Review and Update on Non-Surgical Periodontal Therapy

Mountain AHEC October 14th, 2010

Antonio Moretti, DDS, MS
Associate Professor
Dept. of Periodontology

Presentation Outline

- Review of Concepts and Definitions
- Diagnosis and Treatment Plan
- Initial Periodontal Therapy
  - Oral hygiene instruction
  - Scaling and root planing
  - Removal of plaque retentive factors
  - Lasers in non-surgical periodontal treatment
- Evaluation of the Initial Periodontal Therapy

Presentation Outline

- Additional Topics:
  - Full-Mouth Disinfection
  - Topical Antimicrobials
  - Systemic Antibiotics
  - Locally Delivered Antimicrobials
  - Periodontal Host Modulation
- Final Remarks

REMEMBER THIS ALWAYS ...

There is no substitute for an accurate periodontal diagnosis and adequate conventional (i.e., mechanical) periodontal treatment.

Periodontal Diagnosis

- Full mouth series of radiographs including bitewings
- Full mouth periodontal chart
  - Bleeding on probing
  - Plaque Index
- Description of gingival tissues
- Description of calculus presence
- Risk assessment and goals of treatment
- Thorough discussion with patient regarding findings and treatment plan

Example of Clinical Case
Periodontal Chart

Periodontal Risk Assessment

Periodontal Diagnosis

**Example of chart notes for 1st visit:**
- **Purpose:** Initial comprehensive examination
- **Chief Complaint:**
- **History of Chief Complaint:**
- **Medical History:**
- **Dental History:**
- **Oral Hygiene/Gingival Tissues:** Plaque Index, Percentage of BOP
- **Calculus (location, quantity, distribution):**
- **Treatment Provided:** Full-mouth periodontal charting (probing depth, clinical attachment level, bleeding on probing, mobility, furcation involvement). Explanation of initial findings. Treatment plan explained.
- **Evaluation:**
  - **Radiographic Findings:**
  - **Periodontal Diagnosis (AAP, 1999 Workshop):**
  - **Additional Clinical Findings:**
  - **Occlusal Factors:**
  - **Restorative Factors:**
  - **Risk Assessment and Periodontal Prognosis:**
    - Short Term (< 5 years): whole dentition versus selected teeth
    - Long Term (> 5 years): whole dentition versus selected teeth

Periodontal Diagnosis

**Suggested Treatment Plan:**
- Education on the etiology of periodontal disease
- Oral hygiene instructions and motivation
- Four quadrants of scaling and root planing (SRP)
- Minor/initial restorative care
- Reevaluation of initial periodontal therapy 4-8 weeks after last quadrant of SRP
- Surgical Phase (including antibiotic therapy):
  - Maxillary right
  - Maxillary left
  - Mandibular right
  - Mandibular left
- Reevaluation of surgical therapy 6-8 weeks after the last quadrant of surgery,
- Completion of Restorative Phase and Other Treatment Needs
- Periodontal maintenance at 3-month intervals or according to patient's plaque control
- **Evaluation:**
- **Next Visit:**

**Periodontal Diagnosis**

**Routine Chart Notes:**
- **P** - purpose
- **H** - medical history
- **O** - oral hygiene
- **T** - treatment provided
- **E** - evaluation
- **N** - next visit

**Reference for Periodontal Diagnosis:**

**Reference for Periodontal Risk Assessment:**
Reviewing Concepts:
Probing Depth, Attachment Level and Bleeding on Probing

Periodontal Diseases Are Infections

Experimental Gingivitis in Man

Löe et al., 1965

- Gingivitis (~15 to 21 days)
- Health (~7 to 10 days)

Pathogenesis of Periodontal Disease

- Environmental and Acquired Risk Factors
- Host Immune & Inflammatory Responses
- Genetic Risk Factors
- Clinical Signs of Disease Initiation and Progression

Initial Periodontal Therapy

- Patient education and motivation
- Oral hygiene instruction/daily antimicrobials
- Scaling and root planing combined or not combined with antimicrobials
- Removal of additional retention factors for plaque, such as overhanging margins of restorations, ill-fitting crowns, etc.
- Minor restorative work
- Extraction of hopeless teeth
- Reevaluation in 4-8 weeks after last ScRP

Criteria for Periodontal Surgery

- Gingivitis
  - OHI + ScRP
  - No surgery

- Slight Periodontitis
  - OHI + ScRP

- Moderate Periodontitis
  - OHI + ScRP
  - Surgery (?)

- Severe Periodontitis
  - OHI + ScRP
  - Surgery
Initial Periodontal Therapy: Mechanical & Chemical Aspects

Current Concepts: Mechanical Plaque Control
- Mechanical plaque control: the best approach for the prevention and treatment of gingivitis.
- Prevention of gingivitis requires only meticulous removal of plaque every 48 hours.
- In general, no more than 60% of the overall plaque is removed at each episode of oral hygiene.

Current Concepts: Mechanical Plaque Control
- The main benefit of twice-a-day oral hygiene is the adjunctive chemical action of the dentifrice.
- Epidemiological studies have shown that gingival health improves with up to twice-daily brushing but not more frequently than that.

Current Concepts: Mechanical Plaque Control
- Toothbrush design:
  - Handle size: Long contoured handle performs better than short and flattened.
  - Head size: Small is best.
  - Filament: Arrangement and height do not matter. High-filament density is more effective.
  - Automated brushes ...
Powered Toothbrushes

- Higher compliance: one study showed 62% of participants continued daily use for 36 months
- Sales of powered toothbrushes doubled between 1999 and 2001
- Powered toothbrushes may remove 84% of the plaque in 2 minutes and 93% in 6 minutes

Claydon, 2008

PLAQUE reduction for powered vs. manual toothbrushes at (1-3 months) and (>3 months)

<table>
<thead>
<tr>
<th>Type of Toothbrush</th>
<th>Number of Studies</th>
<th>Number of Participants</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-3 months</td>
<td>&gt;3 months</td>
<td>1-3 months</td>
</tr>
<tr>
<td>Lateral motion</td>
<td>6</td>
<td>2</td>
<td>402</td>
</tr>
<tr>
<td>Counter oscillation</td>
<td>4</td>
<td>2</td>
<td>184</td>
</tr>
<tr>
<td>Rotation oscillation</td>
<td>15</td>
<td>3</td>
<td>1181</td>
</tr>
<tr>
<td>Circular</td>
<td>3</td>
<td>1</td>
<td>168</td>
</tr>
<tr>
<td>Ultrasonic</td>
<td>3</td>
<td>1</td>
<td>171</td>
</tr>
<tr>
<td>Ionic</td>
<td>3</td>
<td>1</td>
<td>179</td>
</tr>
</tbody>
</table>

Claydon, 2008

GINGIVITIS reduction for powered vs. manual toothbrushes at (1-3 months) and (>3 months)

<table>
<thead>
<tr>
<th>Type of Toothbrush</th>
<th>Number of Studies</th>
<th>Number of Participants</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-3 months</td>
<td>&gt;3 months</td>
<td>1-3 months</td>
</tr>
<tr>
<td>Lateral motion</td>
<td>8</td>
<td>2</td>
<td>627</td>
</tr>
<tr>
<td>Counter oscillation</td>
<td>4</td>
<td>2</td>
<td>172</td>
</tr>
<tr>
<td>Rotation oscillation</td>
<td>16</td>
<td>4</td>
<td>1256</td>
</tr>
<tr>
<td>Circular</td>
<td>3</td>
<td>1</td>
<td>168</td>
</tr>
<tr>
<td>Ultrasonic</td>
<td>3</td>
<td>1</td>
<td>171</td>
</tr>
<tr>
<td>Ionic</td>
<td>2</td>
<td>1</td>
<td>116</td>
</tr>
</tbody>
</table>

Claydon, 2008

Interdental Cleaning

- No systematic reviews available
- Overwhelming number of options:
  - Floss or tape, super floss and flossers
  - Woodsticks or brushes (single or multi-tufted)
  - Mechanical or electrical devices
- The general population lacks:
  - Knowledge
  - Motivation
  - Skill
Clinical Studies on Oral Hygiene

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stewart and Wolfe 1989</td>
<td>Lack of reinforcement of oral hygiene over time increased poor compliance.</td>
</tr>
<tr>
<td>MacGregor et al 1998</td>
<td>2-10% of the population floss regularly and effectively.</td>
</tr>
<tr>
<td>Bader 1998</td>
<td>A substantial part of the population never floss at all.</td>
</tr>
<tr>
<td>Beals et al 2000</td>
<td>Patient’s average brushing time is 37 seconds.</td>
</tr>
<tr>
<td>Kalsbeek et al 2000</td>
<td>Only 10% of the population floss daily.</td>
</tr>
<tr>
<td>Lang et al 2004</td>
<td>Only 20% of the patients regularly perform acceptable flossing.</td>
</tr>
</tbody>
</table>

Efficacy of Dental Floss

- The dental professional should determine, on an individual basis, whether high quality flossing is an achievable goal. Routine instruction to use floss is not supported by scientific evidence.

Berchier et al., 2008

Bacterial Putrefaction

- Peptides/Proteins
- Amino Acids
- Putrefaction Products (volatile sulfur compounds)
- Oral Malodor
### Breath VSC & Some Amines

<table>
<thead>
<tr>
<th>Name</th>
<th>Odor Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen sulfide</td>
<td>Rotten eggs</td>
</tr>
<tr>
<td>Methyl mercaptan</td>
<td>Pungent, rotten cabbage</td>
</tr>
<tr>
<td>Dimethyl Sulfide</td>
<td>Unpleasantly sweet</td>
</tr>
<tr>
<td>Allyl methyl sulfide</td>
<td>Garlic-like</td>
</tr>
<tr>
<td>Carbon disulfide</td>
<td>Slightly pungent</td>
</tr>
<tr>
<td>Dimethylamine</td>
<td>Fishy, ammoniacal</td>
</tr>
<tr>
<td>Trimethylamine</td>
<td>Fishy, ammoniacal</td>
</tr>
</tbody>
</table>

Tongue Coating

- **Normal**
- **Light**
- **Heavy**

Winkel et al., 2003

### Irrigation Devices

- **Water jet**: 1,200 pulsations per minute with pressure of 55-90 psi reduces bleeding and gingivitis.
- **Pulsation action**:
  - **Impact zone**: where the solution initially contacts in the mouth at the gingival margin
  - **Flushing zone**: where the water or other irrigant reaches subgingivally

Gorur et al., 2009 and Ciancio et al., 2009

### Dental Water Jet Reduction of Inflammation and Biofilm

<table>
<thead>
<tr>
<th>Study</th>
<th>Duration</th>
<th>N</th>
<th>Agent Used</th>
<th>% Bleeding Reduction</th>
<th>% Gingivitis Reduction</th>
<th>% Plaque Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Mubarak et al. 2002</td>
<td>3 months</td>
<td>50</td>
<td>Water</td>
<td>43.4</td>
<td>66.9</td>
<td>64.9</td>
</tr>
<tr>
<td>Baimai et al 2005</td>
<td>4 weeks</td>
<td>10</td>
<td>Water</td>
<td>36.2-59.2</td>
<td>10.8-15.1</td>
<td>8.8-17.3</td>
</tr>
<tr>
<td>Bronzino et al 1980</td>
<td>8 weeks</td>
<td>44</td>
<td>CHX (0.05%)</td>
<td>52-59</td>
<td>25.4-31.1</td>
<td>14.3-19</td>
</tr>
<tr>
<td>Butch et al 1983</td>
<td>2 months</td>
<td>47</td>
<td>Water</td>
<td>57.1-76.6</td>
<td>26.3-37.7</td>
<td>53-55.7</td>
</tr>
<tr>
<td>Chave et al 1994</td>
<td>6 months</td>
<td>10</td>
<td>CHX (0.04%)</td>
<td>54</td>
<td>36</td>
<td>35</td>
</tr>
<tr>
<td>Ciancio et al 1989</td>
<td>6 months</td>
<td>51</td>
<td>Listerine H2O/Alcohol 5%</td>
<td>27.6</td>
<td>13.6-31.2</td>
<td>23-24</td>
</tr>
<tr>
<td>Callier et al 2000</td>
<td>2 months</td>
<td>52</td>
<td>Water</td>
<td>56</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Blommig et al 1990</td>
<td>6 months</td>
<td>17</td>
<td>CHX (0.05%)</td>
<td>35.4</td>
<td>42.5</td>
<td>53.2</td>
</tr>
</tbody>
</table>

Ciancio, 2009

### Dental Water Jet Reduction of Inflammation and Biofilm

<table>
<thead>
<tr>
<th>Study</th>
<th>Duration</th>
<th>N</th>
<th>Agent Used</th>
<th>% Bleeding Reduction</th>
<th>% Gingivitis Reduction</th>
<th>% Plaque Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flasking et al 1995</td>
<td>6 months</td>
<td>60</td>
<td>H2O/Zn Sulfate</td>
<td>84.5</td>
<td>17.8</td>
<td>8.5</td>
</tr>
<tr>
<td>Blommig et al 1995</td>
<td>6 months</td>
<td>10</td>
<td>Water</td>
<td>22.8</td>
<td>17.8</td>
<td>6.5</td>
</tr>
<tr>
<td>Fine et al 1994</td>
<td>6 weeks</td>
<td>58</td>
<td>Listerine</td>
<td>14.8-21.7</td>
<td>7.5-10.6</td>
<td>15.5-18.4</td>
</tr>
<tr>
<td>Jokovsky et al 1990</td>
<td>3 months</td>
<td>58</td>
<td>CHX (0.04%)</td>
<td>33.1</td>
<td>18.4</td>
<td>51.6</td>
</tr>
<tr>
<td>Lobene 1969</td>
<td>5 months</td>
<td>15</td>
<td>Water</td>
<td>52.8</td>
<td>7.9</td>
<td></td>
</tr>
<tr>
<td>Naumann et al 1994</td>
<td>5 months</td>
<td>5</td>
<td>Water</td>
<td>84.5</td>
<td>17.8</td>
<td>8.5</td>
</tr>
<tr>
<td>Sharma et al 2008</td>
<td>4 weeks</td>
<td>12</td>
<td>Water</td>
<td>84.5</td>
<td>17.8</td>
<td>8.5</td>
</tr>
<tr>
<td>Walsh et al 1992</td>
<td>8 weeks</td>
<td>8</td>
<td>CHX (0.2%)</td>
<td>45</td>
<td>14</td>
<td>77</td>
</tr>
</tbody>
</table>

Ciancio, 2009
**Dental Water Jet Reduction of Inflammation and Biofilm**

<table>
<thead>
<tr>
<th>Product</th>
<th># of Studies</th>
<th>N</th>
<th>Duration (months)</th>
<th>% Bleeding Reduction</th>
<th>% Gingivitis Reduction</th>
<th>% Plaque Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterpik</td>
<td>16</td>
<td>1225</td>
<td>1-6</td>
<td>22.8-84.3</td>
<td>18.8-66.9</td>
<td>0.1-64.9</td>
</tr>
<tr>
<td>OxyJet</td>
<td>1</td>
<td>64</td>
<td>2</td>
<td>26</td>
<td>44</td>
<td>4.4</td>
</tr>
<tr>
<td>Hydro Floss</td>
<td>2</td>
<td>69</td>
<td>3</td>
<td>No data</td>
<td>40% (non-significant)</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Ciancio, 2009

**Chemical Plaque Control: Dentifrices**

- **Dentifrices**
  - An agent with antiplaque activity must have demonstrated a significant benefit on gingival health in randomized controlled studies of at least 6 months duration to receive approval by the ADA.
  - Main components:
    - *Mild abrasives* to remove debris and residual surface stains. Examples: calcium carbonate, dehydrated silica gels, hydrated aluminum oxides, magnesium carbonate, phosphate salts and silicates.
    - *Fluorides* to remineralize tooth. All ADA-Accepted dentifrices contain fluoride.
    - *Humectants* to prevent water loss. Examples include glycerol, propylene glycol and sorbitol.
    - *Flavoring agents*, such as saccharin and other sweeteners to provide taste. (No ADA-Accepted dentifrices contain ingredients that would promote caries.)
    - *Thickening agents or binders* to stabilize the formula. They include mineral colloids, natural gums, seaweed colloids or synthetic cellulose.
    - *Detergents* to create foaming action. They include sodium lauryl sulfate, sodium N-laurylsarcosinate.

**ADA Approved Dentifrices (>50)**

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Number of Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Church &amp; Dwight Co., Inc.</td>
<td>2</td>
</tr>
<tr>
<td>2 Colgate-Palmolive Co.</td>
<td>18</td>
</tr>
<tr>
<td>3 Del Laboratories, Inc.</td>
<td>1</td>
</tr>
<tr>
<td>4 Dental Technologies, Inc.</td>
<td>2</td>
</tr>
<tr>
<td>5 GlaxoSmithKline Consumer Healthcare</td>
<td>4</td>
</tr>
<tr>
<td>6 J.M Murray Center, Inc.</td>
<td>3</td>
</tr>
<tr>
<td>7 Keefe Group</td>
<td>1</td>
</tr>
<tr>
<td>8 Optimal Healthcare Products, LLC</td>
<td>1</td>
</tr>
<tr>
<td>9 Plak Smacker</td>
<td>2</td>
</tr>
<tr>
<td>10 Procter &amp; Gamble Co.</td>
<td>11</td>
</tr>
<tr>
<td>11 Sheffield Pharmaceuticals</td>
<td>2</td>
</tr>
<tr>
<td>12 Tom’s of Maine</td>
<td>7</td>
</tr>
</tbody>
</table>

**Studies of 6 months’ duration involving stannous fluoride dentifrices**

<table>
<thead>
<tr>
<th>Study</th>
<th>Active</th>
<th>Control</th>
<th>Plaque % reduction vs. control</th>
<th>Gingivitis % reduction vs. control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beiswanger et al 1995</td>
<td>SnF</td>
<td>NaF</td>
<td>3</td>
<td>19*</td>
</tr>
<tr>
<td>Beiswanger et al 1997</td>
<td>SnF</td>
<td>NaF</td>
<td>-2</td>
<td>18*</td>
</tr>
<tr>
<td>Mankodi et al 1997</td>
<td>SnF</td>
<td>NaF</td>
<td>20*</td>
<td>21*</td>
</tr>
<tr>
<td>Mankodi et al 2002</td>
<td>SnF</td>
<td>MFP</td>
<td>7*</td>
<td>22*</td>
</tr>
<tr>
<td>McClanahan et al 1997</td>
<td>SnF</td>
<td>NaF</td>
<td>3</td>
<td>21*</td>
</tr>
<tr>
<td>Perlitz et al 1995</td>
<td>SnF</td>
<td>NaF</td>
<td>3</td>
<td>21*</td>
</tr>
<tr>
<td>Williams et al 1997</td>
<td>SnF</td>
<td>NaF</td>
<td>23*</td>
<td>22*</td>
</tr>
<tr>
<td>NaF, sodium fluoride; MFP, sodium monofluorophosphate; SnF, stannous fluoride. * Statistically significant Davies, 2008</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Studies of 6 months’ duration involving triclosan/copolymer dentifrices**

<table>
<thead>
<tr>
<th>Study</th>
<th>Active</th>
<th>Control</th>
<th>Plaque % reduction vs. control</th>
<th>Gingivitis % reduction vs. control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen et al 2002</td>
<td>Tric/copoly</td>
<td>NaF</td>
<td>30*</td>
<td>23*</td>
</tr>
<tr>
<td>Bolden et al 1992</td>
<td>Tric/copoly</td>
<td>NaF</td>
<td>17*</td>
<td>29*</td>
</tr>
<tr>
<td>Cubells et al 1991</td>
<td>Tric/copoly</td>
<td>NaF</td>
<td>25*</td>
<td>20*</td>
</tr>
<tr>
<td>Deasy et al 1991</td>
<td>Tric/copoly</td>
<td>MFP</td>
<td>32*</td>
<td>26*</td>
</tr>
<tr>
<td>Denepitiya et al 1992</td>
<td>Tric/copoly</td>
<td>NaF</td>
<td>18*</td>
<td>32*</td>
</tr>
<tr>
<td>Garcia-Godoy et al 1990</td>
<td>Tric/copoly</td>
<td>NaF</td>
<td>59*</td>
<td>30*</td>
</tr>
<tr>
<td>Grossman et al 2002</td>
<td>Tric/copoly</td>
<td>NaF</td>
<td>14*</td>
<td>4</td>
</tr>
<tr>
<td>NaF, sodium fluoride. * Statistically significant Davies, 2008</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NaF, sodium fluoride. MFP, sodium monofluorophosphate; SnF, stannous fluoride. * Statistically significant Davies, 2008
Chemical Plaque Control: Mouthrinses

Take Home Messages: Dentifrices & Mouthrinses

Antimicrobial Mouthrinses

- For most of our patients, biofilm cannot be suppressed by mechanical methods only
- Evidence supports the adjunctive use of mouthrinses in a daily basis
- Main brands available in the US market are all safe products

Meta-Analysis

- Systematic review of literature to evaluate the efficacy of antigingivitis and antiplaque products in six-month trials.
- Seventeen studies support the antiplaque, antigingivitis effects of dentifrices containing 0.30% triclosan and 2.0% gantrez copolymer.
- There is no evidence of efficacy for triclosan with either soluble pyrophosphate or zinc citrate.
Meta-Analysis

- Stannous fluoride is both clinically and statistically significant as an antigingivitis agent.
- Twenty-one studies support essential oils as efficacious mouthrinses.
- Seven studies support a strong antiplaque, antigingivitis effect for 0.12% CHX.

Gunsolley, 2006
JADA December Issue

Scaling and Root Planing: Rationale

- Smooth surfaces are easier to clean and maintain
- Less potential to accumulate plaque and calculus
- To eliminate biologically-incompatible cementum/dentin (cementum-bound endotoxin)
- To make root surfaces biologically compatible for healing and long-term care

Correction of Defective Restorations

- What is new?
  Should we consider changes?
  - Hand instruments
  - Ultrasonic and Sonic instruments
  - Rotating instruments
  - Reciprocating instruments
  - Laser instruments

Instruments and Instrumentation

Curettes

- Have a series of blades
- Can fracture or crush calculus
- Can gouge root surfaces if used incorrectly
- Examples: Hirschfield and Orban

Files
Sites with PD >5 mm have consistently shown remaining calculus after “closed” ScRP.
- Waerhaug, 1978
- Rabbani et al., 1981
- Magnusson et al., 1984
- Sherman et al., 1990

Surgically treated sites have shown improved efficacy of scaling and root planing.
- Eaton et al., 1985
- Caffesse et al., 1986
Other Factors

- Root anatomy
  - Single-rooted vs. multirooted
  - Concavities
  - Tooth furrows
- Skill of the operator (Brayer et al., 1989)
  - Experience becomes more relevant in deep probing depth (>6mm) sites.
- Time allowed (Badersten et al., 1981)
  - Hand instruments: 6-8 min. per tooth
  - Ultrasonic instruments: 4-6 min. per tooth

Calculus Detection

- Instruments:
  - Explorer EXD 11/12
  - Caries explorer 17
  - Gentle air stream
  - Gauze pressure/drying
  - Soft tissue coloration
  - Root should feel:
    - Smooth
    - Hard
    - No calculus left behind

Ultrasonic and Sonic Scalers

- Outcome: uneven root surface
- Supplement with hand instrumentation for smoother surface (Björn & Lindhe, 1962)
- Clinical studies on ScRP with ultrasonic or hand instruments have shown that 4-7 mm pockets responded equally well to either technique
  - Torafson et al., 1979
  - Badersten et al., 1981

Is a smooth surface really needed?

- Junctional epithelium readapts to root surface after ScRP in uneven root surfaces.
  - Waerhaug, 1956
- Ultrasonic instrumentation is considered the best instrument for ScRP in furcation areas.
  - Leon & Vogel, 1987

Ultrasonic vs. Sonic

- Sonic is air driven and vibrations are generated mechanically.
- Vibrations of 2,000-6,500 cycles per second (Hertz)
  - Studies: in vitro (Lie & Leknes, 1985) and clinical (Loos et al., 1987 and Baehni et al., 1992) have shown that sonic scaler was as effective for calculus removal as the ultrasonic instrument.
  - Sonic scaler caused less root surface roughness than ultrasonic.

Ultrasonic

- Ultrasonic vibrations are produced by a metal core which can change dimension in an electromagnetic field with operating frequency between 25,000 and 45,000 cycles per second (Hertz).
- Two types of ultrasonics:
  - Magnetostrictive – elliptic vibration
  - Piezoelectric – linear vibration
- Sonic and piezoelectric generate less heat than magnetostrictive. Water cools frictional heat only and helps flushing away debris.
Ultrasonic

- Reduction of time and fatigue
- All aspects of the tip work
- Uses water for cooling and lavage
- Improved access to areas such as furcations

• TF 10 (Black) for heavy calculus removal
• Slim-line (Green) for finishing and access

Piezo Power Scaling

Reciprocating Instruments

- Profin®
- Eva®
- PER-IO-TOR®
  - Similar planing properties to manual hand instruments with minimal removal of tooth structures (Mengel et al., 1994)
  - 1.2 mm reciprocating motion

Results After the Use of Reciprocating Instruments

Laser Instruments

- Er:YAG (erbium-doped: yttrium, aluminium and garnet laser) has been used for ScRP with early positive results.
- There is lack of evidence that this technology offers true advantage when compared to traditional methods. (Cobb, 2006)
- There is no evidence to support the superiority of the Nd:YAG laser over traditional modalities of periodontal therapy. (Slot et al, 2009)
### Laser Type

<table>
<thead>
<tr>
<th>Laser Type</th>
<th>Abbreviation</th>
<th>Delivery Tip</th>
<th>Reported Periodontal Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>Hollow waveguide; beam focused when 1 to 2 mm from target surface</td>
<td>Soft tissue incision and ablation; subgingival curettage</td>
</tr>
<tr>
<td>Neodymium:yttrium-aluminum-garnet</td>
<td>Nd:YAG</td>
<td>Flexible fiber optic system of varying diameters; surface contact required for most procedures</td>
<td>Soft tissue incision and ablation; subgingival curettage and bacterial elimination</td>
</tr>
<tr>
<td>Holmium:yttrium-aluminum-garnet</td>
<td>Ho:YAG</td>
<td>Flexible fiber optic system; surface contact required for most procedures</td>
<td>Soft tissue incision and ablation; subgingival curettage and bacterial elimination</td>
</tr>
<tr>
<td>Erbium:yttrium-aluminum-garnet</td>
<td>Er:YAG</td>
<td>Flexible fiber optic system or hollow waveguide; surface contact required for most procedures</td>
<td>Soft tissue incision and ablation; subgingival curettage and bacterial elimination</td>
</tr>
<tr>
<td>Erbium, chromium:yttrium-selenium-gallium-garnet</td>
<td>Er,Cr:YSGG</td>
<td>Sapphire crystal inserts of varying diameters; surface contact required for most procedures</td>
<td>Soft tissue incision and ablation; subgingival curettage and bacterial elimination; osteoplasty and osteotomy</td>
</tr>
<tr>
<td>Neodymium:yttrium-aluminum-perovskite</td>
<td>Nd:YAP</td>
<td>Flexible fiber optic system; surface contact required for most procedures</td>
<td>Soft tissue incision and ablation; subgingival curettage and bacterial elimination</td>
</tr>
<tr>
<td>Sodium-gallium-arsenate-phosphide; gallium-aluminum-silicate; gallium-arsenide</td>
<td>InGaAsP (diode) GaAlAs (diode) GaAs (diode)</td>
<td>Flexible fiber optic system; surface contact required for most procedures</td>
<td>Soft tissue incision and ablation; subgingival curettage and bacterial elimination</td>
</tr>
<tr>
<td>Argon</td>
<td>Ar</td>
<td>Flexible fiber optic system</td>
<td>Soft tissue incision and ablation</td>
</tr>
</tbody>
</table>

### Air Polishing

- **Air Polishing**
  - Air-powered slurry of warm water and sodium bicarbonate.
  - Ideal for extrinsic stain removal and soft deposits.
  - Tooth structure can be lost and gingival tissue injury can occur if improperly used.
  - Other powder: aluminum trihydroxide

### Perioscopy

- **Clinical studies:**
  - The use of periodontal endoscope resulted in statistically significant improvement in calculus removal during ScRP, which was most evident in deeper PD sites.
  - The clinical significance of this level of improvement is unknown.
  - Geisinger et al., 2007
  - Periodontal endoscope use in ScRP provided no significant improvement in calculus removal in multirooted molar teeth.
  - Michaud et al., 2007

### Healing after Initial Therapy
Outcome of Therapy

1. Gingival Recession
2. Reduction of PD and slight gain in CAL
3. Reduced BOP
4. Radiographic bone fill

Clinical Outcome of Therapy

Resolution of inflammation
Gingival Recession

Radiographic Outcome of Treatment

Gingival Flap & ScRP
ScRP only

Pre tx.
1 mo.
6 mo.

Results After ScRP
(Non-Molar Sites)

<table>
<thead>
<tr>
<th>Initial Probing Depth</th>
<th>Probing Depth Reduction</th>
<th>Attachment Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 3 mm</td>
<td>0.5 mm</td>
<td>- 0.5 mm</td>
</tr>
<tr>
<td>3-6 mm</td>
<td>1.0 – 1.5 mm</td>
<td>- 0.5/+ 0.5 mm</td>
</tr>
<tr>
<td>7-&gt;10 mm</td>
<td>2.5 – 5.0 mm</td>
<td>+ 0.5/+2.0 mm</td>
</tr>
</tbody>
</table>

Full-Mouth Disinfection (FMD)

- Conventional ScRP (q 2 weeks)
- Full-mouth ScRP (within 24 hours)
- Full-mouth disinfection (Quirynen et al., 1995)
  - ScRP in 24 hours combined with antimicrobials (CHX rinses, subgingival irrigation, tongue debridement)
  - Prevent re-colonization of bacteria coming from other niches in the mouth (e.g., pockets, tongue, etc.)
- Seven randomized clinical trials (at least 3 months duration) showed a modest advantage for FMD (i.e., PD reduction and CAL gain)

Full-Mouth Disinfection (FMD)

- FMD with CHX use only may lead to pyrexia
- Use of systemic antibiotic has been suggested
- FMD with azithromycin 3 days before procedure has shown benefits
  - Gomi et al., 2007
- Clinicians should select the treatment modality based on practical considerations related to patient preference and clinical workload
  - Kinane & Papageorgakopoulos, 2008
Summary & Conclusions on ScRP

- Critical and relevant phase of periodontal therapy.
- Important to understand soft tissue response
- Develop a professional relationship with patient.
- Success of therapy may lead to no surgery.
- ScRP is a time-consuming and technique-sensitive procedure.
- Before delegating this form of treatment, the dentist needs to understand all technical and scientific aspects related to this topic.

Antibiotics/Antimicrobials & Drug Delivery

- Topical
- Systemic (peroral)
- Controlled-release: polymers to control drug concentrations

Systemic Antibiotics

Systemic Antibiotics in Periodontics

- For common forms of gingivitis and periodontitis, ScRP should always be carried out before antibiotics are administered
- Development of resistant bacterial strains is a major concern in medicine

Systemic Antibiotics in Periodontics: Main Indications

- Refractory Cases
- Aggressive Periodontitis
- Medical conditions
- Acute periodontal infections
  - Periodontal abscess
  - NPD: NUG/NUP
- Periodontal Regeneration Surgeries
- Implant Dentistry
- Post-surgical infections

Selection of Antibiotics

- Travels easily to infection site
- Concentration in GCF, gingiva and bone
- Minimal side effects
- Research showing efficacy
Single-Drug Regimens

- **Penicillin**
  - Beta-lactam, first antibiotic used in humans
  - Broad spectrum
  - More than 90% of dose is absorbed
  - Bactericidal (inhibits synthesis of cell wall)
  - Useful in initial therapy, abscess, NUG and after periodontal surgery
  - Low toxicity, allergic reactions
  - Safe drug in general

Tetracycline
- Most commonly prescribed adjunctive agent in periodontal treatment
- Broad spectrum/bacteriostatic
- GCF concentration 5-7x more than serum
- Gastrointestinal disturbance
- Photosensitivity, discoloration of mucosa
- Discoloration of children’s teeth
- No mixture with calcium or metal ions
- Candida super infection

Minocycline
- Semisynthetic tetracycline
  - Use after scaling and root planing in severe periodontal cases such as aggressive and refractory periodontitis

Doxycycline
- High compliance (single daily dose)
- Use after scaling and root planing in severe periodontal cases such as aggressive and refractory periodontitis

Metronidazole
- Nitroimidazole, effective against anaerobic bacteria and parasites
- No effect on facultative and aerobic organisms
- Side effects:
  - Metallic taste, headache
  - Vertigo, peripheral neuritis
  - No alcohol: intestinal disturbance
- Used in NUG/NUP
- Used in combination therapy with other antibiotics

Clindamycin
- Lincosamide, usually bacteriostatic
- Bactericidal in high doses
- Similar to erythromycin in terms of spectrum
- Main feature: “bone penetration”
- Recommended for patients allergic to Penicillin
- Side effects:
  - Diarrhea and gastric upset
  - Pseudomembranous colitis (rare)

Ciprofloxacin
Fluoroquinolone
- Seems to be beneficial on refractory cases
- It may be combined with metronidazole
- Adverse effects:
  - GI upset
  - Oral candidiasis
  - Photosensitivity
**Single-Drug Regimens**

- **Azithromycin**
  - Macrolides Family
  - Bacteriostatic
  - Used for upper and lower respiratory tract infections, including oral infections such as periodontitis, periodontal abscesses and other acute oral infections
  - It has better absorption than erythromycin due to its high resistance to gastric acids
  - It achieves high oral soft- and hard-tissue concentration

**Combination Therapy**

- **Advantages**
  - Broadens antimicrobial range of the therapeutic regimen of a single antibiotic.
  - Prevents emergence of resistant bacteria through overlapping antimicrobial mechanisms.
  - Lowers the dose of individual antibiotics by exploiting possible synergy between two drugs.

- **Disadvantages**
  - May increase adverse reactions
  - Potential for antagonist drug interactions with improperly selected antibiotics

**Antibiotics and Dosage Often Used in the Treatment of Periodontal Diseases**

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Dosage</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin with Clavulanic Acid</td>
<td>500 mg 3 x/day for 8 days</td>
<td>$12.99</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>500 mg 2x/day for 8 days</td>
<td>$117.10</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>150 mg 3 x/day for 8 days</td>
<td>$24.99</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>200 mg the first day, then 100 mg/day for 15 days</td>
<td>$44.99</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>500 mg 3 x/day for 8 days</td>
<td>$12.99</td>
</tr>
<tr>
<td>Metronidazole and Amoxicillin</td>
<td>250 mg 3 x/day (each drug) for 8 days</td>
<td>$19.99</td>
</tr>
<tr>
<td>Metronidazole and Ciprofloxacin</td>
<td>500 mg 3 x/day (each drug) for 8 days</td>
<td>$24.99</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>500 mg 3 x/day for 21 days</td>
<td>$12.99</td>
</tr>
</tbody>
</table>

**Cost of Systemic Antibiotics**

- Amoxicillin 500 mg 30 caps $12.99
- Augmentin 500-125 mg 30 tabs $166.71
- Z-Pak 250 mg Disp Pack $62.24
- Ciprofloxacin 500 mg 30 tabs $117.10
- Clindamycin 150 mg 30 caps $24.99
- Doxycycline 100 mg 30 caps $12.99
- Doxycycline 100 mg 20 tabs $31.99
- Tetracycline 500 mg 30 caps $15.99
- Metronidazole 500 mg 30 tabs $12.99

*source: [www.drugstore.com](http://www.drugstore.com)
Systemic Anti-Infective Periodontal Therapy: A Systematic Review

- Meta-analysis of 22 studies showed consistent benefit in mean CAL change for different populations, for different therapies, and for different antibiotics.
- Systemic antibiotics were uniformly beneficial in providing improvement in CAL, when used as adjuncts to ScRP and were consistently beneficial, although of borderline significance, when used as adjuncts to ScRP plus surgery or as a standalone therapy.

Systemic Anti-Infective Periodontal Therapy: A Systematic Review

- Found statistically significant improvements for CAL for tetracycline, metronidazole, and an effect of borderline statistical significance for the combination of amoxicillin + metronidazole.
- Aggressive periodontitis patients benefited more from antibiotics than chronic periodontitis patients.

Systemic Anti-Infective Periodontal Therapy: A Systematic Review

- Due to lack of sufficient sample size for many of the antibiotics tested, it is difficult to provide guidance as to the more effective ones.

Haffajee et al., 2003

Conclusions on Systemic Antibiotics

- In periodontics, systemic antibiotics should be an exception rather than the rule.
- If indicated, they should be used as adjuncts to mechanical therapy.
- They should not be used in cases of poor plaque control.
- Evidence has shown that they offer little, if any, adjunctive effect on smokers.

Conclusions on Systemic Antibiotics

- They should be considered especially in refractory and aggressive cases of periodontitis.
- They should be used in acute conditions and some medical situations.
- There is a current trend favoring combined antibiotic therapy (e.g., amoxicillin and metronidazole).
- There is still lack of proper guidelines and decision remains empirical.

Topical Antimicrobial Agents for Treatment of Periodontal Disease
Rationale for Using Topical Antimicrobial Agents

- Pathogens may be unreachable
  - Deep vertical defects
  - Furcation
  - Dentin tubules
  - Biofilm
- Systemic antibiotics
  - Adverse reactions
  - Patient compliance

Principles of Topical Antimicrobial Agents

- Local delivery
  - Pocket irrigation
  - Drug ointment/gel
  - Prolonged release

Local Delivery Device

- Ideally, it should:
  - Establish a drug reservoir
  - Have effective concentration
  - Be active for prolonged period of time

Advantages of Controlled-Release Delivery

- Prolonged drug levels within therapeutic range
- Minimization of harmful or systemic side effects
- Protection of drugs with short in vivo half lives
- Improvement of patient compliance

Disadvantages of Controlled-Release Delivery

- Low volume of the periodontal pocket (0.5 μL): Restricts size of the delivery system and total volume of drug-polymer applied.
- High turnover rate of crevicular fluid (40 times/hr): Participates not only in drug diffusion but also clearance.
Lingering Questions

- Are the improvements with adjunctive locally administered antimicrobials consistent?
- Are the clinical improvements with locally administered antimicrobials clinically relevant or meaningful?

Source: Venezia E, Shapira L. Oral Diseases 2003

Source: Killoy WJ. J Clin Periodontol 2002
Main Results of Systematic Review
(Hanes & Purvis, 2003)

- 32 studies with 3,700 subjects
- All studies reported substantial reductions in gingival inflammation and bleeding
- Meta-analysis on 19 studies comparing ScRP alone or combined with antimicrobials showed favoring results for the combined therapy in both PD reduction and CAL gain

American Academy of Periodontology Statement on Local Delivery of Sustained or Controlled Release Antimicrobials as Adjunctive Therapy in the Treatment of Periodontitis

"The clinician’s decision to use locally delivered antimicrobials should be based upon a consideration of clinical findings, the patient’s dental and medical history, scientific evidence, patient preferences, and advantages and disadvantages of alternative therapies."

Greenstein, J Periodontol 2006 Review Article

Summary: Antimicrobials in General

- Data reaffirm the overall effectiveness of ScRP as the standard of care.
- Evidence consistently demonstrates enhanced clinical improvements with adjunctive antimicrobials in patients with chronic periodontitis.
  - Systemic
  - Topical
  - Controlled-release
- Clinicians must assess overall patient risks (e.g., disease severity, distribution, smoking) and treatment goals in selecting cases for adjunctive antimicrobial treatment.

Periodontal Host Modulation

Host Modulators

- NSAIDs
- Bisphosphonates?
- Statins?
- Low-Dose Doxycycline

In the Periodontium Pro-inflammatory Mediators (IL-1β, IL-6, TNFα, PGE2, MMPs) are released.
Pathogenesis of Periodontal Disease

Health

- Natural Enzyme Inhibitors
  - TGFβ, IL-4, IL-10, IL-12, TIMPs
- Tissue Destructive Enzymes
  - IL-1, IL-6, TNFα, PGE, MMP

Balance of Tissue Destruction in the Periodontium

Disease

- Natural Enzyme Inhibitors
- Overproduction of Tissue Destructive Enzymes

Imbalance of Tissue Destruction in the Periodontium

Compliance, Cost and Significance

- 4 times daily: 27%
- 3 times daily: 44%
- 2 times daily: 67%
- Once daily: 89%

Doxycycline Hyclate (20 mg tabs) 60 tabs = $ 63.98
Doxycycline Hyclate (100 mg tabs) 15 tabs = $ 10.49

Source: www.drugstore.com

Periodontal Host Modulation

- There may be a role for the use of host-modulating agents in the treatment of periodontitis in conjunction with conventional therapy.
- There may be a publication bias and a tendency for significant or beneficial findings to be published over non-significant results for novel therapies.

Periodontal Host Modulation

- Based on data available (meta-analysis) regarding Periostat® with definitive ScRP, it was demonstrated that it provided a statistically significant improvement with respect to PD reductions and gains in CAL when compared to ScRP alone.
- The use of Periostat® appears safe and may be an adjunctive aid in the management of chronic periodontitis.

Arresting Periodontal Disease Progression

Environmental and Acquired Risk Factors

Microbial Challenge

Mechanical Therapy

Antimicrobials

Dentifrices

Antibiotics

Periostat (NSAIDs/Statins)

Periostat Biphosphonates

CT and Bone Metabolism

Genetic Risk Factors

Clinical Signs of Disease Initiation and Progression
Final Remarks

- Clinicians need to decide which patients are at greatest risk for future disease progression. We still lack proper diagnostic tools for this matter.
- Currently, there are a number of adjunctive therapy options that clinicians should consider besides mechanical treatment.

THANK YOU!
antonio_moretti@dentistry.unc.edu