

Comprehensive Periodontal Therapy: A Statement by the American Academy of Periodontology*

The American Academy of Periodontology (AAP) periodically publishes reports, statements, and guidelines on a variety of topics relevant to periodontics. These papers are developed by an appointed committee of experts, and the documents are reviewed and approved by the AAP Board of Trustees.

The American Academy of Periodontology offers the following statement that sets forth the scope, objective, and procedures that constitute periodontal therapy. This statement is provided to assist all members of the dental team who provide periodontal care and should be considered in its entirety. This statement may also be useful to those who supervise, teach, or regulate the provision of periodontal therapy.

SCOPE OF PERIODONTAL THERAPY

As a result of advances in knowledge and therapy, the majority of patients can retain their dentition over their lifetime with proper treatment, reasonable plaque/biofilm control, and continuing care. Periodontics is the specialty of dentistry that encompasses prevention, diagnosis, and treatment of diseases of the supporting and surrounding tissues of teeth and dental implants.

The scope of the specialty of periodontics also encompasses maintenance of the health, function, comfort, and esthetics of all supporting structures and tissues in the mouth. The goals of periodontal therapy are to preserve, improve, and maintain the natural dentition, dental implants, periodontium, and peri-implant tissues in order to achieve health, comfort, esthetics, and function. A healthy periodontium is characterized by the absence of inflammation, which may appear clinically as redness, swelling, suppuration, and bleeding on probing.

PERIODONTAL EVALUATION

A comprehensive assessment of a patient's current health status, history of disease, and risk characteris-

tics is essential to determine the periodontal diagnosis and prognosis of the dentition and/or the suitability of dental implants. Patients should receive a comprehensive periodontal evaluation and their risk factors should be identified at least on an annual basis. Such an evaluation includes discussion with the patient regarding his/her chief complaint, medical and dental history review, clinical examination, and radiographic analysis. Microbiologic, genetic, biochemical, or other diagnostic tests may also be useful, on an individual basis, for assessing the periodontal status of selected individuals or sites. The following procedures should be included in a comprehensive periodontal evaluation:

1. Extra- and intraoral examination to detect non-periodontal oral diseases or conditions.
2. Examination of teeth and dental implants to evaluate the topography of the gingiva and related structures; to measure probing depths, the width of keratinized tissue, gingival recession, and attachment level; to evaluate the health of the subgingival area with measures such as bleeding on probing and suppuration; to assess clinical furcation status; and to detect endodontic-periodontal lesions.
3. Assessment of the presence, degree, and/or distribution of plaque/biofilm, calculus, and gingival inflammation.
4. Dental examination including caries assessment, proximal contact relationships, the status of dental restorations and prosthetic appliances, and other tooth- or implant-related problems.
5. An occlusal examination that includes, but may not be limited to, determining the degree of mobility of teeth and dental implants, occlusal patterns and discrepancy, and determination of fremitus.
6. Interpretation of current and comprehensive diagnostic-quality radiographs to visualize each tooth and/or implant in its entirety and assess the quality/quantity of bone and establish bone loss patterns.
7. Evaluation of potential periodontal-systemic interrelationships.
8. Assessment of the need for and suitability of dental implants.
9. Determination and assessment of patient risk factors such as age, diabetes, smoking, cardiovascular disease, and other systemic conditions associated

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DISCLAIMER: This statement represents the views of the Academy regarding periodontal therapy and related procedures. It must be recognized, however, that decisions with respect to the treatment of patients must be made by the individual practitioner in light of the condition and needs of each specific patient. Such decisions should be made in the best judgment of the practitioner, taking into account all relevant circumstances.

NOTE: The Academy updates guidelines and statements on a periodic basis. All previous publications should be considered in light of their historical context with regard to current knowledge and practices.

with development and/or progression of periodontal disease.

ESTABLISHING A DIAGNOSIS, PROGNOSIS, AND TREATMENT PLAN

Clinical findings together with a diagnosis and prognosis should be used to develop a logical plan of treatment to eliminate or alleviate the signs and symptoms of periodontal diseases, thereby arresting or slowing further disease progression. The treatment plan should be used to establish the methods and sequence of delivering appropriate periodontal treatment, which may include non-surgical, surgical, regenerative, and cosmetic periodontal therapy or dental implant placement. When indicated, the plan should include:

1. Medical and dental consultation or referral for treatment, when appropriate.
2. Surgical and non-surgical periodontal and implant procedures to be performed.
3. Consideration of adjunctive restorative, prosthetic, orthodontic, and/or endodontic consultation or treatment.
4. Provision for ongoing reevaluation during periodontal or dental implant therapy and throughout the maintenance phase of treatment.
5. Consideration of diagnostic testing that may include microbiologic, genetic, or biochemical assessment or monitoring during the course of periodontal therapy.
6. Consideration of risk factors including, but not limited to, diabetes and smoking, which play a role in development, progression, and management of periodontal diseases.
7. Periodontal maintenance program including ongoing evaluation and reevaluation for treatment.

INFORMED CONSENT AND PATIENT RECORDS

Informed consent should be obtained prior to the commencement of therapy. Complete records of the periodontal examination (including full charting), diagnosis, treatment, and recommended follow-up are essential and should be maintained according to state law. Information given to the patient should include the following:

1. The diagnosis, etiology, proposed therapy, possible alternative treatment(s), and the prognosis with and without the proposed therapy or possible alternatives.
2. Recommendations for treatment to be performed by other dentists or physicians.
3. The reasonably foreseeable inherent risks and potential complications associated with the proposed therapy, including failure with the ultimate loss of teeth or dental implants.

4. The need for periodontal maintenance treatment after active therapy due to the potential for disease recurrence.

TREATMENT PROCEDURES

When indicated, treatment should include:

1. Patient education, training in oral hygiene, and counseling on control of risk factors (e.g., stress, medical status, smoking, etc.) with appropriate referral if needed.
2. Management of periodontal–systemic interrelationships, when appropriate.
3. Removal of supra- and subgingival bacterial plaque/biofilm and calculus by comprehensive, meticulous periodontal scaling and root planing. In some instances, these procedures may be incorporated into the surgical treatment.
4. Chemotherapeutic agents may be used as appropriate to reduce, eliminate, or change the quality of microbial pathogens, or to alter the host response through local or systemic delivery.
5. Resective procedures to reduce or eliminate periodontal pockets and create an acceptable gingival form that facilitates oral hygiene and periodontal maintenance. Soft tissue procedures include gingivectomy, gingivoplasty, and various mucogingival flap procedures. Osseous procedures include ostectomy and osteoplasty. Dental tissue procedures include root resection, tooth hemisection, and odontoplasty. Combined dental tissue and osseous procedures may be required.
6. Periodontal regenerative procedures including bone replacement grafts, use of biologics, root biomodification, guided tissue regeneration, and combinations of these procedures for osseous, furcation, and gingival recession defects. Periodontal/oral reconstructive procedures include guided bone regeneration, ridge augmentation, ridge preservation, implant site development, and sinus grafting.
7. Periodontal plastic surgery for gingival augmentation, correction of recession or soft tissue deformities, or enhancement of oral esthetics.
8. Occlusal therapy that may include tooth movement, occlusal adjustment, splinting, periodontally accelerated osteogenic orthodontics, or biteguard therapy as a means to establish and maintain occlusal health.
9. Preprosthetic periodontal procedures including exploratory flap surgery, resective procedures, regenerative procedures, mucogingival procedures, or crown lengthening.
10. Selective extraction of teeth, roots, or implants.
11. Surgical placement of dental implants and management of peri-implant disease.
12. Procedures to facilitate orthodontic treatment including tooth exposure, frenulectomy, fiberotomy,

temporary anchorage devices, and gingival augmentation.

13. Finishing procedures, which include post-treatment evaluation with review and reinforcement of daily oral hygiene when appropriate.

EVALUATION OF THERAPY

Upon completion of planned periodontal therapy, the record should document that:

1. The patient has been counseled on why and how to perform an effective daily personal oral hygiene program including managing their own personal risk factors associated with development and/or progression of periodontal diseases.
2. All indicated therapeutic procedures have been performed.
3. The patient's response to therapy has been evaluated, and treatment objectives have been met.
4. A recommendation has been made for the correction of any tooth form, tooth position, restoration, or prosthesis considered to be contributing to the periodontal disease process.
5. An appropriate professional periodontal maintenance program, specific to individual circumstances, has been recommended to the patient for long-term control of his/her condition, as well as for the maintenance of dental implants, if present. This should include professional management of those risk factors associated with development and/or progression of periodontal diseases including, but not limited to, smoking and diabetes.

FACTORS MODIFYING RESULTS

The results of periodontal therapy may be adversely affected by factors that include systemic diseases; inadequate plaque/biofilm control; unknown or undeterminable etiologies; pulpal-periodontal problems; inability or failure of the patient to follow the suggested treatment or maintenance program; adverse environmental influences such as smoking and stress; occlusal dysfunction; and uncorrectable anatomic, structural, or iatrogenic causalities.

Patients with medical compromises, those who refuse or delay treatment, or those who present with other limitations may be unable to undergo recommended procedures required to establish a completely healthy periodontium. In those situations, appropriate therapy to establish the best possible periodontal health is indicated.

PERIODONTAL MAINTENANCE THERAPY

Upon completion of active periodontal therapy, periodontal maintenance visits should include:

1. Update of medical and dental histories.

2. Evaluation of current extra- and intraoral periodontal and peri-implant soft tissues as well as dental hard tissues and referral when indicated (e.g., for treatment of carious lesions, pulpal pathoses, or other conditions) and diagnostic-quality radiographs when appropriate.

3. Assessment of the oral hygiene status with reinforcement when indicated.

4. Mechanical tooth cleaning to disrupt/remove dental plaque, biofilms, stain, and calculus. Local delivery or systemic chemotherapeutic agents may be used as adjunctive treatment for recurrent or refractory disease.

5. Ongoing assessment of risk factors to identify an individual who may be more highly susceptible to ongoing breakdown of the periodontal or peri-implant tissues, with elimination or mitigation of new or persistent risk and etiologic factors with appropriate treatment.

6. Identification and treatment of new, recurrent, or refractory areas of periodontal and peri-implant pathoses.

7. Establishment of an appropriate interval for periodontal maintenance.

The patient should be kept informed of:

1. Areas of persistent, recurrent, refractory, or newly occurring periodontal or peri-implant disease.
2. Changes in the periodontal prognosis and risk factors associated with periodontal diseases.
3. Advisability of further periodontal treatment or retreatment of indicated sites.
4. Status of dental implants.
5. Other oral health problems that may include caries, defective restorations, and non-periodontal mucosal diseases or conditions.
6. Changes that would warrant referral to, or consultation with, other dental or medical specialists.

BIBLIOGRAPHY

- Aas JA, Paster BJ, Stokes LN, Olsen I, Dewhirst FE. Defining the normal bacterial flora of the oral cavity. *J Clin Microbiol* 2005;43:5721-5732.
- Abdellatif HM, Burt BA. An epidemiological investigation into the relative importance of age and oral hygiene status as determinants of periodontitis. *J Dent Res* 1987;66:13-18.
- Albandar JM, Brunelle JA, Kingman A. Destructive periodontal disease in adults 30 years of age and older in the United States, 1988-1994 [published correction appears in *J Periodontol* 1999;70:351]. *J Periodontol* 1999;70:13-29.
- Albandar JM, Kingman A. Gingival recession, gingival bleeding, and dental calculus in adults 30 years of age and older in the United States, 1988-1994. *J Periodontol* 1999;70:30-43.
- Albandar JM, Rams TE. Global epidemiology of periodontal diseases: An overview. *Periodontol* 2000 2002;29:7-10.

- American Academy of Periodontology. Diabetes and periodontal diseases (position paper). *J Periodontol* 2000;71:664-678.
- American Academy of Periodontology. Epidemiology of periodontal disease (position paper). *J Periodontol* 1996;67:935-945.
- American Academy of Periodontology. Guidelines for the management of patients with periodontal diseases. *J Periodontol* 2006;77:1607-1611.
- American Academy of Periodontology. Periodontal maintenance (position paper). *J Periodontol* 2003;74:1395-1401.
- American Academy of Periodontology. Periodontal regeneration (position paper). *J Periodontol* 2005;76:1601-1622.
- American Academy of Periodontology. Statement on risk assessment. *J Periodontol* 2008;79:202.
- American Academy of Periodontology. Tobacco use and the periodontal patient (position paper). *J Periodontol* 1999;70:1419-1427.
- Andriankaja OM, Genco RJ, Dorn J, et al. The use of different measurements and definitions of periodontal disease in the study of the association between periodontal disease and risk of myocardial infarction. *J Periodontol* 2006;77:1067-1073.
- Armitage GC. Development of a classification system for periodontal diseases and conditions. *Ann Periodontol* 1999;4:1-6.
- Axelsson P, Lindhe J. The significance of maintenance care in the treatment of periodontal disease. *J Clin Periodontol* 1981;8:281-294.
- Axelsson P, Nystrom B, Lindhe J. The long-term effect of a plaque control program on tooth mortality, caries, and periodontal disease in adults. Results after 30 years of maintenance. *J Clin Periodontol* 2004;31:749-757.
- Baharin B, Palmer RM, Coward P, Wilson RF. Investigation of periodontal destruction patterns in smokers and non-smokers. *J Clin Periodontol* 2006;33:485-490.
- Becker W, Becker BE, Ochsenbein C, et al. A longitudinal study comparing scaling, osseous surgery, and modified Widman procedures. Results after one year. *J Periodontol* 1988;59:351-365.
- Behle JH, Papapanou PN. Periodontal infections and atherosclerotic vascular disease: An update. *Int Dent J* 2006;56(4 Suppl. 1):256-262.
- Berglundh T, Lindhe J, Lang NP. Peri-implant mucositis and peri-implantitis. In: Lindhe J, Lang NP, Karring T, eds. *Clinical Periodontology and Implant Dentistry, Two Volumes: Clinical Concepts*, 5th ed. Oxford: Wiley Blackwell; 2008:529-540.
- Bergstrom J. Tobacco smoking and chronic destructive periodontal disease. *Odontology* 2004;92:1-8.
- Berkey CS, Antczak-Bouckoms A, Hoaglin DC, Mosteller F, Pihlstrom BL. Multiple-outcomes meta-analysis of treatments for periodontal disease. *J Dent Res* 1995;74:1030-1039.
- Boggess KA. Maternal oral health in pregnancy. *Obstet Gynecol* 2008;111:976-986.
- Bouchard P, Boutouyrie P, Mattout C, Bourgeois D. Risk assessment for severe clinical attachment loss in an adult population. *J Periodontol* 2006;77:479-489.
- Carnevale G, Kaldahl WB. Osseous resective surgery. *Periodontol 2000* 2000;22:59-87.
- Chace R, Low S. Survival characteristics of periodontally involved teeth: A 40-year study. *J Periodontol* 1993;64:701-705.
- Cobb CM. Non-surgical pocket therapy: Mechanical. *Ann Periodontol* 1996;1:443-490.
- Cobb CM, Williams KB, Gerkovitch MM. Is the prevalence of chronic periodontitis in the USA in decline? *Periodontol 2000* 2009;50:13-26.
- Cortellini P, Tonetti M. Long-term tooth survival following regenerative treatment of intrabony defects. *J Periodontol* 2004;75:672-678.
- Covani U, Marconcini S, Derchi G, Barone A, Giacomelli L. Relationship between human periodontitis and type 2 diabetes at a genomic level: A data-mining study. *J Periodontol* 2009;80:1265-1273.
- Cury PR, Sallum EA, Nociti FH, Sallum AW, Jeffcoat MK. Long-term results of guided tissue regeneration therapy in the treatment of class II furcation defects: A randomized clinical trial. *J Periodontol* 2003;74:3-9.
- D'Aiuto F, Parkar M, Brett PM, Ready D, Tonetti MS. Gene polymorphisms in proinflammatory cytokines are associated with systemic inflammation in patients with severe periodontal infections. *Cytokine* 2004;28:29-34.
- Desvarieux M, Demmer RT, Rundek T, et al. Periodontal microbiota and carotid intima-media thickness: The oral infections and vascular disease epidemiology study (INVEST). *Circulation* 2005;111:576-582.
- Dietrich T, Garcia RI. Associations between periodontal disease and systemic disease: Evaluating the strength of the evidence. *J Periodontol* 2005;76:2175-2184.
- Dietrich T, Jimenez M, Krall Kaye EA, Vokonas PS, Garcia RI. Age-dependent associations between chronic periodontitis/edentulism and risk of coronary heart disease. *Circulation* 2008;117:1668-1674.
- Douglass CW. Risk assessment and management of periodontal disease. *J Am Dent Assoc* 2006;137(Suppl.):27S-32S.
- Douglass CW, Fox CH. Cross-sectional studies in periodontal disease: Current status and implications for dental practice. *Adv Dent Res* 1993;7:25-31.
- Ebersole JL, Machen RL, Steffen MJ, Willmann DE. Systemic acute-phase reactants, C-reactive protein and haptoglobin in adult periodontitis. *Clin Exp Immunol* 1997;107:347-352.
- Esposito M, Grusovin MG, Kakisis I, Coulthard P, Worthington HV. Interventions for replacing missing teeth: Treatment of peri-implantitis. *Cochrane Database Syst Rev* 2008;(2):CD004970.
- Fisher MA, Taylor GW, Tilashalski KR. Smokeless tobacco and severe periodontal disease, NHANES III. *J Dent Res* 2005;84:705-710.
- Franek E, Klamczynska E, Ganowicz E, Blach A, Budlewski T, Gorska R. Association of chronic periodontitis with left ventricular mass and central blood pressure in treated patients with essential hypertension. *Am J Hypertens* 2009;22:203-207.
- Friedewald VE, Kornman KS, Beck JD, et al. The American Journal of Cardiology and Journal of Periodontology editors' consensus: Periodontitis and atherosclerotic cardiovascular disease. *Am J Cardiol* 2009;104:59-68. [Also published in *J Periodontol* 2009;80:1021-1032.]
- Froum SJ, ed. *Dental Implant Complications: Etiology, Prevention, and Treatment*. Oxford: Wiley-Blackwell; 2010.
- Garcia RI, Nunn ME, Dietrich T. Risk calculation and periodontal outcomes. *Periodontol 2000* 2009;50:65-77.
- Geerts SO, Legrand V, Charpentier J, Albert A, Rompen EH. Further evidence of the association between periodontal conditions and coronary artery disease. *J Periodontol* 2004;75:1274-1280.

- Geismar K, Stoltze K, Sigurd B, Gyntelberg F, Holmstrup P. Periodontal disease and coronary heart disease. *J Periodontol* 2006;77:1547-1554.
- Genco RJ. Current view of risk factors for periodontal diseases. *J Periodontol* 1996;67:1041-1049.
- Giannobile WV, Somerman MJ. Growth and amelogenin-like factors in periodontal wound healing. A systematic review. *Ann Periodontol* 2003;8:193-204.
- Goldman M, Ross I, Goteiner D. Effect of periodontal therapy on patients maintained for 15 years or longer. *J Periodontol* 1986;57:347-353.
- Goodson J, Tanner A, Haffajee A, Sornberger G, Socransky S. Patterns of progression and regression of advanced destructive periodontal disease. *J Clin Periodontol* 1982;9:472-481.
- Grau AJ, Becher H, Ziegler CM, et al. Periodontal disease as a risk factor for ischemic stroke. *Stroke* 2004;35:496-501.
- Grossi SG, Zambon JJ, Ho AW, et al. Assessment of risk for periodontal disease. I. Risk indicators for attachment loss. *J Periodontol* 1994;65:260-267.
- Gunsolley JC, Murphy KG. Guided tissue regeneration for the treatment of periodontal intrabony and furcation defects. A systematic review. *Ann Periodontol* 2003;8:266-302.
- Haffajee AD, Socransky SS, Gunsolley JC. Systemic anti-infective periodontal therapy. A systematic review. *Ann Periodontol* 2003;8:115-181.
- Hanes PJ, Purvis JP. Local anti-infective therapy: Pharmacological agents. A systematic review. *Ann Periodontol* 2003;8:79-98.
- Harrel SK, Nunn ME. Longitudinal comparison of the periodontal status of patients with moderate to severe periodontal disease receiving no treatment, non-surgical treatment, and surgical treatment utilizing individual sites for analysis. *J Periodontol* 2001;72:1509-1519.
- Heitz-Mayfield LJ, Trombelli L, Heitz F, Needleman I, Moles D. A systematic review of the effect of surgical debridement vs non-surgical debridement for the treatment of chronic periodontitis. *J Clin Periodontol* 2002;29(Suppl. 3):92-102.
- Herrera JA, Parra B, Herrera E, et al. Periodontal disease severity is related to high levels of C-reactive protein in pre-eclampsia. *J Hypertens* 2007;25:1459-1464.
- Hill RW, Ramfjord SP, Morrison EC, et al. Four types of periodontal treatment compared over two years. *J Periodontol* 1981;52:655-662.
- Hirschfeld I, Wasserman B. A long-term survey of tooth loss in 600 treated periodontal patients. *J Periodontol* 1978;49:225-237.
- Hujoel PP, White BA, Garcia RI, Listgarten MA. The dentogingival epithelial surface area revisited. *J Periodontol Res* 2001;36:48-55.
- Hung HC, Douglass CW. Meta-analysis of the effect of scaling and root planing, surgical treatment, and antibiotic therapies on periodontal probing depth and attachment loss. *J Clin Periodontol* 2002;29:975-986.
- Isidor F, Karring T. Long-term effect of surgical and non-surgical periodontal treatment. A 5-year clinical study. *J Periodontol Res* 1986;21:462-472.
- Jenkins WM, Papapanou PN. Epidemiology of periodontal disease in children and adolescents. *Periodontol* 2000 2001;26:16-32.
- Johnson G, Hill M. Cigarette smoking and the periodontal patient. *J Periodontol* 2004;75:196-209.
- Kaldahl WB, Kalkwarf KL, Patil KD, Molvar MP, Dyer JK. Long-term evaluation of periodontal therapy: I. Response to 4 therapeutic modalities. *J Periodontol* 1996;67:93-102.
- Kavoussi SK, West BT, Taylor GW, Lebovic DI. Periodontal disease and endometriosis: Analysis of the National Health and Nutrition Examination Survey. *Fertil Steril* 2009;91:335-341.
- Kim TS, Schenk A, Lungeanu D, Reitmeir P, Eickholz P. Non-surgical and surgical periodontal therapy in single-rooted teeth. *Clin Oral Investig* 2007;11:391-399.
- Klooster PW, Eber RM, Wang HL, Inglehart MR. Surgical versus non-surgical periodontal treatment: Psychosocial factors and treatment outcomes. *J Periodontol* 2006;77:1253-1260.
- Kornman KS. Mapping the pathogenesis of periodontitis: A new look. *J Periodontol* 2008;79(Suppl. 8):1560-1568.
- Kornman KS, Crane A, Wang HY, et al. The interleukin-1 genotype as a severity factor in adult periodontal disease. *J Clin Periodontol* 1997;24:72-77.
- Kotsovilis S, Karoussis IK, Triant M, Fourmoseuses I. Therapy of peri-implantitis: A systemic review. *J Clin Periodontol* 2008;35:621-629.
- Lalla E, Kaplan S, Chang SM, et al. Periodontal infection profiles in type 1 diabetes. *J Clin Periodontol* 2006;33:855-862.
- Lang NP, Lindhe J, Van der Velden U on behalf of the European Workshop in Periodontology group D. Advances in the prevention of periodontitis. Group D consensus report of the 5th European Workshop in Periodontology. *J Clin Periodontol* 2005;32:291-292.
- Lang NP, Wetzel AC, Stich H, Caffesse RG. Histologic probe penetration in healthy and inflamed peri-implant tissues. *Clin Oral Implants Res* 1994;5:185-189.
- Lindhe J, Westfelt E, Nyman S, Socransky SS, Haffajee AD. Long-term effect of surgical/non-surgical treatment of periodontal disease. *J Clin Periodontol* 1984;11:448-458.
- Listgarten MA. Structure of the microbial flora associated with periodontal health and diseases in man. *J Periodontol* 1976;47:1-18.
- Löe H, Anerud A, Boysen H, Smith M. The natural history of periodontal disease in man. Tooth mortality rates before 40 years of age. *J Periodontol Res* 1978;13:563-572.
- Löe H, Brown LJ. Early-onset periodontitis in the United States of America. *J Periodontol* 1991;62:608-616.
- Loos BG. Systemic markers of inflammation and periodontitis. *J Periodontol* 2005;76:2106-2115.
- Lopez NJ, Da Silva I, Ipinza J, Gutierrez J. Periodontal therapy reduces the rate of preterm low birth weight in women with pregnancy-associated gingivitis. *J Periodontol* 2005;76:2144-2153.
- McFall W. Tooth loss in 100 treated patients with periodontal disease. A long-term study. *J Periodontol* 1982;53:539-549.
- Meador HL, Lane JJ, Suddick RP. The long-term effectiveness of periodontal therapy in a clinical practice. *J Periodontol* 1985;56:253-258.
- Mealey BL. Periodontal disease and diabetes. A two-way street [published correction appears in *J Am Dent Assoc* 2008;139:252]. *J Am Dent Assoc* 2006;137(Suppl.):26S-31S.
- Mealey BL, Oates TW. Diabetes mellitus and periodontal diseases. *J Periodontol* 2006;77:1289-1303.
- Michalowicz BS, Aepli D, Virag JG, et al. Periodontal findings in adult twins. *J Periodontol* 1991;62:293-299.
- Michalowicz BS, Diehl SR, Gunsolley JC, et al. Evidence of a substantial genetic basis for risk of adult periodontitis. *J Periodontol* 2000;71:1699-1707.

- Michalowicz BS, Hodges JS, DiAngelis AJ, et al., for the OPT Study. Treatment of periodontal disease and the risk of preterm birth. *N Engl J Med* 2006;355:1885-1894.
- Michaud DS, Joshipura K, Giovannucci E, Fuchs CS. A prospective study of periodontal disease and pancreatic cancer in US male health professionals. *J Natl Cancer Inst* 2007;99:171-175.
- Michaud DS, Liu Y, Meyer M, Giovannucci E, Joshipura K. Periodontal disease, tooth loss, and cancer risk in male health professionals: A prospective cohort study. *Lancet Oncol* 2008;9:550-558.
- Mombelli A, Lang NP. The diagnosis and treatment of peri-implantitis. *Periodontol* 2000 1998;17:63-76.
- Murphy KG, Gunsolley JC. Guided tissue regeneration for the treatment of periodontal intrabony and furcation defects. A systematic review. *Ann Periodontol* 2003;8:266-302.
- Nabers C, Stalker W, Esparza D, Naylor B, Canales S. Tooth loss in 1,535 treated periodontal patients. *J Periodontol* 1988;59:297-300.
- Needleman I, Tucker R, Giedrys-Leeper E, Worthington H. Guided tissue regeneration for periodontal intrabony defects. A Cochrane systematic review. *Periodontol* 2000 2005;37:106-123.
- Nitzan D, Mamlider A, Levin L, Schwartz-Arad D. Impact of smoking on marginal bone loss. *Int J Oral Maxillofac Implants* 2005;20:605-609.
- Noack B, Genco RJ, Trevisan M, et al. Periodontal infections contribute to elevated systemic C-reactive protein level. *J Periodontol* 2001;72:1221-1227.
- Nunn ME. Understanding the etiology of periodontitis: An overview of periodontal risk factors. *Periodontol* 2000 2003;32:11-23.
- Nyman S, Lindhe J. A longitudinal study of combined periodontal and prosthodontic treatment of patients with advanced periodontal disease. *J Periodontol* 1979;50:163-169.
- Oates TW, Robinson M, Gunsolley JC. Surgical therapies for the treatment of gingival recession. A systematic review. *Ann Periodontol* 2003;8:303-320.
- Offenbacher S. Periodontal diseases: Pathogenesis. *Ann Periodontol* 1996;1:821-878.
- Offenbacher S, Beck JD, Jared HL, et al. Effect of periodontal therapy on rate of preterm delivery. *Obstet Gynecol* 2009;114:557-559.
- Oliver R. Tooth loss with and without periodontal therapy. *Periodontol Abstr* 1969;17:8-9.
- Olsen CT, Ammons WF, van Belle G. A longitudinal study comparing apically repositioned flaps with and without osseous surgery. *Int J Periodontics Restorative Dent* 1985;5(4):10-33.
- Page RC, Martin J, Krall EA, Mancl L, Garcia R. Longitudinal validation of a risk calculator for periodontal disease. *J Clin Periodontol* 2003;30:819-827.
- Page RC, Offenbacher S, Schroeder HE, Seymour GJ, Kornman KS. Advances in the pathogenesis of periodontitis: Summary of developments, clinical implications, and future directions. *Periodontol* 2000 1997;14:216-248.
- Papapanou PW, Wennström JL. The angular bony defect as indicator of further alveolar bone loss. *J Clin Periodontol* 1991;18:317-322.
- Paraskevas S, Huizinga JD, Loos BG. A systematic review and meta-analysis on C-reactive protein in relation to periodontitis. *J Clin Periodontol* 2008;35:277-290.
- Paster BJ, Olsen I, Aas JA, Dewhirst FE. The breadth of bacterial diversity in the human periodontal pocket and other oral sites. *Periodontol* 2000 2006;42:80-87.
- Pennel B, Keagle J. Predisposing factors in the etiology of chronic inflammatory periodontal disease. *J Periodontol* 1977;48:517-532.
- Pihlstrom BL, McHugh RB, Oliphant TH, Ortiz-Campos C. Comparison of surgical and non-surgical treatment of periodontal disease. A review of current studies and additional results after 6 1/2 years. *J Clin Periodontol* 1983;10:524-541.
- Preshaw PM, Heasman PA. Periodontal maintenance in a specialist periodontal clinic and in general dental practice. *J Clin Periodontol* 2005;32:280-286.
- Pussinen PJ, Alfthan G, Rissanen H, et al. Antibodies to periodontal pathogens and stroke risk. *Stroke* 2004;35:2020-2023.
- Pussinen PJ, Tumoisto K, Jousilahti P, et al. Endotoxemia, immune response to periodontal pathogens, and systemic inflammation associated with increased incidence in cardiovascular disease events. *Arterioscler Thromb Vasc Biol* 2007;27:1433-1439.
- Reddy MS, Geurs NC, Gunsolley JC. Periodontal host modulation with antiproteinase, anti-inflammatory, and bone-sparing agents. A systematic review. *Ann Periodontol* 2003;8:12-37.
- Reynolds MA, Aichelmann-Reidy ME, Branch-Mays GL, Gunsolley JC. The efficacy of bone replacement grafts in the treatment of periodontal osseous defects. A systematic review. *Ann Periodontol* 2003;8:227-265.
- Roos-Jansaker AM, Renvert S, Egelberg J. Treatment of peri-implant infections: A literature review. *J Clin Periodontol* 2003;30:467-485.
- Rose LF, Steinberg BJ, Atlas SL. Periodontal management of the medically compromised patient. *Periodontol* 2000 1995;9:165-175.
- Schillinger T, Kluger W, Exner M, et al. Dental and periodontal status and risk for progression of carotid atherosclerosis: The inflammation and carotid artery risk for atherosclerosis study (ICARAS) dental sub-study. *Stroke* 2006;37:2271-2276.
- Seymour GJ, Ford PJ, Cullinan MP, Leishman S, West MJ, Yamazaki K. Infection or inflammation: The link between periodontal and cardiovascular diseases. *Future Cardiol* 2009;5:5-9.
- Slade GD, Ghezzi EM, Heiss G, Beck JD, Riche E, Offenbacher S. Relationship between periodontal disease and C-reactive protein among adults in the Atherosclerosis Risk in Communities study. *Arch Intern Med* 2003;163:1172-1179.
- Socransky SS, Haffajee AD, Cugini MA, Smith C, Kent RL Jr. Microbial complexes in subgingival plaque. *J Clin Periodontol* 1998;25:134-144.
- Tezal M, Sullivan MA, Hyland A, et al. Chronic periodontitis and the incidence of head and neck squamous cell carcinoma. *Cancer Epidemiol Biomarkers Prev* 2009;18:2406-2412.
- Tonetti MS, Cortellini P, Lang NP, et al. Clinical outcomes following treatment of human intrabony defects with GTR/bone replacement material or access flap alone. A multicenter randomized controlled clinical trial. *J Clin Periodontol* 2004;31:770-776.
- Trombelli L. Which reconstructive procedures are effective for treating the periodontal intraosseous defect? *Periodontol* 2000 2005;37:88-105.
- Trombelli L, Cho KS, Kim CK, Scapoli C, Scabbia A. Impaired healing response of periodontal furcation

- defects following flap debridement surgery in smokers. A controlled clinical trial. *J Clin Periodontol* 2003;30:81-87.
- Tu YK, Tugnait A, Clerehugh V. Is there a temporal trend in the reported treatment efficacy of periodontal regeneration? A meta-analysis of randomized-controlled trials. *J Clin Periodontol* 2008;35:139-146.
- Van der Velden U, Abbas F, Armand S, et al. Java project on periodontal diseases. The natural development of periodontitis: Risk factors, risk predictors, and risk determinants. *J Clin Periodontol* 2006;33:540-548.
- Van Dyke TE. The management of inflammation in periodontal disease. *J Periodontol* 2008;79:1601-1608.
- Van Dyke TE, Sheilsh D. Risk factors for periodontitis. *J Int Acad Periodontol* 2005;7:3-7.
- Venezia E, Goldstein M, Boyan BD, Schwartz Z. The use of enamel matrix derivative in the treatment of periodontal defects: A literature review and meta-analysis. *Crit Rev Oral Biol Med* 2004;15:382-402.
- White BA, Maupome G. Making clinical decisions for dental care: Concepts to consider. *Spec Care Dent* 2003;23:168-172.
- Wilson TG Jr., Glover ME, Malik AK, Schoen JA, Dorsett D. Tooth loss in maintenance patients in a private periodontal practice. *J Periodontol* 1987;58:231-235.
- Zambon JJ. Periodontal diseases: Microbial factors. *Ann Periodontol* 1996;1:879-925.