Obesity and Periodontal Disease: A New Model for Risk Assessment

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Biological Pathways Linking Obesity and Periodontal Disease

Effect of Obesity on Oral & Overall Health

Obesity is widely recognized as a state of low grade inflammation
White adipose tissue (fat cells)
Continuously upregulate a ‘cocktail’ of inflammatory factors
2-3 fold increase in systemic concentrations of cytokines (potent inducers of inflammation)
TYN-α
IL-6

These inflammatory mediators also contribute to destructive periodontal disease

This fuels risk for many diseases:

Type 2 diabetes
Hypertension
Dyslipidemia
Coronary heart disease
Stroke
Gallbladder disease
Liver disease
Osteoarthritis
Sleep apnea
Pulmonary dysfunction
Certain types of cancer (colon, endometrial, post-menopausal breast, and kidney)
Reproductive abnormalities

First Report on Relationship between Obesity & Periodontal Disease

1977; Perlstein & Bissada
Purpose: evaluate the extent to which obesity and/or hypertension modifies the response of rats’ periodontium to chronic gingival irritation
Ligature-induced periodontitis on 44 rats
Normal
Hypertensive
Obese
Obese-hypertensive

Effect of Obesity on the Periodontium

Obesity
Insulin Resistance
Hypertension
Hyperglycemia
Type 2 Diabetes
Periodontal Disease

Insulin Resistance
Increase in fatty acids
Increased risk for life threatening diseases

Diet high in fats & carbohydrates
Sedentary life style

Dyslipidemia
(↑CH, ↑TG)

Hyperinsulinemia
Hyperglycemia
CRP
↑CRP
Findings
Alveolar bone resorption > in obese rats compared with non-obese rats
Under healthy oral conditions, obesity per se, did not promote pathologic periodontal alterations
In response to bacterial plaque accumulation, periodontal inflammation and destruction were more severe in obese rats
In obese and hypertensive rats, plaque accumulation caused even more pronounced periodontal destruction than in obese rats without hypertension

What did Perlstein and Bissada’s findings suggest?
The amount of periodontal inflammation and destruction in obese individuals may depend upon bacterial challenge associated with plaque accumulation
Authors conclusions: A combination of risk factors, such as those defined by the Metabolic Syndrome, may elicit the most severe periodontal effects

There is a positive association & biologically plausible role for obesity in the development of periodontal disease
Which comes first- obesity or periodontal disease? Based on obesity trends, we should expect to see a higher prevalence of periodontal disease in clinical practice


Forest Plot of Individual Results Contributing to Meta-analysis

Summary of Studies Assigned Greatest Weight in Meta-Analysis
Wang, 2009
After controlling for significant factors, type 2 diabetes was positively associated with the risk for periodontal disease, with only waist circumference as a statistically significant effect modifier
Bouchard, 2006
Patient profile for severe CAL also included body mass index and white blood cell count

Griffin, 2009
Subjects with rheumatoid arthritis, diabetes or a liver condition were 2X as likely to have urgent need for dental treatment as were subjects who did not have these diseases
After controlling for common risk factors, arthritis, cardiovascular disease, diabetes, emphysema, hepatitis C virus, obesity and stroke were still associated with dental disease

Morita, 2009
BMI, blood pressure, triglycerides, fasting blood glucose, and HbA1c were significantly elevated in patients with periodontal pockets of ≥ 4 mm
After adjusting for age, gender & smoking, there was a gradient effect between presence of periodontal pockets and the number of components of MetS
OR of 1.8 for periodontal pockets when subjects with 2 positive components
OR of 2.4 for periodontal pockets when subjects had 3-4 positive components

Al-Zahrani, 2003
Significant association between measures of body fat & periodontal disease among younger adults, but not middle or older adults
Prevalence of periodontal disease among obese individuals (BMI ≥ 30 kg/m²) aged 18-34 was 76% higher than normal weight individuals in this age group
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Adjusted odds ratios (OR) for having periodontal disease:
- 0.21 for subjects with BMI <18.5 kg/m²
- 1.00 for subjects with BMI 25–29.9 kg/m²
- 1.76 for subjects with BMI ≥30 kg/m²
Younger subjects with high WC had a 27% higher risk for developing periodontal disease.
Younger population subset may become predisposed to chronic inflammatory diseases at a much younger age than their older cohorts.

Obesity is such a dominant factor, that it may nullify the effect that periodontal treatment has on hsCRP.
Correlation between severity of obesity and the progression of periodontal disease
Each unit increase in BMI = increase of 5% in the hazard of experiencing progression of alveolar bone loss
1-centimeter increase in WC = 1-2% increase in the hazard of experiencing progression of probing pocket depth and clinical attachment loss.

With each 1% increment in baseline waist-height ratio (WHtR) there was a 3% increase in the hazard of experiencing periodontal disease progression events (e.g., alveolar bone loss, probing pocket depth, clinical attachment loss).
Subjects 17-21, each 1-kg increase in weight was associated with a 6% increase in risk of periodontal disease.
Each 1-cm increase in WC was associated with a 5% increase in risk of periodontitis.

The Role of Periodontal Infection in Amplifying Cardiometabolic Risk (CMR)

Susceptibility of Obese People to Periodontal Disease
Individuals with a BMI ≥ 30 may have almost 9 times higher risk of developing periodontal disease than individuals with a BMI < 20.
A 5% increase in body fat corresponds to a 30% increased risk of periodontal disease.
Periodontal disease is exacerbated by metabolic syndrome.

Increased physical activity may decrease risk for periodontal disease.
Visceral fat accumulation in upper body is associated with periodontal disease (also increases risk for CVD, diabetes, insulin resistance and increased liver fat).

Metabolic Syndrome (MetS) (“Syndrome X”)
A leading cause of death for obese people, people with diabetes & other high risk population subgroups = 24% of adult Americans have MetS.
Genetic predisposition underlies susceptibility.

Hyperlipidemia and periodontal disease are synergistic in nature; modifiable risk factors.
Total cholesterol, LDL cholesterol, and triglycerides appear to be significantly higher in subjects with periodontal disease.

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September 11, 2018; Viva Learning Webinar

**Metabolic Syndrome & Periodontal Disease**

People with MetS have constant, low-grade inflammation throughout the body. Periodontal disease is associated with MetS, independent of other risk factors. Periodontal disease may contribute to development of MetS. Severity and extent of periodontal disease is significantly higher among patients with MetS compared to those without.

Presence of periodontal pockets may be associated with a positive conversion of MetS components, suggesting that preventing periodontal disease may prevent MetS. Periodontal disease should be considered as part of the MetS.

As a countermeasure against MetS, patients should undergo periodontal check-up during medical examinations.

Nesbitt, et al. 2010

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Acharya A, et al. Metab Syndr Relat Disord 2010
Morita, et al. 2010

**Multiple Sources of Chronic Inflammation**

- Imbalance in the intake of omega-6 & omega-3 fats
- Diet high in red and processed meats; refined carbohydrate and other processed foods; high saturated fatty acids
- Psychosocial stressors
- Cigarette smoking
- Lack of quality sleep
- Environmental toxins
- Food sensitivities
- Infection

**Potential to achieve:**
- Better patient outcomes (both oral health and metabolic control)
- Better use of health care resources
- Lower overall healthcare costs

**Diseases/Conditions with Underlying Inflammation**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periodontal disease</td>
<td>Rheumatoid arthritis</td>
</tr>
<tr>
<td>Atherosclerosis</td>
<td>Lupus</td>
</tr>
<tr>
<td>Gastrointestinal conditions</td>
<td>Alzheimer’s disease</td>
</tr>
<tr>
<td>(e.g., Crohn’s Disease)</td>
<td>Cancer</td>
</tr>
<tr>
<td>Inflammatory bowel syndrome</td>
<td>Depression</td>
</tr>
<tr>
<td>(chronic gastritis)</td>
<td>Depression</td>
</tr>
<tr>
<td>Respiratory diseases</td>
<td>Chronic infections (e.g.,</td>
</tr>
<tr>
<td>(asthma)</td>
<td>Hepatitis B&amp;C; recurrent</td>
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<tr>
<td></td>
<td>sexually transmitted diseases,</td>
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<tr>
<td></td>
<td>HIV/AIDS, Tuberculosis)</td>
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<tr>
<td>Poorly controlled diabetes</td>
<td>Obesity</td>
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<tr>
<td>Osteoporosis, osteopenia</td>
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**A New Model of Risk Assessment:**

Cumulative inflammatory burden add a layer of inflammation; the more sources, the greater the cumulative inflammatory burden.
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Inflammatory Priming

Compared to normal weight individuals, people who are overweight or obese are ‘inflammatory primed’

This creates greater risk for periodontal disease and systemic sequela (i.e., other inflammatory driven disease states) known to be linked to obesity

By virtue of their overweight or obese status, there are many individuals who present for dental care who are ‘inflammatory primed’; these are people who are already in an inflammatory driven state

For example, periodontal disease in an obese person may trigger complications in type 2 diabetes or negatively impact the clinical outcome in cases of coronary heart disease in people who do not have diabetes.

Apple-Shaped Physique Denotes Visceral Fat Distribution & Risk for MetS

Educating Patients About Obesity and its Threat to Oral Health

Key Messages to Educate Patients about Role of Obesity in Increasing the Risk for Periodontal Disease

Obesity increases the risk for periodontal disease; insulin resistance may play a role in this relationship

Abdominal obesity, waist circumference > 40 inches in men; > 35 inches in women, significantly increases risk of developing diabetes

Abdominal obesity may also be considered a risk factor for periodontal disease, especially in younger individuals
People with BMI of ≥ 30 may be almost 9 times more likely to develop periodontal disease than individuals with a BMI < 20.

Increased body fat is linked to increased risk for periodontal disease.

To consider whether a patient might be at risk for periodontal disease, ask him/her to take his/her own measurements for central adiposity and calculate his/her BMI.

Perceived Major Barriers to Offering Obesity-related Interventions Among General Dentists & Pediatric Dentists

- Fear of offending parent or patient
- Fear of appearing judgmental of parent or patient
- Lack of trained personnel
- Lack of patient acceptance of weight-loss advice from a dentist

Curran AE, et al. Dentists' Attitudes About Their Role in Addressing Obesity in Patients: A national survey. JADA 14111; 1307-1316

Barriers to Implementing Obesity-related Interventions

- No coherent effort by schools and medical societies
- No correlation between caries and obesity
- No clear guidelines
- Do not know how to start the conversation
- Cultural biases toward overweight
- Fear of upsetting pediatricians, large source of referrals
- Being overweight themselves and thus not being credible

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Feasibility of implementing obesity-related interventions in dental practice

- Fear of contradicting advice that pediatricians may have given to parents
- Legal issues associated with a failure to achieve weight-loss results

Conclusions: Models of intervention of obesity within the scope of dental practice must be developed

Clinical Implications: Educating dentists about obesity and counseling may reduce barriers for those interested in addressing obesity in their practices
Bi-lateral Point-of-care Screening & Referral of Patients at Risk for Obesity and Periodontal Disease

If statistics on the incidence of obesity are superimposed onto the patient base of the average dental practice (general dentistry) this equates to over 330 adult patients and 85 children or adolescents in a single practice, who are obese.

HCPs from all disciplines must work together to evaluate patients for the presence of chronic, low-grade inflammation, at the point of care. OHCPs are in a unique position to target obesity in their patients, especially in children, adolescents and teenagers.

Referrals for Weight Loss
- Physicians specializing in weight loss
- Registered dieticians
- Reputable on-site programs
- Weight Watchers
  - Meetings
  - Online
- Reputable self directed programs
  - Diets with low glycemic index (South Beach)
  - Physical trainers
  - Government sponsored programs (online)
  - Other?

Health Professionals who Play an Important Role in Weight Loss & Management Programs
- Nutritionists
- Exercise physiologists
- Physical education instructors
- Nurses
- Psychologists
- Physicians

Ellen
- 55-year-old Caucasian woman
- Height = 5′8″; weight = 195 lbs; BMI = 31
- Diagnosed with pre-diabetes 2 years ago
- Last time she saw her physician was about 9 months ago at which time her blood pressure was 145/95
- Presents as serious, intense, worried about her health

Ellen
- Current medications
  - Thyroxine (TX of hypothyroidism)
  - Hydrochlorothiazide (TX of hypertension)
- Non-compliant to recommendations for life style modifications
- No dental care in over 5 years
- Presents with Stage III; Grade B periodontitis
- Missing teeth: 2, 14, 15, 19, 31
Would you open a discussion about weight with a patient like Ellen? Why or why not?
What words you would use to bring up the issue of obesity?
What would be a practical way you could intervene in Ellen’s obesity?
What is or could be your referral network for weight management options in the care of obese people?

Questions or Comments?
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