teeth that have been sealed and then have lost the sealant have had fewer lesions than control teeth. This is possibly due to the presence of tags that are retained in the enamel after the bulk of the sealant has been sheared from the tooth surface (Figure 6-1).

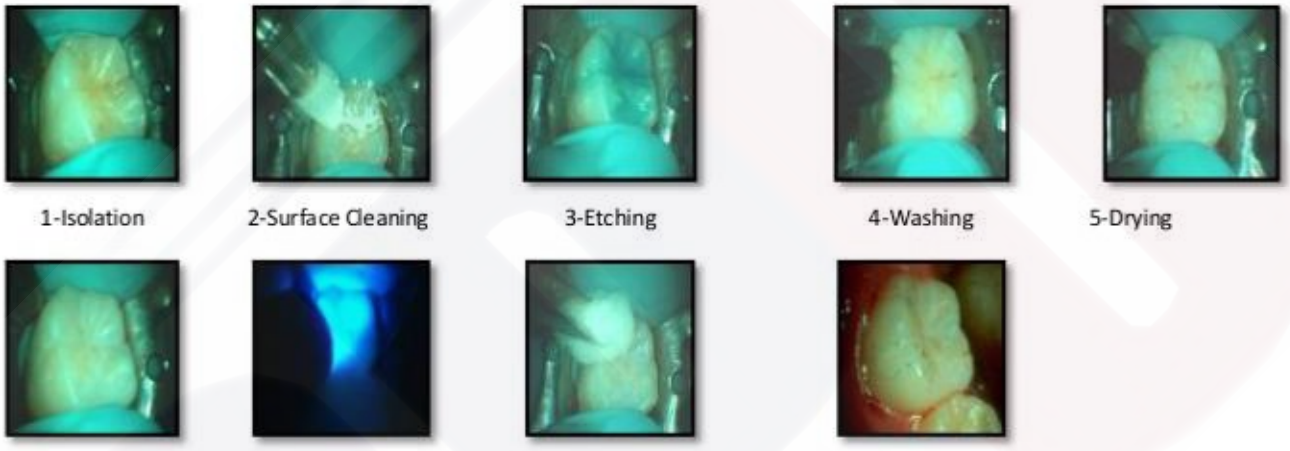


Figure 6-1 Technique for resin sealants

RECOMMENDATIONS FOR USE

The decision to apply a fissure sealant should be made on clinical grounds based on a thorough clinical examination, supported by radiographs where appropriate, and taking into account risk factors such as medical and social history as well as past caries experience and present caries activity.

Patient and tooth selection

1. Children and young people with medical, physical or intellectual impairment: The application of sealant to all susceptible sites of primary and permanent teeth should be considered, especially when systemic health could be jeopardised by dental disease or the need for dental treatment.

2. Children and young people with signs of acute caries activity: All susceptible pit- and fissure sites should be considered for sealing including the buccal fissures of permanent molars

3. Children and young people with no signs of caries activity: Only deeply fissured (extremely plaque retaining fissures) and thus potentially susceptible surfaces should be considered for sealing.

It should be mentioned that all children, irrespective of caries activity, should be regularly monitored for any change in risk factors and/or clinical or radiographic evidence of a change in their caries status.

Clinical considerations

1. When there is an indication for placement, then sealants should be placed as soon as possible since the tooth is most caries susceptible during the post-eruption period. However, susceptible sites of teeth can be sealed at any age depending on assessment of risk factors.

2. The choice between resin/composite and glass-ionomer sealants should be based on adequacy of moisture control. Since the resins are most durable they should generally be preferred, while glass ionomer cements should be used in cases where moisture control is difficult, e.g. in erupting or newly erupted teeth. GIC sealants in these cases are regarded more as a temporary sealant or a fluoride release vehicle, rather than a true fissure sealant.

3. Where there is a real doubt about the caries status of a susceptible site on clinical examination, e.g. a stained fissure, then a bitewing radiograph should be obtained. If there is unequivocal evidence that the lesion is confined to enamel then the surface can be sealed and monitored clinically and radiographically. When the evidence is equivocal, then removal of the stained areas in the fissures (enamel biopsy) should be performed, using rotating instruments.

4. If the lesion extends into dentine after removal of staining then a sealant restoration ("preventive resin/glass ionomer restoration") may be placed. A more extensive cavity will require a conventional restoration.

Follow up and review

1. All sealed surfaces should be regularly monitored clinically and radiographically. Bitewing radiographs should be taken at a frequency consistent with the patient's risk status, especially where there has been doubt as to the caries status of the surface prior to sealant placement. The exact intervals between radiographic review will depend not only on the risk factors, which may change with time, but also on the monitoring of other susceptible sites, for example approximal surfaces.

2. Defective sealants and/or preventive resin or glass ionomer restorations should be investigated and the sealant reapplied in order to maintain the marginal integrity, provided the surface is caries free.

Preventive Resins Restorations (PRRs)

Due to its superior wear resistance and superior mechanical properties, composite resin materials rather than glass ionomers are the material of choice for treatment of early occlusal caries in permanent teeth.

Indications

- ✓ Tooth that can be isolated.
- ✓ Minimal "catches" in the grooves / areas with distinct incipient enamel caries.
- ✓ Isolated lesions / minimal evidence of dentinal caries.
- ✓ No / minimal evidence of radiographic caries.

Method of PRRs

- ✓ Use local anaesthesia and rubber dam isolation if caries extends into dentine.
- ✓ With a small high-speed diamond bur obtain access into the questionable fissure.
- ✓ Remove the carious dentine. Although it is important not to remove more enamel than necessary it is essential to have adequate access to the underlying dentine to be certain of complete caries removal. Unsupported enamel need not be removed if access and vision are clear. The cross-section most closely resembles a tear drop shape.
- ✓ Deeper dentinal caries should be removed using a slow-speed round bur.
- ✓ Place a glass ionomer liner over the dentine extending it up to the amelodentinal junction and light cure for 40 seconds.
- ✓ Gel etchant is placed for 20 seconds on the enamel margins and occlusal surface. And washed and dried. It is not necessary to etch the liner; sufficient roughening of the surface of the glass ionomer cement (GIC) will result from the washing process.
- ✓ Place a thin layer of bonding resin into the cavity and cure for 20 seconds. An excess of resin will produce pooling and reduce the integrity of the bond.
- ✓ Incrementally fill and polymerize the cavity with hybrid composite resin until it is level with the occlusal surface.
- ✓ Flow opaque unfilled fissure sealant over the restoration and the entire occlusal fissure pattern and cure for 20 seconds. There is no need to re-etch the occlusal surface prior to placing the fissure sealant.
- ✓ Remove the rubber dam and check the occlusion.

Periodontal Disease Prevention

The normal periodontium consist **(**Figure7-1**):**

1-The gingiva (G)

2-The periodontal ligament (PL)

3-The root cementum (RC)

4-The alveolar bone (AB).

Figure 7-1 The normal periodontium

The gingiva divide anatomy to (Figure 7-2):

1-Marginal or free gingiva (FG)

2-Attached gingiva (AG)

3-Interdental gingiva (IG).

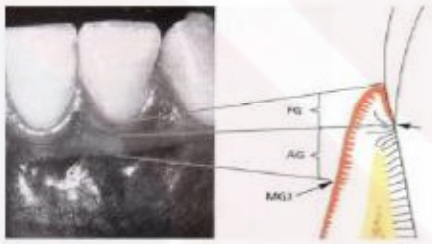


Figure 7-2 Anatomic parts of gingiva

The gingiva is connective tissue covered by stratified squamous epithelium. Gingival epithelium is three types (Figure 7-3):

1-Oral Epithelium (OE)

2-Oral Sulcular Epithelium (OSE)

3-Junctional Epithelium (JE)

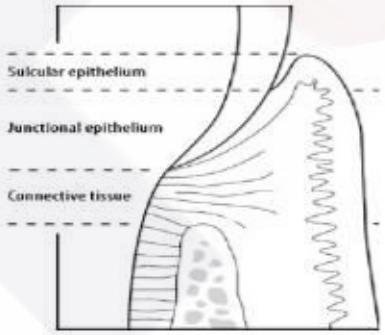


Figure 7-3 types of gingival epithelium

Bacteria in dental plaque are the direct cause of the most widespread of all human diseases—dental caries and inflammatory periodontal diseases. Plaque forms initially on the organic layer coating the erupted tooth. This organic layer originates from salivary products that are deposited on the teeth, forming an acquired pellicle to which bacteria adhere. Adhesion is mediated by a variety of bonding mechanisms, including physicochemical and electrostatic interactions, and stereo-chemical interactions between bacterial adhesins and receptors in the acquired pellicle and bacterial surfaces. The earliest of the primary bacterial colonizers are mainly Gram-positive facultative cocci. They are followed by a variety of Gram-positive and Gram-negative species—the secondary colonizers. Caries-related bacterial species have a greater ability than others to adapt to excess sugars and their metabolites. Supragingival plaque is associated with caries and gingivitis, whereas subgingival plaque is associated with gingivitis and periodontitis. With higher pH (i.e., less acidity), some plaques mineralize to form supra- and subgingival dental calculus. In calculus formation, mineralization of

dental plaque generally begins in the extracellular matrix and eventually spreads to include the bacteria. Rarely, mineralization may begin within the walls of bacterial cells and spread to the extracellular matrix. Calculus is generally covered by actively metabolizing bacteria, which can cause caries, gingivitis, and periodontitis. Regular toothbrushing and flossing can remove dental plaque and control its formation. Once dental plaque mineralizes to form calculus, professional instrumentation is necessary for its removal. Notwithstanding the contribution of calculus to inflammatory periodontal diseases, it is stagnation of pathogenic bacteria at critical sites that leads to both dental caries and periodontal diseases. Later chapters deal with the wide range of methods, mechanical and chemical, increasingly used to control plaque and calculus formation. All of these methods have the aim of preventing, arresting, or reversing the progression of dental caries and periodontal tissue inflammation.

Several agents are currently available to reduce calculus formation, including dentifrices that contain pyrophosphate, or metal ions such as zinc. One dentifrice contains two soluble phosphates, *tetrasodium pyrophosphate* and *disodium dihydrogen pyrophosphate,* in addition to fluoride. The pyrophosphate ion not only serves as a structural analog of the orthophosphate ion, disrupting the formation of calcium phosphate crystals, but also inhibits some bacterial growth at concentrations significantly lower than the levels found in dentifrices.

Two of the most important messages of the entire chapter are: (1) at the first sign of gingival bleeding, regardless of age, a dentist should be seen immediately for diagnosis, treatment, education and monitoring; and, (2) for all patients who smoke, to encourage and help facilitate their participation in an anti-smoking program.

Many indices are used to determine the prevalence and severity of gingivitis and/or periodontitis among a given population, or to determine the severity of gingivitis and/or periodontitis among individual patients. The most commonly used markers are a plaque index, gingival bleeding, loss of epithelial attachment and pocket depth. With computer software, data collection can be easily extended to include recession, suppuration, furcation involvement, tooth mobility and others. The most important detail that delineates gingivitis from periodontitis is the integrity of the epithelial attachment. As long as the pocket depth measurements approximate 3 millimeters with no bleeding and no recent loss of epithelial attachment, the periodontium can be considered in excellent health. As the pocket probing depths become greater, noninvasive preventive procedures become more difficult to apply while invasive treatment becomes more frequent and complex. Manual probes are used to determine sulcus depth; however, the constant-force electronic probes appear to be more accurate, reproducible and easier to use in recording data.

Facts about Gingivitis and Periodontitis

There are powerful influencing factors that can modify the course of the diseases such as (1) *smoking,* (2) *genetic differences,* (3) baseline severity of disease, (4) Presence of *P. gingivalis, P. intermedia,* and *B. forsythus,* and *Actinobacillus actinomycetemcomitans,* and (5) *individual compliance* with established standards for oral self-care. Another strong risk indicator is the observed relationship of several *systemic* diseases to gingivitis and periodontitis. Among these are diabetes mellitus, Down's syndrome, and more rarely diagnosed conditions such as Haim-Munk syndrome and Papillon-Le Fevre syndromes. Also noticed has been a greater frequency of cardiovascular accidents and nonhemorrhagic strokes among individuals with periodontitis.

Possibly one of the most important harbingers of gingivitis and periodontitis is cigarette smoking and/or use of smokeless tobacco products. Many studies have found that tooth loss from periodontal disease is associated with tobacco use. Investigators have reported that current smokers have a greater prevalence of severe periodontal problems, as well as accompanying breakdowns of various components of the immune system than do individuals who have never smoked. With smoking, the challenge organisms are rarely confronted by a fully effective immune defense system.

Epidemiology and Risk Assessment

Periodontal Disease Indicators

O'Leary's Plaque Record (Index), (Figure 8-4):

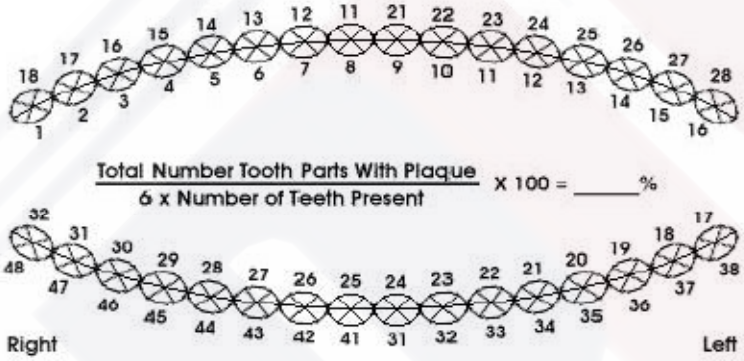


Figure 8-4 The chart used for O'Leary's Plaque Index

Plaque Index(PI) (Silness and Löe 1963)

The index of Silness and Loe also requires that the four surfaces of designated teeth be visually examined and a score recorded, viz., the maxillary right first molar, maxillary right lateral incisor, and the left first bicuspid; the the mandible, the mandibular left first molar, the left lateral incisor and the right first bicuspid—a total of six teeth. For each of the surfaces of these teeth a score of 0 to 3 is given that matches the severity of the listings in Table 8-1. In this way, the average amount of plaque for each tooth can be determine by dividing by 4; the scores for all six teeth be divided by 6 to get the average for the mouth. The highest scores can be expected to occur on the interproximal surfaces.

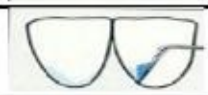
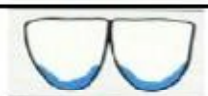
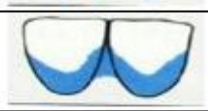
Score	Criteria	
0	No plaque	
1	Thin film of plaque at the gingival margin. Visible only when scraped wirh an explorer or Detection Dye	
2	Moderate amount of plque along the gingival margin: interdental space free of plaque: plaque visible with the naked eye.	
3	Heavy plaque accumulation at the gingival margin: interdental space filled with plaque	

Table 8-1 Plaque Index(PI) (Silness and Löe 1963)

Gingival Index (GI) Loe and Silness

Gingival inflammation Index (GI) Loe and Silness assesses severity of gingivitis based on color, consistency & bleeding (Table 8-2).

Score	Criteria
0	Normal
1	Mild inflam, slight color change and edema, no bleeding
2	Moderate inflam, redness, edema, bleeds on probing
3	Severe inflam, marked redness and edema, ulceration, spontaneous bleeding

Table 8-2 Gingival Index (GI) Loe and Silness

Papillary Bleeding Index (PBI) Muhlemann

Papillary Bleeding Index (PBI) Muhlemann Measures severity of bleeding, quantifies bleeding in the papillary region (Table 8-3).

Score	Criteria
0	No bleeding
1	Point of blood
2	Line, points, speck
3	Triangle
4	Profuse bleeding

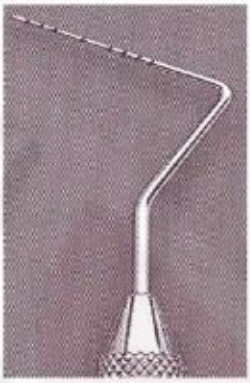
Table 8-3 Papillary Bleeding Index (PBI) Muhlemann

Periodontal Probes

As illustrated in Figure 8-5, there are several variations of periodontal probes. Each has circumferential markings on the probing tip to aid in determining sulcular depth; others also have color-coding to further facilitate accurate measurements. The probe is used for four main purposes: (1) the measurement of *pocket depth,* (2) the measurement of epithelial *attachment loss,* and (3) the detection of *subgingival calculus* as part of the periodontal examination. The probe may be of metal, or of a hard polymer. The probing tip is approximately 0.5 millimeter in diameter. Its tactile *reproducibility* and *accuracy* depends much upon the experience of the operator.

There is always a need for caution in probing, especially in the presence of inflammation. Probing inflamed gingival tissue sites with its fragile capillaries risks inducing a *bacteremia.* For individuals at risk of infective *endocarditis,* both a clinical and radiographic assessment is indicated prior to a decision to probe. Prophylactic antibiotic coverage may be indicated.

WHO (3,5-8,5-11,5mm)



Williams (1,2,3,5,7,8,9mm)

Figure8-5 Two types of calibrated periodontal probes useful in assessing the depth and configuration of periodontal pockets

Periodontal Probing

As previously mentioned, two of the main purposes of periodontal probing are to determine *pocket depth,* and to measure the amount of *attachment loss*. Both have one requirement in common, namely a careful step-by-step circumferential probing around each tooth.

The measurement of *epithelial attachment loss* involves the same format of probing as for determining *pocket depth*. The main *difference* is the *reference point from which* the measurement is recorded. For pocket depth, it is from the depth of the pocket *to the crest* of the free marginal gingiva. For calculating attachment loss, the measurement is made from the depth of the pocket on each surface *to a fixed site,* such as the cementoenamel junction or occlusal plane. Two measurements *separated in time* but at the same site are necessary to estimate the amount of apical migration (if any) of the epithelial attachment. Sites that show a 2-millimeter loss of attachment between two sequential recall examinations should be considered as active.

Gingival Recession

As the attachment loss continues, the free gingival margin may recede apically along with the epithelial attachment as well as the underlying alveolar bone. In such a case, the pocket depth may be near normal (as measured from the crest of the free gingival margin), while the attachment loss increases (as measured from the cementoenamel junction).

Community Periodontal Index of Treatment Needs (CPITN)

The previous plaque, and bleeding indices were epidemiological instruments that could be *visually* accomplished for events occurring *above* the gingival margin. The next one widely used epidemiology indices, the Community Periodontal Index of Treatment Needs (CPITN) require probing to evaluate the periodontal health (or otherwise) that occurs below the gingival margin.

A special color-coded black banded probe from 3.5 to 5.5 mm and circular rings at 8.5 and 11.5 facilitates uniformity of scores in the world-wide accomplishment of the CPITN (WHO probe, pressure: no greater than 15-25g). In this screening index, the periodontal treatment needs are recorded for six segments (sextants). The segments are the anterior and two posterior sets of maxillary and

mandibular teeth. The system excludes the third molars, except where the third molars are functioning in the place of the second molars. A sextant must have at least two functional teeth. The *highest* (worst) of the coded conditions in Table 8-4 is recorded for *each sextant*.

Score	Condition	Treatment Needed
0	Healthy No pockets- entire black area of probe visible	Preventive
1	Bleeding on probing No pockets- entire black area of probe visible	Oral hygiene instruction (OHI)
2	Calculus or iatrogenic marginal irritation No pockets- entire black area of probe visible	OHI and debridement
3	Shallow pockets up to 5mm Gingival margin is on black area of probe	OHI and debridement
4	Deeper pockets from 6mm Black area of probe not visible	OHI, calculus removal and complex treatment

Table 8-4 Community Periodontal Index of Treatment Needs (CPITN)

Noninvasive Treatment Guidelines for Gingivitis

Gingivitis of plaque origin is a *preventable and curable* periodontal disease. The *objective of professional and home self-care is to eliminate or severely reduce the etiologic organisms in the dental plaque and to prevent or reverse gingival inflammation.* This effort can be abetted by a thorough prophylaxis, supplemented at home by use of the *toothbrush, dental floss* and an *irrigation device* (Figure 8-6). This "brush, floss, and flush" routine can be enhanced by the daily use of a fluoride toothpaste, over-the-counter products with *essential oils,* such as Listerine, or dentist prescribed *chlorhexidine* mouthrinses.

Figure 8-6 Two *irrigation devices*

Noninvasive Primary Preventive Care for Periodontitis

Once a patient develops *periodontitis,* therapy usually includes additional measures to those recommended for gingivitis. As the probing depth increases, it becomes more difficult to eliminate the bacteria of the subgingival plaque. In addition to routine calculus removal at the time of the prophylaxis, *scaling* and *root planing* needs to be accomplished. The mouthrinses used in a self-care programs do not penetrate deeply enough into the periodontal

pockets. However, when irrigation is accomplished in the office, a greater penetration of the pocket can be attained by placing the therapeutic irrigating solution in the fluid container of the ultrasonic scaler (Figure 8-7). To complete the treatment, often a slow-delivery medication is placed in the pocket, or antibio- tic therapy can be initiated to eliminate microbes that have invaded the sulcular tissues. Once a maximum treatment success has been achieved, an every-3-month monitoring is *mandatory*.

Figure 8-7 The ultrasonic scaler.

Invasive Procedures Required to Access the Subgingival Pocket

As the pocket continues to deepen it becomes more difficult to apply noninvasive preventive procedures. To solve this problem, the clinician should be to *refer patients* to periodontist for treatment.

Prevention of dental trauma

Dental injuries are very common, and up to 30% of children injure their primary teeth. Tooth injury is more common in males (greater than a 2:1 ratio).

Patterns and Risk Factors:

The most common injury site is the maxillary (upper) central incisors, which account for more than 50% of all dental injuries.
Oral injuries typically result from falls (most common), bike and car accidents, sports-related injuries, and violence.

Missing Teeth

Missing teeth should be accounted for. Do not assume that missing teeth were lost at the scene of the accident because they may be imbedded in soft tissues, intruded into the alveolar bone or sinus cavity, aspirated, or swallowed.
Radiographs (soft tissue and chest X-rays) should be done to look for missing teeth.

Types of Tooth Injury

Tooth injury can be divided into 7 main categories:

1. Concussion
2. Subluxation
3. Lateral Luxation
4. Intrusion
5. Extrusion
6. Avulsion
7. Fracture

Prevention

Prevention is the most effective intervention. Pediatricians are in a unique position to help families prevent accidental trauma, including oral trauma, by providing anticipatory guidance at routine visits.

Accident Prevention

Suggestions for accident prevention specifically related to oral trauma:
1. Advise parents about possible injury to developing permanent teeth from trauma if a primary tooth is injured.
2. Review and anticipate developmental milestones.
3. Counsel about the risks of walkers and trampolines.
4. Discuss childproofing the home.
5. Review safety measures for outdoor activities and sports.
6. Stress the importance of adequate supervision at all times, especially on furniture, stairs, at the playground, and at athletic events or practices.

Sports and Protective Gear

Sports participation poses a significant risk for trauma. The highest risk sports for oral trauma arebaseball, soccer, football, basketball, and hockey. Skateboarding, rollerblading, and bicycling injuries are also common.

Helmet and face masks should be properly fitted and worn during all games and practices for the sports in which they are recommended. Statistically, children are more often injured in practice than during a game, so all protective gear should be worn during practice as well.

Mouth Guards

Mouth guard use is mandatory for football, ice hockey, lacrosse, field hockey, and boxing. Several states have also passed regulations to mandate mouth guards for soccer, basketball, and wrestling.

- Facts About Mouth Guard Use

1. Mouth guards help to protect the teeth and soft tissues of the mouth from injury.
2. The better the fit, the more protection offered.
3. Mouth guard use may reduce the risk or severity of a concussion.

- Types of Mouth Guards

There are 3 types of mouth guards(Figure 9-1):
1. Stock. (A)
2. Mouth-formed, or "boil-and-bite." (B)
3. Custom fit.(C)
   - Vacuum thermoformed
   - Pressure laminated

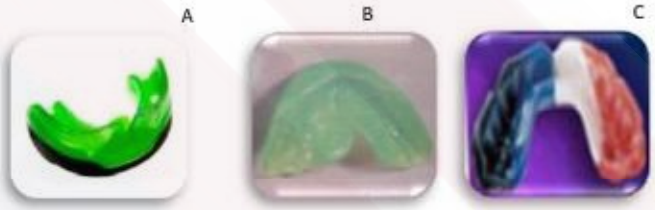


Figure 9-1 A,B, and C Some types of mouth guards

Stock Mouth Guards

These pre-formed, over-the-counter, ready-to-wear mouth guards are generally the least comfortable and, therefore, the least likely to be worn. Because of poor fit, they also offer the least protection and require constant biting down to stay in place.

Boil and Bite Mouth Guards

Made of thermoplastic material that conforms to the shape of the teeth after being placed in hot water, these mouth guards are commercially available and the most common type used by athletes. They vary in fit, comfort, and protection.

Custom Fit Mouth Guards

This type of mouth guard must be made by a dentist for the individual. It is the most expensive, but also offers the most protection and comfort.
Custom mouth guards are preferred by dentists and usually preferred by athletes because of their increased comfort, wear-ability, and retention, as well as ease of speaking when worn.

- Recommendations for Mouth Guards

The American Academy of Pediatric Dentistry (AAPD) recommends properly fitted mouth guards for all children participating in organized and unorganized contact and collision sports.

The AAPD supports mandates for use of athletic mouthguards in any sporting activity containing a risk of orofacial injury.

Proper Care of Mouth Guard

- Mouth guards should fit properly and not block breathing or interfere with Speech
- Prevent possible disease transmission and infection through cleaning and proper maintenance.

- Mouth guards are porous and may allow bacterial growth
- Bacteria in a mouth guard may cause gum infection and illness.

Steps to Keeping Mouth Guard Clean

- Wash after each use in cold water
- Do not use warm, hot or boiling water because it will change the shape
- Use a soft toothbrush to clean
- Store in a protective case after cleaning
- Soak in cold denture cleaning solution if white, hard deposits form.

Equally or more important to prevent serious facial injuries is that the use of *seat belts* should be strongly advocated across all age.

How to Respond to a Dental Emergency

If a Tooth is Knocked Out

- Time is critical
- Do not touch the tooth root
- Gently rinse the tooth
- Place in milk or water (not tissue!)
- Go to the dentist or emergency room, with the tooth, immediately.

If a Tooth is Pushed Out of Place Or Broken

- Clean injured area with warm water
- If there is swelling, apply cold packs to outside of face
- Go to a dentist or emergency room immediately.

If a Jaw is Broken

- DO NOT move the jaw
- Wrap a scarf, handkerchief or towel around the head to keep the jaw still
- Go to a hospital emergency room immediately!

Prevention of malocclusion

Preventive orthodontics

General factors influence the development of a malocclusion

1. Abnormal oral musculature. High tongue position coupled with a strong mentalis muscle may damage the occlusion after the loss of a mandibular primary molar and distal drifting of the anterior segment will result. A collapse of the lower dental arch

2. Oral habits. Thumb or finger habits cause abnormal forces on the dental arch and are responsible for initiating a collapse after the untimely loss of teeth.

3. Existing malocclusion. Arch-length inadequacies and other forms of malocclusion, particularly class II, division 1, usually become more severe after the untimely loss of mandibular primary teeth.

4. Stage of occlusal development. In general, more space loss is likely to occur if teeth are actively erupting adjacent to the space left by the premature loss of a primary tooth.

Preventive Orthodontics:

Preventive Orthodontics is the action taken to preserve the integrity of what appears to be normal at a specific time. Any procedure that attempt to ward off untoward environmental attacks or anything that would change the normal course of events.

Various Preventive procedures are

1. Pre-dental procedures:

1. Proper nutrition of the child
2. Proper nursing care of the infant.
3. Bottle feeding should be discouraged.

2. Care of deciduous dentition:

Prevention and timely restoration of carious teeth. Every afford should be made to preserve the integrity of deciduous dentition by under taking regular dental checkups, simple preventive procedures like application of fluorides, pit and fissure sealants etc.

3. Patient and parent's education programs:

Need of maintaining good oral hygiene should be explained to the patient and the parents. Demonstration of brushing methods and diet counseling etc are also important.

4-Anomalies of teeth number:

Each jaw is designed to hold only a specific number of teeth at a particular age. However, if the number of teeth present increases, or size of teeth is abnormally large, it can cause crowding or hamper the eruption of succedaneous teeth in their ideal positions

Similarly, if the number of teeth present is less than normal then gaps will be seen in the dental arch.

- **Anomalies in the number of teeth can be of two types:**
  - Increased number of teeth or supernumerary teeth.
  - Less number of teeth or missing teeth

supernumerary teeth

Supernumerary teeth can vary remarkably in size, shape and location.

The most commonly seen supernumerary tooth is the "mesiodens" It is usually situated between the maxillary central incisors and can vary considerably in shape.

Supernumerary teeth can cause:

- Noneruption of adjacent teeth
- Delay the eruption of adjacent teeth
- Increase the arch perimeter
- Crowding in the dental arch

Supernumerary teeth, which bear a close resemblance to a particular group of teeth and erupt close to the original sight of these teeth, are called *supplemental teeth*.They are more commonly seen in the premolar region or the lateral incisor region.

- **Missing teeth:**

Congenitally missing teeth are far more commonly seen as compared to supernumerary teeth. The most commonly congenitally missing teeth are the third molars, followed by the maxillary lateral incisors

5. Early loss of deciduous teeth:

Early loss of the primary adjacent tooth decrease space availability for eruption

Early loss of primary tooth leading to mucosal thickening over the permanent tooth.

Early loss of the primary tooth might cause excessive bone disposition over the permanent tooth

Space maintainer should be fitted after the early loss of deciduous teeth particularly the molars.

6. Ankylosed deciduous teeth:

Ankylosis is a condition characterized by absence of the periodental membrane in a small area or whole of the root surface.
Presence of ankylosed deciduous teeth. These might not get absorbed causing a delay in the eruption of the permanent tooth .
They should be removed surgically at appropriate time to allow emergence of the successor.

7. Ectopic eruption:

Appropriate measure should be taken to prevent ectopic eruption of any teeth by timely removal of any supernumerary tooth, retained root etc.

8. Proximal caries:

Proximal caries are especially to blame for the reduction in arch length. This might be brought about by migration of adjacent teeth or tilting of adjacent teeth into the space and/or supra-eruption of the teeth in the opposing arch.
Caries can also lead to the premature loss of deciduous or permanent teeth.
To maintain the integrity of dental arch, carious teeth must be treated promptly.
Dx: By clinical and radiographic examination (Bitewing radiograph)
Malocclusions can be caused due to improper dental restorations.

Under contoured proximal restoration can lead to a significant decrease in the arch length especially in the deciduous molars.
Over contoured proximal restorations might bulge into the space to be occupied by a succedaneous tooth and result in a reduction of this space.
Overhang or poor proximal contacts may predispose to periodontal breakdown around these teeth.
Premature contacts on over contoured occlusal restoration can cause a functional shift of the mandible during jaw closure.
under-contoured occlusal restorations can lead to the supra-eruption of the opposing dentition.

9. Prolonged retention of deciduous teeth:

It causes:

- Buccal/labial or palatal/lingual deflection in its path of eruption.
- Impaction of the permanent tooth
- Most commonly impacted tooth is the maxillary canine (third molars not taken into account).
- They should be extracted to allow the successor teeth to erupt in normal position.

10. Labial frenum:

At birth the labial frenum is attached to the alveolar ridge with some fibers crossing over and attaching with the lingual dental papilla.
As the teeth erupt, bone is deposited and the frenal attachment migrates superiorly with respect to the alveolar ridge.
Some fibers may persist between the maxillary central incisors . These fibers which persist between these teeth are capable of preventing the two contra lateral central incisors from coming into close approximation causing the midline diastema .
Surgical removal of the abnormal labial frenum is needed to prevent median diastema.

11. Grinding of cusp tips/occlusal equilibration:

Cuspal interference should be removed by selective grinding of the tooth. Abnormal anatomical features like enamel pearl, may cause premature contact.
Problem:
Deviation in the mandibular path of closure
Predispose to bruxism
Dx: articulating paper/bite paper

12. Tongue tie:

If such tie of the tongue interferes with the normal speech and or swallowing, it should be removed surgically.

13. Oral habits:

Abnormal oral habits should be recognized and patient should be helped by motivation or by fitting a suitable habit breaking appliance.

14. Space maintainers:

Premature loss of deciduous teeth can cause drifting of the adjacent teeth into the space. Space maintainers must be inserted in appropriate cases after the loss of teeth, particularly after the loss of deciduous molars in inadequate arches.

Preventive management of the development occlusion

A tooth is maintained in its correct relationship in the dental arch as a result of the action of a series of forces (Figure 10-1).

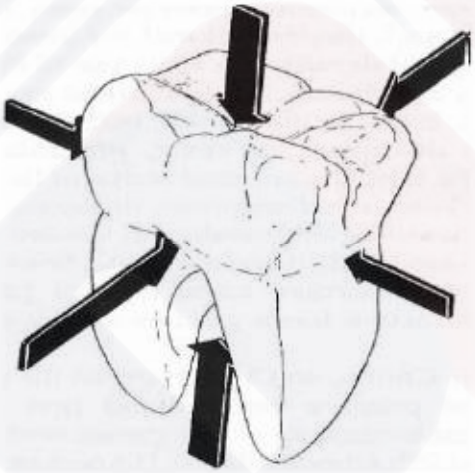


Figure 10-1 Forces that act on a tooth to maintain its relationship in the arch.

If one of these forces is altered or removed, changes in the relationship of adjacent teeth will occur and will result in drifting of teeth and the development of a space problem.

Oral Cancer Prevention

Most cancers of the mouth are *easy* to see, while those of the floor of the mouth can be *easily* palpated. The typical early intraoral lesion is usually an *indurated ulcer*. Any ulcer that persists for *3 weeks should be biopsied.* The early detection, and early referral leading to a more favorable outcome of therapy, *is* a crucial responsibility of the *general dentist!*

A tragedy associated with many head and neck cancer deaths is that in *most cases* the disease *could have been prevented.* The great majority of head and neck cancers arise from *three* sources: (1) *smoking* and the use of smokeless tobacco, (2) exposure of the lips and face to the *sun,* and (3) excessive consumption of *alcohol.*

Usually, there are early nonhealing, *precancerous* changes in the oral cavity or on the face that should alert an individual to immediately seek professional care. Cessation of the use of tobacco, avoiding excessive exposure to the sun, and consuming alcohol in moderation *will help* return the tissues to normal. Finally, if the cancer is diagnosed in the early stages, *immediate treatment* is usually followed by a "clinical cure," provided there is not a return to the original habits.

The Profile of the Oral-Cancer Patient

The average oral cancer patient is over 40 years of age, with men afflicted more often than women. The most common intraoral cancer is a *squamous cell* cancer that might have been preceded by *leukoplakia.* The seriousness of the cancer is designated by a *TNM* classification system (staging) with scoring assigned in three areas of clinical assessment: *(T)*umor size, involvement of the lymph *(N)*odes draining the area and presence/extent of *(M)*etastasis. The greater the scoring numbers from 0 to 4 in each of the categories, the *more serious* the prognosis.

Treatment of Oral Cancer

The treatment for cancer of the oral cavity involves a choice of *surgery, radiation, chemotherapy,* or combinations thereof. Surgery is used to *excise* smaller cancerous lesions or to *debulk* large tumors (remove as much as possible of large volume cancers). As a co-therapeutic modality, *chemotherapy or radiotherapy* can be an option *following* surgery. The addition of radiotherapy adds two very disconcerting problems to the treatment regimen—*mucositis* and *osteoradionecrosis (ORN).* Host damage by radiation is usually *localized* to the field of irradiation, while the side effects of chemotherapy are *systemic.*

Dental Intervention, Cancer

If possible, all needed dental surgery for the newly diagnosed cancer patient should be accomplished *prior* to radiotherapy. All teeth with a questionable prognosis should be extracted, such as those with moderate-to-severe periodontal disease, extensive caries, impacted third molars and irreversible pulpitis. In making a decision to extract or retain teeth, consideration should be given to the past evidence of the patient having maintained a fastidious level of plaque control, overall prognosis, attitudes and expected compliance with written and verbal preventive dentistry instructions.

After exodontia there should be a 21-day waiting interval *before* radiation since the risk of developing ORN increases with a shorter interval elapsing between surgery and radiation therapy.

Following radiation, all dental care should be *conservative,* emphasizing endodontic and other tooth retention measures instead of extraction. Unfortunately, regardless of the adequacy of self-care of the preserved teeth, the risk of ORN is *perpetual,* even though the risk exists only for the osseous tissue that was within the field of radiation. Recognizing that patient compliance with oral care instructions following radiotherapy is reported to be less than 50%, frequent recalls are essential. Research to date has clearly shown that routine self-care hygiene measures combined with use of fluoride therapy plus regular dental monitoring, significantly reduces the incidence of postradiation caries and the progression of periodontal disease.

Diagnosis and Prevention of Dental Erosion

Aetiology

Erosion is undoubtedly a multifactorial process but the pattern of tooth tissue loss may give some clues as to the most important of the aetiological factors.
All acids, whether from within the body or from external sources, are capable of de mineralizing tooth tissue and therefore of causing erosion.

1. Intrinsic Acidic Sources

These are essentially of gastric acid origin and enter the mouth from gastric reflux, vomiting or rumination.

2. Extrinsic Acid Sources

A. Environmental

Various sources of contact with acids as part of work or leisure activities have been reported.

B. Dietary

This is particularly the case in relation to the consumption of soft drinks with a considerable increase in quantity and change in age distribution. Some alcoholic drinks, such as dry wines and alcopops are also acidic. However, it is not just the total consumption of acidic dietary sources that is important but also the periodicity and relationship to toothbrushing practices.

C. Medication and Oral Hygiene products

A number of common medications, such as Vitamin C tablets and iron preparations are very acidic as well as some proprietary mouthwashes.

D. Lifestyle

Changes in general lifestyle have increased exposure to extrinsic acidic sources.

Management

Early diagnosis is important so that possible aetiological factors can be identified and preventive measures can be taken to halt further progression.

1. Recording Erosion

The most useful diagnostic index is the Tooth Wear Index (T.W.I) of Smith and Knight. Study casts are essential and good clinical photographs helpful.

2. Dietary Analysis

Record at least a 3 day detailed diet history.

3. Dietary Counselling

This must be tailored to the individual.

- Limit acidic foods and drinks to mealtimes.
- Reduce frequency.
- Finish meals with alkaline foods.
- Avoid acid foods and drinks last thing at night.
- Avoid toothbrushing after acidic substances.

- Check the pH of medication, mouthwashes etc.
- Chewing gum has been shown to stimulate salivary flow but may also cause increased gastric secretions.

4. Intrinsic Acid Sources:

Gastric Reflux and Vomiting

- If there is evidence or suspicion then referral to the General Medical Practitioner and onwards to a Gastroenterologist or Psychiatrist may be required.
- Anti reflux medication may be helpful. This should be prescribed in liaison with the General Medical Practitioner and/or Gastroenterologist. Omeprazole can be useful.
- Following reflux, rinsing the mouth with water and sodium bicarbonate helps to neutralise the oral environment.
- An occlusal guard containing sodium bicarbonate can be used at night if there is significant reflux at that time.

5. Remineralisation and Desensitisation

- Fluoride mouthrinses and varnish.
- High fluoride level toothpaste. (Caution in children under 6 years).
- Low abrasive toothpaste.
- Sugar free chewing gum.
- Dentine bonding agents.

6. Restorative Treatment

Identify the problem first, covering eroded teeth may merely disguise the problem. Adhesive restorations in composite/compomers may be useful as an interim treatment. Adhesive metal castings and porcelain veneers may be used later.

Dental Health Programs

The maintenance of good oral health requires a partnership between the dental professional and the patient. No preventive program can be a success unless the patient participates in a home self-care program to supplement office care programs, with the level of success being proportionate to the amount of participation. Maximum participation can be expected when the patient knows what to do, how to do it, and above all has the motivation to adhere to recommended procedures. Educational strategies can be used to teach facts and skills, but these are useless without motivation. Motivation can be initiated by an individual based on some need or desire, or it can be facilitated by persuasion from external sources.

Health promotion and health education are integral components of most successful dental public-health programs. *Health promotion* consists of any planned combination of educational, political, regulatory, and organizational supports for actions and conditions conducive to the health of a community or group of individuals in a defined geographic location. Projects designed to be administered in schools, such as fluoride mouthrinse programs and dental-sealant programs, have been particularly successful, because dental caries is prevalent in children and those with the greatest needs may reside with parents/guardians who are otherwise unable to provide for their treatment needs in personal healthcare facilities.

School-Health Programs Past and Present

School-health programs (SHP) originated around the beginning of the 20th century to help *cope with contagion, screening needs* for physical disabilities, *nutritional deficiencies,* and *first aid* ministrations. Since their inception, school-health programs have varied in quality and content by state and community. children were provided nutritional supplements, eye examinations, health education, smallpox vaccinations, and in some cases oral-health services.

But, the concepts and requirements of school health programs have been greatly broadened over the last three decades. At the onset of the 21st century, *school-health services now include or attempt to address major societal health issues* that have invaded the schools. These include: alcohol, drugs, and tobacco use (smoking and "spit"); safe-sex, HIV, AIDS, other sexually transmitted diseases; gang violence and child abuse; and self-esteem, depression...

Protecting the oral health of future generations is a commitment that must be shared by parents, teachers, school administrators, and all health professionals.