Hands on Heaven

UOR 2016
Dr. Rand T. Mattson, DDS
Diane Bosgieter, RDH

Objectives
1. Curved ultrasonics
2. Orientations
3. Strokes
4. Force
5. Adaptation

Bacteria → BIOFILM → Plaque → Calculus

Host response

REMEMBER!
Not all biofilm develops to plaque,
Not all plaque forms calculus,
Not all calculus that forms is clinically detectable

We are here - July 2016
Most of our patients have bacteria through calculus

Make it go away!
Bacteria beneath the gum line AND plaque retentive deposits must be reduced.
The reductions need to be enough to allow the inflammation to go away. Return to periodontal health.
Reductions vary for every individual, and their specific host response.
What & We Want to Happen…
Break up and remove biofilm below the gum line
Remove plaque and calculus to, like calculus
Make the inflammation go away

Here is where we are in April 2015
Most of our patients have bacteria through calculus

Therefore, rather than aiming for an unattainable objective of complete removal of all deposits, an instrumentation method that can predictably remove as much clinically evident and microscopic etiology as possible should be used to insure that an adequate reduction is achieved in all individuals.

Goals of Biofilm Management
• Remove and disrupt biofilm
• Eliminate or minimize plaque retentive factors, i.e. calculus
• Conserve tooth structure
• Create a biologically acceptable root surface
• Resolve inflammation

Bacterial Biofilm
Matrix-enclosed bacterial populations adherent to each other and /or to surfaces or interfaces

Cynthia Fong, CDS Midwinter meeting, 2015

*Becomes plaque when clinically detectable and "Calculus" when it calcifies
If you know your enemy and you know yourself you need not fear the results of a hundred battles. If you know yourself but not the enemy for every victory gained you will also suffer a defeat.

**Art of War, Sun Tzu, 544 BC**

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**Calculus**

"Every spec must be removed"


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**Calculus**

Radiographs are ineffective in determining if calculus is present 56% of the time


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**Calculus**

Leave lots of the stuff

• Grooves and furcations
• Cemento-enamel junction greatest


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**Calculus**

• 3 to 80 % of instrumented surfaces had residual calculus.
• In shallow pockets (4-6mm’s) only 43% of instrumented surfaces were free of calculus after closed SRP.


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**Calculus**

• We can’t tell when we have removed it “Furthermore, we clinicians are not very effective in determining whether we have fully removed calculus or not.”
• And when we check… 77% of surfaces scored as free actually had residual calculus.

George D, Donley T, Preshaw P. Ultrasound Periodontal Debridement Theory and Technique. Kindle 662

Calculus

...remaining calculus to be free of live bacteria.

Compared to manual instrumentation, ultrasonics increase the likelihood that biofilm will be disrupted below the threshold necessary to result in disease resolution.


Calculus lives here

1. CEJ
2. Grooves
3. FURCATIONS
4. AMOUNT

remaining after instrumentation is directly correlated with pocket depth

The Point!

Calculus is important but.....

Calculus is a retentive surface for BIOFILM.

This is why we target the inflammation

Calculus removal

• We are not so hot at it
• “every speck of it must be removed”*
• Remaining calculus
  – Hand and sonic 17% Gellin et al., 1986
  – 19% clinically, 57% microscopic Sherman et al., 1990 647
  - 4-6mm pockets 57% residual, >6mm pockets 68% residual Caffesse et al., 1986

Speed is the essence of war

Art of War, Sun Tzu, 544 BC
**Benefits of Ultrasonics**

- Lavage – rinses and removes the smear layer
- More ergonomic. Less muscle strain, fatigue and pain
  - Less force
- Faster
- No blades
- Removes less tooth structure

**5 common US errors**

1. Worn inserts
2. Not using terminal portion
3. Point to tooth surface
4. Poor adaptation
   a. Parallel to root surface being treated
   b. Tip pointing to interdental space
5. Not enough strokes


**Balancing the Scale(r)s**

- Dominates on stain removal
- Ease, speed, efficiency
- Round tip easier on oral structures
- Reduced bacterial counts

* 4/2/2016/dentalTown.com

**Why use hand scalers?**

- Tactile sensitivity
- Access to severe crowding, interproximals
- Removes more buildup along gum line
- Better visibility

**Myths and facts**

- Nothing tops hand instruments for tactile sensitivity. Fact: Tactile sensitivity INCREASED w/ Ultrasonics and DECREASED w/hand instruments over 45 minute scaling period.
- Experienced clinicians report equal or greater ability to feel attachment levels and root irregularities with slim US tips compared with hand instruments.


**% Use of US vs Hand**

- 25/75 unless pt has heavy plaque or calculus
- 50/50 in healthy pt, 80/20 on perio pts
- 50/50 unless there is xs buildup
Myths and Facts

• You don’t have to change tips which saves time. Only 1 hand scaler?
• Because there is no cutting edge it won’t remove all of the build up like a hand instrument.

Loss of Tooth Structure

<table>
<thead>
<tr>
<th>Manual</th>
<th>Ultrasonics</th>
</tr>
</thead>
<tbody>
<tr>
<td>108.9µm</td>
<td>11.6µm</td>
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NOTE: Just 12 working stokes

Tip selection across brands

• Thicker tips
  – Heavy to moderate deposits
  – Flat or contoured anatomy
• Medium thickness tips
  – Heavy to light calculus, all biofilm
  – All contours, R and L
• Thin tips
  – Moderate calculus through all biofilm
  – Flat surfaces

Basic inserts

PowerLine
  • Heavy calculus
  • Low to high power

THINsert 37%
  • Light to moderate calculus
  • Medium to high power

slimLine 30%
  • Light to moderate calculus
  • Low to medium power

Back Convoy
Looking Lateral

Belly Concave
This is what we are doing….

Tissue response as an end point of therapy should be stressed verses total calculus removal

Inflammation eradication through biofilm elimination

Drisko and Killoy, Current Opin Dent 1991
Mattrison & Boeinger today

Ultrasonic instrumentation

Used properly
= unmatched speed, efficiency and safety

Loss of Tooth Structure

Manual 108.9μm
Ultrasonics 11.6μm


Loss of tooth structure

Curette 27.09 microns
Air Polisher 10.68 microns

NOTE: Just 12 working stokes

Know your forces

• Magnetostrictive between 50 to 200 grams of force. That’s 10 quarters on the low end.
• Manual forces average about 561 grams. (4035, Zappa et al, 1991) (3960)
• Lateral force, tip design and power setting are additive relative to root surface lost.
(Flemming et al, 1998a,b; Jepsen et al., 2004) (3996)

Lateral forces

• Lateral force and tip angulation have the greatest impact on root surface damage.
• It’s additive
• (NOT power) So it is technique
• (Flemming et al., 1998a,b. Kindle 3999)
Keep your tips up!

Great scaling can and has been done for years with “flat” surface or edged scalers by controlling lateral force and tip angulation!

Think skiing the bumps

FORCE!

Ultrasonic scaling force should be between .5 N-2.0 N (50-200 g)

Zappa et al., 1991

Just do it!

• 50-ish g of force
• Constant speed
• 2-3 mm stroke, equally distributed, bidirectional
• Overlapping
• Use lateral surfaces, back
• Use face
• *Digital*, wrist is motionless

Piezoelectric

• More technique sensitive (4013)
• Use no more than 50 g of lateral pressure vs up to 200 g with magnetostrictive technology
• Assumes low power and 0° angulation
• Newer research may indicate that these differences are due to tip design (Jepsen et al., 2004; Lea et al., 2009b, Kindle 4021)
Magnetostrictive Note

- 1000 series are square, that is to say have more of an edge
- Everything else is round in cross section

Sonic vs. Ultrasonic

Significant increases in roughness and loss of tooth structure
Resulting root surface damage is unacceptable for root surface debridement, contraindicated for anything other than coronal calculus removal

Ultrasonic Irrigation

- Use of ultrasonic scalers set on high water eliminated a substantial number of organisms (2.5 log).
- Before treatment > 5 million organisms, after treatment = 20,000 organisms

Loss of Tooth Structure

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Manual and Ultrasonic instrumentation of calculus

Both groups left calculus bacteria free.

SO it becomes a question of root surface damage and speed

Know Anatomy

Breininger et al., 1987 Kindle 1157
CURVED TIPS!

Curved bites

Goals of left and right
• Identify left and right, then look on the stack
• Look at the insert to determine where it is used
• POINT GOES AWAY FROM THE TOOTH
4 Adaptations

1. Vertical
   • = to long axis of tooth
   • Requires a right shaped tip
   • Directs tip to base of pocket
   • Facilitates cavitation and microstreaming removal of biofilm (Walmsley et al (1998, Kindle 5954)
   • Biofilm removal from 6x to 8x
   • Favors any tip surface to any tooth surface
   • Concave and convex root surfaces - allows more of tip in contact

2. Horizontal (AKA Perpendicular)
   • For interproximal spaces
   • Back and face of tip

3. Oblique
   • Lateral surfaces adapted in orientation to long axis of tooth
   • Same orientation as bladed instruments, 3875
   • Not the best orientation  3894

4. Tapping
   • Close contact with the tooth
   • 0° to 15°MAX for ultrasonics
   • Hand instruments use 45° to 90°

Vertical adaptation

• Vertical adaptation i.e. 0°-15° results in an eight fold increase in biofilm removal 3826
• Adaptations greater than 15° results increased root surface loss  Flemming et al. 1997, 1998a,b) 3927

Close contact with the tooth

≈6°

≈28°
4 Stroke Directions

A. Horizontal
B. Vertical
C. Oblique
D. Tapping

Working Stroke

- Clinicians, not the tips, “stroke” - DIGITAL
- Contacts every mm of tooth surface
- Poor stroking and overlapping results in calculus* remaining
- Begins at gingival margin and moves sub gingivally. **Opposite of manual**
- Very light pen grasp “splitting” the grip

Erasing motion DIGITAL
- Bi directional
- Equally distributed
- Short, 2-3mm’s in total length
- Overlapping
- Constant
- BACKWARDS occlusal/incisal to apical direction

Contrast the difference between
top down vs bottom up
- Digital activation vs wrist activation
- Light forces
- Minor cementum removal

The 4 transitions

- Uses all of the surfaces of the curved inserts
- Start with your insertion @ line angle
- #1 Transition to the proximal (NOT interproximal) surface
- Vertical, oblique stroke. Horizontal if possible, do not rotate tip
The 4 Transitions

#1 Line angle to proximal space
• Vertical adaptation maintained
• Mesial=back, Distal=lateral
• Oblique stroke
• DO NOT rotate tip at line angle, wait for contact

Transition 1

Insertion point
Transition to proximal, stay vertical w/ lateral adaptation

Lateral and back surface in vertical position

The 4 Transitions

Transition #2 to interproximal space
• Maintain tooth contact, roll from vertical to horizontal **CLOSE ANGLE**
• Face adapts on distal aspect, back on mesial aspects
• Must be on enamel (Avoids root surface damage)
• Vertical strokes

Transition 2

The 4 Transitions

#3 Move to next tooth while contacting enamel
• Stay in horizontal position
• Move to distal aspect of next tooth
• Stroke vertically
The 4 Transitions

#4 Transition from the interproximal space

- Contact with enamel to root surface
- Roll slightly from a horizontal position to a vertical position, lateral adaptation to distal
- Stroke obliquely to vertical position
Just Do It
The 4 transitions

Posterior Instrumentation
CURVED

Note the 0° orientation of the tip
Go to the proximal surface
What surface is touching the tooth? Should be the lateral surface

Moved from line angle to the proximal (distal) surface
Stay vertical, open to lateral surface

What are we doing?

| Angulation | 0° |
| Orientation | Vertical |
| Stroke | Vertical & Horizontal, 2-3mm’s |
| Speed | Constant |
| Channeling apically | |
| Force | Light, 50 grams |
| Activation | Digital |
| Surface | Lateral to face. Stay lateral |

Just do it!
*Open the angle by moving away from the arch.
*Places lateral surface in contact with distal root surface.
*Water port clearly visible.

What are we doing?

- Angulation: 0°
- Orientation: Vertical
- Stroke: Vertical & Horizontal & finish oblique
- Channeling apically
- Force: Light, 50 grams
- Activation: Digital
- Open angle from B to keep face off of root surface

Just Do It
* Roll from oblique to horizontal
* Distal use face
* Mesial use back
* Stay on enamel
* Watch handle orientation so as not to gouge
* Distal with no tooth, reverse process and transition to line angle

Transition to Buccal surface

- Transition to buccal surface
- Vertical, 0° adaptation
- Lateral surface
- Consistent, 2-3 bi-lateral strokes going apically. Horizontal and vertical
- Light lateral force
Move to the next transition point, the MB line angle.

Instrument Class 1 furcations as you encounter them.

*Stroke to mesial line angle
*Perform 4 transitions
*Always keep tip off root surface
*Light force
*Constant motion, bilateral, 2-3 mm’s
*Vertical to contact, then oblique.
This catches root surface to the P of the contact.

*Now on M surface
*Back is active
*Vertical, 0°
*Horizontal strokes in a apically vertical direction
*Light force
*Constant, bi-directional, 2-3mm’s
Just Do It

Straight tip posterior

Straight

Curved
Easier to draw to facial; there is no hook to gouge.
Oblique sweep when contact is encountered
When moving to distal of anterior tooth be sure not to gouge the mesial of the posterior root surface by staying perpendicular.
Move to DL line angle
Stay vertical and closed
Lateral surface
Transition to proximal surface
Go to contact

Roll to horizontal
Stay closed on enamel
Vertical strokes
Reverse process to mesial line angle

Transition to oblique strokes
Roll to horizontal
Stay closed on enamel
Vertical strokes
Reverse process to mesial of bicuspid

Transition from L surface to proximal surface
• Oblique strokes
• Teeth don’t really move apart like that
• Transition from lingual surface to mesial surface

• Transition to horizontal
• Back is on mesial of canine
• Vertical strokes

• CAUTION! Don’t use the face if at all possible
• Move to distal of lateral
• Horizontal strokes

• Oblique strokes
• Horizontal and vertical
• Short
• Overlapping
• Consistent speed

• Transition to vertical
• Horizontal and vertical strokes
- Transition to proximal surface
- Vertical
- Horizontal strokes, transitioning vertically
- Channeling

Move forward to show transition
Just Do It!

One more note on LA’s

- In theory, cross over at mid line
- In reality if you can get behind the patient you can use the same tip for the entire lingual of the lower arch
Furcations

- I Small involvement into flute, no horizontal attachment loss. Treat as encountered.
- II Attachment lost into furcation but not through. “cul-de-sac”
- III Horizontal loss resulting in pass all the way through
- IV Same as above but clinically visible

Glickman, 1953; Ultrasonic Periodontal Debridement Theory and Technique 3372

Furcation classes
- Max and Man furcation entrances are 81% ≤ 1mm wide, 58% ≤ 0.75 mm wide*
- Typical hand instruments width 0.75-1.10
- Mandibular molars are wider mid furcation than entrance 3401
- Narrow diameter curved ultrasonic tips best for narrow furcations 3411


Conclusions
- Furcation tips more effective than regular tips and hand instruments*
- Ultrasonic furcation tips more effective in calculus removal than regular ultrasonics and hand especially in deeper pockets+

*Badee AS, Maravic L, Smith et al. 1999; Smith et al. 2010; Change et al., 2002

Buccal/lingual furcations
- Left
• Use a left
• Back or lateral surface to entrance
• Debride with short horizontal strokes
• Overlap
• Go to the dome

• Short strokes
• 0 to dome
• DO NOT gouge P root

• Pass out the other furcations if you can.
  Mesial is the best bet
• Explore non active.
  OFF!
• More anguation to pass out

• Lateral surface to the internal surface of the M root
• DO NOT use face. GOUGES!
• Horizontal orientation, vertical strokes

• From dome roll lateral surface to internal of distal root
• Horizontal adaptation
• Stroke up and down (Vertically)
  REMEMBER all digital activation
Face on internal surface of the mesial root will gouge.

Tooth #3, mesial furcation
• Use a right
• Palatal access

• Must have access
• Debride entrance vertically
• Short overlapping horizontal or vertical strokes
• Transition to horizontal adaptation

• 0° adaptation to dome
• Horizontal
• Short in and out strokes
• Transition to back of tip to palatal root

• Back of tip on palatal root
• Vertical or oblique strokes
• You must have access
• Go back to dome (back, 0°, horizontal adaptation)

• Adapt lateral surface to mesial root
• Stroke vertically
• AVOID FACE
Distal furcation #3

- Left curved
- Buccal access

- Vertical adaptation
- Debride entrance with short, overlapping horizontal strokes
- Roll to horizontal adaptation
- Transition to horizontal adaptation 0° to dome

- Lateral surface to dome, 0°
- Short, overlapping horizontal strokes
- In and out strokes
- Debride dome

“It’s not fun to do smart things”
Nor is it......

» Easy
» Inexpensive
» Quick
Etcetera, yada, yada

Mac Attack
The average bill for treatment for a heart attack without major complications at a hospital in Danville, Ark., was $3,334. Across the country in Modesto, Calif., the same diagnosis incurred an average bill of $92,057.

CNN Money. Heart attack bill: $3,300 in Arkansas, $92,000 in California. Chris Isidore.
http://money.cnn.com/2013/05/08/news/economy/hospital-bills/
Date accessed: Nov. 26, 2014

There are far, far better things ahead than any we leave behind

-CS Lewis
Thank You