The Diabetes $\leftrightarrow$ Periodontitis Interface

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Objectives

• Recognize the signs and symptoms of gingival health, gingivitis and periodontitis.

• Describe how periodontitis can be associated with certain complications of diabetes as well as poor control.

• Identify at least one change you will incorporate into your clinical or community health practice as a result of this training.
Healthy gums
Periodontal Diseases

The two most common types of periodontal disease:

- **Gingivitis**
- **Periodontitis**
Measuring the pockets associated with periodontitis

Gingivitis

Periodontitis

Illustrations by Dr. Tom Taylor
Prevalence of periodontitis:

US adults over 30 with teeth:
• 8.7% - mild form
• 30.0% - moderate form
• 8.5% - severe form

Much higher prevalence than previously thought; almost 50% of adults have periodontitis. NHANES 2010, n=3742, Eke, JDR 2012

• 17% - severe form in AI/AN age 35 and over IHS 2015, Phipps and Ricks
Diagnosing periodontitis:

<table>
<thead>
<tr>
<th>Location:</th>
<th>Chronic Perio</th>
<th>Aggressive Perio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localized</td>
<td>&lt; 30% of TEETH involved</td>
<td>1st molars &amp; incisors</td>
</tr>
<tr>
<td>Generalized</td>
<td>≥ 30% of TEETH involved</td>
<td>3 or more additional teeth</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Severity:</th>
<th>Slight</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slight</td>
<td>4mm pockets, up to 15% bone loss, BOP</td>
<td>5-6 mm probings, 15-30% bone loss, BOP</td>
<td>≥ 7mm probings, &gt;30% bone loss, BOP</td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td></td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Guidelines for Determining Severity of Periodontitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probing depths</td>
</tr>
<tr>
<td>Slight (Mild)</td>
</tr>
<tr>
<td>&gt;3 &amp; &lt;5 mm</td>
</tr>
<tr>
<td>Moderate</td>
</tr>
<tr>
<td>≥5 &amp; &lt;7 mm</td>
</tr>
<tr>
<td>Severe (Advanced)</td>
</tr>
<tr>
<td>≥7 mm</td>
</tr>
<tr>
<td>Bleeding on probing</td>
</tr>
<tr>
<td>Slight (Mild)</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Moderate</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Severe (Advanced)</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Radiographic bone loss</td>
</tr>
<tr>
<td>Slight (Mild)</td>
</tr>
<tr>
<td>Up to 15% of root length or ≥2 mm &amp; ≤3 mm</td>
</tr>
<tr>
<td>Moderate</td>
</tr>
<tr>
<td>16% to 30% or &gt;3 mm &amp; ≤5 mm</td>
</tr>
<tr>
<td>Severe (Advanced)</td>
</tr>
<tr>
<td>&gt;30% or &gt;5 mm</td>
</tr>
<tr>
<td>Clinical attachment loss¹</td>
</tr>
<tr>
<td>Slight (Mild)</td>
</tr>
<tr>
<td>1 to 2 mm</td>
</tr>
<tr>
<td>Moderate</td>
</tr>
<tr>
<td>3 to 4 mm</td>
</tr>
<tr>
<td>Severe (Advanced)</td>
</tr>
<tr>
<td>≥5 mm</td>
</tr>
</tbody>
</table>

AAP Update to the 1999 Classification of Periodontal Diseases and Conditions
J Periodontol • July 2015
Severe Periodontitis - Molars
Oral Effects in Patients with Diabetes

- Increased gingivitis and periodontitis
- Impaired intraoral healing
- Xerostomia (dry mouth)
- Caries
- Burning mouth and tongue
- Cheilosis and candidiasis
- Multiple periodontal abscesses
Gingival polyps/granulomatous tissue

Diabetic nonsmoker
Diabetic with severe periodontitis and oral inflammation
Undetected diabetics with periodontitis
Diabetic with a history of severe periodontitis, but healthy gums and stable bone levels
The Evidence/Association

- A review of 55 studies involving subjects with diabetes found consistent evidence of increased:
  - Prevalence of periodontitis
  - Incidence of periodontitis
  - Severity of periodontitis
  - Progression of periodontitis

Periodontitis is more prevalent in those with poorer glycemic control.
Taylor 2008, Garcia 2015

When the blood sugar is under control, there is no greater risk for severe periodontitis.
Tsai 2002 NHANES III analysis, Nitta 2017
The Two-Way Relationship

• Does periodontitis increase risk of:
  • Poorer glycemic control?
  • Diabetes complications like heart attacks and kidney disease?
  • Mortality?

Periodontal Disease

Diabetes Mellitus
DM and Periodontitis- The 2 Way Relationship

DM

- Poor PMN Function
- AGE binding/accumulation
- Inflammatory State
- Destructive Environment

serum lipids
blood glucose

Further aggravated lipid metabolism & insulin resistance

Chronic infection of periodontitis, with local and systemic inflammation

Increased Periodontal Destruction

Periodontal Pathogens
The Systemic Connection

- Periodontal disease → Worsening of diabetes
- Periodontal disease → Cardiovascular disease
- Periodontal disease → Chronic kidney disease
- Periodontal disease → COPD
- Periodontal disease → Rheumatoid arthritis
The Systemic Connection
Bacterial Access and Inflammatory Response

• Ulcerated epithelium within infected periodontal pockets allows bacteria, toxins, and inflammatory mediators access to the blood stream.
Heavy calculus and immediately after its removal demonstrating inflammation and ulceration

In a patient with moderate to severe perio there is an estimated $10-20\text{cm}^2$ of ulcerated surface area and tissue necrosis.

Hujoel 2001
Which is 3-5X larger than this foot ulcer in this patient with diabetes.
Gum Disease is usually painless and easy to ignore
Periodontitis is an anaerobic infection flooding the blood stream 24 hours a day with endotoxins and inflammatory mediators.  

Offenbacher, 1998
Periodontitis and Systemic Inflammation

- Pro-inflammatory cytokines (IL-1, IL-6, TNF-α) and prostaglandins (PgE2) accumulate in the gum tissues in active periodontitis at extraordinary levels and can enter the circulation.  
  
  Salvi 1997

- Periodontitis is asso. with increased systemic inflammation (CRP, IL-6, TNF-α) which is decreased by periodontal treatment.

Not all oral bacteria are created equal.

Stealth like properties enable oral organisms to persist at extraoral sites, even for years, through immune evasion, selective virulence, and the ability to disseminate.

Oral bacteria (S. mutans serotype e, f, and k, Campylobacter concisus Cluster I, Fusobacterium nucleatum, oral Treponema, and P. gingivalis) are found in extraoral sites.

Periodontal diseases have an effect on certain systemic conditions

Offenbacher 2004

Han JDR 2013
Diabetic subjects had an increased risk of a worsening of HbA1c over 2-3 years when severe periodontitis was present at baseline. Pima study. Taylor et al, JOP 96

Patients with Type 1 DM had sig. higher prevalence of proteinurea and cardiovascular complications such as stroke, TIA, angina, and MI when severe perio was present at baseline. Thorstensson J Clin Perio 1996

Severe perio and progression of perio associated with increased HbA1c in Type 2 DMs. Costa JOP 2017
Periodontal disease is a strong predictor of mortality from ischemic heart disease and diabetic nephropathy

- Prospective longitudinal study (median 11 years) on the effect of periodontitis on cardiovascular mortality.
- After adjusting for many factors, for ischemic heart disease:
  - Severe Perio = 2.3 X greater risk of cardiac mortality
- For diabetic nephropathy:
  - Severe Perio = 8.5 X greater risk of renal mortality

Saremi et al, Diabetes Care 2005, n= 628
Incidence of macroalbuminuria and ESRD increased with severity of periodontitis.

After adjusting for many factors, compared to those periodontally healthy:

- Moderate perio: OR ESRD 2.3
- Severe perio: OR ESRD 3.5

Conclusion: Periodontitis predicts development of overt nephropathy and ESRD in a dose dependent manner in individuals with type 2 DM.

Shultis et al, Diabetes Care 2007
Perio Therapy Improves Diabetic Control

- Scaling and root planing provides a significant improvement in glycemic control (average 0.40% decrease) in the majority of studies and meta-analyses.

- Perio treatment leads to improved glycemic control for at least 3 months

- It is not clear if and when antibiotics and other antimicrobial treatments improve the diabetes.
Periodontal therapy and diabetic control: Recent reviews and meta analyses:

• **Janket et al JDR 2005**
  Meta analysis of 10 intervention trials. Non-significant but HbA1c decreased 0.7% with SRP + Ab, 0.4% with SRP alone.

• **Darre et al Diabetes Metab 2008**
  Meta analysis/Systematic review of 25 studies. SRP provided a small but significant improvement in glycemic control (mean 0.79% decrease).

• **Teeuw et al Diabetes Care 2010**
  Meta analysis/Systematic review. 5 articles met inclusion criteria. Perio tx leads to an improvement of glycemic control in Type 2s for at least 3 months.

• **Simpson. Cochran Library 2010**. Treating perio may lower blood sugar levels in type 2’s. Limited evidence type 1’s.

• **Engebretson JCP/JOP 2013**- Meta analysis mean 0.36% decrease.
Effect of nonsurgical periodontal therapy on hemoglobin A1c levels in persons with Type 2 diabetes and chronic periodontitis

Largest, multicenter, RCT n=514.
Treatment: SRP, OHI, chlorhexidine for 2 weeks
Conclusion: Perio therapy did not improve glycemic control.
Results: After treatment,
- 71% had high plaque scores
- 42% had bleeding on probing
- 10% had pockets ≥5mm.

Engebretson JAMA 2013
Periodontal Treatment Terminology:

**Gingivitis**- “Prophy” or “prophylaxis”. “Cleaning.”

**Periodontitis**-

- “Deep scale” or “SRP” (Scaling and root planing)- often under topical or local anesthetic to numb the teeth and gums.
- “Flap curettage” – surgery to expose the teeth and roots to remove the calculus that was under the gums.
- “Osseous Resective surgery” – to achieve proper physiologic contour and tissue adaptation amenable to good OH.
- “Regeneration” or “bone grafting-” surgery to rebuild the bone around the teeth.
Dental treatment protocol in diabetics with moderate to severe perio:

• Intensive oral hygiene instruction and motivation
• 1/2 mouth deep scaling with local anesthesia
• Extract hopeless teeth that can’t improve with therapy
• Antibiotic
  • Doxy 100mg bid X 14 days or Augmentin 500mg bid X 10 days
• Antimicrobial mouthrinse
• Analgesic if needed
• Recall in 3-6 months
Before scaling the teeth/deep cleaning

Inflamed Gums

Calculus
Patient return at 6 months after cleaning

Healthy gums with no inflammation, local or systemic

Calculus Removed
Generalized Mod to Severe Perio.  HbA1c = 11.3

6 months after deep cleaning and doxycycline
Prior to deep cleaning

3 Years Post Therapy
Generalized Severe Chronic Periodontitis
28 y.o. with FBS 347. Diabetic protocol treatment
Perio health improved 2 months post-protocol
Severe periodontal breakdown in a poorly controlled diabetic after no dental care for 2 years post periodontal treatment
Treating periodontitis:
Scale the teeth and roots to remove bacteria and calculus, and use antimicrobials, decreasing inflammation and infection.
The use of powered toothbrushes, mouthrinses and toothpastes with antiseptic agents should be recommended.  
Ryan, 2007
Home care is critical, particularly cleaning between the teeth. Help the patient understand: “Diabetes increases risk for severe gum disease, and gum disease can make it harder to control your blood sugar.”
Early treatment of periodontitis (1st year) lowered total medical costs for Aetna members with DM, CAD, and stroke. Albert, BMC Health Services Res, 2006

Blue Care Network (MI)- Medical costs for DMs decreased 11%/month with 1 or 2 perio txs/yr vs no tx. Taylor 2009, n= 2674

BC/BS of MA -Dental care decreases medical costs $144 per member per month. ($238 if CAD).

Regular dental cleanings reduced hospitalizations and ER visits for diabetes-specific medical care (vs those who didn’t receive dental care. Mosen 2012

Completing periodontal therapy and recalls reduced hospitalizations by 39%, with $2840 annual reduction in overall medical costs (compared to those who did not complete their cleanings or recalls). Jeffcoat, Am J Pre Med 2014

Perio treatment in newly dx T2 DM patients is assoc with lower total healthcare costs (-$1799) in those not receiving DM Rx drug therapy. Nasseh Health Economics 2016
• Ask at least annually for symptoms of gum disease, and to seek treatment if present.

• Ask about regular oral health check ups.

• Remind that daily oral hygiene is an important part of diabetes self-management.

• Educate on the relationship between diabetes and gum disease.

International Diabetes Federation 2009
SYMPTOMS OF GUM DISEASE INCLUDE

- Red or swollen gums
- Tender or bleeding gums
- Painful chewing
- Loose teeth
- Sensitive teeth
Know your referral process to Dental. An example:

- For toothache/acute care no referral should be required:
- For a Dental exam:
  - Provide an oral screen for patients with diabetes
  - If > 1 year since last dental exam, or signs of gum disease present:
    a. Complete a “Golden Ticket.” or
    b. Enter referral into the EHR. Or
    c. Have pt go to dental to get an appt.
Chronic inflammation is the link between many illnesses, including diabetes and periodontitis.

Diabetes increases risk for periodontitis, and periodontitis increases risk for diabetic complications and poor metabolic control.

Periodontal treatment reduces the cumulative systemic pathogen and inflammatory burden throughout the body. “The consequences of undertreatment could be more than the loss of a few teeth.”  

McGuire 2008

For additional info check out the Clinical Tools for the Oral Health Best Practice at www.ihs.gov/MedicalPrograms/Diabetes and the AAP’s www.perio.org
Thank You

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