

NYS DJ

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Cover: NYSDA's increasingly diverse membership includes professionals like Kate Perham, young and female and pursuing a less-traveled path. (Photo by Emma Enness)

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The Best Game in Town

Organized dentistry. It's good for you and for the profession.

Including my time as a student, I have been a member of the American Dental Association for 40 years. It hardly seems possible. When I attended dental school, there was no American Student Dental Association and being a member of the ADA was voluntary. But even then, I believed it was important to belong to the premier dental association in the United States and, arguably, the world. I have never thought differently.

I left dental school and went on to study orthodontics. When I finished my postgraduate education, I joined the American Association of Orthodontists. I am no longer a member of the AAO. The reason for the break goes back to the 2003 meeting of the ADA House of Delegates. I was a first-time delegate that year, which was the year NYSDA introduced the country to the idea of PGY-1. As an orthodontist, this idea resonated with me as a sensible path to licensure. It could possibly mean that a specialist, such as myself, would not have to take a general dental board to obtain licensure in a particular jurisdiction.

I attended a breakfast with other delegates from the AAO and spoke in favor of PGY-1. You would have thought I was advocating drowning baby kittens. I heard the usual arguments—that it's the right of the state to determine how to license an individual, and that the public needed to be protected. In short, the concept would never fly. I still wonder about that. How does a two-day test under artificially stressful conditions tell anyone what kind of a dentist you would be, I asked. No one had an answer. But the AAO did not support our position.

That incident opened my eyes. It seemed the AAO didn't have my best interests at heart if it couldn't grasp the importance of PGY-1. I dropped my membership.

A Critical Decision

As a newly minted orthodontist, I returned to Buffalo to practice. Anxious to reacquaint myself with the Western New York dental

culture, I immediately joined the Eighth District Dental Society and the Erie County Dental Society. I have never regretted this decision. I was welcomed into the societies with open arms, and I opened a network among colleagues that to this day supports me in my professional goals. And being active in the district has helped me give back to a profession that I love. What I have gained is much more than just CE, or insurance or any of the other benefits I enjoy as a member of the ADA.

Not too long into my association with the Eighth District, I began looking for a way to become more personally involved in the society. I thought about what it was I liked to do, which was write. I asked if there was any way I could put that talent to use. Turned out there was. I became an associate editor for the Eighth District Dental Bulletin. Not long after that I was named the editor. This helped broaden my involvement in the organization, as it required that I attend all society board meetings, which expanded my knowledge and understanding of what was going on in organized dentistry.

I became even more involved with time, moving through the chairs of the Eighth District, which culminated in my becoming president in 2002. I truly enjoyed my time in office and going to meetings of all the county dental societies, where I listened to members voice their concerns about the present and hopes for the future. I listened and I tried to address what they were saying.

Following my term as president, I was appointed to NYSDA's Board of Governors. I served for seven years—another “job” I loved. It got me involved at the state level and introduced me to more colleagues and more issues. I learned we shared similar wishes for the profession but that we also differed in some of our concerns. Again, my eyes were opened.

In 1995, I was appointed to the State Association's Council on Publications. The council, chaired at the time by Ed Feinberg from the Ninth District, oversaw production of all of the

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Association's publications, particularly *The New York State Dental Journal*. Dr. Feinberg championed making *The Journal* a peer-reviewed publication. I remember the discussions and debates we had on whether this was a good idea or not. There is nothing better than a spirited debate to get the juices flowing! I looked forward to those meetings.

In 2003, I was named associate editor of *The Journal* and editor of the *NYSDA News*. I learned a great deal under the tutelage of the editor, Elliott Moskowitz, and managing editor, Mary Grates Stoll. I also became good friends with both, friendships I cherish to this day. When I was appointed editor in 2009, it was the culmination of a career that had started back in 1987 when I was an associate editor of the Eighth District Dental Bulletin.

A Word to the Wise

In relating my experiences, I hope to provide insight into what it means to be a part of organized dentistry. It's been an important part of my professional life, as it has put me in contact with a group of colleagues who support me. I have seen this in the many years I have been a member. In fact, not too long ago I wrote an editorial recounting how organized dentistry saved my practice when I had a health challenge, how the Eighth District jumped in and kept my office open while I recuperated. Without my connection to organized dentistry, I doubt this would have happened.

My advice to those who are not members is simple: Join. Membership will open opportunities for you unavailable to nonmembers. You don't have to become involved in the politics of organized dentistry, like I did. But most likely you do have talents to offer. By using these talents to better your dental society, you will have a hand as well in improving the profession. More importantly, you will enhance your personal life in ways you can't imagine. But that is for you to discover. Join. Do it now.

 D.D.S.

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Introduction to Decision Aids Should be Part of Evidence-based Dental Curriculum

Decision aids provide specific information on treatment options for patients to help them make informed choices.

Brian Laurence, D.D.S., Ph.D.

Decision aids guide patients through the decision-making process by providing information so patients have realistic expectations of the benefits and harms of various treatment options. They are used to supplement patient-provider interaction and are often presented in the form of leaflets, brochures, interactive videos or web-based tools.¹ Evidence has shown that decision aids are superior to standard counseling in improving patients' expectations about the results of treatment.^{2,3}

Decision aids are being used with increased frequency in medicine.⁴ However, while they are gaining increased acceptance in medicine, there is very little published data about their use and acceptability in dentistry. Instruction in the methods of evidence-based decision making (EBDM) in dental schools is now a requirement for predoctoral training to maintain accreditation; and schools have taken different approaches to meet this requirement. The proven effectiveness of decision aids suggest that this tool should be introduced to dental students as part of an evidence-based dental curriculum.

Health care in the 21st century will see an increased emphasis on inter-professional collaboration; and dentists will likely have greater exposure to decision aids in one form or another in the near future. Decision aids will ultimately be developed that are specific for treatment options in dentistry. In order to more effectively develop these instruments, we need informed and educated clinicians and patients. The International Patient Decision Aid Standards (IPDAS) Collaboration has developed criteria that can help patients, health care providers, researchers and policy-makers develop and evaluate decision aids.⁵ These criteria and related relevant literature should encourage

dental schools to move forward toward introducing dental students to this effective and important tool, which will lead to improved clinical outcomes among patients receiving dental care.

Here at Howard University, we are taking a broader brush in our approach to evidence-based decision making by trying to ensure that our developing dental professionals are exposed to tools that we expect will be used with increased frequency in the future. In addition to providing training to our dental students in the fundamentals of epidemiology and study design and how to read and assess the professional literature, we are also providing exposure to systematic reviews, meta-analysis, decision aids and patient-reported outcomes. *///*

Queries about this article can be sent to Dr. Laurence at blaurence@howard.edu.

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Memo to our Members

Here to Serve You

This issue of *The New York State Dental Journal* is devoted in part to the expression of a fervently held belief at NYSDA that “every member counts.” We are so committed to attending to the needs of our members that we have made it the basis of just about everything we do in the name of the Association. Most recently we even added a membership concierge to staff, someone who is solely responsible for making members feel welcome in the Association and for helping them find solutions to problems they might be having with their membership.

NYSDA has about 9,000 actively practicing members, another 2,700 retired members, about 600 residents and 1,300 dental students. That’s over 14,000 dentists total—an impressive number and enough to rank New York as the second largest state in the ADA. As you can imagine, with so many members, there are thousands of stories to be told about how people came to enter the dental profession, or why they decided to practice in one area of the state rather than another. We have identified several members whose stories are representative of the diversity of our members’ professional experiences to profile in this issue.

Our editor and legal counsel also contributed to this issue. Editor Kevin Hanley describes his own experience to explain how organized dentistry enhances a dentist’s professional life. And Attorney Lance Plunkett provides an inside look at the workings of the NYSDA Governmental Affairs Council, responsible for preserving the independence and integrity of the dental profession.

We hope to return in another issue with more stories about our multi-talented members and more information about how NYSDA can help enhance your practice and enable you to achieve the highest level of dental professionalism. In the meantime, keep up with Association and professional developments on the NYSDA website, www.nysdental.com, and follow us on Facebook and Twitter (@NYSDentalAssn). ✍

Jay Skolnick, D.M.D., Webster, NY (Seventh District)
Chairperson, Council on Membership and Communications

Returning to Her Rural Roots

Kate Perham tried a large urban area before deciding she was most comfortable practicing in a less developed city with a small town feel.

Joshua Poupore

Practicing dentistry in a small community in rural upstate New York State might not seem like the most exciting path for graduating dental students, but one NYSDA member has found her experience to be rewarding in ways she never imagined during her years in school.

After graduating from Siena College in Loudonville, Kate Perham headed off to Tufts University School of Dental Medicine in the heart of downtown Boston. Here she would get a taste of big city life while finishing out her four years of dental school. She lived in Boston's Back Bay neighborhood, known for its rows of Victorian brownstone homes, cultural institutions and fashionable shopping district.

As graduation neared, Kate faced a decision all dental students must confront—where to begin their professional career. While most of her classmates were headed to urban or suburban areas, Kate felt pulled back to her roots in upstate New York.

“A lot of Tufts alums were headed to urban or suburban areas,” Kate said. “I think lifestyle has a lot to do with it. They don't realize that small towns and rural areas have a lot to offer. And there's a misconception that you have to work in the city to be successful.”

So instead of settling in Boston or moving to some other metropolitan area, Kate returned to New York State to enter into a PGY-1 program, which requires young dentists to complete a residency program as a pathway to licensure. She spent a year at St. Peter's Hospital in Albany, and was surprised by how much she enjoyed her work there because she had always wanted to work in private practice. It appealed to her so much that she stayed on for another two years when she was offered a job upon completion of her program.

“I always wanted to be in private practice, but when I did my residency, I found I really enjoyed hospital dentistry,” Kate said. “I could do all aspects of dentistry, including pedo on a mobile unit that went out to schools. It gave me good exposure to everything.”



Kate Perham

After three years at St. Peter's, the urge to work in private practice returned. The transition from hospital-based dentistry was easier than she expected, in part because of connections she had made through her membership in the ADA and NYSDA. Although she wasn't an ASDA member during dental school, she joined the ADA/NYSDA during her residency. And she eventually connected

with Matt Kearney, D.D.S., a general dentist, also an ADA/NYSDA member, practicing in Gloversville, a small, rural city not far from the Fulton County community of Mayfield where she grew up. She began working in Dr. Kearney's office as an associate and has never looked back. She says she likes working in a family practice because of the personal connection she has with the patients.

Dr. Perham has great appreciation for the value of her membership. She uses Medical Liability Mutual Insurance Co. (MLMIC), a NYSDA-endorsed service, for her malpractice coverage. And she appreciates, she said, the information she gets on the NYSDA website and through email updates, as well as the additional endorsed services the ADA, NYSDA and her local (Fourth District) component provide.

“Having the stamp of approval from the State Association gives me a level of comfort,” she said. “I can research things on my own, but there is always fine print to go through. Knowing that NYSDA has done the research for me saves me time.”

When asked what advice she would give a dental student or resident considering moving to a rural area Kate said, “Dentistry is a rewarding profession no matter where you are.” And although she has found value in her membership, she had some advice for NYSDA too: “Less mail.”

Message received! 

Mr. Poupore is NYSDA Assistant Executive Director for Marketing and Communications. He can be reached at jpoupore@nysdental.org.

An Accidental Career

For Mina Kim, dentistry was a not her first choice, but it turned out to be the right choice.

Josh Poupore

The path to dentistry is not always a straight one. Mina C. Kim, D.D.S., knows that all too well. After starting out in the corporate world, Mina took a turn when she left her job to work in her father's dental office. It was only supposed to be a temporary stay, but it ended up changing the trajectory of her professional life.

After graduating from Barnard College in 2002 with a degree in economics and math, Mina went to work for a large corporate law firm in Manhattan. "I always wanted to work in the corporate world; it just seemed very exciting," Mina said. However, after two years in the legal field, Mina became disenchanted with the idea of spending her entire career at a large corporation. She missed having personal connections.

Mina went to work with her father, Syngnum Kim, D.D.S., in his New York City office, Bryant Park Dental Associates. Despite having grown up with a father who was a dentist, Mina never seriously considered following in his footsteps. But shortly after starting out in his office, she had an experience that would change everything for her.

A patient came to the office in need of significant restorative work. "When she first came to the office, she was very nervous and embarrassed about her smile," Mina recalled. "She would cover her mouth, and she never smiled." Over the next year, this patient came back for many visits and received a full restoration. In that time, Kim witnessed a complete transformation as the woman began to trust and rely upon her dental team and gain confidence from her restored smile.

"I saw the transformation, the trust she had in our office, so much that she brought her daughter to meet everyone. That



Mina Kim

was the moment I realized that I wanted to be a dentist," Mina said. "I was only supposed to work there for a year, but after that experience, I knew that the way for me to help people and to have that kind of effect on their lives was through dentistry."

Kim graduated from Columbia University College of Dental Medicine in 2010 and completed

a general practice residency at New York Methodist Hospital in Brooklyn. She admits she wasn't active in the American Student Dental Association (ASDA) during dental school, but she was aware of ASDA activities and of organized dentistry. It wasn't until her residency that she became involved.

Mina said she enjoyed her time at New York Methodist. "There was a lot of personal attention," she said. "My instructors taught me about the value of membership in organized dentistry. They would actually drive us to local meetings so we could get to know established members. And they were all so willing to give us advice."

Kim took that enthusiasm for organized dentistry with her to New York County, where she is now a member. She started the Give Kids a Smile program for the society and also serves as the New York County representative to the NYSDA New Dentist Committee. And she helped organize the ADA Signing Day at New York University and Columbia.

"I never planned on being a dentist, but I can't think of anything else I'd rather do. And I appreciate that my association helps me to give back even more," Kim said. ✍

Mr. Poupore is NYSDA Assistant Executive Director for Marketing and Communications. He can be reached at jpoupore@nysdental.org.

Vincent Filanova Embraces Challenge of Treating Special Needs Patients

New dentists encouraged to consider public health dentistry.

Josh Poupore

Vincent Filanova, D.D.S., is not your typical dentist. At a time in his career when most of his peers were looking toward retirement, and possibly taking on associates to transition out of full-time work, Vince moved in an entirely different direction. In 2012, after 25 years in private practice, he left to become director of dental services at Whitney M. Young Jr. Health Center, a federally qualified health center in Albany, NY.

Despite his time in private practice, Vince was no stranger to special needs patients. In fact, he treated developmentally disabled patients and geriatric patients part time throughout his career, while still maintaining his primary practice. The transition from private practice to public health dentistry was an easy one.

“Private practice is a great thing. You get the emotional attachment to patients you see year after year. You are able to control all aspects of the dental practice,” Vince said. “The reason I transitioned is that I wanted to provide dentistry to special needs patient through the New York State Office for Persons with Developmental Disabilities (OPWDD). This evolved into becoming the dental director at Whitney Young and providing care to a wider group of underserved patients.”

Vince is happy in his new role because he sees his facility, and all federally qualified health care centers (FQHCs) as true safety nets for the public. About 70 percent of the patients at Whitney Young are on Medicaid. Another 28 percent are uninsured and are provided with a “sliding scale fee” based on income. The remaining 2 percent have commercial insurance. And the clinic is busy. Staff sees about 6,500 patients a year, with 13,800 visits annually. All



Vincent Filanova

of that work is completed by just four full-time and one part-time dentist and three full-time hygienists.

FQHCs are good for the patients, but they’re good for dentists too. Of the dentists working under Vince at Whitney Young, two are currently participating in the student loan forgiveness program. Through the National Health Service Corps, dentists are eligible to receive loan repayment

assistance to support qualified health care. Awardees receive up to \$50,000 in exchange for two years of service in a dental health professional shortage area (dHPSA) ranked as Tier I, or up to \$30,000 for two years of service in a lower ranked dHPSA. Whitney Young Health Center is a Tier I facility.

In New York State, there are approximately 65 FQHC facilities, with most in the New York City metro area.

Vince sees his clinic and other FQHCs as good options for dentists, especially young dentists just starting out. “For a young grad, working in a public health setting like Whitney Young, or any FQHC, is a great learning experience,” Vince said. “You get help with a portion of your loans repaid, but you also get the opportunity to treat a diverse population—along with the challenges associated with that.”

NYSDA, through a grant from the New York State Department of Health, offers assistance finding a dHPSA qualified facility. For more information, contact Mercedes Susi at NYSDA, msusi@nysdental.org.

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The Significance of Ecstasy Use to Dental Practice

William James Maloney, D.D.S.; George Raymond, D.D.S.

ABSTRACT

3,4 Methylenedioxymethamphetamine (MDMA), commonly known as ecstasy, is an illicit drug used by individuals seeking mood enhancement. Ecstasy's pharmacology, systemic, oral and dental manifestations are presented. Use of this drug is not limited to a particular socioeconomic class and, as such, all practicing dentists must be aware of both the intra-oral effects of this drug and any possible alterations to dental treatment that might become necessary. Dental manifestations include bruxism, increased incidence of caries, xerostomia and oral ulcers.

Every day dentists throughout the world encounter individuals presenting for various professional dental services. As such, each dentist will, from time to time, encounter patients who are using illegal drugs regardless of their socioeconomic status. Such illicit drug use causes physical, legal and psychological issues for the patient, in particular, and society, in general. They cost the world's economies billions of dollars each year in attempts to curb their use. And they endanger the lives of law enforcement officers engaged in a never-ending struggle to curb their use.

The authors examine the dental/oral manifestations of a drug commonly known as ecstasy in order to make the dental professional aware of the many oral conditions that can be caused by its use. And they review what precautions or changes to

routine dental treatment might be necessary in individuals using the drug.

The dentist must be aware of the use of ecstasy in the patients they are treating in order to: 1. avoid possible contraindications during dental treatment; 2. recognize the many oral and cranio-facial manifestations of such drug use; 3. be able to provide the necessary dental treatment to combat the dental/oral ravages of illicit drug use; and 4. be able to refer these patients, if desired, to the proper professionals for counseling.

What is Ecstasy?

The origin of methylenedioxymethamphetamine (MDMA), commonly known as ecstasy, is not clear and has been the subject of controversy.¹ The drug was patented in 1914 by the Merck Company as an experimental compound.¹ It was later rediscovered in the 1970s, when psychiatrists and therapists began using it as an adjunct to psychotherapy.²

MDMA is structurally related to both the stimulant amphetamine and the hallucinogen mescaline. It promotes the release of serotonin and dopamine from synaptic terminals.³ It has been described as the "love drug," "XTC," "Adam" or simply "E," and became established as a dance drug, popular at "rave" parties. Ecstasy is taken for its mood-enhancing properties, which are known as the three E's: energy, empathy and euphoria.⁴ It has been classified as an empathogen and/or entactogen. The terms empathogen and entactogen are used to describe a class of psychoactive drugs that produce distinctive emotional and social effects similar to those of ecstasy.⁴

Systemic Manifestations

A variety of systemic symptoms and sometimes severe sequelae are manifested from MDMA use (Figure 1). Symptoms, including tachycardia, diaphoresis and hyperthermia, are common; occasionally, disseminated intravascular coagulopathy (DIC), rhabdomyolysis and acute renal failure may occur.⁵ Hyperthermia is the most common adverse effect associated with a severe acute toxic reaction.⁵ Most cases of hyperthermia and hyperpyrexia appear to be associated with excessive exertion coupled with inadequate fluid replacement, which is necessary to facilitate thermoregulation.⁵ Hyperthermia is believed to be the beginning of the cascade leading to DIC, rhabdomyolysis, myoglobinuria and acute renal failure.⁵

A high proportion of the case reports of serious MDMA toxicity include the observation that the patient was jaundiced. This finding most probably is explained by the pathways of metabolism of the drug. In some cases, hepatotoxicity progresses rapidly into fulminating liver failure, which proves fatal unless the patient is fortunate enough to receive a liver transplant.⁶ One study reported eight cases of ecstasy-related acute liver damage, of which five patients developed encephalopathy and severe coagulopathy sufficient to merit listing for transplantation. Of those

Figure 1.
Systemic Manifestations^{5,8-16}

- Arrhythmias
- Hypertension
- Serotonin (5-HT) syndrome
- Liver problems
- Seizures
- Long-lasting neurocognitive impairments

Figure 2.
Dental and Head/Neck Manifestations^{19-22,24-29}

- Bruxism
- Increased incidence of caries
- Tooth wear
- Lip paresthesia
- Oral ulcers
- Xerostomia
- Trismus

five patients, two died within one month post transplantation due to overwhelming sepsis.⁷

An excess of serotonin can produce serotonin syndrome (SS). The Hunter Serotonin Toxicity criteria are used by medical professionals to diagnose SS. These criteria include spontaneous clonus, inducible clonus and/or ocular clonus with agitation or



diaphoresis, tremor or hyperreflexia, or hypertonia and ocular clonus. A triad of clinical features characterizes this syndrome. They include cognitive or mental state changes, neuromuscular abnormalities and autonomic hyperactivity.⁸⁻¹¹ Mild SS may have a more subclinical, less severe presentation; however, patients with a rapidly increasing temperature and muscle rigidity can progress to multi-organ failure within hours.^{8,12}

Other systemic toxic manifestations include cardiovascular effects, which are primarily caused by the increase of norepinephrine. These effects consist of two basic types: hypertension, with an increased risk of ruptured blood vessels and internal hemorrhage; and tachycardia, with a consequently increased cardiac work load and resulting risk of heart failure.¹³

Rhabdomyolysis from the increased production of heat causes an array of microscopic damage to the muscle tissue, which may lead to necrosis. Even when recovery occurs, the necessary surgical removal of large amounts of necrotic muscle tissue may leave the patient with some residual disability related to the area affected.^{13,14}

Renal disease is also a manifestation that may arise from the rhabdomyolysis. The myoglobin released during the rhabdomyolysis is taken up by the kidney and excreted in the urine. This

myoglobin is toxic to the kidney and the end result, in severe cases, is hemodialysis to prevent death from uremia.^{13,15}

As noted earlier, the toxic effects of ecstasy use affect a variety of organ systems. The wide array of symptoms from the use of the drug continues to present itself to the medical community in various ways. Mintzer et al.¹⁶ describe a 29-year-old male patient who after ingesting ecstasy on nine occasions experienced Parkinsonism as a result of a delayed neurotoxic effect of MDMA.

Extent of Use

Most ecstasy users are adolescents and young adults. In 2010, 2.4% of 8th graders in the United States were categorized as being ecstasy users, while 4.7% of American 10th graders used the drug. By the time American students reached their senior year of high school, more than 10% had used ecstasy at least once.

Ecstasy is primarily ingested orally in the form of tablets ranging in price from \$3 to \$45.¹⁷ At times, individuals co-abuse ecstasy and LSD. This practice is known as “candy flipping.” New York City, Miami and Los Angeles are the main markets for ecstasy in the United States. The ecstasy being used in this country is produced primarily in European clandestine laboratories found in the Netherlands and Belgium.¹⁸ There is no licit use of ecstasy.



Dental Significance

There are many manifestations of ecstasy with dental significance (Figure 2). It has been reported that 93% to 99% of individuals experience xerostomia during an ecstasy-induced hallucinogenic episode.¹⁹⁻²¹ Many ecstasy users turn to sugar-filled soft drinks to combat the dry mouth. Of course, the effects of such chronic use of sugar-containing acidic drinks are detrimental to the user's dentition. It has also been noted that these individuals are at an increased risk of enamel erosion due to reduced saliva secretion and buffering capacity.²¹ Such individuals must be told they have an increased risk of caries and taught ways to combat these risk factors. It could be suggested that the individual substitute water for sugar-containing soft drinks. Also, fluoride rinses and toothpastes may be prescribed for the patient.

Seventy percent of people who abused ecstasy claimed they felt pain or tenderness in their jaw muscles or joints.²⁰ This is most probably due to frequent jaw clenching and grinding during the use of ecstasy, which was reported in 50% to 89% of users.^{19-21,24-28} This clenching and grinding of one's teeth continued for a significant amount of hours after the drug's hallucinogenic effects had worn off.²² Chewing gum has been used to reduce the trismus and bruxism in these individuals.^{22,29}

Oral ulcers and lip paresthesia have also been seen in existing ecstasy users. Occasionally, dentists might prescribe monoamine oxidase inhibitors and tricyclic antidepressants to manage the pain associated with the temporomandibular joint.^{22,30,31} It is known that ecstasy has slight interactions with these drugs. Also, the dentist must avoid using any epinephrine-containing products, such as certain local anesthetics and retraction cords, as ecstasy causes a systemic increase in blood pressure.

Conclusion

It is imperative that dentists be cognizant of the many oral/dental manifestations of the use of ecstasy in order to properly diagnose various conditions with which patients routinely present to dental practices and to treat (or sometimes to delay treatment) in an efficient manner without doing harm to the patient. The treating dentist must remember that drug addictions affect all gender, socioeconomic and age groups. The dentist must discuss with the patient his or her history of drug abuse in a non-condemnatory fashion during the review of the patient's medical history prior to treatment. It is hoped that some of these patients will also be willing to be referred to a professional drug treatment facility to attempt to put an end to the ceaseless ravages that illicit drug abuse cause many members of our society. //

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Comparison of Soft Toothbrush and New Ultra-soft Cleaner in Ability to Remove Plaque from Teeth

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ABSTRACT

In this single-blind, crossover study, the difference between a brushless tooth cleaner and a soft toothbrush was studied to compare plaque removal efficiency. The sample was composed of 15 human subjects who were categorized into two groups. Group 1 was composed of subjects randomly assigned to the brushless tooth cleaner for the first two weeks. Group 2 was composed of those randomly assigned to begin the study using the soft toothbrush. After two weeks of brushing with their assigned device, subjects returned to their normal modality to brush their teeth for one week. For the last two weeks of the study, subjects were told to brush with the opposite device they were originally assigned to at the beginning of the trial.

Investigators recorded the subjects' gingival indices (based on probe depths) and Quigley scores (based on plaque indices using disclosing solution) at the beginning of week one, the end of week two, the end of week three and the end of week five. The main outcomes in this study were the Silness Loe Index (SLI) and the Quigley Hein Index (QHI). The SLI was assessed on the buccal, lingual, mesial and distal surfaces of six teeth, for a total of 24 surfaces. The

QHI was assessed on the buccal and lingual surfaces of six teeth, for a total of 12 surfaces. Each index was measured at each visit by the sum total score divided by the total number of surfaces. The data were analyzed separately using a mixed-effects repeated measures analysis of variance (RMANOVA) for crossover designs. Results indicate that, according to the SLI, there is no significant difference between the two treatments after the first or second weeks. However, based on the QHI, statistically significant differences existed between the two treatments after week one and two. After week one, the soft toothbrush use had a higher QHI than the brushless tooth cleaner. After week two, the brushless tooth cleaner had a higher QHI than the soft toothbrush.

Toothbrushes have been the gold standard for cleaning plaque from teeth for generations. They have ranged in texture from hard to soft and natural to synthetic materials. A recent study by David Pashley, et al., the Medical College of Georgia School of Dentistry, Augusta, GA, entitled "Consensus-Based Recommendations for the Diagnosis and Management of Dentin Hypersensitivity,"

The ultra-soft cleaner that is the subject of the study described here was invented by Jack Gruber, D.D.S., a periodontist affiliated with North Shore University Hospital and New York University College of Dentistry.

introduced the term “toothbrush disease.” The term means gingival recession and wear of the root surface caused by overuse of toothbrushes and toothpaste, which contribute to hypersensitivity of the teeth to touch and temperature change.

The PeriClean was designed to eliminate the deleterious effects of the standard toothbrush while being as effective as the toothbrush in removing plaque buildup. The bristles on a toothbrush can cause gum recession and sensitivity, hence the move from hard bristles to soft bristles over recent years. As of this date there are no studies we know of that compare a brushless cleaner (the PeriClean) to a soft toothbrush for effectiveness in removing plaque from teeth.

The aim of this study was to observe whether a brushless cleaning device can be equally as effective at removing plaque from teeth as a soft toothbrush. The aim was to give people an alternative to bristle brush cleaning if they find they are brushing too hard. The hypothesis was that it is possible to maintain healthy teeth and gingiva by using brushless methods in conjunction with flossing.

Materials

The toothbrush being used was a standard soft-bristled toothbrush that is FDA approved. The PeriClean is made of all materials that are FDA approved as well. The handle will be made from polypropylene.

Polypropylene (PP) Total 3824WZ is a versatile thermoplastic used in a variety of applications, among them, food packaging, textiles, laboratory equipment and automotive components. Its particulars are as follows:

- Antibacterial properties.
- FDA approved.
- Made in USA.
- Recyclable.
- Excellent flexibility to assist in minimizing force applied to teeth and gums.
- Suitable tensile and tear strength to avoid product deterioration.
- High elongation before breaking but reasonable stiffness.
- Low taste and odor concerns.
- Low density light weight compared to other materials.
- Weight: 24 grams.

The pad

The pad is made of soft thermoplastic rubber. It is GLS CL2000X. Generally, thermoplastic rubbers are considered a high-tech, space-age material. It possesses the following properties:

- FDA approved.
- Made in USA.
- Recyclable.

- Crosslink bond in its structure contributes to high elastic properties and soft and rubbery “feel.”
- Its softness assists in minimizing force applied to teeth and gums.
- Its softness also conveys being non-destructive to teeth and gums.
- Excellent tear strength (relative to this application).
- Good wear resistance (relative to this application).
- Low taste and odor concerns.
- Weight: 3 grams.

Cement

The adhesive is Loctite 4011. It is very strong, water resistant and FDA approved.

Methods

The Quigley Hein Index (QHI) and the Silness Loe Index (SLI) were obtained at each study visit. For the Quigley scores a disclosing solution was used, which colored the plaque. This disclosing solution is in general use in dentistry to highlight plaque. It is made from vegetable dyes and is not a permanent coloring agent. The Silness gingival uses periodontal probing gently between the gum and tooth and is also in general use by hygienists and dentists. Subjects selected needed to be 18 years of age or older and have healthy gingiva. Those with braces on their teeth were excluded. Also excluded were people who are decisionally impaired and need authorized representatives to sign consent forms.

Recruitment was done via direct contact from our patient population. If a subject was found to be eligible to participate, she or he was approached by someone from the research team during a scheduled visit. Patients were screened at 400 Community Drive, Manhasset NY 11030. A total of 15 subjects were recruited for this study.

No forms of advertising were used. If in the future advertisements are to be used, approval will be obtained from the Institutional Review Board (IRB) prior to use. The recruitment methods used provided equitable selection of subjects.

Informed consent was obtained by study personnel approved by the IRB. The consent form conformed to 45 CFR 46.116, 21 CFR 50.20, and institutional requirements. The informed consent process was a comprehensive discussion between the study doctor and a prospective subject about the nature of the research study, risks and benefits, alternatives to research and rights of a study subject.

All potential research participants were provided with the information in the IRB-approved consent form both verbally and in a copy of the consent form. They were given ample time to think about whether they wished to participate, and had the opportunity to ask questions. If the potential subject needed more time, she or he was given the form to take home and was advised to think about participating and to discuss it with family and friends. If

consent was obtained on the same day that research procedures were initiated, the investigator documented in the research record the date that consent was obtained and that it occurred prior to initiation of the research procedures.

The study investigator then ensured, to the best of his or her ability, that prospective subjects understood why the research was being done and why they were being asked to participate. The study investigator documented the process in the subject's medical record and/or research record. A subject's autonomy was respected at all times; and the consent process was free of all elements of coercion.

Obtaining initial informed consent was documented by the use of a written consent form approved by the IRB and signed and dated by the subject, a witness and the study doctor. One copy of the signed consent form was given to the subject and a second copy was placed in the subject's medical chart (if appropriate). The original signed consent form was retained with the principal investigator's research records.

After consent was obtained, subjects were randomly assigned by a 1:1 ratio to the toothbrush or PeriClean (brushless tooth cleaner). During the first visit, the subject's teeth were washed with a disclosing solution. Investigators also did periodontal probing gently between the gum and tooth to look at the gingival index. Subjects brushed their teeth for two weeks (at home) with the PeriClean or toothbrush, depending on which one they were randomized to. After two weeks, subjects came for a second study visit. At this visit, the following occurred: 1. teeth were washed with a disclosing solution; and 2. periodontal probing was done.

After their week two visit, subjects were advised to return to the normal modality they used to brush their teeth. They did this for one week. At week three, subjects came back into the office; their teeth were again washed with a disclosing solution. Investigators also did periodontal probing gently between the gum and tooth to look at the gingival index again. This was used as the baseline measure for the crossover period. After this wash-out period, subjects crossed over to the other toothbrushing method. If subjects were originally randomized to the PeriClean, they then used a toothbrush for the last two weeks of the study (weeks three through five). If subjects were originally randomized to a toothbrush, they switched over to the PeriClean for the last two weeks of the study (weeks three through five).

Two weeks later (five weeks from the beginning of the study), subjects returned for the final study visit. At this visit, all of the previous exams were done.

Statistical Methods

The Biostatistics Unit developed a randomization procedure using a permuted block design. The randomization assignment was opened and provided the subject with the assigned PeriClean or toothbrush, to be used at home. All patients involved in this

crossover trial were randomly allocated, in a 1:1 ratio, to two sequences:

1. PeriClean followed by soft toothbrush; or
2. soft toothbrush followed by PeriClean.

Descriptive statistics (means \pm standard deviation [SD] and frequency [%]) were calculated for baseline patient characteristics (i.e., age and sex).

The primary outcomes variables in this study were the SLI and the QHI. The SLI was assessed on the buccal, lingual, mesial and distal surfaces of six teeth (3, 7, 12, 14, 23, 28), for a total of 24 surfaces. The QHI was assessed on the buccal and lingual surfaces of six teeth, for a total of 12 surfaces. Each index was measured at each visit by the sum total score / total # of surfaces. All measurements were recorded by a single, experienced examiner.

SLI and QHI data were analyzed separately using a mixed-effects, repeated measures analysis of variance (RMANOVA) for crossover designs, with treatment (PeriClean or soft toothbrush) and period (one or two) as factors in the model. A carryover effect was excluded in the model, as it was assumed that any carryover effects were minimized with the washout period between switching modalities.

A result was considered statistically significant at the $p < 0.05$ level of significance. All analyses were performed using SAS version 9.3 (SAS Institute Inc., Cary, NC).

Methodology

The Gingival Index (GI) was developed by Loe and Silness to describe the clinical severity of gingival inflammation, as well as its location.

Teeth examined:

1. Maxillary right first molar
2. Maxillary right lateral incisor
3. Maxillary left first bicuspid
4. Mandibular left first molar
5. Mandibular left lateral incisor
6. Mandibular right first bicuspid

Appearance	Bleeding	Inflammation	Points
normal	no bleeding	none	0
slight change in color and mild edema with slight change in texture	no bleeding	mild	1
redness, hypertrophy, edema and glazing	bleeding on probing/pressure	moderate	2
marked redness, hypertrophy, edema, ulceration	spontaneous bleeding	severe	3

Surfaces examined on each tooth:

1. Buccal
 2. Lingual
 3. Mesial
 4. Distal
- Gingival Index for a specific tooth = AVERAGE (points for the four surfaces).
 - Gingival Index for type of tooth (first molar, first bicuspid, lateral incisor) = AVERAGE (Gingival Indices for the two teeth).
 - Gingival index for patient = AVERAGE (Gingival Indices for all six teeth).

Average Gingival Index	Interpretation
2.1 - 3.0	severe inflammation
1.1 - 2.0	moderate inflammation
0.1 - 1.0	mild inflammation
< 0.1	no inflammation

For the Quigley scores, a disclosing solution was used, which colored the plaque. This disclosing solution is in general use in dentistry to highlight plaque. It is made from vegetable dyes and is not a permanent coloring agent.

The Silness Gingival Index uses a periodontal probe gently between the tooth and gum and is also in general use by hygienists and dentists. It is not invasive to the tissues of the gums and teeth.

Results

The average age of the 15 subjects in this study was 34.7 ± 8.1. There were 11 females (73.3%) and 4 males (26.7%).

SLI

The estimated “treatment” difference between PeriClean and soft toothbrush mean SLI was -0.121 [95% confidence interval:-0.219, -0.0235]. This treatment effect was significant (p<0.0189). However, the period effect was not statistically significant (p<0.1504), implying that it does not seem to matter whether the patients used the soft toothbrush or the PeriClean in the first period or the second period.



QHI

The estimated “treatment” difference between PeriClean and soft toothbrush mean QHI was 0.166 [95% confidence interval: 0.069, 0.262]. This treatment effect was significant ($p < 0.0026$). The period effect was also statistically significant ($p < 0.0001$), implying that it does matter whether the patients used the soft toothbrush or the PeriClean in the first period or the second period.

The table below contains a breakdown of the SLI mean \pm SD and QHI mean \pm SD for each treatment at the end of each period.

Period	Treatment	N	SLI	QHI
1	PeriClean	7	0.05 \pm 0.09	0.58 \pm 0.32
	Toothbrush	8	0.19 \pm 0.17	0.91 \pm 0.48
2	PeriClean	8	0.14 \pm 0.13	0.83 \pm 0.53
	Toothbrush	7	0.24 \pm 0.16	0.18 \pm 0.18

Discussion

This comparison of the soft toothbrush versus the brushless cleaner is significant to the oral health field because it showed us that both

are equally effective in their ability to remove plaque from teeth. The statistics suggest that while it does not matter which device was used when, the brushless cleaner can stand up to the conventional soft toothbrush in plaque removal. Because this device is still in the beginning stages, there are gaps in the literature. However, the brushless cleaner appears to be gentler on the gingiva and may show promise in the future for preventing gingival recession.

As with many other research endeavors, this study had limitations. While a larger sample size would have been more desirable, only 15 subjects were used in conducting this research. Using subjects from a larger age range may also provide more comprehensive results. And while gender did not prove to be a factor, 73.3% of the subjects were female, which may have given skewed results.

Future research in this topic could be invaluable for the field of oral health. In order to get a better understanding of the brushless cleaner, more studies should be done without the pre-existing limitations. A much larger sample size that incorporates a more even distribution of males to females, as well as a much more varied age range should be used. Other relevant studies that could be done in the future should determine the effects of the brushless cleaner on the regrowth of gingiva. *///*

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Increased Number of Dental Professionals in New York State Counties

H. Barry Waldman, D.D.S., M.P.H., Ph.D.

ABSTRACT

Despite decreases in the population for 49 of the 62 counties in New York State between 2006 and 2013, the number of dentists increased in 52 counties. In addition, in 2013, there were more dental hygienists than dental establishments in 54 of the state counties. This change in landscape from 2000 to 2006, when the number of dentists decreased in 27 counties and a sizeable proportion of the state had little or no coverage, is reviewed using federal and state government reports.

The series of dire demographic reports for New York State during the first years of this century indicated dramatic population and dental profession developments. While population decreases continued in 37 state counties between 2010 and 2012, more recent information from the New York State Office of the Professions points to significant developments in the numbers of dentists and dental hygienists in New York counties. These include:

- Between 2006 and 2013, the number of licensed and registered dentists decreased in seven counties but increased in 52 New York counties.
- In 2013, there were more licensed and registered dental hygienists than dental establishments in 54 New York counties.³

Method

Data were drawn from a series of U.S. Census Bureau and New York State Office of the Professions statistical reports. While the number of dentists and dental hygienists at the county lev-

el is available for 2013, the latest population figures that were available at the county level were for 2012.⁽¹⁾ The latest dental establishment data were available for 2011.⁽²⁾⁴ Therefore, the combinations of the numbers of dental professionals and other county data should be considered as approximations for the 2013 period.

Number of Dentists

Between 2008 and 2012, there was a general increase in New York State in the annual number of new dental licenses, from approximately 500 to 600 licenses (2008 – 497; 2009 – 502; 2010 – 601; 2011 – 542; 2012 – 597).³

During the period between 2006 and 2013, there was an overall increase of 1,216 licensed and registered dentists in the state, including 502 in New York City and 714 in the rest of the state (Table 1).

- (1) Throughout this review, “the county location reflects the licensee’s primary mailing address on record with the Office of the Professions; the address is not necessarily the licensee’s practice address. Although licensees must be registered to use the professional title or to practice within New York State, being registered does not mean the licensee is actively doing so.”³ The total number of registered dentists and dental hygienists used in this review does not include the numbers of licensed individuals who are registered but are not located in New York State (2,908 dentists and 1,295 dental hygienists).³
- (2) An establishment is a single physical location where services are performed. It is not necessarily identical to a company or enterprise, which may consist of one or more establishments. In addition, one or more dental practitioners may be present in an establishment. Throughout this presentation, the term “dental establishment” refers to those facilities: 1. with employees (including dentists); and 2. subject to federal income tax. Government agency programs (hospitals and health department clinics) are not included.⁴

Population per Dentist

Between 2006 and 2013, the population per dentist decreased in 49 counties, including a decrease of more than 1,100 residents per dentist in St. Lawrence and Greene counties, more than a decrease of 2,200 residents per dentist in Allegany County and more than 3,000 residents per dentist in Yates County. The dramatic changes in these counties were associated with a combination of decreases in population and increases in the relatively limited number of practitioners in 2006 (Tables 1 & 2).

In 2013, the population per dentist ranged from:

- Between 572 and 845 residents per dentist in New York (Manhattan), Nassau, Westchester and Rockland counties; to
- More than 3,000 residents per dentists in Schuyler, Yates,

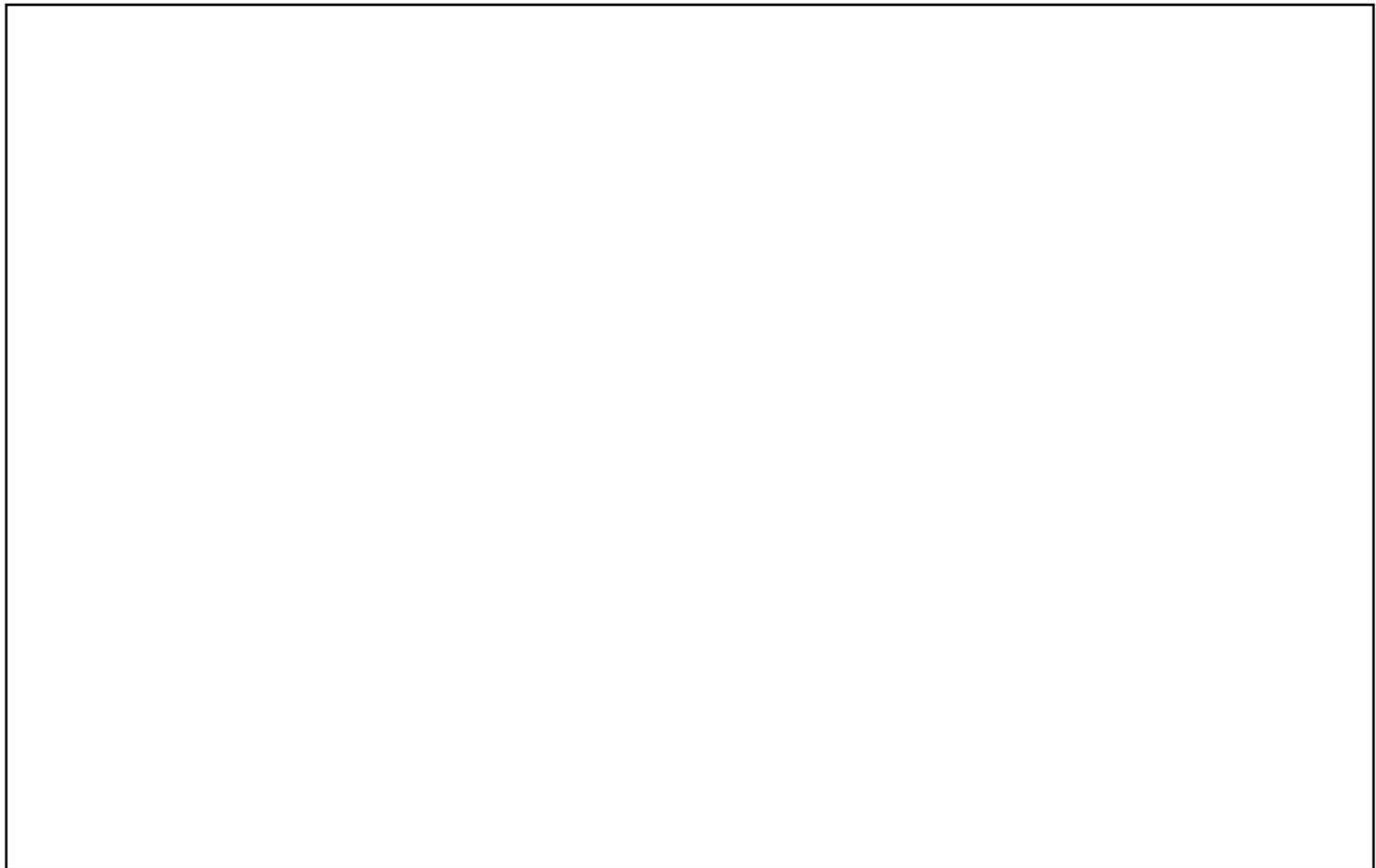
TABLE 1

New York City and State Dentists and Population per Dentist by County: 2006, 2012, 2013^{3,5}

	Number Dentist Change		Population per Dentist Change	
	2013	2006-2013	2012/2013*	2006 - 2012/2013*
New York City				
Bronx	404	19	3,486	- 40
Kings	1,469	112	1,746	- 86
New York	2,827	343	572	- 69
Queens	1,665	- 7	1,359	19
Richmond	398	35	1,296	17
Totals				
New York City	6,763	502	1,232	- 68
Rest of State	9,722	714	1,155	- 78
New York State	16,485	1,216	1,187	- 74

*Population data are for 2012. Dentist data are for 2013.

- Seneca, Cortland, Orleans and Washington counties; and
- More than 4,000 residents in Tioga and Hamilton counties (Tables 1 & 2).



“Most of upstate New York continues to lose people... Although New York State grew by 87,093 people in the 15 months after the 2010 census, 37 upstate counties lost population, according to new U.S. Census Bureau population estimates.”¹

(Notes: No discussion of dentist-to-population ratios would be complete without attention to the fact that, “The number of dentists working part time is increasing ...”⁶ Further, “... female dentists younger than 40 years (are) at least five times more likely to work part time than their male counterparts (31.3 percent vs. 5.6 percent) ... As the number of female dentists increases, their impact on the dental workforce will be significant...”⁶ Also, the population-to-dentist ratios were developed using Census Bureau county residency data. The reality is that many individuals may travel to neighboring counties for dental services. These ratios provide one approach to determine the general trends of the potential pool of patients for individual practices.)

Dental Hygienists

During the years from 2008 to 2012, between 422 and 455 new licenses were issued annually to dental hygienists. As of 2013, there were 9,610 New York State licensed and registered dental hygienists with a primary mailing address in the state. There were an additional 1,295 licensed and registered New York State dental hygienists who lived out of state.³

Distribution of Dental Hygienists

There are more dental hygienists with New York State mailing addresses (9,610) than dental establishments (9,237). The greater number of dental hygienists than dental establishments exists in 54 of the state counties. Exceptions are:

- New York City (not including Richmond County).
- Counties in the metropolitan area of NYC—Nassau, Rockland and Westchester.
- Tomkins County (the only non-metropolitan NYC county), with 29 dental hygienists and 39 dental establishments (Table 3).

New York County (Manhattan), the county with the greatest number of dental establishments (1,438), had

TABLE 2
New York State Dentists and Population per Dentist by County: 2006, 2012, 2013³⁻⁵

	Number Dentist Change		Population per Dentist Change	
	2013	2006-2013	2012/2013*	2006 - 2012/2013*
Albany	262	28	1,165	- 106
Allegany	17	7	2,844	- 2,216
Broome	146	23	1,356	- 261
Cattaraugus	37	9	2,147	- 799
Cayuga	42	7	2,150	- 179
Chautauqua	66	1	2,023	- 66
Chemung	55	2	1,616	- 72
Chenango	20	2	2,496	- 379
Clinton	42	4	1,944	- 215
Columbia	32	5	1,953	- 403
Cortland	15	- 2	3,298	438
Delaware	18	3	2,626	- 542
Dutchess	244	43	1,218	- 248
Erie	803	28	1,144	- 56
Essex	16	0	2,435	18
Franklin	23	- 1	2,251	125
Fulton	22	5	2,496	- 776
Genesee	25	2	2,399	- 177
Greene	28	8	1,280	- 1,204
Hamilton	1	1	4,778	**
Herkimer	20	1	3,225	- 131
Jefferson	66	4	1,822	- 55
Lewis	6	1	4,537	- 777
Livingston	38	12	1,705	- 764
Madison	33	1	2,193	- 5
Monroe	582	- 2	1,284	29
Montgomery	27	3	1,849	- 191
Nassau	2,153	124	626	- 31
Niagara	133	39	1,640	33
Oneida	143	8	1,633	- 101
Onondaga	358	26	1,304	- 75
Ontario	67	16	1,619	- 429
Orange	258	41	1,451	- 267
Orleans	12	0	3,569	- 46
Oswego	42	6	2,897	- 55
Otsego	35	8	1,763	- 560
Putnam	60	16	1,660	- 624
Rensselaer	76	- 4	2,103	163
Rockland	376	33	845	- 8
St. Lawrence	52	15	2,158	- 1,117
Saratoga	182	38	1,220	- 272
Schenectady	123	8	1,261	- 35
Schoharie	11	- 1	2,918	- 309
Schuyler	6	1	3,085	- 783
Seneca	11	1	3,209	- 276
Steuben	44	4	2,251	- 217
Suffolk	1,288	25	1,163	104
Sullivan	46	15	1,669	- 970
Tioga	12	- 1	4,206	775
Tompkins	60	0	1,709	43
Ulster	118	16	1,540	- 251
Warren	50	2	1,310	- 56
Washington	16	1	3,933	226
Wayne	38	4	2,446	- 307
Westchester	1,243	124	773	- 67
Wyoming	15	3	2,792	- 765
Yates	8	4	3,168	3,021

* Population data are for 2012. Dentist data are for 2013.
** There were no dentists in Hamilton County in 2006.

- 4 counties between \$36,000 and \$39,000 (Suffolk, Westchester, Nassau and Putnam).
- New York County (Manhattan) - \$41,000.⁷

During the years between 2006 and 2013, there were dramatic changes in the economics of the country, which in turn had profound effects upon the economics of a dental practice. In addition, so too is the concern over the “graying” of one’s community as a result of the flight of young adults from so many upstate counties. However, the varied and increasing dental needs of an older generation, whose numbers will represent one-in-five members of the national population within the next two decades, could represent a significant segment of a new and/or continuing successful practice.⁸

The dramatic increases in the number of dentists and dental hygienists in more than 80 percent of the state counties, including most of the upstate counties, occurred around the time of the 2010 census when “37 upstate counties lost population....”¹ Since the middle of the last decade, there has been a change in the dental landscape since the period “...between 2000 and 2006, when the number of licensed and registered dentists decreased in 27 (New York State) counties.”² Whether these increases in the number of practitioners are temporary or a long-term development must be considered as the profession plans for the next

generation of dental professionals and the needs of the residents of New York State. ✍

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Can Gingival Crevicular Blood be Relied upon for Assessment of Blood Glucose Level?

Shivani Dwivedi, M.D.S.; Sharmila. J. Verma, M.D.S.; Monali Shah, M.D.S.; Kapil Jain, M.D.S.

ABSTRACT

Diabetes mellitus (DM) is undiagnosed in approximately half of the patients actually suffering from the disease. In addition, the prevalence of DM is more than twice as high as in patients with periodontitis when compared to periodontally healthy subjects. Thus, a high number of patients with periodontitis may have undiagnosed DM. The purpose of the present study was to evaluate whether blood oozing from a gingival crevice during routine periodontal examination can be used for determining glucose levels.

Materials and Methods: Observational cross-sectional studies were carried out in 75 patients (43 males and 32 females) with chronic periodontitis who were divided into two groups: Group I and Group II, respectively. Blood oozing from the gingival crevices of anterior teeth following periodontal probing was collected with the stick of glucose self-monitoring device, and the blood glucose levels were measured. At the same time, finger-prick blood was taken for glucometric analysis and subsequent readings were recorded.

Results: The patient's blood glucose values ranged from 74 to 256mg/dl. The comparison between gingival crevicular blood and finger-prick blood showed a very

strong correlation, with a t value of 3.97 (at P value = 0.001).

Conclusions: The data from this study has shown that GCB collected during diagnostic periodontal examination can be an excellent source of blood for glucometric analysis.

Diabetes mellitus (DM) is among the most frequent metabolic disorders, with an estimated prevalence of 7% in industrialized countries, of which nearly half the cases are undiagnosed.¹ Patients with undiagnosed DM are at significantly increased risk for coronary heart disease, stroke and peripheral vascular disease. Periodontitis has been considered to be the sixth complication of diabetes. Because of the large number of patients who seek dental treatment each year, the dentist may increase his or her importance as a member of the health team by participating in the search for undiagnosed, asymptomatic DM patients.

Investigators have indicated there is a large group of patients with mild asymptomatic DM whose disease remains undetected unless blood tests are employed routinely. It is estimated that for every patient with known diabetes, there is one with undiagnosed DM. It's the responsibility of dental practitioners to screen for undiagnosed cases, which may influence dental treatment or the general well-being of their patients. Thus, monitoring a patient's blood glucose during the office visit may be a better alternative.

Glucose self-monitoring systems have provided reliable, rapid blood glucose determinations in diabetes screening and in-home monitoring. When utilized in a dental office, such a system could

result in a more objective parameter for referral for diagnosis of DM. Dental office screening could result in earlier treatment and possible minimization of serious complications.

Periodontal inflammation with or without the complicating factor of DM is known to produce ample extravasated blood during diagnostic procedures. Routine probing during periodontal examination is more familiar to the practitioner and less traumatic than a finger puncture with a sharp lancet. Development of a non-invasive method for measuring blood glucose levels is an urgent necessity. Putting such a method into practical use will remove some of the physical and mental stress that patients with diabetes have to endure. To realize a non-invasive blood glucose monitor, the gingival crevicular blood was investigated.

Development of an intraoral blood sampling technique as opposed to the typically used finger site could make such tests even more suitable for use by dental practitioners.² Recently, more accurate self-monitoring devices have been developed for testing small amounts of blood obtained from areas much less sensitive than fingertips, such as the forearm, upper arm, thigh or base of thumb. This might be of considerable interest to dental practitioners since this glucometer is accurate, simple and relatively inexpensive and can be used as an in-office screening device for any patient suspected of having diabetes or as a way to monitor blood sugar levels in known diabetics.³

In previous studies, in-office screening of gingival blood glucose levels in known diabetics⁴ and periodontitis patients⁵ has been evaluated. However, these devices have required considerably larger blood volumes than those that usually ooze from the crevice after probing in mild or moderate gingivitis.

Blood from the gingival crevice after probing is generally a mixture of capillary blood and gingival crevice fluid.⁶ In particular, in healthy situations, glucose levels in gingival crevicular fluid are considerably lower than blood glucose levels.⁷ Thus, the question may arise whether glucose levels measured in blood samples obtained during periodontal examination are sufficiently related to glucose levels in capillary blood obtained from the finger prick.³ Glucometers are commonly used by patients with diabetes for home monitoring of blood glucose levels. Recently, more accurate self-monitoring devices have been developed for testing small amounts of blood obtained from areas much less sensitive than fingertips, such as the forearm, upper arm, thigh or base of thumb. In general, accuracy of these novel glucometers has been acceptable.

An even more sensitive device, the Accu-Chek glucose monitoring system, needs only 0.4 µl of blood and may actually allow for totally painless testing of blood oozing from the gingival crevices of patients with mild or moderate gingivitis during routine periodontal examination.

Aims and Objectives

The aim of the study was to investigate the feasibility of measuring glucose levels in capillary blood obtained during routine

periodontal probing in patients with chronic periodontitis and assessing an intraoral sampling technique for reliability of blood glucose determination via a self-monitoring glucometer.

The primary objectives were:

1. To evaluate a quick, safe and non-invasive method for screening for diabetes during regular periodontal examination.
2. To investigate the feasibility of measuring glucose levels in capillary blood obtained during routine periodontal probing in patients (diabetic and non-diabetic) with chronic periodontitis.
3. To compare gingival crevicular measurements and finger-prick blood glucose measurements using a self-monitoring glucometer.

Material and Method

The study patients were recruited from the Periodontics Out Patient Department of K.M. Shah Dental College and Hospital. Seventy-five patients with moderate or severe periodontitis were included in this study.

The excluded patients had a disorder that accompanied an abnormally low or high hematocrit, severe cardiovascular, hepatic, immunologic, renal, hematological or other organ disorder. Also excluded were patients with an intake of substances that interfere with the coagulation system, for example, coumarin derivatives, non-steroidal anti-inflammatory drugs or heparin, and patients who required antibiotic premedication.

An observational cross-sectional study was performed on a total of 75 patients (43 males and 32 females).

Gingival Crevicular Blood

Samples of gingival crevicular blood (Figure 1) were obtained at random from diabetic and non-diabetic patients. Upper front teeth, irrespective of their probing depths were chosen. After selecting the bleeding site, the site was isolated with gauze or cotton rolls. The interdental papillae was probed with an UNC-15 probe and observed for bleeding. At this stage, the test end of the strip (mounted on the glucose monitoring device already) was touched to the bleeding site to obtain the blood sample on the test strip, as depicted in Figure 1.



Figure 1. Sample collection of gingival crevicular fluid.

Finger-Prick Blood

Samples for finger-capillary blood (Figure 2) were taken, preferably, from the soft tissue surface of the index finger of the patient's non-dominant hand. The side of the pad of the finger was selected. After wiping with surgical spirit, the finger was punctured with a sterile lancet and the test end of the strip was touched to the bleeding site until the instrument displayed the blood glucose measurements on the screen in mg/dl.



Figure 2. Sample collection of finger-prick blood.

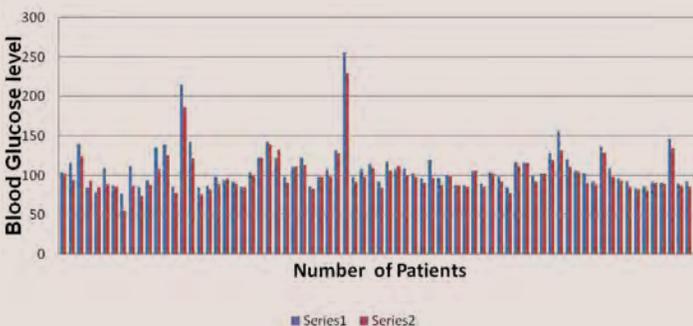


Figure 3. Comparison of gingival crevicular blood and finger-prick blood, where series 1 depicts finger-prick and series 2 gingival crevicular blood glucose levels, respectively.

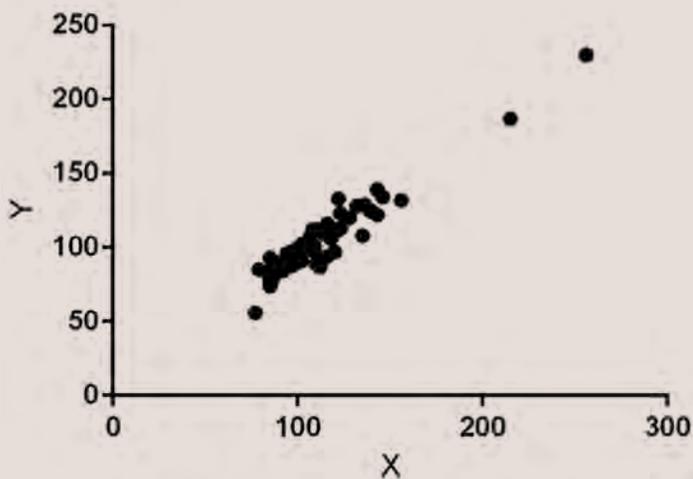


Figure 4. Regression line and scatter plot of linear relationship between glucose measurements from gingival blood and finger-prick method where x depicts finger-prick method and y depicts gingival crevicular blood and $y=0.8381 X + 10.49$.

Descriptive data were presented as mean \pm SD and range values. The difference between the measurements (gingival crevicular blood, finger-prick blood) in the same individual was tested by a paired "t" test.

Pearson's product moment correlation coefficient was found to assess the relationship between measurements.

Results

The range of the gingival crevicular blood glucose measurements varied from 74 to 230 mg/dl, with a mean value of 101.46 mg/dl and a standard deviation of 24.31mg/dl. The range of the finger-prick blood glucose measurements of the patients varied from 77 to 256 mg/dl, with a mean value of 108.4 mg/dl and a standard deviation of 27.86 mg/dl. On comparison of gingival crevicular blood glucose and finger-prick blood glucose measurements, finger-prick capillary blood glucose showed a higher mean value (108.46 mg/dl) than gingival crevicular blood glucose mean value (104.1 mg/dl). Pearson's correlation analysis results showed r- value 0.92 with p value as 0.0001, indicating a highly significant correlation between gingival crevicular blood and finger-prick blood.

Regression line and scatter plot of the linear relationship between the glucose measurements of the gingival blood and finger puncture method were performed (Figure 3).

Discussion

DM is a complex disease of multiple conditions and syndromes that have glucose intolerance in common.² It is associated with a wide range of complications, among them, retinopathy, nephropathy, micro- and macrovascular disease, altered wound healing and periodontitis.⁸ Periodontitis has been proposed as a sixth complication of DM.⁹ In fact, there is a two-way relationship between DM and periodontitis. On one hand, poorly controlled DM increases the risk for developing destructive periodontitis and impairs treatment outcome. On the other, chronic inflammatory periodontal disease considerably complicates diabetic control.¹⁰ It has been estimated that about one-third of Type 2 cases are undiagnosed, and screening for undiagnosed type 2 DM is highly recommended.

From the close interrelationship seen between diabetes and periodontitis, it can be assumed that the dental practitioner and especially periodontists are extremely likely to encounter an increasing number of undiagnosed diabetes patients with periodontitis. The early diagnosis of diabetes, however, might help to prevent its long-term complications, which are responsible for the high morbidity and mortality of diabetic patients.¹

Considerable effort has been made in the past few years to develop painless and non-invasive methods to measure blood glucose. However, until now, none is employed in routine clinical practice.¹¹ Since periodontal inflammation with or without the complicating factor of DM is known to produce ample extravasate of blood during diagnostic periodontal examination,¹² no extra procedure, e.g.,

finger puncture with a sharp lancet, is necessary to obtain blood for glucometric analysis. Even in the case of very low gingival crevicular bleeding, a glucose measurement is possible with the use of a self-monitoring device because of the low amount of blood (3 μ l) necessary to perform the analysis. Moreover, the technique described is more familiar and less traumatic to the patient than a finger puncture.

Thus, Accu-Chek Advantage (second generation glucometer) offers the advantage over the first generation glucometer, which needs a larger blood sample, i.e., about 10-15 μ l, and requires that the blood sample be placed on the test strips to be wiped off later by the user. Thus, it gives the reading by color matching.⁴ It also offers an advantage over the third-generation glucometer, which is a non-invasive meter whereby the samples are obtained without direct contact with the body tissues.¹³ Hence, its use for detecting the glucose readings with the GCB sample may not be possible.

In the present study, 75 patients were divided into two groups. GCB and FP blood glucose were measured in each patient using a self-monitoring glucometric device. On comparison between GCB glucose measurements and FP blood glucose measurements, a very strong correlation was found (Figure 4).

The results of this study are in agreement with other studies⁴

that examined diabetic patients with unknown periodontal status and found a very strong correlation between gingival crevicular and finger-prick capillary and the corrected intravenous blood glucose measurements. Additionally,⁵ a strong correlation was observed between GCB and finger-stick capillary-measured blood glucose when diabetic and non-diabetic patients with moderate-to-advanced periodontitis were examined.

On comparison of GCB glucose and FP blood glucose measurements, a very strong correlation was seen with an r value of 0.92, which was statistically highly significant (P level < 0.001), respectively. The results are in agreement with the study conducted by Beikler T, et al. in 2002,⁵ and Shetty, et al.,¹⁴ wherein, a strong correlation was observed between GCB and finger-stick capillary-measured blood glucose when diabetic and non-diabetic patients with moderate-to-advanced periodontitis were examined.

In the present study, the GCB measurements showed consistently lower measurements compared to FP blood glucose measurements. This could be due to contamination of GCF, which dilutes the glucose concentration and produces lower measurements.³

Dental practitioners, however, may find the intraoral sampling technique more convenient, as the sample can be obtained during routine scaling and the strip system provides a more objective indica-

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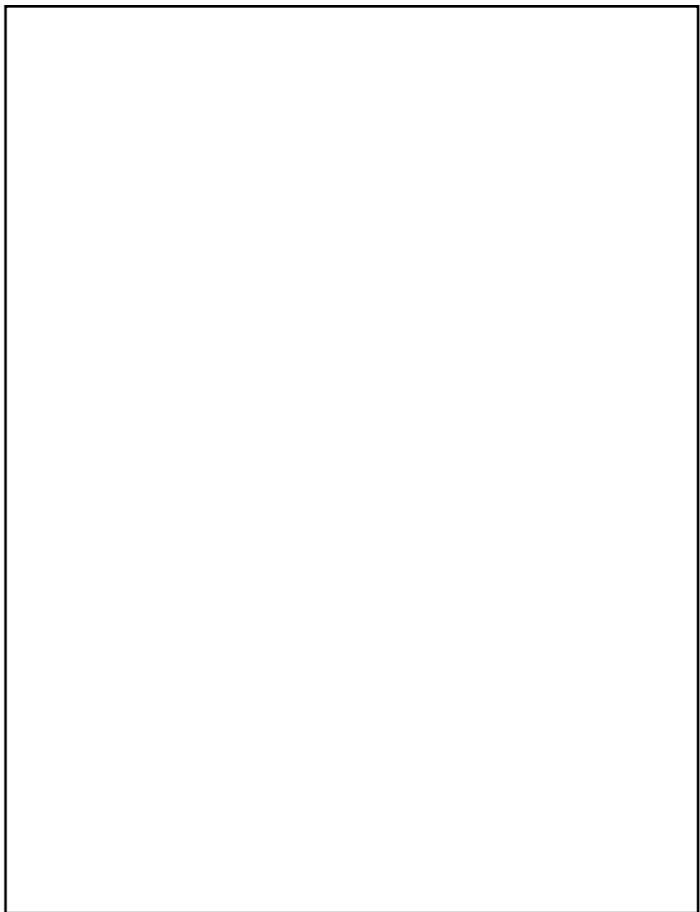


tor for referral to physicians than the more commonly used medical history review and observation symptoms that suggest DM.²

The strong correlation obtained in the present study on comparison between the various blood glucose measurements indicates the feasibility of using periodontal sulcular blood as an alternative to the FP blood and IV B. However, in a study conducted by Muller, et al. in 2005³ on diabetic and non-diabetic patients with gingivitis and moderate-to-advanced periodontitis, the results failed to provide any evidence for the usefulness of GCB for testing blood sugar during routine periodontal examination.

The results of the present study indicate that gingival crevicular blood collected during diagnostic periodontal examination may be an excellent source of blood for glucometric analysis. In addition, the technique described is safe, easy to perform and comfortable for the patient. It might, therefore, help to increase the frequency of diabetes screening in dental offices. The sampling procedure performed in the study is much easier and less time-consuming, since no additional tools are necessary to collect GCB and an adequate amount of blood was found to cover the strip.

Though a strong correlation has been seen between GCB and FP, it is not the correlation of the whole group but, instead, the predictability of the single measurements on one patient. This is



important because even a perfect correlation can have poor clinical significance for individual measurements. The precision must be considered to better weigh the values of individual measurements.⁴

Conclusion

Within the limitations of this study, the following conclusion can be made: GCB collected during diagnostic periodontal examination may be an excellent source of blood for glucometric analysis. The technique is safe, easy to perform and comfortable for the patient; therefore, it helps to increase the frequency of diagnosing diabetes during routine periodontal therapy, which provides a more objective indicator for referral to physicians than traditional methods. Thus, the dentist may increase his or her importance as a member of the health team by participating in the search for undiagnosed asymptomatic DM. ✍

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