

**"A SIMPLIFIED INSTRUMENTATION APPROACH TO
ULTRASONIC DEBRIDEMENT"**
Hands On Workshop

Cynthia Fong, RDH, MS

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PRE AND POST TEST

1. Refer to the patient case on the screen. Of the six ultrasonic inserts provided to you, what total number of inserts should be used to provide complete periodontal debridement for this patient?
 - a. 1 to 2
 - b. 3 to 4
 - c. 5 to 6
 - d. more than 6

2. Observe the placement of a curved insert on the screen. Which photograph demonstrates the correct adaptation of the insert for subgingival debridement of the furcation, utilizing a modified instrumentation technique?
 - a. left photograph
 - b. right photograph

3. What is the clinical end point of treatment for periodontal debridement?
 - a. mechanical
 - b. microbial
 - c. surface smoothness
 - d. tissue response

4. Which of the following variables influences the working tip area that is active on an ultrasonic insert?
 - a. water output
 - b. frequency
 - c. power setting
 - d. insert design

5. The power knob on the unit controls which of the following?
 - a. length of stroke
 - b. frequency
 - c. tuning
 - d. water output

6. Different power settings should be used with different inserts. Theoretically, the basic principle is the thinner the insert, the lower the power setting.
 - a. both statements are TRUE
 - b. both statement are FALSE
 - c. the first statement is TRUE, the second is FALSE
 - e. the first statement is FALSE, the second is TRUE

7. Which of the following factors should be used to determine the need to replace an ultrasonic insert?
 - a. number of days since the insert was purchased
 - b. amount of wear sustained by the insert
 - c. time interval based on the manufacturers recommendation
 - d. inconsistent water spray patterns

8. Which of the following factors would BEST dictate the ultrasonic insert selected for debridement?
 - a. patient threshold to pain
 - b. quantity of deposit (gross versus fine)
 - c. location of deposit (supragingival versus subgingival)
 - d. clinician's preference

9. What is the rationale for using a RIGHT and LEFT slim type insert?
 - a. periodontitis patients
 - b. furcation involvement
 - c. access depths greater than 4 millimeters
 - d. all of the above

10. When treating a patient during a re-care appointment, which of the following inserts should be used for subgingival deplaquing?
 - a. right angled shank, standard diameter
 - b. contra angled shank, slim diameter
 - c. straight shank, standard diameter
 - d. left angled shank, broad diameter
 - e. both a and c

11. Each of the following instrumentation criterion should be applied during ultrasonic debridement EXCEPT one. Which one is the EXCEPTION?
 - a. use a light exploratory grasp
 - b. adapt the active tip area of the insert
 - c. position the concave surface of the insert against tooth
 - d. avoid placement of the point of the insert on the tooth

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COURSE DESCRIPTION:

This hands on workshop will go beyond the fundamentals of ultrasonics to focus on the instrumentation criteria used for gross ultrasonic debridement, definitive debridement, de-plaquing and instrument sequencing. Patient cases will be utilized to simplify proper clinical technique and to assist in selecting the appropriate technology and insert design to meet the individual needs of the patient. At the completion of this workshop, the participant will gain the confidence and skills necessary to immediately incorporate the use of power scalers into your practice.

COURSE NOTES:

1. Periodontal debridement:

Treatment of gingival and periodontal inflammation through mechanical removal of tooth and root surface irritants to the extent that the adjacent soft tissues maintain or return to a healthy non-inflamed state.

Young NS et al. Comprehensive Dental Hygiene Care. 4th Edition. St. Louis; Mosby 1993; 533-570.

2. End point of periodontal therapy:

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

Drisko and Killoy, Current Opin Dent 1991.

3. Ultrasonic effects:

acoustic turbulence
intensified

tip stroke causes coolant to accelerate producing an

acoustic streaming
cavitation

swirling effect

uni-directional fluid flow caused by ultrasound waves
the formation of bubbles in liquid by rapid pressure changes; when bubbles implode they produce shock waves in the liquid

Acoustic turbulence, acoustic streaming and cavitation have been shown to be effective in removing lipopolysaccharides from root surfaces. The ultrasonic waves have a lethal effect on the gram-negative pathogens.

4. Basic ultrasonic terminology:

frequency the number of times per second the insert tip moves back and forth during one cycle

active tip area effected by frequency
higher frequency = smaller active tip area

stroke the maximum distance the insert tip moves during one cycle

tuning automatic power adjusted by clinician
frequency is automatically tuned to peak performance as the tip is loaded against the tooth/root surface
manual power and frequency are adjusted by the clinician through sight and sound

clinical power the ability to remove deposits under load
factors which determine clinical power: stroke, frequency, type of motion and angulation of the motion against the tooth surface

5. Types of power scalers:

Sonic

- uses compressed air to move rotor system to produce vibrations
- water is delivered through hose designed for high and low speed handpiece
- 3,000 to 8,000 cycles per second
- elliptical movement at the tip

Ultrasonic

piezoelectric

- electrical energy is applied to crystals in the handpiece that emits vibration
- 24,000 – 45,000 cycles per second
- linear movement of the tip

magnetostrictive

- electrical energy is applied to coil in handpiece and magnetically changes dimension of metal stack to produce vibrations
- 18,000 – 42,000 cycles per second
- elliptical movement of the tip

6. Clinical preparation procedures:

Patient

- a. Comfort tips
 - use low power setting
 - use light pressure
 - position insert parallel to the long axis
 - do not use the point of the insert
 - keep the tip active
 - assess the water control
- b. Review medical and dental histories
 - Medical patient considerations
 - predisposition to infection
 - infectious disease transmitted by aerosols
 - respiratory diseases
 - pacemaker
 - children
 - Dental patient considerations
 - areas of demineralization
 - margins of restorations
 - extreme sensitivity
- c. Use of protective apparel
- d. Patient positioning
- e. Use of anesthetics
- f. Administer pre-procedural rinse
- g. Explanation of the procedure

Unit

- a. Position of the unit
- b. Minimize water contamination
- c. Insert insertion
- d. Handpiece line positioning
- e. Control settings (power, tuning and water adjustments)
 - the patient's oral condition, comfort level, safety, proposed treatment plan and type of insert to be used should ultimately determine the proper control settings
 - in general, use a low power setting for removal of light calculus, stain or for de-plaquing and use a medium to high setting for removal of gross calculus and stain

Operator

- a. Use of protective apparel
 - gloves
 - mask
 - eyewear

7. Care and maintenance of ultrasonic inserts:

Sterilization

- do not use cold sterilization or disinfectant solutions
- use an ultrasonic bath with a non-ionic solution
- rinse, dry, bag and sterilize
- do not use an all-plastic bag, use an all paper bag or a combination paper and plastic

Maintenance

- Piezoelectric insert replacement
 - contingent on the amount of wear sustained by the insert; the use of an efficiency (wear) indicator is recommended
- Magnetostrictive insert replacement and maintenance
 - replacement is contingent on factors such as wear, condition of stacks and length of time insert has been in use
 - most manufacturers recommend replacement on a yearly basis
 - O-Ring replacement
 - indicated when insert is difficult to seat
 - insert extrudes from the handpiece upon activation
 - leakage occurs
 - replace o-ring with the specific manufacturer's o-ring part
 - External water tube realignment
 - never manipulate the external water tube itself
 - counter rotate the metal grip and the metal stack until the tube is properly positioned

8. Ultrasonic insert designs:

Critically evaluate

- Lavage (water delivery)
- Access (size)
- Adaptation (shape)

9. Insert selection is based on the quantity of the deposit to be removed:

- To remove moderate to heavy deposits generally inserts possess an external or internal water delivery system, is large in diameter, universal in design is recommended.
- To remove slight to moderate deposits or for de-plaquing inserts possessing an external or internal water delivery system and are slim/thin in diameter with either a straight shank or contra-angled shank is recommended.

10. Instrument sequence:

- Step 1: Universal ultrasonic insert for gross debridement
- Step 2: Thin diameter straight and contra angled ultrasonic inserts for definitive scaling
- Step 3: Hand instrumentation for definitive scaling
- Step 4: Polishing

11. Clinical ultrasonic technique:

- Grasp
- Fulcrum/finger rest
- Instrumentation techniques

Theoretically, if the stroke pattern of the insert is elliptical, then the back, face and lateral borders may be adapted to the tooth/root surfaces since all surfaces are active (360 degrees). If the stroke pattern of the insert is linear, then only the lateral borders may be adapted. To avoid damage to the root or tooth, never adapt the point or tip of the ultrasonic insert toward the tooth/root surface.

- Magnetostrictive Technology

Either a traditional instrumentation technique (which follow the principles of periodontal hand instrumentation) OR a modified instrumentation technique can be used.

The following visual cue may assist you in determining if the correct curved slim diameter insert (right or left) is being properly adapted utilizing a modified subgingival technique:

- place the point or tip of the insert on the occlusal or incisal edge of a tooth
- observe the convex back curve of the insert
- use the insert on the tooth surface opposite the direction of the convex curve with the point away from the tooth

- Piezoelectric Technology

Only a traditional instrumentation technique can be used that follow the principles of periodontal hand instrumentation.

12. Calculus removal versus plaque removal strokes:

- a. calculus removal
 - adapt the appropriate insert on the tooth
 - utilize the anterior one third of the insert's working end
 - engage the most coronal portion of the deposit with the insert tip
 - use light intermittent strokes against the deposit
 - continue the stroke in lateral and apical directions until the deposit is completely removed
- b. inadvertent and definitive deplaquing
 - adapt the appropriate insert on the tooth
 - utilize the anterior one third of the insert's working end
 - begin instrumenting in a systematic order in short, controlled, overlapping, eraser-like strokes to ensure that every square millimeter of the tooth/root surfaces are treated

13. Treatment evaluation:

- During treatment
 - concentrate on the process of instrumentation
 - use tactile and visual cues
- Post treatment
 - soft tissue response
 - levels of periodontal pathogenic organisms

ULTRASONIC BIBLIOGRAPHY:

Please email a request to cfong4954@aol.com

T:R/R/R/L/L-S/L-S/R-S/R
M:L/L/L/R/R/R/L/L

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ULTRASONIC INSTRUMENTATION SELF-DIRECTED CLINICAL EXERCISES

INSERT IDENTIFICATION

1. Identify the following inserts according to design:
 - universal with internal water delivery exiting at base
 - universal with internal water delivery exiting at anterior third
 - straight shank, slim diameter with internal water delivery
 - contra-angled, slim diameter with internal water delivery
2. First, identify the following parts of a magnetostrictive ultrasonic insert:
 - working tip (face, back, lateral borders, point or tip, shank)
 - grip
 - stacks (note date of manufacturing)

Next, relate the parts of an ultrasonic insert to the parts of a hand instrument (working end, shank and handle). What similarities or differences can you identify?

3. For each insert, identify and compare the site in which water exits the ultrasonic insert. How does each site influence the control and pattern of the water spray?
4. Compare the differences in diameter between the various types of ultrasonic inserts.
5. Look for variations in the angulation of the ultrasonic insert's shank and relate it to the angulation associated with hand instruments.

INSERT INSERTION

6. Simulate bleeding of the handpiece line to reduce any potential contaminants in the tubing.
7. Simulate filling the handpiece with water.
8. Insert and firmly seat the insert.

GRASP

9. Use a modified pen or pen grasp with LIGHT pressure to increase optimal efficiency.
10. Drape the handpiece tubing on your forearm or secure it with your pinky finger.

CONTROL SETTINGS

11. Adjust the water knob to ensure that sufficient water accesses the tip of the insert.
12. Adjust the power knob to a setting appropriate for the treatment planned. In general, the insert selected and the amount of deposit requiring removal dictates the power setting. Use a low setting for removal of light calculus, stain or for deplaquing and a medium to high setting for removal of gross calculus and stain.

INSTRUMENTATION TECHNIQUES

Notes:

- Theoretically, if the stroke pattern of the insert is elliptical (magnetostrictive technology), then the back, face and lateral borders may be adapted to the tooth/root surfaces since all surfaces are active (360 degrees).
- If the stroke pattern of the insert is linear (piezoelectric technology), then only the lateral borders may be adapted.
- To avoid damage to the root or tooth, never adapt the point or tip of the ultrasonic insert toward the tooth/root surface.

13. For the following traditional and modified instrumentation adaptation exercises, you will be required to determine which of three inserts (right, left and/or straight) is the correct insert(s) that permits the proper adaptation and access to the surface specified in the tables provided.

Using the adaptation criteria provided, adapt the "Right", "Left" and "Straight" inserts to each tooth and surface. Write in either "Right", "Left" and/or "Straight" in the column marked "Insert(s)" to signify your answer to which of the insert(s) can be properly adapted for the individual tooth and technique.

Traditional Adaptation

This adaptation can be used with both magnetostrictive and piezoelectric technologies; is similar to the criteria used with hand periodontal instruments (i.e. gracey curets); and can access both subgingival and supragingival surfaces:

- position the terminal shank of the insert parallel to the long axis of the surface that is to be instrumented
- the point of the insert should be the leading portion of the insert during instrumentation
- adapt only the active tip area of the insert against the tooth surface
- use multi-directional short, intermittent, overlapping strokes

TOOTH #/NAME	SURFACE	INSERT(S)
3 – Max Right 1 st Molar	Buccal	
14 – Max Left 1 st Molar	Distal (Lingual)	
18 – Mand Left 2 nd Molar	Mesial (Buccal)	
30 – Mand Right 1 st Molar	Buccal	
23 – Mand Left Lateral	Lingual	
12 – Max Left Bicuspid	Distal (Buccal)	
27 – Mand Right Cuspid	Facial	
29 – Mand Right Bicuspid	Mesial (Lingual)	

Modified Adaptation

This adaptation is used only with magnetostrictive technology since the back of the insert is adapted to the tooth surface. When using a curved slim diameter insert (right or left) for this technique, the following visual cues may assist you in confirming the correct curved insert (right or left) is properly adapted:

- place the point or tip of the insert on the occlusal or incisal edge of a tooth
- observe the convex back curve of the insert
- use the insert on the tooth surface opposite the direction of the convex curve with the point away from the tooth

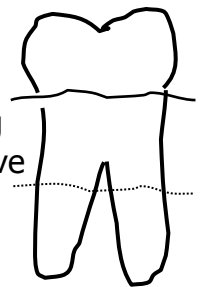
When employing this technique, also keep in mind that:

- both subgingival and supragingival surfaces can be accessed
- only the active tip area of the insert should be adapted against the tooth surface
- use multi-directional short, intermittent, overlapping strokes

Adapt the "Right" and "Left" inserts to each tooth, surface and depth. Write in either "Right" or "Left" in the column marked "Insert(s)" to signify your answer to which of the inserts can be properly adapted utilizing a modified instrumentation technique.

TOOTH#/NAME	SURFACE	DEPTH	INSERT
3 – Max Right 1 st Molar	Buccal	5 mm	
14 – Max Left 1 st Molar	Distal (Lingual)	8 mm	
18 – Mand Left 2 nd Molar	Mesial (Buccal)	6 mm	
30 – Mand Right 1 st Molar	Buccal	7 mm	
23 – Mand Left Lateral	Lingual	6 mm	
12 – Max Left Bicuspid	Distal (Buccal)	8 mm	
27 – Mand Right Cuspid	Facial	7 mm	
29 – Mand Right Bicuspid	Mesial (Lingual)	5 mm	

14. When deplaquing with an ultrasonic insert, short controlled, overlapping, eraser like strokes must be used to ensure that every square millimeter of the tooth/root surface is treated. This exercise will assist you in developing a visual appreciation of the number of strokes and time it requires to achieve complete deplaquing.



On the tooth schematic provided, use a pen or pencil to "color-in" the entire root surface from the gingival margin to the epithelial attachment and extending to the proximal surfaces so that no paper color can be seen on the root surface.