Periodontal Disease:
Diagnosis, Treatment Planning and Therapy

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Diplomates, American Board of Periodontology and Implant Surgery

Beavercreek Mason
Comprehensive periodontal disease therapy

• Periodontal disease is environmentally and genetically influenced
• No cure exists for periodontal disease
• Goals of therapy are:
  – Arrest the progression of disease
  – Regenerate lost tissues where possible
  – Improve the microbiological environment
  – Prevent recurrence
Data Acquisition: Clinical

- Oral health and hygiene
- Probing depths (6 sites/tooth)
- Recession (6 sites/tooth)
- Bleeding (6 sites/tooth)
- Mobility
- Furcation involvement
- Occlusion
Data Acquisition: Radiographic

Full mouth series

Periapical

Vertical bite wings

Cone Beam CT Scan
Diagnosis

• **Environmental factors:**
  – Bacterial plaque (biofilm)
  – Tobacco
  – Overhanging margins, etc.

• **Genetic factors:**
  – Immunological disposition

“Bacteria are necessary but not sufficient”

- Offenbacher, *Pathogenesis*
Enamel

Ligament

Hyperplastic Epithelium

Bone

Connective tissue

G+ Flora

G- Flora

Leukocyte Wall

Hyperplastic Epithelium

PGE$_2$

IL-1$\beta$

TNF$\alpha$

IL-6

MMPs

Macrophages & Lymphocytes

Cementum

Ligament

Bone
Diagnosis

- Indicates current status as well as long-term genetic disposition
- No cure exists
- Based on the collective findings, not any one factor
Diagnosis

- Location: Generalized vs. Localized
- Severity: Slight, Moderate, Severe
- Type: Aggressive or Chronic
- Disease: Periodontitis

Examples:

Generalized slight to moderate chronic periodontitis
Localized severe chronic periodontitis #12
2017 World Workshop on the Classification of Periodontal and Peri-implant Diseases and Conditions

• Intent is to create higher sensitivity (do we diagnose the disease) and specificity (is the diagnosis accurate) using Staging and Grading
• Still a work in progress
• October 2018 AAP Vancouver – controversial comments from membership on how this new classification system helps us explain disease to our patients and referring dentists
• Slow implementation as refinement occurs
You have **Periodontitis** if:

1) Interdental CAL is detectable at > 2 non-adjacent teeth
2) Buccal or oral CAL ≥ 3 mm with pocketing > 3 mm that is detectable at > 2 teeth
3) AND the observed CAL cannot be ascribed to non-periodontal causes such as:
   • Gingival recession of traumatic origin
   • Dental caries extending into cervical area of the tooth
   • Presence of CAL on distal aspect of 2\textsuperscript{nd} molar and associated with malposition of extraction of 3\textsuperscript{rd}
   • Endodontic lesion draining (sinus tract)
   • Vertical root fracture

This case definition does not stipulate a specific threshold of detectable CAL (e.g., 2mm) to avoid misclassification of initial periodontitis cases as gingivitis and maintain consistency of histological and clinical definitions.
Review: CAL = Clinical Attachment Loss

CAL (Loss) is not always exactly the same as CAL (Level), but ignore that for the moment.

Clinical Attachment Level by Paulette Lamothe on Prezi

**Calculating CAL when the gingival margin is at the CEJ.**

There are no calculations required when the gingival margin is level to the CEJ because the probing depth and the CAL are equal.

For example:
- Probing depth measurement: 6mm
- Gingival margin level: 0mm
- Clinical attachment loss: 6mm
Calculating CAL when the gingival margin covers the CEJ

When the gingival margin is coronal to the CEJ, the CAL is calculated by SUBTRACTING the gingival margin level from the probing depths.

For example:
Probing depth measurement: 9mm
Gingival margin level: -3mm
Clinical attachment loss: 6mm
Calculating CAL in the presence of gingival recession

When recession is present, the CAL is calculated by ADDING the probing depth to the gingival margin level.

For example:
Probing depth measurement: 4mm
Gingival margin level: +2mm
Clinical attachment loss: 6mm


Periodontitis

**Stages**: Based on Severity and Complexity

- **Stage I**: Initial Periodontitis
- **Stage II**: Moderate Periodontitis
- **Stage III**: Severe Periodontitis with potential for more tooth loss
- **Stage IV**: Severe Periodontitis with potential for loss of dentition

**Extent and distribution**: localized, generalized, molar-incisor distribution

**Grades**: Evidence of risk of rapid progression, anticipated treatment response

- **Grade A**: Slow rate of progression
- **Grade B**: Moderate rate of progression
- **Grade C**: Rapid rate of progression
Periodontitis: Staging

• Staging intends to classify
  • the **severity** and **extent** of a patient’s disease based on the measurable amount of destroyed and/or damaged tissue as a result of periodontitis
  • and assess the **specific factors** that may attribute to the **complexity** of long-term case management.

• Initial staging should be determined
  • using **clinical attachment loss (CAL)**
  • If CAL is not available, use **radiographic bone loss (RBL)**
  • Tooth loss due to periodontitis may shift the stage to a higher level (3 -> 4).
# Staging Guidelines

<table>
<thead>
<tr>
<th>Severity</th>
<th>Periodontitis</th>
<th>Stage I</th>
<th>Stage II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdental CAL</td>
<td>1 – 2 mm</td>
<td>3 – 4 mm</td>
<td></td>
</tr>
<tr>
<td>RBL</td>
<td>Coronal third (&lt;15%)</td>
<td>Coronal third (15% - 33%)</td>
<td></td>
</tr>
<tr>
<td>Tooth loss (due to periodontitis)</td>
<td>No tooth loss</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pocket Probing Depths: $\leq 4 \text{ mm}$ $\leq 5 \text{ mm}$
## Staging Guidelines

<table>
<thead>
<tr>
<th>Severity</th>
<th>Periodontitis</th>
<th>Stage III</th>
<th>Stage IV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interdental CAL</td>
<td>≥5 mm</td>
<td>≥5 mm</td>
</tr>
<tr>
<td></td>
<td>(at site of greatest loss)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RBL</td>
<td>Extending to middle third of root and beyond</td>
<td>Extending to middle third of root and beyond</td>
</tr>
<tr>
<td></td>
<td>Tooth loss (due to periodontitis)</td>
<td>≤4 teeth</td>
<td>≥5 teeth</td>
</tr>
</tbody>
</table>

**Pocket Probing Depths:** > 6 mm
Stage 1

- CAL = 1-2 mm
- RBL < 15% (coronal third)
- No tooth loss due to periodontitis
- Max. probing depth ≤ 4 mm
- Mostly horizontal bone loss
Stage 1: RBL in coronal third (<15%)  
(same case as in prior slide)
Stage 2

CAL = 3-4 mm
RBL < 15-33% (coronal third)
No tooth loss due to periodontitis
Max. probing depth ≤ 5 mm
Mostly horizontal bone loss
Stage 2: RBL in coronal third (15-33%)  
(same case as in prior slide)
Stage 3

CAL > 5 mm
RBL > 33% (past coronal third)
< 4 teeth lost due to periodontitis
Probing depths ≥ 6 mm
Vertical bone loss ≥ 3 mm
Furcation involvement (2 or 3)
Stage 3: RBL in middle third or more (> 33%)
(same case as in prior slide)
Stage 3

- CAL ≥ 5 mm
- RBL > 33%
- Probes ≥ 6 mm
- Vertical ≥ 3mm
- Furcation: 2 or 3

GM

Recession Depth
3 5 4

Rec 3 5 4

tooth
1 2

3 4 5 6 7 8

9 10 11 12 13 14 15

4 3 5 2 1

3 2 1 3 2 3

4 3 2 1 2

4 3 2 1
Stage 4

Everything as in Stage 2 PLUS:
> 5 teeth lost to periodontitis and

 Needs complex rehab due to
- Masticatory dysfunction
- Secondary occlusal trauma
- Severe ridge defects
- Bite collapse, drifting, flaring
- < 20 teeth (10 opposing pairs)
Stage 4
Stage 4

Everything as in Stage 2 PLUS:

> 5 teeth lost to periodontitis

Needs complex rehab due to

- Masticatory dysfunction
- Secondary occlusal trauma
- Severe ridge defects
- Bite collapse, drifting, flaring
- < 20 teeth (10 opposing pairs)
### Periodontitis Grading

Aims to indicate:

- Rate of periodontal progression
- Responsiveness to standard therapy
- Potential impact on systemic health

<table>
<thead>
<tr>
<th>Primary criteria</th>
<th>Progression</th>
<th>Grade 1 - Slow rate</th>
<th>Grade 2 - Moderate rate</th>
<th>Grade 3 - Rapid rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct evidence of progression</td>
<td>Radiographic bone loss or CAL</td>
<td>No loss over 5 years</td>
<td>&lt;2 mm over 5 years</td>
<td>≥2 mm over 5 years</td>
</tr>
<tr>
<td>Indirect evidence of progression</td>
<td>% bone loss / age</td>
<td>&lt;0.25</td>
<td>0.25 to 1.0</td>
<td>&gt;1.0</td>
</tr>
<tr>
<td>Case phenotype</td>
<td>Heavy biofilm deposits with low levels of destruction</td>
<td></td>
<td>Destruction commensurate with biofilm deposits</td>
<td>Destruction exceeds expectations given biofilm deposits; specific clinical patterns suggestive of periods of rapid progression and/or early onset disease</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade modifiers</th>
<th>Risk factors</th>
<th>Smoking</th>
<th>Non-smoker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>Non-smoker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>Normoglycemic/no diagnosis of diabetes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hba1c &lt;7.0% in patients with diabetes</td>
<td>Hba1c ≥7.0% in patients with diabetes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Grading Summary

<table>
<thead>
<tr>
<th>Progression</th>
<th>Progression</th>
<th>Grade A: Slow</th>
<th>Grade B: Moderate</th>
<th>Grade C: Rapid rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct evidence of progression</td>
<td>Radiographic BL or CAL</td>
<td>No loss over 5 yrs</td>
<td>(&lt; 1\text{mm} \text{ over 5 yrs})</td>
<td>(\geq 2\text{mm} \text{ over 5 yrs})</td>
</tr>
<tr>
<td>Indirect evidence of progression</td>
<td>RBL = %BL/age</td>
<td>(&lt; 0.25)</td>
<td>(0.25 \text{ to 1.0})</td>
<td>(&gt; 1.0)</td>
</tr>
<tr>
<td>Prefer direct evidence</td>
<td>Phenotype</td>
<td>Heavy biofilm but little damage</td>
<td>Destruction commensurate with biofilm</td>
<td>Worse than expected Early onset or rapid progression</td>
</tr>
<tr>
<td>Grade Modifiers</td>
<td>Risk Factors</td>
<td>Smoking</td>
<td>Non-smoker</td>
<td>(&lt; 10 \text{ Cigs/day})</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td>Normoglycemic</td>
<td>(\text{HbA1c} &lt; 7.0) in pts with DM</td>
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New Paradigm Diagnosis Overview:

**Stages**: Based on Severity and Complexity

- Stage I: Initial Periodontitis
- Stage II: Moderate Periodontitis
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**Extent and distribution**: localized, generalized, molar-incisor distribution

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Grade A: Slow rate of progression
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### Staging summary

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<tr>
<th>Parameter</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
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<tbody>
<tr>
<td>Max CAL</td>
<td>2 mm</td>
<td>4 mm</td>
<td>≥ 5 mm</td>
<td></td>
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<tr>
<td>RBL</td>
<td>&lt; 15%</td>
<td>&gt; 15-33%</td>
<td>&gt; 33%</td>
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<tr>
<td>Tooth Loss</td>
<td>0</td>
<td>0</td>
<td>≤ 4</td>
<td>≥ 5</td>
</tr>
<tr>
<td>Max PPD</td>
<td>≤ 4 mm</td>
<td>≤ 5 mm</td>
<td></td>
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**Severity**

**Complexity**

- VBL ≥ 3 mm
- ≥ 6 mm Furcation 2 or 3
- FM Recon
- PBC
- Mobility ≥ 2
- < 10 opp pairs

### Grading

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<td>Radiographic BL or CAL</td>
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<td>≥ 2mm over 5 yrs</td>
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<td>Indirect evidence</td>
<td>RBL %/BL/age</td>
<td>&lt; 0.25</td>
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**Additional complexity factors and grade modifiers:**

**Diagnosis:** Stage 1 2 3 ____________________________ Grade A B C

**Distribution pattern**

**Examiner Name and Date:** ____________________________
Diagnosis: Example

- Generalized 1-7 mm pocketing with notable plaque and calculus
- Class I-II furcations in molars
- Class I mobility on several teeth
- Generalized moderate to advanced horizontal bone loss
- Non smoker, no medical contributions

DX: Generalized moderate to severe chronic periodontitis (Stage III, Grade B)
Diagnostic Key Points

• Etiology – what is causing the disease? If we get “what” right, then “how” we treat is effective

• Susceptibility – genetics and environment play a role in all diseases; understanding your patient is this regard will help engineer more “solution” oriented therapy
Treatment

- Focused on addressing environmental factors (plaque/biofilm, occlusal/restorative contributions, smoking, uncontrolled diabetes, etc.)

- In doing so, you reduce the intensity of the immune response to a controlled level
Non-Surgical Therapy

- Starting point for most disease therapy
- Provided in pockets $\geq 4$ mm with bleeding
- Most often delivered under local anesthesia over 1-4 appointments
- Occlusal discrepancies addressed if needed
- Requires re-evaluation approximately 6 weeks afterward to quantify outcomes
- Many patients with pocketing $\geq 6$ mm will still require surgical intervention
Scaling and root planing

Initial pocketing ≥ 4 mm

Mechanical disruption of the biofilm remains paramount
Antibiotics

• **Systemic:**
  – Used very selectively in chronic disease patients and more routinely in aggressive periodontitis situations
  – Host modulation agents (Periostat®) are used selectively as well and confer a anti-inflammatory benefit (anti-collagenase)

• **Local antibiotics**
  – Used locally not generally
  – In our practice, employed most often after re-evaluation or during periodontal maintenance
Comprehensive periodontal therapy: Local antibiotics

Arestin® (Minocycline microsphere)

Subgingival placement of Arestin® following scaling and root planing
ATRIDOX® (doxycycline hyclate) is a locally applied antibiotic that is placed gently below the gum line into periodontal pockets where bacteria thrive and cause infection.

- Flows freely and easily to the bottom of the pocket and adapts to root morphology
- Controlled release of doxycycline for a period of 21 days
- Single syringe effectively treats multiple infected pockets/sites
Resective Surgical Therapy

- Follows initial therapy
- Provided most often in pockets $\geq$ 6 mm
- Goals:
  - Access for debridement
  - Pocket reduction
  - Hard and soft tissue recontouring for long-term maintenance
- May result in post-surgical sensitivity (controllable) and esthetic compromises
Surgical treatment: Resection
Regenerative surgical therapy

- Follows initial therapy
- Provided most often in pockets $\geq 6$ mm with vertical bone loss
- Goals:
  - access for debridement
  - pocket reduction through new attachment
Regenerative materials

- Autogenous bone
- Allografts (human donors)
  - Demineralized freeze-dried bone (DFDBA)
  - Mineralized freeze-dried bone (FDBA, Puros™)
- Xenografts (other species donors)
  - Inorganic bovine-derived bone (Bio-Oss™)
- Alloplasts (synthetic materials)
- Tissue engineering proteins (sources vary)
  - Recombinant platelet derived growth factor (Gem21™)
  - Enamel matrix derivative (Emdogain™)
Surgical treatment: Regeneration using GEM 21 (recombinant platelet derived growth factor)

Traumatized tooth: Post-endodontic treatment 14 mm pocket on the straight palatal
3 mm pocket at 3 months
Surgical treatment: Regeneration using Emdogain

Pocket depths of 7-8 mm on the distofacial and distolingual of #29
Pre-treatment radiographs
Pre- and Post-treatment radiographs (6 months duration)
Re-entry: Gem 21s and Puros

9-10 mm PD

4 mm PD
Lasers for periodontal treatment

- In recent years interest has grown for the use of lasers

- Soft tissue applications:
  - Gingivectomies (NOT CROWN LENGTHENING)
  - Frenectomies (lingual better than facial)
  - Implant exposures (if abundant attached tissue present)
  - Biopsies
Lasers for periodontal treatment

- Millennium Dental promotes the LANAP (laser assisted new attachment procedure)
- Born from ENAP (excisional new attachment procedure) – no validity
- Lacks good evidence
Lasers for periodontal treatment

• 4 published human studies involving a total of 57 patients that have evaluated the effects of subgingival laser application

• All four papers report reductions in putative periodontal pathogenic microbes following laser treatment. Two of the papers also reported laser induced root damage. The remaining two papers did not evaluate treated teeth for root damage.

• To the contrary, there is peer reviewed evidence, both in vivo and in vitro, that use of lasers for ENAP procedures and/or gingival curettage may place patients at risk for damage to root surfaces and subjacent alveolar bone that, in turn, could render these tissues incompatible to normal cell attachment and healing.

• In conclusion, The American Academy of Periodontology is not aware of any randomized blinded controlled longitudinal clinical trials, cohort or longitudinal studies, or case-controlled studies indicating that "laser ENAP" or "laser curettage" offers any advantageous clinical result not achieved by traditional periodontal therapy. Moreover, published studies suggest that use of lasers for ENAP procedures and/or gingival curettage could render root surfaces and adjacent alveolar bone incompatible with normal cell attachment and healing.
Lasers for periodontal treatment

- Multicenter comparative trial in currently underway (5 universities)

- 4 treatments:
  - Coronal polishing
  - Scaling and root planing
  - Modified Widman Flap (no osseous sx)
  - LANAP

- 5 year data (2018): SRP=LANAP=Modified Widman > Coronal polishing

- Criticisms:
  - Modified Widman has no surgical validity
  - LANAP promotes a regenerative outcome but no surgical regenerative control is used in comparison

- 2018 AAP – Panel agreed with these findings
Maintenance

• Due to patient susceptibility, periodontal maintenance should occur every 3-4 months.

• **Generalized moderate to severe chronic periodontitis** – optimally every 3 months alternating between general practice and periodontist.

• **Generalized slight chronic periodontitis** – potentially every 4 months with optional alternating between general practice and periodontists.

• **Localized periodontal issues** are on an individual case basis with a similar philosophy as above – mild situation may be maintained by the general practitioner alone, whereas moderate to advanced needs benefit from a shared maintenance scheduled with the periodontist.
Maintenance

• Full mouth periodontal charting – pocket depths, recession, furcations, mobility
• Ultrasonic, hand scaling, polish, optional fluoride
• May include local delivery antibiotics
• VERTICAL BITE WINGS should be taken every 6 months
• Full mouth series OR Cone Beam CT scan every 3-5 years
• Schedule their next visit in your office and help them schedule their next visit with the periodontist if this is not already done
Maintenance - Homecare

- Suggest electric toothbrushes
  - Oral – B

- Toothpaste:
  - Crest Pro-Health
  - Prevident

- Flossing
  - Polytetrafluoroethylene (PTFE)
  - Waxed
  - Proxybrushes
  - Waterpik/Hydrofloss helpful under bridges, full arch prostheses

- Rinses
  - Crest Pro-Health
Future directions

- Via cone beam computed tomography (CBCT), periodontal defects will be mapped.
- A 3-D printer will fabricate biologically inert carrier infused with mediators to regenerate the periodontium.
- Case report(s) underway at University of Michigan and other institutions.
- STAY TUNED!!
When to Refer?

• Treat or refer at the earliest signs of breakdown (4-5 mm pockets with bleeding)
• Be confident in your ability to provide non-surgical care
• Re-evaluate for progress following treatment and refer if pocketing is 6 mm or greater