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Presents:
Power Scaling-It's a Matter of Choice

Academy of General Dentistry PACE Program Approval for Continuing Education

Hu-Friedy

Disclosure

The author of this course, Erika A. Eatherton, is the Product Manager for Magnetostrictive Power Scaling at Hu-Friedy Mfg Co., Inc.

Resources:

Bonnie Francis, R.D.H., M.S.
Department of Dental Ecology
University of North Carolina School of Dentistry

Nancy S. Geistfeld, R.D.H., M.S.
Assistant Professor
Dental Hygiene
Minnesota State University- Mankato

Patricia Parker, R.D.H., B.A.
Business Unit Manager, Ultrasonics
Hu-Friedy Mfg. Co., Inc.
Chicago, Illinois

Module Description:

This module will focus on the clinical rationale of power scaling in non-surgical perio therapy, as well as discuss the design, application, and usage techniques of both Magnetostrictive inserts and Piezo tips.

Module Objectives:

Upon the completion of this ultrasonic instrumentation module, each participant can expect to:

- Provide an overview of the current status of ultrasonic power scaling options.
- Understand the role of ultrasonics in non-surgical perio therapy.
- Discuss the therapeutic objectives related to ultrasonic instrumentation.
- Define, compare and contrast Piezoelectric and Magnetostrictive technologies, their applications, and their designs.
- Identify and select an armamentarium for specific patient needs.

What is power scaling?

- The goal of any power scaler is to convert electrical energy to mechanical power to assist in the removal of debris.
- There are three power scaling technologies currently present:
  - Sonic
  - Ultrasonic- Piezo
  - Ultrasonic- Magnetostrictive

What is power scaling?
The following slides will aid you in:
- Comparing and contrasting popular technologies.
- Comprehending different equipment options.
- Understanding:
  - The use of transducers to generate energy.
  - The relevance of frequency, amplitude, and their association to tip movement.
  - Choices in tip adaptation based on power dispersion.

Sonic Scalers:
- Sonic units operate in the audible range.
- The tips move at 2,500 to 7,000 cycles per second (or Hz).
- The sonic tip attaches to a conventional handpiece and is driven by compressed air from the dental unit.
- The attached tip vibrates in an orbital or elliptical pattern.
- All surfaces of the tip are active and can be adapted to the tooth structure.

Magnetostrictive Scalers:
- The most commonly used ultrasonic scaler in North American dental offices today.
- Magnetostrictive units function above the audible range between 20,000 to 42,000 cycles per second (or Hz).
- When subjected to a magnetic field in the handpiece, a ferromagnetic transducer (usually a nickel stack located on the ultrasonic insert) generates energy resulting in an elliptical movement of the tip.
- Heat is generated in the stack when the conversion of energy from electrical to mechanical occurs therefore, a cooling mechanism is needed.
- All surfaces of the tip are active with surface variance in the degree of energy dispersed.

Piezoelectric Scalers:
- Piezoelectric units employ acoustical vibrations above the audible range.
- The tips move at 29,000 to 50,000 cycles per second (or Hz) in a linear movement.
- A ceramic transducer is present to generate energy to the tip.
- No magnetic field is present and little heat is generated to the tip.
- Lateral surfaces are most active, and are best adapted to tooth structure.

Equipment Options
- Manually tuned units allow the clinician to adjust the tip vibration by varying both power and frequency. Water flow is also adjustable.
- Auto tune units pre-set the frequency, resulting in the maximum level of vibration at a given power setting. Only the power levels and water are adjustable.
- Magnetostrictive units are available with either manual or auto tune frequency.
- Piezoelectric and Sonic units are only available with auto tune frequency.

Frequency Control
- In manually tuned units the frequency control can be used to operate an insert above or below resonant frequency (similar to fine tuning radio frequency). Thus altering the number of times the tip cycles per second and reducing the amount of energy generated to the tip.
- Allows fine-tune tip vibration for a broad range.

Amplitude (Power) Control
- Affects amplitude of vibrations, determining the length of the stroke.
- Higher power delivers a broader, more powerful stroke.
- Lower power delivers a shorter, less powerful stroke.

Clinical Application of Power Scaling :
- Instrumentation focuses on the mechanical removal of detectable deposits to create a biologically acceptable root surface.
- Many clinicians use ultrasonic instrumentation for orthodontic cement removal.
- Ultrasonics are most widely used in contemporary periodontics.

Clinical Application of Power Scaling in non-surgical periodontal therapy:

- Ultrasonics are an important element in today's supportive periodontal therapy (SPT)*.
- The efficacy of debris removal and the healing benefits of lavage support the use of ultrasonic therapy for periodontal debridement.
- Treatment of gingival conditions such as acute gingivitis, pericoronitis, and necrotizing ulcerative gingivitis and periodontitis.
- Surgical applications of ultrasonics for efficient removal of residual deposits and granulation tissue.

*The best results are probably obtained by combining sonic/ ultrasonic instruments with manual scaling. (Charles M. Cobb D.D.S., M.S., Ph.D.. Annals of Periodontology. Vol. 1 Nov. 1996)

Clinical Application of Power Scaling in periodontal therapy:

- The endpoint of treatment can be evaluated as follows:
  - Tactile sense of the tooth surface.
  - Visual assessment of the tooth surface within the field of view.
  - Confirm visually that no additional debris is being flushed from the pocket.
- Assessment of soft tissue response to therapy is vital to the assessment of the success of therapy.

Advantages of Ultrasonic Instrumentation

- Proper use may reduce clinician fatigue.
- Proper ultrasonic tips/ inserts reduce repetitive stress injuries.
- Newer slender tip designs increase access with less tissue distension.
- Tapered design can increase tactile sense of the pocket topography.
- Potential for antimicrobial delivery into the pocket area.
- Benefits of lavage have shown to increase the tissue's rate of healing.
- Additional benefits:
  - Washed field for better visibility
  - Less soft tissue trauma
  - May require less time

Advantages of Ultrasonic Instrumentation

- Handpiece sterilization- Not all handpieces can be sterilized. In which case, only surface disinfectants can be used.
- Altered tactile sensitivity- Some clinicians may subjectively claim greater tactile sensitivity with a hand instrument.
- Fluid control/ evacuation is needed to maintain a clear field of vision.
- Effects of noise, vibration- Long term effects have not yet been determined.

Possible Contraindications

- Certain older style cardiac pacemakers- contact patient's cardiologist prior to treatment.
- Communicable diseases- associated with the production of aerosols.
- Medically compromised patients- increased risk of infection.
- Patients at respiratory risk- aerosols may introduce transmission of organisms.
- Patients with dysphagia (prone to gagging) may be unable to tolerate the fluid delivery.

Clinical Benefits of Water Flow

- Lavage is associated with improved healing time.
- Possible bactericidal effect because of cavitational phenomenon and oxygenation of the soft tissue environment.
- Washed field for enhanced visibility.
- Keeps the tip cool for patient safety and comfort, and easy subgingival insertion.

Instrumentation Fundamentals

- Select insert design appropriate for clinical situation.
- Adapt tip parallel to tooth surface maintaining near zero degree angulation.
- Use light lateral pressure for optimum efficacy and patient comfort.
- Keeping the tip moving at all times avoids iatrogenic damage and increases patient comfort.
- Be patient, let the tip do the work.

Grasp

- Holding the insert in a light grasp; similar to the grasp used with a periodontal probe will:
  - Increase tactile sense of deposits and pocket topography and allow the tip to work properly
  - Reduce clinician fatigue
  - Increase patient comfort
  - Reduce effects of repetitive stress injury (RSI).
  - And increase rotation control

Cord Management

- Draping the cord around the back of the neck, wrapping around forearm, or running between the fingers of the dominant hand will:
  - Reduce tension and torque from the handpiece cord.
  - And support a light grasp for greater instrument balance.

Fulcrum

- Soft tissue, extra-oral or cross arch rests allow the clinician to:
  - Focus on balance rather than strength.
  - Achieve smooth, continuous motion.
  - Maintain light lateral pressure.
  - And enable biocentric hand positioning keeping wrist in neutral position.

Tip Action and Insertion

- Activating the tip prior to placement on tooth alerts patient and eases subgingival tip insertion.
- Keeping the tip moving at all times reduces frictional heat.

Tip Adaptation

- Keep the shank of the insert parallel to the tooth surface.
- Maintain tip angulation near zero degrees.
- Never adapt tip at 90-degree angle- may cause damage to tooth surface
- Use little or no lateral pressure, minimized tip angulation, and the lowest effective power.

Stroke

- Let the tip do the work for you.
- Use short overlapping strokes in a brush-like or erasing manner, covering every millimeter of tooth surface.
- Maintain a light touch to effectively remove deposits.
- Approach calculus from the edge to aid in deposit removal.
- Stop periodically and evaluate with an explorer.

Basic Instrument selection

Optimizing your level of clinical care includes selecting tip designs
based on the following clinical factors:

- State of tissue health or disease
- Tooth and root anatomy
- Types and locations of deposits
- Tooth alignment
- Root and furcation exposure
- Pocket depth

Magnetostrictive Power Scaling

- Tip Designs
- Clinical Applications
- Technique

#10 Standard Universal

- Standard diameter
- Straight shank

Intended Use

- Standard diameter design efficiently removes moderate to heavy deposits.
- Straight shank can be used on all accessible tooth surfaces.
- These designs are most effective on:
    - Buccal and lingual surfaces of all teeth.
    - Interproximal surfaces of anterior teeth.

#100 Thin Universal

- Thin diameter
- Straight shank

Intended Use

- Thin diameter designs are approximately 40% slimmer than standard tips, enhancing access in periodontal pockets.
- The straight shank of the #100 thin is ideal for light to moderate supragingival deposits in shallow pockets.
- Thin tips should be used only on low to medium power settings.
- Straight shank can be used on all accessible tooth surfaces.
- Most effective on:
    - Buccal and lingual surfaces of all teeth.
    - Interproximal surfaces of anterior teeth.

Thin Right and Left Designs

- Thin diameter
- Contra-bend shank

Intended Use

- Thin diameter designs are approximately 40% slimmer than standard tips, enhancing access in periodontal pockets.
- For light to moderate supragingival deposits in shallow pockets.
- Should be used only on low to medium power settings.
- Most effective on interproximal surfaces of posterior teeth.
- Also effective in furcations, tight contacts, malpositioned molars and concave surfaces.

Tip Identification

- Identify tips by rotating the insert so the tip is pointing away from you then looks at the direction on the first bend or angle.
- First bend right, indicates the right insert.
- First bend left, indicates the left insert.
- Right or left refers only to the bend in the design, not to a location for use in the mouth.

#1000 Triple Bend

- Beveled working end
- Unique bends in shank

Intended Use

- Beveled edge design efficiently removes heavy to gross deposits.
- Uniquely bent shank can be used on all accessible supragingival tooth surfaces.
- These designs are most effective on:
    - Buccal and lingual surfaces of all teeth.
    - Interproximal surfaces of anterior teeth.

Piezoelectric Power Scaling

- Tip Designs
- Clinical Applications
- Technique

#P Standard Universal

- Standard diameter
- Straight shank
- Profile – flat

Intended Use

- Standard diameter design efficiently removes moderate to heavy deposits.
- Straight shank can be used on all accessible tooth surfaces
- These designs are most effective on:
  - Buccal and lingual surfaces of all teeth.
  - Interproximal surfaces of anterior teeth.

#P10 Standard Universal

- Standard diameter
- Contra-bend shank
- Profile – round

Intended Use

- Standard diameter design efficiently removes heavy to gross deposits.
- Unique contra-bend shank can be used on all accessible supragingival tooth surfaces.
- These designs are most effective on:
  - Buccal and lingual surfaces of all teeth.
  - Interproximal surfaces of anterior teeth.

#10 Standard Universal

- Standard diameter
- Straight shank
- Profile – flat

Intended Use

- Standard diameter design efficiently removes moderate to heavy deposits.
- Straight shank can be used on all accessible tooth surfaces
- These designs are most effective on:
  - Buccal and lingual surfaces of all teeth.
  - Interproximal surfaces of anterior teeth.

#100 Thin Universal

- Thin diameter
- Straight shank
- Profile – flat

Intended Use

- Thin diameter design enhances access in periodontal pockets
- The straight shank of the #100 thin is ideal for light to moderate supragingival deposits in shallow pockets, and can be used on all accessible tooth surfaces.
- Thin tips should be used only on low to medium power settings.
- Most effective on:
  - Buccal and lingual surfaces of all teeth.
  - Interproximal surfaces of anterior teeth.

#U Thin Universal

- Thin diameter
- Straight shank
- Profile – round

Intended Use

- Thin diameter enhances access in periodontal pockets.
- The straight shank is ideal for light to moderate supragingival deposits in shallow pockets.
- Thin tips should be used only on low to medium power settings.
- Straight shank can be used on all accessible tooth surfaces.
- Most effective on:
  - Buccal and lingual surfaces of all teeth.
  - Interproximal surfaces of anterior teeth.

Bladed Curette Designs

- Thin diameter
- Profile – bladed curette
- Contra-bend shank

Intended Use

- Thin diameter enhances access in periodontal pockets
- The curette blade is ideal for light to moderate supragingival deposits in shallow pockets, as well as, moderate to heavy deposits and necrotic cementum.
- Thin tips should be used only on low to medium power settings.
- Contra-bend shank allows for greater adaptivity to all accessible tooth surfaces
- Most effective on:
  - Anterior Teeth
  - Pre-molars

Curette Right and Left Designs

- Standard diameter
- Contra-bend shank
- Profile – bladed curette

Intended Use

- Thin diameter enhances access in periodontal pockets
- The curette blade is ideal for light to moderate supragingival deposits in shallow pockets, as well as, moderate to heavy deposits and necrotic cementum.
- Contra-bend shank allows for greater adaptivity to all accessible tooth surfaces.
- Thin tips should be used only on low to medium power settings.
- Most Effective on:
  - Interproximal surfaces
  - Posterior surfaces

#1D Straight Diamond

- Thin diameter
- Universal design
- Slight contra-bend
- Profile – round
- Diamond coating

Intended Use

- Thin diameter enhances access in periodontal pockets
- The universal design is ideal for light to moderate supragingival deposits in shallow pockets. A slight contra-bend allows the tip to be used on all accessible tooth surfaces
- Thin tips should be used only on low to medium power settings.
- Most effective on:
  - Finishing instrument
  - Subgingival deposits

Diamond Right and Left Designs
- Very thin diameter
- Contra-angle shank
- Diamond coating

Intended Use
- Thin diameter enhances access in periodontal pockets.
- Contra-bend shank allows for greater adaptivity to all accessible tooth surfaces.
- The diamond coated tip is ideal for use as a finishing instrument.
- Thin tips should be used only on low to medium power settings.
- Most effective on:
  - Interproximal surfaces
  - Posterior surfaces

Conclusion: It's a Matter of Choice

Research indicates that the differences between sonic and ultrasonic instrumentation are clinically insignificant.*

The best results are probably obtained by combining sonic/ ultrasonic instruments with manual scaling.*

Conclusion: Therapeutic Objective- Heavy Debris Removal
When the objective of therapy is to efficiently remove heavy deposits, a medium or higher power setting should be selected because it will produce a longer, more powerful stroke.

The clinician should select a standard tip design to accommodate the higher power setting. A standard tip is appropriate for heavy debris located supragingivally as well as subgingivally if access permits. Once the heavy deposits are removed, the clinician should follow up with thin perio designs and/ or hand instruments for definitive removal.

Conclusion: Therapeutic Objective- Heavy Debris Removal

Magnetostrictive Tip Selection
- #10 Universal Insert
- #1000 Triple Bend Insert

Piezoelectric Tip Selection
- #P Standard Universal
- #P10 Standard Universal
- #10 Standard Universal
- Bladed Curette Design

Conclusion: Therapeutic Objective- Light Debris Removal
When the objective of therapy is to remove light deposits or to deplaque/ detoxify the root surface, low to medium power should be selected.

A shorter, less powerful stroke will adequately remove the debris and increase patient comfort. A thin, perio insert is preferred for these procedures.

Magnetostrictive Tip Selection
- #100 Thin Insert
- Thin Right and Left Insert

Piezoelectric Tip Selection
- #100 Thin Universal
- Thin Bladed Curette Designs
- Thin Diamond Coated Designs

About the Author

Erika Eatherton holds a Bachelor of Science degree in Marketing, and is currently an MBA candidate at DePaul University in Chicago, Illinois. She has been serving the dental hygiene market since 2000, and has devoted hundreds of hours to continuing dental education.

Erika spent the first four years of her dental career working closely with the hygiene community at Sunstar Americas, Inc. (formerly the John O. Butler Co.) while managing their floss and accessories product lines. In 2004, Erika joined the dental hygiene practitioners department at Hu-Friedy Mfg. Co., Inc. as the Product Manager for Diagnostic Instruments. Since 2005, Erika has managed Hu-Friedy's Power Scaling line. During her time at Hu-Friedy, Erika has been actively involved in several new product development projects.

She may be reached via e-mail: ebogener@hu-friedy.com

CE Accreditation

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