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Knowledge and utilization of ultrasonic/sonic scaling instruments: A survey of West Virginia dental hygienists.

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KNOWLEDGE AND UTILIZATION OF ULTRASONIC/SONIC SCALING INSTRUMENTS: A SURVEY OF WEST VIRGINIA DENTAL HYGIENISTS

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ABSTRACT

KNOWLEDGE AND UTILIZATION OF ULTRASONIC/SONIC SCALING INSTRUMENTS: A SURVEY OF WEST VIRGINIA DENTAL HYGIENISTS

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Recent progress in understanding periodontal disease, combined with advances in the design and efficiency of powered scaling instruments suggest the need to reexamine the use of powered scaling instruments. A literature review reveals a lack of information addressing the extent of utilization of these instruments by dental hygienists. However, the literature is replete with information recommending the use of these devices in the treatment of periodontal disease. Information describing the knowledge level dental hygienists posses about ultrasonic/sonics and their current philosophy for using these instruments is needed. The purpose of this study was to determine how dental hygienists use powered scaling instruments and their philosophy of using these instruments.

A 29-item survey instrument was developed by a team of three dental hygienists and one hygienist/periodontist; all educators. Survey topic areas included: degree/program and employment demographics, subgingival/supragingival use, ultrasonic/sonic philosophy of use, frequency of use, reasons for non-use, type of tip insert(s) used, power/water settings and patient/operator comfort. A 51 % response rate (n=374) was achieved. It was found that West Virginia hygienists are aware of the changing philosophy regarding the use of power scalers for periodontal debridement and that use has increased and changed from merely gross scaling supragingivally to more thorough subgingival periodontal debridement.

DEDICATION

TO

Mom, my Guardian Angel, and to Dad
Who figures he gave me enough support
During his time on earth
That he is now away somewhere in Heaven
Harmonizing with the Angels.

I love and miss you both "very much".

Your loving daughter,
Jan

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Chapter I

INTRODUCTION

Recent progress in understanding the causes and effects of periodontal disease and its management, combined with advances in the design and efficiency of ultrasonic instruments, suggest the need to re-examine the use of powered scaling devices (PSDs) (1). In recent years, the dental literature has shown a dramatic shift in the philosophy of using powered scaling devices. Changing perspectives on the etiology and treatment of periodontal disease have been the contributing factors in this shift. The role calculus, plaque and host immune response play in periodontal disease progression is being evaluated more thoroughly by today's researchers. Many current studies are challenging old ideas and assumptions in the search for the best way to treat periodontal disease (2).

The purpose of this study is to determine how dental hygienists licensed and residing in West Virginia utilize powered scaling devices and their philosophy of using these instruments.

STATEMENT OF THE PROBLEM

There is a lack of literature addressing the utilization of powered scaling devices by dental hygienists. There is also a lack of literature describing current philosophy for using powered scaling devices among dental hygienists.

SIGNIFICANCE OF THE PROBLEM

In traditional dental hygiene practice, powered scaling devices have been described as "most effective with patients having gross stains, calculus and debris" (3). The dental hygiene student has typically been instructed to only use these devices in cases where heavy supragingival calculus and stains existed. Initial "gross scaling" with a powered scaling device was always followed by "fine scaling" with hand instruments (3, 4) and, often, meticulous "root planing" performed one quadrant at a time at a high cost

to both patient and operator (2). Complete cementum removal (5, 6), resulting in a "glassy-smooth" root surface was the goal of periodontal treatment. Traditionally, dental hygiene education has focused on the use of curets for subgingival calculus removal. More recent studies (7-11) suggest re-evaluating many traditional techniques and assumptions because new evidence supports a changing perspective in the utilization of periodontal therapy (2, 12).

The goals of periodontal therapy are to control infection and to regenerate the periodontium, thereby preserving the dentition. Therapy should resolve inflammation, arrest disease progression, maintain esthetics, maximize patient comfort, regenerate lost periodontium and create an environment that discourages recurrent disease (13). One aspect of achieving the control of infection is subgingival instrumentation. A newer approach to periodontal debridement changes the definition of successful therapy from "over treatment" of the root surface to the establishment of a more biocompatible subgingival environment that is conducive to the healing and maintenance of the periodontium (1, 2, 14). There is evidence that endotoxins (lipopolysaccharides or LPS) from gram-negative bacterial cell walls simply adhere as a thin smear layer (9) to the surface of the cementum, rather than penetrating it (7, 10), as previously thought. Earlier it was believed that complete cementum removal was necessary in order to remove the disease-causing agents, but recent findings suggest that extensive removal of cementum is not necessary to render the root free of bacterial endotoxins (15). Researchers discovered around 1970 that ultrasonic vibrations have a destructive effect on bacteria and that gram-negative bacteria are especially vulnerable to sonification (16). The mechanical effects of cavitation (shock and stress waves) can disrupt and lyse bacterial cell walls (16, 17) and result in reduced numbers of periodontal pathogens.

QUESTIONS TO BE ANSWERED

A survey instrument was developed to determine the use and philosophy of using powered scaling devices by dental hygienists currently licensed and residing in the state of West Virginia. This study was designed to answer the following questions:

- Is power scaler use impacted by education source or is use impacted by philosophy?
- Does length of practice of the hygienist correlate with a change in philosophy?
- Does the comfort level of the hygienist affect the extent of use of PSDs?
- Does the comfort level of the patient affect the extent of use of PSDs?
- Does length of practice correlate with a change in use?
- Do hygienists with fewer years of practice have a more current philosophy than hygienists with more years of experience?
- Are hygienists in West Virginia aware of the current philosophy in the dental literature regarding the use of PSDs?
- What impact has awareness of the current philosophy had on the extent of use of PSDs by hygienists?
- What effect has the educational source had on extent of use of PSDs?
- Is tactile sensitivity apparent during use of PSDs?

OPERATIONAL DEFINITIONS

Sonic scaling instruments–air turbine instruments which are attached to a conventional dental handpiece and used for periodontal and tooth debridement. Vibrations at the tip range from 2500 to 7000 cycles per second. The tip revolves in an elliptical or an orbital path.

Ultrasonic scaling instruments–electronically powered devices that produce vibratory motions to fracture deposits from tooth surfaces. The ultrasonic unit consists of an electric generator, a handpiece assembly, a set of interchangable debridement inserts and a foot control.

Scaling–the instrumentation of the crown and root surfaces of the teeth to remove plaque, calculus and stains (18).

Root planing–follows calculus removal by scaling. A definitive treatment procedure designed to remove cementum or surface dentin that is rough, impregnated with calculus, or contaminated with toxins or microorganisms. The traditional approach to root planing was to remove "necrotic" cementum and to achieve a "glassy-smooth" root surface.

Periodontal debridement—refers to the treatment of gingival and periodontal inflammation through mechanical removal of tooth and root surface irritants to the extent that the adjacent soft tissues maintain or return to a healthy, noninflamed state (2). This process is a combination of traditional scaling and root planing, focusing less on heavy strokes to remove cementum, (thus achieving an eventual "hourglass" shape to the root) and focusing more on lighter strokes and the removal of endotoxins.

Endotoxin—a toxic substance, also known as Lipopolysaccharide or LPS, that is exhibited by gram-negative bacteria on their outer cell walls. It has been shown to initiate the host's immune response, which can lead to tissue destruction (8).

Cavitation—a "cold boiling" of a liquid as it passes over the vibrating tip of a powered scaling device. Energy is released as bubbles of the liquid implode and collapse, creating a scrubbing effect (19).

ASSUMPTIONS

Two assumptions were made in this study:

1.) Dental professionals have been trained in the correct use of powered scaling devices during their formal dental hygiene schooling or through continuing education courses.

2.) Dental professionals have access to a powered scaling device at the workplace.

LIMITATIONS

The validity of the data received from the target population was dependent on their response rate and the accuracy of their responses. A cover letter enclosed with the questionnaire encouraged truthful, accurate responses and the assurance of anonymity.

DELIMITATIONS

1.) The survey questions only addressed sonic and ultrasonic powered scaling devices.

2.) Only dental hygienists currently licensed and residing in the state of West Virginia received questionnaires.

Chapter II

REVIEW OF THE LITERATURE

A review of the dental literature which describes the change in philosophy that has occurred in the use of powered scaling devices in periodontal treatment includes the following topics: (a) the development and initial uses of ultrasonic dental instruments; (b) mechanism of action of power scalers; (c) recommendation for use; (d) hand scaling versus power scaling; (e) plaque endotoxins; (f) cavitation and lavage; (g) aerosol production and infection control; (h) root planing and root surface texture; (i) periodontal debridement; (j) technique; (k) contraindications for use.

DEVELOPMENT OF ULTRASONIC INSTRUMENTS

In 1880 Pierre and Jacques Curie found that crystals of various materials placed under mechanical stresses develop electrical charges on their surfaces. This conversion of mechanical energy into electrical energy is called the piezoelectric effect. When electrical energy is applied across piezoelectric substances, small and rapid changes in shape occur in these materials. These vibrations have a specific frequency and amplitude. Ultrasonic instruments use this principle. Alternating current of high frequency applied to a piezo-electric substance causes corresponding lengthening and shortening of the substance over tiny distances, resulting in physical vibrations (19).

From 1920 to 1955 some important developments in electronic circuitry occurred. By using quartz, barium titanate, lead zirconate titanate, Rochelle salts, lithium sulfate and ferromagnetic metals, processes like ultrasonic cleaning, drug and chemical processing, flow metering and others were being developed. When metal transducers were produced it became possible to develop a handpiece and instrument tips that could be used as clinical instruments on the surfaces of the teeth (19). In 1953, Catuna was the first to call attention to the possibility of applying the ultrasonic cutting principle in dentistry (20).

When ultrasonic instruments were first introduced to the field of dentistry, they had already been used in industry for cutting glass, ceramics and similar hard, brittle materials (21). Dentists were initially interested in using this tool as a cutting device for the teeth. Attempts to cut extracted teeth appeared to be successful.
The cuts were smooth and accurate (22). When the device was eventually used on patients, reaction was favorable. Patients reported no pain when dentin was being cut (2, 21, 23). However, a liberal slurry of an abrasive and water was required to control heat production that considerably reduced visibility (23). During this time, high-speed turbine drills were developed and introduced and were found to be very effective. As the turbine drill became the instrument of choice of the dental profession, the ultrasonic drill was phased out. In his 1968 textbook, "Ultrasonic Therapy in Periodontics" (19) Ewen recommended the ultrasonic instrument for periodontal debridement, scaling and root planing. This suggestion apparently became forgotten as ultrasonic instruments failed to hold up under scrutiny in other applications, such as gingivoplasty, gingivectomy, mucogingival surgery, ultrasonic curettage and drug administration (19, 24).

In the 1960s, dental professionals believed that periodontal inflammation was caused by the presence of calculus. They believed that surface roughness of the calculus irritated and inflamed healthy tissues. This seemed to indicate that complete calculus removal was necessary to attain healing (3). Dental hygiene education focused closely on calculus detection and removal with hand instruments. During the 1950s, 60s, and 70s researchers, in an attempt to determine which method of therapy produced the smoothest root surface (25-28), examined extracted teeth that had been treated by either hand or ultrasonic instruments (28). Scanning electron microscopes were used to study the surfaces of the teeth after instrumentation. Over four decades of study, hand instruments, specifically curets, were shown to produce a smoother root surface and were supported as the preferred means of scaling and root planing. Wilkins recommended ultrasonic instrumentation as an adjunct to manual scaling but, specifically, not as a substitute. She wrote

that root planing was not accomplished by ultrasonic instruments and should be performed by curets (3). The fear of "undesirable surface alterations" discouraged using ultrasonics for anything other than "gross stains, calculus and debris" (3).

In the mid- 1970s and early 1980s researchers began to question whether a smooth root surface was the actual catalyst for periodontal healing (2). In 1983, Khatiblou and Ghodossi divided twelve patients with localized advanced periodontitis into experimental and control groups. After measuring attachment loss and pocket depth in each group, modified Widman flap surgery was performed. A number of shallow horizontal grooves were made on the root surfaces of the experimental group to roughen them. Measurements were taken again after four months. The results indicated that in both groups gain of attachment and pocket reduction were statistically significant (29).

During this time, studies showed that curets produced significantly smoother tooth and root surfaces than ultrasonic instruments, and, since a smooth tooth surface was the goal of periodontal therapy, using powered scaling devices was considered only for patients with heavy tooth deposits (26, 30, 31). In recent years, with the shift in perspective toward root debridement being seen as a way to treat a bacterial infection instead of the tooth/root surface itself, the use of powered scaling devices has gained in popularity as a means of treating periodontal disease (32).

MECHANISM OF ACTION

High frequency sound waves are the principal action of the ultrasonic scaling instrument. These waves vibrate at a rate of 24,000 to 50,000 cycles per second (3). The working tip vibrations of ultrasonic scaling instruments vary: magnetostrictive devices (Dentsply Cavitron™) have an elliptical tip motion; piezoelectric units have a linear tip motion; and ferromagnetic units (Odontoson™) have a rotational motion. The titanium tip in the Odontoson rotates 360 degrees in three different planes which results in equal effectiveness of all sides of the tip. Sonic instruments vibrate at frequencies ranging from

2500 to 7000 cycles per second (3). The working tip moves in an elliptical or orbital motion.

Ultrasonic scaling units convert high-frequency electrical current into mechanical vibrations. These conversions are attained by either magnetostrictive or piezoelectric transducers (4). Sonic instruments are driven by air turbine (3, 7th Ed.). Both magnetostrictive and piezoelectric units have a generator that produces high frequency electrical current. However, they differ in the way the electrical energy is changed into mechanical vibrations, the number of surfaces on the tips that are activated, and the mode of action. A quartz or metal alloy crystal transducer changes electrical impulses into ultrasonic vibrations in the piezoelectric unit (2).

Magnetostrictive (Ultrasonic) Scalers

The magnetostrictive type of ultrasonic unit produces an alternating electromagnetic field in the handpiece insert where the transducer shortens and lengthens when the foot pedal is depressed. Electrical current enables the transducer to produce ultrasonic vibrations that are dissipated as heat. The removal of hard and soft deposits from the tooth surface is attributed mostly to the vibratory "chipping" action of the scaling tip when the direction of motion is roughly parallel to the surface of the tooth (23). The entire unit is movable and compact and attaches to electrical and water outlets. It has manual power and water controls and the on /off switch is located in the foot pedal. The working tip is attached to the transducer and this apparatus is inserted into the handpiece of the unit (4).

Piezoelectric (Ultrasonic) Scalers

In the piezoelectric scalers, electrical energy is converted into ultrasonic vibrations by a quartz or metal alloy crystal transducer. No magnetic field is produced, so less heat is generated. Vibrations produced at the working tip of the instrument range from 29,000 to 50,000 cycles per second in a linear direction (3). The Piezoelectric tip has cutting edges that help remove tooth deposits. These cutting edges are located along the

side of the working tip. Water is used to cool the heat build-up produced by the friction between the working tip and the surface of the tooth (3).

Sonic Scalers

Sonic instruments are small power scaling devices that produce mechanical vibrations from air pressure instead of electricity. Air passed over a metal rod inside the handpiece produces the vibrations. The sonic scaler fits directly into the handpiece line of a dental unit that provides the power. There is no electrical unit and this gives the sonic scaler the advantage of easy mobility in the dental setting. Because the sonic scaler operates at a much lower audible range than the ultrasonic devices, its effectiveness is influenced by the type of tip used, air pressure input, and the application load (33). Heat is not generated during operation of the sonic scaler, but water passes through the handpiece to the tip to reduce the frictional heat that may be produced and to act as a lavage (4).

In an *in vitro* study in 1985, Lie and Leknes compared root surfaces of extracted teeth that had been instrumented with sonic or ultrasonic scalers. Using scanning electron microscopy, the results indicated that the Titan-S sonic scaler was as effective at calculus removal as the Dentsply Cavitron ultrasonic scaler. However, the Titan-S sonic scaler appeared to cause less root surface roughness than the ultrasonic scaler (34).

RECOMMENDATIONS FOR USE

In 1985, the ADA Council on Dental Materials, Instruments and Equipment provided a list of the following recommendations for the use of ultrasonic scalers (35).

1.) Use the lowest power setting possible, yet one that is still effective for removing calculus, cement, etc.

2.) Use an adequate supply of water to avoid heat build-up at the tip of the instrument and tooth surfaces.

3.) Keep the tip constantly in motion and use quick, light, back-and-forth brush strokes.

4.) Remove any roughness present on the instrument tips to prevent scratching of the tooth surface.

5.) Wear protective glasses and a face mask when performing these procedures.

6.) Frequently check the tooth surfaces with the unpowered instrument tip or a dental explorer for remaining adherent deposits.

7.) Finish scaling and plaque removal with hand instruments to obtain a smooth tooth surface that is free of subgingival deposits.

8.) Do not apply pressure with the instrument tip against the tooth. It will not increase the effectiveness of calculus removal and can damage tooth and root surfaces, and restorations.

9.) Do not use an ultrasonic scaler if the patient or clinician has a pacemaker or another electronic life-support device.

It has been shown that some interference with pacemakers occurs when certain ultrasonic and electrosurgical dental devices are used near the treatment area. Miller, et. al., in 1998, found that "atrial and ventricular pacing were inhibited by electromagnetic interference produced by the electrosurgical unit up to a distance of 10 cm, by the ultrasonic bath cleaner up to 30 cm, and by the magnetostrictive ultrasonic scalers up to 37.5 cm." The devices named were as follows: The Sensimatic 300 SE (electrosurgical unit by Parkell Electronics), two magnetostrictive ultrasonic scalers, (Cavitron by Dentsply and LeClean, Parkell Electronics) and an ultrasonic bath cleaner (Jelenko, Jelrus Technical). These devices were found to inhibit atrial and ventricular pacing. No other devices were found to interfere with pacemaker activity (36).

Research in the 1960s and 1970s found that ultrasonics seemed to leave a rougher surface than hand curets (37, 38). Several studies were designed to determine which method of therapy produced the smoothest root surface (25-28) since it was thought that root smoothness was an important factor in the treatment of periodontal disease. Since it had been shown that curets produced a smoother root surface, dental clinicians were advised against using power scalers in the subgingival areas of the oral cavity.

HAND SCALING VERSUS POWER SCALING

The question of whether hand scalers or powered scaling devices produce a subgingival environment most conducive to health has been studied. In 1978, Walsh and Waite studied 15 patients requiring periodontal surgery in the maxillary posterior quadrants. Using a split-mouth technique, at given time intervals, assessments were carried out using the Gingival Index, crevicular fluid measurement, Plaque Index and Retention Index. Periodontal flap surgery was carried out about 8 weeks after the first assessment. On one side, debridement was performed using an ultrasonic scaler. On the other side, hand instrumentation only was used. An increased rate of healing (as measured by the Gingival Index and crevicular fluid) was observed on the side receiving ultrasonic debridement during surgery.

In 1982, Thornton and Garnick compared the effectiveness of hand and ultrasonic instrumentation in removing subgingival plaque. Twenty-four teeth in five patients were assigned randomly to be scaled by hand instruments, by ultrasonic instruments, or not instrumented as a control. After delineating the subgingival area, the teeth were extracted for periodontal reasons. No significant difference was found between the two methods in subgingival plaque removal. It was also found that neither method removed all of the plaque (39).

In a study that resulted in a change in dental professionals' attitude toward use of ultrasonics subgingivally, Leon and Vogel used differential dark-field microscopy and gingival crevicular fluid flow in 1987 to compare the effectiveness of hand scaling and ultrasonic debridement in various classes of furcations. They found that both hand scaling and ultrasonic debridement were equally effective in Class I furcations for promotion of healing. However, ultrasonic debridement was significantly more effective than hand scaling in Class II and Class III furcations in returning these areas to a healthy state (40).

Checchi and Pelliccioni used extracted, periodontally-involved teeth to determine whether ultrasonic scalers were as effective as curets in providing fibroblast attachment to the scaled root surfaces. The teeth were cut along the sagittal plane; one half of the

root was scaled with a curet, the other half scaled with an ultrasonic instrument. Monkey kidney fibroblasts were suspended in a petri dish containing root fragments of the tooth halves. After treating the dishes with radioisotopic techniques, no significant difference in fibroblast growth between periodontally involved root surfaces treated with curets or ultrasonic scalers was found. However, both treatments caused a loss of toxicity of the roots (11).

In 1994 Drisko et. al. evaluated calculus removal on extracted teeth and reported significantly ($p < .05$) less residual calculus following 40-second use of a Cavitron equipped with Slimline tips compared to 40-second use of sharp curets. In a separate case study, a total of one hour of periodontal debridement using only the Odontoson ultrasonic scaler was performed on the left half of the subject's mouth. Two sessions of one and a half hours each of quadrant scaling and root planing were perfomed with local anesthetic on the right half of the patient's mouth. At the two-month reevaluation appointment, average pocket depth reduction and attachment gain on the hand-instrumented side was 0.52 mm and 0.65 mm respectively, where the side treated with only ultrasonic resulted in nearly identical probing depth reduction (0.59 mm) and slightly better attachment gain (0.87 mm). Drisko states, "In this case the aggressive hand instrumentation seemed to be of little benefit since the ultrasonic-treated side achieved similar results in considerably less time (66 percent). Less operating time was needed for the power scaler in these studies. Four advantages to decreased operating time were listed: "(1) increased patient flow and acceptance of the treatment regimen; (2) decreased fatigue for the operator and patient; (3) increased cost-effectiveness for the patient; (4) increased productivity for the clinician" (41).

PLAQUE ENDOTOXINS

During the 1970s, data from *in vitro* experiments suggested that periodontally involved root surfaces harbored substances of bacterial origin, endotoxins, that were determined to be toxic to epithelial and fibroblast cells (5, 6, 8, 42) Lipopolysaccharide

(LPS) was the term suggested for the toxic substance that gram-negative bacteria exhibit on their outer cell walls (43). These toxic substances were believed to be bound to the cementum (5, 6), and it was postulated that all contaminated cementum be removed to create a biologically acceptable root surface (15, 27). As a result it was believed for many years that endotoxins in "diseased" cementum would prevent healing after periodontal therapy. This belief led to the idea that periodontal therapy must include removal of the cementum to promote proper healing (13). Some studies also showed that endotoxins from periodontally-involved cementum caused changes in living tissue. In 1969 Nowotny showed that LPS is toxic to living tissues by injecting it into animals. This resulted in fever, destruction of bone marrow, changes in white blood cells, shock and death (44).

In 1986, Hughes and Smales studied periodontally-involved teeth after extraction and concluded that LPS is only present on the surface of the cementum. They reported no evidence that LPS penetrated into the cementum (45).

In 1988 Hughes, et.al. used scanning electron microscope immunohistochemistry and found that, after careful scaling, most of the endotoxin that remains on the root surfaces is associated with residual plaque and calculus rather than the absorption of LPS into the cementum (10). In 1982, Nakib and others showed that endotoxins simply adhere to the surface of the root cementum in a smear layer rather than penetrating it as previously thought. According to this study they are superficial and can be easily removed by rinsing or brushing (7).

CAVITATION AND LAVAGE

In 1968, Ewen described ultrasonic cleaning as the energy generated by sound waves to create cavitational bubbles in a liquid. Water acts as a coolant and as water contacts the vibrating tip it cavitates into a spray of tiny vacuum bubbles that implode and collapse inward. The vibration and collapse of these bubbles creates a scrubbing

action that helps the vibrating tip remove plaque, calculus and stains and clears the field of debris. Ewen calls this process “cold boiling” (19).

Walmsley also suggested that the efficiency and action of the powered scaling device are not just related to the mechanical action of the scaling tip. He showed that additional areas of plaque removal were seen when he compared water-cooled to non-water-cooled power scaling. He concluded that the effectiveness of the cooling water from the active ultrasonic scaler is due primarily to the cavitational activity present, but it is also dependent on the type of scaling tip used, how this tip is oriented to the tooth, and on the selection of a suitable power setting of the unit (46, 47).

In 1996, Westfelt stated that “ultrasonic instrumentation has a beneficial effect in creating a smooth surface without extensive removal of cementum.” He added that the cavitational activity that occurs with the ultrasonic instrument contributes to plaque removal and this makes the instrument even more suitable for maintenance therapy. He used tissue healing response to assess the result of the debridement (48). However, according to Zitterbart, in a 1987 review of the literature, cavitation was “once believed to be an important factor in dislodging calculus from the teeth” but stated that deposits must be touched with the instrument for complete mechanical removal (49).

Fine and others have made a distinction between adherent plaque and loosely adherent plaque and compared the two kinds for their pathogenic potential. They reported that oral irrigation does not remove attached plaque but that it does remove loosely adherent subgingival plaque. They found that although the mass of adherent plaque was four to five times greater than that of loosely adherent plaque, the pathogenic potential of the loosely adherent plaque was 2 to 60 times greater. This suggests that the toxicity of plaque could be reduced by other methods of plaque removal, such as with water irrigation devices (50).

AEROSOL PRODUCTION AND INFECTION CONTROL

Since Suppipat first drew attention to the dangers of aerosol transmission of pathogens in 1974 (51), there has been concern with environmental contamination in the dental operatory and in open clinics. Using powered scaling instruments in the patient's mouth produces aerosols which can be heavily contaminated by bacteria known to be indigenous to the oral cavity (52).

In a 1978 British study Holbrook and co-workers (53) studied the types and numbers of microorganisms present from samples collected from a periodontal clinic when 12 ultrasonic scalers were used compared with the numbers obtained from clinics in which no ultrasonic scalers were being used. They found that there was a thirty-fold increase of airborne bacteria when ultrasonic scalers were in use, most of which can be identified as coming from the oral cavity. In a follow-up study (54) protection against both direct ballistic splatter and floating particles was recommended for controlling contamination in the dental environment. A face mask and glasses were recommended for protection from splatter. A vigorous two-minute pre-operative use of a 0.2 per cent chlorhexidine gluconate mouthwash was recommended for reduction of aerosol contamination.

Harrel, et. al. produced an evacuator attachment for the ultrasonic scaler in an effort to reduce the presence of airborne pathogenic microorganisms. This device combined a high-volume evacuator sheath (which is connected to a standard high volume dental unit evacuation system) with the ultrasonic scaler handpiece. In this study, he reported that there was a significant reduction of aerosol contamination without increased heat transfer to the tooth during use of the device. It was also noted that a small amount of coolant water that acts as a lavage and lubricant for the tooth and scaler tip is not captured by the evacuator and that about 3 to 4 ml/min of water that flushed the treatment site escaped the vacuum (55).

ROOT PLANING AND ROOT SURFACE TEXTURE

Recent studies have examined whether root debridement in the treatment of periodontal disease should include cementum removal in order to achieve periodontal health (1, 7-11, 15).

In the early 1970s, Aleo and co-workers suggested that lipopolysaccharide (endotoxin) was bound to cementum and that thorough cementum removal was indicated to achieve periodontal health (5, 6). Although it had not been established at that time that the LPS actually incorporated itself into the cementum, the LPS was said to be "cementum bound." This justified the goal of complete removal of cementum by meticulous root planing. Recent studies have shown, however, that purposeful removal of disease altered cementum by aggressive root planing may not be necessary (7-11, 15). In 1990 Smart and co-workers performed an *in vitro* investigation to determine the detoxifying effects of a conservative regimen of ultrasonic root debridement. Twenty extracted periodontally-involved teeth were debrided with a Cavitron TF-10 tip using light pressure and overlapping strokes. Their findings of LPS levels of less than 2.5 ng per root in 19 out of 20 teeth after such debridement was comparable to LPS levels found on healthy, non-involved control teeth. They suggested that root surface cleanliness can be readily achieved (56).

PERIODONTAL DEBRIDEMENT

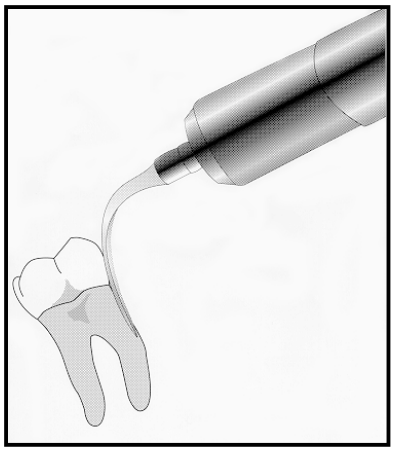
In 1987, using a split-mouth design, Loos and colleagues studied 10 adult patients with periodontitis. These patients were treated with oral hygiene instruction and a single episode of supra-and subgingival debridement with either a sonic or ultrasonic instrument. Measurements of dental plaque, bleeding on probing, probing depths and probing attachment levels were taken at baseline and then every third month for 12 months. An improvement in periodontal health was observed in the initial 3-6 month period. This study "failed to demonstrate any difference between the healing events following the use of the sonic instrument and the use of the ultrasonic instrument". The authors concluded

that the sonic scaler under study provided a further alternative instrument choice efficacious for periodontal treatment (57). There was no significant difference in clinical response observed between sites treated with sonic or ultrasonic instruments (57).

A growing body of evidence suggests that the long-held belief in periodontal therapy of forcefully instrumenting the root surface to achieve cementum removal may be unnecessary and may actually cause more harm than good. In fact, overzealous root planing removes important protein components such as bone morphogenic proteins and slows down critical fibrous attachment from bone to root (58). It also leaves the dentinal tubules open which allows disease-causing bacteria to travel between the periodontal pocket and the pulp while also causing root sensitivity (59). Rather than creating a glassy-smooth root surface, Thompson believes that "velvety smooth, clean surfaces with a resulting decrease in root sensitivity" is most conducive to tissue healing. He states that ultrasonic scalers are "on the forefront of a major technologic and philosophic change in periodontal therapy...'root debridement' rather than root planing" (58). The term "debridement" has been a frequently used medical term, but the phrase "periodontal debridement" was rarely used in dental hygiene literature until 1994 when Woodall, O'Hehir and Young first developed and wrote of the concept. O'Hehir states in a separate article (59) that debridement is more than simply removing deposits from root surfaces. It also takes into account the pocket space, the pocket wall, the underlying tissues and also the immune response of the patient, while controlling a bacterial infection. The water lavage of power scalers aids in rinsing away the bacteria and their endotoxins, and the mechanical vibrations remove the calculus deposits (59).

TECHNIQUE

The most important aspect of learning to perform ultrasonic periodontal debridement is to develop a feather-light touch. Traditionally designed power (ultrasonic or sonic) inserts are adapted similarly to their hand instrument counterparts. Slimline™



Slimline™ Insert placement

ultrasonic inserts, on the other hand, are inserted and adapted very much as is the periodontal probe. Upon insertion, the tip of the SlimlineTM insert is directed apically and the entire length of the insert is placed against the root surface (see illustration).

Activation of most power scaling inserts occurs by depressing the foot pedal. Debridement can then be performed by moving the insert in short overlapping horizontal and vertical strokes along the root surface.

The patient should experience less discomfort because of reduced tissue distension and trauma. The power is reduced to a low setting and warm water is suggested, if available. A cross-hatch stroke is made across each surface of every tooth with light horizontal and vertical movements (58, 59, 60).

CONTRAINDICATIONS FOR USE

The degree of aerosolization from the spray of water at the tip is the main reason that patients with a known communicable disease should not be subjected to the ultrasonic or sonic scaler. It has been shown that pathogens from the oral cavity of one person may be passed to that of another in the dental environment and it is advisable to reduce that risk by using hand instruments instead of powered devices. It has been suggested that an antimicrobial rinse, such as chlorhexidine, or provodone iodine used just before treatment may reduce the number of airborne bacteria. However, the herpes or hepatitis viruses are unaffected by these medicaments (4).

In the case of a patient with a known respiratory risk, such as chronic pulmonary disease, there is concern that septic material and microorganisms from bacterial plaque associated with diseased periodontal pockets may be aspirated into the lungs (3).

As with any form of instrumentation, the use of power scaling devices in the treatment of the immunosuppressed may warrant antibiotic premedication due to these

patients' susceptibility to infection. Some examples of immunosuppressive conditions include leukemia, HIV, uncontrolled diabetes and organ transplants. Aerosol contaminants created by PSDs may remain airborne for a period of time. These contaminants have the potential to be passed to other patients in close proximity.

The substantial amount of water that can fill the mouth may be uncomfortable for patients presenting with swallowing or gagging problems. Mouth breathers or people who cannot breathe through their nose for any reason will find this procedure intolerable (3).

The large pulp chambers in the teeth of young children may be susceptible to damage from ultrasonic vibrations. It has been suggested that children may also exhibit fear or sensitivity to the vibrating tip (3,19).

Chapter III

METHODS AND MATERIALS

A 29-question survey, approved by the West Virginia University Institutional Review Board for the Protection of Human Subjects (Appendix A), was mailed to all dental hygienists licensed and residing in West Virginia (n=730). This population was chosen as a convenience sample and considered to be representative of dental hygienists practicing across the country. A current list of dental hygienists was provided by the West Virginia Board of Dental Examiners.

The survey and a self-addressed, stamped return envelope was mailed to each dental hygienist in this population. Attached to the survey was a cover letter explaining the purpose of the study and that the survey was being conducted in partial fulfillment of the requirements for a master's degree in dental hygiene at West Virginia University (See Appendices B and C). It stated that the purpose of the study was to determine how dental hygienists use powered scaling instruments and their philosophy of using these devices. The cover letter requested that the dental hygienist answer as many questions as possible, and, if she/he does not use a powered scaling instrument, to indicate that and return the questionnaire. The letter also stated that all individuals participating would remain anonymous and would be identified in generalities only. The cover letter also requested that the respondent complete the survey by March 5, 1999. This allowed approximately two weeks for respondents to return the completed questionnaire.

The survey consisted of multiple choice questions. Several of these questions had a choice of "other" which allowed the respondent to answer the question more specifically. There were also a limited number of open-ended questions which invited comments for more detailed information from individuals.

Questions asked in the survey addressed the following topics: demographics, dental hygiene education, employment, utilization of power scaling devices and respondents' philosophy of using power scaling devices.

RESULTS

Demographics

A response rate of 51 % (n=374) was achieved. Twenty questionnaires were returned undeliverable. Results were reported in frequencies and percentages. Chi square analysis was used to test for statistical significance at the p<.01 level. Ninety-nine percent of the respondents were female and 19% had practiced dental hygiene for twenty years or less. The majority (73%) possessed associate degrees.

Of those responding, 84% (n=314) were currently employed in dental hygiene. The majority (48%) of the respondents employed in dental hygiene had been practicing for eleven years or less. Fifty-five percent worked full time and 49% were employed part-time. These figures exceeded 100% because these groups overlapped, with some reporting they were in two or three part-time positions, resulting in full-time employment. Seventy-five percent reported they were employed in West Virginia and 19% reported that they worked in another state. Six percent of respondents did not reply to this question.

The majority (58%) of respondents were employed in private practice, seven percent held faculty positions and eight percent worked in a variety of settings, such as a public health department, school dental sealant program or as a sales representative for dental products. The remaining 27% of respondents did not denote their work setting.

The respondents ranged in age as follows: twenty-six percent between 20-29, twenty-eight percent between 30-39, thirty-two percent between 40-49, eleven percent between 50-62, and three percent were 63 or older.

Education About PSDs

The majority of hygienists responding were initially trained in the use of PSDs in dental hygiene school. Continuing education courses, journal articles, and employment setting made up the remainder of the responses.

A significant difference (p<O1) was found between where an individual received training (dental hygiene school versus other) in power scaling instrumentation and

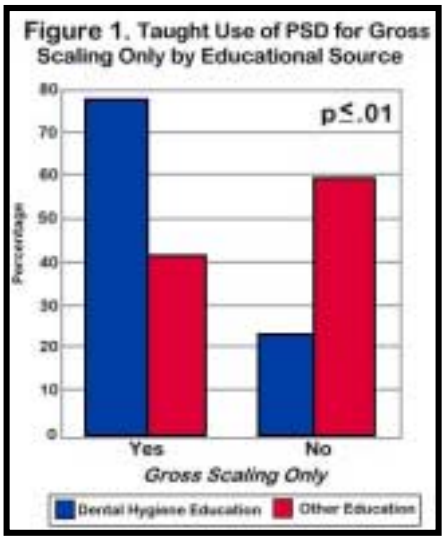


Figure 1

whether they were taught powered scaling devices were indicated for gross scaling only. Seventy-seven percent of individuals responding were taught in dental hygiene school and 41 % in an environment other than dental hygiene school that powered scaling devices were only to be used for gross scaling (See Figure 1).

No significant difference existed between the type of degree program (associate/baccalaureate) from which the respondent graduated and the use of PSDs. Similarly, no significant difference was found between the year the respondent graduated from dental hygiene school and the use of PSDs. Over one-third of the respondents (37%) said they did not believe they had received adequate training to use a powered scaling device in school.

Surprisingly, seventy-three percent of respondents reported they had been taught in their dental hygiene education that PSDs could be used in the subgingival area. Twenty-seven percent indicated they had been taught that PSDs should only be used supragingivally. Eighty-five percent were taught that the operator has diminished tactile sensitivity while using a PSD, and 55% indicated they believed a PSD could alter the root surface if used improperly.

Characteristics of Powered Scaling Device Use

Powered scaling devices were used by 90% of the respondents employed in dental hygiene. Those respondents who do not use PSDs (10%) were asked to check all of the reasons they did not use these instruments. The following reasons were cited: 35% stated they did not like to use it; 24% stated their patients complained about the noise and/or water; 11 % said it commonly malfunctions during use; 14% reported it was often not in working condition; 27% reported it was inaccessible, and 32% stated they perform a more thorough treatment with curets. Seven percent stated that they were employed in a pediatric practice where PSDs were not necessary or were contraindicated. Although

most respondents stated their dentist employers leave the decision to use PSDs up to them, 21 % of respondents stated their dentist employer actually discouraged the use of PSDs.

Thirty-five percent of respondents who use PSDs reported using the powered scaling instrument 1-2 times a day or more. Twenty-four percent stated they use the device approximately one to two times per week, and 15% reported using it one to two times per month. Twenty-six percent rarely or never used PSDs.

Ultrasonic scaling devices were used more frequently than sonic scalers. Sixtyfour percent of hygienists responding indicated they used an ultrasonic scaler. The remaining 36% cited a wide variety of brand names. The CavitronTM, manufactured by the Dentsply Corporation, York, PA, was named by the majority (23%) of respondents using PSDs.

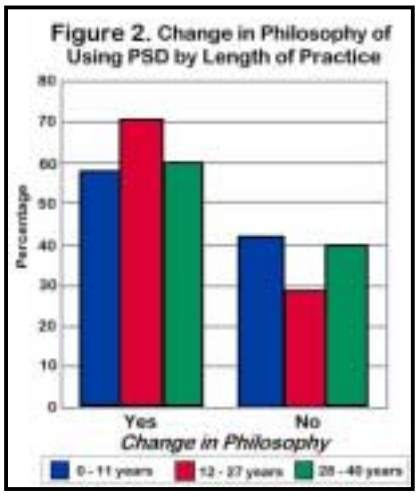


Figure 2

Respondents were asked if they had changed their philosophy of using powered scaling devices over the course of their careers. The majority of respondents in all age groups had changed their philosophy from gross scaling only to a more extensive periodontal debridement. Those who had been practicing 12 – 27 years were more likely to have changed their philosophy. However, of those practicing 28-40 years, there was a less dramatic change in philosophy (See Figure 2).

When asked whether respondents used high, medium or low power setting during use of a PSD, the majority (63%) indicated they use the medium setting. Similarly, the water setting most often used was medium (68%).

Respondents were questioned about their own comfort level while using powered scaling devices. Using chi-square analysis, this data was compared with their frequency of use (frequent = daily/weekly use, infrequent = monthly/yearly use). Results suggested

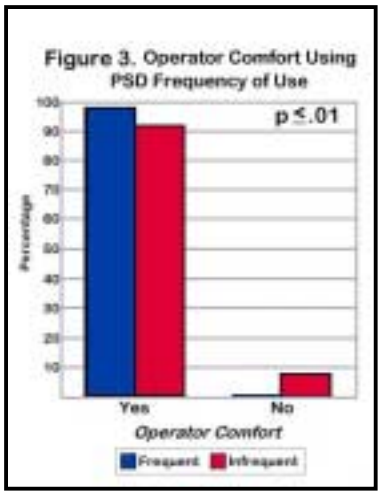


Figure 3

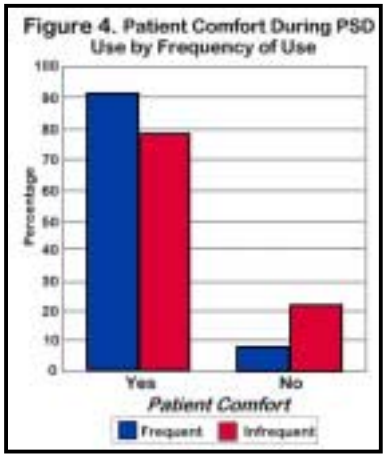


Figure 4

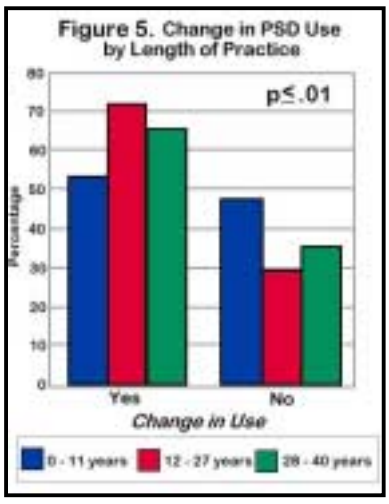


Figure 5

that the comfort level of the hygienist while using power scaling devices was directly proportional to the frequency of use of PSDs (p< .O1) (See Figure 3). Many hygien ists reported that as their skill level using the device improved their comfort level also increased.

Respondents were asked if they believed their patients were comfortable during use of a PSD. This data was compared with the respondents' frequency of use and was found to be directly propoWonal and statistically significant (p< .01) (See Figure 4).

When asked if the hygienist had changed the way she/he uses powered scaling instruments over the course of their practice, 59% reported they had changed their use from only using PSDs for gross scaling to more thorough periodontal debridement procedures. This data was compared with the number of years of dental hy giene practice. A more dramatic change in use occurred for those dental hygienists practicing over 12 years (p< .01) (See Figure 5). The overwhelming way in which they had changed was an increase in subgingival scaling with the device. The SlimlinerM tips were often credited for this increased use of powered scaling devices subgingivally. Respondents became familiar with S1imlineTM tips via dental hygiene journal ads, articles, continuing education courses and sales representatives.

DISCUSSION

It is evident that the dental profession is beginning to understand and appreciate the benefits of using powered scaling devices in the treatment of periodontal disease. Although these devices have been available for many years, it has been only recently that they have been widely used subgingivally in periodontal debridement procedures. Several studies have linked the lysing of the bacterial cell wall to cavitation and endotoxin removal to a water lavage, or rinsing. Since power scalers accomplish both processes, the benefits in the reduction of active disease become obvious. Periodontal debridement, by cleansing every tooth and root surface as far into the subgingival area as the tip can comfortably be manipulated by the clinician, appears to be the most effective way to destroy periodontal pathogens in the treatment and maintenance of periodontal disease.

Few, if any, definitive studies exist addressing patient comfort during use of a powered scaling device. However, when hygienists were asked if they believed their patients were comfortable during use of these instruments, there were many enthusiastic positive responses. The comfort level of both hygienist and patient influenced the extent of use of PSDs. When practitioner and patient were comfortable with the power scaler, the practitioner tended to use it more frequently.

The years of practice of the hygienist seems to have little or no bearing on whether they are more up-to-date in their philosophy of using power scalers. Those respondents with fewer years of experience (0-11) may have been taught a more current philosophy in school. Most of the more experienced individuals (12-27 years) were taught the old philosophy in school (i.e., supragingival, gross deposits, etc.) and they have discovered the benefits of using PSDs over the course of their careers. Dental hygienists graduating over 28 years ago did not change their philosophy as drastically as those practicing between 12-27 years. This may be due to the fact that the dental hygienist practicing over 28 years ago may never have formulated a philosophy. Ultrasonics were not available during their dental hygiene education, and they may have subsequently learned PSD use while in practice.

Many hygienists commented that they were initially reluctant to use power scaling devices because they were taught in school that these instruments were to be used sparingly, on supragingival "gross calculus deposits". Generally, only a small amount of time was spent on techniques of use in the dental hygiene program. However, since the instruments themselves have undergone many design improvements, hygienists reported increased confidence in using power instruments as their skills have increased with practice.

The majority of West Virginia hygienists seem to be aware of the changing philosophy of using power scalers. Most reported they use PSDs freely now and their patients are asking for them to be used during their periodontal maintenance and regular prophylaxis visits in the dental office. There were only a few individuals who stated they were completely opposed to using PSDs on their patients. More research into the benefits and advantages of power scaling and dental professionals' increased awareness of these benefits is contributing to a greater extent of use.

It appears that the majority of dental hygienists formulated their current philosophy on PSD use from sources other than their educational program. When hygienists learned in school how to use PSDs, they were more likely to have been taught limited use than if they had learned from another source, such as CE courses or journal articles. Schools tend to promote the use of hand instruments to strengthen the skills of exploring, detection and deposit removal.

In the past, the philosophy of dental hygiene practice emphasized that there would be little or no tactile sensitivity during power scaling, but experience has taught frequent users otherwise. Tactile sensitivity can be developed over time with the use of power scalers, but it differs in intensity from that of hand instruments. For this reason the general consensus among hygienists, both those in private practice and dental hygiene education, is to still follow-up power scaling with an explorer to ensure adequate or thorough debridement.

CONCLUSIONS AND RECOMMENDATIONS:

From the results of this study the following conclusions and recommendations can be made:

- Dental hygiene schools should consider increasing students' exposure time to PSDs and thoroughly educate students on the more current philosophy on the use of PSDs for periodontal infection control.
- Since 21 % of respondents' employers discourage the hygienist from using a power scaling device, a CE program designed to inform dentists of the current literature and philosophy of using PSDs is needed.
- The majority of West Virginia dental hygienists reports a realization of the advantages of using powered scaling devices. Recent improvements in design of power scalers and tip inserts, increased experience using PSDs, and seeing positive results in both healing and patient acceptance have contributed to this recognition.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD
APPLICATION FOR EXEMPTION

West Virginia University Institutional Review Board PO Box 6845
Phone: 293-7073

Application for Exemption

You must receive approval from the IRB staff prior to beginning the research described below. Please type all responses and submit this form with original signatures.

1. Title of study: Utilization of Powered Scaling Instruments by Dental Hygienist Licensed in West Virginia

2. Investigators (list all investigators, principal investigator first; attach additional sheets if necessary):

Name	Signature	Dept./College	PO Box	Tel No.
Janet L. Bee		Periodontics/ Dental Hygiene	PO Box 9425	622-5586

3. Estimated period of human subject involvement: Starting date 2/99

4. Reason for conducting research ☐ Professional ☐ Dissertation ☒ Thesis ☐ Class Assignment ☐ Other _____ (specify)

5. Source of funding (if applicable) West Virginia Dental Corp.

6. This research involves (check all that apply—see attached "Exempt Research" page):

___ a. collection or study of existing data, documents, records or specimens, recorded without identifiers

___ b. normal educational practices conducted in established or commonly accepted educational settings

___ c. educational tests (cognitive, diagnostic, aptitude, achievement)

___ d. observation of public behavior

X e. surveys, interviews or hand-outs for subjects over 18 **(use age ranges, not actual age, for demographic information):** ☒ mail ☐ telephone ☐ person-to-person

___ f. any possibility of identifying a subject (discuss in cover letter)

___ g. the possibility that the subject's responses or conduct (if they became public) may place the subject at risk of criminal or civil liability or be damaging to the subject's financial standing or employability

___ h. sensitive aspects of personal behavior (for example: illegal conduct, drug use, sexual behavior or use of alcohol)

___ i. investigator's participation in activities being observed

___ j. only surveys or interviews of elected or appointed public officials or candidates for public office

___ k. audiotaping

___ l. children under age 18 (see Chapter II of the Guidelines)
Note: Interviews and surveys with children are *never* exempt.

___ m. food tasting and evaluation

n. research and demonstration projects

7. Goal of research To determine how dental hygienists licensed in West Virginia use powered scaling instruments and their philosophy of using these devices

8. Explanation of procedures involved in research

An anonymous survey of instruments will be sent to all RDH's licensed in West Virginia (n = 830).

9. Explanation of known risks to human subjects

None

10. Explanation of how records will be kept

Returned surveys will be tabulated and results will be published in thesis format. Surveys will be kept in the possession of the investigator.

A cover letter addressed to respondents must accompany any survey or questionnaire. The cover letter **must** be on *your WVU departmental letterhead* and must include the following:

1. a statement that the project is research being conducted in partial fulfillment of the requirements for a course, master's thesis, dissertation, etc.
2. purpose of study
3. a statement that subjects' responses will be kept anonymous or confidential (explain extent of confidentiality if subjects' names are requested)
4. if audiotaping, a statement that subject is being audiotaped (explain how tapes will be stored or disposed of during and after the study)
5. a statement that subjects do not have to answer every question
6. a statement that subject's class standing, grades, or job status (or status on an athletic team, if applicable) will not be affected by refusal to participate or by withdrawal from the study
7. a statement that participation is voluntary

Attachments:

_X_ questionnaire/survey to be used

___ telephone text (including introductory remarks as in a cover letter—see above)

_X_ cover letter

___ permission from external institution, on their letterhead (if applicable)

I have reviewed the above information and recommend this study for exemption.

Dean or Director

1-15-99

Department Chair

Faculty Advisor

APPENDIX B

COVER LETTER

ROBERT C. BYRD
HEALTH SCIENCES CENTER
OF WEST VIRGINIA UNIVERSITY
School of Dentistry
Division of Dental Hygiene

February 1, 1999

Dear Dental Hygienist:

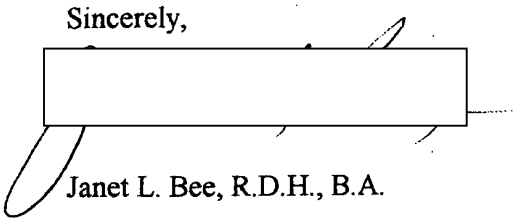
I am pursuing a Master's Degree in Dental Hygiene and am currently working on my research thesis. I would appreciate it very much if you would take a few minutes of your time to help me with this project.

The purpose of my study is to determine how dental hygienists licensed in West Virginia utilize powered scaling instruments and their philosophy of using powered scaling instruments. If you would be kind enough to answer the enclosed questionnaire, it will greatly help me acquire this information. It is not necessary to answer every question, but, naturally, the more data I receive, the more valid my results will be. If you do not use a powered scaling instrument, please convey this on the questionnaire and return it to me by the stated deadline.

Your responses will be anonymous and the results will be reported in generalities only. Your participation is voluntary. Neither your licensure nor your job status will be affected by your participation or refusal to participate.

There is a lack of literature addressing this subject, so your input is very important. Thank you in advance for contributing to this study. Please enclose the complete survey in the self-addressed, stamped envelope by March 5, 1999.

Sincerely,



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APPENDIX C

SURVEY: UTILIZATION OF POWERED SCALING INSTRUMENTS BY DENTAL HYGIENISTS LICENSED IN WEST VIRGINIA

SURVEY: Utilization of Powered Scaling Instruments by Dental Hygienists Licensed in West Virginia

PLEASE PLACE A CHECK MARK BESIDE THE CORRECT ANSWER

DEMOGRAPHICS

1. Gender

_____Female
_____Male

2. Age in Years

_____20-29
_____30-39
_____40-49
_____50-62
_____63 or older

3.

Degree/Program	Primary Field	Year Completed
Certificate/ Associate Degree	_____	_____
Bachelor's Degree	_____	_____
Master's Degree	_____	_____
EdD/PhD	_____	_____
DDS/DMD	_____	_____
Other _____	_____	_____

4. Are you employed in Dental Hygiene?
_____Yes
_____ No

5. How many years have you been practicing Dental Hygiene?

_____0-3
_____4-7
_____8-11
_____12-15
_____16-19
_____20-23
_____24-27
_____28-31
_____32-35
_____36-39
_____40 or more

6. If you are employed in dental hygiene, please describe employment: (check all that apply)

_____Full-time
_____Part-time
_____ WV
_____Other state (Please list)_____

7. If employed in dental hygiene, do you use a powered scaling instrument?

_____Yes
_____No
_____I am not employed in dental hygiene

8. Does your dentist employer encourage you to use a powered scaling instrument?

_____Yes
_____No
_____Not applicable

EDUCATION

9. Do you believe you received adequate training to use a powered scaling instrument?

_____Yes
_____No
_____Not sure

10. Where were you trained in the use of powered scaling instruments? (Please check all that apply)

_____Dental hygiene school (please give name)_____
_____Continuing Education course(s)
_____Journal article(s)
_____Other_____

11. Were you taught that powered scaling instruments should only be used for gross calculus removal?

_____Yes
_____No

12. Were you taught that powered scaling instruments can be used subgingivally?

_____Yes
_____No

13. Were you taught that the operator has diminished tactile sensitivity while using a powered scaling instrument?

_____Yes
_____No

14. Do you believe that a powered scaling instrument can alter the surface of the tooth?

_____Yes
_____No
_____Not Sure

15. How often do you use a powered scaling instrument?

_____1-2 times a day or more (Go to question # 17)
_____1-2 times a week (Go to question # 17)
_____1-2 times a month (Go to question # 17)
_____1-2 times a year (Go to question # 17)
_____Never (Go to question # 16)

16. If you never use a powered scaling instrument, why not? (Please check all that apply)

_____I don't like to use it
_____My patients complain about the noise and/or water
_____It commonly malfunctions during use
_____It is frequently not in working condition
_____It is inaccessible
_____We don't have the right tips
_____I can do a better job with curets
_____Other _____

[IF YOUR ANSWER TO QUESTION # 15 IS NEVER, THANK YOU, YOU HAVE COMPLETED THE SURVEY. PLEASE RETURN THE QUESTIONNAIRE IN THE POSTAGE-PAID ENVELOPE. IF YOU USE POWERED SCALING INSTRUMENTS, PLEASE CONTINUE.]

17. On which of the following patients would you use a powered scaling instrument? (Please check all that apply)

_____Heavy supragingival calculus
_____Heavy subgingival calculus

_____Moderate supragingival calculus
_____Moderate subgingival calculus
_____Light supragingival calculus
_____Light subgingival calculus
_____Periodontal maintenance
_____ANUG patient (Acute Necrotizing Ulcerative Gingivitis)
_____Other _____

UTILIZATION OF POWERED SCALING INSTRUMENTS

18. Do you use a sonic or ultrasonic scaling instrument? (Check all that apply)

_____Sonic (Brand Name _____(Go to question # 24)
_____Ultrasonic (Brand Name _____(Go to question # 19)
_____Other _____

IF YOU USE EITHER OR BOTH SONIC AND ULTRASONIC INSTRUMENTS, PLEASE COMPLETE QUESTIONS # 19-29

19. What kind of tip inserts do you use? (Please check all that apply)

_____25K P-10
_____25K P-3 Thin Beavertail
_____25K EWPP Perio-Probe
_____30K TFI
_____30K FSI
_____30K Slimline
_____30K FSI Slimline
_____TFI 1000
_____Other _____

20. How were you introduced to the Slimline® tips?
_____Manufacturer
_____Continuing Education course
_____Dental hygiene school
_____Other (please explain)_____
_____I am not familiar with these tips

21. If you use the Slimline® tips, how long have you been using them?

_____Less than one year
_____Greater than one year
_____Not applicable

22. What power setting do you use when using a powered scaling instrument?

_____High
_____Medium
_____Low

23. What water setting do you use when using a powered scaling instrument?

_____High
_____Medium
_____Low

24. Do you feel comfortable using a powered scaling instrument?

_____Yes
_____No
_____Not sure

25. Do you believe your patients are comfortable during use of a powered scaling instrument on their teeth?

_____Yes
_____No
_____Not Sure

26. Do you believe you have tactile sensitivity while using powered scaling instruments?

_____Yes
_____No
_____Not Sure

27. Has your philosophy of using powered scaling instruments changed during the course of your dental hygiene practice?

_____Yes
_____No
_____Not Sure
If yes, please explain_____

28. Have you changed the way you use powered scaling instruments during the course of your dental hygiene practice?

_____Yes
_____No
_____Not Sure
If yes, please explain_____

29. Do you believe powered scaling instruments will be utilized more in the future?

_____Yes
_____No
_____Not Sure

THANK YOU FOR YOUR PARTICIPATION!

VITA

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