

VOLUME 3 | NUMBER 4 | FALL 2019

# RIDA

JOURNAL OF THE  
RHODE ISLAND  
DENTAL ASSOCIATION



**DENTAL MANAGEMENT**  
OF THE HEAD AND NECK CANCER PATIENT  
TREATED WITH RADIATION THERAPY

**THE EFFECT OF VARIOUS  
ANTIMICROBIALS**  
MIXED WITH ZINC OXIDE-EUGENOL SEALER ON  
TWO COMMON ENDODONTIC PATHOGENS

**RIDA CONTINUING  
EDUCATION**





**EDITORIAL STAFF**

JOHN KIANG, DMD / EDITOR  
GREGORY STEPKA, DMD / CO-EDITOR  
CHRIS KLIMECKO / ASSOCIATE EDITOR  
MADELINE BENNER / ASSOCIATE EDITOR

**2018-2019 OFFICERS**

MARTIN ELSON, DDS / PRESIDENT  
KARYN WARD, DDS / PRESIDENT ELECT  
JOHN KIANG, DMD / VICE PRESIDENT  
GREGORY STEPKA, DMD / SECRETARY  
JENNIFER TORBETT, DMD / IMMEDIATE PAST PRESIDENT  
STEVEN BROWN, DMD / LONG TERM DELEGATE

**RIDA STAFF**

CHRIS KLIMECKO / EXECUTIVE DIRECTOR  
MADELINE BENNER / OFFICE MANAGER

**BOARD OF TRUSTEES**

KERRI-RAE AGIN, DMD / GUEST TRUSTEE  
MATTHEW ALMEIDA, DMD / WOONSOCKET  
FRANK DEQUATTRO, DMD / SOUTH COUNTY  
FOTINI DIONSOPOULOS, DMD / CRANSTON  
RAY ENGLISH III, DMD / KENT COUNTY  
FREDERICK MCMILLEN, DDS / PROVIDENCE  
WILLIAM NAUGHTON, DDS / PAWTUCKET  
PETER SCHOTT, DMD / NEWPORT

**CONTACT US**

Rhode Island Dental Association  
875 Centerville Road  
Bldg. 4, Suite 12  
Warwick, RI 02886  
P: (401)825-7700  
F: (401)825-7722  
www.ridental.org  
info@ridental.org



American Dental Association  
800.621.8099  
www.ada.org

*The Journal of the Rhode Island Dental Association is a peer reviewed publication. Opinions expressed by the authors do not necessarily represent the policies of the Rhode Island Dental Association or the Journal of the Rhode Island Dental Association.*

*The Journal of the Rhode Island Dental Association is published four times a year: winter, spring, summer, and fall. For information regarding advertising, email: info@ridental.org or visit www.ridental.org/news-classifieds/RIDA-Journal*

TABLE OF CONTENTS



2

CONTINUING EDUCATION

*Upcoming Courses*

5

ADA DUES SIMPLIFICATION

*Changes in ADA dues for 2021*

6

THE EFFECT OF VARIOUS ANTIMICROBIALS

*Mixed with Zinc Oxide-Eugenol Sealer on Two Common Endodontic Pathogens*

12

A NOTE FROM RICH ROSATO

*New ADA First District Trustee*

13

DENTAL MANAGEMENT

*Of the Head and Neck Cancer Patient Treated with Radiation Therapy*

20

APPLYING FOR A BUSINESS LOAN?

*Tips and Resources*



# RIDA MEMBERSHIP

by Chris Klimecko, RIDA Executive Director

We spend a great deal of time on items such as legislation, continuing education, and dental benefits. These are all important things that make up a major part of why the RIDA exists. But with all the busyness surrounding those issues and others, it's easy to lose sight of the fact that one of our main goals is recruiting and retention. For an organization such as the ADA or RIDA to be successful, it must maintain a substantial number of members. What a substantial number is for us is somewhat subjective. However, it's safe to say that the larger the number, the more effective we can be.

Here is where we stand today vs. past years:

	2019	2018	2017	2016	2015
Members:	528	520	510	497	490
Total Market:	745	732	723	739	724
% Market Share:	70.9	71.0	70.5	67.3	67.7

As you can see, we're holding our own. Our total membership has increased, which is a great trend, however, given the increase in licensed dentists, our market share is essentially unchanged from last year at this time. Please keep in mind that the total market includes residents.

Our biggest challenge is attracting new dentists. Current recruiting efforts include at least one new dentist social event, attending events at New England based dental schools, and at times working at undergraduate events. What really helps at these events is participation from other members. Sharing your member experience with potential new members has more value than can be stated.

Fortunately for us, we have a new dentist committee chair; Dr. Sal Rizzuto, who is enthusiastic and engaged in our program, as are the officers, board members, and RIDA members.

Thank you to all that help our recruiting and retention efforts. Your assistance helps to ensure that the RIDA will remain a strong, viable, and relevant organization for many years to come.

## 2020 Dental Procedure Code Changes

As is normally the case, there will be CDT code changes and revisions that take effect on the first of the new year. Changes for 2020 include:

- o 37 new codes
- o 5 revised codes
- o 6 deleted codes

The ADA sells a variety of CDT code related products. They can be purchased at the following website: <https://www.ada.org/en/publications/ada-catalog/cdt-products>

## RIDPAC EVENT

The RI Dental Political Action Committee (RIDPAC) held an evening event in August. MC for the evening was Dr. Steve Brown and the guest speaker was Representative Joseph McNamara. Representative McNamara is the Chairperson of the House Committee on Health, Education, and Welfare, a member of the House Committee on Labor, and member of the House Committee on Rules.

RIDPAC's purpose is to encourage dentists and others to become aware of government, the important political issues, and the records of the office holders and candidates; to assist dentists and others in organizing themselves for more effective political action; to encourage the coordination of efforts with the Council on Governmental Affairs of the Rhode Island Dental Association; to raise funds for the aforementioned purposes, and from such funds to make contributions to assist persons in political activities, without regard to party affiliation, who by their acts have demonstrated their interest in dental health, and to take any action necessary or desirable for attainment of the purposes stated above.

We will be holding another RIDPAC event on November 21, 2019 at 6:30pm. More details are being sent separately via regular mail and email. We encourage you to join us or to give us a call if you have any questions.

**SAVE MORE  
ON DENTAL SUPPLIES  
THAN YOU PAY IN DUES**

SHOP ONLINE AND  
START SAVING TODAY

tdsc.com The Dentists  
Supply Company





NOVEMBER 13, 2019  
9:00AM-4:00PM | 6 CEUS

Dr. Lou Graham: "Geriatric Dentistry: The Fastest Growing Demographic in Dentistry". With patients entering their 8th and 9th decades of life and even more, our role as health care providers continues to face new challenges in treating this population. As these patients walk into our offices, they present challenges that are often unique and require customized approaches to their care.

Dr. Graham the founder of Catapult Education. A graduate of Emory Dental School, he is an internationally recognized lecturer extensively involved in continuing education for dental professionals. His lectures focus on incorporating current clinical advancements through "conservative dentistry."



FEBRUARY 12, 2020  
9:00AM-4:00PM | 6 CEUS

Dr. Thomas Dudney: "Be Aware of Wear: A Systematic Approach to Diagnosing, Treatment Planning, and Restoring the Worn Dentition" and "What's a Dentist to Do?: Diagnosis, Treatment Options, and Rehabilitation of Difficult and Unusual Cases". "Be Aware of Wear" will illustrate the different types of tooth wear with clinical examples, and demonstrate a systematic approach to diagnosis and treatment. "What's a Dentist to Do?" will examine clinical situations for the restorative dentist that are out of the ordinary and can be difficult to treatment plan.

Dr. Dudney graduated from the University of Alabama at Birmingham School of Dentistry. He lectures at dental meetings around the country.



APRIL 15, 2020  
9:00AM-12:00PM | 3 CEUS

Dr. Shannon Mills will be covering 1.5 hours of OSHA, and current hot topics like dental waterlines and measles. He will continue with 1.5 hours of opioid risks and alternatives and antibiotic stewardship.

Dr. Mills graduated from the Baylor College of Dentistry and was commissioned in the United States Air Force (USAF) Dental Corps. While at the USAF Dental Investigation Service at Brooks Air Force Base Texas, he served the Consultant to the Air Force Surgeon General on Dental Infection Control. He has authored or co-authored numerous scientific papers on infection control with an emphasis on dental waterline biofilms. \*Fee not included in membership\*

Register Now

[www.ridental.org/educate/ce/reg](http://www.ridental.org/educate/ce/reg)



# NEW COMPONENT STRUCTURE ALMOST HERE

The RIDA efforts to move from seven components to three, is well under way. This change will take place on January 6 of 2020. The combined districts will be made up as follows:

**Northern District Dental Society:** Burrillville, Central Falls, Cumberland, East Providence, Foster, Glocester, Johnston, Lincoln, North Providence, North Smithfield, Pawtucket, Providence, Scituate, Smithfield, and Woonsocket.

**Central District Dental Society:** Coventry, Cranston, East Greenwich, North Kingstown, Warwick, West Greenwich, and West Warwick.

**Southern District Dental Society:** Barrington, Block Island, Bristol, Charlestown, Exeter, Hopkinton, Jamestown, Little Compton, Middletown, Narragansett, Newport, Portsmouth, Richmond, South Kingstown, Tiverton, Warren, and Westerly.

I strongly believe that this change is a move in the right direction. The combined meetings will increase member awareness and promote networking. On September 25th, I got a firsthand look at a combined meeting in action. I had the opportunity to participate in the combined South County -Newport meeting at the Dunes Club in Narragansett. Attendance was high, the venue, food, and speakers were all excellent. It was an informative, productive, and enjoyable evening for all that attended. Over the next two months, I will be attending meetings with the future Northern and Central Components. Establishing the leadership of the new components will be a priority at these meetings. Hopefully these changes will breathe new life into our base, which is the strength of the RIDA.

Looking ahead, we've got the New England President and

President-elect Conference coming up on November 1st and 2nd in Newport. Each year, this event is hosted by one of the New England states and this is Rhode Island's year. The presidents and presidents-elect from the six New England states, along with their respective executive director's will participate in the event.

As we move into the holiday season, consider joining your fellow dentists for an evening social, hosted by RIDPAC on November 21st. Our guest will be Senator Joshua Miller. The meeting will take place at the Squantum Association in Riverside beginning at 6:30pm. Beautiful venue, great food. Our last event was a great success. Come join us.

I would like to thank all of you who give your time to support the efforts of the RIDA. Enjoy the upcoming holiday season and be safe.

Martin Elson, DDS  
RIDA President

## STRUGGLING WITH ADDICTION?

**Providence: Safe Stations** is your connection to recovery. Visit any Providence fire station to connect to recovery services.

- **No referrals** needed and **free**.
- All Providence fire stations are open **24/7** for walk-ins.
- **Trained Fire/EMS and recovery professionals** will connect you to help.
- Call **(401) 942-STOP** to talk to a counselor 24/7.

**When you're ready, we're HERE for you.**

[WWW.PVDSAFESTATIONS.COM](http://WWW.PVDSAFESTATIONS.COM)

CSDA'S ANNUAL  
**CHARTER OAK  
DENTAL MEETING**



**Save the Dates:  
May 6-8, 2020**

Head over to <http://www.csdadentalmeeting.com/> for more information!



# THREE PERIODS WITH RICH ROSATO, DMD ADA FIRST DISTRICT TRUSTEE

Clear and consistent communication is essential to the success of any elected leader. I have always taken this fact seriously. Whether as a Component Society President, a Delegate At-Large, an ADA Council Member, a Caucus Chair, a husband, a dad, and now as your First District Trustee, I have always appreciated the value of good communication. To this end, I am pleased to present the first of my trustee editorials. Please also take a moment to like "Rich Rosato, ADA First District Trustee" on Facebook so you can see live video updates to gain information in "small bites" at more frequent intervals.

For those who do not know me, I am an avid hockey fan, hence this report's title (which is also reflective of the ADA's "Power of Three"). Each editorial, I will be focusing on three important issues facing the ADA and you, the Membership. This month, I would like to focus on the following: the latest on "do-it-yourself" dentistry, Medicare, and community water fluoridation.

**FIRST PERIOD:** As long as the public perception that dentistry is too expensive persists, there will be those who seize upon such attitudes in order to sell what they believe to be lower-cost alternatives. "Do-It-Yourself" dental services like SmileDirectClub are one such model. Such forms of disruptive dentistry can be inherently dangerous – instead of a qualified, licensed dentist taking and analyzing impressions, the patient takes his or her own impressions and sends them in the mail back to the company, which produces the aligner without a fitting or care plan.

The issue here is patient safety. To this end, the ADA has already filed complaints with the FCC and FDA (through a citizen's petition), with these complaints citing SmileDirectClub's marketing practices – that the products should be considered "over the counter" devices – as deceptive and dangerous for the uninitiated patient. ADA has also ended its partnership with CVS effective September 10, 2019, which had begun offering SmileDirectClub products and services in its pharmacies nationwide. Patient safety is paramount to any dentist. I'm happy to report that ADA continues to make this point abundantly clear as we battle varying forms of do-it-yourself dentistry.

**SECOND PERIOD:** As an oral surgeon in a largely rural state, I have long accepted public assistance programs. Most dentists – especially those with small staffs - acknowledge

that such programs are cumbersome and difficult to navigate. Add to these issues the fact that reimbursement is comparatively low and slow to repay the dentist.

There are two realities we must face in the current political environment: first, many in Congress (including several Presidential candidates) are pushing for a dental benefit as part of the "Medicare for All" initiative; second, the idea of a dental Medicare benefit is one that raises a great many more questions than answers for dentists who may have never participated in such a program. Fortunately, ADA Members have one of the country's top governmental relations teams. ADA's Governmental Affairs staff have for months been engaging legislators, CMS regulators and the White House to ensure that dentists have a seat at the table and that they have all the information they need to make an educated decision on how they can provide care to Medicare-eligible patients. Stay tuned as this evolves both pre and post the presidential 2020 election.

**THIRD PERIOD:** Last month in San Francisco, the New England states – particularly Massachusetts dentist Dr. John Fisher – scored a major victory for community water fluoridation (CWF) activism. In my home state of New Hampshire, a concerning bill was filed this year that proposed a ban on community water fluoridation, one of the greatest public health achievements of the 20th century. In the end, facts won the day, as hundreds of ADA dentists shared with their legislators their expertise on the subject, and the bill was defeated. However, anti-vaccination activists, in tandem with anti-fluoride organizations, continue to flood state houses across the country with misinformation and at-best questionable studies of their own. The ADA will stay vigilant in assessing the future science but at this time supports CWF and the benefits it provides especially to communities lacking access.

In San Francisco, our own First District - led by Dr. Fisher - successfully introduced a resolution that would make available to the general public - at no charge - ADA's seminal resource, "Fluoride Facts", along with a vast array of other informational documents and data. These resources help state societies battle anti-fluoride campaigns so that we can protect existing CWF programs

*continued on page 24*

**YANKEE**  
DENTAL CONGRESS

**JANUARY 30 - FEBRUARY 1, 2020**  
**BOSTON CONVENTION**  
**& EXHIBITION CENTER**

**REGISTER NOW**



## Why Are Thousands of Doctors Trusting OMNICHROMA?

**"OMNICHROMA is GROUNDBREAKING—**  
a win-win for all offices. No need to stock 30 composite shades that expire and take up space. So economical and it works great!"

-Dr. Peter Auster

"OMNICHROMA has all the features you need from handling, strength, polishability, and, most importantly, it matches all the tooth shades. This is my go-to composite from the simplest to the complex... **The result speaks for itself.**"

- Dr. Allan Mohr



Case image courtesy of Dr. Peter Auster,  
Pomona, NY



Case image courtesy of Dr. Allan Mohr,  
Massapequa Park, NY



REQUEST  
YOUR SAMPLE  
TODAY

[OMNICHROMA.COM/US](http://OMNICHROMA.COM/US)

USE CODE: **TRDA**



Innovated to color-match like you've never seen before, Tokuyama's unique dental composite matches every shade from A1 to D4 with just one shade of composite. By streamlining the restorative process, OMNICHROMA simplifies day-to-day dentistry and saves you time and money.

\*Limit one sample kit per doctor. While supplies last. Offer valid until 1/31/20. Please allow 4-6 weeks for delivery of complimentary goods. Offer valid in US and Canada only. For evaluation purposes only. Participating doctors or dentists are obligated to properly report and reflect any bonus product, rewards, rebates, discounts or other benefit they receive on their submissions to Medicare, Medicaid, state or federally funded healthcare program and/or private insurance.



Call us at +1 (877) 378-3548



# ADA DUES SIMPLIFICATION

At the end of 2018 the ADA enjoyed a membership market share of 62% with a net membership of 163,000 members. Even so, the Association was operating in a more challenging environment than ever before with changing member demographics and membership shifts posing future risks. There is a shared need to address the long-term financial sustainability across the tripartite. The question of collective future prosperity was the driving factor to re-evaluate an approach to membership dues. That's why the ADA Board of Trustees asked the ADA Council on Membership to deliver a growth strategy aiming for a more balanced approach to membership and revenue. The end result was a streamlined dues structure recently approved at the 2019 House of Delegates.

To get there, the Council examined on two things: 1.) how changing the current structure of dues discounting impacts membership numbers and dues revenue; and 2.) what potential, future-facing dues models would deliver financial sustainability and growth. This included a thorough analysis of: existing membership base and trends; member research, pricing sensitivity studies and refinement opportunities by various groups including staff, volunteers, and state dental societies.

These Council efforts led to an operational plan that simplified dues categories and monetary dues stabilization. The following four plan scenarios were identified as driving dues sustainability and moved forward as resolutions to the 2019 House of Delegates:

- H.R. 14 creates policy asking the Board of Trustees to consider proposing an annual dues adjustment of at least the average consumer price index (CPI) over the last five years, currently 1.3%. *Establishing the annual ADA dues amount remains the responsibility of the ADA House of Delegates.*
- H.R. 15 provides amendments to the ADA Governance and Organizational Manual intended to streamline the comprehensive dues rate plan as follows:
  - Elimination of the \$30 dues for graduate students/residents, making it a \$0 dues category.
  - Restructure of the dues discounts for new graduates. This eliminates the current 25% and 75% dues discounts, making it a two-year dues reduction of \$0 first year following year of graduation and 50% of full dues the second year following graduation. New graduates would pay full dues beginning the third year following graduation.
  - Discontinuation of a 25% discount for active life members to bring that category to full dues.

During its 2019 session, the ADA House of Delegates approved both House Resolution 14 (H.R.14) and House Resolution 15 (H.R. 15) to take effect with the 2021 ADA dues cycle.

Combined, resolutions 14 and 15 address the biggest structural challenge facing the ADA and most of the state societies – the steep decline in full dues-paying members. While changes in the membership dues structure pose a certain level of member growth risks, it is imperative that the future dues structure promote a healthy balance among membership growth and financial sustainability. Despite the ADA and many state and locals experiencing net member gain over the last several years, there was an unhealthy balance between member growth and revenue in 39 of 53 (74%) dental societies. The dues structure changes present opportunity for alignment across the ADA and offer societies a chance to capitalize on the positive revenue outcomes.

To be sure, the Council did due diligence in examining the various risk-benefit scenarios. Essentially, the potential member loss associated with the new dues structure was forecasted nationally and also for each dental society over the next five years. However, estimates were made based on a much higher attrition rate for members than ADA has experienced historically or in recent years. This approach was taken as a risk-mitigation strategy that based projections on a 'worst-case scenario which was a scenario that doubled the expected risk.

ADA remains committed to growing and sustaining membership and market share through goals outlined in its new Strategic Plan, Common Ground 2025. It recognizes many state and local dental society partners have membership goals as well. Investment of both additional monies and efforts with state capacity building, positions the ADA and all of its state partners for membership gains and recovery of any membership loss, as a result of the new dues structure, within less than the five years forecasted.

Autumn Wolfer  
Dental Society Outreach Manager  
American Dental Association  
wolferra@ada.org

# THE EFFECT OF VARIOUS ANTIMICROBIALS MIXED WITH ZINC OXIDE-EUGENOL SEALER ON TWO COMMON ENDODONTIC PATHOGENS

reprinted with permission from New York State Dental Association

Patrick J. Battista, DDS; Elaine L. Davis, PhD; Violet I. Haraszthy, DDS, MS, PhD; Robert E. Cohen, DDS, MS, PhD

## ABSTRACT

The aim of this study was to combine various antimicrobial agents with a common endodontic sealer and test its antibacterial effect on two common endodontic pathogens. Various concentrations of triclosan, cetylpyridinium chloride, vancomycin, amoxicillin or a triple antibiotic were incorporated into Pulp Canal Sealer EWT (Kerr, Orange, CA) and allowed to set. Sealer without an antimicrobial served as the control. *Porphyromonas endodontalis* and *Enterococcus faecalis* were plated on blood agar plates, with one of the sealer groups placed in the center. This created 32 groups. The plates were then incubated for 72 to 96 hours. Zones of inhibition were measured for each group. For *P. endodontalis*, both the triple antibiotic and amoxicillin resulted in significantly greater mean zones of inhibition than vancomycin. For *E. faecalis*, amoxicillin resulted in a significantly greater mean zone of inhibition compared to vancomycin or the triple antibiotic. For both bacteria, significantly greater mean zones of inhibition were found with 2.5% and 5% concentrations as compared to 1% concentration. Our studies suggest that using endodontic sealers with antimicrobial properties may improve endodontic outcomes.

The etiology of endodontic infection is bacterial.<sup>1-3</sup> Therefore, the primary goal of endodontic therapy is to eliminate those bacteria through cleaning and shaping of the root canal system.<sup>4</sup> Mechanical instrumentation alone considerably reduces the bacterial load, but does not eliminate it.<sup>5-7</sup> In addition, mechanical instrumentation leaves many root canal walls uninstrumented.<sup>8</sup> Adding chemical irrigants and/or intracanal medicaments with antibacterial effects further reduces, but does not completely eliminate, the bacterial load present within the canal.<sup>9,10</sup> Bacteria remaining within the canal is a primary factor for failure, as teeth with a periapical lesion have a lower success rate than vital or necrotic teeth without a periapical lesion.<sup>11</sup>

Two common endodontic pathogens associated with endodontic infections are *Porphyromonas endodontalis* and *Enterococcus faecalis*. *P. endodontalis* is a Gram-negative, nonsporeforming, anaerobic, rod-shaped bacterium that produces porphyrin (dark black/brown) pigments. This organism is found in primary endodontic

infections. *E. faecalis* is a Gram-positive, facultative anaerobe and is non-motile. It is found primarily in secondary infections.

The purpose of obturation is to seal the apical foramina from bacterial byproduct leakage that would cause persistent apical periodontitis. Materials used for obturation have limited antibacterial effect.<sup>12-14</sup> The incorporation of antibacterial agents with obturation materials might reduce the bacterial load and lead to a higher success rate in teeth with periapical lesions.<sup>15-16</sup>

Some antibacterial agents include triclosan, cetylpyridinium chloride, vancomycin, amoxicillin and a triple antibiotic mixture consisting of metronidazole, minocycline and ciprofloxacin. Triclosan is an antimicrobial agent that is used in numerous consumer products to reduce and control bacterial contamination. Although its use has been limited by the Food and Drug Administration due to lack of effectiveness,<sup>17</sup> at higher concentrations, it is a biocide that targets the cell membrane. At lower concentrations, it is bacteriostatic by inhibiting fatty acid synthesis.<sup>18</sup>

Cetylpyridinium chloride (CPC) is an antiseptic, bactericidal agent. It is a cationic quaternary ammonium compound. CPC is found in some mouthwashes and toothpastes because of its effectiveness in reducing gingivitis and preventing dental plaque.<sup>19</sup>

Vancomycin is a bactericidal glycopeptide antibiotic used in the treatment of infections caused by Gram-positive bacteria. It inhibits cell wall cross-linking by binding to alanine residues on the ends of the NAG/NAM peptide chains that form the cell wall.<sup>20</sup> This prevents the cross-linking of the peptide chains.

Amoxicillin is a bactericidal,  $\beta$ -lactam antibiotic that has a moderate spectrum of activity, and is effective against Gram-positive and some Gram-negative bacteria. It induces cell lysis by inhibiting cell wall synthesis. Amoxicillin inhibits cross-linking of peptidoglycan polymer chains in the cell wall by binding to transpeptidase penicillin-binding proteins (PBPs).<sup>21</sup>

Revitalization procedures sometimes use a triple antibiotic paste. This mixture is a combination of ciprofloxacin, metronidazole and minocycline antibiotics, as described by Hoshino.<sup>22</sup> Ciprofloxacin is a second-generation fluoroquinolone that interferes with DNA replication by



inhibiting DNA gyrase and topoisomerase II.<sup>23</sup> Metronidazole affects anaerobic bacteria through selective resorption.<sup>24</sup> Once absorbed, it is reduced by ferredoxin (iron-sulfur proteins) and then inhibits critical bacterial enzymes. Finally, minocycline is a bacteriostatic antibiotic from the tetracycline family. This antibiotic inhibits protein synthesis by binding to the 30S ribosomal subunit inhibiting translation.<sup>25</sup>

The objective of this study is to combine various antibacterial agents with Pulp Canal Sealer EWT (Kerr, Orange, CA), a zinc oxide-eugenol sealer, and to test their antibacterial effect on two common root canal pathogens.

### Materials and Methods

The sealer powder was combined with antimicrobial agents to obtain 1%, 2.5% and 5% concentrations of each agent. Those powders were mixed with the Pulp Canal Sealer EWT liquid (eugenol) in a ratio of 4.85 g powder to 1 mL liquid. Sealer mixtures were placed in a 10 mm disc mold and were allowed to set overnight in an incubator at 37°C.

*P. endodontalis* and *E. faecalis* were grown anaerobically and aerobically, respectively, on blood agar plates. Bacteria were placed in brain heart infusion broth to an optical density of approximately 0.1 using a spectrophotometer (600 nm wavelength) to standardize the number of cells. A 100 µL aliquot of this broth was plated on blood agar plates using a sterile glass rod. A cured disc of sealer was then placed in the center of each plate and incubated for 72 to 96 hours.

This created 32 groups: Group I, 1% triclosan; Group II, 2.5% triclosan; Group III, 5% triclosan; Group IV, 1% CPC; Group V, 2.5% CPC; Group VI, 5% CPC; Group VII, 1% vancomycin; Group VIII, 2.5% vancomycin; Group IX, 5% vancomycin; Group X, 1% amoxicillin; Group XI, 2.5% amoxicillin; Group XII, 5% amoxicillin; Group XIII, 1% triple antibiotic; Group XIV, 2.5% triple antibiotic; Group XV, 5% triple antibiotic; Group XVI, control of sealer with no antimicrobial added. All of these groups were with *P. endodontalis*. The same sealers were then paired with *E. faecalis* to create another 16 groups.

This resulted in 32 groups, one for each antimicrobial agent (5) by concentration (3) combination, in addition to a control group of sealer with no antimicrobial added, for each bacterium.

After the incubation period, the largest diameter of the zones of inhibition were measured in millimeters and recorded. The experiment was performed in triplicate. The effectiveness of antimicrobial agents at the three concentrations was determined using two-way analysis of variance (ANOVA) with zone of inhibition (mm) as the dependent variable. Trials for *E. faecalis* and *P. endodontalis* were performed and analyzed separately. Tukey multiple comparison tests were used to determine specific group differences when ANOVA results were statistically significant. A significance level of .05 was used for all tests.

### Results

Figure 1 shows the means of the zones of inhibition of the various antimicrobial agents at various concentrations against *P. endodontalis* and *E. faecalis*.

#### *P. endodontalis*

Means and standard deviations for zone of inhibition by antimicrobial agent and concentration are noted in Table 1. Because of the lack of variability in the control, triclosan and CPC, those agents were eliminated from the analysis. ANOVA results indicated violation of the homogeneity of variance assumption, despite transformation to square root and square mm. ANOVA performed on rank transformed scores returned nearly identical results, providing support for interpretation of the original data.<sup>26</sup> Results indicated significant main effects for both antimicrobial agent ( $F_{2,18} = 29.864$ ,  $p < .005$ ) and

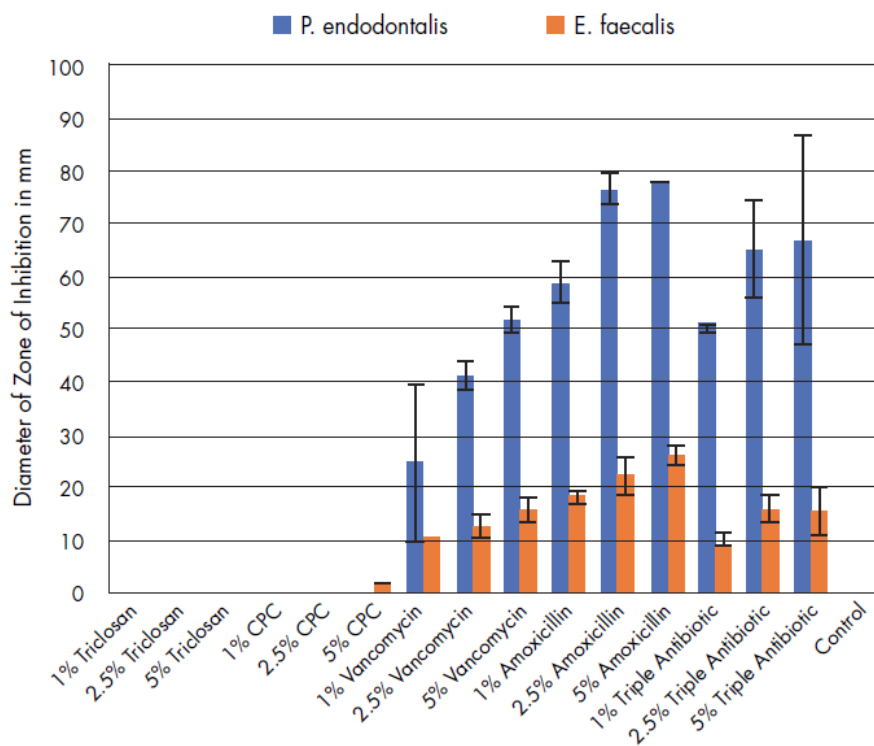


Figure 1. Averages of Zones of Inhibition in mm of Various Antimicrobials with Standard Deviations

**TABLE 1**

ANTIMICROBIAL	CONCENTRATION	MEAN (MM)	SD
Triclosan	1%	.00	.000
	2.5%	.00	.000
	5%	.00	.000
	Total	.00	.000
CPC	1%	.00	.000
	2.5%	.00	.000
	5%	.00	.000
	Total	.00	.000
Vancomycin	1%	24.67	14.742
	2.5%	41.00	2.646
	5%	51.67	2.517
	Total	39.11	14.013
Amoxicillin	1%	58.67	3.786
	2.5%	76.33	2.887
	5%	78.00	.000
	Total	71.00	9.579
Triple Antibiotic	1%	50.33	0.577
	2.5%	65.00	8.888
	5%	66.67	19.630
	Total	60.67	13.295
Total	1%	26.73	26.042
	2.5%	36.47	33.209
	5%	39.27	35.101
	Total	34.16	31.436

Means and Standard Deviations for Zone of Inhibition by Antimicrobial Agent and Concentration for *P. endodontalis*.

**TABLE 2**

ANTIMICROBIAL	CONCENTRATION	MEAN (MM)	SD
Triclosan	1%	.00	.000
	2.5%	.00	.000
	5%	.00	.000
	Total	.00	.000
CPC	1%	.00	.000
	2.5%	.00	.000
	5%	2.00	.000
	Total	0.67	1.000
Vancomycin	1%	10.67	2.082
	2.5%	12.67	2.082
	5%	15.67	2.082
	Total	13.00	2.828
Amoxicillin	1%	18.33	1.155
	2.5%	22.00	3.464
	5%	25.67	2.082
	Total	22.00	3.808
Triple Antibiotic	1%	10.33	1.155
	2.5%	16.00	2.646
	5%	15.33	4.619
	Total	13.89	3.822
Total	1%	7.87	7.347
	2.5%	10.13	9.288
	5%	11.73	10.089
	Total	9.91	8.921

Means and Standard Deviations for Zone of Inhibition by Antimicrobial Agent and Concentration for *E. faecalis*.

concentration ( $F_{2,18} = 13.562, p < .005$ ). There was no significant interaction effect between antimicrobial agent and concentration ( $F_{4,18} = .373, p = .825$ ). Tukey results indicated significantly higher mean zone of inhibition for both triple antibiotic and amoxicillin compared to vancomycin. There was no significant difference in mean zone of inhibition between triple antibiotic and amoxicillin. For concentration, there was a significantly higher zone of inhibition for 2.5% and 5%, compared to 1%, and no significant difference between 2.5% and 5% concentrations. Figure 2 illustrates growth of *P. endodontalis* on blood agar culture medium.

### ***E. faecalis***

Means and standard deviations for one of inhibition by antimicrobial agent and concentration appear in Table 2. Because of the lack of variability in the control, triclosan and CPC, these agents were eliminated from the analysis. NOVA results indicated significant main effects for both antimicrobial agent ( $F_{2,18} = 33.022, p < .005$ ) and concentration ( $F_{2,18} = 11.558, p = .001$ ). There was no significant interaction effect between antimicrobial agent and concentration ( $F_{4,18} = .793, p = .545$ ). Tukey results indicated a significant difference between amoxicillin and both vancomycin and triple antibiotic, with greater mean zone of inhibition for amoxicillin. There was no significant difference in inhibition between vancomycin and the triple antibiotic. For concentration, there was a significantly higher zone of inhibition for 2.5% and 5% compared to 1%, and no significant difference between 2.5% and 5% concentrations. Figure 3 illustrates growth of *E. faecalis* on blood agar culture medium.

### **Discussion**

Persistent infection is the primary cause of post-treatment disease.<sup>27</sup> This is demonstrated by histologic analysis of well-prepared and sealed



root canals resisting coronal leakage even with frank exposures to the oral environment.<sup>28</sup> In addition, positive cultures at the time of obturation have poorer outcomes,<sup>29</sup> and by vital and necrotic teeth have different rates of success.<sup>11</sup> If a secondary infection, via coronal leakage, was the primary etiology of infection, there would be no difference in success rates.

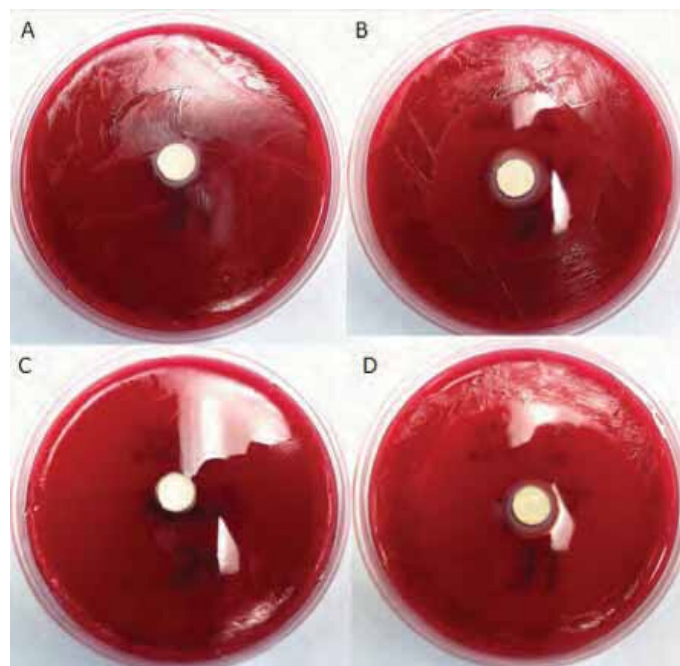
Coronal leakage frequently has been cited as the primary cause of post-treatment disease.<sup>30</sup> More recently, however, some investigators have questioned how coronal leakage influences treatment failure.<sup>28,31</sup> Collectively, those studies conclude that bacterial persistence is the primary cause of endodontic failures.

The present study investigated the effects of various antimicrobial agents incorporated into zinc oxide-eugenol sealer on two common endodontic pathogens using aerobic and anaerobic culturing techniques. The results of our study showed that the controls and non-antibiotic antimicrobials, triclosan and cetylpyridinium chloride, were ineffective against *P. endodontalis* or *E. faecalis*. Note that cured sealers were used in this experiment. It is possible that freshly mixed sealer may have antimicrobial effects, and that those effects are lost after setting. Also set sealer may interfere with the antimicrobial abilities of triclosan and CPC.

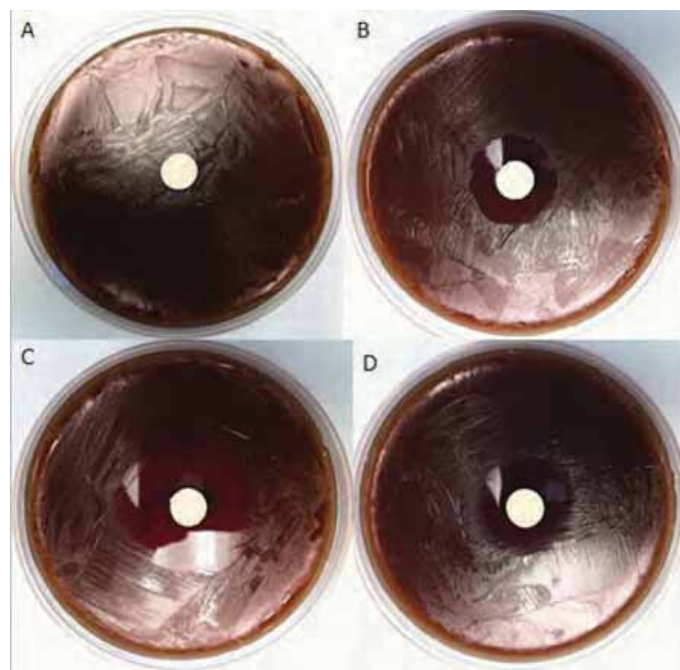
For *P. endodontalis*, the statistical analysis showed a significantly greater inhibition for amoxicillin and the triple antibiotic compared to vancomycin. Concentrations of 5% and 2.5% were significantly better from 1%, but no significant difference was noted between the higher concentrations.

For *E. faecalis*, the statistical analysis showed a significant difference between amoxicillin and both vancomycin and the triple antibiotic, with amoxicillin having the greatest inhibition. There was no statistical difference between vancomycin and the triple antibiotic. Concentration showed the same results as for *P. endodontalis*, with 5% and 2.5% being significantly better than 1%, but no significant difference between themselves.

Our results suggest that, for clinical application, the primary treatment effect is obtained with Pulp Canal Sealer EWT at a powder concentration of 2.5%. Since there is no difference between 5% and 2.5%, the lower concentration would be used to minimize any possible side effect, and also minimize any possible adverse biological response or bacterial resistance that might occur. Once chemomechanical cleaning and shaping of the root canal system is complete, it is likely that viable organisms persist. Obturating with an antibacterial root canal sealer might result in further reduction of viable bacteria and reduce the incidence of post-treatment disease.



**Figure 2.** *P. endodontalis* cultured anaerobically on blood agar plates. (A) Control; (B) 2.5% Vancomycin; (C) 2.5% Amoxicillin; (D) 2.5% Triple Antibiotic.



**Figure 3.** *E. faecalis* cultured aerobically on blood agar plates. (A) Control; (B) 2.5% Vancomycin; (C) 2.5% Amoxicillin; (D) 2.5% Triple Antibiotic.

Limitations of this study include being an in vitro study, and in vivo trials will be necessary to further assess efficacy and clinical applicability. Secondly, this study was performed with growing bacteria that were not present as biofilms. Amoxicillin and vancomycin are bactericidal agents that inhibit cell wall synthesis. The cell wall is synthesized by bacteria only in the growth stage, and bacteria present in root canal infections are not necessarily in the growth phase. Also, bacteria within the root canal system have been shown to readily form intraradicular biofilms in up to 80% of primary infections.<sup>32</sup> Bacteria in biofilms are up to 1,000-fold more resistant to antibiotics compared to planktonic bacteria.<sup>33</sup> In addition, cured sealers were used in this experiment. It is possible that freshly mixed sealer may have antimicrobial effects, and that those effects are lost after curing. Moreover, it is possible that cured sealer may interfere with the antimicrobial abilities of triclosan and CPC. Finally, further studies are indicated to assess how the physical properties, handling characteristics, setting time and sealer effectiveness might be altered when antimicrobials are incorporated.

In conclusion, our results show that amoxicillin, vancomycin and the triple antibiotic at varying concentration are capable of inhibiting *P. endodontalis* and *E. faecalis* on blood agar plates in this in vitro model, with amoxicillin being the most effective. There also is a suggestion that incorporating antimicrobial agents into endodontic sealers might be effective in enhancing clinical endodontic outcomes, and that the possibility of incorporating antimicrobial agents in the obturation, and not just the cleaning and shaping phase of root canal therapy can be considered. Consequently, future research will be directed to clinical applications and to evaluate this effect on bacterial biofilms.

Queries about this article can be sent to Dr. Battista at [pjb24@buffalo.edu](mailto:pjb24@buffalo.edu)

## References

1. Kakehashi S, Stanley HR, Fitzgerald RJ. The effects of surgical exposures of dental pulps in germ-free and conventional laboratory rats. *Oral Surg Oral Med Oral Pathol* 1965;20:340-9.
2. Sundqvist G. Bacteriological studies of necrotic dental pulps (PhD Thesis). Umea, Sweden: University of Umea; 1976.
3. Moller AJ, Fabricius L, Dahlen G, Ohman AE, Heyden G. Influence on periapical tissues of indigenous oral bacteria and necrotic pulp tissue in monkeys. *Scand J Dent Res* 1981;89(6):475-84.
4. Schilder H. Cleaning and shaping the root canal. *Dent Clin North Am* 1974;18(2):269-96.
5. Bystrom A, Sundqvist G. Bacteriologic evaluation of the efficacy of mechanical root canal instrumentation in endodontic therapy. *Scand J Dent Res* 1981;89(4):321-8.
6. Bystrom A, Sundqvist G. Bacteriologic evaluation of the effect of 0.5 percent sodium hypochlorite in endodontic therapy. *Oral Surg Oral Med Oral Pathol* 1983;55(3):307-12.
7. Bystrom A, Sundqvist G. The antibacterial action of sodium hypochlorite and EDTA in 60 cases of endodontic therapy. *Int Endod J* 1985;18(1):35-40.
8. Peters OA, Schonberger K, Laib A. Effects of four Ni-Ti preparation techniques on root canal geometry assessed by micro computed tomography. *Int Endod J* 2001;34(3):221-30.
9. Rocas IN, Siqueira JF, Jr. In vivo antimicrobial effects of endodontic treatment procedures as assessed by molecular microbiologic techniques. *J Endod* 2011;37(3):304-10.
10. Rocas IN, Siqueira JF, Jr. Comparison of the in vivo antimicrobial effectiveness of sodium hypochlorite and chlorhexidine used as root canal irrigants: a molecular microbiology study. *J Endod* 2011;37(2):143-50.

11. Sjogren U, Hagglund B, Sundqvist G, Wing K. Factors affecting the long-term results of endodontic treatment. *J Endod* 1990;16(10):498-504.
12. Orstavik D. Antibacterial properties of root canal sealers, cements and pastes. *Int Endod J* 1981;14(2):125-33.
13. Slutzky-Goldberg I, Slutzky H, Solomonov M, et al. Antibacterial properties of four endodontic sealers. *J Endod* 2008;34(6):735-8.
14. Moorer WR, Genet JM. Evidence for antibacterial activity of endodontic gutta-percha cones. *Oral Surg Oral Med Oral Pathol* 1982;53(5):503-7.
15. Baer J, Maki JS. In vitro evaluation of the antimicrobial effect of three endodontic sealers mixed with amoxicillin. *J Endod* 2010;36(7):1170-3.
16. Hoelscher AA, Bahcall JK, Maki JS. In vitro evaluation of the antimicrobial effects of a root canal sealer-antibiotic combination against *Enterococcus faecalis*. *J Endod* 2006;32(2):145-7.
17. FDA issues final rule on safety and effectiveness of antibacterial soaps. US Food and Drug Administration Home Page: 2016. "https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm517478.htm".
18. Russell AD. Whither triclosan? *J Antimicrob Chemother* 2004;53(5):693-5.
19. Cortelli SC, Cortelli JR, Shang H, Costa R, Charles CA. Gingival health benefits of essential oil and cetylpyridinium chloride mouthrinses: a 6-month randomized clinical study. *Am J Dent* 2014;27(3):119-26.
20. Watanakunakorn C. Mode of action and in-vitro activity of vancomycin. *J Antimicrob Chemother* 1984;14 Suppl D:7-18.
21. Yocum RR, Rasmussen JR, Strominger JL. The mechanism of action of penicillin. Penicillin acylates the active site of *Bacillus stearothermophilus* D-alanine carboxypeptidase. *J Biol Chem* 1980;255(9):3977-86.
22. Hoshino E, Kurihara-Ando N, Sato I, et al. In-vitro antibacterial susceptibility of bacteria taken from infected root dentine to a mixture of ciprofloxacin, metronidazole and minocycline. *Int Endod J* 1996;29(2):125-30.
23. Drlica K, Zhao X. DNA gyrase, topoisomerase IV, and the 4-quinolones. *Microbiol Mol Biol Rev* 1997;61(3):377-92.
24. Edwards DI. Nitroimidazole drugs—action and resistance mechanisms. I. Mechanisms of action. *J Antimicrob Chemother* 1993;31(1):9-20.
25. Garrido-Mesa N, Zarzuelo A, Galvez J. Minocycline: far beyond an antibiotic. *Br J Pharmacol* 2013;169(2):337-52.
26. Conover W. Practical Nonparametric Statistics. 2nd ed. NY: John Wiley & Sons; 1980. p. 337.
27. Siqueira JF, Jr, Rocas IN. Clinical implications and microbiology of bacterial persistence after treatment procedures. *J Endod* 2008;34(11):1291-301 e3.
28. Ricucci D, Bergenholtz G. Bacterial status in root-filled teeth exposed to the oral environment by loss of restoration and fracture or caries—a histobacteriological study of treated cases. *Int Endod J* 2003;36(11):787-802.
29. Sjogren U, Figdor D, Persson S, Sundqvist G. Influence of infection at the time of root filling on the outcome of endodontic treatment of teeth with apical periodontitis. *Int Endod J* 1997;30(5):297-306.
30. Ray HA, Trope M. Periapical status of endodontically treated teeth in relation to the technical quality of the root filling and the coronal restoration. *Int Endod J* 1995;28(1):12-8.
31. Ricucci D, Grondahl K, Bergenholtz G. Periapical status of root-filled teeth exposed to the oral environment by loss of restoration or caries. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000;90(3):354-9.
32. Ricucci D, Siqueira JF, Jr. Biofilms and apical periodontitis: study of prevalence and association with clinical and histopathologic findings. *J Endod* 2010;36(8):1277-88.
33. Costerton JW, Stewart PS, Greenberg EP. Bacterial biofilms: a common cause of persistent infections. *Science* 1999;284(5418):1318-22.

## ABOUT THE AUTHORS

**Patrick J. Battista, D.D.S.**, is director of predoctoral endodontics and clinical assistant professor, Department of Periodontics and Endodontics, School of Dental Medicine, University at Buffalo, The State University of New York, Buffalo, NY. Dr. Battista performed the experimental procedures and wrote the manuscript.

**Elaine L. Davis, Ph.D.**, is professor, Department of Oral Diagnostic Sciences, School of Dental Medicine, University of Buffalo, The State University of New York, Buffalo, NY. Dr. Davis performed the statistical analysis of the date and the results section of the manuscript.

**Violet I. Haraszthy, D.D.S., M.S., Ph.D.**, is professor, Department of Restorative Dentistry, School of Dental Medicine, University of Buffalo, The State University of New York, Buffalo, NY. Dr. Haraszthy contributed to the experimental design.

**Robert E. Cohen, D.D.S., M.S., Ph.D.**, is professor, Department of Periodontics and Endodontics, School of Dental Medicine, University of Buffalo, The State University of New York, Buffalo, NY. Dr. Cohen edited the manuscript and contributed to the experimental design.



# FOUR REASONS TO STOCK UP ON EQUIPMENT SOONER

When managing your day-to-day overhead, it can seem challenging to allocate spending to upgrade, enhance or expand your dental equipment. However, being strategic about when to purchase higher-dollar items can help you realize the most value. By filling your supply and equipment needs before the end of this year, you can categorize to your advantage before next year's tax time and get your practice running at peak efficiency.

## Alleviate pain points

Perform an equipment performance audit by asking yourself and your team:

- How often are we having poor-performing equipment serviced or repaired? At what cost?
- What has been the cost of not being able to treat patients during equipment downtime?
- How much time have we lost due to ineffective tools or lack of tools?
- Do any of our current tools compromise our patients' comfort?

## Improve productivity

To evaluate your return on investment in new equipment, it takes the full view of what your practice needs to achieve peak production. Ask these questions:

- What steps can we take to increase confidence in our equipment and decrease stress?
- Where would digital equipment streamline processes and save money over time?
- Have we missed potential revenue streams by not investing in new technology?

Acknowledge that value doesn't always mean the lowest price. Securing durable equipment from authorized vendors means that it will likely have a longer lifetime. Trusted products that are well-designed and properly maintained generally have a lower cost per use.

## Leverage depreciation

Professional equipment that has a "useful life" of one year or more may be tax-deductible. Dental equipment and technology are usually depreciated over a period of five years; furniture and fixtures (including dental cabinets) over seven years—reducing taxable income each year. A dental practice can deduct up to \$1 million in equipment purchases during 2019 as long as the total purchase of equipment during 2019 does not exceed \$2.5 million.

## Accelerate deductions

The Tax Cuts and Jobs Act of 2017 provides an opportunity to maximize savings and tap into tax deductions sooner. Section 179 of the IRS tax code allows businesses to now deduct the full price of qualifying equipment and/or off-the-shelf software purchased during the tax year. That means that if you buy dental equipment and put it into service in 2019, you can deduct 100% of the purchase price from your reported 2019 gross income.

To manage your tax brackets and leverage deduction benefits, you could choose to use the Section 179 accelerated deduction for part of an equipment's purchase price and depreciate the remainder over five years.

However, it's important to know that you cannot use Section 179 deductions to lower your income below zero and create a loss. This can prove to be a "trap" for dentists using S Corporations who do not have sufficient owner's equity (basis) to realize the benefits of expensing equipment.

Through the year 2026, Section 168(k) also allows business owners to take an additional first-year depreciation deduction in the placed-in-service year of qualified property. There are no dollar limits, and you can create losses if you desire. But, S Corporations do have the same basis limitations related to losses.

There are, of course, complexities and limitations to claiming deductions. And different practices and different dentists' spending habits will yield different results. A dentistry-specific CPA can provide in-depth expertise on the many important tax considerations associated with purchasing large equipment or renovating your office.

Stock up for success in 2020 When it is time to buy, know that there are resources to help members of organized dentistry secure the best deals. Through The Dentists Supply Company, association members benefit from negotiated discounts and free shipping on an expansive online catalog from authorized vendors. Don't delay in purchasing items that can improve your practice's total productivity. Explore, compare and save at TDSC.com. For assistance getting your practice set up to shop, call 888.253.1223 or email [support@tdsc.com](mailto:support@tdsc.com).

# DENTAL MANAGEMENT OF THE HEAD AND NECK CANCER PATIENT TREATED WITH RADIATION THERAPY

Carol Ann Murdoch-Kinch, D.D.S., Ph.D., and Samuel Zwetchkenbaum, D.D.S., M.P.H.

Approximately 36,540 new cases of oral cavity and pharyngeal cancer will be diagnosed in the USA this year; more than 7,880 people will die of this disease.<sup>1</sup> The vast majority of these cancers are squamous cell carcinomas. Most cases are diagnosed at an advanced stage: 62 percent have regional or distant spread at the time of diagnosis.<sup>2</sup> The five-year survival for all stages combined is 61 percent.<sup>1</sup> Localized tumors (Stage I and II) can usually be treated surgically, but advanced cancers (Stage III and IV) require radiation with or without chemotherapy as adjunctive or definitive treatment.<sup>1</sup> See Table 1.<sup>3</sup> Therefore, most patients with oral cavity and pharyngeal cancer receive head and neck radiation therapy (RT) as part of their treatment.

The oral complications of head and neck RT result from radiation injury to the salivary glands, oral mucosa and taste buds, oral musculature, alveolar bone, and skin. They are clinically manifested by xerostomia, oral mucositis, dental caries, accelerated periodontal disease, taste loss, oral infection, trismus, and radiation dermatitis.<sup>4</sup> Some of these effects are acute and reversible (mucositis, taste loss, oral infections, and xerostomia) while others are chronic

(xerostomia, dental caries, accelerated periodontal disease, trismus, and osteroradionecrosis.) Chemotherapeutic agents may be administered as an adjunct to RT. Patients treated with multimodality chemotherapy and RT may be at a greater risk for oral mucositis and secondary oral infections such as candidiasis. The oral complications of therapy for head and neck cancer can significantly impair quality of life.<sup>5</sup>

The oral health care team serves a vital role in the prevention and management of short- and long-term oral complications of cancer treatment. Hospital-based dentists specially trained in oral oncology treat some of these patients, but currently in North America most long-term dental care is provided by general dentists in private practice.<sup>6-8</sup> Depending on available health care resources, the patient may rely on his local dentist for pre-treatment oral care and supportive care during cancer treatment, as well as continued oral health care to manage the long-term oral complications of cancer therapy. It is essential that all health professionals caring for the cancer patient be knowledgeable about the diagnosis, prevention and management of oral complications of therapy and their sequelae, in order to work together as a team to minimize the impact of these toxicities on the patient's life. This article provides an overview of oral complications of RT for head and neck cancers, with a particular emphasis on caries,

Table 1 - TNM Staging for Head-and-Neck Cancer

Stage	Tumor	Nodes	Distant Metastases
0	T <sub>is</sub>	N <sub>0</sub>	M <sub>0</sub>
I	T <sub>1</sub>	N <sub>0</sub>	M <sub>0</sub>
II	T <sub>2</sub>	N <sub>0</sub>	M <sub>0</sub>
III	T <sub>3</sub>	N <sub>0</sub>	M <sub>0</sub>
	T <sub>1</sub>	N <sub>1</sub>	M <sub>0</sub>
IVA	T <sub>2</sub>	N <sub>1</sub>	M <sub>0</sub>
	T <sub>4</sub>	N <sub>0</sub>	M <sub>0</sub>
	T <sub>4</sub>	N <sub>1</sub>	M <sub>0</sub>
IVB	Any T	N <sub>2</sub>	M <sub>0</sub>
	Any T	N <sub>3</sub>	M <sub>0</sub>
IVC	Any T	Any N	M <sub>1</sub>

T<sub>is</sub>: in situ  
 T<sub>1</sub>: < 2cm  
 T<sub>2</sub>: > 2cm and < 4cm  
 T<sub>3</sub>: > 4cm  
 T<sub>4</sub>: Invades adjacent structures  
 N<sub>0</sub>: No nodal involvement  
 N<sub>1</sub>: Ipsilateral, < 3cm

N<sub>2a</sub>: Ipsilateral > 3cm and < 6cm  
 N<sub>2b</sub>: Ipsilateral, multiple, < 6cm  
 N<sub>2c</sub>: Bilateral/contralateral, < 6cm  
 N<sub>3</sub>: > 6cm  
 M<sub>0</sub>: No metastases  
 M<sub>1</sub>: Distant Metastases

Adapted from Brandwein Gensler and Smith (3).



periodontal disease, and osteoradionecrosis of the jaws, and guidelines for the dental management of the head and neck cancer patient treated with RT.

### Oral Complications of Head and Neck RT

#### a. Xerostomia and salivary gland hypofunction:

Xerostomia is the most common oral complication of head and neck RT. In fact, up to 64 percent of patients treated with conventional head and neck RT still experience a moderate to severe degree of permanent xerostomia when assessed up to 22 years after radiation therapy.<sup>9</sup> The most severe complaints occur in patients treated for cancer of the nasopharynx and oropharynx, most likely due to the close proximity of the field to the parotid glands.

Paradoxically, for such highly differentiated tissues, salivary glands are very sensitive to radiation. There is a sharp decrease in the salivary flow rate during the first week of RT with conventional fractionation (2 Gy/day). The decrease in flow rate continues throughout the treatment period, especially when both parotids are irradiated.<sup>5,10</sup> This correlates to the dose and duration of RT. There is immediate serous cell death accompanied by inflammatory cell infiltration, and then continuous reduction of salivary flow rates. Patients often complain of thick, ropy saliva and a sensation that there is too much saliva because it is difficult to swallow. The exact mechanism of radiation-induced damage to the salivary glands is not currently well understood.<sup>11</sup>

With conventional RT, xerostomia is permanent. Salivary gland-sparing techniques using intensity modulated radiation therapy (IMRT) have been pioneered at the University of Michigan.<sup>12-15</sup> IMRT is rapidly emerging as the standard of care for head and neck cancer.<sup>16</sup> Salivary gland-sparing IMRT is associated with gradual recovery of salivary flow over time, and improved quality of life as compared to conventional RT.<sup>12-15,17-20</sup> Residual salivary flow can be stimulated by sialogogues such as pilocarpine<sup>21-22</sup> or cevimeline, and/or use of sugarless gum and buffered citric acid tablets<sup>23</sup> (Numoisyn™, Align Pharmaceutical, Berkeley Heights, N.J.) Salivary substitutes provide transient symptomatic relief.<sup>21,24-27</sup>

**b. Radiation mucositis:** Mucositis is an important common acute short-term complication of head and neck RT. It is a dose-limiting toxicity and may be more severe in patients receiving multimodality therapy for head and neck cancer. It is characterized by ulceration in the oro-esophageal and gastrointestinal mucosa, resulting in significant pain and dysphagia.<sup>28-31</sup>

Mucositis initially presents clinically as erythema after 4-5 days of therapy, corresponding to cumulative doses of 10 Gy to the head and neck. The patient often complains of oral



**Figure 1** - Xerostomia and radiation mucositis in patient one month after the end of radiotherapy. Saliva is thick and sticky. Mucositis is painful and interferes with eating.



**Figure 2** - Silicone mucosal guards. These custom-made guards cover metallic restorations with 5mm of silicone impression material, to prevent heating of the metal and backscatter of radiation in contact with the mucosa.

burning or intolerance to spicy food. As the mucositis progresses after cumulative radiation doses of 30 Gy (approximately two weeks), ulcers develop. (Figure 1) Radiation-induced mucositis can involve any radiation-exposed area, including the hard palate. It may be worse in tissue in direct contact with metallic restorations. Radiation-induced mucositis peaks at two weeks post RT of 60-70 Gy. This ulcerative phase may last for up to 5-7 weeks following RT, with gradual healing. Chronic mucositis is a rare occurrence following RT.<sup>29,32-33</sup>

Mucositis has a significant health and economic impact on cancer patients. It is one of the most common reasons for a break in the administration of RT.<sup>32</sup> Measures specifically designed to prevent and treat oral mucositis can be provided by the patient's oncology team. The dentist can assist by providing basic oral care consisting of patient education,

disease control, and oral hygiene instruction. These measures can decrease the microbial load in the oral cavity and prevent other complications associated with therapy. In addition, patients who have heavily restored teeth may benefit from the use of silicone mucosal guards worn during RT (Figure 2) to reduce the severity of mucositis associated with scatter of radiation off metal restorations.<sup>34-36</sup>

**c. Oropharyngeal candidiasis (OPC):** This is a very frequent complication of cancer therapy; up to 27 percent of patients undergoing RT present with evidence of OPC.<sup>37</sup> It may present as a pseudomembranous candidiasis (thrush), with thick white plaques that wipe off (Figure 3), or as generalized erythema and burning discomfort. Clotrimazole has been shown to be more effective than nystatin for treatment of OPC.<sup>38</sup> Some topical preparations have a high sucrose content that may contribute to caries risk in the xerostomic



**Figure 3** - Oral candidiasis in a head-and-neck cancer patient six months post-radiotherapy. These white plaques on the tongue dorsum could be wiped off. This infection responded to Nystatin suspension.



**Figure 4** - Rampant dental caries post-radiotherapy.

patient. Fluconazole 50-100 mg daily has been associated with clinical recovery in 80 percent of patients within 10 days, or within five days with 200 mg daily. Complete mycologic cure is difficult to achieve. Resistance to fluconazole is associated with non-albicans yeast such as *Candida glabrata* and *C.krusei*.<sup>39</sup> A recent systematic review of this topic failed to find strong enough evidence to support one drug over another in the treatment of OPC in this population.<sup>40-41</sup> Although initially encountered during RT, it also can present a long-term problem in patients with xerostomia. Antifungal prophylaxis may be beneficial in high-risk patients; the oncology team should make this decision.

**d. Dental caries:** After standard RT there is a profound shift in the oral microflora to a predominance of acidogenic microbes, primarily *Streptococcus mutans* and lactobacilli, coincident with a decrease in salivary flow, and an increase in caries risk.<sup>42-44</sup> Dental caries in irradiated patients may develop rapidly, as early as three months after RT. Lesions typically involve the cervical portions of the teeth (Figure 4); however, caries may affect any tooth surface, including those typically resistant to dental caries such as the incisal edges of the mandibular incisors.<sup>45-46</sup>

Prevention and treatment of dental caries. A strict daily oral hygiene regimen that includes fluoride and meticulous plaque removal has been shown to prevent the development of caries.<sup>43,45</sup> Chlorhexidine gel has also been shown to clinically reduce caries risk by lowering mutans streptococci and lactobacilli counts in patients undergoing RT.<sup>47-48</sup> Chlorhexidine gel is not currently available in the U.S.; however, chlorhexidine mouthrinse could provide similar benefits.<sup>48</sup> Alcohol-free formulations should be selected to reduce discomfort in patients with dry mouth. Caries lesions should be restored before RT to prevent progression of disease and reduce microbial load. Also, the patient will be more comfortable during treatment if the oral mucosa is intact. Patients should also receive diet counseling about cariogenic foods and their deleterious effects on the dentition.

Vissink and colleagues<sup>49</sup> concluded that a lifelong commitment to improved oral hygiene and home care should include meticulous oral hygiene and frequent self-applications of fluoride, either neutral NaF 1 percent gel applied at least every other day<sup>46,50</sup> in custom-made<sup>4</sup> fluoride carriers or NaF 3 percent toothpaste twice per day.<sup>45</sup> The daily use of 4 percent stannous fluoride also is effective.<sup>51-52</sup> Presently, there is inadequate evidence to support one type of fluoride product over another for patients undergoing RT; the frequency of application appears to be more important. Because hyposalivation is irreversible in most head and neck irradiation patients, especially those who treated with standard therapy, the application of fluoride must be continued indefinitely; otherwise, caries will develop within months.<sup>50,53-56</sup>



In patients receiving parotid-sparing IMRT, where salivary output has been shown to increase over time<sup>12,14-15,17,20</sup> and in patients receiving amifostine during RT, evidence suggests that caries risk may be reduced.<sup>57</sup> Amifostine is a radioprotective drug that has been shown to have a significant protective effect on the salivary glands<sup>58</sup> and oral health.<sup>57</sup> In the past, controversy has surrounded this drug because of two potential problems: tumor protection and toxic side effects. Nevertheless, amifostine is increasingly being added to many chemoradiation (CRT) protocols to protect the salivary glands.<sup>59</sup> If so, these new types of RT may allow modification of current caries prevention recommendations. Further research is needed to investigate modification to current guidelines for these new treatment modalities.

**e. Periodontal disease:** RT effects on periodontal health include direct effects on the periodontium, and indirect effects associated with changes in the oral microflora caused by radiation-induced xerostomia. Two potential problems result: accelerated periodontal attachment loss and increased risk for osteoradionecrosis (ORN) associated with periodontal disease. RT causes changes in both bone and soft tissue that can produce hypovascular, hypocellular and hypoxic bone.<sup>60-61</sup> This reduces the capacity of the affected bone to remodel and, depending on the dose, may increase the risk of infection, which can lead to osteoradionecrosis, discussed in the next section.

A recent study showed increased tooth loss and greater periodontal attachment loss in teeth that were within high-dose irradiated sites (Figure 5).<sup>62</sup> Because attachment loss in teeth was greater in the irradiated fields, the authors recommend that dentists consider the impact of increased attachment loss on remaining teeth, when planning dental treatment before RT.



**Figure 5** - Gingival recession on mandibular teeth in the field, more than two years post radiotherapy. Patient wears a complete upper denture.

It is well-established that periodontal involvement of teeth in high-dose irradiated sites can produce osteoradionecrosis.<sup>63-64</sup> Extractions in irradiated bone may increase risk for ORN but pre-irradiation extraction of teeth carries a lower risk of ORN than extractions following RT.<sup>64-66</sup> Periodontal treatment, including periodontal surgery, is possible within irradiated sites. In a study conducted in 1994<sup>67</sup>, various periodontal surgeries were performed in compliant patients with good oral hygiene and a mean follow-up of 38 months. Although all patients showed isolated sites of increased pocket depth, only four patients showed sites where the pocket depth increased by more than 2 mm. The authors concluded that if few stigmata of RT are seen, such as induration of soft tissue, mucosal and skin telangiectasia, loss of facial hair, mucosal cutaneous atrophy, and xerostomia, the risk of osteonecrosis (ORN) might be reduced. Meticulous surgical technique should be employed with nonsurgical periodontal management. The authors further concluded that periodontal surgery could be performed in selected patients following RT, if all these conditions are met.<sup>67</sup>

*Prevention of periodontal disease and attachment loss.* Optimal oral hygiene must be maintained because of the lowered biological potential for healing of the periodontium after radiation therapy. The risk for developing ORN is reduced in patients who receive topical fluoride applications and maintain good oral hygiene because they are less likely to develop caries, periodontal disease and their sequelae.<sup>53,68-69</sup> These measures help to reduce the likelihood of rampant periodontal destruction that occurs in the absence of good oral hygiene, especially within high-dose irradiated sites.<sup>63</sup>

**f. Osteoradionecrosis (ORN):** ORN is caused by the hypoxic, hypocellular, hypovascular deterioration of bone that has been irradiated. Marx<sup>60</sup> has proposed that this results from the radiation-induced deficient cellular turnover and collagen synthesis in a hypoxic, hypovascular and hypocellular environment in which tissue breakdown exceeds the repair capabilities of the wounded tissue. Clinically, ORN may initially present as bone lysis under intact gingiva and mucosa (type I). This process is self-limiting because the damaged bone sequesters, then is shed with subsequent healing. If the soft tissue breaks down, the bone becomes exposed to saliva and secondary contamination occurs. Sepsis may also be introduced by dental extraction or surgery, producing a more aggressive form (type II) (Figure 6). This progressive form may produce severe pain or fracture, and require extensive resection. The reported incidence of ORN varies widely depending on the institution, type of RT, and follow-up time. The reported incidence of ORN ranges from 0.92 percent of all head and neck cancer patients receiving RT to 2.59 percent of patients receiving post-irradiation extractions.<sup>69-70</sup>



**Figure 6** - Osteoradionecrosis in the right posterior mandible, five years post-radiotherapy and after hyperbaric oxygen therapy. This female patient received chemoradiotherapy for squamous cell carcinoma of the right tongue base, and within a few months developed permanent xerostomia and rampant dental caries. Reportedly, daily fluoride and preventative dental treatment had not been implemented. Pain and infection ensued and led to extraction of molars on this side. This asymptomatic lesion consisting of exposed bone was unchanged since her previous recall, six months prior.

Sulaiman and colleagues<sup>69</sup> reviewed the records of 1,194 patients followed in the Memorial Sloan Kettering Cancer Center (MSKCC) Dental Service during 1998- 2001. Mean time for follow-up was 22.09 months. Decisions to perform pre-irradiation dental extractions were based on several factors: radiation dose, modality of treatment, field of radiation, and tumor prognosis, as well as pre-existing periodontal condition of the tooth or teeth, severity of caries, pulpal involvement and status, presence of advanced or symptomatic periodontal disease, mobility with root furcation involvement, residual root tips not fully covered by alveolar bone or showing radiolucencies and symptomatic impacted or incompletely erupted teeth that were not fully covered by alveolar bone. Following formal empiric guidelines at MSKCC regarding dental extractions in patients receiving radiation therapy for head and neck cancer, almost 85 percent of patients did not require dental extractions to prevent ORN. Of the 77 patients who had extractions before radiation, the majority (41 patients) had periodontal disease, usually in an acute or advanced state. Tooth mobility accounted for 37.66 percent of the patients who had extractions.<sup>69</sup>

Both the study of Sulaiman and colleagues<sup>69</sup> and a previous study by Beumer and colleagues<sup>71</sup> reported that selected tooth removal before radiation therapy reduced the risk of necrosis when the teeth had periodontal disease, particularly mandibular molars with furcation involvement. In the Beumer study, 2.14 percent (four patients) developed ORN. All four patients who developed ORN after extractions

in irradiated bone originally had squamous cell carcinoma of the base of tongue (2), oral tongue (1) or floor of mouth (1). Two of these patients had a radiation dose greater than 70 Gy. All of the extractions were located in the posterior region of the mandible in the irradiated field.<sup>71</sup>

In the Sulaiman study<sup>69</sup> extractions were done at least two weeks before RT whenever possible. Their protocol for dentate patients undergoing RT or with a history of RT included a neutral fluoride regimen — usually neutral NaF 1.1 percent in a 5,000-ppm dentifrice toothpaste. For patients with extensive dental restorations, fluoride trays were also fabricated. Because 84.34 percent of their patients did not require extractions after RT, the investigators concluded that the fluoride regimen was efficacious. In addition, follow-up in the immediate post-radiation period was mandatory, with average follow-up time of 22 months post-extraction, with a range of 0-149 months. Most of the patients who had extractions did not experience post-operative complications.<sup>69</sup>

A recent retrospective study showed a further reduced incidence of ORN following IMRT for head and neck cancer. This reduced incidence was attributed to parotid sparing and better dental treatment, which reduced the number of dental extractions and surgical procedures required post-radiotherapy.<sup>36</sup>

*Prevention of ORN.* ORN may be prevented by extracting these teeth at least two weeks before RT: periodontally involved teeth; unerupted teeth with communication with the oral cavity; third molars with evidence of pathology such as cysts or pericoronitis; and pulpally involved or nonrestorable teeth. Prevention of dental caries and periodontal disease and their sequelae can prevent ORN in most cases. If teeth must be extracted after RT, care should be given to use atraumatic technique, smooth sharp edges of bone, and avoid reflection of the periosteum, if possible. The risk of dental extraction-related ORN does not appear to decrease over time after RT.

**g. Trismus.** Trismus can be a significant side effect of RT, especially if the lateral pterygoid muscles are in the field. In patients in whom the pterygoid muscles were irradiated, and not the temporomandibular joint (TMJ), 31 percent experienced trismus. In addition, radiation to the TMJ also was associated with a decrease in maximum vertical opening.<sup>72-73</sup> Limited mouth opening can interfere with proper oral hygiene and dental treatment. Therefore, before RT starts, patients who are at risk for developing trismus should receive instruction in jaw exercises that will help them maintain maximum mouth opening and jaw mobility. Tongue blades can be used to gradually increase the mandibular opening. Dynamic bite opening appliances have also been used.<sup>74-75</sup> The dentist should measure the patient's maximum mouth opening and lateral movements before RT and reevaluate mandibular opening and function and follow-up dental visits. For patients who experience



reduced mouth opening, the intensity and frequency of the exercises should increase, and a physical therapy regimen prescribed.

### Pre-RT Dental Assessment and Treatment

Patients scheduled to undergo RT should receive a comprehensive dental assessment before therapy begins. The assessment should be conducted soon after diagnosis to allow adequate time for wound healing if teeth need to be extracted. The dentist must understand the basis for RT, the radiation treatment planned (dose, schedule and fields), and the oral/dental/periodontal status of the patient in order to make appropriate treatment decisions. Therefore, a consultation with the radiation oncologist and the medical oncologist, if the patient is undergoing chemotherapy, is recommended.

### Goals of Dental Management

The dentist caring for a head and neck cancer patient should have clearly defined goals of dental management during the three phases of treatment:

1. Pretreatment goals
  - a. eliminate potential sources of infection;
  - b. counsel patient about short-and long-term complications of cancer therapy;
  - c. provide preventative care.
2. Goals during cancer therapy
  - a. provide supportive care for oral mucositis;
  - b. provide treatment of oral candidiasis;
  - c. manage xerostomia;
  - d. prevent trismus.
3. Long-term, post-treatment goals
  - a. manage xerostomia;
  - b. prevent and minimize trismus;
  - c. prevent and treat dental caries;
  - d. prevent postradiation osteonecrosis (ORN);
  - e. detect tumor recurrence.

Pre-RT dental treatment planning is imperative to address:

1. the limited time to provide dental treatment to the patient, especially if the prognosis for survival is poor;
2. the risk of ORN in irradiated bone with dental extractions or untreated infection;
3. the increased risk of dental caries in the patient whose radiation field includes major salivary glands.

Ideally, treatment planning for all patients should include disease control and prevention phases of care. Prosthetic rehabilitation usually is provided several months after RT. Disease control includes caries removal and restorations, scaling and prophylaxis, establishing good oral hygiene, removing overhanging restorations, and replacing defective restorations, especially if irritating the soft tissues. If deep scaling is needed (pocket depths less than 6mm) the dentist should allow 14 days healing time before therapy if possible.

Ill-fitting dentures should be repaired or replaced. The placement of soft liners should be avoided because they can be a nidus for candidiasis<sup>76</sup> and the surfaces tend to be irregular and irritating.

If teeth are to be retained, the dentist should provide the patient with daily fluoride therapy, either as 1.1 percent NaF gel in custom dental trays or as 1.1 percent NaF toothpaste to be used once daily before, during and after RT, for the rest of the patient's life. Regular dental recalls are essential to maintain compliance with preventive strategies<sup>53,77</sup> and detect disease at an early stage.

The dentist should encourage the patient to adopt a non-cariogenic diet. Tooth extraction should be performed 14 days before radiation or chemotherapy starts. After RT, allow at least three months of healing time to elapse before providing prostheses in edentulous patients. There appears to be little evidence to support a longer delay to definitive prosthetic care.<sup>78</sup> During pre-RT extractions, the dentist should aggressively remove sharp pieces of bone to avoid alveoloplasty later. If the lateral pterygoid muscles are within the field of radiation and trismus poses a risk, the patient should receive instruction on mandibular range of motion exercises. After RT, the exercises should be reassessed and, if necessary, modified. Caries prevention plans may also include the prescription of pilocarpine or cevimeline to stimulate salivary flow<sup>22,79</sup>, chewing sugarless gum containing xylitol, and rinsing with artificial saliva containing calcium and phosphate to encourage remineralization.<sup>80</sup>

*Decisions to extract teeth.* Formalized dental treatment planning models have been proposed in which decisions are based on both dental and cancer therapy conditions.<sup>81-82</sup> The primary decision is when teeth should be extracted before therapy. In Schiodt's model<sup>82</sup>, dental conditions associated with high risk dental risk factors (DRF) include:

- teeth with primary and secondary deep caries;
- root caries > 1/2 the root circumference;
- pulpal disease and periapical disease (nonvital pulps and no previous RCT), periapical osteitis > 3mm;
- internal/external root resorption;
- probing depth or gingival recession > 6mm.

Other high risk factors include furcation involvement, mobility >2mm, partially impacted teeth and residual root tips, fully impacted teeth with "pericoronal pathoses," poor oral hygiene and low dental awareness or lack of cooperation.

This model also considers malignancy risk factors (MRF). High malignancy risk factors include radiation dose > 55 Gy, a radiation field that includes molars, teeth that are near the

tumor, and if radiotherapy begins in fewer than 14 days. This decision-making model suggests that teeth considered as high MRF and high DRF should be removed.<sup>82</sup> However, extraction decisions also should consider the strategic importance of the teeth, the overall impression of the patient, and the risk associated with extraction (clinical judgment).<sup>81</sup>

Zlotolow<sup>76</sup> also proposed that the dentist consider the following factors when determining whether or not to extract teeth:

- an optimal recovery time after teeth extraction is 14 to 21 days;
- bone remodeling may occur after RT;
- the risk of ORN is greater in the mandible;
- primary wound closure and alveolectomy may be needed to decrease healing time;
- nonvital asymptomatic teeth in the field can be endodontically treated.

In summary, the decision to extract teeth before RT should consider:

- teeth that are in a high-dose radiation field. Such teeth are non-restorable or may require significant restorative, periodontal, endodontic, or orthodontic intervention.
- patients with moderate to severe periodontal disease (pocket depths > 5-6mm) or with advanced recession.

The dentist may develop a more aggressive dental treatment plan for the patient with low dental awareness, lack of motivation or cooperation, a poor history of regular dental care treatment, poor oral hygiene, and evidence of past dental/periodontal disease. The dentist also should consider factors such as position of teeth, relative importance of such teeth for function, oral hygiene, potential impact of trismus and limited mouth opening on oral hygiene and dental treatment, taurodontism, and root anatomy.

See Table 2 for the Pre-Radiation Therapy Protocol from the University of Michigan Department of Oral and Maxillofacial Surgery and Hospital Dentistry. This and other information can also be accessed at <http://sitemaker.umich.edu/dent.onc>. At our institution all patients planned to receive head and neck RT are referred for dental evaluation and treatment, and cleared from a dental standpoint before RT begins. Although the majority of patients are seen in the Hospital Dentistry Department prior to RT, in order to expedite treatment, most patients return to their private dentist in the community for long-term dental maintenance. In cancer treatment centers and hospitals without a dentistry department, which is most common, this pre-RT dental care is provided by private practice dentists in the community.

Although not widely published in the literature, and thus not cited in the aforementioned guidelines, at the University of

Michigan and other medical centers in the U.S. standard supportive care for dentate patients undergoing head and neck RT with metal restorations included the fabrication of mucosal guards. These guards are made of putty silicone impression material with the patient in occlusion, and cover the teeth to prevent radiation backscatter off metallic restorations to oral mucosa which would normally be in direct contact with these fillings and crowns (Figure 2). The patient wears these guards during simulation and subsequent radiation treatments. In our experience this strategy appears to reduce the severity of mucositis in regions of mucosa which are normally in contact with these restorations. More formal investigation of the efficacy of these mucosal guards to reduce mucositis associated with RT is clearly indicated.<sup>35-36</sup>

## Conclusions

Dental treatment decisions require an understanding of the staging of the patient's cancer and prognosis for survival, the types of therapy planned, timing of therapy, patient's motivation and ability to cooperate, and anticipated oral complications of treatment.

In general, the dental care provider can help prepare the patient prior to therapy by treating any active or potential dental infection, providing patient education, and supportive care during treatment. The dental treatment and oral management of patients with head and neck cancer should include an oral evaluation including periodontal examination before the patient begins cancer treatment. This evaluation will help to prevent or mitigate oral complications associated with radiation and chemotherapy, and systemic sequelae of oral infection.

Many of the oral complications of cancer therapy, such as mucositis, oral candidiasis, and osteoradionecrosis, are managed by the oncology team. Radiation-induced xerostomia and dental disease is the responsibility of the dental team. The general dentist or specialist in private practice who is asked to provide dental care for the head and neck cancer patient must be familiar with the most current recommendations for care and understand the scientific rationale. Dentists should be prepared to consult with the oncology team in order to provide the most appropriate care for the cancer patient before treatment, and for the rest of the patient's life.

*Table 2 and additional references available on page 22*

1. Jemal A, Siegel R, Xu J, Ward E. Cancer statistics, 2010. *CA Cancer J Clin* 2010;60:277-300.
2. Jemal A, Siegel R, Ward E, Murray T, Xu J, Thun MJ. Cancer statistics, 2007. *CA Cancer J Clin* 2007;57:43-66.
3. Brandwein-Gensler M, Smith RV. Prognostic indicators in head and neck oncology including the new 7th edition of the AJCC staging system. *Head Neck Pathol* 2010;4:53-61.
4. Dreizen S. Oral complications of cancer therapies. Description and incidence of oral complications. *NCI Monogr* 1990:11-5.
5. Cooper JS, Fu K, Marks J, Silverman S. Late effects of radiation therapy in the head and neck region. *Int J Radiat Oncol Biol Phys* 1995;31:1141-64.



# READY TO APPLY FOR A BUSINESS LOAN?

By: Lana M. Glovach,  
US Small Business Administration

Securing financing for your business start-up or expansion can be a time-consuming and frustrating endeavor. There are, however, several things you can do to expedite the loan application process *before* you fill out an application:

✓ **HAVE A GOOD BUSINESS PLAN** - There is an art to being both thorough and concise at the same time. A good business plan will outline the business, the industry, the competitive landscape, and the business's unique market differentiator. It will also demonstrate your ability to repay the requested loan amount. Be sure to show how borrowing money will allow you to become more profitable.

- **EXECUTIVE SUMMARY** - The most effective business plans begin with a one page executive summary outlining your business, your reason for borrowing money, the amount requested, and how you intend to repay it. This information gives the loan officer a broad overview of your organization before getting down to the nitty-gritty of the loan request. *This summary is the first thing a loan officer will review.*
- **CONVEY YOUR BORROWING NEEDS** - In your business plan, be clear about how much money you are asking for and exactly what you will do with it. Lenders need to determine collateral coverage and evaluate the risk. In order to do that, they need to know how each dollar they are loaning is being used. When a loan officer asks, "How much money would you like to borrow?" the worst possible answer is, "How much can I get?"
- **REALISTIC FINANCIAL PROJECTIONS** - Financial projections are a critical element of any good business plan. Borrowers need to share how the loan proceeds will be used and to do so verbally as well as numerically. Incorporate the debt and expected revenue into your forecasted Balance Sheet, Income Statement, and Statement of Cash Flows. Present these statements monthly for a three-year period.  
Be realistic. Of course you think your idea will be successful, so it's only natural when doing your research to look for information that reinforces your belief. You will need to justify why you believe sales will increase at the rate you are forecasting and, if forecasted, expenses are lower than current ones, a lender will scrutinize and potentially 're-adjust' your forecast. To be on the

safe side, estimate low sales and high expenses and make sure the forecast is still profitable. If you get assistance preparing these projections, be sure *you* can explain them to your lending institution. *These projections are the second thing a loan officer will review* (even though they're at the back of your business plan).

✓ **PROVIDE TAX RETURNS** - Existing businesses will need to provide their lender with tax returns for three years (fewer if the business has not been open for three years). The bank will use the returns to determine, in part, the borrower's ability to repay the loan sought. So, if your returns do not show profitability, you will need to make a strong case that the loan you seek will allow your business to generate enough profit to repay the loan and be financially solvent.

✓ **CHECK YOUR CREDIT REPORT** - Obtain your credit report from one of the many available free services and review it to make sure all items belong to you. If not, contact the credit agencies and begin the process of cleaning it up. If you have any delinquent accounts, try to bring them current before applying for a loan. Tax liens, unpaid/delinquent child support, and student loans make it very difficult to obtain new financing. Other concerns on your credit report may be explainable, and a lender may be able to work with them. Be sure to discuss them with your loan officer. If you don't, your lender is left to draw its own conclusions, which will likely be less favorable than your explanation. Cleaning up your credit report may take time, and it might mean putting your request for financing on hold. If so, set up a budget and timeline to get your finances back on track before applying for a loan.

✓ **BE PREPARED TO CONTRIBUTE**- Banks want to see that you have some of your own resources invested in the project - that you have some "skin in the game." If you don't have any resources to contribute, consult a loan officer to find out how much you will need. Then you can save the required money and apply at a later date. That said, starting a business without any reserve is a recipe for failure, so be sure not to deplete your liquid resources entirely. Don't worry: lenders won't want you to start a business without reserve funds either.

✓ **COMPLETE THE APPLICATION FULLY** - Banks will not process a loan application unless it is complete. Borrowers are naturally anxious for an approval and can easily become frustrated when the process slows down. However, the slowdown is, in some cases, the borrower's fault, as s/he has not provided all required information.

Preparing all of this information can be a daunting task, particularly if you do not have any experience doing so. The SBA has resource partners that provide *no cost, confidential business counseling*. They can help you put forward the best possible application, thereby maximizing your chances for approval. Please contact one of our RI-based resource partners for assistance:

**Center for Women & Enterprise**

[www.cweonline.org](http://www.cweonline.org)  
(401) 277-0800

**SCORE**

[www.ri.score.org](http://www.ri.score.org)  
(401) 266-0077

**Small Business Development Center**

[www.risbdc.org](http://www.risbdc.org)  
(401) 874-7232

**BUSINESS PLAN LINKS**

**U.S. SMALL BUSINESS ADMINISTRATION**

<http://www.sba.gov/category/navigation-structure/starting-managing-business/starting-business/how-to-write-business-plan>

**SCORE**

<http://www.score.org/resources/business-planning-financial-statements-template-gallery>

**South Eastern Economic Corporation (SEED)**

**SBA Microlender**

<https://seedcorp.com/business-assistance/business-planning/>

**RI Medical Society -**

**Physician Health Program**

The Physician Health Program endeavors to promote and support the physical and mental well-being of healthcare professionals, thereby contributing to safe and competent patient care in Rhode Island. Looking for help? Concerned about the well being of a doctor? Please call:

**(401) 443-2383**

As a peer review body, The Physician Health Program and its Committee have the strong protection of both RI and federal law for the confidentiality of its work.

**Malpractice Insurance | By Dentists, For Dentists®**



Robert Bartro, DDS  
EDIC Board Director

**Real Advocacy. Real Dentists.**

**The EDIC Advantage For RIDA Dentist Members**

Eastern Dentists Insurance Company (EDIC), the endorsed dental malpractice carrier for Rhode Island dentists, has partnered with RIDA for over 20 years. With this endorsement, RIDA members have value-added benefits as well as local representation on the EDIC Board of Directors. Former RIDA President, Dr. Robert Bartro, serves on the EDIC Board and guarantees your voice is being heard as he participates in every decision that EDIC makes and actively advocates EDIC's "By Dentists, For Dentists®" philosophy.

**The EDIC Advantage:**

- Board of Directors is comprised of dentists
- Proactive risk management program with FREE webinars earning CEU's
- EDIC's customer service team is personally dedicated to you
- Outstanding claims handling with a 92% win rate of claims that go to trial

**EDIC Supports Our Colleagues 100%  
Because We Are Dentists Too.  
Join EDIC Today!**

**800-898-3342 • [www.edic.com](http://www.edic.com)**



**EDIC is the Endorsed  
Dental Malpractice  
Carrier Of**



**Rhode Island  
DENTAL ASSOCIATION**



**Table 2 - Pre-Radiation Therapy Oral Evaluation Protocol, University of Michigan Hospital Dentistry**

1. Patient education, both oral and written
  - a. Effect on salivary glands
    - i. Dry mouth strategies
      1. Increased hydration
      2. Salivary substitutes
      3. Salivary stimulation - sugarless chewing gum, pilocarpine, cevimeline
    - ii. Caries prevention
      1. Diet counseling
      2. Daily fluoride use
      3. Regular frequent dental check-ups
  - b. Effect on bone in irradiated field
    - i. Need for pre-RT dental evaluation
      1. Consult usually requested by radiation oncology
    - ii. Need for UMHS contact prior to future extraction or surgery in the irradiated field
  - c. Potential for trismus
    - i. Maintain range of motion
      1. Tongue blades
        - a. Therabite™
        - b. Dynabite™
2. Patient evaluation and treatment plan
  - a. Consult should provide adequate information about planned field. If not, contact radiation oncologist.
    - i. All head and neck cancer patients at University of Michigan now undergo parotid-sparing IMRT
  - b. Determine the need for extraction based on periodontal and dental condition, oral hygiene, history of regular dental visits, etc.
  - c. If time permits and patient wishes, perform extractions at the time; or schedule for future day.
  - d. Inform radiation oncologist of time required for healing before starting RT.
  - e. Oral hygiene instructions, other treatment to be scheduled.
3. If indicated in consult, fabricate silicone tooth guards to minimize radiation backscatter. Consult should indicate if guards should be fabricated in a position with teeth open or closed. If time is available to trim and smooth the guards, deliver at this time. If not enough time is available, reschedule the patient.
4. If xerostomia is anticipated, consider fluoride use using toothbrush application or carriers. If there are multiple missing teeth, the toothbrush technique is preferred. Alignate impressions are made if carriers are to be made. Schedule patient to return for delivery of these. At this time prescription can be provided for fluoride.
  - a. Sodium fluoride dentifrice or gel, OR
  - b. Stannous fluoride gel
5. Schedule the patient to return in approximately seven weeks, during the last week of radiation therapy. If the date is not known, advise the patient to schedule this appointment. During this appointment, reinforce the information provided earlier about caries prevention. Determine where the patient will be getting his routine dental care, either with the local dentist or in our clinic.
6. If care is to be provided in private practice, we continue to be a resource regarding dental treatment and information for the patient and his dentist.

6. Barker GJ, Epstein JB, Williams KB, Gorsky M, Raber-Durlacher JE. Current practice and knowledge of oral care for cancer patients: a survey of supportive health care providers. *Support Care Cancer* 2005;13:32-41.

7. Epstein JB, Parker IR, Epstein MS, Gupta A, Kutis S, Witkowski DM. A survey of National Cancer Institute-designated comprehensive cancer centers' oral health supportive care practices and resources in the USA. *Support Care Cancer* 2007;15:357-62.

8. Epstein JB, Parker IR, Epstein MS, Stevenson-Moore P. Cancer-related oral health care services and resources: a survey of oral and dental care in Canadian cancer centres. *J Can Dent Assoc* 2004;70:302-4.

9. Wijers OB, Levendag PC, Braaksmma MM, Boonzaaijer M, Visch LL, Schmitz PI. Patients with head and neck cancer cured by radiation therapy: a survey of the dry mouth syndrome in long-term survivors. *Head Neck* 2002;24:737-47.

10. Moller P, Perrier M, Ozsahin M, Monnier P. A prospective study of salivary gland function in patients undergoing radiotherapy for squamous cell carcinoma of the oropharynx. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;97:173-89.

11. Grundmann O, Mitchell GC, Limesand KH. Sensitivity of salivary glands to radiation: from animal models to therapies. *J Dent Res* 2009;88:894-903.

12. Eisbruch A, Ten Haken RK, Kim HM, Marsh LH, Ship JA. Dose, volume, and function relationships in parotid salivary glands following conformal and intensity-modulated irradiation of head and neck cancer. *Int J Radiat Oncol Biol Phys* 1999;45:577-87.

13. Malouf JG, Aragon C, Henson BS, Eisbruch A, Ship JA. Influence of parotid-sparing radiotherapy on xerostomia in head and neck cancer patients. *Cancer Detect Prev* 2003;27:305-10.

14. Henson BS, Eisbruch A, D'Hondt E, Ship JA. Two-year longitudinal study of parotid salivary flow rates in head and neck cancer patients receiving unilateral neck parotid-sparing radiotherapy treatment. *Oral Oncol* 1999;35:234-41.

15. Henson BS, Inglehart MR, Eisbruch A, Ship JA. Preserved salivary output and xerostomia-related quality of life in head and neck cancer patients receiving parotid-sparing radiotherapy. *Oral Oncol* 2001;37:84-93.

16. Mell LK, Mehrotra AK, Mundt AJ. Intensity-modulated radiation therapy use in the U.S., 2004. *Cancer* 2005;104:1296-303.

17. Murdoch-Kinch CA, Kim HM, Vineberg KA, Ship JA, Eisbruch A. Dose-effect

relationships for the submandibular salivary glands and implications for their sparing by intensity modulated radiotherapy. *Int J Radiat Oncol Biol Phys* 2008;72:373-82.

18. Jabbari S, Kim HM, Feng M, et al. Matched case-control study of quality of life and xerostomia after intensity-modulated radiotherapy or standard radiotherapy for head-and-neck cancer: initial report. *Int J Radiat Oncol Biol Phys* 2005;63:725-31.

19. Chao KS, Majhail N, Huang CJ, et al. Intensity-modulated radiation therapy reduces late salivary toxicity without compromising tumor control in patients with oropharyngeal carcinoma: a comparison with conventional techniques. *Radiother Oncol* 2001;61:275-80.

20. Chao KS. Protection of salivary function by intensity-modulated radiation therapy in patients with head and neck cancer. *Semin Radiat Oncol* 2002;12:20-5.

21. Johnson JT, Ferretti GA, Nethery WJ, et al. Oral pilocarpine for post-irradiation xerostomia in patients with head and neck cancer. *N Engl J Med*

22. Johnson JT, Ferretti GA, Nethery WJ, et al. Oral pilocarpine for post-irradiation xerostomia in patients with head and neck cancer. *N Engl J Med* 1993;329:390-5.

23. Gorsky M, Epstein JB, Parry J, Epstein MS, Le ND, Silverman S, Jr. The efficacy of pilocarpine and bethanechol upon saliva production in cancer patients with hyposalivation following radiation therapy. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;97:190-5.

24. Axelsson P, Larsson UB. [Saliva stimulating effect of SST. A clinical long-term study]. *Tandlakartidningen* 1991;83:698-9.

25. Epstein JB, Schubert MM. Synergistic effect of sialagogues in management of xerostomia after radiation therapy. *Oral Surg Oral Med Oral Pathol* 1987;64:179-82.

26. Epstein JB, Emerton S, Le ND, Stevenson-Moore P. A double-blind crossover trial of Oral Balance gel and Biotene toothpaste versus placebo in patients with xerostomia following radiation therapy. *Oral Oncol* 1999;35:132-7.

27. Momm F, Volegova-Neher NJ, Schulte-Monting J, Guttenberger R. Different saliva substitutes for treatment of xerostomia following radiotherapy. A prospective crossover study. *Strahlenther Onkol* 2005;181:231-6.

28. Rhodus NL, Bereuter J. Clinical evaluation of a commercially available oral moisturizer in relieving signs and symptoms of xerostomia in postirradiation head and neck cancer patients and patients with Sjogren's syndrome. *J Otolaryngol* 2000;29:28-34.

29. Rubenstein EB, Peterson DE, Schubert M, et al. Clinical practice guidelines for the

- prevention and treatment of cancer therapy-induced oral and gastrointestinal mucositis. *Cancer* 2004;100:2026-46.29. Sonis ST. Mucositis: The impact, biology and therapeutic opportunities of oral mucositis. *Oral Oncol* 2009;45:1015-20.
30. Elting LS, Cooksley CD, Chambers MS, Garden AS. Risk, outcomes, and costs of radiation-induced oral mucositis among patients with head-and-neck malignancies. *Int J Radiat Oncol Biol Phys* 2007;68:1110-20.
31. Elting LS, Keefe DM, Sonis ST, et al. Patient-reported measurements of oral mucositis in head and neck cancer patients treated with radiotherapy with or without chemotherapy: demonstration of increased frequency, severity, resistance to palliation, and impact on quality of life. *Cancer* 2008;113:2704-13.
32. Scully C, Sonis S, Diz PD. Oral mucositis. *Oral Dis* 2006;12:229-41.
33. Sonis ST. Oral mucositis in cancer therapy. *J Support Oncol* 2004;2:3-8.
34. Kaanders JH, Fleming TJ, Ang KK, Maor MH, Peters LJ. Devices valuable in head and neck radiotherapy. *Int J Radiat Oncol Biol Phys* 1992;23:639-45.
35. Reitemeier B, Reitemeier G, Schmidt A, et al. Evaluation of a device for attenuation of electron release from dental restorations in a therapeutic radiation field. *J Prosthet Dent* 2002;87:323-7.
36. Ben-David MA, Diamante M, Radawski JD, et al. Lack of osteoradionecrosis of the mandible after intensity-modulated radiotherapy for head and neck cancer: likely contributions of both dental care and improved dose distributions. *Int J Radiat Oncol Biol Phys* 2007;68:396-402.
37. Redding SW, Zellars RC, Kirkpatrick WR, et al. Epidemiology of oropharyngeal candida colonization and infection in patients receiving radiation for head and neck cancer. *J Clin Microbiol* 1999;37:3896-900.
38. Vazquez JA, Sobel JD. Mucosal candidiasis. *Infect Dis Clin North Am* 2002;16:793-820.
39. Groll AH, Piscitelli SC, Walsh TJ. Clinical pharmacology of systemic antifungal agents: a comprehensive review of agents in clinical use, current investigational compounds, and putative targets for antifungal drug development. *Adv Pharmacol* 1998;44:343-500.
40. Clarkson JE, Worthington HV, Eden OB. Interventions for treating oral candidiasis for patients with cancer receiving treatment. *Cochrane Database Syst Rev* 2004;CD001972.
41. Worthington HV, Clarkson JE, Eden OB. Interventions for treating oral candidiasis for patients with cancer receiving treatment. *Cochrane Database Syst Rev* 2007;CD001972.
42. Brown LR, Dreizen S, Daly TE, et al. Interrelations of oral microorganisms, immunoglobulins, and dental caries following radiotherapy. *J Dent Res* 1978;57:882-93.
43. Keene HJ, Fleming TJ. Prevalence of caries-associated microflora after radiotherapy in patients with cancer of the head and neck. *Oral Surg Oral Med Oral Pathol* 1987;64:421-6.
44. Llory H, Dammron A, Gioanni M, Frank RM. Some population changes in oral anaerobic microorganisms, *Streptococcus mutans* and yeasts following irradiation of the salivary glands. *Caries Res* 1972;6:298-311.
45. Regezi JA, Courtney RM, Kerr DA. Dental management of patients irradiated for oral cancer. *Cancer* 1976;38:994-1000.
46. Daly TE, Drane JB. Proceedings: The management of teeth related to the treatment of oral cancer. *Proc Natl Cancer Conf* 1972;7:147-54.
47. Epstein JB, McBride BC, Stevenson-Moore P, Merilees H, Spinelli J. The efficacy of chlorhexidine gel in reduction of streptococcus mutans and lactobacillus species in patients treated with radiation therapy. *Oral Surg Oral Med Oral Pathol* 1991;71:172-8.
48. Joyston-Bechal S, Hayes K, Davenport ES, Hardie JM. Caries incidence, mutans streptococci and lactobacilli in irradiated patients during a 12-month preventive programme using chlorhexidine and fluoride. *Caries Res* 1992;26:384-90.
49. Vissink A, Burlage FR, Spijkervet FK, Jansma J, Coppes RP. Prevention and treatment of the consequences of head and neck radiotherapy. *Crit Rev Oral Biol Med* 2003;14:213-25.
50. Jansma J, Vissink A, Gravenmade EJ, Visch LL, Fidler V, Retief DH. In vivo study on the prevention of post-radiation caries. *Caries Res* 1989;23:172-8.
51. Fleming TJ. Use of topical fluoride by patients receiving cancer therapy. *Curr Probl Cancer* 1983;7:37-41.
52. Al-Joburi W, Clark C, Fisher R. A comparison of the effectiveness of two systems for the prevention of radiation caries. *Clin Prev Dent* 1991;13:15-9.
53. Epstein JB, van der Meij EH, Lunn R, Stevenson-Moore P. Effects of compliance with fluoride gel application on caries and caries risk in patients after radiation therapy for head and neck cancer. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1996;82:268-75.
54. Dreizen S, Brown LR, Daly TE, Drane JB. Prevention of xerostomia-related dental caries in irradiated cancer patients. *J Dent Res* 1977;56:99-104.
55. Horiot JC, Bone MC, Ibrahim E, Castro JR. Systematic dental management in head and neck irradiation. *Int J Radiat Oncol Biol Phys* 1981;7:1025-9.
56. Horiot JC, Schraub S, Bone MC, et al. Dental preservation in patients irradiated for head and neck tumours: A 10-year experience with topical fluoride and a randomized trial between two fluoridation methods. *Radiother Oncol* 1983;1:77-82.
57. Rudat V, Meyer J, Momm F, et al. Protective effect of amifostine on dental health after radiotherapy of the head and neck. *Int J Radiat Oncol Biol Phys* 2000;48:1339-43.
58. Brizel DM, Wasserman TH, Henke M, et al. Phase III randomized trial of amifostine as a radioprotector in head and neck cancer. *J Clin Oncol* 2000;18:3339-45.
59. Brizel DM, Overgaard J. Does amifostine have a role in chemoradiation treatment? *Lancet Oncol* 2003;4:378-81.
60. Marx RE. Osteoradionecrosis: a new concept of its pathophysiology. *J Oral Maxillofac Surg* 1983;41:283-8.
61. Marx RE, Johnson RP. Studies in the radiobiology of osteoradionecrosis and their clinical significance. *Oral Surg Oral Med Oral Pathol* 1987;64:379-90.
62. Epstein JB, Lunn R, Le N, Stevenson-Moore P. Periodontal attachment loss in patients after head and neck radiation therapy. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998;86:673-7.
63. Galler C, Epstein JB, Guze KA, Buckles D, Stevenson-Moore P. The development of osteoradionecrosis from sites of periodontal disease activity: report of 3 cases. *J Periodontol* 1992;63:310-6.64. Epstein JB, Rea G, Wong FL, Spinelli J, Stevenson-Moore P. Osteonecrosis: study of the relationship of dental extractions in patients receiving radiotherapy. *Head Neck Surg* 1987;10:48-54.
65. Chang DT, Sandow PR, Morris CG, et al. Do pre-irradiation dental extractions reduce the risk of osteoradionecrosis of the mandible? *Head Neck* 2007;29:528-36.
66. Lee JJ, Koom WS, Lee CG, et al. Risk factors and dose-effect relationship for mandibular osteoradionecrosis in oral and oropharyngeal cancer patients. *Int J Radiat Oncol Biol Phys* 2009;75:1084-91.
67. Epstein JB, Corbett T, Galler C, Stevenson-Moore P. Surgical periodontal treatment in the radiotherapy-treated head and neck cancer patient. *Spec Care Dentist* 1994;14:182-7. 68. Epstein JB, Stevenson-Moore P. Periodontal disease and periodontal management in patients with cancer. *Oral Oncol* 2001;37:613-9.
69. Sulaiman F, Huryn JM, Zlotolow IM. Dental extractions in the irradiated head and neck patient: a retrospective analysis of Memorial Sloan-Kettering Cancer Center protocols, criteria, and end results. *J Oral Maxillofac Surg* 2003;61:1123-31.
70. Morrish RB, Jr., Chan E, Silverman S, Jr., Meyer J, Fu KK, Greenspan D. Osteonecrosis in patients irradiated for head and neck carcinoma. *Cancer* 1981;47:1980-3.
71. Beumer J, 3rd, Harrison R, Sanders B, Kurrasm M. Post-radiation dental extractions: a review of the literature and a report of 72 episodes. *Head Neck Surg* 1983;6:581-6.
72. Teguh DN, Levendag PC, Voet P, et al. Trismus in patients with oropharyngeal cancer: relationship with dose in structures of mastication apparatus. *Head Neck* 2008;30:622-30.
73. Bensadoun RJ, Riesenbeck D, Lockhart PB, Elting LS, Spijkervet FK, Brennan MT. A systematic review of trismus induced by cancer therapies in head and neck cancer patients. *Support Care Cancer* 2010;18:1033-8.
74. Brunello DL, Mandikos MN. The use of a dynamic opening device in the treatment of radiation induced trismus. *Aust Prosthodont J* 1995;9:45-8.
75. Shulman DH, Shipman B, Willis FB. Treating trismus with dynamic splinting: a case report. *J Oral Sci* 2009;51:141-4.
76. Zlotolow IM. *Dental Oncology and Maxillofacial Prosthetics*. Philadelphia: Lippincott Raven; 1999.
77. Epstein JB, van der Meij EH, Emerton SM, Le ND, Stevenson-Moore P. Compliance with fluoride gel use in irradiated patients. *Spec Care Dentist* 1995;15:218-22.
78. Gergross PJ, Martin CD, Ball JD, et al. Period between completion of radiation therapy and prosthetic rehabilitation in edentulous patients: a retrospective study. *J Prosthodont* 2005;14:110-21.
79. Gornitsky M, Shenouda G, Sultanem K, et al. Double-blind randomized, placebo-controlled study of pilocarpine to salvage salivary gland function during radiotherapy of patients with head and neck cancer. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;98:45-52.
80. Singh ML, Papas AS. Long-term clinical observation of dental caries in salivary hypofunction patients using a supersaturated calcium-phosphate remineralizing rinse. *J Clin Dent* 2009;20:87-92.
81. Bruins HH, Jolly DE, Koole R. Preradiation dental extraction decisions in patients with head and neck cancer. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1999;88:406-12.
82. Schioldt M, Hermund NU. Management of oral disease prior to radiation therapy. *Support Care Cancer* 2002;10:40-3.
83. Berean K, Epstein JB. Correspondence re: Brandwein M, Nuovo G, Ramer M, Orlowski W, Miller L: Epstein-Barr virus reactivation in hairy leukoplakia. *Mod Pathol* 9:298, 1996. *Mod Pathol* 1996;9:869-70.

.....

## ABOUT THE AUTHORS

**Carol Anne Murdoch-Kinch, D.D.S.**, is dean of the Indiana University School of Dentistry at IUPUI. Dr. Murdoch-Kinch previously served as associate dean for academic affairs and the Dr. Walter H. Swartz Professor of Integrated Special Care Dentistry at the University of Michigan School of Dentistry. She received her D.D.S. degree in 1985 from Dalhousie University, completed a residency in oral medicine and radiology, and completed a Ph.D. from Indiana University in 1996.

**Samuel Zwetckhenbaum, D.D.S., M.P.H.**, received his D.D.S. degree from the University of North Carolina and completed a general practice residency at Hennepin County Medical Center in Minneapolis. He completed training programs in prosthodontics and then maxillofacial prosthodontics at M.D. Anderson Cancer Center in Houston, Texas. He received an M.P.H. in health management and policy from the University of Michigan School of Public Health in 2006. Dr. Zwetckhenbaum is currently the Dental Director of the Oral Health Program with the Rhode Island Department of Health.

continued from page 12

and one day, hopefully, expand such initiatives into new areas. I could not be prouder of our District, which made a positive and major impact at this year's Annual Meeting and helped create another important Member benefit!

In closing: I look forward to connecting with all of you and having an opening dialogue so I can be a conduit to the ADA. I reside in NH with Laurie, my wife of 26 years (general dentist), and our three children (Rich Jr., Colin, and Madison). I look forward to learning about you and what the ADA can do to excite you, keep you excited and maybe even ignite you to stimulate a colleague to join the ADA! Please do not hesitate to reach out to me.

Rich Rosato, DMD  
ADA First District Trustee  
rosator@ada.org



Our philanthropic arm; the Rhode Island Dental Foundation, is accepting grant proposals for 2020. Grant requests for will be considered for various oral health related causes. They include education and research programs designed to improve the art and science of dentistry in the State of Rhode Island, dental public service projects in Rhode Island, programs geared towards improving accessibility and availability of dental care for underserved citizens within our state, oral health education for the public, Rhode Island based charitable or educational projects related to oral health, and Rhode Island based free dental clinics.

Grant request forms are now available via the RIDA website.

## WELCOME NEW MEMBERS

### **Lucia Najera Bonilla, DMD**

Boston University School of Dental Medicine, 2018  
Employed: 1090 Cranston St., Cranston

### **Tyler Phelan, DDS**

Dalhousie University Nova Scotia, 2019  
Employed: 222 Jefferson Blvd., Warwick, RI

### **Barrett Nordstrom, DMD**

University of California-Los Angeles, 2014  
Graduate: Ohio State University College of Dentistry, 2017  
Employed: 1226 Hartford Ave., Suite 101, Johnston, RI

### **Victoria Gill, DDS**

Columbia University, 2019  
Graduate: NYU Langone - St Josephs Health Center, 2021

## RETIRED MEMBERS

### **Christine Benoit, DMD**

42 Years of membership

## IN MEMORIUM

John Kacewicz, DMD



# RIDA CALENDAR

## NOVEMBER

- **November 1-2**  
NE President/President-elect Conference  
Newport, RI
- **November 11**  
Veterans Day  
RIDA Executive Office - CLOSED
- **November 13**  
"Geriatric Dentistry"  
presented by Dr. Lou Graham  
9:00am-4:00pm  
Quidnessett Country Club, North Kingstown
- **November 19**  
RIDA House of Delegates  
RIDA Executive Office 6:30pm
- **November 21**  
RIDPAC Event  
Squantum Club 6:30pm
- **November 28-29**  
Thanksgiving  
RIDA Executive Office - CLOSED

## DECEMBER

- **December 10**  
RIDA Board of Trustees Meeting  
RIDA Executive Office 6:30pm
- **December 25**  
Christmas  
RIDA Executive Office - CLOSED

## JANUARY

- **January 1**  
New Years Day  
RIDA Executive Office - CLOSED
- **January 30 - February 1**  
Yankee Dental Congress  
Boston Convention Center, Boston

## FEBRUARY

- **February 11**  
RIDA Board of Trustees Meeting  
RIDA Executive office 6:30pm
- **February 12**  
"Be Aware of Wear" & "What's a Dentist to Do?"  
presented by Dr. Thomas Dudney  
9:00am-4:00pm  
Quidnessett Country Club, North Kingstown

## MARCH

- **March 10**  
RIDA Board of Trustees Meeting  
RIDA Executive office 6:30pm

## CLASSIFIEDS

Looking for experienced general dentist one to two days per week in Northern Rhode Island. Days and times flexible. Please email resumes to [madeline@ridental.org](mailto:madeline@ridental.org)

\*\* All dates are subject to change. Please check the website for any updates.



Specializing in health care law, medical malpractice defense litigation, risk management, state and federal regulatory compliance for a wide variety of clients including dentists, Christy Durant, Esq., is the Rhode Island Dental Association's legal counsel.

Legal assistance is available at a discounted rate for members only.

To contact Attorney Durant, please call (401) 825-7700.



# RHODE ISLAND DENTAL ASSOCIATION

875 Centerville Rd.  
Bldg. 4, Suite 12  
Warwick, RI 02886

ADDRESS SERVICE REQUESTED

## ADA MEMBER ADVANTAGE ENDORSED PRODUCTS AND SERVICES



The products and services you'll find here can help manage the business-side of your practice, as well as your personal life, more smoothly and efficiently. Make your choice with confidence knowing these resources have been thoroughly researched and endorsed for Members of the American Dental Association.

Visit [adamemberadvantage.com](http://adamemberadvantage.com) for more information

## RIDA ENDORSED PRODUCTS AND SERVICES

