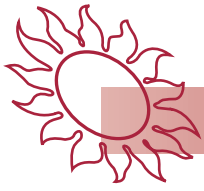

CHAPTER 37

Prevention of Periodontal Disease

By Amid I. Ismail, Donald W. Lewis and Jennifer L. Dingle

37

Prevention of Periodontal Disease

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In 1979 the Canadian Task Force on the Periodic Health Examination found there was insufficient evidence to recommend for or against examination for periodontal diseases and encouragement of daily oral hygiene. Since that time, significant advances have occurred in the understanding of the histopathology, epidemiology, natural history, and effectiveness of prevention and management of multimicrobial infection leading to plaque-associated gingivitis and periodontitis.

Burden of Suffering

Periodontal diseases are the most prevalent chronic diseases affecting children, adolescents, adults, and the elderly. The periodontium is a complex, highly specialized, shock-absorbing and pressure-sensing system consisting of four interrelated tissues supporting the teeth: cementum, periodontal ligament, alveolar bone and junctional and sulcular epithelia (Figure 1).

Gingivitis is a necessary but not a sufficient prerequisite for initiation of periodontitis

The most common type of periodontal disease is gingivitis and its most common form is chronic plaque-associated inflammation – a polymicrobial infection with no single associated bacterial agent. Gingivitis is a necessary but not sufficient prerequisite for initiation of periodontitis. Loss of alveolar bone results in formation of a pocket around the tooth which then acts as a reservoir favouring the growth of anerobic bacteria.

In the most recent survey of American children and adolescents 60% of those examined had at least one tooth site with gingival bleeding; on average, less than 6% of the tooth sites per child had bleeding. The prevalence of gingival bleeding increases significantly until age 34 years when it reaches a plateau; overall, prevalence is 47-55%.

Periodontal diseases affect most adults but only 3-13% experience advanced periodontitis, usually involving only a few teeth

Periodontitis is highly prevalent, affecting 53% of 18-19 year-old American adults and 98% of individuals over 60 years of age. The prevalence of advanced periodontitis (defined by presence of a pocket depth of at least 6 mm) was 7.6% and 34% in adult and elderly Americans, respectively, and 12% for elderly Ontarians. In most people, advanced periodontitis affects relatively few teeth. Only 3-13% of the population is susceptible to rapid and advanced loss of

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periodontal attachment, while about 80% of adults experience low or moderate progression.

Dental plaque is the bacterial mass that adheres to and builds up on a tooth surface. There is good evidence that supragingival (above gingival line) plaque causes gingivitis.<1> Epidemiological studies have found a weak correlation between plaque mass and attachment loss but the presence of *Actinobacillus actinomycetemcomitans*, *Prevtella (Bacteroides) intermedia* and *orphyromonas (Bacteroides) gingivalis* in plaque has been associated with attachment loss.

Calculus or calcified dental plaque acts as a retention web for bacteria. It is associated with loss of attachment in patients with poor oral hygiene status who have limited access to professional dental care but not in those with excellent oral hygiene status. There is no evidence to support any direct causal role for calculus in the initiation of gingivitis or periodontitis but calculus is an important contributor to the chronicity of both.

A consistent association between cigarette smoking and periodontitis has been confirmed in both cross-sectional and longitudinal studies.<2-5> Use of smokeless tobacco has been associated with localized loss of periodontal attachment and oral leukoplakia but not with severe periodontal destruction.<6,7> Other risk factors are non-insulin dependent diabetes and possibly malocclusion and defective host defenses.

In 1981, the estimated treatment time required to manage all individuals with gingivitis and periodontitis in the U.S., over a 4-year period, was 120 to 133 million treatment hours, at a cost of U.S. $5 to $6 billion annually.

Maneuver

Gingival bleeding is a valid sign of inflammation in the gingiva regardless of the presence or absence of visual signs (redness and inflammation). Periodontal pocket depth provides a cross-sectional indicator of periodontitis but does not indicate whether the disease is active or not.

Specific bacterial identification methods such as DNA probes have recently been developed to identify periodontopathogens and aid dental practitioners in predicting when periodontal disease activity is occurring and may provide a promising tool in the future. As yet, the presence or absence of a certain bacterial species or specific antibody response are not reliable predictors of future periodontal destruction.

Effectiveness of Prevention

Prevention of gingivitis and periodontitis is based primarily on plaque and calculus control around the teeth. There have been no

studies on the effectiveness of physician counselling (screening or referral) to prevent gingivitis and periodontitis.

Toothbrushing and Flossing (Personal Oral Hygiene)

Toothbrushing and flossing are effective in preventing gingivitis; frequency of professional care should depend upon periodontal disease status

Gingivitis develops in healthy adults after 10 to 21 days in the absence of personal plaque removal,<1> providing strong evidence for recommending at least daily toothbrushing.

Cross-sectional epidemiological studies have shown a negative correlation between periodontal disease and the frequency of toothbrushing. Cohort studies have shown an association between good oral hygiene and low prevalence of periodontitis.<8,9> A clinical trial<10> confirmed that effective plaque removal every 48 hours was associated with gingival health. However, the external validity of this study is limited because the participants cleaned their teeth under supervision.<11,12> The daily routine of the procedure was reported by the participants to be "very boring".<11>

In a unique longitudinal study (without a control group),<13> 375 participants received scaling and root planing (described below) to remove calculus every 2-3 months during the first 9 years of the study, and twice annually during the following 6 years. The participants were instructed on maintaining oral hygiene practices at home. After 15 years, the participants had no clinically detectable loss of periodontal attachment level. However, the costs and commitment required in such an intensive program may make this approach impractical.

A recent two-week clinical trial with adults found that while twice daily toothbrushing alone produced a 35% reduction in gingival bleeding, toothbrushing and flossing at home resulted in a 67% reduction.<14> No differences were found between waxed and unwaxed floss. This study again cannot be generalized to unsupervised flossing at home because the participants were checked daily. A recent clinical trial involving third grade schoolchildren found that toothbrushing was as effective as combined toothbrushing and flossing.<15> Nevertheless, flossing should be part of an oral hygiene program for children because of the need to build the skill and establish flossing as a habit.

There is no scientific evidence to support the superiority of any of the techniques (or styles) of toothbrushing. Physicians and dentists should advise their patients concerning the damaging effects of some toothbrushing techniques (for example, horizontal scrubbing can result in abrasion or systemic bacteremia and too frequent brushing leads to gingival recession).

There is no consistent evidence to support the long-term superiority of electric toothbrushes over manual brushes.<16-19>

While electric toothbrushes may help some patients to increase the frequency of toothbrushing and are very helpful in maintaining good oral hygiene in patients who cannot manage a manual toothbrush properly, the additional benefits should be judged relative to the higher cost.

Professional Care

The most common form of professional preventive care for gingivitis and periodontitis is scaling and polishing of teeth in a dental office. During scaling, specially designed sharp dental instruments are used to remove calculus and bacteria located either above the gingiva (supragingival) or inside the gingival crevice or pocket (subgingival). An abrasive is then applied to remove stains and plaque and to smooth the scaled areas. Another mechanical preventive procedure is root planing. Calculus is removed from the root surface using scalers. Root planing is performed either with or without surgical exposure of the root by opening a gingival flap.

The studies of Axelsson *et al*<13,20,21> have been used to support the contention that regular professional care is necessary for maintenance of periodontal health. However, these studies lack external validity and the frequency and techniques used for scaling are different from those used regularly in North America. Adults have also been shown to benefit from receiving 11 professional prophylaxes during a 3-year period.<22> Again the frequency of intervention was intensive. This does not mean that the conventional frequency of dental prophylaxis is harmful or not recommended, but rather that the scientific evidence supporting its effectiveness is weak.

For periodontally healthy adults, annual scaling has been shown to be as effective as scaling carried out more frequently in maintaining gingival health.<23-26> No recent clinical trial has been carried out to test the optimal frequency and efficiency of scaling for periodontally healthy individuals with excellent home maintenance vis-a-vis those who cannot personally maintain their periodontal health. The recall interval should be individualized based upon patient oral hygiene status and severity of gingivitis and periodontitis.

Antimicrobial Agents

For high-risk patients other effective measures include: smoking cessation, chlorhexidine or Listerine® rinse, and anticalculus toothpaste

An oral rinse with chlorhexidine (0.12% or 0.2%), an anti-bacterial agent, has been found to be effective in reducing supragingival plaque and gingivitis.<27-29> Unsupervised use of chlorhexidine for 6 months was more effective than sanguinarine and Listerine® (Warner-Lambert Canada Inc., Scarborough, Ontario) rinses in the reduction of plaque and gingival bleeding.<27> Side effects associated with chlorhexidine use include increased calculus formation, bad taste, and staining of teeth.<29>

There are also short-term studies (6 to 9 months) which have documented the effectiveness of Listerine® in the prevention of gingivitis when compared to a placebo.<30,31> Side effects of Listerine® are poor taste and a burning sensation in the mouth.

There are no long-term studies documenting the effectiveness of unsupervised use of over-the-counter mouthrinses such as Plax® (Pfizer Canada Inc., Kirkland, Quebec), Scope® (Procter and Gamble, Toronto, Ontario) and Cepacol® (Merrell Dow Pharmaceutical Inc., Richmond Hill, Ontario) in preventing gingivitis.

The use of antibiotics (tetracyclines) in the prevention of gingivitis and periodontitis in the population at large has not been tested because of possible side effects, and the potential development of resistant bacterial strains and patient hypersensitivity.

Anti-Calculus Toothpastes

"Anti-tartar" toothpastes contain soluble pyrophosphates which prevent calcification of plaque. The percentage reduction in supragingival (but not subgingival) calculus is between 32%<32> and 45%.<33> Cases of cheilitis and mucosal erythema have been reported<34> and the long-term value of these products in preventing gingivitis and periodontitis has not been established.

Recommendations of Others

In 1989, the U.S Preventive Services Task Force<35> recommended that all patients be encouraged to visit a dental care provider on a regular basis and that primary care providers should counsel patients regarding daily tooth brushing and dental flossing. Clinicians were advised to be alert for obvious signs of oral disease while examining the mouth and to counsel all patients regarding the use of tobacco products. These recommendations are currently under review.

Conclusions and Recommendations

Absence of gingival bleeding is a highly specific indicator of the lack of periodontal disease activity. While the presence of gingivitis cannot be used to predict periodontitis, assessment of gingivitis in a periodic dental examination is recommended. The presence of periodontal pockets and loss of periodontal attachment should also be recorded for all teeth. However, evidence for optimal frequency of professional care in preventing development or progression of periodontitis is not available for the population at large. The frequency of professional scaling should be based upon the patient's periodontal disease status and stability of periodontal health over time. The current practice of advising regular biannual or annual scaling for all

patients is costly and cannot be supported for periodontally healthy patients.

There is evidence to recommend personal toothbrushing (B Recommendation) and flossing (A Recommendation) to prevent gingivitis in adults. In children there is fair evidence to support toothbrushing only (B Recommendation); however, flossing is recommended to develop the necessary skills and establish a habit (C Recommendation). Toothbrushing and flossing may prevent periodontitis; however, brushing and flossing are strongly recommended to prevent gingival inflammation and reduce the level of supra-gingival bacteria. Supervised toothbrushing and flossing is recommended for patients with malocclusion, diabetes or HIV infection based on poor evidence (C Recommendation). There is also fair evidence to recommend professional scaling and plaque removal in periodontally healthy individuals (B Recommendation).

There is also good evidence to recommend the use of chlorhexidine oral rinse as an adjunct to self-care in the prevention of gingivitis (A Recommendation) in special patients (mentally handicapped, cancer, or those who cannot clean their teeth because of a physical disability). Listerine is less effective than chlorhexidine (B Recommendation). There are no long-term studies of the effectiveness of other antimicrobial rinses marketed for home use (D Recommendation as effective alternatives available).

Anticalculus dentifrices are recommended for people with high levels of calculus formation to reduce the accumulation of supra-gingival calculus (B Recommendation) but for the general population the benefits are unclear (C Recommendation). Antibiotics are not recommended for the prevention of gingivitis or periodontitis (E Recommendation). There is fair evidence to recommend smoking cessation to reduce the risk of developing periodontitis (B Recommendation) (and good evidence overall, see Chapter 43 on Prevention on Tobacco-Caused Disease).

Physicians should ask patients during a periodic health examination whether they experience bleeding gingiva especially during chewing of foods or toothbrushing (C Recommendation). They should refer those patients who are diagnosed with any systemic condition (for example, diabetes or HIV infection) which may lead to a reduction of immune response or an increase of collagen tissue breakdown. Patients scheduled to receive chemotherapy or radiation therapy should also be seen by a dentist or periodontist.

Unanswered Questions (Research Agenda)

The identification of those at high risk for rapid progression of periodontitis is a major challenge for future research as is defining risk profiles for periodontal disease.

Evidence

A literature search was conducted for the period starting from 1980 to 1993 using MEDLINE with the keywords: periodontal diseases. Selected studies published prior to 1980 were also reviewed if there were no recent updates. This review was initiated in June, 1991 and recommendations were finalized by the Task Force in November, 1992. A report with a full reference list was published in 1993.<36>

Acknowledgements

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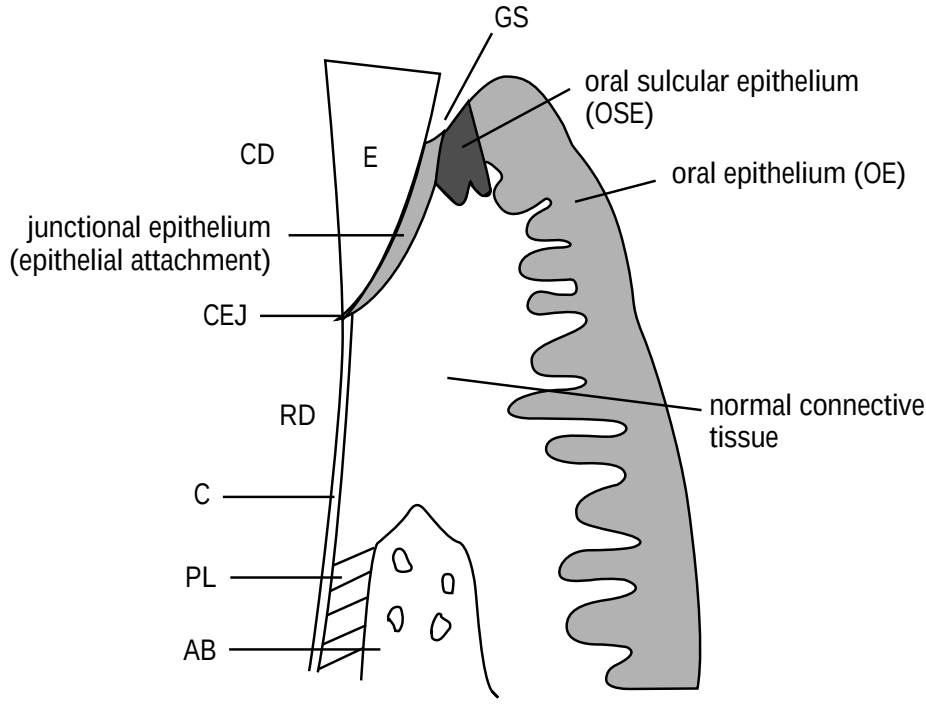
Figure 1: A schematic longitudinal section through dento-gingival part of a healthy tooth and its periodontium



Caption:
E: enamel
RD: root dentin
AB: alveolar bone
CEJ: cemento-enamel junction
CD: coronal dentin
PL: periodontal ligament
C: cementum
GS: gingival sulcus

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Prevention of Periodontal Disease

MANEUVER	EFFECTIVENESS	LEVEL OF EVIDENCE <REF>	RECOMMENDATION
Toothbrushing and flossing	Toothbrushing is effective in preventing gingivitis. Patients who are not motivated or dextrous may not comply.	Randomized controlled trial<10> (I); descriptive study<1> (III)	Fair evidence to recommend toothbrushing for prevention of gingivitis (B)
	Flossing is ineffective in preventing gingivitis in children.	Randomized controlled trials<11,12,15> (I)	Flossing is recommended to develop the skill and establish a habit but poor evidence to include or exclude (C)
	Flossing is effective in preventing gingivitis in adults.	Randomized controlled trial<14> (I)	Good evidence to recommend flossing in adults (A)
	Brushing and flossing may prevent periodontitis. **High risk groups:** There is no evidence that brushing or flossing is effective.	Cohort studies<8,9> (II-2)	Supervised toothbrushing and flossing is recommended for patients with malocclusion, diabetes or HIV infection based on poor evidence (C)
Use of electrically powered toothbrush	Electric toothbrushes are not superior to manual toothbrushes; the benefit to those with limited dexterity or motivation must be weighed against cost.	Randomized controlled trials<16-19> (I)	Fair evidence not to recommend (D) for general population but recommended for patients with limited dexterity based on poor evidence.
Professional scaling and prophylaxis	**In periodontally healthy patients:** Intensive professional oral hygiene and prophylaxis prevents chronic gingivitis and periodontitis. Annual scaling provides no additional benefit for those who maintain good oral hygiene.	Randomized controlled trials<13,20-26> (I)	Fair evidence to recommend professional scaling and prophylaxis depending on the periodontal disease status of the patient (B)

(Continued on next page)

Prevention of Periodontal Disease (concl'd)

MANEUVER	EFFECTIVENESS	LEVEL OF EVIDENCE <REF>	RECOMMENDATION
Use of chlorhexidine oral rinse as adjunct to toothcleaning	Effective in preventing gingivitis and as an antimicrobial. Reduces supragingival plaque but increases calculus formation. Rinse has bad taste and stains teeth.	Randomized controlled trials<27-29> (I)	Good evidence to recommend twice daily use of 0.12% chlorhexidine rinse (A) for those with difficulty cleaning teeth (e.g patients with disability, cancer)
Use of listerine® oral rinse	Less effective than chlorhexidine but effective in preventing gingivitis with over 6 months of use. Poor taste and burning sensation in mouth.	Randomized controlled trials<30,31> (I)	Fair evidence to recommend use by patients with severe gingivitis (B)
Use of other over-the-counter oral rinses	No long-term studies of effectiveness and alternatives available.		Fair evidence not to use (D)
Toothbrushing with anticalculus dentifrice	Effectiveness in preventing gingivitis not documented. Effectiveness in reducing supragingival calculus; no long-term evaluation.	Randomized controlled trials<32-34> (I)	No evidence to recommend for general population (C); fair evidence to recommend for patients at risk of calculus formation (B)
Antibiotic prophylaxis	No evidence of effectiveness in preventing gingivitis or periodontitis in the general population.		Good evidence not to recommend antibiotics for preventive use because of side effects (E)
Smoking cessation	Eliminates increased risk of periodontal disease due to smoking.	Cross-sectional and cohort studies<2-7> (II-2)	Fair evidence to recommend smoking cessation to prevent periodontal disease (B)
Screening for periodontal disease by physicians (reports of gingival bleeding during toothbrushing)	Not evaluated.		Insufficient evidence to evaluate but recommended in areas with no dental services (C)