Ultrasonic Periodontal Therapy — Benefits for the Patient and the Practice

A Peer-Reviewed Publication
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Educational Objectives
Upon completion of this course, the clinician will be able to do the following:
1. Describe the inflammatory nature of periodontal disease and oral-systemic links.
2. Consider the factors involved in ultrasonic scaling.
3. List practice-building considerations with ultrasonic scaling.
4. Be knowledgeable about considerations for specific diseases with respect to periodontal treatment.

Abstract
The prevention of periodontal disease is a key factor in oral health. It has also become evident that periodontal health is associated with systemic health. Nonsurgical scaling and root planing is the standard of care for periodontitis. Supragingival plaque removal influences the bacterial environment in pockets up to 3 mm in depth, while subgingival scaling and root planing is essential in pockets 4 mm or more with attachment loss to remove and reduce the levels of periodontal bacteria. The thorough removal of both supragingival and subgingival deposits is important to remove niches for microbes, prevent inflammation, and prevent future growth of a mature subgingival biofilm. Ultrasonic scaling offers practical and practice-building advantages over manual scaling. Consideration of the advantages, safety and technique-sensitivity of method of scaling is required in selecting one. Given the oral-systemic link, periodontal treatment is important to help systemic health and the patient’s quality of life.

Introduction/Overview
The prevention of periodontal disease is a key factor in oral health. Over the last decade, as research into the oral-systemic link has continued, it has also become evident that periodontal health is associated with systemic health, and conversely that periodontal disease is associated with systemic disease.

Periodontal disease is an inflammatory process involving the periodontal soft tissues and alveolar bone. The initiation of periodontal disease depends on the presence of a mature subgingival biofilm (plaque) rich in gram-negative periodontal bacteria. The inflammatory process begins with reversible gingivitis. Over a period of several weeks, the nature of the biofilm changes and the disease changes to one that is irreversible without clinical intervention. The progression of periodontal disease relies on host susceptibility and response. As periodontal disease progresses, clinical attachment loss (CAL) and bone loss occur, resulting in periodontal pockets of increasing depth and complexity if left untreated, ultimately leading to tooth loss. Periodontal disease progresses episodically. The inflammatory process is associated with the release of immune modulators and chemical mediators. Their release occurs when oral bacteria and lipopolysaccharides bind to macrophages and monocytes. Neutrophils, lymphocytes, and macrophages all play a role. Chemical mediators involved in the disease process include prostaglandins and cytokines, including interleukin-1 (IL-1), tumor necrosis factor-alpha (TNF-α), and interleukin-6 (IL-6). These chemicals also act as stimulators for liver production of C-reactive protein (CRP). While chemical mediators are part of a protective function, they also result in destruction.

The oral-systemic link
Periodontal disease is linked to specific systemic diseases including cardiovascular disease (CVD), respiratory disease, renal disease, osteoporosis, and pulmonary disease. In CVD, the same chemical mediators associated with periodontal disease influence CVD. Elevated levels of CRP result in an increased risk of heart attack. Interleukin produces fibrinogen — also associated with thrombus formation; TNF-α is associated with triglyceride production, high levels of which are also associated with CVD; IL-1 receptor antagonist has been found inside atherosclerotic plaques; oral bacteria are also found in the bloodstream as well as in cardiac plaques. Patients with severe periodontitis may have twice the risk for CVD, and an increased risk for stroke. CRP has also been linked to reduced renal function, and antibodies to periodontopathogens have been found to be linked to kidney disease and have been identified in the bloodstream. Preterm low-birth-weight babies are also associated with the presence of periodontal bacteria in expectant mothers.

Clinical treatment of periodontal disease is essential for oral and systemic health. Treating periodontal disease has been found to result in improvements in systemic health markers and conditions. Following periodontal treatment, while CRP levels initially increase they later decline, endothelial function may improve six months after periodontal therapy. In addition, performing scaling and root planing in pregnant women may reduce the number of preterm births, and treating periodontal disease helps improve glycemic control in diabetics. Given the oral-systemic link and the associations of periodontal disease and health with systemic disease and health, appropriate treatment of periodontal disease is doubly important. Reducing the presence of periodontopathic bacteria is essential for health.

Scaling and Root Planing
Nonsurgical scaling and root planing is the standard of care for periodontitis. Its goals are to remove the biofilm, periodontal bacteria, toxins, calculus, and debris from the full circumference of exposed surfaces of the teeth supra- and subgingivally. It is important that the bases of pockets be debrided, particularly since periodontal bacteria concentrate more in the depths of pockets. Furcations must be thoroughly debrided — furcation involvement is a factor in poor periodontal treatment outcomes, making their thorough debridement and treatment imperative. If calculus remains on the root surface, this acts as a site on to which bacteria can adhere and a mature
biofilm can develop. In addition, calculus contains bacteria embedded within it.16

Periodontal bacteria initially migrate from supragingival sites in an immature biofilm to subgingival sites where a mature subgingival biofilm containing high concentrations of these bacteria develops. Migration of residual periodontal bacteria is known to occur following scaling and root planing, resulting in recolonization of other sites. A recent study by Quirynen et al. found that colonization of “pristine implant-related pockets” could occur as little as a week from solely supragingival bacteria.17 Full-mouth disinfection, whereby same-day full-mouth scaling and root planing is combined with the use of chemotherapeutics to kill bacteria in other intraoral sites, has been proposed to reduce periodontal bacteria and recolonization. Separately, same-day full-mouth scaling and root planing without any chemotherapeutic disinfection has also been proposed. One recent study concluded that the improved clinical parameters were partially due to the disinfection and partially due to early completion of treatment in a single visit.18 Other recent studies have concluded that there are no differences in outcomes whether scaling and root planing is performed in separate visits for each quadrant or as a same-day full-mouth procedure.19-22

Supragingival plaque removal influences the bacterial environment in pockets up to 3 mm in depth, while subgingival scaling and root planing is essential in pockets 4 mm and greater with true periodontal involvement, to remove and reduce the levels of periodontal bacteria.23 The thorough removal of both supragingival and subgingival deposits is important to remove niches for microbes, prevent inflammation, and prevent future growth of a mature subgingival biofilm. It is also important to leave the teeth with smooth root surfaces following completion of scaling and root planing.

The thorough removal of both supragingival and subgingival deposits during scaling and root planing is essential.

**Instrumentation Options**

Nonsurgical scaling and root planing can be accomplished by several methods, including with the use of manual scalers, ultrasonic scalers, sonic scalers, lasers, or combinations of these. Ultrasonic scaling has increasingly become the method of choice for clinicians, in some cases together with isolated areas of hand scaling or utilizing hand scalers for fine debridement.24

Both manual and ultrasonic scaling have been found to be effective when properly performed, with one study finding no supplemental benefit for hand scaling.25 Nonsurgical ultrasonic instrumentation and manual scalers were equally effective in one study in patients with severe periodontitis, with treatment assessed by clinical and microbiological parameters.26 Current research on the Er:YAG laser is inconclusive. In a 2007 study comparing ultrasonic scaling with sonic scaling or use of an Er:YAG laser, it was found that reductions in periodontal bacteria were similar for all three methods when assessed post-treatment in patients with chronic periodontal disease.27 A second study found lasers to be less effective and capable of resulting in surface damage.28

Table 1. Instrumentation options

| Hand (manual) scalers — curettes, chisels, hoes |
| Ultrasonic scaler — piezoelectric and magnetostrictive units |
| Sonic scaler |
| Er:YAG laser |
| Combinations of the above |

**Advantages of Ultrasonic Scalers**

Ultrasonic scaling offers several advantages over other scaling and root planing techniques, in particular compared to hand scaling. Carpal tunnel syndrome and other injuries are common amongst dental clinicians.29 An appropriate scaling and root planing technique is an important consideration to help prevent these injuries. Using ultrasonic scalers, clinicians are able to complete scaling and root planing in a manner that is ergonomically an improvement over hand scaling and results in less wear and tear. Hand scaling requires the clinician to position the fingers and wrist in awkward positions and involves intricate movements — this results in muscle strain and fatigue, and in the long term can result in work-related injury. In comparison, ultrasonic scaling entails using very light force, less movement, and less muscle strain.

Ultrasonic scalers are effective supra- and subgingivally. When used correctly, their use during prophylaxis appointments (D1110) as well as in scaling and root planing patients will result in thorough and safe deposit removal with the potential for reduced treatment time.

The choice of ultrasonic scaler determines the type and number of scaler inserts and tips used to accomplish scaling and root planing, and therefore the amount of wrist pivoting and finger positioning required. Minimizing the number of inserts required reduces the need for the clinician...
to stop, change positions, and then reposition again. Slim and probe-like magnetostrictive and piezoelectric insert tips are better able to adapt to curvatures and furcations, and to access the base of pockets, than wide inserts, and when compared to hand scaling with Gracey curettes provide better access in furcation areas. One piezoelectric unit has a single probe-shaped insert tip that is used circumferentially on all its surfaces, requires less applied force (3–5 grams), and is a true universal tip (Pro-Select® Platinum).

Figure 2. Insert tips

Other piezoelectric units require more inserts for a procedure and they can only be used on their lateral surfaces. Magnetostrictive scaling (Cavitron®) also requires the use of multiple inserts — however, all surfaces of the inserts are active, resulting in this unit and the Pro-Select® Platinum piezoelectric unit being less technique-sensitive.

Table 2. Ultrasonic insert tips

<table>
<thead>
<tr>
<th>Insert tip designs</th>
<th>Multiple tips required</th>
<th>Active surfaces</th>
<th>Wrist pivot required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piezo-electric</td>
<td>Bladed, beveled, slim, probe-like</td>
<td>Yes</td>
<td>Lateral sides only</td>
</tr>
<tr>
<td>Piezo-electric Pro-Select® Platinum</td>
<td>Probe-like tip</td>
<td>No</td>
<td>All</td>
</tr>
<tr>
<td>Magnetostrictive</td>
<td>Straight, slim, curved, furcation, chisel, other</td>
<td>Yes</td>
<td>All</td>
</tr>
</tbody>
</table>

The improved visibility available with ultrasonic units incorporating fiber optics or LED lights is also ergonomically desirable, and may result in time savings. Other visualization aids include loupes, Optragate, Isolite and dental microscopes that improve visibility and clinician positioning for both manual and ultrasonic scaling. Similarly, ultrasonic scaler units that result in less copious water spray (Pro-Select® Platinum) and have directional spray (Cavitron® focused spray), while still scaling effectively and safely, help improve visibility.

Patient considerations and preferences
A recent study found that patients preferred ultrasonic scaling compared to sonic scaling or Er:YAG laser scaling.30 Ultrasonic scaling may also be less uncomfortable than hand scaling for a patient (in the absence of local or locally-applied topical anesthetic) due to the extra force required with hand
scalers; the sharp edges of curettes, chisels, and hoes; and the extra width required to insert a hand scaler apical to deposits to remove them. On the other hand, the use of cold coolant or irrigant may cause discomfort. The use of an ultrasonic unit that generates less heat and uses less coolant, or can be used with warmer coolant, may alleviate this potential problem. Additionally, the use of less copious amounts of coolant and adequate suction will help prevent the patient from getting a mouthful of water or gagging. Studies have found that, in general, patients perceive the same level of discomfort with magnetostrictive and piezoelectric scalers.31 Irrespective of the scaling method used, careful technique is required.

Preserving Dental Integrity
Potential issues associated with ultrasonic scaler use include root surface damage due to inappropriate instrumentation (which can also occur with hand scaling), as well as periodontal and pulpal damage.

Periodontal and pulpal damage can occur if the temperature at the tooth surface increases during ultrasonic scaling, depending on the amount of force applied and the amount and temperature of the coolant. Periodontal and pulpal damage can be avoided by the use of only light force and contact of the ultrasonic insert tip against the tooth, adequate coolant, and lower power settings; less heat is generated by piezoelectric units.

Root surface damage can be avoided through careful selection and use of inserts and technique. Hand scaling with curettes has been found to result in more surface roughness and gouging than ultrasonic scaler insert tips,32 encouraging the selection of an ultrasonic scaler. Flemmig et al. compared root surface gouging and damage with either a magnetostrictive or piezoelectric scaler unit, with magnetostrictive unit inserts resulting in less damage. The piezoelectric units used were active only on their lateral surfaces.33,34 Piezoelectric tips that can be used on their full circumference (Pro-Select® Platinum) are not subject to the same limitations, and are less technique-sensitive.

Increased force is associated with increased damage, irrespective of the ultrasonic scaler.35 In clinical practice, piezoelectric units require less applied force. Wider scaler tips have been found to be more aggressive on root surfaces than are slim insert tips, suggesting the use of slimmer tips.36 Insert tip points, regardless of type, must not be placed in contact with the tooth — doing so results in surface damage and gouging.

Tip Wear, dental integrity, and efficiency
As tips wear, the terminal tip area widens with negative implications for the preservation of tooth structure. The ability to debride decreases as tip wear increases, and worn tips affect instrument performance.37

For hand scalers, dulled inserts must regularly either be resharpened manually (a time-consuming and exacting process), machine-sharpened in the office, or sent out for sharpening. Ultrasonic scaler tips do not require sharpening; they need to be discarded and replaced once a certain degree of wear has been reached. Methods for identifying when a tip should be discarded include tip cards that can be used to measure the length of the tip against the line on the card (Varios, NSK; Satelec® Newtron®, Acteon) and a wrench through which the insert tip is inserted; when the tip no longer protrudes through the wrench hole it is ready to be discarded (Pro-Select® Platinum).

Practice building
226 million prophylaxis and 28 million periodontal procedures were estimated to be performed in 1999,38 making these procedures an important component in the dental office and presenting opportunities for practice building. Several factors result in practice-building advantages for ultrasonic scaling compared to manual scaling. These include the time required, patient perceptions and comfort, and ergonomic advantages.

<table>
<thead>
<tr>
<th>Table 3. Factors in preserving dental integrity</th>
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<tr>
<td>Applied force</td>
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<tr>
<td>Angulation of insert*</td>
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<tr>
<td>Width of insert tip</td>
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<tr>
<td>Insert tip wear</td>
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<tr>
<td>Tip selection</td>
</tr>
<tr>
<td>Careful technique, expertise</td>
</tr>
<tr>
<td>Power setting</td>
</tr>
<tr>
<td>Heat generation**/amount, flow of coolant</td>
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</tbody>
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* Critical for piezoelectric tips with only active lateral sides
** Greater with magnetostrictive units in general

Figure 4. Wrench and insert tip

Figure 5. Card and insert tip
Less time is required to treat patients with ultrasonic scalers than with hand scalers, with an estimated reduction in time required of up to 34%. In addition, piezoelectric scaling took approximately 28% less time than magnetostrictive scaling in one study, albeit for one tooth. Based on estimated times taken, time savings with two half-mouth appointments or a full-mouth appointment could range from one to one-and-one-half hours, respectively.

Minimizing the number of inserts required saves time, as there is no need to stop several times during the procedure to exchange tips to reach different anatomical features such as furcations or different areas of the mouth. A typical series of instruments used with magnetostrictive scaling could include the use of standard inserts to remove gross deposits in shallow pockets, followed by the use of slim tips to scale and root plane deeper pockets (≥ 4 mm). Depending on the patient, right and left curved inserts, furcation insert tips to access furcation areas, and other designs of inserts may also be required to help access. There is no universal insert tip for magnetostrictive scalers. Piezoelectric units typically require the use of at least three insert tips used during scaling and root planing, while with one piezoelectric unit (Pro-Select® Platinum) only one probe-like insert is necessary.

As tips wear, they should be replaced both to preserve root surface during scaling and to improve performance. In addition to the above considerations, automatic foot controls for scaling (Satelec® Suprasson® P-Max Lux; Pro-Select® Platinum; Cavitron®) and irrigating (Pro-Select® Platinum) eliminate movement and save time.

A procedure that is less fatiguing and ergonomically favorable is more likely to be efficient. Ultrasonic scaling enables the clinician to perform full-mouth scaling and root planing in one or two visits, and without experiencing the fatigue and discomfort that would be associated with full-mouth hand scaling, or to complete separate quadrant visits more quickly with fewer abnormal positions and movements of the fingers and wrist (and therefore also with less fatigue). Fewer, longer visits can make for better use of resources and scheduling of appointments. Longer appointments can be reserved in advance in the schedule for patients in general (rather than just specific patients) — if this is not done, a long period of time may no longer be available and short appointments may have broken up this time period. A procedure performed equally well but taking less time is also favorable for patients and more convenient for some, and may result in fewer no-shows partway through a course of nonsurgical periodontal treatment. Optimizing therapy and consistently completing treatment are important for oral and systemic health and are also practice-builders.

### Infection and Systemic Disease/Condition Considerations

#### Preventing Cross-contamination and Infection

The creation of bacterial aerosols during ultrasonic scaling is a disadvantage compared to manual scaling, and results in cross-contamination. Ultrasonic scaling is considered to be the greatest single culprit for bacterial aerosols. The spray generated is uncontaminated but becomes a contaminated aerosol following exposure to intra-oral microbes and fluids. The aerosol is minimized by selecting a unit requiring less copious amounts and flow of coolant and by using high-power suction to evacuate fluids before, and as, they become aerosolized. One study found only limited aerosol production using a piezoelectric unit. A supplemental approach is to institute preprocedural rinsing. This has been found to reduce the load of aerosolized bacteria with chlorhexidine use, as well as other chemotherapeutics. Subgingival irrigation may also reduce microbial loads in aerosol.

#### Disease and Condition Considerations

Patients with systemic diseases, including those with cardiovascular disease, diabetes, HIV/AIDS, patients with lung disease, and those scheduled for operations and hospitalization, present with special considerations for dental procedures.
Cardiovascular disease
Cardiovascular patients require careful monitoring during dental procedures, and blood pressure checks should be routinely performed prior to a course of treatment. Depending on the patient, referral to a physician or consultation with the patient’s physician prior to starting treatment may be required.

Dental procedures are known to result in stress and increases in blood pressure. Minimizing stress for all patients, and cardiovascular patients in particular, is important during dental procedures. It has been recommended that long, stressful dental appointments should be avoided for CVD patients and appointments be maximum one hour in length to reduce stress. Given that ultrasonic scaling reduces the time in the dental chair and may also result in less discomfort than manual scaling, its use in CVD patients in general can be expected to have the potential to reduce stress, representing an advantage over manual scaling. For patients with pacemakers, magnetostrictive ultrasonic scalers are contraindicated as the magnetic field created by the application of electricity through the unit’s ferromagnetic stacks can result in interference with pacemakers. For these patients, a piezoelectric ultrasonic scaler is indicated.

Ultrasonic and manual scaling, as well as other invasive dental procedures, results in a transient bacteremia. A recent study found that scaling and root planing resulted in a transient bacteremia in 80.9% of patients with chronic periodontitis, and for 19% of patients this was still evident 30 minutes after the procedure had been completed. In a separate study, however, bacteremias were found to result from ultrasonic scaling in 13% of patients, 20% upon periodontal probing, and in 3% as a result of toothbrushing. Current guidelines regarding bacteremia and antibiotic prophylaxis to prevent bacterial endocarditis for heart conditions are available from the American Heart Association.

Diabetes
The importance of thorough scaling and root planing cannot be underestimated, given the two-way dynamics of diabetes/glycemic control and periodontal disease. In addition, it is important to avoid stress in diabetic patients. Ultrasonic scaling provides a safe and effective method of treating diabetic patients that may also reduce treatment time and stress.

Lung disease
In a review and analysis of 30 studies, it was found that poor oral hygiene and periodontal disease enable respiratory pathogens to colonize intra-orally and then result in nosocomial infections in hospitalized patients. Nosocomial infections are reduced in cardiac patients and oncology patients, as well as intubated patients in general, in studies involving oropharyngeal decontamination with chemotherapeutics and/or mouthrinsing. The increasing evidence of nosocomial infection by microbes from oral sites underscores the value of periodontal disease prevention and scaling and root planing. Patients with pulmonary disease will benefit from an improved periodontal status and reduction in intra-oral bacteria, as will pre-operative patients prior to hospitalization.

HIV-positive patients
There is little literature or evidence on increased risks associated with procedures such as scaling and root planing in HIV-positive patients. One recent study found a complication rate of 4.8% for invasive treatment in this patient group overall. Given the increased risk of infection and poor response to infection seen in this patient population, maintaining good oral hygiene and preventing periodontal disease progression are critical. One small study found that following ultrasonic scaling there were reductions in the gingivitis.

Table 5. Ultrasonic scaling and systemic conditions

<table>
<thead>
<tr>
<th>Table 5. Ultrasonic scaling and systemic conditions</th>
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<tbody>
<tr>
<td><strong>General</strong></td>
</tr>
<tr>
<td>Minimize bacterial aerosol if performing ultrasonic scaling</td>
</tr>
<tr>
<td>Chemotherapeutic pre-rinsing reduces bacterial loads</td>
</tr>
<tr>
<td><strong>Cardiovascular patients</strong></td>
</tr>
<tr>
<td>Minimize stress -</td>
</tr>
<tr>
<td>— Appointments &lt; 1 hour</td>
</tr>
<tr>
<td>— Patient comfort</td>
</tr>
<tr>
<td>Pacemaker patients - magnetostrictive scalers contraindicated</td>
</tr>
<tr>
<td>Bacteremia - current guidelines on antibiotic prophylaxis</td>
</tr>
<tr>
<td>Periodontal treatment can result in CRP declines over time</td>
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<tr>
<td>Periodontal treatment may improve endothelial function</td>
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<tr>
<td><strong>Diabetic patients</strong></td>
</tr>
<tr>
<td>Minimize stress</td>
</tr>
<tr>
<td>Diabetics have poorer periodontal health</td>
</tr>
<tr>
<td>Poor periodontal health impact glycemic control</td>
</tr>
<tr>
<td>Periodontal treatment can help control glycemic levels</td>
</tr>
<tr>
<td><strong>Lung disease</strong></td>
</tr>
<tr>
<td>With poor oral hygiene, respiratory pathogens colonize intra-orally</td>
</tr>
<tr>
<td>Poor OH and periodontal disease can result in nosocomial infections</td>
</tr>
<tr>
<td>Periodontal treatment can benefit patients with pulmonary disease</td>
</tr>
<tr>
<td>Periodontal treatment prior to hospitalization can help reduce nosocomial infections by microbes originating intra-orally</td>
</tr>
<tr>
<td><strong>HIV positive</strong></td>
</tr>
<tr>
<td>General increased risk of infection and poor response to infection</td>
</tr>
<tr>
<td>Ultrasonic scaling shown to reduce bleeding, GI, bacterial counts</td>
</tr>
<tr>
<td>Patients can be successfully treated with routine scaling and root planing</td>
</tr>
<tr>
<td>Ultrasonic scaling may reduce sharps injuries (risk of cross-infection)</td>
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gival index and bleeding in both HIV-positive patients and the HIV-negative control group. Bacterial counts remained reduced in both groups 90 days after treatment.\(^5\) HIV-positive patients can be successfully treated with routine scaling and root planing techniques for periodontal disease. As HIV status progresses, a patient's periodontal status deteriorates; this necessitates intensive periodontal therapy.\(^6\) A further consideration is the risk of cross-infection to the treating clinician. Sharps injuries were found in one survey to be most common with needle sticks and scalers.\(^7\) Using ultrasonic scalers removes the risk of sharps injuries (from sharp hand scalers) that could result in cross-infection from blood-borne viruses such as HIV, as well as other microbes, during scaling and root planing procedures or disinfection prior to sterilization of instruments. In addition to routine infection control procedures, when scaling ultrasonically care should be taken to minimize bacterial aerosols, which may also contain blood,\(^8\) by using high-speed suction and considering selection of an ultrasonic scaler that requires and uses minimal coolant.

**Summary**

Periodontal health is important for both oral and systemic health. The standard periodontal treatment is scaling and root planing, which can be performed using manual scalers, ultrasonic scalers, lasers, sonic scalers, and combinations of these. Ultrasonic scaling offers practical and practice-building advantages over manual scaling. Ultrasonic scaling is less fatiguing for the clinician, may result in improved patient comfort, and it can be performed in less time thereby enabling half-mouth or full-mouth visits. Access to the bases of pockets and furcations may be improved with ultrasonic scaling, provided appropriate tips and appropriate technique are used. Ultrasonic scaler units include magnetostriective and piezoelectric. Practice-building advantages of ultrasonic scaling include the improved ergonomics, reduced time required for procedures, as well as clinician and patient comfort. Additional considerations include the number of tips required, tip wear, and automated controls. Careful consideration of the advantages, safety and technique-sensitivity of method of scaling is required in selecting one. Given the oral-systemic link, periodontal treatment is also important to help systemic health and the patient’s quality of life.

**References**


Questions

1. Periodontal health is associated with systemic health.
   a. True
   b. False

2. Periodontal disease _________.
   a. is an inflammatory process
   b. is irreversible without clinical intervention
   c. requires the presence of periodontal bacteria
d. all of the above

3. Periodontal disease progresses _________.
   a. linearly
   b. episodically
   c. algorithmically
   d. none of the above

4. Chemical mediators involved in the periodontal disease process include _________.
   a. interleukins
   b. tumor necrosis factor-α
   c. prolactin
   d. a and b

5. C-reactive protein is produced by the ________, and high levels are associated with _________.
   a. pancreas; neuropathy
   b. liver; CVD and renal disease
   c. pancreas; CVD and renal disease
d. none of the above

6. Antibodies to periodontopathogens have been ________.  
   a. linked to kidney disease
   b. associated with hair loss
   c. found in the bloodstream
   d. a and c

7. Following periodontal treatment, CRP levels have been found to _________.
   a. initially decline then increase again
   b. initially increase then later decline
   c. remain static
d. none of the above

8. During scaling and root planing, the full circumference of exposed surfaces of the teeth supra- and subgingivally must be instrumented.
   a. True
   b. False

9. Periodontal bacteria initially migrate from supragingival sites in an immature biofilm to subgingival sites.
   a. True
   b. False

10. Recent studies comparing scaling and root planing performed during separate visits for each quadrant to a same-day full-mouth procedure concluded that _________.
    a. there are significant differences in outcomes
    b. there are no significant differences in outcomes
    c. separate visits were superior to two visits
d. none of the above

11. Supragingival plaque removal influences the bacterial environment in pockets of up to 5 mm in depth.
    a. True
    b. False

12. Carpal tunnel syndrome and other injuries are ________ among dental clinicians.
    a. rare
    b. common
    c. unheard of
d. none of the above

13. Piezoelectric tips that are round _________.
    a. can be used on all surfaces
    b. do not require special angulation
    c. are available with all piezoelectric units
d. a and b

14. Compared to manual scaling, ultrasonic scaling entails using _________.
    a. very light force
    b. less muscle strain
    c. less movement
d. all of the above

15. Minimizing the required number of inserts _________.
    a. reduces the need for the clinician to stop
    b. helps save time
    c. is unimportant
d. a and b

16. Visualization aids that improve visibility and clinician positioning include _________.
    a. LED/fiber-optic scaler handpieces
    b. Isolite
    c. loupes
d. all of the above

17. A recent study found that patients preferred ultrasonic scaling over sonic scaling or Er:YAG laser scaling.
    a. True
    b. False

18. The use of less copious amounts of coolant (if appropriate) and adequate suction can _________.
    a. help prevent the patient from getting a mouthful of water
    b. help prevent the patient from gagging
    c. help result in a better patient experience
d. all of the above

19. Periodontal and pulpal damage can be avoided by _________.
    a. using only light force and contact of the insert tip against the tooth
    b. using an appropriate amount and flow of coolant
c. using lower power settings
d. all of the above

20. The points (ends) of insert tips can be safely used against the teeth.
    a. True
    b. False

21. As ultrasonic insert tips wear, _________.
    a. instrument performance decreases
    b. the preservation of tooth structure is impacted
    c. they can continue to be used safely until they are 90% of the way down the insert tip
d. a and b

22. Methods for identifying when an ultrasonic insert tip should be discarded include _________.
    a. tip cards
    b. in-office SEM calibration
    c. a wrench through which the insert tip is inserted
d. a and c

23. In clinical practice, piezoelectric ultrasonic units require less applied force.
    a. True
    b. False

24. Practice-building advantages of ultrasonic scaling compared to manual scaling include _________.
    a. the time required
    b. patient perception and comfort
c. ergonomics
d. all of the above

25. Time savings for ultrasonic scaling with two half-mouth appointments or one full-mouth appointment could be _________.
    a. 15 to 30 minutes
    b. 30 minutes to one hour
c. one to one and a half hours
d. three to four hours

26. There is no universal usage insert tip for magnetostriective scalers.
    a. True
    b. False

27. The use of ultrasonic scaling _________.
    a. can be expected to reduce chairside time and therefore has the potential to reduce stress
    b. is contraindicated with magnetostriective devices in heart pacemaker patients
    c. results in a transient bacteremia, as do other invasive procedures
d. all of the above

28. One study found that following ultrasonic scaling there were reductions in the gingival index, bleeding and bacterial counts in both HIV-positive and HIV-negative patients.
    a. True
    b. False

29. During ultrasonic scaling, _________.
    a. a bacterial aerosol is created
    b. appropriate suction must be used
    c. the risk of sharps injury may be reduced
    d. all of the above

30. Given the oral-systemic link, periodontal treatment is important for systemic health.
    a. True
    b. False
Ultrasonic Periodontal Therapy — Benefits for the Patient and the Practice

Name: ____________________________ Title: ____________________________ Specialty: ____________________________

Address: ____________________________ E-mail: ____________________________

City: __________________ State: _______ ZIP: ____________________________

Telephone: Home ( ) Office ( )

Requirements for successful completion of the course and to obtain dental continuing education credits: 1) Read the entire course. 2) Complete all information above. 3) Complete answer sheets in either pen or pencil. 4) Mark only one answer for each question. 5) A score of 70% on this test will earn you 4 CE credits. 6) Complete the Course Evaluation below. 7) Make check payable to PennWell Corp.

Mail completed answer sheet to
Academy of Dental Therapeutics and Stomatology, A Division of PennWell Corp.
P.O. Box 116, Chesterland, OH 44026
or fax to: (440) 845-3447

Educational Objectives

1. Describe the inflammatory nature of periodontal disease and oral-systemic links.
2. Consider the factors involved in ultrasonic scaling.
3. List practice-building considerations with ultrasonic scaling.
4. Be knowledgeable about considerations for specific diseases with respect to periodontal treatment.

Course Evaluation

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

1. Were the individual course objectives met?  Objective #1: Yes No  Objective #2: Yes No  Objective #3: Yes No  Objective #4: Yes No
2. To what extent were the course objectives accomplished overall? 5 4 3 2 1 0
3. Please rate your personal mastery of the course objectives. 5 4 3 2 1 0
4. How would you rate the objectives and educational methods? 5 4 3 2 1 0
5. How do you rate the author's grasp of the topic? 5 4 3 2 1 0
6. Please rate the instructor's effectiveness. 5 4 3 2 1 0
7. Was the overall administration of the course effective? 5 4 3 2 1 0
8. Do you feel that the references were adequate? Yes No
9. Would you participate in a similar program on a different topic? Yes No
10. What additional continuing dental education topics would you like to see? __________________________________________________________

PLEASE COPY PHOTOOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.

Please photocopy this answer sheet for additional participants.

AGD Code 495

PLEASE COPY PHOTOOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.

AGD Code 495

For IMMEDIATE results, go to www.ineedce.com and click on the button “Take Tests Online.” Answer sheets can be faxed with credit card payment to (440) 845-3447, (216) 398-7922, or (216) 255-6619.

Payment of $59.00 is enclosed.

If paying by credit card, please complete the following:

Acct. Number: ____________________________ Exp. Date: ____________________________

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12. ✔ ✔ ✔ ✔ ✔

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