

# Periodontal & Systemic Disease Seminar and Workshop 2009

## “Periodontal Medicine. Medical Manifestations of Periodontal Disease”

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### Objectives:

- Understand the impact dental professionals have beyond the oral cavity.
- Understand the central importance of periodontal health

### Biofilm:

Living film

Small proportion of bacteria are perio pathogens

Early biofilm colonizers not pathogenic:

Actinomyces and Streptococcus

Later biofilm colonizers include perio pathogens:

Porphyromonas, Tannerella, Treponema

Survival strategies: continuous evolution, genetic diversity, protective and adhesive matrix, impenetrable, antimicrobial resistance, heterogeneous, adhesive, high reproductive rate, adaptation to resources.

Heterogeneous property ensures biofilm survival

Two primary survival strategies: high reproductive rate, adaptation to available resources

Bacteria occupy different positions in gingival sulcus/perio pocket

Bacteria present in the interior of gingival epithelial cells and connective tissue

Adhesion: first and most critical step in perio disease development

Perio pathogens disturb structure and function of gingival epithelium, facilitating bacteria invasion of epithelial cell.

Infection: detrimental colonization by a foreign species.

*Periodontal disease is a chronic, non-curable bacterial infection.*

Toll-Like Receptors: transmembrane proteins recognizing bacterial endotoxins, mobilizing inflammatory response.

Inflammatory response: blood vessel dilation, increased vascular permeability.

### **Periodontal disease development**

White blood cells (WBC's) respond to bacteria and toxins rapidly

WBC's and connective tissue release inflammatory mediators (WBC's, cytokines, enzymes including collagenase, elastase, and proteinases)

Extracellular matrix: collagen turned over by collagenase

Collagenase involved in normal and pathological conditions including:

Matrix turnover, pregnancy, cancer, arthritis and wound repair

Collagenase must be actively turned off. Interfering with the "off" switch perpetuates collagenase activity and collagen breakdown, leading to gingivitis

Periodontal tissue destruction primarily the result the inflammatory response.

It is the body's response to biofilm that destroys the periodontium

Bacteria are necessary but not capable on their own of producing perio disease

Gingivitis progression to periodontal disease: not automatic, not every patient or site

Failure to confine inflammatory response to gingival tissue leads to periodontitis

Aggressive, early diagnosis and addressing of gingivitis important

Periodontal bone resorption: Inflammatory mediators favor maturation of osteoclasts.

Bone loss also primarily the result of the inflammatory response.

The etiology of perio disease is bacterial infection. The pathogenesis is inflammatory.

### **C-reactive protein (CRP)**

Early manifestation of perio disease is ulceration of gingival epithelium, exposing underlying connective tissue and capillary beds. Bacteria gain access to circulatory system, resulting in a bacteremia (live bacteria and endotoxins in circulatory system)

Body responds to bacteremia by mounting a systemic immuno-inflammatory response

As part of the normal immune system response, the liver produces CRP in the presence of injury, inflammation, infection.

CRP recognizes foreign pathogens and damaged cells in the body and attracts inflammatory mediators.

CRP promotes platelet adhesion to endothelial cells

High levels of CRP associated with high incidence of cardiovascular events

### **Risk factors for periodontal Disease**

Heredity, smoking, diabetes, stress, medications, nutrition, poor oral hygiene, faulty dentistry, hormonal variations, immunocompromise, connective tissue disorders, previous Hx of active perio disease

The two biggest risk factors for perio disease are diabetes and smoking

Risk factors are not additive, they are exponential

The primary goal of all dental providers is risk reduction

### **Oral/Systemic Links**

Same inflammatory mediators in; periodontal disease, coronary heart disease, rheumatoid arthritis and pregnancy complications

#### Cardiovascular events

SRP with LAA's associated with significantly improved vascular function

Tonetti MS, et al. N Engl J Med. 2007 Mar 1;356(9):911-20

Perio pathogens present in atherosclerotic plaques in coronary arteries

Zaremba M, et al. J Periodontol. 2007 Feb;78(2):322-7

Padilla C, et al. J Periodontal Res. 2006 Aug;41(4):350-3

Coronary heart disease and perio disease are genetically related

Schaefer AS, et al. PLoS Genet. 2009 Feb;5(2):e1000378

#### Rheumatoid arthritis (RA)

*P. gingivalis* initiates RA in susceptible individuals by increasing autoimmune response

Smolik I, et al. Compendium. 2009 May;30(4):188-197

#### Adverse pregnancy events

Pregnant women with periodontal disease may be more likely to give birth to pre-term, low birth weight babies

Oral Microbes cross the placenta and expose the fetus to infection

Leon R, et al. J Periodontol. 2007 Jul;78(7):1249-55.

Han YW, et al. J Clin Microbiol. 2006 Apr;44(4):1475-83.

Moutsopoulos NM, et al. Ann NY Acad Sci. 2006 Nov;1088:251-64.

#### Diabetes

Chronic metabolic disorder characterized by high blood sugar (hyperglycemia)

Type 1

Type 2

Gestational diabetes

Insulin action in muscle and fat cells. Facilitates glucose uptake and utilization

Hemoglobin A1c (HbA1c). Primary blood test to monitor glycemic control.  
Levels of 6.5-7.0%, good control. 8% and above, poor control

Diabetic complications are related to glycemic control

Medical complications of hyperglycemia

Retinopathy, neuropathy, nephropathy, cardiovascular disorders, infections, ulcers, cataracts, connective tissue disorders

Heart disease is the leading cause of diabetes related deaths. 65% of diabetic deaths from heart disease and stroke.

High A1c levels increase risk of heart attack

The primary goal of physicians is keeping HbA1c levels low

Diabetes and periodontal disease

Bi-directional relationship

How diabetes increases risk and severity of periodontal disease:

Hyperglycemia causes increased levels of collagenase, fibroblast and neutrophil function

How periodontal disease worsens glycemic control:

Increased vascularity in periodontal disease increases bacteremia and release of pro-inflammatory mediators which increase insulin resistance

Poor blood sugar control results in: worsening pocket depth, attachment loss, bone loss

Dental conditions impacted by diabetes

Periodontal disease, infection, caries, xerostomia, candidiasis, lichen planus, sensory alterations

Diabetes is the #1 condition that increases susceptibility to periodontal disease

The #1 systemic condition adversely affected by periodontal disease is diabetes

Glycemic levels adversely affected by persistence of periodontal pathogen (*P. gingivalis*)

CRP and diabetes

High CRP levels associated with increased risk of heart attack

#1 cause of death in diabetic individuals is cardiovascular disease

Periodontal disease increases CRP

Oral flora in diabetic and non-diabetic individuals is essentially the same

Glycemic level affected by persistence of *P. gingivalis*

Type 2 diabetes improved following perio treatment

Navarro-Sanchez AB et al. J Clin Perio. 2007 Oct;34(10):835-43.

Faria-Almeida R, et al. J Periodontol. 2006 Apr;77(4):591-8

One point reduction in HbA1c level results in 35% reduction in diabetic complication risks.

Periodontal disease and diabetes; managing 2 chronic conditions

Common oral diabetes medications; Glucotrol, Micronase, Diabeta, Glynase, Glucophage, Avandia, Actos, Januvia, Amaryl, Byetta, Prandin, Precose

82% of diabetics with severe periodontitis will experience one or more major cardiovascular, cerebrovascular or peripheral vascular events compared to 21% of diabetics without periodontal disease.

Measley BL, Oates TW. J Periodontol 2006 Aug;77(8):1289-1303.

Thorstensson H, et al. J Clin Periodontol 1996;23:194-202.

Optimal oral health is essential to the medical management of the diabetic patient

Dr. Maria Emmanuel Ryan

### **Practice Modifications**

Address cause of gingivitis

Manage risk factors for periodontal disease (previously listed)

Children of parents with perio disease are 12X more likely to harbor perio pathogens

Prophy is a non-therapeutic procedure for the maintenance of a healthy mouth

Periodontal Maintenance is on-going therapy, every 3 months for life

The longevity of successful perio treatment outcomes depends on home care and perio maintenance at 3 month intervals

Address gingivitis aggressively

Ask the HbA1c level of all diabetic patients

Never ignore that one 5mm pocket

Be very suspicious of rapidly progressing perio disease without risk factors in patients with a family history of diabetes.

27-53% probability of being an undiagnosed diabetic and should be

## **Conclusions**

Bacterial causes of perio disease vitally important.

Critical importance of the effect of inflammation on the rest of the body

Perio treatment is not an elective procedure

Treat every patient, every time, with any level of perio disease

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