Detection of Tooth Color before and after Bleaching using an Electronic Device
David Keinan, D.M.D., MSc., Ph.D., M.H.A.; Avi Shemish, D.M.D.; Mariel Webber, D.D.S.
Evaluation of tooth color before, during and after internal bleaching usually relies on a color scale and comparing the shade of that to the tooth. However, in some cases, bleaching results are not obvious. The digital color process evaluates the tooth going through all phases of internal bleaching and can easily be used at every dental clinic.

Conservative Approaches to Replacing Congenitally Missing Maxillary Lateral Incisors
Ahmad M. Al-Thobity, B.D.S., M.D.S., FRCD; Talal Alhassar, B.D.S., M.D.S., FACP, FRCD; Robert J. Flinton, D.D.S., M.S., FACP
Authors describe various approaches and techniques for managing missing lateral incisors. Techniques were chosen based mainly on amount of space in mesiodistal and incisocervical dimensions. Amount of underlying bone played important role in selecting treatment modalities. Case series.

Fluoride Varnish: Knowledge, Preferences and Practices of General and Pediatric Dentists
Survey of licensed dentists in Western New York concluded that fluoride varnish was underutilized, and pointed to need for guideline-based strategies.

Dental Economics and the Increasing Hispanic Population in the U.S. and New York State
Relationship of growing Hispanic population and economic concerns of dental practice is explored through prism of oral health needs, limited finances, health insurance and cultural orientation.

Pleomorphic Adenoma of the Upper Lip: A Rare Case
Mahnaz Fatolahzadeh, D.M.D., M.S.D.
Pleomorphic adenoma, the most common salivary gland neoplasm, frequently arises in major salivary glands. Case of patient with asymptomatic, long-standing mass of upper lip, found to be pleomorphic adenoma, is described.

Multiple Recession Coverage using Pericardium Membrane
Remigius Divakaran, M.D.S.; Divya Khanna, M.D.S.; Irfana Babrawala, B.D.S.; Joann Pauline George, M.D.S.
Use of porcine pericardium membrane, along with modified coronally advanced flap, in treating Millers Class I and II gingival recession in 38-year-old male patient offers significant advantages over traditional connective tissue grafting.
Fake News in Dentistry: Misinformed Consent

False and misleading information, easily accessible online, is complicating dentists’ ethical and legal responsibility to provide their patients with the best possible treatment.

Don’t believe everything you read. A cynical warning, but good advice in the era of fake news. Fake, because it deliberately deceives readers for profit. Such misinformation has plagued the print media at various times for hundreds of years. Today, however, fueled by the Internet, it reaches millions of people at the speed of light. Regrettably, when politically motivated, such propaganda can pose a threat to our governance structure, since the success of that structure requires accurately informed citizens.

A less blatant, but just as destructive, form of fake news currently invades dentistry. Misinformation, in the form of biased online dental product or service advertising disguised as science or professional advice, now pervades healthcare websites and social media. If practitioners fail to correct the resultant patient misunderstandings, it will threaten the integrity and credibility of our informed-consent process in the dentist-patient relationship. Patients increasingly turn to online searches to seek answers to their dental problems. If they, ultimately, base their decision to select and complete their dental care on false and misleading information, “misinformed consent” would better describe the process. How dentists and our profession respond to any confusion between the healthcare fact and fiction found on the Internet will determine the future trust patients place in their relationship with their dentist and the trust society places in the dental profession as the primary source of oral healthcare information.

What’s a patient to believe? The Internet makes access to oral health information faster, easier and cheaper than in the past. At the same time, it can hide the uneven quality of information that exists from site to site. Some websites fail to disclose the true source of the information presented and whether the content is evidence-based and current. Other sites portray profit-driven advertisements or opinions as scientific conclusions. Moreover, when patients do stumble upon reliable information, the web cannot help them personalize the knowledge and apply it to their individual case. Amid all the hype and spin, reasonable people often cannot discern between scientifically based truth and biased promotion. It induces the public to make treatment decisions based on the worst possible evidence: financially interested opinion.

What’s a dentist to do? As clinicians and practice owners, we can contribute to or turn a blind eye to the misinformation in the name of increased practice profits. Consider this frightening, worst-case scenario. A misinformed patient with Internet-generated misconceptions demands his dentist facilitate a patient-made treatment plan that is not in the best interests of that patient’s oral or general health. The dentist, who may personally act either as a source of online oral health misinformation or a willing accomplice to the patient’s confusion, agrees to perform the requested care. The dentist thereby functions as the patient’s agent to the patient’s own detriment, for the financial benefit of the dentist, all based upon the patient’s misinformed consent.
Ethically and legally, dentists must enter into a collaborative dialogue with patients regarding all treatment alternatives and their respective risks and benefits. This requirement includes the dentist’s duty to correct misinformation and patient misconceptions. We must dispel the fictions and ensure that the patient makes an informed decision. When a patient’s request would lead to substandard care, then the dentist has a duty to refuse to render such treatment.

In order to avoid contributing to the problem, individual practitioners must market their services ethically. The profession must continue to publish its own Internet sources of accurate and evidence-based oral healthcare information. Most importantly, dentists and organized dentistry must educate patients on how to generally assess the credibility of health information online to improve patients’ oral health literacy. Dentistry must prepare patients to evaluate the source and intended purpose of oral health information, including potential bias, the credentials of the author(s) and the current supporting scientific evidence.

Ultimately, misinformed consent will dissipate the trust patients place in the dentist-patient relationship and the trust society has in the dental profession. Angry and dissatisfied patients will respond with ethical and legal complaints. A disillusioned public will demand increased regulation of dentistry that is applicable more to a trade than a profession.

Currently, the dental profession stands as the most credible source of oral health care information. Patients look to us for an honest interpretation. This is how we earned the public’s trust; this is how we must keep it.

ENDNOTES
Are You Confused?

Is there a shortage of dentists, or an under use of services?

H. Barry Waldman, D.D.S., M.P.H., Ph.D.; Paul R. Creighton, D.D.S.; Steven P. Perlman, D.D.S., MScD, DHL (Hon)

According to the Department of Health and Human Services, Health Resources and Services Administration (HRSA), “Nation¬ally, (between 2012 and 2025) increases in supply will not meet the increases in demand for dentists, which will exacerbate the existing shortage... All 50 states and the District of Columbia are projected to experience a shortage of dentists.... States projected to experience the greatest shortfalls in the number of dentists in 2025 are: California, Florida and New York.”

The chief economist and vice president of the American Dental Association Health Policy Institute, weighs in saying he “... (agrees) there will be more dentists in the market in the coming years... HRSA's demand modeling is where there are some larger issues. The analysis, in my view, is based on assumptions that are inconsistent with the best available empirical evidence...

"First, there is strong evidence of significant unused capacity within the dental care system today. (The ADA report) shows the percentage of professionally active dentists who report they are not busy enough and could see more patients in selected states (ranging from less than 10% in North Dakota to almost 60% in Idaho) where data are available." And "Waiting times have decreased, dentists’ earnings are stagnating, and dentists who accept Medicaid tend to be busier."

"Second, there is compelling evidence to show that the main barriers to dental care are overwhelmingly financial and are not related to the availability of providers."

From the editor of Quintessence International comes this: There has been a “...marked decline in tooth decay and the accompanying reduction in traditional treatment patients” (emphasis added).

And from The PEW Charitable Trusts: “When it comes to improving the U.S. dental care delivery system, the issue that usually takes center stage is how to cover the nearly 127 million Americans who lack dental insurance.”

We responded to these differing views in a recent article in The NYSDJ in which we emphasized the need to expand the scope of a dental practice to provide care beyond the traditional population that served as the bulwark of many dental practices—that is, white middle- and higher-income populations. Consider the following from an article that appeared in the New York Times:

“The term ‘minority,’ at least as used to describe racial and ethnic groups in the United States, may need to be retired or rethought soon; by the end of this decade, according to Census Bureau projections, no single racial or ethnic group will constitute a majority of children under 18. And in about three decades, no single group will constitute a majority of the country as a whole.”

For example, the Hispanic population is projected to “…more than double, from 53.3 million in 2012 to 128.8 million in 2020. Consequently, by the end of the period, nearly one-in-three U.S. residents would be Hispanic, up from about one-in-six today.”

The Census Bureau reported that in mid-2014, non-Hispanic whites are less than a majority in four states (California, Texas, New Mexico and Hawaii) and the District of Columbia.

In addition, in letters to the editor in Quintessence International and the JADA, we pointed to another glaring omission. “...no mention is made of the underserved dental needs of the more than a half billion people throughout the world with one or more disabilities; or, specifically, in the United States, the underserved dental needs of the 57 million, men, women and children with intellectual disabilities, physical and/or sensory impairment, including more than 38 million with severe disabilities.”

In a recent NYSDJ article, we considered the relationship between ethics, economics and the dental profession. "When we speak of ethics, most often it is meant to describe an individual’s..."
“While many practitioners do provide care for individuals with disabilities... the challenge is for the dental profession to expand services to individuals with disabilities.”

Prepared Practitioners

“While many practitioners do provide care for individuals with disabilities... the challenge is for the dental profession to expand services to individuals with disabilities.”

It was not until 2004, that the U.S. Commission on Dental Accreditation adopted a new standard (with implementation in 2006) stating that “Graduates (from U.S. dental schools) must (sic) be competent in assessing the treatment needs of patients with special needs.” The standard does not require clinical experience during dental school training. Subsequent to the establishment of the new standard, a study of the clinical experience in the care of individuals with special needs indicated that some dental schools had augmented their curriculum to include clinical experiences in the care of these patients.

In addition, there are barriers to preparing current practitioners to provide care to individuals with special needs—that is, the dentists who graduated from dental school prior to implementation of the Commission on Dental Education programmatic standard in 2006 or later, depending upon the review schedule of individual schools. For instance, an increasing number of state dental boards require dentists to complete a defined number of mandatory continuing education hours as a precondition for relicensure. However, they do not specify courses for the care of individuals with special needs. The fact is that a review of continuing education courses in the larger dental conventions provides few if any courses for the care of individuals with special needs. For example:

1. Attaining mastership in the Academy of General Dentistry, a professional designation within the Academy that reflects a general dentist’s ongoing commitment to provide quality care through continuing education, requires a specified minimum number of hours of continuing education in a range of subjects, including special patient care. Unfortunately, only a limited number of course presentations are available to meet these requirements.

2. The Massachusetts Dental Society “Yankee Institute” listing of license renewal approved continuing education courses between March and October 2016 has about 40 programs, among them, infection control, eating disorders, oral cancer, radiology, ethics, sleep apnea and management. There is a single listing for “Success and preparation for patients with special needs.” An e-mail inquiry to the presenter of this continuing education course regarding the makeup of the audience elicited the following response: “On average, I do get a wonderful turnout for my program (usually over 100 and sometimes close to 200 for the bigger meetings), but, in general, the room is full of mostly dental hygienists and dental assistants.”

3. A review of the 2016 Greater New York Dental Meeting Program and Exhibit Guide provided the following information regarding sessions for the care of individuals with “special needs” or “disabilities”:
   - In 2015, there were 54,486 individuals registered for the meeting.
   - In the 200-page program “Topic Index” listings, three sessions were indicated under the section for “special needs patients.” They are: an all-day session for diabetes teamwork—collaboration, coordination and control; a three-hour session on an overview of cardiovascular disease—dental considerations and patient care; a three-hour session on an overview of patient self-medication and its dental consideration.
   - Under “Current Topics in Pediatric Dentistry,” a three-hour session on oral healthcare for patients with special needs that was not listed under the general “Topic Index” for “special needs patients.” This could make it difficult for the general practitioner to locate the course.
   - Under the “Dental Hygienists’ Program,” two sessions in a three-hour series of the four-section program addressed: treating children with autism spectrum disorders—guidance for the dental professional; and remember to address the oral health needs of Alzheimer’s patients. These topics are not listed under any section for dentists.
   - The only use of the word “disabilities” in the 200-page listings was a notice and telephone number for registrants in need of “disability-related accommodations or wheelchair access information.”

In 2014, among the civilian non-institutionalized U.S. population, there were 39.8 million residents with severe disabilities (12.6% of the population), including more than 3.5 million residents with severe disabilities in the tristate area, broken out as follows:

- Connecticut - 389,252 residents (11.0% of the population).
- New Jersey - 929,477 residents (10.5% of the population).
- New York – 2,236,461 residents (11.5% of the population).
This number will grow as increasing numbers of children with severe disabilities survive to adulthood and the general population ages.15

Realities

There is no single right or wrong view in this discussion. The nation is undergoing dramatic demographic changes. Private insurance and government funding for dental services is inadequate. Preparation of dental students and current practitioners to provide care for individuals with disabilities is inadequate.

Out-of-pocket spending represents 44% of all dental service costs. By contrast, it represents 14% for all healthcare expenditures for the total population, including 17% of the costs for youngsters <18 years; 15% for the 18-to-64-year population; and 12% for the 65+ year population.16 In essence, spending for dental services “is felt” to a greater extent than for total health services for the following reasons:

- Private insurance does not cover 54% of dental expenses.16
- Medicaid provides 6% of all expenses for dental services. However, it represents 42% of costs for children less than 5 years, 21% for the Hispanic population, 38% for the below-the-poverty-level population and 73% for the 65+ years individuals with public insurance.17
- Studies suggest that fewer than 25% of all dentists accept Medicaid patients and fewer than 10% have at least 30% of their practice represented by Medicaid beneficiaries.18

Yes, there are explanations, including inadequate fee schedules and Byzantine bureaucratic impediments. However, from the perspective of the public, the results are limited by the availability of dentists to provide access to care.

Nevertheless, decisions made by the ADA in early 1965 have had a long-term impact on the current and future delivery of services. The ADA opposed the inclusion of dental services in the proposed Medicare legislation—which carried no patient income limitations; instead, it supported proposals for Medicaid with mandatory dental services for children in low-income families, but stipulated dental services for low-income adults as an elective.19-20

In times of economic stress, many states have all but eliminated Medicaid dental services for adults. Almost 50 years later, this trend continues with passage of the Affordable Care Act, which provides an increase in dental services for children in states that have elected to increase services under the expansion of the Medicaid program.

The question faced by the profession and individual practitioners is how to respond to the needs of the evolving population, the prospects of limited changes in government economic support for dental care and the increasing essential care for the poor and individuals with special needs. Is there a shortage of dentists, an under use of services, or both? And why? 

Queries about this article can be sent to Dr. Waldman at h.waldman@stonybrook.edu.

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The Dental Quality Alliance (DQA) is a multi-stakeholder organization of a variety of dentally involved entities working together to develop quality measures for use by the dental profession. Its mission is to advance performance measurement as a means to improve oral health, patient care and safety through a consensus-building process, and to advance the effectiveness and scientific basis of clinical performance measurement and improvement. It draws its strength from its diverse members and its open and transparent operation.

DQA Overview
In 2008, the Centers for Medicare and Medicaid Services (CMS) approached the American Dental Association (ADA) to spearhead the development and implementation of quality measures in dentistry, with the purpose of improving the delivery of healthcare and increasing the desired health outcomes.

Following a resolution adopted by the ADA Board of Trustees, a steering committee of involved factions from across the dental spectrum was formed to begin the process of developing performance measures for the dental delivery system. The committee held its first formal meeting in 2010. Since then, the group has grown to include 35 member entities, with representatives from a number of ADA agencies, including the Board of Trustees and the councils on Dental Benefits Programs (CDBP), Access, Prevention and Interprofessional Relationship (CAPIR), Government Affairs (CGA) and Dental Practice (CDP). Representatives from all of the dental professional and specialty groups, along with the American Dental Education Association (ADEA), Academy of General Dentistry (AGD), American Dental Hygienists’ Association (ADHA), American Academy of Pediatric Dentistry (AAPD) and Medicaid/Medicare and State CHIP Dental Association (MSDA).

Several federal agencies are also involved as technical advisors to the DQA, including the CMS, Centers for Disease Control (CDC), Agency for Healthcare Research and Quality (AHRQ), Health Resources and Services Administration (HRSA) and the Veterans Health Administration (VHA). A number of insurance industry representatives (America’s Health Insurance Plans and National Association of Dental Plans) and dental plans like DeltaQuest, Delta Dental and the Managed Care Network Administration (MCNA) are also DQA members. Each group has a representative who sits on the alliance to provide insight into decisions made regarding the development and ultimate implementation of quality measures. The ADA provides in-kind support through two full-time staff and use of its Chicago facilities for all DQA-related activities, including its twice-a-year meetings. The list of DQA members is provided in Table 1.

The DQA’s Executive Committee oversees management of the alliance’s strategic, operational and organizational business. To carry out its mission and objectives, the DQA has three core committees. They are the Measures Development and Maintenance Committee (MDMC), the Education Committee and the Implementation and Evaluation Committee (IEC). As the only comprehensive multi-stake collaborative, the DQA is well-positioned to coordinate and lead in measure development in dentistry through its members’ experience, expertise and support.

Quality Measurement
Buzzwords like “performance measurement” and “quality improvement” have been floating around medicine for nearly 15 years. Although this terminology and how to employ it remains unfamiliar and daunting to many dentists, they are wrought with far too many implications that could dictate practice—specifically, how dentists provide care to their patients and how they are paid for their services by third-party payers—for dentists to take a back seat in these decisions. So what exactly is “quality measurement?”

Dental Quality Alliance
A Practitioner’s Perspective

Empowering the profession to measure its performance for the betterment of oral health.

Michael R. Breault, D.D.S.
Basically, it is a way of evaluating patient care in a given setting. This may be at a reimbursement plan/program level (government sponsored or commercial), to evaluate the care provided to beneficiaries, or at a practice or provider level, to evaluate care provided in that particular setting. But this is nothing new to the profession, as we all do this on a regular basis and have been doing it for a considerable period of time. All practitioners measure their performance clinically by assessing the results of their actions. All large corporate practices have internal measures, just as large practices involving multiple clinicians have measures, that must be consistent and easily compared.

As an example, when a crown margin is insufficient or lacks clinical integrity, the clinician will assess that situation and rectify it. That in itself is a measurement of quality on a personal basis. Similarly, when I as a periodontist probe a patient on recall who I have treated for pocket reduction, I am, in essence, assessing how well the treatment I rendered has served the patient. That is an outcome of the specific therapy I provided and a measurement of the quality as measured by the success of the treatment.

The difficulty comes when we as a profession try to quantify these various measures to enhance the quality of care provided to our patient population at large and not to the individual. Therefore, the development of standardized quality measures that can be applied broadly across various settings to measure population health is extremely important.

**TABLE 1**

<table>
<thead>
<tr>
<th>Organizational Members</th>
<th>Associate Organizational Members</th>
<th>Public Member</th>
<th>Federal Government Technical Advisor Liaisons</th>
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<tr>
<td>American Academy of Pediatric Dentistry</td>
<td>American Academy of Periodontology</td>
<td>American Academy of Endodontists</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>American Association of Oral and Maxillofacial Surgeons</td>
<td>American Association of Orthodontists</td>
<td>American Association of Public Health Dentistry</td>
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<td>American College of Prosthodontists</td>
<td>American Dental Association’s Board of Trustees</td>
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<td>American Dental Education Association</td>
<td>American Dental Hygienists’ Association</td>
<td>American Medical Association</td>
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<td>America’s Health Insurance Plans</td>
<td>Council on Access, Prevention and Interprofessional Relations (ADA)</td>
<td>Council on Dental Benefit Programs (ADA)</td>
<td>Delta Dental Plans Association</td>
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<tr>
<td>Council on Dental Practice (ADA)</td>
<td>Council on Government Affairs (ADA)</td>
<td>Medicaid-CHIP State Dental Association</td>
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<td>DentaQuest</td>
<td>Managed Care of North America Dental</td>
<td>National Network for Oral Health Access</td>
<td>The Joint Commission</td>
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<td>American Association for Dental Research</td>
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<td>Adirondack Oral &amp; Maxillofacial Surgery</td>
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<td></td>
<td>Federal Government Technical Advisor Liaisons</td>
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### TABLE 2
**List of DQA Measures**

#### EVALUATING UTILIZATION

<table>
<thead>
<tr>
<th>Measure Name</th>
<th>Description</th>
<th>NQF #</th>
<th>Data Source</th>
<th>Measure Domains</th>
<th>Level(s) of Measurement</th>
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</thead>
<tbody>
<tr>
<td>Utilization of Services</td>
<td>Percentage of all enrolled children under age 21 who received at least one dental service within reporting year.</td>
<td>2511</td>
<td>Administrative enrollment and claims</td>
<td>Access/ Process</td>
<td>Program, Plan</td>
</tr>
<tr>
<td>Preventive Services for Children at Elevated Caries Risk</td>
<td>Percentage of all enrolled children who are at “elevated” risk (i.e., “moderate” or “high”), who received topical fluoride application and/or sealants within reporting year.</td>
<td>N/A</td>
<td>Administrative enrollment and claims</td>
<td>Related Health Care Delivery: Use of Services</td>
<td>Program, Plan</td>
</tr>
<tr>
<td>Treatment Services</td>
<td>Percentage of all enrolled children who received treatment service within reporting year.</td>
<td>N/A</td>
<td>Administrative enrollment and claims</td>
<td>Related Health Care Delivery: Use of Services</td>
<td>Program, Plan</td>
</tr>
</tbody>
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#### EVALUATING QUALITY OF CARE

<table>
<thead>
<tr>
<th>Measure Name</th>
<th>Description</th>
<th>NQF #</th>
<th>Data Source</th>
<th>Measure Domains</th>
<th>Level of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Evaluation</td>
<td>Percentage of enrolled children under age 21 who received comprehensive or periodic oral evaluation within reporting year.</td>
<td>2517</td>
<td>Administrative enrollment and claims</td>
<td>Process</td>
<td>Program, Plan</td>
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<tr>
<td>Topical Fluoride for Children at Elevated Caries Risk</td>
<td>Percentage of enrolled children aged 1–21 years who are at “elevated” risk (i.e., “moderate” or “high”) who received at least 2 topical fluoride applications within reporting year.</td>
<td>2528</td>
<td>Administrative enrollment and claims</td>
<td>Process</td>
<td>Program, Plan</td>
</tr>
<tr>
<td>Sealants for 6–9-Year-Old Children at Elevated Caries Risk</td>
<td>Percentage of enrolled children in age category of 6–9 years at “elevated” risk (i.e., “moderate” or “high”) who received a sealant on a permanent first molar tooth within the reporting year.</td>
<td>2508</td>
<td>Administrative enrollment and claims</td>
<td>Process</td>
<td>Program, Plan</td>
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<tr>
<td>Sealants for 6–9-Year-Old Children at Elevated Caries Risk</td>
<td>Percentage of enrolled children in age category of 6–9 years at “elevated” risk (i.e., “moderate” or “high”) who received sealant on permanent first molar tooth within reporting year.</td>
<td>2509</td>
<td>Administrative enrollment and claims</td>
<td>Process</td>
<td>Program, Plan</td>
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<tr>
<td>Care Continuity</td>
<td>Percentage of all children enrolled in two consecutive years who received comprehensive or periodic oral evaluation in both years.</td>
<td>N/A</td>
<td>Administrative enrollment and claims</td>
<td>Process</td>
<td>Program, Plan</td>
</tr>
<tr>
<td>Care Continuity</td>
<td>Percentage of all children enrolled in two consecutive years who received comprehensive or periodic oral evaluation in both years.</td>
<td>N/A</td>
<td>Electronic Health Records</td>
<td>Process</td>
<td>Practice</td>
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<td>Usual Source of Services</td>
<td>Percentage of all children enrolled in two consecutive years who visited same practice or clinical entity in both years.</td>
<td>N/A</td>
<td>Administrative enrollment and claims</td>
<td>Access/ Process</td>
<td>Program, Plan</td>
</tr>
<tr>
<td>Ambulatory Care Sensitive Emergency Department Visits for Dental Caries in Children</td>
<td>Number of emergency department visits for caries-related reasons per 100,000 member months for all enrolled children.</td>
<td>2689</td>
<td>Administrative enrollment and claims</td>
<td>Outcome</td>
<td>Program</td>
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<tr>
<td>Follow-Up after Emergency Department Visit for Dental Caries in Children</td>
<td>Percentage of ambulatory care sensitive Emergency Department (ED) visits for dental caries among children 0–20 years in reporting period for which member visited dentist within (a) 7 days and (b) 30 days of ED visit.</td>
<td>2695</td>
<td>Administrative enrollment and claims</td>
<td>Process</td>
<td>Program</td>
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#### EVALUATING EFFICIENCY AND COST

<table>
<thead>
<tr>
<th>Measure Name</th>
<th>Description</th>
<th>NQF #</th>
<th>Data Source</th>
<th>Measure Domain</th>
<th>Level of Measurement</th>
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</thead>
<tbody>
<tr>
<td>Per Member Per Month Cost of Clinical Services</td>
<td>Total amount that is paid on direct provision of care (reimbursed for clinical services) per member per month for all enrolled children during reporting year.</td>
<td>N/A</td>
<td>Administrative enrollment and claims</td>
<td>Related Health Care Delivery: Efficiency and Cost</td>
<td>Program, Plan</td>
</tr>
</tbody>
</table>
with a history of chronic periodontitis who have had an oral evaluation in a measurement year or who have had active periodontal therapy and are on a maintenance schedule. Currently, these measures are being validated. Other measures for the adult population being considered for testing are use of the emergency room for dental-related reasons and measures related to the oral-systemic link.

Measure Development Process
The measure development process is somewhat lengthy and involves a series of procedures, including testing the measure for validity, reliability, feasibility and usability. DQA undertakes this time-consuming process to ensure that the measures it approves are appropriate for use and have been tested scientifically.

The DQA’s measure-development process is overseen in its entirety by its MDMC, which begins by identifying measure concepts through literature review and environmental scan. In order to implement standardized measurement, it is imperative that, along with concepts, a uniform set of feasible, valid and reliable specifications are used across measurement agencies using similar data sources in order to develop benchmarks and compare results towards identifying improvement opportunities.

All concepts identified and proposed for testing undergo repetitive review and input from the dental community. Once the concepts have been identified and proposed for testing, they undergo validation testing. This usually involves an open and competitive request for proposal (RFP) and access to at least multiple data sources at both program and plan levels. This will determine if they meet the criteria established for the information needed to fully validate it. The validity, reliability and feasibility testing involves statistical and contextual information analysis. When testing is completed, the measures will be moved forward to the entire DQA for final approval. Input from the dental community is critical through every step of the process.

Current Measurement Status
The sealant measure was one of the first measures developed and validated by the DQA. It is currently incorporated in the CMS’s CHIP measures core set. DQA measures are also being used by 14 state Medicaid programs, according to an annual survey conducted by the MSDA with California’s state-based health exchange. In California, the measures can be applied at the plan or program level. Dental plans that participate in exchanges will be required to meet certain levels of quality measurements, such as in California. This means that payers that participate in an exchange must have the data available to meet the criteria set by the exchange in that state.

Once validated, the measures need to be implemented and reviewed regularly to maintain their properties. Implementation is critical and is determined by the specific implementer’s requirements and the information they deem necessary to align with the particular measure. The DQA provides technical assistance with implementing its measures, so that the correct data required for the measure is obtained and the information received is valid. This retains the properties of the measure.

Seven DQA measures are now endorsed by the National Quality Forum (NQF), an independent not-for-profit organization that evaluates healthcare quality measures, considered the gold standard for healthcare quality. NQF-endorsed measures are evidence-based and valid, and in tandem with the delivery of care and payment reform. NQF endorsement is an important criterion for quality measure selection for many public and private payers and attests to the caliber of the DQA’s measure-development processes.

It is also important for the DQA to continue to monitor the measures put into place as a means of maintaining the measures. As entities change and clinical aspects undergo modification and transformation, it is important for the measures to be continually validated for their relevance and sustainability in the marketplace. The DQA completes this through periodic reviews and further validation analysis done regularly by a specific committee.

Implications and the Future
This is an ongoing process that will be part of the future of the profession. Currently, there are components of the DQA that are focused on educating the profession specifically and the population in general about the need for and future use of quality measures. For the profession, this includes a User’s Guide and tutorials in the DQA section of the ADA website, along with periodic webinars used for further educational aspects and to answer questions.

It is important for the profession to understand that these measures are not to be construed as an encroachment upon anyone’s practice, but as a tool to enhance patient quality care. Measure development, integration, maintenance and implementation are controlled by the profession and can assist and protect the dentist at all levels of practice. With the increasing role played by government entities in the healthcare system, it is imperative that the development and implementation of these measures remain within and under the purview of the profession itself. With its multi-stakeholder engagement within the dental community, the DQA has been extremely successful in ensuring that the process is maintained and controlled by the profession.

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Dr. Breault of Schenectady is immediate past chair of the Dental Quality Alliance and a past president of NYSDA. Queries about this article can be sent to him at mbrea65866@aol.com
Detection of Tooth Color before and after Bleaching Using an Electronic Device

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ABSTRACT
The purpose of this article is to present a new computerized technique for evaluating tooth color before and after internal bleaching. Internal bleaching is a common and relatively safe procedure, from which results can be easily evaluated by both the dentist and the patient. Clinically, evaluation of the tooth color before, during and after internal bleaching is usually completed by using a color scale and comparing the shade to that of the tooth. However, since in some cases the bleaching results are not obvious, this method has limited value for complicated cases and especially for dental research.

The case presented here demonstrates the digital color evaluation process of a tooth going through all phases of internal bleaching. The detected color is presented as the color scale numbers and can easily be saved for follow-up. Those results are presented on the device screen for the all-labial surface and also separately for the incisal, middle and cervical areas.

This digital method for color detection can easily be used at every dental clinic as a validated dental record for the bleaching process. This method can also be used for dental research that evaluates the efficacy of bleaching techniques. The esthetic results can be verified easily and precisely.

Discoloration of an anterior tooth or teeth is a major concern in contemporary dentistry. Clinically, this problem can often be solved by conservative bleaching techniques. But some refractory cases may involve preparation of teeth leading to laminate veneers and even crowns. Internal and external bleaching are the two main techniques used to address the esthetic problem arising with discoloration of anterior teeth. Optimum results of bleaching are difficult to decide and are often influenced by patient expectation and anticipation. The ideal result for a single tooth is usually achieved by matching the color of the tooth that will be bleached with the adjacent teeth.

Internal bleaching is a well-known clinical procedure for improving discoloration of endodontically treated teeth.
This procedure is performed with the use of sodium perborate (SP), which renders predictable results due to the release of active oxygen radicals.12,14 The second technique, known as external bleaching, is proposed mainly for vital teeth that have a decrease in the translucency, resulting in a yellowing-to-dark hue.15 This technique requires the use of a customized mouth tray and application of a carbamide peroxide gel, which acts as the bleaching medium.7,16-19 External bleaching can be proposed for multiple teeth or a single tooth by modifying the bleaching tray.

The prognosis for bleaching techniques is unclear, though most studies have reported some color improvement after initiation of bleaching.20-23 Nevertheless, even in cases that have immediate satisfactory results, there remains a risk of future color regression.22 It has been reported that discoloration after trauma or necrosis is more receptive to the bleaching process than discoloration caused by dental material and restorations.24 Since the end result of bleaching is not predictable, it may be beneficial to have validated data before, during and after the bleaching procedure. This is even more important for cases that are part of clinical and in vitro studies on the efficacy of bleaching materials or techniques.

Several recent studies have demonstrated that tooth color can be efficiently and reproducibly assigned by using dental spectrophotometers or colorimeters.25-28 These color measurement devices enable the clinician to detect tooth color objectively, while also providing a precise way to monitor color changes.

The aim of the present study is to demonstrate the use of a dental spectrophotometer device in defining tooth color before and after the bleaching procedure.

**Case Report**

A 20-year-old man complained about his discolored maxillary left central incisor (Figure 1). The patient did not report pain or sensitivity to temperature changes or percussion. The clinical examination revealed a central incisor with grayish staining and a composite restoration in the palatal access. The radiographic examination demonstrated a continuous root canal filling from the CEJ to 1 mm short of the apex. The periodontal ligament was continuous, with no widening, and the lamina dura appeared normal.

For accurate evaluation of pretreatment tooth color and bleaching outcomes, we used a dental spectrophotometer (Spectro shade micro, MHT, Swiss). The detected tooth color was established to be D3 for the middle and incisal labial surface and D2 for the cervical part (Figure 2A). The detected color was also presented as the average color for the entire tooth surface as C2 (Figure 2B).

At the first visit, the tooth was isolated with a rubber dam (Hygenic, Coltène/Whaledent, OH) and an access cavity was designed after removing excess gutta-percha to the level of the cemental-
enamel junction. Care was taken not to overextend the access cavity, since there was minimal residual tooth structure. A resin-modified glass ionomer (RMGI) liner (*3M ESPE VitrebondTM Light Care Glass Ionomer Liner/Base, VB*) was placed over the canal orifice. A mixture of SP was placed, following the common protocol for internal bleaching.

A week later, at the second visit, major color change was noted, and the bleaching process was repeated. At the final visit, bleaching results were confirmed by the dental spectrophotometer with color data of A1-B2 noted (Figure 3). The SP was flushed out and a temporary restoration with a calcium sulphate-based material (*Coltosol, Colten, Langenau, Germany*) was placed. A week later, the patient was satisfied with the color of the tooth (Figure 4) and a permanent restoration was placed.

**Discussion**

Color perception is based on the object, detector (either by eye and brain or by an electronic device) and a light source. Trying to achieve precise and repeatable dental color visually is a challenging clinical task for contemporary aesthetic dentistry. Clinician experience has a major impact on visual color detecting, yet even minor changes in room lighting may impact this process. Spectrophotometers can measure and record all the color parameters, i.e., value, chroma and hue for the tested teeth. By using a spectrometer the clinician is able to achieve repeatable measurements. The data can also be presented to the patient in order to give a more reliable appreciation of the treatment results. Yet these results are not an indicator of correct shade measurement, since color perception by the patient is more important clinically.

Dental staining is a common consequence after dental trauma, caused by iron compounds produced during blood hemolysis. Furthermore, degradation of pulp proteins can lead to tooth discoloration as pulp necrosis progresses. Dental trauma may also lead to pulp chamber calcification, causing a decrease in dentinal transparency that may lead to yellow-to-brown color. Systemic dentinal staining is known to be related to medicines and products containing tetracycline and fluoride. In these cases, the suggested treatment is to perform root canal, followed by internal bleaching, to help resolve severe discoloration due to tetracycline staining.

Teeth-whitening procedures are clinically very common, yet the prudent dentist should always bear in mind that free radicals have the potential of being mutagenic and carcinogenic.
knowledge requires the appropriate use of bleaching materials and not extending the treatment after achieving satisfactory results. Care should be taken not to overuse SP and to limit the number of appointments in order to reduce the risk of coronal fracture.

Conclusions

The case presented here demonstrates the use of a dental spectrophotometer for evaluating internal bleaching. The dental spectrophotometer enables the dentist to accurately evaluate the results of the bleaching technique used.

This case may encourage use of dental spectrophotometers as a gold standard for performing clinical and in vitro studies. Employing an electronic device for color verification before and after bleaching can give repeated values with less inter-examiner bias and may give calibrated data for the prognosis of the bleaching results.

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ABSTRACT
Management of missing lateral incisors presents a challenge to attaining optimum esthetics and must be preceded by careful examination of areas of missing teeth and the relationship to adjacent soft and hard tissues. This case series describes various approaches and techniques for managing missing lateral incisors. These techniques were chosen depending mainly on the amount of space in mesiodistal and insiocervical dimensions. The amount of underlying bone played an important role in selecting the treatment modalities.

The lateral incisor is considered the most common congenitally missing tooth among the maxillary anterior teeth, and usually affects 1% to 2% of the world’s population.1 The congenitally missing lateral incisor is among the most challenging esthetic dental situations, and restoring these teeth depends mainly on the patient’s age, the amount of space available and the condition of adjacent teeth.2

There are four different treatment modalities for replacing congenitally missing lateral incisors. One of these is canine substitution, in which the canine is reshaped to establish the normal shape of a lateral incisor.2 The space between the central incisor and the canine should be closed orthodontically, to allow for optimum esthetics. Gingivectomy and gingivoplasty will help re-establish the proper gingival contour around the anterior teeth.3,4,5

The second modality is restoring the missing incisor with a fixed partial denture prosthesis (FPD). This could be a conventional FPD, resin-bonded FPD or cantilever FPD.6 The resin-bonded FPD is considered the most conservative but the least predictably successful over the long term.7,8 Creugers et al. evaluated the long-term survival rate of resin-bonded FPDs to be up to 10 years. They found that anterior resin-bonded FPDs had a significantly higher survival rate compared to posterior resin-bonded FPDs.9 The conventional FPD is the least conservative treatment modality, but may be an appropriate treatment option when adjacent teeth require restoration.10

The third option to restore missing incisors is restoration with interim or definitive removable partial denture (RPD).

Implant placement is the last option or treatment modality for restoring congenitally missing lateral incisors.11,12 The main advantages of this modality are that the adjacent teeth are left untouched, especially in young patients, and it allows patients to maintain good oral hygiene more easily than with FPD restorations. In addition, single-tooth implant restorations have shown long-term success.12-14 Naert et al. evaluated the outcome of a
single-implant restoration over 11 years. They found that success rates were 93% for the implants and 96% for the restorations.14 There are certain requirements for using implant placement to achieve optimum esthetics. One is to have sufficient alveolar bone in the width and height to allow for proper implant placement.14-16 Orthodontically, the canine must be moved distally to allow for adequate space to place and restore the implant after completion of facial growth.17

Cast surgery should be performed on the model, and a diagnostic wax-up should be done to determine the appropriate space for the missing lateral incisors before starting orthodontic treatment.18,19 There are other methods for determining the appropriate space, such as the rule of Golden Proportion and the Bolton Analysis.20-23

This report describes clinical cases in which various conservative treatment modalities were used to replace congenitally missing lateral incisors.

Case Report One
A 17-year-old female presented to the Postgraduate Prosthodontics Clinic at Rutgers School of Dental Medicine (SDM) in Newark, Nj. Her chief complaint was she was dissatisfied with her smile because of missing primary teeth. The patient was healthy and did not complain of any medical condition. Her dental history revealed she had congenitally missing lateral incisors, retained deciduous teeth and misaligned permanent teeth. During the clinical examination, it was found she had retained deciduous maxillary lateral incisors and canines (Figure 1A). The maxillary permanent canines were erupted palatally, and she had congenitally missing permanent lateral incisors (Figure 1B). There were irregular multiple spaces between the maxillary teeth. Orthopantographic examination revealed that the maxillary permanent lateral incisors were congenitally missing (Figure 1C). The permanent canines were erupted palatally to the maxillary central incisors. The patient was classified according to the American College of Prosthodontists Prosthodontic Diagnostic Index (ACP, PDI) as Class I.24

Treatment planning involved input from multiple disciplines, including prosthodontics, orthodontics and periodontics to achieve optimum esthetics and functional results. The plan included extraction of the deciduous teeth, orthodontic traction of the maxillary permanent canines to their normal position in the maxillary arch and implant placement in the area of the maxillary lateral incisors, with the final ceramic restorations.

Patient Treatment
Preliminary maxillary and mandibular impressions were made with alginate impression material (Jeltrate Plus Dustless Alginate-Fast
Set; Dentsply, York, PA). Face-bow and maximum intercuspation position records were made using polyvinyl siloxane registration material (Blu-Mousse; Dentsply, York, PA). The diagnostic maxillary and mandibular casts were mounted on Hanau Arcon Wide-View articulator. Diagnostic wax-up and cast-surgery were performed to determine the available space after the orthodontic treatment for placement of implants in the areas of maxillary lateral incisors. The Bolton Analysis was made to verify the available space.21,22 The maxillary deciduous lateral incisors were extracted, and the patient was referred to the orthodontist for canine traction (Figure 1D).

After taking out the orthodontic appliances, a removable retainer was made with prosthetic teeth to ensure post-orthodontic retention. The surgical treatment was started at 20 years of age. A hand-wrist X-ray was made to ensure complete skeletal growth. A surgical stent was made on the diagnostic wax-up to be used as a guide during the implant placement procedure. Two Nobel Biocare implants (Replace Select, Tapered 3.5 mm x 11.5 mm) were placed in the area of the maxillary lateral incisors (#7 and #10) (Figure 1E). Temporary abutments, Engaging Nobel Replace Narrow Platform (Nobel Biocare, Swiss) were used for immediate temporization of both implants.

Cement-retained temporary crowns were fabricated and cemented using zinc oxide eugenol cement (Tempbond; Kerr, CA). Both crowns were out of occlusion in centric and eccentric movements. After three months, a maxillary fixture-level impression was made using polyvinyl siloxane (PVS) impression material (Aquasil Monophase; Dentsply, York, PA). The impression was poured in Type-4 die stone (UltiRock; Whip Mix, KY). Two zirconia abutments (Nobel Procera Abutment Zirconia; Nobel Biocare, Switzerland) were milled via CAD/CAM technology with a 1 mm subgingival finish line. Shade A2 was selected using the classic VITA shade guide. Zirconia copings were made and tried in the patient’s mouth to evaluate the coping contour, the emergence profile and to assure adequate space for the veneering porcelain. Feldspathic porcelain was used as a veneer for the definitive crowns. The abutments were torqued to 35 Ncm, according to the manufacturer’s recommendation, using a torque wrench system. The screw holes were filled with cotton pellets and closed with Fermit temporary restorative material (Fermit Resin; Ivoclar Vivadent, NY). The all-ceramic crowns were tried in the patient’s mouth to check the interproximal contacts, the marginal adaptation, the emergence profile and the occlusion. Final cementation was performed with temporary resin cement (Premier Implant Cement; Premier Products Co., PA) (Figure 1G).

Postoperative instructions were given to the patient. Follow-up visits were maintained at 24 hours, two weeks, one month, three months and one year (Figure 1H).

Case Report Two
A 35-year-old female was referred to the Postgraduate Prosthodontics Clinic at SDM to restore her anterior teeth, which she
felt were small, and to provide her with “a better smile.” The patient was healthy and did not complain of any medical condition. Her dental history revealed she had congenitally missing lateral incisors and multiple composite restorations in the posterior teeth. She had been referred to the orthodontist to close the diastema between the maxillary central incisors and to open the space distally to replace the missing lateral incisors. During the clinical examination, it was found there was altered passive eruption of the maxillary anterior teeth and that these teeth were small, with the incisal edge position short, as evidenced by phonetics and esthetics (Figure 2A). The patient was classified according to the ACP, PDI classification system as Class I.24

After the orthodontic treatment was completed, final evaluation for the incisal edge position and gingival margins of the maxillary anterior teeth was made based on esthetics and phonetics. The diagnostic wax-up was completed, and a surgical guide was fabricated to place implants in the lateral incisor positions and perform a gingivectomy and gingivoplasty for placement of gingival margins on all anterior teeth and bicuspids (Figure 2B).

Two Biomet 3i Implants (3.25 mm x 10 mm) were placed in the area around the maxillary lateral incisors. Gingivectomy and gingivoplasty were performed according to the surgical guide. At 12 weeks postsurgery, tooth preparation was done for the maxillary right first premolar, maxillary right canine and maxillary central incisors for laminate veneers (Figure 2C). Light and regular body PVS impression material was used to make the final impression (Aquasil; Dentsply, York, PA) for implants, as well as the natural teeth. Four laminate veneers and two all-ceramic crowns were made of lithium disilicate (IPS Emax; Ivoclar Vivadent, NY) for the natural teeth and the implants. The laminate veneers were cemented with definitive resin cement (Variolink; Ivoclar Vivadent, NY), and the two implant-supported crowns were cemented with temporary resin cement (Premier Implant Cement; Premier Products Co., PA) (Figures 2 D, E). It was confirmed that the anterior restorations exhibited light contact in the maximal intercuspation position and canine guidance in the excursive movements.

**Case Report Three**

An 18-year-old male presented to the Postgraduate Prosthodontics Clinic at SDM. He expressed displeasure with the smallness of some of his teeth, which, he felt were not aesthetically pleasing. The patient was healthy and did not complain of any medical condition. During the clinical oral examination, it was found that he had retained primary maxillary canines, the maxillary right lateral incisor and the mandibular central incisor (Figure 3A). The mandibular ridge around the mandibular central incisor was deficient in width. Radiographic examination revealed no secondary teeth following in the locations of the previously described retained, deciduous teeth. The ACP PDI classification of this patient is Class II.
The initial treatment was extraction of the primary teeth. Immediate implant placements were done in the areas around the maxillary canines using Zimmer implants (3.7 mm x 11 mm). The lateral incisor was planned to be cantilevered off the implant in the area of the maxillary right canine for esthetic purpose (Figure 3B). After extraction of the mandibular primary central incisor, demineralized, freeze-dried bone allograft (DFDBA) was placed to re-establish the deficient ridge.

Three months after placement, the implants were uncovered and cement-retained provisional restorations were placed to establish the emergence profile and evaluate the patient’s esthetics. Two weeks later, a maxillary closed-tray, fixture-level impression was made using PVS monophase impression material, and the clinical and laboratory procedures were completed as in the first case. A zirconia framework for the right maxillary canine and cantilevered lateral incisor was made and tried in the patient’s mouth to evaluate the framework contour, the emergence profile and to ensure there was adequate space for the veneering porcelain (Figure 3C). The final restorations were tried in the patient’s mouth and cemented with temporary resin cement (Premier Implant Cement; Premier Products Co., PA) (Figures 3D, E). As the patient has a Class III canine relationship, group function was developed in the lateral mandibular movements. The mandibular central incisor will be replaced with a narrow diameter dental implant after consolidation of the bone grafting.

Case Report Four
A 17-year-old female patient reported to the Postgraduate Prosthodontics Clinic at SDM for post-orthodontic treatment. She said she wanted to replace her missing front teeth. The patient had a unilateral (right) cleft lip. During the clinical examination, it was found that she had congenitally missing lateral incisors, multiple composite restorations; the maxillary ridge in the area of the missing lateral was deficient in width (Figure 4A). Resin-bonded FPD was the treatment of choice because of the bony defect in the area around both missing lateral incisors. The patient was classified according to ACP PDI as Class I.

Treatment
After completing a diagnostic work-up, teeth #6, #8, #9 and #11 were prepared for a resin-bonded FPD (Figure 4B). A definitive maxillary impression was made with polyvinyl siloxane (Examix; GC, IL). Face-bow and maximum intercuspation position records were made using polyvinyl siloxane registration material (Blu-Mousse; Dentsply, PA). The maxillary and mandibular casts were mounted on Hanau Wide-View Articulator. The framework for the resin-bonded FPD was designed and built with light-cured universal modeling resin (Primopattern; Primotec, Germany). The framework was invested and pressed using lithium disilicate (IPS Emax; Ivoclar Vivadent, NY) (Figures 4C, D). The incisal edge was
layered with veneering ceramic (IPS e.max Cream; Ivoclar Vivadent). Resin-bonded FPD was cemented with definitive resin cement (Variolink; Ivoclar Vivadent) (Figure 4E). The restorations of the maxillary lateral incisors are in light contact in the maximal intercuspation position with no contact in the excursive mandibular movements.

**Case Report Five**

A 20-year-old female patient presented to the Postgraduate Prosthodontics Clinic at SDM. Her objective, she said, was to replace her missing teeth. The patient was healthy and did not complain of any medical condition. Her dental history revealed she had had orthodontic treatment and her congenitally missing lateral incisors had been replaced by two implants and provisional crowns. During the clinical examination, it was noted that two Nobel Biocare implants (Replace Select Tapered, 3.5 mm x 11.5 mm) were placed in the area of the maxillary lateral incisors (#7 and #10) (Figure 5A). Temporary abutments (Temporary Abutment Engaging Nobel Replace NP) were used for temporization of both implants. The implants were placed coronal to the level of the cementoenamel junction of the adjacent teeth. The ACP PDI classification for this patient is Class I.

**Treatment**

After finishing all diagnostic work-up, gingivectomies were performed on both implants, #7 and #10 (Figure 5B), to create longer clinical crowns, with recontouring of the gingival third of the crowns. Two weeks later, after soft-tissue healing (Figure 5C), a fixture-level impression was made for both implants using polyvinyl siloxane (PVS) monophase impression material. Because of the limited space, two screw-retained zirconia copings were designed and milled via CAD/CAM technology (Figure 5D). Feldspathic porcelain (VITA VM9; VitaZahnfabrik, Bad Säckingen, Germany) was used as a veneer for the definitive crowns. The abutments were torqued to 35 Ncm, according to the manufacturer’s recommendation, using a torque wrench system. The screw holes were filled with cotton pellets and closed with Fermit temporary restorative material. The final restorations were tried in the patient’s mouth and cemented with temporary resin cement (Premier Implant Cement, Premier Products Co., PA) (Figure 5E). Both restorations are in light contact in the maximal intercuspation position, with no contact in the excursive mandibular movements.

**Discussion**

Selection of the appropriate treatment modality to restore congenitally missing lateral incisors depends upon multiple factors. The main factors are patient age, space requirement for the restoration, the amount of soft tissue, the bone quality and quantity, and patient desire.

In young patients, it is necessary to wait until skeletal development is completed, especially if the implant treatment...
modality is selected. Hand/wrist X-rays can be taken to confirm development. For example, cases One and Three were presented at the clinic before complete growth of the maxilla. The patients were instructed to wait two years before final treatment was provided; both patients had undergone hand/wrist X-ray.

The amount of space available to restore the missing lateral incisors affects the selection of the treatment modality. The mesiodistal dimension of the space could be analyzed by Bolton Analysis and confirmed in the diagnostic wax-up procedure. In cases One, Two and Three, the patients were referred to the orthodontist to provide the appropriate space to restore the missing teeth. After the orthodontic treatment was done, the diagnostic wax-up was performed to confirm that the available space was sufficient to provide the treatment selected.3-5

The incisocervical dimension of space is also an important factor that affects the treatment selection. For example, in Case Five, implants were placed coronal to the cementoenamel junction of the adjacent teeth. It was found that the amount of soft tissue coronal to the implants was excessive, which resulted in the two clinical crowns appearing short and unaesthetic. Gingivectomy and gingivoplasty procedures were performed to increase the clinical crown length and provide the patient with esthetic restorations. The ideal space to provide cement-retained restoration is 4 mm for the abutment height—to provide adequate retention and resistance for the restoration—2 mm for the occlusal material and 2 mm for the biologic width. Two screw-retained crowns were delivered because the final incisocervical space wasn't enough to fabricate cement-retained restorations.25

Bone quality and quantity are also considered determining factors in selecting the treatment to restore the missing lateral incisors. Because of the amount of bone deficiency in Case Four, as a result of cleft lip and palate, resin-bonded FPD restorations were selected as the final treatment modality for this patient.7,8 In Case Two, the amount of bone affected implant placement, as both implants were placed with little labial inclination following bone angulation. In the final restorations, pink porcelain was applied in the cervical third of the crowns in an attempt to match the soft-tissue levels of neighboring teeth.

Finally, we concluded that appropriate clinical and laboratory examinations and an understanding of the factors that affect selection of the appropriate treatment modality are guides to providing patients with good esthetic restorations and predictable, excellent long-term prognosis.

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ABSTRACT
To determine the use of fluoride varnish (FV) to prevent dental caries and explore related factors, a survey was mailed to all 540 licensed general and pediatric dentists in eight Western New York counties. Of 193 surveys analyzed, 47.5% of dentists used FV in children. Only 44% accurately assessed high-risk cases for caries. Dentists serving children under age 2 and those correctly assessing high-risk children for caries were more likely to use FV in children under 7. Only 28% correctly recommended the first visit at 6/12 months; 38.7% recommended age 3. The authors concluded that FV was underutilized, suggesting a need for guideline-based strategies.

Approximately 300,000 U.S. children under the age of 6 experience significant levels of early childhood caries (ECC); an additional approximately 1.5 million U.S. children experience lesser levels of ECC. Dental caries not only affect early growth and development, they can affect the overall health of a child. Dental services account for almost one-quarter of the total health-care expenditures for children. Between 2009 and 2018, annual spending for dental services in the United States is expected to increase 58%, from $101.9 billion to $161.4 billion. Also, the proportion of children between 2 and 5 years with cavities has increased 15% during the past decade.

Overall, preventive measures have been shown to improve dental health in the United States, but children have not yet benefited at the same rates as adults. This burden on healthcare can be reduced with effective preventive measures. Dental caries, although a serious concern, can be prevented. Fluoride varnish is a highly concentrated product (approximately 22,600 ppm) and is applied professionally in as little as five minutes. It is generally acceptable to patients, does not require expensive equipment and can also reverse early carious lesions. In high-risk populations, applying fluoride varnish two times a year is efficacious in preventing caries. There is excellent quality of evidence for the efficacy of high-concentration fluoride varnish in preventing dental caries in children at moderate-to-high risk.

In a study of children ages 3 to 5 enrolled in Head Start, among the children with active dental caries who received fluoride varnish application, 81% of the active caries became inactive after nine months, compared with 38% in children who did not receive fluoride varnish application. In another study, among 376 Chinese and Latino infants and children ages 6 to 44 months...
from families with low incomes, those who received oral hygiene counseling, as well as fluoride varnish application, had a lower incidence of dental caries than their counterparts who received only counseling. 10

Efforts are continuously being made to improve access to fluoride varnish especially for children who are at risk. Recently, New York State began reimbursing physicians for the application of fluoride varnish and is now among 44 states in the U.S. where Medicaid provides such reimbursement. 5

A study in the past found that dentists underutilize fluoride varnish in adults. 31 However, there has been no study that has examined the use of fluoride varnish by dentists among children, despite the fact that there are recommendations for this from the American Dental Association. The primary objective of this study was to determine how many dentists in one targeted region use fluoride varnish to prevent dental caries in children with a survey research approach. The secondary objective of the study was to explore the factors that affect the decision to use or not use fluoride varnish in children among a sample of dentists in one geographic region in Western New York.

Methods
Survey Development
The preliminary work done by Fiset et al. helped crystallize the use of the Socioecological Model, which provided a framework for understanding relevant factors (barriers and facilitators) potentially associated with the use of fluoride varnish at the model’s various levels (individual, interpersonal, organizational, policy). 11 For this study, the Precede-Proceed model was used, which helped conceptualize relevant factors. The model assesses health and quality-of-life needs for designing, implementing and evaluating health promotion. This model has two parts: the “precede” component, which covers the process from pre-assessment through planning, and the “proceed” component, which covers implementation through post-assessment. 12 Characteristics included for analysis were in stages 6 and 7 of the model, which look at the implementation stage of the fluoride varnish by dentists and, at the same time, tries to identify the practices of the dentists and their preferences regarding various types of fluorides used to prevent dental caries, especially in children under 7 years of age (the cutoff age determined by qualitative interviews during survey development).

Preliminary qualitative methods with parents, dentists (pediatric and general) and hygienists provided formative information that aided in the development of survey domains and items. The survey was pre-tested with 10 subjects for content and design improvements and was further pre-tested with 15 subjects to maximize reliability and validity. In the initial phase, the survey was sent to dentists who were randomly selected from the list of currently licensed New York State dentists practicing in eight upstate counties. There were no changes needed for the survey or any recruitment procedures during this phase; hence, the results of these pilot surveys were included in the study. The study was approved as an exempt study by the University of Rochester Institutional Review Board.

Survey Method
This cross-sectional study used a self-administered survey sent to the entire population of general and pediatric dentists, as these professionals provide preventive oral care to pediatric patients. The dentists were licensed and practicing in the eight upstate New York counties (Monroe, Wayne, Ontario, Livingston, Seneca, Steuben, Yates, Cayuga) comprising the Seventh District Dental Society. The contact list of 540 dentists was prepared by obtaining a list of currently licensed and practicing general and pediatric dentists supplied by the Greater Rochester Area Tobacco Cessation Center (GRATCC) and the websites of Excellus Blue Cross Blue Shield (BCBS), Seventh District Dental Society and the American Dental Association (ADA). Prepaid return envelopes were sent each time, along with the survey and cover letter. Reminder mailings were sent twice, at two-week intervals, to all those who had not responded. The recruitment phase ended after two reminder mailings; the data collection was done between February and April of 2011.

The survey was administered using successful public health approaches. 13 The recruitment was done using mixed methods for survey delivery, including website, email, fax and targeted mailings. An information letter was provided to each potential subject with instructions that participation was voluntary and that consent was implied by completion and return of the survey. Confidentiality was assured and anonymity attained at the end of the recruitment period. The survey consisted of 22 questions encompassing dental practice, preferences of the general and pediatric dentists regarding the various types of topical fluoride formulations, dental case scenarios and personal data.

The survey consisted of three case scenarios, each evaluating various caries risk, topical fluoride preferences and the frequency of application. All of the case scenarios included in the
survey were based on the caries risk assessment for different age groups provided by the American Academy of Pediatric Dentistry.\textsuperscript{14} The first case scenario included a child at high risk for dental caries, while the second and third depicted moderate and low risk, respectively.

**Case Scenario One:** A healthy, 2-year-old Hispanic girl presents to your office as a new patient to the practice. She lives with her parents in a fluoridated community and is insured by New York State Medicaid. Both parents report they have “cavities” at the present time. The girl is caries-free, without visual plaque on clinical examination, and has open contacts between all primary teeth. The parents report the girl drinks sugar-containing drinks from a sippy cup more than three times a day.

**Data Analysis**
The data analysis for this study was generated using SAS\textsuperscript{®}/STAT software, (Version 9). Descriptive statistics included frequencies of categorical data; percentages to identify the most commonly used form of fluoride; and the means and standard deviation of the continuous variables. Univariate analyses of the three outcome variables (use of fluoride varnish for high-risk patient, risk assessment of a high-risk child and use of fluoride varnish in children less than 7 years of age) were performed. For the continuous independent variables (e.g., percentages of patients of various ages seen by the dentist and percentages of patients seen by the dentist based on insurance), the differences in the means for all three outcome variables and the independent variables were analyzed statistically.

Outcome Variable 1 (dentists preferred fluoride varnish for high-risk patient in Case Scenario One) had four categories, which were collapsed into two to convert them into a dichotomous variable: i) “Yes” included all those who used fluoride varnish in a child at high risk; ii) “No” included all those who used fluoride gel or foam or did not prefer any fluoride.

Outcome Variable 2 (risk assessment where the child was high risk in Case Scenario One) involved identifying the case correctly as “High” vs. “Moderate/Low.”

Outcome Variable 3 (use of fluoride varnish in children under 7 years of age in Case Scenario One) had four levels of use, which were collapsed into two levels. “Always” and “Often” were categorized as “Yes” and “Rarely,” and “Never” as “No.”

Outcome variables for Case Scenario Two and Case Scenario Three were similar to Case Scenario One.

Independent variables that were significantly associated with the outcome variables for Case Scenario One at 0.1 level of significance were included in logistic regressions. Multivariate logistic regressions were performed with each of the above outcome variables for Case Scenario One only (Tables 4, 5). A final model was built with independent variables identified from the above that were significantly associated at 0.05 level, and with a dichotomous dependent variable.

### TABLE 1
Demographic of Characteristics of Participants (Dentists):

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>140 (72.54%)</td>
</tr>
<tr>
<td>Female</td>
<td>45 (23.32%)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>164 (84.97%)</td>
</tr>
<tr>
<td>African-American</td>
<td>4 (2.07%)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>3 (1.55%)</td>
</tr>
<tr>
<td>Native American</td>
<td>0</td>
</tr>
<tr>
<td>Asian</td>
<td>6 (3.11%)</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>1 (0.52%)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (2.07%)</td>
</tr>
</tbody>
</table>

### TABLE 2
Dental Practice Characteristics: Practice Type, Specialty, Location

<table>
<thead>
<tr>
<th>Dental Practice</th>
<th>(Frequency) Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice Type</td>
<td></td>
</tr>
<tr>
<td>Solo Practice</td>
<td>111 (57.51%)</td>
</tr>
<tr>
<td>Group Practice</td>
<td>56 (29.02%)</td>
</tr>
<tr>
<td>Academics</td>
<td>8 (4.15%)</td>
</tr>
<tr>
<td>Military</td>
<td>0</td>
</tr>
<tr>
<td>Community Dentistry</td>
<td>7 (3.63 %)</td>
</tr>
<tr>
<td>Public Health Clinic</td>
<td>4 (2.07 %)</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>4 (2.07 %)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grouped Practice Type</th>
<th>(Frequency) Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solo</td>
<td>111 (58.73%)</td>
</tr>
<tr>
<td>Group</td>
<td>78 (41.27%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specialty</th>
<th>(Frequency) Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>166 (86.01%)</td>
</tr>
<tr>
<td>Pediatric</td>
<td>19 (9.84%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location of Practice</th>
<th>(Frequency) Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>33 (17.10%)</td>
</tr>
<tr>
<td>Suburban</td>
<td>122 (63.21%)</td>
</tr>
<tr>
<td>Rural</td>
<td>29 (15.03%)</td>
</tr>
<tr>
<td>Other</td>
<td>8 (4.15%)</td>
</tr>
</tbody>
</table>
Results
The survey was sent out to a total of 540 dentists. Eighteen mail surveys were returned because of incorrect mailing addresses. Five dentists responded saying that they did not treat children and did not complete the survey. Five replied they had retired. The response rate was 38.89% after the third mailing; 193 responses were included in the data analyses. Table 1 describes the demographics. Tables 2 and 3 provide the practice characteristics of the study sample. Of the respondents, 86% identified themselves as general dentists and 9.8% as pediatric dentist; 58.7% were in a solo practice as opposed to 41.2% who were in a group practice.

Overall, 43% of dentists reported they provided service to children under the age of 2. Medicaid insurance constituted 55.8% for the source of payment. Nearly four-out-of-ten dentists (38.7%) reported the first dental visit should be at 3 years of age, while 23% recommended at age 1. Among the respondents, 61.2% mentioned that ADA guidelines influenced their decision to choose the type of fluoride formulation.

In this study, 47.5% of the dentists reported using fluoride varnish in children under 7 years of age. Approximately 41% reported using fluoride varnish in children 7 to 13 years of age, while 40% reported using fluoride varnish in children older than 13. Only 44% of dentists correctly assessed the risk of the child as high for caries in Case Scenario One. Forty-two percent of the dentists preferred to use fluoride varnish in the high-risk child. Two-thirds (65.6%) preferred to recommend fluoride treatment every 6 months for the child at high risk for caries.

In Case Scenario Two of the survey, the child described was at moderate risk; 60.4% identified this correctly. Most (90%) of the dentists identified the child at low risk for dental caries correctly. When asked what influences their decision to choose one type of fluoride formulation over the other, dentists reported ease of application (72.1%), age of the patient (64.4%), child acceptance (66.1%) and ADA guidelines (61.2%) as important factors. Surprisingly, 29% of the dentists had attended a continuing education course within the last two years that focused on the use of fluoride for prevention of dental caries.

Multiple logistic regression analysis showed that dentists who assessed the high-risk child correctly were approximately two-times more likely to use fluoride varnish. Dentists who provided services to children under the age of 2 were approximately two-times more likely to use fluoride varnish in high-risk cases for dental caries. Also, dentists who were aware of the change in Medicaid policy for reimbursement

### Table 3
Dental Practice Characteristics: Description of Patients in Practice

<table>
<thead>
<tr>
<th>Variable Name (n)</th>
<th>Mean (Standard Deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Patients by Geographic Location: (193)</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>24.96 (25.41)</td>
</tr>
<tr>
<td>Suburban</td>
<td>59.28 (30.43)</td>
</tr>
<tr>
<td>Rural</td>
<td>28.31 (28.00)</td>
</tr>
<tr>
<td>Percentage of Patients by Age</td>
<td></td>
</tr>
<tr>
<td>Age 1-2 years (192)</td>
<td>10.36 (28.15)</td>
</tr>
<tr>
<td>Age 3-5 years (192)</td>
<td>16.22 (29.27)</td>
</tr>
<tr>
<td>Age 6-12 years (192)</td>
<td>19.86 (28.37)</td>
</tr>
<tr>
<td>Age 13-17 years (192)</td>
<td>20.36 (27.32)</td>
</tr>
<tr>
<td>Age 18 and Over (192)</td>
<td>70.66 (27.22)</td>
</tr>
<tr>
<td>Percentage of Patients by Payment Source</td>
<td></td>
</tr>
<tr>
<td>Fee-for-service (193)</td>
<td>36.49 (29.41)</td>
</tr>
<tr>
<td>Private Insurance (192)</td>
<td>12.57 (27.96)</td>
</tr>
<tr>
<td>Medicaid (192)</td>
<td>55.81 (29.09)</td>
</tr>
<tr>
<td>Child Health Plus (192)</td>
<td>8.89 (22.66)</td>
</tr>
<tr>
<td>Other (191)</td>
<td>6.13 (23.16)</td>
</tr>
<tr>
<td>Number of Years in Practice (193)</td>
<td>27.69 (18.07)</td>
</tr>
</tbody>
</table>

### Table 4
Statistical Test (Chi-square) Comparing Preference of Fluoride Varnish in High-risk Child (Outcome Variable 1 - Dentists preferred fluoride varnish for high-risk patient in Case Scenario 1)

<table>
<thead>
<tr>
<th>Independent Variable Name</th>
<th>Chisq</th>
<th>Df</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grouped Practice Type</td>
<td>6.6504</td>
<td>1</td>
<td>0.0099</td>
</tr>
<tr>
<td>Provide services to children less than 2 years of age</td>
<td>10.1976</td>
<td>1</td>
<td>0.0014</td>
</tr>
<tr>
<td>Recommended age for first dental visit</td>
<td>28.5102</td>
<td>7</td>
<td>0.0002</td>
</tr>
<tr>
<td>Use of fluoride foam in children under 7 years of age</td>
<td>35.7374</td>
<td>3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Use of fluoride gel in children under 7 years of age</td>
<td>6.6809</td>
<td>3</td>
<td>0.0828</td>
</tr>
<tr>
<td>Use of fluoride varnish in children under 7 years of age (grouped)</td>
<td>61.7005</td>
<td>1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Use of fluoride foam in children under 7-13 years of age</td>
<td>29.3228</td>
<td>3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Use of fluoride gel in children under 7-13 years of age</td>
<td>17.1154</td>
<td>3</td>
<td>0.0007</td>
</tr>
<tr>
<td>Use of fluoride varnish in children under 7-13 years of age</td>
<td>53.2698</td>
<td>3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Use of fluoride foam in children over 13 years of age</td>
<td>20.1484</td>
<td>3</td>
<td>0.0002</td>
</tr>
<tr>
<td>Use of fluoride gel in children over 13 years of age</td>
<td>12.1468</td>
<td>3</td>
<td>0.0069</td>
</tr>
<tr>
<td>Use of fluoride varnish in children over 13 years of age</td>
<td>42.1899</td>
<td>3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Risk assessment in Case Scenario 1 (grouped)</td>
<td>5.5539</td>
<td>1</td>
<td>0.0184</td>
</tr>
<tr>
<td>Frequency of use of fluoride in Case Scenario 1</td>
<td>30.3520</td>
<td>6</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Awareness about change in Medicaid policy</td>
<td>9.3236</td>
<td>1</td>
<td>0.0021</td>
</tr>
<tr>
<td>Impact of change in policy on use of fluoride varnish</td>
<td>6.9392</td>
<td>3</td>
<td>0.073</td>
</tr>
<tr>
<td>Agreement for pediatricians applying fluoride varnish</td>
<td>5.0463</td>
<td>1</td>
<td>0.0247</td>
</tr>
</tbody>
</table>
for fluoride varnish were approximately four-times more likely to use fluoride varnish in children who were at high risk for dental caries. Interestingly, dentists who had a solo practice, as well as male dentists, were less likely to use fluoride varnish.

**Discussion**

The ADA recommends using fluoride varnish in children with a moderate-to-high risk, due to its effectiveness.\(^{15}\) Despite this, fewer than 50% of dentists reported using fluoride varnish in accordance with the recommendations. More than 50% of the dentists were not able to correctly identify the high-risk dental caries patient vignette. Evidence suggests that to be successful at preventing dental caries, dentists must begin preventive interventions within the first year of life.\(^{14}\) However, the majority of the dentists recommended the first dental visit at 3 years of age. An earlier study by Fiset et al. showed that although dentists’ awareness and adoption of fluoride varnish had increased since 1995, fluoride varnish was underutilized in adult patients; nonetheless, the present study indicates that it is underutilized in pediatric patients as well.\(^{16}\)

As increasingly demonstrated in the literature, fluoride varnish treatment effectively inhibits demineralization, which results in highly significant caries reductions.\(^{17}\) Findings from the present study strongly suggest there is a definite need to educate dentists with current evidence-based recommendations, particularly regarding prevention of dental caries. This is especially

<table>
<thead>
<tr>
<th>Independent Variable Name</th>
<th>Point Estimate</th>
<th>Confidence Interval</th>
<th>Df</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk assessment in Case Scenario 1 (grouped)</td>
<td>2.077</td>
<td>1.053, 4.097</td>
<td>1</td>
<td>0.0350</td>
</tr>
<tr>
<td>Provide services to children less than 2 years of age</td>
<td>2.103</td>
<td>1.066, 4.150</td>
<td>1</td>
<td>0.0321</td>
</tr>
<tr>
<td>Awareness about change in Medicaid policy</td>
<td>3.948</td>
<td>1.174, 13.277</td>
<td>1</td>
<td>0.0265</td>
</tr>
</tbody>
</table>
important as our study also found positive association between dentists’ ability to identify high-risk caries patients and their likelihood of using fluoride varnish. From our study it is also evident that an awareness of the Medicaid reimbursement policy had a positive association with dentists’ likelihood of using fluoride varnish. This indicates that awareness of policy changes may have an impact upon dentists’ likelihood of using fluoride varnish.

The respondent data included in the study were self-reported. Since the survey included dentists practicing in Monroe County and seven neighboring counties in Western New York, the results may be applicable to dentists across New York State, where policies regarding fluoride varnish are the same. However, the results may not be generalizable to dentists outside of New York State, where policies may be different. There could also be a potential non-responder bias. However, a more thorough analysis of non-responder characteristics was not possible.

Future research using a nationwide survey to assess trends regarding the use of fluoride varnish is needed to provide a more general estimate of prevalence and to account for policy differences. Given the advent of updated guidelines and recommendations to address recommendations for the use of fluoride varnish with children, there is also a need to implement strategies to improve fluoride varnish utilization by dentists as per such guidelines. Findings of this study could help identify the need for and content of materials to educate dentists about fluoride varnish. Such findings could help to reduce the burden of dental caries and improve the oral health of children.

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REFERENCES

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Dental Economics and the Increasing Hispanic Population in the U.S. and New York State


ABSTRACT
The continuing dramatic increases in the U.S. Hispanic population are considered relative to the economic concerns of dental practice. Oral health needs, limited finances and health insurance, together with varying cultural orientation, are reviewed in terms of the potential for growing Hispanic political strength.

The features section of the August 2015 issue of the Journal of the American Dental Association reported on numerous analyses from the ADA Health Policy Institute that demonstrated that the percent of dentists who say they are not busy enough and can see more patients has risen steadily for approximately a decade. Waiting times have decreased, dentists’ earnings are stagnating and dentists who accept Medicaid tend to be busier.5 “As the general economy of the nation continues to improve, there undoubtedly will be increasing use of oral health services. The need is to expand the delivery of care to underserved populations, including the poor, individuals with disabilities, minorities and new immigrant populations for whom oral health services may not be a priority commodity.”6

Oral Health Needs
“Hispanic children have higher rates of untreated dental disease than any other children in the country.”11 Among children 6 to 9 years, 26% of Hispanics have untreated dental caries, compared to 14% of non-Hispanic whites. Among 13- to 15-year-olds, 12% of Hispanic children and 9% of non-Hispanic white children have untreated dental caries.12

Hispanic children are at the highest risk of not having seen a dentist. “The following factors contributed to the unmet dental needs of the (Hispanic) population: 1. lack of dental insurance;
“There were 54 million Hispanics in the United States in 2013, comprising 17.1% of the total U.S. population (with projections to reach 128 million, or 29% of the U.S. population by 2050). In 1980, with a population of 14.8 million, Hispanics made up just 6.5% of the total U.S. population.”1,2

“(As of 2005) ...there were more Hispanics living in the United States than in Central America.”3

“Among all Hispanics, the share that was born in another country was 35.2% in 2013, down from a peak of about 40% earlier in the 2000s.”1

“English proficiency is rising among Hispanics ages 5 and older. In 2013, 67.8% of Hispanics said they speak only English at home or indicate that they speak English ‘very well’...”4

2. lack of education about dental care; 3. lack of diversity and cultural competency among dental providers; 4. lack of access to dental care, including transportation and work leave time.”11

Cultural Considerations
There are many factors that may influence the need for and use of health services. They include the following.

Language—It is significant that the prevalence of special healthcare needs varies substantially depending on whether English or Spanish is the primary language spoken at home. Among Spanish-speaking families, 8.2% of children are reported to have special healthcare needs (CSHCN). Among English-speaking Hispanics, the proportion of CSHCN is similar to that of non-Hispanic white children (14.4%).13 The list of adverse health consequences for children because of language and communication issues (e.g., inadequate or incorrect medical and family histories and the listing of medications being taken) could result in a misdiagnosis, inappropriately prescribed medication and/or hospitalization.

Not just language—Hispanic parents, especially parents from Spanish-speaking households, may be less likely to report health problems and needs for their children because of a reluctance to share personal details in a telephone survey.14 The outcome of these and other related characteristics is that Hispanic children "...experience marked disparities in obtaining timely medical care, only some of which is associated with language differences."15 One cannot over-emphasize the need for healthcare providers to maintain an awareness of the diversity of the Hispanic population, which consists largely of persons of Mexican, Puerto Rican and Cuban descent. "In spite of the fact that Hispanics share a similar language, religion and belief system, there are other significant cultural differences among these subgroups. In addition, English-language proficiency and socioeconomic variables, factors that are known to influence healthcare outcomes may also differ markedly among Hispanic subgroups.”15

Immigration—About four million children in the U.S., roughly 7% of all people under 18 years of age, have at least one parent who is an illegal immigrant. 79% of these children are U.S. citizens because they were born in this country. The Department of Homeland Security reported that there are 10.8 million illegal immigrants in the country.16

(Note: Any assumption that the proportion of illegal and legal immigrant children with disabilities is comparable may underestimate the reluctance of families to come forward because of fear of deportation. Now add the general difficulties by all immigrants of overcoming the barriers of culture, economics, language and the availability of health services.)
What about New York State?
Aren’t Hispanic issues the primary concern of California, the states along the Mexican border and New York City? The reality is that New York State (with 3.5 million Hispanics [18% of the total state population]) ranks 4th (behind California, Texas and Florida) in the total number of Hispanic residents. The majority of Hispanic residents in New York State do live in New York City (2,373,000 individuals; 67.8% of Hispanics in the state). However, 457,000 Hispanics live on Long Island (Nassau and Suffolk counties [representing 15% to 17% of the county populations]). In addition, almost 400,000 Hispanics live in seven upstate counties, representing between with 10% and 22% of the respective county populations. Another 150,000 live in eight upstate counties, with between 5% and 9% of the respective county populations (Table 1).

New York State Hispanic Residents in 2011
What follows is a demographic profile of New York’s Hispanic residents.

- 62% of Hispanic residents are native born. 82% of foreign-born Hispanics are of non-Mexican origin.
- Reflecting the great numbers of Hispanic youngsters, the median age of all Hispanics was 30 years, compared to 42 years for non-Hispanic whites.
- Among residents 25 years and older, 21% of Hispanics and 6% of non-Hispanic whites had less than a high-school diploma.
- Among residents 16 years and older, 12% of Hispanics and 7% of non-Hispanic whites were unemployed.
- The median earnings of Hispanics 16 years and older with income was $23,000, compared to $37,000 for non-Hispanic whites. Median household income of Hispanics was $37,800, compared to $62,200 for non-Hispanic whites.
- 22% of Hispanics, 14% of non-Hispanic blacks and 7% of non-Hispanic whites have no health insurance.
- 21% of Hispanics reported that only English was spoken at home.17

Realities
1. There has been an increase in the percent of dentists who report they are not busy enough. A previous review in The NYSDJ detailed decreases in the standard dollars (i.e., removing the effects of inflation) estimated average business receipts in 43 counties, including all counties in New York City, of the 61 counties with dental establishments—i.e., the increase in business receipts did not keep pace with the rate of inflation between 2007 and 2012.6
2. There has been (and will be?) dramatic increases in the Hispanic population in the U.S. and, specifically, in many areas of New York State.
3. There are issues of poverty, lack of health insurance, cultural differences and limited numbers of Hispanic dentists. In 2014, 17.4% of the general population was reported as Hispanic, compared to 5.3% of all active dentists in 2010.18,19
4. The political potential of an increasing Hispanic population provides an opportunity for the health professions to increase attention paid to health and social needs for this population.
5. “While much of the economy has recovered since the Great Recession, the earnings of general (dental) practitioners have not, according to the ADA. In fact, 2014’s average earning of $174,780 for all GP’s follows 2013’s average earning of $183,885 and comes at the end of a nearly decade-long decline since 2005’s inflation-adjusted peak of $219,378.”20
6. As Yogi Berra intoned, “The future ain’t what it used to be!”

Queries about this article can be sent to Dr. Waldman at h.waldman@stonybrook.edu.

| TABLE 1. Number and Percent of New York State Hispanic Residents by County: 2011 |
|---|---|---|
| Counties | HISPANIC RESIDENTS | Percent of State Hispanic Population |
| | Number (in 000s*) | Percent of Total Pop.* |
| New York City | 2,373 | 67.8% |
| Bronx | 748 | 54% |
| Kings | 507 | 20 |
| New York | 411 | 26 |
| Queens | 625 | 28 |
| Richmond | 18 | 18 |
| Long Island | 457 | 13.1% |
| Nassau | 202 | 15% |
| Suffolk | 255 | 17 |
| Upstate: 10% - 22% | 395 | 11.3% |
| Dutchess | 32 | 11% |
| Montgomery | 6 | 12 |
| Orange | 69 | 18 |
| Putnam | 12 | 12 |
| Rockland | 51 | 16 |
| Sullivan | 11 | 14 |
| Westchester | 214 | 22 |
| Upstate: 5% - 9% | 152 | 4.3% |
| Chautauqua | 8 | 6% |
| Erie | 43 | 5 |
| Greene | 2 | 5 |
| Jefferson | 7 | 6 |
| Monroe | 56 | 7 |
| Oneida | 11 | 5 |
| Schenectady | 9 | 6 |
| Ulster | 16 | 9 |
| Upstate - <5% | 40 counties | 3.4% |
| | 120 | 1% - 4% |
| New York State | 3,497 | 18.0% |

* Rounded
REFERENCES


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Pleomorphic Adenoma of the Upper Lip
A Rare Case

Mahnaz Fatahzadeh, D.M.D., M.S.D.

ABSTRACT

Salivary gland tumors account for a small fraction of head and neck tumors. Pleomorphic adenoma, the most common salivary gland neoplasm, frequently arises in major salivary glands; its localization to minor salivary glands is uncommon and typically involves the palate. We describe a patient with an asymptomatic, long-standing mass of the upper lip, which was found to be a pleomorphic adenoma.

Salivary gland neoplasms are considered rare, accounting for about 3% to 5% of all head and neck tumors. Minor salivary gland tumors account for up to 20% of all salivary gland neoplasias and have a high rate of malignancy. The most common benign tumor of salivary glands is pleomorphic adenoma (PA), which arises primarily in major salivary glands but may also develop within minor salivary glands. Pleomorphic adenoma can affect all age groups, including children, but has a slight predilection for females in the fourth to sixth decade of life.

Previously referred to as a “mixed tumor,” PA is thought to have a mixed origin, arising from myoepithelial, epithelial and mesenchymal elements within glandular tissues. Although the true etiology of PA is unknown, molecular studies describe abnormalities in 8q12 and 12q25 chromosomes. Pleomorphic adenoma has wide histological diversity related to its biphasic elements. Microscopic features include sheets or cords of tumor cells, ductal elements, cystic structures, chondroid and/or myxoid stroma, and ossification. Myoepithelial cells, which produce the components of extracellular matrix, may assume a variety of morphological appearances, including spindle-shaped, myxoid, squamoid, star-shaped and basaloid.

The tumor is typically well-circumscribed but often partially enveloped by a connective tissue pseudo-capsule. Typical presentation of PA in minor salivary glands is a slow-growing, firm submucosal mass that causes no symptoms, ulceration or neurosensory deficits. Nevertheless, cosmetic concerns or interference with oral functions have been reported.

Clinically, tumors with large cystic cavities or abundance of mucin may feel soft on palpation. We present the case of a patient with long-standing pleomorphic adenoma on his upper lip, a rarely reported location for this minor salivary gland tumor.

Case Summary

A 58-year-old white male was referred to the Oral Medicine Service at Rutgers School of Dental Medicine for evaluation of an asymptomatic submucosal mass in the upper left labial mucosa. The patient had been aware of the nodular growth for many years and related its onset to lip trauma 25 years earlier. He denied paresthesia or change in the size of the nodule, but had noticed recent upper lip asymmetry (Figure 1A).
The patient's medical history was significant for hypertension, gastric reflux disease and psoriasis. His medications included olmesartan and omeprazole. He denied having allergies. His social history was non-contributory and a review of systems was within normal limits.

Extraoral examination revealed no lymphadenopathy or major salivary gland enlargement. There was left-side fullness and droopiness of the upper lip, but neurosensory function was normal. Intraorally, a firm, well-circumscribed, freely movable, non-tender submucosal growth of about 1.5 cm was palpable in the left upper labial mucosa (Figure 1B). The corresponding skin and mucous membrane were intact, unaltered and free. The remainder of the intraoral examination was non-contributory. The differential diagnosis included a minor salivary gland tumor, a mesenchymal tumor, such as rhabdomyoma, neurilemmoma, as well as a traumatic foreign body granuloma.

Our benign clinical impression, based on mobility and the circumscribed nature of the growth, prompted an excisional biopsy. A yellowish mass, which appeared well-encapsulated, was enucleated and submitted for H&E analysis (Figures 1C, D). Microscopic examination revealed a partially encapsulated round-to-ovoid structure composed of a mixture of neoplastic glandular epithelial and myoepithelial cells within a stroma that varied from myxoid to hyalinized. The epithelial cells were arranged in duct or cystic structures, as diffuse sheets or in clusters (Figures 2A-D). No malignant features were noted, but tumor elements abutted the inked surgical margin devoid of fibrous encapsulation. Histopathological features were consistent with pleomorphic adenoma; however, the adequacy of excision was uncertain. Healing was uneventful, and postoperative examination revealed improved upper lip symmetry (Figure 3).

The patient was informed of the diagnosis and options were discussed. He opted for periodic surveillance rather than complementary surgical treatment and was placed on long-term follow-up for the absence of recurrence.

Discussion
The most common pathology of minor salivary glands is PA,1,3,11 with a predilection for the junction of the hard and soft palate.1-4,7 This benign tumor may develop in other oral locations, such as the lip, buccal mucosa or floor of mouth, where minor salivary glands are present.2,3,11

Despite the presence of numerous mucous-secreting minor salivary glands in the lower lip,11 the majority of minor salivary gland tumors within the lip affect the upper lip,8,12 and a significant proportion of them are benign.13 In a review of 4,042 cases of PAs originating in the salivary glands, Krolls et al. identified 445 involving the minor salivary glands. Of these, 14.5% were localized to the upper lip and 2.9% to the lower lip.11 In fact, the
The majority of gland-related lesions in the lower lip are a mucous-extravasation phenomenon rather than neoplastic growths.8,12

A number of explanations for this differential predilection have been proposed. Among these is the fusion of three embryonic processes involved in the formation of the upper lip—a process with an inherent potential for entrapment of embryonic cell nests and conducive to development of salivary gland tumors. In addition, the lower lip is at greater risk for local trauma, such as from parafunctional oral habits.11 Even when trauma is not sufficient to cause obstruction of glandular ducts and lead to mucocele formation, it may promote an inflammatory milieu rich in lymphocytes and plasma cells. The latter may help destroy abnormal cells with a tendency to develop salivary gland tumors.11

Although both the age of this patient and the location of his tumor were consistent with the literature, his gender differed from that reported previously for labial PA. This may be explained by the influence of race and geographical area on gender predilection of minor salivary gland tumors.14 Studies support marked female predilection of PA in African and Japanese populations, compared to Caucasians.14,15

Pathological entities considered in the differential diagnosis of a slow-growing, asymptomatic intraoral mass include minor salivary gland neoplasms, as well as mesenchymal tumors.4-5,10 In view of the reported history of lip trauma, our differential also included foreign body granuloma. Both benign and malignant entities in this location may be long-standing and asymptomatic or present with minimal features, such as pain or ulceration, considered suspicious for malignancy.16

Patients may not recognize the presence of an asymptomatic, slow-growing intraoral mass, or they may consider it a low priority in terms of seeking care.4 A thorough clinical exam, including visual inspection and manual palpation of oral tissues by dentists has the potential to uncover these submucosal abnormalities and expedite management.4,17 Intraoral PA is usually mobile, unless it is located in the hard palate.16 Although encapsulation and mobility are features often associated with benign lesions, definitive evaluation and timely surgical management are essential for intraoral swellings of uncertain etiology.1,2,5,17 This is important because the risk of transformation into carcinoma ex-pleomorphic adenoma (CXPA)3,18 increases with the length of time the PA remains untreated.17 Unlike its predecessor, this tumor is characterized by aggressive behavior and worse prognosis.1,3,17 As a malignant derivative of PA, CXPA accounts for about 6% of all PAs.1,12,18,19

Rare development of CXPA from a pre-existing pleomorphic adenoma within minor salivary glands of the palate and upper lip has been reported.17,18 The risk of transformation is greater in older patients, as well as in cases of large or recurrent PAs.12,17 Suspicious features for transformation include pain, ulceration or a recent rapid growth in a long-standing, quiescent intraoral mass.17 Our patient was aware of the labial mass for 25 years but did not seek treatment because it was painless.

A diagnostic work-up of asymptomatic, submucosal masses in the oral cavity may involve a number of modalities. Fine needle aspiration cytology (FNAC) is frequently used and has proven to be accurate in the preoperative evaluation of salivary gland tumors.3,18,20 Despite the high sensitivity of FNAC in the diagnosis of PA, a wide spectrum of histopathological variations and potential overlap in microscopic features with other glandular pathologies may pose interpretational difficulties.20 This can be minimized by repeat aspirations from different regions of the tumor to obtain more representative samples.20 Magnetic resonance imaging helps delineate palpable salivary gland masses from the surrounding structures and provide information about the extent of the lesion or osseous involvement1,3,10,21 Although imaging studies can’t differentiate between benign and malignant salivary gland neoplasms, they assist with diagnosis and surgical planning.20

Both incisional biopsy1,10 and surgical excision3-5,8 as the initial approach have been used for microscopic evaluation of oral masses of unknown origin, including those suspected of having a salivary gland etiology.3,10 Staining specimens with immunohistochemical markers, such as S-100, vimentin, keratin and alpha smooth muscle actin, also help identify myoepithelial and ductal elements to confirm histopathological diagnosis.3,7,8

The definitive treatment of choice for PA is surgical excision,10 with a safety margin of surrounding normal tissue to ensure complete removal of the tumor.2 This is because, despite the benign nature of PA, violation of the capsule or extension of tumor elements through the incomplete envelope pose the risk of seeding during tumor enucleation.4,5,7 Positive surgical margins indicate additional surgery for removal of residual elements to prevent subsequent recurrence.3,10 However, a number of issues may lead to histopathological misinterpretation. For example, microscopic absence of adequate cuff of adjacent normal tissue may not necessarily mean close margins.12 Also, microscopic absence of a visible capsule caused by retraction and fixation shrinkage may be misinterpreted as incomplete tumor excision.12 To minimize these issues, it is best to provide the entire, unaltered specimen to the pathologist for examination.12

The estimated incidence of recurrence for inadequately excised PA is reported to be between 5% and 30%,2,22 with the likelihood of it being greater when the tumor first appears prior to the age of 30.22 For tumors excised with a safety margin, the rate of relapse is less than 5%.3,10 The rate of recurrence for labial PA, however, is lower than that reported in other anatomical sites.16,22 In this patient, the clinical impression of a benign minor salivary gland mass prompted enucleation as the initial diagnostic proce-
The tumor clinically appeared to be fully encapsulated and was removed with ease through a mucosal incision.

Because of the positive margins, the risk of recurrence was discussed, but the patient declined complementary surgery. The benign histology of the tumor, the advanced age of the patient and the labial location of the tumor, rendering it accessible for frequent examination, supported a low risk for recurrence, and the patient was placed on regular, long-term follow up. Prolonged vigilance after excision of a PA is warranted because recurrence of this tumor may be delayed by five or more years. A summary of pertinent features of pleomorphic adenoma is provided in Table 1.

**Conclusions**

The innocuous appearance and asymptomatic nature of pleomorphic adenoma may lead to a failure to recognize it or assignment of a low priority for seeking care. The increased risk of malignant transformation in long-standing pleomorphic adenoma, however, highlights the importance of definitive evaluation when intraoral swellings of unknown etiology are discovered by dentists during clinical examination. The formulation of a prioritized list of differential diagnosis, appropriate diagnostic work-up, as well

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**TABLE 1. Summary of Pertinent Features for Pleomorphic Adenoma**

| **Epidemiology** | Most common salivary gland tumor  
| Slight predilection in females  
| Peak incidence during 4th-6th decades of life  |
| **Sites of Predilection** | Major salivary glands: Parotid > Submandibular  
| Minor salivary glands: Palate > lips, buccal mucosa, floor of mouth  |
| **Clinical Features** | Asymptomatic & slow growing  
| Well-circumscribed & firm  
| Freely movable mass with intact mucosa  |
| **Histological Features** | Biphasic microscopic elements (epithelial & stromal)  
| Wide spectrum of histological and morphological diversity  
| Partially or fully encapsulated  |
| **Biological Behavior** | Benign  
| Risk of malignant transformation in long-standing, large & recurrent tumors  |
| **Diagnosis** | Diagnostic adjuncts: FNAC, MRI  
| Incisional or excisional biopsy and histopathological exam  |
| **Management** | Early & complete excision with a safety margin  |
| **Recurrence** | High risk of seeding & potential for recurrence if enucleated  
| Recurrence rate of < 5% in adequately excised tumors  |

Based on references 3-8, 10, 12, 17, 18, 21
as early and complete surgical removal of pleomorphic adenoma minimizes the surgical sequelae and improves prognosis.

Queries about this article can be sent to Dr. Fatahzadeh at fatahza@sdm.rutgers.edu.

REFERENCES

Mahnaz Fatahzadeh, D.M.D., M.S.D., is professor of oral medicine, Department of Diagnostic Sciences, Rutgers School of Dental Medicine, Newark, NJ.
ABSTRACT

Anatomical characteristics, periodontal diseases and toothbrushing trauma make the management of multiple, adjacent, recession-type defects (MARTDs) particularly challenging. Even though connective tissue grafting is considered the gold standard in management, it has limitations, such as a second surgical site and limited amount of donor graft. Porcine pericardium membrane (PPM) is a reliable soft-tissue substitute with a three-dimensional collagen network that exhibits better stability, slow degradation, high-tear resistance, good handling properties and enhanced vascularization. This article describes the use of PPM, along with modified coronally advanced flap (Zucchelli’s technique), in treating Millers Class I and II gingival recession in a 38-year-old male patient. Satisfactory outcomes were observed in gingival recession depth and clinical attachment loss from the baseline to six months postoperative. Two-thirds of the sites showed 100% root coverage. The mean root coverage achieved was 88.8%. A significant increase in the width of keratinized tissue was observed after six months of follow-up. The PPM was safe and healed uneventfully.

Multiple Recession Coverage using Pericardium Membrane

Remigius Divakaran, M.D.S.; Divya Khanna, M.D.S.; Irfana Babrawala, B.D.S.; Joann Pauline George, M.D.S.

Gingival recession is defined as the displacement of the soft-tissue margin apical to the cementoenamel junction (CEJ). Multiple, adjacent, recession-type defects (MARTDs) are frequent clinical occurrences that manifest regardless of age and ethnicity. They mainly occur as a result of periodontal disease or traumatic toothbrushing habits. MARTDs are a challenge to treat because of various stumbling blocks to root coverage, such as a larger surgical field, prominent roots, increased avascularity and insufficient autogenous graft tissue.

A variety of techniques have been used to manage MARTDs (Table 1). Among these, coronally advanced flap (CAF) with connective tissue graft (CTG) is considered to be the most predictable option. However, the disadvantage of this technique is the procurement of insufficient graft, a second surgical site that increases patient morbidity and the lack of true periodontal regeneration during healing. Newer, soft-tissue substitutes that can accomplish the role of CTG and also heal with new attachment is warranted. Guided tissue regeneration (GTR) procedures for root coverage show histological evidence of connective tissue attachment in humans.

One such novel GTR membrane is porcine pericardium membrane (PPM) (Jasons membrane; Botiss Dental, GmbH, Dieburg, Germany). This membrane has been used successfully to enhance osseointegration around implants placed in fresh extraction sockets and for root coverage procedures. And it has been the sub-
ject of reports detailing its use in sinus lift and ridge augmentation. However, there is limited scientific literature documenting the use of PPM for root coverage. The primary objective of this case report is to describe for the first time the effectiveness of PPM for recession coverage in MARTDs.

Clinical Presentation

A systemically healthy, nonsmoking, 32-year-old male reported to our clinic with root hypersensitivity in the maxillary anteriors. The patient presented with Millers Class I and II gingival recession on teeth #22, #23 and #24 that could be due to the horizontal scrub method he used to brush his teeth. Oral hygiene instructions that included a modified toothbrushing technique were provided to the patient. Scaling and root planing were performed. The patient demonstrated satisfactory plaque control and gingival health when reassessed three weeks later. Surgical management of MARTD with modified coronally advanced flap and PPM was planned. An informed consent was ob-

TABLE 1

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Technique</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pini-Prato GP et al, 2010</td>
<td>CAF v/s CAF+ CTG</td>
<td>CRC noted was similar at 6-month follow-up, but better with CAF+CTG (52%) v/s CAF alone (35%) at 5-year follow-up.</td>
</tr>
<tr>
<td>Zucchelli G et al, 2009</td>
<td>MCAF</td>
<td>CRC achieved was 73% and 0.6mm increase in keratinized tissue width at 1 year noted.</td>
</tr>
<tr>
<td>Tunali M et al, 2015</td>
<td>CAF + L-PRF</td>
<td>Degree of root coverage achieved at 12 months with L-PRF is 76.63% and CTG is 77.36%.</td>
</tr>
<tr>
<td>Shetty SS et al, 2014</td>
<td>CAF+PRF vs CAF+ amniotic membrane</td>
<td>100% root coverage achieved with both the membranes.</td>
</tr>
<tr>
<td>Ahmedbeyli C et al, 2014</td>
<td>CAF vs CAF+ ADM</td>
<td>Mean and complete defect coverage were 94.84% and 83.33% in test group, 74.99% and 50.00% in control group, respectively.</td>
</tr>
<tr>
<td>Cardaropoli D et al, 2014</td>
<td>CAF vs CAF + mucograft</td>
<td>58% and 72% CRC achieved with CAF and CAF+ mucograft, respectively.</td>
</tr>
<tr>
<td>Alkan EA et al, 2013</td>
<td>CAF+CTG vs CAF+ EMD</td>
<td>The mean PRC at 1 year was 89% ± 17% for the coronally advanced flap (CAF) + EMD group and 93% ± 17% for the CAF + CTG group.</td>
</tr>
<tr>
<td>Ozturan S et al, 2011</td>
<td>CAF vs CAF + diode laser</td>
<td>CAF+IIIT presented greater complete root coverage (70%) compared with CAF (30%) after treatment.</td>
</tr>
<tr>
<td>Zabalegui I et al, 1999</td>
<td>CAT</td>
<td>CRC achieved was 66.7% with a mean root surface coverage of 91.6%.</td>
</tr>
<tr>
<td>Aroca S et al, 2013</td>
<td>MCAT</td>
<td>CRC achieved for MCAT+CM was 42% and for MCAT+CTG was 85%. MRC measured 71±21% mm at MCAT+CM versus 90±18 mm at MCAT+CTG.</td>
</tr>
<tr>
<td>Zadeh HH et al, 2011</td>
<td>VISTA</td>
<td>Satisfactory CRC was observed.</td>
</tr>
</tbody>
</table>
tained from the patient. The clinical parameters with respect to the affected teeth three weeks after scaling and root planing were documented with UNC-15 (University of North Carolina 15 periodontal probe; Hu Friedy, Chicago, IL) probe and customized acrylic stent for standardization (Table 2) (Figure 1).

Clinical Procedure
After administration of a local anesthesia with 2% lignocaine hydrochloride (Lignox 2%; Indoco Remedies Ltd., Goa, India) and epinephrine concentration of 1:80,000, a modified CAF was performed. An oblique submarginal incision (Figure 2A) in the interdental areas, which continued with the intrasulcular incision at the recession defects, was made. Each surgical papilla (SP) was dislocated with respect to the anatomic papilla by the oblique submarginal interdental incision. The envelope flap was raised; split-full-split approach in coronal-apical direction was employed. The surgical papilla was dissected in a split thickness manner; the gingival tissues apical to the root exposure were raised in a full thickness manner; and the most apical portion of the flap was elevated in a split thickness manner; the gingival tissues apical to the root exposure were raised in a full thickness manner; and the most apical portion of the flap was elevated in a split thickness manner to facilitate coronal displacement of the flap. The exposed root surfaces were planed with area-specific curettes, and the anatomic interdental papilla was denepithelialized (Figure 2B). Sharp dissection into the vestibular lining mucosa eliminated lip and muscle tension, thereby facilitating flap displacement to passively reach a level coronal to CEJ9 (Figure 2C).

PPM was interposed between the flap and the root surfaces, extending from the CEJ to 2 mm to 3 mm apical to bone crest (Figure 2D). The membrane adhered to the root surfaces and, hence, the membrane was not sutured independently (Figure 2E). The flap was coronally repositioned 1 mm10 above the CEJ, covering the entire membrane, and was sutured with 5-0 non-absorbable suture material (Mersilk, Ethicon; Johnson & Johnson, Himachal Pradesh, India) with simple interrupted sutures. Lip tension on the marginal portion of the flap was reduced by performing an additional horizontal double-mattress suture apically9 (Figure 2F).

Postoperative oral instructions were given. The patient was prescribed nonsteroidal analgesic ibuprofen 400 mg three times a day for three days11 and 0.2% chlorhexidine rinse three times a day for two weeks. The patient was recalled after 10 days for suture removal.11 Baseline measurements were repeated at follow-up visits, at three and six months (Figure 3). Standardized digital photographs with horizontal format 1:1 at each interval were taken and transferred to Digimizer software (Image Analysis Software; MedCalc Software, Byba, Belgium) for photogrammetric analysis (Figure 4).

Clinical Outcomes
All clinical parameters improved from baseline to six months. The GRD on tooth #22 was reduced from 1.5 mm (baseline) to 0.5 mm (six months postsurgical) with recession reduction of 1 mm and 66.7% root coverage. Teeth #23 and #24 demonstrated 100% root coverage. Mean root coverage of 88.8% was noted, with two of the three teeth showing complete root coverage (66.7%). The mean recession reduction and CAL gain of 0.8 mm was observed at six months (Table 3). The final esthetics showed acceptable cosmetic results both in color match and tissue contour, and the patient no longer reported hypersensitivity.

Discussion
The management of MARTD is challenging for the clinician, especially given esthetic considerations. PPM is a native collagen membrane originating from porcine pericardium; therefore it exhibits characteristics of natural tissue. The propitious characteristics of PPM, such as strong multidirectional-linking of the collagen network that provides a long-lasting and adequate barrier function for three to six months, facilitates wound healing. The membrane’s adaptability to surface contours, its excellent tear resistance—because of its three-dimensional structure—and easy handling in wet or dry form provides easy maneuverability, enhances the uniqueness of PPM and makes it more favorable for regeneration purposes. The bioresorbable nature of this membrane eliminates a surgical re-entry procedure.8

<table>
<thead>
<tr>
<th>Tooth No</th>
<th>GRD(mm)</th>
<th>CAL(mm)</th>
<th>PPD(mm) (B)</th>
<th>GRD(mm)</th>
<th>CAL(mm)</th>
<th>PPD(mm) (B)</th>
<th>RecRed(mm)</th>
<th>MRC%</th>
<th>CRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>1.5</td>
<td>2.5</td>
<td>1</td>
<td>0.5</td>
<td>1.5</td>
<td>1</td>
<td>1</td>
<td>66.6</td>
<td>66.7%</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>0.5</td>
<td>2.5</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0.5</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Mean (mm)</td>
<td>1</td>
<td>2.3</td>
<td>1.3</td>
<td>0.2</td>
<td>1.5</td>
<td>1.3</td>
<td>0.8</td>
<td>88.8%</td>
<td></td>
</tr>
</tbody>
</table>

GRD= gingival recession depth; CAL= clinical attachment level; PPD= pocket probing depth; RecRed = recession reduction; MRC= mean root coverage; CRC= complete root coverage

TABLE 2
Preoperative Measurements of Clinical Parameters

<table>
<thead>
<tr>
<th>Tooth No</th>
<th>GRD (mm)</th>
<th>PPD(mm) (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>1.5</td>
<td>1</td>
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<tr>
<td>23</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>0.5</td>
<td>2</td>
</tr>
</tbody>
</table>

GRD= gingival recession depth; PPD= pocket probing depth
Rotundo in 2012 used collagen matrix for treating isolated recession defects and demonstrated that 9 of the 11 sites exhibited CRC,12 which is similar to the clinical outcomes in the study presented here.

When chorion membrane was used for root coverage, 14 of the 21 treated sites showed CRC. The percentage of root coverage obtained was 89.92% ±15.59%,11 which is similar to PPM (88.8%).

The result of this case report suggests that PPM, when used with modified CAF, showed satisfactory recession depth reduction and CAL gain in the treatment of MARTDs. The PPM was well tolerated by the patient, with no evidence of side effects. However, the added advantage of PPM needs to be tested with a larger sample size and controlled clinical trials. Since this case report shows a short-term follow-up of six months, a long-term follow-up of one to five years would be more conclusive.

Queries about this article can be addressed to Dr. George at drjoannpaulinegeorge@gmail.com.

REFERENCES