“STRAIGHTFORWARD ULTRASONIC DEBRIDEMENT”

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COURSE DESCRIPTION:

This course provides the fundamentals of ultrasonics that will enable clinicians to immediately incorporate ultrasonics in clinical practice for the purposes of complete periodontal debridement. It will begin with a discussion of the changes that have occurred in the treatment of periodontal disease and its impact on the use of power scalers. Emphasis will be placed on differentiating between technologies and providing clinical recommendations. In depth detailed instructions will be presented on instrumentation techniques and sequencing when using a variety of inserts.

COURSE NOTES:

1. Current Standard of Care

   a. 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.

   b. Clinical 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.

   c. Bacterial biofilm:
   Matrix-enclosed bacterial populations adherent to each other and/or to surfaces or interfaces.

   d. Critical mass theory:
   Reduce the quantity (mass) of pathogenic microflora below the level (critical) where the host can defend itself.
   1989 World Workshop on Clinical Periodontics.

e. Smear layer:
- consists of dental calculus, contaminated root cementum and subgingival plaque
- potentially inhibits reattachment or slow reattachment of cells to root surfaces
- hand instruments routinely leave a smear layer while thin diameter ultrasonic inserts do not leave a smear layer

2. Recording Clinical Attachment Levels (CAL):

- Gingival Recession
  - Record: Sulcular depth (Epithelial Attachment to Gingival Margin)
  - Record: Recession (Gingival Margin to Cementoenamel Junction)
  - CAL: ADD sulcular depth measurement plus recession measurement

- Gingival Margin Coronal to Cementoenamel Junction (CEJ)
  - Record: Sulcular depth (Epithelial Attachment to Gingival Margin)
  - Record: CEJ to gingival margin
  - CAL: SUBTRACT CEJ to gingival margin measurement from sulcular depth measurement

- Gingival Margin at Cementoenamel Junction
  - Record: Sulcular depth (Epithelial Attachment to Gingival Margin)
  - Record: Epithelial attachment to CEJ
  - CAL: Both measurements are equal

3. Ultrasonic effects:

acoustic turbulence	tip stroke causes coolant to accelerate producing an intensified swirling effect
acoustic streaming	uni-directional fluid flow caused by ultrasound waves
cavitation	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. Periodontal Disease Classification System of the American Academy of Periodontology 1999 (Abbreviated Version) See Appendix A.

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. Characteristics of power scalers:

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

7. 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

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. 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

11. 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: De-plaquing
    - Step 5: Polishing

12. 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.

      - <u>Magnetostrictive Technology</u>

      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.

13. 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

14. 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

APPENDIX A

Periodontal Disease Classification System of the American Academy of Periodontology 1999 (Abbreviated Version)

CLASS	DISEASE
I.	Gingival Diseases
	A. Dental plaque-induced gingival disease
	B. Non-plaque-induced gingival lesions
II.	Chronic Periodontitis (slight: 1-2 mm CAL; moderate: 3-4 CAL; severe: >5mm CAL)
	A. Localized
	B. Generalized (>30% of sites are involved)
III.	Aggressive Periodontitis (slight: 1-2 mm CAL; moderate: 3-4 CAL; severe: >5mm CAL)
	A. Localized
	B. Generalized (>30% of sites are involved)
IV.	Periodontitis as a Manifestation of Systemic Diseases
	A. Associated with hematological disorders
	B. Associated with genetic disorders
	C. Not otherwise specified
V.	Necrotizing Periodontal Diseases
	A. Necrotizing ulcerative gingivitis
	B. Necrotizing ulcerative periodontitis
VI.	Abscesses of the Periodontium
	A. Gingival abscess
	B. Periodontal abscess
	C. Pericoronal abscess
VII.	Periodontitis Associated with Endodontic Lesions
	A. Combined periodontic-endodontic lesions
VIII.	Developmental of Acquired Deformites and Conditions
	A. Localized tooth-related factors that modify or predispose to plaque-induced gingival disease/periodontitis
	B. Mucogingival deformities and conditions around teeth
	C. Mucogingival deformities and conditions on edentulous ridges
	D. Occlusal trauma