The Science Behind the Dental Water Jet:

Biofilm and Inflammation

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The Advancement of Oral Self-Care

LOUIS F. ROSE, DDS, MD;1 AND BEVERLY BIZUP HAWKINS, RDH, MA2

The Waterpik® dental water jet has a long, rich history: the first device—developed by a dentist—was introduced to the dental community in 1962. Dentists and dental hygienists welcomed its unique cleaning ability for patients with orthodontic appliances or physical challenges. At that time, the “plaque hypothesis” was in full swing. However, in the last 10 years, a better comprehension of the efficacy of the dental water jet became evident with groundbreaking research on inflammatory mediators and biofilm, coupled with the understanding of the pathogenesis of periodontal infections and plaque as a biofilm.

Today, self-care devices must meet the needs of a changing population. Patients are living longer and keeping their teeth, and they have a choice of restorative materials such as implants, veneers, and composites. They want products that are effective on multiple levels, safe on dental materials and tissue, and easy to use. The market provides a number of dental products that can help patients control biofilm and reduce inflammation at home. However, few feature the comprehensive research of the dental water jet.

The outcome of oral self-care is no longer confined to the mouth. The intent is to manage the oral cavity as it relates to the whole body. A device that can reach difficult areas, remove biofilm, reduce inflammation, modulate the host response, and reduce inflammatory markers in the body would be a comprehensive solution indeed. While no such self-care device yet exists, the dental water jet comes close making it a device not for a select few, but for many.

In this issue, the articles are designed to broaden your knowledge of dental water jet research and introduce new findings in biofilm removal. Gorur and colleagues evaluate dental water jets and management of biofilms, and Ciancio provides an overview of the research. Tilliss discusses the changing face of self-care practices, while Levin promotes the dental water jet as an in-office value-added service. Enjoy sharing the clinical findings and concepts presented in this issue with your colleagues, and we hope to have provided you with a spark for enthusiastic professional exchange.

1 Clinical Professor of Periodontics, University of Pennsylvania, Philadelphia, Pennsylvania, and New York University, New York, New York; Professor of Medicine, Drexel University College of Medicine, Philadelphia, Pennsylvania; and private practice, periodontics and implant dentistry, Philadelphia, Pennsylvania

2 Research Faculty, Drexel University Department of Obstetrics and Gynecology, Drexel Medical School; and private practice, Philadelphia, Pennsylvania

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Scientific technology has expanded the profession's understanding of dental plaque. Treatment and prevention are now focused on dental plaque as a biofilm. Biofilms are three-dimensional arrangements of bacteria that are loosely or more firmly adherent to teeth and tissue. Biofilms consist of microcolonies of bacteria embedded in slimy matrices. Biofilms are self-sufficient, dynamic communities that can survive in hostile environments. The regular removal of dental plaque biofilm, which contain the bacteria responsible for caries formation and for the etiology of gingivitis and periodontitis, is the well-accepted sine qua non of dental health.

In other ecosystems in which biofilms harbor bacteria that attack surfaces, such as steel,\(^1\) two basic strategies of biofilm control have emerged.\(^2\) The first is predicated on the use of chemicals to kill the bacteria in the biofilm to induce the natural sloughing of dead biofilm, thus cleaning the surface and preventing corrosion.\(^3\) The second is to remove the matrix-enclosed bacterial microcolonies from the surface by the use of shear forces that overcome the tensile strength of the matrix material without damaging the integrity of the material’s surface. The chemical approach suffers from the limitation that the most effective antimicrobial agents do not penetrate the biofilm, so it is very difficult to deliver enough of the agent to clean the surface, and the biofilm can return to its original state easily. The physical removal of biofilm from surfaces cleans the surfaces very effectively,\(^4\) and removes the insidious bacteria from the system completely. Shear forces are widely used to clean oil and water pipelines, and the same is true for dental biofilms. Mechanical removal is the most effective method to control the growth of biofilm. Biofilms are accessible to a dental professional and can be effectively removed by scaling.

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1. University of Southern California Center for Biofilms, Los Angeles, California
2. Water Pik, Inc, Fort Collins, Colorado
3. University of Southern California Center for Biofilms, Los Angeles, California
4. Founding Director, University of Southern California Center for Biofilms, Los Angeles, California
and root planing. It is more difficult for patients to effectively remove or disrupt the biofilm from all surfaces of the tooth on a daily basis.

The dental water jet has been studied extensively for the past 45 years. The research demonstrates that a combination of 1,200 pulsations per minute and pressure settings of 55 psi to 90 psi are safe and can significantly reduce bleeding and gingivitis in a variety of cohorts. Clinical studies of inflammation have shown statistically significant repeatable improvement with the use of the water jet, but erythrosine-based plaque indices have yielded equivocal data. Some studies have shown a reduction in the plaque index with the use of the water jet compared with a control, while other studies have shown no significant differences. The impact of a dental water jet on the quality and quantity of supragingival plaque biofilm remains essentially unknown. A few studies have examined the supra- and subgingival biofilm microscopically.

Brady and colleagues examined the impact of a dental water jet on the ultrastructure of supragingival dental biofilm on rhesus monkeys with an electron microscope. Experimental sites were treated with a pulsating water jet at a pressure setting of 70 psi. Posttreatment biofilm samples showed either removal of biofilm or irreversible damage to the bacteria in the biofilm matrix compared with untreated sites. Cobb et al found similar results in human patients. Periodontally involved teeth were treated with water irrigation at a pressure of 60 psi and then extracted with the epithelial lining intact. The treated sites showed few cocci and short rods randomly dispersed and associated with a light fibrin-like matrix. In contrast, the untreated controls exhibited thick matts of organisms (short rods, long fusiforms, and chains of cocci), including spirochetes. Other studies have evaluated the reduction of specific subgingival organisms and have shown a significant reduction in Prevotella intermedia, Bacteroides species, and spirochetes in 4-mm to 6-mm pockets.

This study evaluated the hydraulic forces (shear forces) produced by a pulsating dental water jet (Water Pik, Inc, Fort Collins, CO) on ex vivo and in vivo biofilm using scanning electron microscopy (SEM).

**METHODS AND MATERIALS**

Eight teeth were extracted from a patient with advanced aggressive periodontitis. Institutional Review Board approval was obtained (proposal No. IR00000792), as well as informed consent from the patient. The teeth were fixed in Karnovsky’s solution for 48 hrs at 4˚C and washed twice in phosphate-buffered saline. Ten thin slices comprising the regions spanning above and below the cementoenamel junction were cut from four of the extracted teeth and sterilized by autoclaving. The cut slices were placed in two 6-well plates and filled with 6 mL of Todd-Hewitt media. Saliva was taken from a volunteer and incubated in Todd-Hewitt media for 24 hrs at 37˚C. The two 6-well plates containing the tooth slices were inoculated with the precultured salivary biofilm (ex vivo) and incubated for 4 days at 37˚C with daily media change. Eight of the tooth slices were mounted individually on a clamp. The dental water jet was used in accordance with the manufacturer’s instructions for the standard jet and the orthodontic jet tip. The unit was set on a medium-pressure setting of 60 psi. Each sample was treated for 3 seconds and timed using a digital metronome (Metrina Multi 353, Zen-On
Music, Co, Ltd, Tokyo, Japan) set to 120 (two beats per second). Four tooth slices were treated with the standard jet tip (Figure 1A), and four tooth slices were treated with the orthodontic jet tip (Figure 1B). Two tooth slices with ex vivo-grown salivary biofilm served as controls. The 10 treated and untreated slices with ex vivo salivary biofilms were examined by SEM. The four remaining extracted teeth were treated with the orthodontic jet tip to evaluate the effect on in vivo calcified biofilm. No additional salivary biofilm was grown on these teeth as described previously. The four samples with in vivo-calcified biofilm were evaluated with the naked eye and SEM.

**SCANNING ELECTRON MICROSCOPY**

The treated and untreated tooth slices were dehydrated in graded ethanol, critical point-dried with carbon dioxide, and mounted on a stub. The samples were sputter-coated with 25 nm platinum and examined with a scanning electron microscope with 5 KeV in the secondary electron mode (XL 30 S, FEG, Philips/FEI Co, Hillsboro, OR).

Images of the control and samples were taken in the SEM from representative areas of treated and untreated regions of the tooth slices, and total bacteria numbers were counted on standard areas of 10 µm x 10 µm. The mean was determined, and the results were extrapolated on a standard area of 1 cm². The extrapolated area was then multiplied with the number of bacterial layers of the biofilm. The total bacterial load was calculated. Because of the simplistic assumptions (exact determination of the tooth surface, number of biofilm layers, and even distribution), this calculation can be regarded only as a semi-quantitative approximation of the number of bacteria in the biofilm.24

**RESULTS**

When the tooth slices with the ex vivo-grown salivary biofilm were examined under the scanning electron microscope, they were colonized by luxuriant biofilm covering the entire surface (Figure 2A through Figure 2C). The biofilms appeared to be several micrometers thick. The predominant morphotypes in the biofilms were fusiform bacteria and cocci. Several regions showed co-aggregation between the two morphotypes, which is a phenomenon of mutual dependence for nutrition and growth. The salivary-derived biofilm showed characteristics typical of a naturally occurring in vivo biofilm in the mouth. The standard jet tip treatment

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**Figure 2A through Figure 2C** Progressively magnified scanning electron micrographs of a tooth slice used as a substrate to grow salivary biofilm. Note the extensive growth of saliva biofilm serving as control. The saliva-derived biofilm was composed of fusiform bacteria (recognizable by their characteristic tapered ends) and cocci.
for 3 seconds on the tooth slices with ex vivo-grown biofilm showed extensive areas of biofilm removal in comparison with the untreated control slices (Figure 2D through Figure 2F). The standard jet removed 99.99% of the salivary biofilms. The orthodontic tip treatment for 3 seconds on the tooth slices appeared to clear very extensive areas of ex vivo-grown salivary biofilm (Figure 3A and Figure 3B). Biofilm removal was observed both at the crown surface and below the cementoenamel junction. The percentage of biofilm removed by the orthodontic tip was 99.84%. Observation with the naked eye indicated that treatment of in vivo biofilm with the orthodontic tip removed significant amounts of this calcified biofilm. This was evident in SEMs, which showed the presence of clearance marks (Figure 3C) caused by the bristles associated with this tip.

**DISCUSSION**

A high level of confidence can be placed in the direct demonstration of the removal of biofilm by microscopic methods, in contrast with other studies that have used scraping for recovery and plating techniques for the enumeration of sessile bacteria. This confidence can be assured because of a recent demonstration that bacterial cells in biofilm grow poorly, if at all, when they are placed on the surfaces of agar plates, so that the enumeration of biofilm bacteria by scraping and plating is not valid. This study approached the real situation in the oral environment, in that the removal of biofilm from well-defined regions of the surfaces of extracted teeth was compared with untreated regions of the same tooth and untreated controls. The teeth used in this study were extracted from a patient with severe periodontitis, so that supragingival and subgingival biofilm was available for evaluation and was the ideal surface for growing ex vivo salivary biofilm. The data presented here demonstrate that a 3-second exposure to hydraulic forces produced by a pulsating water stream from a dental water jet with 1,200 pulsations per minute exerting shear force (~70 psi) removed biofilm from the tooth surface both above and below the cementoenamel junction with 99.99% and 99.84% efficiency.

Comparing dental biofilm against the whole spectrum of biofilm studied by biofilm engineers, dental biofilm’s susceptibility to removal by shear forces fits into a logical pattern. Microbial biofilms have been shown to vary the cross-linking of the component polymers of their matrices

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*Figure 2D through Figure 2F* Scanning electron micrographs of tooth slices subjected to the standard jet tip treatment for 3 seconds.
to develop a tensile strength appropriate for their retention on surfaces in the ecosystem in which they operate. Various degrees of mineralization of biofilms make them much more resistant to removal by shear forces. In the oral ecosystem, mineralization takes the form of calcification, and the deeper layers of the biofilm used in this study were, in fact, calcified to the extent that they had tensile strengths approaching that of the enamel of the tooth. For this reason, the authors distinguished between the removal of less calcified ex vivo salivary biofilm and the removal of calcified biofilm that had formed over a long period on the patient’s teeth in vivo.

Recent published clinical studies measuring the use of water with either the orthodontic tip or standard jet tip on biofilm removal have used traditional plaque biofilm indices. A randomized clinical study comparing a dental water jet with the orthodontic tip plus manual toothbrushing with manual toothbrushing and flossing or manual toothbrushing alone showed a significantly greater reduction in biofilm for the dental water jet group compared with flossing (3.76 times) or manual toothbrushing (5.83 times) in adolescent patients with fixed orthodontic appliances. A dental water jet paired with either manual or sonic toothbrushing showed a greater reduction in biofilm removal compared with manual toothbrushing and flossing. The differences were significant for sonic toothbrushing and dental water jet use compared with manual toothbrushing and flossing. A 2-week study demonstrated a significantly greater reduction in biofilm with the standard jet tip use compared with routine oral hygiene practices.

This microscopic study adds to the existing data and provides an explanation for the consistent reduction in inflammation from using a dental water jet. Along with biofilm removal, other studies have shown reductions in the subgingival microflora, changes in the cells resulting in decreased viability and cell death, and a reduction in the serum and gingival crevicular fluid measures of pro-inflammatory mediators.

CONCLUSION
This study demonstrated microscopically that the hydraulic forces produced by a dental water jet with 1,200 pulsations per minute on medium pressure (~70 psi) (Water Pik, Inc) can significantly remove biofilm from tooth surfaces above and below the cementoenamel junction in vitro. A standard jet tip can remove 99.99% of ex vivo-grown biofilm with 3

Figure 3A through Figure 3C Scanning electron micrographs of tooth slices with ex vivo-grown salivary biofilm subjected to the orthodontic tip treatment for 3 seconds. (A) The crown area of the tooth slice exhibited scattered regions of biofilm growth (denoted by arrows 1) amidst large areas of complete biofilm clearance after dental water jet treatment. Biofilm removal also was evident around the cementoenamel junction (arrow 2). (B) Scanning electron micrograph depicting the area under the cementoenamel junction with patches of biofilm (arrow). (C) Biofilm clearance marks caused by the bristles (denoted by arrows) were evident throughout the treated areas on the extracted tooth with calcified, naturally grown in vivo periodontal biofilm.
Research

seconds of use. An orthodontic tip can remove 99.84% of ex vivo-grown biofilm with 3 seconds of use. And, an orthodontic tip can remove in vivo-grown biofilm significantly with 3 seconds of use, as observed by the naked eye and SEM.

REFERENCES
The Dental Water Jet: A Product Ahead of Its Time

SEBASTIAN G. CIANCIO, DDS*

Abstract: The dental water jet was invented by Dr. Gerald Moyer, a dentist, and John Mattingly, an engineer, in Ft. Collins, Colorado, in the late 1950s. The dental water jet, also known as an oral irrigator, was introduced to the dental profession in Texas during the 1962 Dallas Dental Convention. Numerous studies measuring the irrigator’s efficacy in different cohorts have been published in peer-reviewed journals. The results of those studies are discussed in this article. The bulk of research has been conducted on one product (Waterpik® dental water jet, Water Pik, Inc, Fort Collins, CO). This article is designed to provide dental professionals with the evidence essential to making an informed decision on the oral health benefits and expected outcomes of the dental water jet.

Learning Objectives
After reading this article, the reader should be able to:

- discuss the effect the dental water jet has on inflammation and infection.
- explain how dental water jets can be more effective than traditional self-care devices, particularly dental floss.
- explain the impact of the dental water jet on clinical measurements such as bleeding, biofilm, gingivitis, bacteria, and inflammatory mediators.
- discuss the benefits and concentration of chemotherapeutic agents delivered with a dental water jet.

MECHANISM OF ACTION
Pulsation and pressure are the critical mechanisms in the action of a dental water jet. The combination provides for phases of compression and decompression of the gingival tissue to remove supragingival plaque biofilm and expel subgingival bacteria and other debris as well as stimulating gingival tissue.1 In comparison, studies have shown that a pulsating device was three times more effective than a continuous stream device.2 The pulsating action creates two zones of hydrokinetic activity (Figure 1):

- The impact zone—where the solution initially contacts in the mouth at the gingival margin
- The flushing zone—where the water or other irrigant reaches subgingivally

This hydrokinetic activity results in subgingival penetration and reduction of plaque biofilm.3 Subgingival access is beneficial because the plaque biofilm in this area contains a number of agents associated with inflammation and infection, such as gram-negative bacteria, endotoxins, and polymorphonuclear leukocytes.

A pulsating dental water jet allows for the regulation of pressure. Bhaskar et al4 showed that attached gingiva can withstand high amounts of pressure, up to 160 psi for up to 30 seconds, without producing irreversible damage. Moveable tissue is more vulnerable. From this, it was concluded that up to 90 psi is acceptable on undamaged oral tissue, while 50 psi to 70 psi is recommended for inflamed or ulcerated tissue.1 Selting et al5 found that efficacy was similar between medium- and high-pressure settings, but at lower settings, efficacy was less than 50%. These findings

*Distinguished Service Professor and Chair, Department of Periodontics and Endodontics; Adjunct Professor of Pharmacology, Director, Center for Dental Studies, University at Buffalo, State University of New York, Buffalo, New York
are in agreement with a position paper of the American Academy of Periodontology, which stated that “irrigation of 80 psi to 90 psi generally can be tolerated without untoward effects.”

**EFFECT ON BIOFILM AND BACTERIA**

In 2001 the American Academy of Periodontology stated, “Among individuals who do not perform excellent oral hygiene, supragingival irrigation with or without medications is capable of reducing gingival inflammation beyond that normally achieved by toothbrushing alone. This effect is likely due to the flushing out of subgingival bacteria.” A number of researchers have found that a dental water jet reduces the amount of bacteria in the gingival crevice. Cobb et al and Drisko et al found that bacterial counts were reduced up to 6 mm. Cobb found that pulsed water irrigation also affected bacterial viability and the bacteria remaining in the pockets had a disrupted cell wall and reduced cytoplasm. These are referred to as “ghost cells” because they are non-functioning or dead (Figure 2A through Figure 2C).

A recent in vitro study evaluated the effect of a standard and orthodontic dental water jet tip on plaque biofilm (see Gorur et al, pp 1-6). Ex-vivo plaque biofilm was grown on teeth extracted from a patient with advanced aggressive periodontitis. Tooth samples were treated with water, using either the standard jet tip or the orthodontic jet tip for 3 seconds at a medium-pressure setting. The samples were evaluated via scanning electron microscopy. Comparisons between the treated areas of the tooth sample and the untreated samples (control) revealed a 99.9% removal of salivary plaque biofilm by the standard jet tip and 99.8% by the orthodontic tip. The orthodontic tip also demonstrated significant removal of calcified in vivo-grown plaque biofilm.
ANTI-INFLAMMATORY EFFECTS

Several studies have shown that the dental water jet significantly reduces inflammation.9-12 Chaves et al9 found that the dental water jet significantly reduced inflammation even in sites with good plaque biofilm control. This result led Chavez to hypothesize that the dental water jet works by a mechanism independent of plaque biofilm removal and may involve specific host–microbial alterations in the subgingival environment.

Other studies confirm that bacterial cells exposed to pulsed irrigation produced less tissue-based mediators of inflammation. Al-Mubarak et al11 showed that patients who used twice-daily irrigation had significantly better reductions in serum measures of interleukin-1-beta (IL-1β) and prostaglandin E2 (PGE₂) at 12 weeks. Cutler et al12 showed that daily water irrigation significantly reduced gingival crevicular levels of the proinflammatory mediators IL-1β, and PGE₂ associated with attachment and alveolar bone loss.

Table 1

Reduction of Inflammation and Plaque Biofilm

<table>
<thead>
<tr>
<th>Study</th>
<th>Duration</th>
<th>N</th>
<th>Agent Used</th>
<th>% Bleeding Reduction</th>
<th>% Gingivitis Reduction</th>
<th>% Plaque Biofilm Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Mubarak et al⁹</td>
<td>3 months</td>
<td>50</td>
<td>Water</td>
<td>43.4</td>
<td>66.9</td>
<td>64.9</td>
</tr>
<tr>
<td>Barnes et al⁹</td>
<td>4 weeks</td>
<td>105</td>
<td>Water</td>
<td>36.2–59.2</td>
<td>10.8–15.1</td>
<td>8.8–17.3</td>
</tr>
<tr>
<td>Brownstein et al²²</td>
<td>8 weeks</td>
<td>44</td>
<td>CHX (0.06%)</td>
<td>52–59</td>
<td>25.4–31.1</td>
<td>14.3–19</td>
</tr>
<tr>
<td>Burch et al²²</td>
<td>2 months</td>
<td>47</td>
<td>Water</td>
<td>57.1–76.6</td>
<td>29.3–37.7</td>
<td>52–55.7</td>
</tr>
<tr>
<td>Chaves et al⁹</td>
<td>6 months</td>
<td>105</td>
<td>CHX (0.04%)</td>
<td>54</td>
<td>26</td>
<td>35</td>
</tr>
<tr>
<td>Ciancio et al²²</td>
<td>6 weeks</td>
<td>61</td>
<td>Essential oils†</td>
<td>27.6</td>
<td>54–55.7</td>
<td>23–24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water and alcohol 5%</td>
<td>13.6–31.2</td>
<td>59.8–61.9</td>
<td>9.6–13.3</td>
</tr>
<tr>
<td>Cutler et al¹⁰</td>
<td>2 weeks</td>
<td>52</td>
<td>Water</td>
<td>56</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Flemmig et al¹⁷</td>
<td>6 months</td>
<td>175</td>
<td>CHX (0.06%)</td>
<td>35.4</td>
<td>42.5</td>
<td>53.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water</td>
<td>24</td>
<td>23.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Flemmig et al¹⁸</td>
<td>6 months</td>
<td>60</td>
<td>Acetylsalicylic acid 3%</td>
<td>8.9</td>
<td>29.2</td>
<td>55.6</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Water</td>
<td>50</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Felo et al²⁰</td>
<td>3 months</td>
<td>24</td>
<td>CHX (0.06%)</td>
<td>62</td>
<td>45</td>
<td>29</td>
</tr>
<tr>
<td>Fine et al²⁰</td>
<td>6 weeks</td>
<td>50</td>
<td>Essential oils‡</td>
<td>14.8–21.7</td>
<td>NR</td>
<td>36.8–37.7</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Water</td>
<td>7.5–10.6</td>
<td>NR</td>
<td>15.5–18.4</td>
</tr>
<tr>
<td>Jolkovsky et al⁹</td>
<td>3 months</td>
<td>58</td>
<td>CHX (0.04%)</td>
<td>NR</td>
<td>33.1</td>
<td>51.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water</td>
<td>NR</td>
<td>18.6</td>
<td>25.6</td>
</tr>
<tr>
<td>Lobene¹⁹</td>
<td>5 months</td>
<td>155</td>
<td>Water</td>
<td>NR</td>
<td>52.9</td>
<td>7.9</td>
</tr>
<tr>
<td>Newman et al²⁰</td>
<td>6 months</td>
<td>155</td>
<td>Water</td>
<td>22.8</td>
<td>17.8</td>
<td>6.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water and zinc sulfate (0.57%)</td>
<td>8.8</td>
<td>6.5</td>
<td>9.2</td>
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<tr>
<td>Sharma et al²¹</td>
<td>4 weeks</td>
<td>128</td>
<td>Water</td>
<td>84.5</td>
<td>No Data</td>
<td>38.9</td>
</tr>
<tr>
<td>Walsh et al²¹</td>
<td>8 weeks</td>
<td>8</td>
<td>CHX (0.2%)</td>
<td>NR</td>
<td>45</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quinine salt</td>
<td>NR</td>
<td>14</td>
<td>0</td>
</tr>
</tbody>
</table>

CHX = chlorhexidine; NR = Not reported.
⁹Reported the range for the two irrigation groups.
‡Reported the range for prophy and non-prophy groups.
⁹Percentages were reported for differences between CHX and water irrigation groups.

Adapted from Greenstein et al.⁵
DEPTH OF DELIVERY

Studies have evaluated the depth of delivery into a periodontal pocket by a dental water jet. Boyd et al.\textsuperscript{13} found that using the supragingivally placed tip (Standard Jet Tip, Water Pik, Inc, Fort Collins, CO) placed at the gingival margin allowed penetration of a solution to 54\% of the depth of a pocket. An earlier study showed that a standard jet tip placed at 45° or 90° at 70 psi achieved penetration of solutions up to 71\% in shallow (0 mm to 3 mm) pockets, 44\% in moderate (4 mm to 7 mm) pockets, and 68\% in deep (> 7 mm) pockets. Also, depth of penetration was found to be 75\% or greater in 60\% of deep sites.\textsuperscript{14} Statistically, tip angulation did not influence penetration.

Using a subgingival irrigation tip (Pik Pocket\textsuperscript{®} tip, Water Pik, Inc), it has been shown that a solution reached 90\% of the depth in pockets \textgtr 6 mm.\textsuperscript{15} In comparison, rinsing the mouth for 30 seconds reached 21\% of the depth of the pockets (Figure 3). These depths of penetration studies help to explain why the dental water jet has been shown to be of benefit in patients with gingivitis and periodontitis.

RATIONALE FOR PATIENT USE

The rationale for having patients use a dental water jet is based on a number of studies. A dental water jet has been found to be significantly effective in reducing gingivitis, bleeding on probing, and plaque biofilm (Table 1).\textsuperscript{9-12,16-27} In many cases, these outcomes were achieved above and beyond routine oral hygiene, including flossing.\textsuperscript{10-12,16} In a 2005 position paper, the American Academy of Periodontology stated that “supragingival lavage can assist individuals with gingivitis or poor oral hygiene. The greatest benefit is seen in patients who perform inadequate interproximal cleansing.”\textsuperscript{6} The validity of this statement was demonstrated in a recent study. A dental water jet was paired with a manual or a power toothbrush and both were compared with traditional manual brushing and flossing to see which regimen was the most effective.\textsuperscript{10} The addition of a dental water jet, once daily with plain water, to either a manual or power brushing routine was an effective alternative to dental floss for the reduction of bleeding, gingivitis, and plaque biofilm. It is likely that many patients currently using a power toothbrush may get further improvements in oral health by the addition of a dental water jet.

DENTAL WATER JET DEVICES

Most of the evidence to support the efficacy of the dental water jet has been generated from investigations using the

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Studies of 1 Month or Longer for Inflammation and Biofilm Measures Using Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>No. of Studies</td>
</tr>
<tr>
<td>Waterpik\textsuperscript{9-12,16-26,32}</td>
<td>16</td>
</tr>
<tr>
<td>OxyJet\textsuperscript{25}</td>
<td>1</td>
</tr>
<tr>
<td>Hydro Floss\textsuperscript{28,29}</td>
<td>2</td>
</tr>
</tbody>
</table>

\textsuperscript{*}No data reported in one study and non-significant reduction of 27\% in gingivitis in second study of only lower anterior teeth.

\textsuperscript{†}Data only available for lower anterior, showing a reduction of 40\% in plaque and calculus as one score classed as “accretions.”
Waterpik dental water jet (Water Pik, Inc) (Table 2). A study of a device using a tip that incorporates microbubbles (Oral-B® OxyJet, Procter and Gamble Co, Cincinnati, OH) found that the observed effects were significantly different from their baseline scores, but there was no difference compared with regular oral hygiene regimens.\textsuperscript{28} Studies also have been published using a magnetized dental water jet (Hydro Floss\textsuperscript{®}, Oral Care Technologies, Inc, Bessemer, AL).\textsuperscript{29,30} The device's efficacy was evaluated on the lower anterior teeth in two studies. The index used to measure tooth accretions did not separate calculus from plaque and is not used in the literature as a standard method of measuring plaque and calculus. The “Accretion Index” has been used only in these studies. The index showed a statistically significant reduction of “accretions” on the lower anterior teeth compared with controls.\textsuperscript{29} The dropout rate of subjects who participated in one study was 24%, which far exceeds the 10% to 14% rate found in most 3-month studies and resulted in only 20 subjects who used the test device. The control irrigator in these studies was the same unit without the magnet. Other studies suggest that reduction in calculus of 40% or greater can be accomplished with an irrigator without “magnetized” water. Lobene\textsuperscript{19} used a published calculus index and found a 50% reduction in calculus with a non-magnetized dental water jet (Waterpik dental water jet) compared with control. Felo\textsuperscript{20} found a 42% reduction with a non-magnetized device when delivering 0.06% chlorhexidine compared with a 22% increase in the 0.12% chlorhexidine rinse group.

IRRIGATION WITH CHEMICAL AGENTS

Most dental water jets are designed so that commercially available mouthrinses can be used without causing any harm to the device mechanism. The chemical agents that have been shown to be the most effective are chlorhexidine and essential oils. Chlorhexidine (CHX) has been evaluated frequently in dental water jet studies (Table 1).

One of the benefits of using CHX is better interproximal and subgingival penetration compared with rinsing. Also, diluting CHX is acceptable for use in a dental water jet. Dilutions of 0.04% and 0.06% (based on a 0.12% concentration) have been shown to be effective via randomized clinical trials.\textsuperscript{9,17,21,22} Essential oils also have been studied as irrigants. Their efficacy has been demonstrated using the rinses at full strength.\textsuperscript{23,25} The efficacy of diluting these agents has not been studied.

RESEARCH WITH SPECIAL POPULATIONS

Orthodontic Patients

Orthodontic appliances present significant challenges for plaque biofilm control. A number of studies have evaluated use of the dental water jet in patients with orthodontic appliances. The studies demonstrated a significantly better reduction in plaque biofilm and inflammation compared with controls.\textsuperscript{27,31,32} A recent study compared the effect of a dental water jet with a special orthodontic jet tip with floss on plaque biofilm and bleeding in adolescent patients with fixed orthodontic appliances.\textsuperscript{26} Patients were randomly assigned to one of three treatment groups: (1) once-daily irrigation plus use of a manual toothbrush; (2) once-daily flossing plus a manual toothbrush; or (3) use of a manual toothbrush only. Patients assigned to the flossing and irrigation groups had to demonstrate proficiency with the use of a floss threader or the dental water jet. At 4 weeks, the dental water jet group exhibited 3.76 times the reduction of the floss group and 5.83 times the reduction of the brush group for plaque biofilm removal. The dental water jet group showed an 84.5% reduction in bleeding from baseline, which was 26% better than the reduction demonstrated by brushing and flossing.

Diabetes

There are more than 20 million people living with diabetes in the United States and 246 million worldwide. Because patients with diabetes have an increased risk for periodontal diseases compared with patients without diabetes, effective biofilm control is essential for them. Al-Mubarak et al\textsuperscript{11} looked at the effect of a dental water jet on individuals with diabetes. They found that, in addition to reducing the traditional clinical parameters of plaque biofilm, gingivitis, and bleeding on probing, twice-daily use of the dental water jet with a specialized subgingival delivery tip significantly reduced the expression of two destructive inflammatory mediators, IL-1\textbeta{} and PGE$_2$, better than routine oral hygiene regimens.

Periodontal Maintenance

A dental water jet with water added to the daily routine of patients in periodontal maintenance programs had significantly better reductions in gingival inflammation, bleeding on probing, and probing depth reduction compared with
routine oral hygiene regimens. Likewise, studies that have used scaling and root planing followed by daily use of the dental water jet have also found better reductions in inflammation. Patients with periodontal diseases or who have completed periodontal therapy may especially benefit from use of a dental water jet as an adjunct to regular oral hygiene.

Implants
A study by Felo et al found that a specialized subgingival delivery tip (Pik Pocket tip, Water Pik, Inc) was both safe and effective for controlling bleeding and inflammation around implants. When a dental water jet using 0.06% (half-strength) CHX was compared with rinsing with 0.12% (full-strength) CHX, significant reductions strongly in favor of the dental water jet were observed. This study demonstrated that irrigation with 0.06% CHX was 87% more effective at reducing bleeding than rinsing with 0.12% CHX.

SAFETY
Safety is as important as efficacy in recommending use of a product or device to a patient. Early studies confirmed the safety of the Waterpik dental water jet. Over time, the compilation of evidence from the more than 50 studies in more than 2,000 patients provides a well-documented profile on the safety of this dental water jet for most patients with daily use. In all of these studies, no significant adverse events have been observed by researchers or reported by patients.

Transient bacteremia is common in dentistry with the manipulation of the oral tissue and teeth. The 2007 American Heart Association guidelines for the prevention of infective endocarditis states, “Transient bacteria also occurs frequently during routine daily activities unrelated to a dental procedure, such as tooth brushing and flossing (20% to 68%), use of wooden toothpicks (20% to 40%), use of water irrigation devices (7% to 50%), and chewing food (7% to 51%).” The evidence supports the need to maintain good oral hygiene with the goal to eradicate dental disease to decrease the frequency of bacteremia from routine daily activities.

COMPLIANCE
Compliance is a major consideration when recommending any self-care device. Compliance has been evaluated in a few studies, with good compliance being reported. For example, a 6-month study by Flemmig et al found a 91.5% compliance rate with the dental water jet. In another study, Lainson et al followed up with subjects 1 year after the completion of participation in an oral irrigation study. They found two thirds of the patients still were using the dental water jet. Importantly, those using the dental water jet had significant reductions in gingivitis compared with those who stopped using one.

CONCLUSION
In view of the emerging data suggesting the important role of inflammation not only on periodontal diseases but also on the oral-systemic connection, the benefits of using the dental water jet may go beyond that of managing periodontal diseases, not only by reducing inflammation but also by affecting proinflammatory cytokines, which can affect the activities of a variety of body organs. The dental water jet is a safe and effective evidence-based device for improving and maintaining oral health in a wide variety of patient populations and oral health conditions. It is cost-effective, easy to use and, when used with water and paired with either a manual or powered toothbrush, has demonstrated clinical outcomes that are desired by both patients and practitioners. Finally, the dental water jet is an effective alternative to dental floss for those individuals who will not or cannot floss, providing significant reductions in bleeding, gingivitis, and plaque biofilm. Manufacturers’ specifications, especially for pressure and pulsation setting, are not equivalent. Dental water jets need to be evaluated separately, based on research specific to each product.

DISCLOSURE
The author has received an honorarium from Water Pik, Inc.

REFERENCES
Continuing Education Quiz

1. What are the critical mechanisms in the action of a dental water jet?
   a. solution concentration and tip width
   b. water temperature and stream speed
   c. pulsation and pressure
   d. tip angle and opening width

2. Studies have shown that a pulsating device was three times more effective than:
   a. toothbrushing with a manual toothbrush.
   b. a continuous stream device.
   c. flossing once a day.
   d. using a power toothbrush three times a week.

3. Subgingival access is beneficial because the biofilm in this area contains:
   a. gram-negative bacteria.
   b. endotoxins.
   c. polymorphonuclear leukocytes.
   d. all of the above

4. Bhaskar et al\(^4\) concluded that how much pressure is acceptable on undamaged oral tissue?
   a. up to 90 psi
   b. between 100 and 110 psi
   c. exactly 120 psi
   d. more than 160 psi

5. Cobb et al\(^3\) found that pulsed water irrigation:
   a. also affected bacterial viability.
   b. bacteria remaining in the pockets had a disrupted cell wall and reduced cytoplasm.
   c. gingival tissue responded.
   d. a and b

6. One study\(^14\) found that, using a supragingivally placed tip, depth of penetration was found to be 75% or greater in how many deep sites?
   a. 50%
   b. 60%
   c. 70%
   d. 80%

7. Using a subgingival irrigation tip, it has been shown that a solution reached how much of the depth in pockets \(\geq 6 \text{ mm}\)?
   a. 40%
   b. 60%
   c. 90%
   d. 100%

8. A dental water jet has been found to be significantly effective in reducing:
   a. gingivitis, bleeding on probing, and plaque biofilm.
   b. periodontitis, surface staining, and bleeding on probing.
   c. periodontal pockets, bleeding on probing, and volatile sulfur compounds.
   d. plaque biofilm, volatile sulfur compounds, and gingivitis.

9. In a study on orthodontic patients, the dental water jet group showed what reduction in bleeding from baseline?
   a. 76.8%
   b. 84.5%
   c. 87.3%
   d. 92.6%

10. A 6-month study by Flemmig et al\(^17\) found what compliance rate with the dental water jet?
    a. 90%
    b. 90.8%
    c. 91.5%
    d. 95%

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Oral healthcare providers know that toothbrushing alone does not effectively remove interproximal plaque biofilm from teeth. The challenge is getting patients to use something in between their teeth, to do something in addition to brushing. Usually, that something is the use of dental floss. Likewise, for patients the consistent daily challenge is using dental floss. For most, this challenge is finding the motivation to floss habitually. For many others, the problem is the dexterity required. For those who do floss routinely, less than half may be using proper flossing technique. If flossing is so challenging and frustrating for practitioners and patients alike, why is there still so much focus on recommending it?

What a relief it would be to many dental patients if floss would just go away. For two thirds of them, it already has. They do not think about it, they do not use it, and they do not care that they do not use it except possibly during the regular scolding that they hear at their dental visits.

The routine use of dental floss has consistently been dramatically low. Even among a group of health professionals, including dentists, less than two thirds used floss daily. The reality is that flossing is a demanding means of interproximal cleaning. The effectiveness of a product or device is irrelevant, if noncompliance issues are compelling, as with flossing.

TO FLOSS OR NOT TO FLOSS

Not surprisingly, oral healthcare providers care a great deal more about flossing than their patients. Patients expect the dental floss lecture at each visit, but many do not really listen to it. More importantly, often they hate dental floss and do not plan to change their behaviors. The floss talk may no longer instill feelings of guilt, which practitioners mistakenly hope will lead to behavior changes. It was Albert Einstein who defined insanity as doing the same thing over and over, expecting different results. It turns out that he described quite well the continued efforts of dental professionals to get their patients to use dental floss regularly.

Dr. Harriet Lerner has written several books for the mainstream reader about facilitating changes in relationships. Most of these books have the word dance in them, such as the *The Dance of Anger*, *The Dance of Intimacy*, and *The Dance of Fear*. The word dance in the titles suggests that for change to occur, one party must change the dance step. When that happens, the other party, surprised at the change, has no choice but to vary his or her dance step in response. This process is how change occurs. When the dance steps always stay the same, so does the dance. When the decision is made to no longer lecture patients...
about their need to floss, practitioners will have changed the dance step, and consequently, so will patients. Perhaps it is time to publish *The Dance of Floss*.

Adjunctive oral care would be easier to attain if there were an acceptable alternative to floss that enhanced patient compliance by offering yet another way to complete interproximal cleaning. It would not necessarily replace dental floss, although for some patients—especially patients who are adverse to flossing—it may. This something would have to be easier to use and comply with, as well as be easily added to a daily routine. The alternative would need to prevent and control gingivitis and periodontitis. Some newly developed device that is here today and gone tomorrow would not be an option. It would need to stay on the market reliably, and be easy for patients to find and buy.

**THE DENTAL WATER JET**

There are devices that non-flossers can more readily accept. And practitioners have always had the power to recommend something besides floss. Remember *The Wizard of Oz*, when the good witch Glinda tells Dorothy that she has always had the power to get home, she just needed to want it badly enough? Most practitioners do want to recommend something besides floss badly enough, especially those who are frustrated by unsuccessfully pushing floss for so long.

One interdental device that could be used in place of floss has existed for more than 45 years. If this device has been around for decades, why haven’t dental professionals fully embraced it? The answer is that current science has finally caught up with the technology. In an amazing twist of historical perspective, daily oral irrigation has reemerged as a powerfully effective technology. The dental water jet device was introduced back when we used to think plaque biofilm was just plaque (Figure 1). Early daily oral irrigation studies showed that the amount of disclosed plaque did not always change dramatically, yet improvement could be demonstrated in gingival parameters. Anything that did not remove “plaque” significantly, as measured by disclosing, was not judged to be very worthwhile. It was difficult to make sense of the improved gingival findings, and practitioners did not want to advocate a practice that did not remove a significant amount of plaque. Consequently, the Waterpik® dental water jet (Water Pik, Inc, Fort Collins, CO) was not often recommended. The current understanding of plaque as a biofilm has changed everything. The dental profession now knows that it is not only the amount of plaque biofilm present, but also its content, that impacts virulence. So, even if the total amount of plaque biofilm is not altered, a change in the content of the biofilm, rendering it less toxic to periodontal tissues, can decrease the disease-causing potential.

Armed with this new understanding of plaque biofilm and the role of inflammation in periodontal disease, the dental water jet (Figure 2 and Figure 3) is now making a comeback, like an actor being rediscovered due to a new starring role.

**BENEFITS OF IRRIGATION**

Many studies have demonstrated that regular use of the dental water jet reduces the important parameters of gingival/periodontal disease: periodontal pathogens, bleeding, probing depth, calculus, and gingivitis.9-11 The fascinating part is how it happens. Not only are the destructive pathogens affected, but so are the host inflammatory agents.12 There is finally an explanation for how the reduction in the amount of plaque biofilm after using a Waterpik dental water jet can be equivalent to traditional self-care, and yet lead to greater improvement in the disease process. Dental floss works by disrupting plaque biofilm, but there is no evidence to support its effect on inflammatory agents.

Today, the spotlight is on the importance of inflammation in periodontal disease and in the linkages between systemic and oral disease. A new oral disease paradigm requires a new look at the evidence regarding the benefits of oral irrigation.

Daily oral irrigation has a direct impact on the inflammatory process. In a study of the gingival crevicular fluid of

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Figure 2 Pulsating dental water jet (courtesy of Water Pik, Inc).
adult periodontal patients, 2 weeks of oral irrigation added to routine oral hygiene was shown to impact inflammatory mediators.\textsuperscript{12} Two mediators that promote inflammation were reduced, one anti-inflammatory mediator was increased, and the level of a different anti-inflammatory mediator was maintained. Additionally, there was a significant reduction in bleeding on probing, which correlated with the reduction in the inflammation-promoting agents.

Similarly, another investigation demonstrated that oral irrigation can change a constituent of plaque biofilm. Ordinarily, a fibrin-like mesh envelops biofilm and its associated debris. This mesh envelope is not evident after oral irrigation,\textsuperscript{9} offering more evidence to support the idea that changes in biofilm components can contribute to improvement in clinical parameters.

But, would the use of floss have had the same outcome? That question has been answered by a dental hygienist researcher, Dr. Caren Barnes, of the University of Nebraska.\textsuperscript{10} She and her colleagues acquired a population of about 100 people with moderate plaque and bleeding. One third of the patients added daily oral irrigation to their use of a power toothbrush, one third added oral irrigation to their use of a manual toothbrush, and another third combined manual brushing and flossing. The researchers were able to demonstrate that a manual toothbrush and oral irrigation significantly reduced bleeding and gingivitis over manual brushing and flossing. And, the use of a power toothbrush and oral irrigation was significantly better than a manual toothbrush and flossing in reducing bleeding and gingivitis.\textsuperscript{10} Finally, there is an evidence-based alternative to the pairing of brushing and flossing, with the attendant compliance issues.

Despite the proven benefits of power toothbrushing, a large category of patients will not use a power toothbrush, and also will not floss. The Barnes study suggests that the addition of an oral irrigator could overcome the deficiencies of manual brushing as compared with power brushing. Patients would be relieved and thrilled if the lecture designed to coax them into regular flossing would stop. Will they prefer a dental water jet to floss? Many practitioners find that patients prefer any alternative to floss.

**SUPPORT FOR THE DENTAL WATER JET**

The American Academy of Periodontology, often viewed as the authority in treatment recommendations, has endorsed oral irrigation by promoting supragingival lavage to assist those with gingivitis or poor oral hygiene.\textsuperscript{13} It is suggested that the greatest benefit of oral irrigation would be for patients who perform inadequate interproximal cleansing.\textsuperscript{13} Inadequate interproximal cleansing is commonplace. Consequently, it appears that most patients could benefit from home use of oral irrigation.

Interestingly, there has been evidence in the literature for quite some time that various other alternate approaches are equivalent or superior to floss for oral self-care. These include rinses of chlorhexidine and fluoride as well as cetylpyridinium chloride and fluoride, which can reduce interproximal plaque better than floss;\textsuperscript{14} interdental brushes, which can improve interproximal gingivitis better than floss;\textsuperscript{15} and curved interdental brushes, which can improve clinical parameters better than floss after 6 and 12 weeks.\textsuperscript{16} Another study showed that plaque biofilm removal and probing depth reduction was superior to that achieved with floss after 6 weeks of interdental brush use; patients also preferred the brushes over floss.\textsuperscript{17} One possible reason that floss does not perform as well in plaque biofilm removal in some studies is its inability to conform to a concave interproximal surface. An equivalent benefit has been demonstrated between the interdental brush and floss on subgingival plaque biofilm and proximal gingival health, and again, patients preferred the interdental brush because of simplicity of use.\textsuperscript{18}

Clearly, practitioners have witnessed that for periodontal health, other options such as the Waterpik dental water jet, chemotherapeutic rinses, and interdental brushes meet or beat floss. Oral irrigation is the only one of these options that also impacts the mediators of inflammation, which are important in controlling periodontal disease. Research results, combined with descriptions in the literature of self-induced damage that can result from improper floss use,\textsuperscript{19,20} further support the idea that floss may not be the panacea that it has been considered to be for so long.

**Figure 3** Cordless pulsating dental water jet (courtesy of Water Pik, Inc).
FLOSS IS NOT A PANACEA

Perhaps there are suitable alternatives to floss for soft-tissue health, but for decay prevention, floss has traditionally been viewed as essential, particularly for those prone to interproximal decay. Despite almost universal endorsement in dentistry, it is surprising how little evidence is available to support this claim. A comprehensive, systematic review of the literature on dental flossing and interproximal caries was published recently.21 Six trials were identified; however, study-to-study differences and the potential for bias among some of the researchers complicated study comparisons. No research studies were identified that used adult patients or unsupervised self-flossing.

Among the reviewed studies, flossing was performed professionally in four of the trials, supervised in one trial, and unsupervised in another. Four studies did not show a flossing benefit for caries prevention. For three of these studies, reasons such as small sample size and infrequent professional flossing may have precluded a flossing benefit. The fourth study used a split-mouth design with young adolescents who were supervised as they self-flossed each school day for 2 years. An anticaries benefit could not be demonstrated. One explanation might be that the study protocol included pulling waxed floss up and down once through the contact point instead of wrapping the floss around the tooth and using up-and-down strokes. Another reason that an anticaries benefit was not evident may have been that the use of fluoridated toothpaste by the children masked the benefits of flossing. In the two studies where a flossing benefit was observed, exposure to topical fluorides was unclear.

Consequently, the authors of the systematic review suggested that the presence of topical fluoride exposure, which is so prevalent today, may mask the sole effects of flossing. The authors observed that in the absence of convincing decay-preventive evidence, the endorsement of floss for caries prevention has been based largely on common sense logic. This logic suggests that plaque biofilm is cariogenic and because dental floss disrupts and removes some interproximal plaque biofilm, it would follow that flossing would reduce the caries risk. The authors went on to state that this logic-based assessment is a low form of scientific evidence, particularly when there is stronger support for other caries-preventive measures. They also provided a reminder about the possible harmful effects of improper self-flossing and advocated for more research about floss damage.19,20

Certainly, if flossing is already a habit, the practice should be continued, provided that it is improving oral health. The configuration of the gingival unit filling the embrasure space can determine indication for flossing. Floss is most effective in removing plaque in type I embrasures where the papilla fills the interproximal space. For type II, with slight to moderate recession of the papilla, or type III, with extensive loss of papilla, other oral hygiene practices can be more effective than the use of dental floss.22,23

The reciprocal relationship between oral and systemic health is particularly evident in diabetes. Patients with diabetes who used a dental water jet in addition to brushing and flossing showed reduced levels of several proinflammatory mediators and a reduction in periodontal and systemic measures.24 Currently, the oral irrigator appears to be the only oral hygiene device where the impact on host immune factors has been documented and correlated with a beneficial effect on soft-tissue health. Other beneficial applications of oral irrigation have been demonstrated for implants25 and for orthodontic patients, where superiority over manual brushing and flossing has been demonstrated.26

The Canadian Dental Hygiene Association recently commissioned a review and critical analysis of the literature on dental flossing to develop a position statement on the use of dental flossing as a preventive oral health behavior. This comprehensive review focused on compliance issues, difficulty of changing behaviors toward flossing, differing levels of efficacy depending on oral conditions, and the variety of other less awkward forms of interproximal cleansing. After supporting the importance of interdental cleansing to supplement toothbrushing, the position statement asserted that interproximal cleansing recommendations should be based on the oral condition, preference, and ability of each individual.2

CONCLUSION

Among oral healthcare providers, recommending the combined floss and toothbrush regimen has been traditional.
However, evidence-based practice has replaced tradition-based practice. To be truly patient-centered, practitioners must shift to recommendations that patients can embrace. New knowledge about plaque biofilm and the role of the immune system has been incorporated into current understanding of the etiology of oral disease. It is time to recommend an oral hygiene self-care regimen that is aligned with current concepts of human behavior and oral disease etiology. The Waterpik dental water jet is one such regimen.

DISCLOSURE
The author has received an honorarium from Water Pik, Inc.

REFERENCES
There is a great deal of discussion in the business world today about how to create value for customers. The same question applies to dentistry. How do we create value for patients and differentiate our office as a high-quality, caring practice? While there are many ways to approach this question, it is often the overlooked areas that may provide the best answers. This article focuses on the value and benefits of the Waterpik® dental water jet (Water Pik, Inc, Ft. Collins, CO) for patients and practice.

**THE VALUE OF A WATERPIK DENTAL WATER JET**

The Waterpik dental water jet is not a new item. Because it has been around for so many years, there is a tendency by some to overlook or to not understand the value of this device as an adjunct for oral home care. However, an increasing number of practices are recommending and dispensing the Waterpik dental water jet, based on the substantial evidence demonstrating excellent oral home care and creating added value for patients.

You may be surprised to think of a Waterpik dental water jet as a way to add real value to your practice. After all, dentists think about adding value through new products, new services, or a host of other clever and glitzy ideas. While many of these may have a place in your practice, the Waterpik dental water jet is proving to be one of the strongest value-added tools for practices because it enhances both patient care and practice productivity in the ways discussed in this article.

**IMPROVES PATIENT HEALTH**

The research on the Waterpik dental water jet spans 45 years and demonstrates significant reductions in inflammation and infection. In addition, a new study has demonstrated significant biofilm removal. This information allows dentists and hygienists to engage in an entirely new level of conversation with patients. The discussion of periodontal disease, biofilm, and inflammation is of great interest to patients, especially in light of research linking periodontal disease to other systemic conditions, including diabetes and cardiovascular disease. As soon as patients understand that untreated periodontal disease may have repercussions on their overall health, they become tremendously interested in the conversation. All of a sudden the Waterpik dental water jet comes across not as an established technology that has been in the consumer market for years, but rather a new way to create periodontal health, control biofilm, and reduce the risk for infection as it relates to systemic disease.

**DEMONSTRATES A HIGHER LEVEL OF CARE**

Practices should provide patients more direction on home care. A dentist’s recommendations can have a real impact on improving a patient’s oral care regimen. In a world where most opinions are shaped by retail marketing, it is time that dental practices take a stand on what they believe. Fortunately, an increasing number of practices are not only emphatically recommending Waterpik dental water jet to patients for home care, but also dispensing dental water jets in unprecedented quantities. Some dentists feel uncomfortable with the idea of selling a product in their offices. But offering excellent home-care products at a reasonable (or reduced) price is viewed favorably by many patients because they can enhance their oral health without having to drive to a retail store.

Practices that recommend and offer the Waterpik dental water jet for purchase in their offices are creating a

*CEO, Levin Group, Inc, Owings Mills, Maryland*
greater sense of caring. It is one thing to simply tell patients that they should brush and clean interdentally every day. It is another to tell them specifically what type of brush, interdental aid, or other device they should be using. When this information is combined with educating patients on how Waterpik dental water jets remove and disrupt biofilm, the relationship between the practice and patients is greatly strengthened.

While dentists have been recommending flossing for years, many patients do not follow through on this recommendation. For noncompliant patients, the Waterpik dental water jet is often the perfect solution because it allows them to achieve interdental care along with normal brushing.

**INCREASES PATIENT RETENTION**

Often, patient retention increases and no-shows and last-minute cancellations decline when the hygienist takes a strong role in educating patients and making recommendations for a specific home-care regimen. When patients understand that the hygiene appointment is not a cleaning, but a periodontal maintenance and oral cancer examination appointment, their sense of value for those appointments goes up. For example, many would never miss their annual physical, but would not think twice about giving up a dental appointment if “something else” came up. This type of mentality starts to change when the hygiene department enhances the level of value it provides. The home-care conversation, including the Waterpik dental water jet recast with new research and information, is an essential part of how patients view their hygiene visits.

**INCREASES PRACTICE PRODUCTION**

While dentists should only recommend or dispense products in which they truly believe, there is a financial benefit to using a dispensing system. An increasing number of practices dispense Waterpik dental water jets and use the additional revenue to fund continuing education, staff bonuses, retirement plans, or other practice investments. However you choose to use the revenue, practices need to augment their financial position, especially in today's slow economy. Remember, it is not uncommon for physicians to sell products. Dermatologists sell a variety of skincare products and ophthalmology practices sell glasses. Why should dentistry be any different? Keep in mind that dentistry is a business. Practices, while providing the highest possible quality of patient care, need to achieve a certain level of profitability to reinvest in the office and generate income. Dentistry is more costly to provide than ever before, and any avenue that enhances patient health and quality of care should be considered.

**ENSURES BETTER HOME CARE FOR PATIENTS**

The Waterpik dental water jet is an excellent home-care tool for patients because it enhances the effectiveness of regular brushing. In addition, it can help patients with orthodontics, implants, and other dental appliances or restorative dentistry, greatly improving their at-home care. It allows patients to clean around hard-to-reach areas and is also beneficial for patients with diabetes or those who are in a periodontal maintenance program. Dentists do not want patients to receive orthodontic or cosmetic care and then end up with periodontal or other dental problems shortly thereafter. The proper home-care regimen helps all patients to maintain optimal oral health. For patients undergoing orthodontic or other specialized treatment, the Waterpik dental water jet may be one of the best ways to protect their investment for a more attractive smile.

**CONCLUSION**

The Waterpik dental water jet is an established product with a new face. The new research clearly indicates that it provides tremendous benefit by disrupting and reducing plaque biofilm. This research creates an opportunity to educate patients and impress upon them the need for office visits and streamlined oral home care. In addition, Waterpik dental water jets can contribute revenue to the practice while providing excellent quality of care, including helping patients maintain some of the more complex cases that dentistry is providing today.

In a world of high technology, the Waterpik dental water jet is reemerging as one of the most beneficial technologies both for patients and the practice. Ultimately, this is what providing excellent dentistry is all about.

**DISCLOSURE**

Water Pik, Inc is a corporate sponsor of Levin Group, Inc.

**REFERENCE**

Mr. Hates-to-Floss has Found a New Love.

And you’ll love Waterpik® dental water jets, too, because they’re easier and more effective than flossing for your non-compliant patients.

NEW!

Breakthrough Plaque Removal Data

Removed 99.9% of plaque biofilm after 3-second application.¹

Scientifically Proven Results

- 3X as effective as floss for cleaning around orthodontic appliances²
- Up to 93% more effective than floss for reducing gingival bleeding³
- Effectively removes plaque biofilm

¹, ², ³ Data on file.

www.waterpik.com