

Dental TEAMWORK

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The parallel advance / Une avancée parallèle

Early intervention of peri-implant mucositis secondary to inadequate restorative protocols: a clinical report / Apparition précoce de mucosite péri-implantaire à la suite de protocoles de restauration inadéquats: rapport clinique

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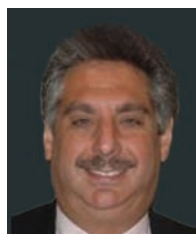
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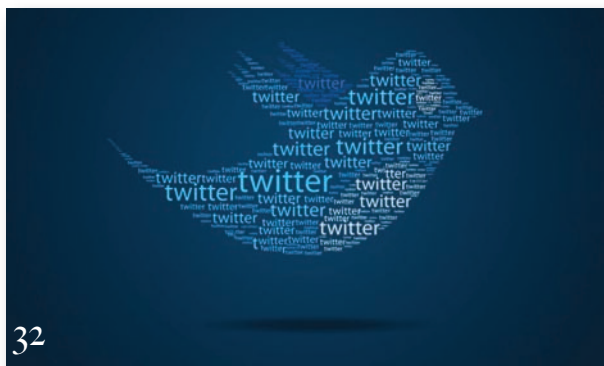
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• Cover Art by Yvonne Lo

A Profession in Transition:



Dr. Hubert Gaucher

Key Forces Reshaping the Dental Landscape

Dr. Hubert Gaucher, BA, DDS, MScD, FADI, FCARDP

ADA 2013 REPORT:

“...Ignoring what is happening in the health and consumer environment will mean ceding the future of the profession to others.”

Readers will recall our Journal's recent Summer editorial that highlighted the **FDI's Vision 2020**¹ document titled: “Shaping the Future of Oral Health”. Continuing in that mindset, we are now featuring the ADA's recent report whose title introduces this editorial.²

Why is a Canadian national dental publication such as ours, looking at international reports regarding the future of our profession? Well, when it comes to Oral Health Care Services, there are no geographical boundaries. With information instantaneously appearing at our www fingertips, and given that practices affecting 190,000 dentists in the US inevitably have bearing upon our profession here in Canada, we would be amiss to ignore current dental affairs on a larger scale. If Restorative and Prosthodontic care providers do not get involved in the management of their future orientations, then others will gladly take over that task. In fact, they've already started!

A very informative section (underwritten by a third party consultant) of this ADA Report pertains to the **Environmental Scan of Emerging Trends**³ that affect the future of Dentistry.

“The population is getting older and more diverse, leading to different disease patterns, care-seeking behavior and ability to pay... Consumers are becoming more astute purchasers of health care and seeking value for their

spending...Pressures are growing for an expanded dental team to provide preventive and restorative services...Commercial dental plans are increasingly using more selective networks, demanding increased accountability through data and performance measures, and pressuring providers to reduce costs...”

The **Practice Implications derived from the Environment Scan**³ are influenced by these four color coded entities:

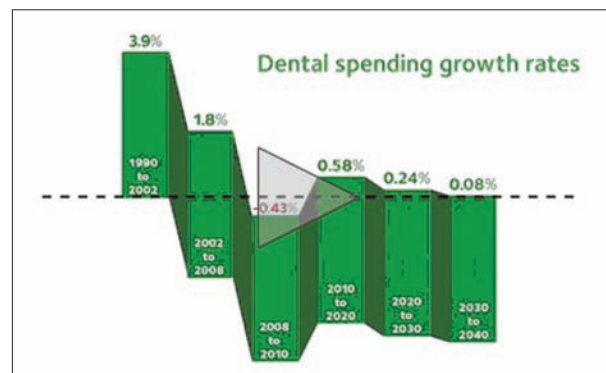


Figure 1: ADA 2013 Report Video⁴: A Profession in Transition

Here is a sampling of findings pertaining to each of these color coded factors:

- **Red: People**
- **Green: Providers**
- **Blue: Payments**
- **Purple: Policies**

AN EMERGING CONSUMERISM: There is a shift among the American population from wanting to be regarded as “patients,” to one in which they view themselves as health care “consumers” with differing behaviors, expectations and needs. ADA 2013 Report

The increase in dentists may meet the continued demand, and perhaps create a surplus, in the private sector. However, there are not likely to be sufficient providers to meet the demand in the growing publicly insured sectors of the population. **PRESSURES ARE GROWING FOR AN EXPANDED DENTAL TEAM TO PROVIDE PREVENTIVE AND RESTORATIVE SERVICES:** In the virtual dental home model, a mid-level practitioner in a community setting (e.g. school) performs a visual exam and takes radiographs which the remote dentist reviews and uses to develop a treatment plan. The dentist may then recommend that the mid-level practitioner administer the care under his/her remote supervision. ADA 2013 Report

PAYMENT FOR DENTAL SERVICES IS SHIFTING FROM COMMERCIAL DENTAL INSURANCE TO PUBLIC COVERAGE AND PERSONAL OUT OF POCKET PAYMENTS. Health coverage is changing as employers are becoming less likely to provide health insurance, and the public programs provide coverage to more Americans. Interviews with dental plans showed a trend toward cost containment through smaller provider networks and diminished reimbursement with increased accountability through metrics on utilization, provider profiling and cost controls. ADA 2013 Report

There will be a continued drive for dental diagnostic codes to monitor efficacy and quality of treatments and track population health and disparities. The adoption of electronic dental records will also enhance the ability to track the necessary metrics. Implementation of these processes will be more practical in larger practices that cover more consumers over a longer period of time. ADA Report 2013

Practice Implications

In the coming years, the solo practice will become less dominant as more cost-efficient, larger practices predominate... With increased pressure from dental plans, practices will need to incorporate new data systems that can track outcome metrics as well as integrate with health records. Individual consumers with increasing out-of-pocket dental expenses will seek value and become more cost-conscious... Third party payors are seeking to contract with a limited group of practices to reduce administrative costs and drive down reimbursements... While alternate practice models such as corporate practices or dental management services organizations are growing at a slow rate, they are predicted to experience continued growth... Multi-location practices are receiving an increasing percentage of dental receipts and new dentists are more receptive to working in these practices... As the increasing number of women entering dentistry attempt to balance family and professional lives, they will be more open to practices other than solo practice... As Accountable Care Organizations mature under health reform they will begin to seek the inclusion of oral health and seek the same measures of outcomes, quality and efficiency. ADA Report 2013

Conclusion

Many challenges are confronting dentistry and the status quo is unsustainable...This is a critical moment for the profession...To ignore the shifting landscape is to lose control and allow others determine the future of dentistry. ADA Report 2013

Can Organized Dentistry adapt and meet these challenges?

Organized dentistry: Professional orders and colleges, provincial, national and international associations, academies and federations, local and regional societies, etc.; i.e. all of those wonderful affiliations to which we adhere, pay for, and hope to benefit from.

Clinical Dental Research:

Both the **FDI's Vision 2020 report** and the current **ADA 2013** report are making a plea for the transitioning of our Profession from its status quo policies. They underline the urgent need to introduce measures that will ensure the long-term revitalization and continued autonomy of Dentistry as a professional entity. Little doubt remains as to the need for us, as individual practioners, to commit to this pressing endeavour. I remain, however, somewhat cynical over Organized Dentistry's record for implementing meaningful changes. Consider the Dental Research models that, for decades now, have been calling on our organizations to evolve and adapt.⁵ Have they?

The dismal track record of Clinical Dental Research, for instance, which is the backbone of oral health care delivery, is summarized in the following **Assessment of Guidelines for Dental Procedures**.⁶ Table I illustrates the distribution of Systematic Reviews of the various dental specialties, evaluating the scope of the evidence they provide. After nearly a decade of Evidence Based Dentistry theory and training, a number of specialties still fail to meet minimal scientific standards. Just have a look at the paltry Prosthetic Dentistry results.

TABLE I. Distribution of systematic reviews in different dental specialties			
Specialty	No. of reviews	No. of reviews reporting adequate evidence	Percentage of reviews reporting adequate evidence
Cariology/Restorative dentistry	26	8	31
Endodontics	5	0	0
Implantology	14	2	14
Periodontics	10	3	30
Oral and maxillofacial surgery	19	3	16
Orthodontics	15	3	20
Prosthetic dentistry	6	0	0
Others	25	7	28

Here's another example of the lack of dental research leadership on the part of Organized Dentistry, produced by the **Canadian Agency for Drugs and Technologies in Health (CADTH)**. In 2013, its **Summary with Critical Appraisal on "Neuromuscular Occlusion for Diagnosis and Treatment of Temporomandibular Joint Disorders: A Review of the Clinical Evidence"**⁷ ascertained the following:

"It was shown that electromyography produced a wide range and inconsistent values of specificity and sensitivity that prevent its adoption as a diagnostic test for TMD. These EMG indices were not consistently different between TMD patients and the healthy controls." In other words, the results were inconclusive and should never have been heeded. Yet somehow, these basic scientific verifications escaped Organized Dentistry. Such an oversight, in turn, generated numerous malpractice litigations as well as ongoing oral rehabilitation controversies.

Government is Stepping In:

So now, with such a dismal track record, don't be surprised if you notice extraneous entities showing up in our jurisdiction. A case in point: The Québec Government's Regulatory Agency, the Office des Professions, published its 2013 report: *Le Comité d'experts sur la modernisation des pratiques professionnelles dans le domaine buccodentaire*.⁸ Translated, it reads: The committee of experts on the modernisation of professional practices in the dental field.

This report's conclusions are devastating for Organized Dentistry; such as its recommendation to take away the laboratory work order prescription for dental appliances and prostheses from the dentist's professional responsibility and hand it over to the dental laboratory, giving it complete autonomy for the design, material selection and manufacturing procedures.

In over 40 years of working closely with dental technicians, I have never been exposed to such demands. Where does this come from? What is the motive for wanting to marginalize the dentist's authority as the Dental Team Leader? To top it

off, I should mention that this Regulatory Agency operated without the presence of an Order of Dentists of Québec representative since the latter refused to participate in such a sham.

Dental Consumerism

Affordability: In view of bleak dental spending projections in this ADA Report, and of patients becoming "dental consumers", Organized Dentistry needs to ensure that oral care remains financially accessible. A recent research article⁹ concluded the following: *"This study suggests that affordability issues in accessing dental care are no longer just a problem for the lowest income groups in Canada, but are now impacting middle-*


income earners as a consequence of their lack of, or decreased access to, comprehensive dental insurance.” If we don’t take the bull by the horns, then the marketplace will go as far as providing self-treatment dental kits.¹⁰ You’ve got to see this!

Increased efficacy: One way to reduce fees is to reduce costs. The DGPA, Dental Group Practice Associations that are described in this ADA Report, are just one viable option for improving dental practice efficacy. Couldn’t Organized Dentistry think of other options? Here are a few suggestions:

- **Generate high standards of Evidence Based Treatments using Dental Practice Based Research (DPBR) networks:** Make no mistake, “dental consumers” will be demanding more evidence based documentation for dental procedures, materials and technologies, as they shop around for a dental care provider. Accordingly, Organized Dentistry must initiate and support networking activity among all dentists through their mandatory participation in DPBR. This is where the standardized Patient Electronic file becomes indispensable.
- Organized Dentistry should also be in charge of providing innovative **Practice Management Tools** in order to significantly reduce equipment, instrumentation, sundries and laboratory costs for dental practices. Dentists can and ought to, pool their resources, through Organized Dentistry, in order to obtain significant purchasing discounts directly from manufacturers. In other words: negotiate group prices and eliminate the middle man wherever possible. Then afterwards, these same dentists will rate the products and technologies, not only for their performance, but in terms of their cost efficiency and overall value. It is up to us to hold the reins of our practices.
- And there’s the high cost of **Dental Education** to consider. This factor, according to the ADA report, determines the practice environment that graduates opt for. Dental Faculties cost a lot to run. Why not offer networking incentives to Dental Faculties for sharing some online courses, thereby reducing duplication? Imagine if students could access the best lecturers, while saving substantially on tuition? Organized Dentistry could achieve such a project.
- **Conclusions:** While dental practitioners are rightfully held accountable for every professional act they undertake, that same high standard of accountability should also apply to Organized Dentistry. We need, and should expect, more from our professional associations. That is their job, since they are propelled by their membership.
- As for Information Technology applications supporting Dentistry’s credibility, their numbers and levels of

evidence based standards are still lacking. Organized Dentistry must be instrumental in bringing our profession to a much improved quality and quantity of research, unassailable by public scrutiny.

- And finally, our Organized Dentistry needs to be more hands-on and widespread in representing its members among policy makers.¹¹

Your Editorial Board members join me in wishing you and your families a Happy and Peaceful Holiday Season. 



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Une profession en transition: La réfection du paysage dentaire



Dr. Hubert Gaucher

Dr. Hubert Gaucher, BA, DDS, MScD, FADI, FCARDP

Rapport ADA 2013:

“Si nous ignorons la dynamique santé/consommateur, nous livrons, par le fait même, l’avenir de notre profession à d’autres.”

Nos lecteurs se souviendront de l’éditorial dans notre Journal de l’été 2013, mettant en relief le document de la FDI sur la **Vision 2020**¹ intitulé: “Shaping the Future of Oral Health”. Dans la même veine, voici des bribes du récent rapport du ADA.²

Pourquoi une publication nationale canadienne comme la nôtre s’intéresserait-elle à des rapports internationaux? Et bien, lorsqu’il s’agit de services de soins dentaires professionnels, il n’existe pas de frontières. Avec l’information instantanée accessible au bout de nos doigts *www*, et vu que la pratique de 190,000 dentistes aux États-Unis affecte sans aucun doute leurs cousins du nord, nous aurions tort d’ignorer ce qui se passe chez-eux. Si les pourvoyeurs de soins restaurateurs et prosthodontiques ne s’impliquent pas rapidement dans la gestion de leur propre orientation, alors d’autres s’occuperont de le faire. D’ailleurs, cette tendance est déjà entamée!

Une section fort intéressante de ce rapport du ADA vise les nouvelles directions que prendra la dentisterie.³

“The population is getting older and more diverse, leading to different disease patterns, care-seeking behavior and ability to pay... Consumers are becoming more astute purchasers of health care and seeking value for their spending... Pressures are growing for an expanded dental team to provide preventive and restorative

services... Commercial dental plans are increasingly using more selective networks, demanding increased accountability through data and performance measures, and pressuring providers to reduce costs...”

Les implications pour la pratique dentaire de cette perspective du futur³ sont représentées par les quatre entités chromacodées suivantes:

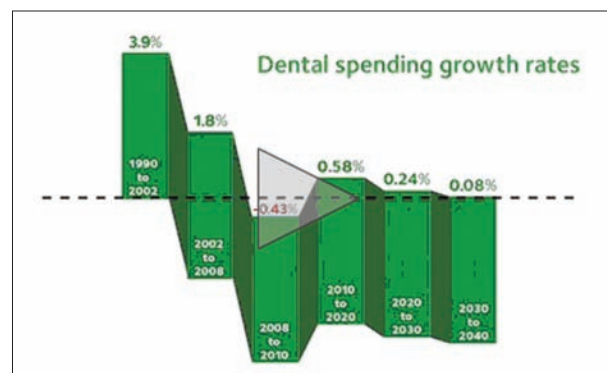


Figure 1: ADA 2013 Report Video 4: A Profession in Transition

Voici un échantillon des conclusions relatives à chacune de ces couleurs:

- Rouge: People
- Vert: Providers
- Bleu: Payments
- Violet: Policies

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La dentisterie organisée est-elle en mesure de rencontrer ces défis et de s'adapter en conséquence?

Dentisterie organisée: Ordres et collèges professionnels, associations provinciales, nationales et internationales, académies et fédérations, sociétés locales et régionales, etc.; i.e. toutes ces affiliations auxquelles nous adhérons et desquelles nous souhaitons bénéficier.

La recherche dentaire clinique:

Les rapports de FDI Vision 2020 ainsi que celui du ADA 2013 nous supplient d'effectuer une transition dans notre profession en soulignant l'urgence d'introduire des mesures qui assureront la longévité et l'autonomie professionnelle de la Dentisterie. Il y a peu de doute que, en tant que praticiens individuels, nous devons nous engager dans ce sens. Cependant, j'entretiens un certain cynisme vis-à-vis de la volonté de la Dentisterie organisée à réaliser des changements probants. Nous n'avons qu'à remarquer l'évolution de nos organismes au fil des dernières décennies pour constater qu'ils ne se sont pas maintenus au courant ni adaptés aux modèles contemporains de la recherche dentaire.⁵

La piètre performance de la Recherche dentaire clinique est résumée dans le tableau ci-bas, **Assessment of Guidelines for Dental Procedures**.⁶ Il montre la distribution des revues systématiques des différentes spécialités dentaires, évaluant l'envergure des preuves s'y rattachant. Or, même après plus de

different between TMD patients and the healthy controls.” Autrement dit, les résultats étaient peu concluants. Pourtant, la Dentisterie organisée a manqué à l'appel pour faire une vérification scientifique aussi élémentaire. Cette omission, en revanche, a généré moult litiges et controverses, sans compter les dommages causés aux patients.

Le gouvernement commence à s'en mêler:

Alors maintenant, ne soyez pas surpris de voir s'immiscer des entités étrangères dans notre juridiction. En voici un cas: l'Office des professions du Québec a publié un rapport en 2013 intitulé: Le Comité d'experts sur la modernisation des pratiques professionnelles dans le domaine buccodentaire.⁸

Ses conclusions sont dévastatrices pour la Dentisterie organisée. Il recommande, entre autres, d'éliminer le rôle du dentiste pour la prescription d'appareils et de prothèses afin de céder cette responsabilité professionnelle au laboratoire dentaire, conférant à ce dernier l'autonomie et l'autorité totale en matière de design, sélection de matériau et procédures de fabrication.

Dans mes quarante années de proche collaboration avec les techniciens dentaires, je n'ai jamais encouru une telle exigence. Quelle en est l'origine? Quel est le motif pour vouloir marginaliser la compétence du dentiste en tant que responsable de l'équipe dentaire? Je dois ajouter que ce comité a agi en l'absence d'un représentant de l'Ordre des dentistes du Québec, puisque ce dernier a refusé de participer à un tel cirque.

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Others	25	7	28

Consommérisme dentaire

Situation pécuniaire: Étant donné les sombres prévisions des moyens financiers du patient dentaire, et le fait que ce patient devient progressivement un consommateur dentaire, la

dix ans de théories et de pratique dentaire basées sur les faits, bon nombre de spécialités ne rencontrent toujours pas les critères scientifiques minimaux. Je porte votre attention sur la dentisterie prothétique.

Voici une autre occurrence du manque de direction en recherche dentaire de la part de la Dentisterie organisée: L'agence canadienne des médicaments et des technologies de la santé (ACMTS), dans son évaluation critique concernant l'occlusion neuromusculaire pour le diagnostic et le traitement de troubles de l'articulation temporomandibulaire, ont conclu:⁷ *"It was shown that electromyography produced a wide range and inconsistent values of specificity and sensitivity that prevent its adoption as a diagnostic test for TMD. These EMG indices were not consistently*

Dentisterie organisée doit assurer l'accessibilité des soins bucco-dentaires à la population. Un article de recherche récent⁹ conclut: *"This study suggests that affordability issues in accessing dental care are no longer just a problem for the lowest income groups in Canada, but are now impacting middle-income earners as a consequence of their lack of, or decreased access to, comprehensive dental insurance."* Si on ne prend pas le taureau par les cornes, c'est le marché qui se chargera de fournir à la population l'accès à des traitements. Exemple?¹⁰ On en est rendu là.

Efficacité accrue: Une façon évidente de diminuer les honoraires est de diminuer les coûts. Le DGPA (Dental Group Practice Associations), qui est décrit dans le rapport du ADA, représente une option viable pour améliorer

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l'efficacité d'une pratique dentaire. Notre Dentisterie organisée ne pourrait-elle pas en faire autant? Voici quelques suggestions:

- **On ne peut trop insister sur la nécessité d'exiger des standards de haut niveau dans la recherche dentaire basée sur les faits et de réseauter nos données: Ouvrons grands les yeux,** car les consommateurs de soins dentaires deviennent très vite des consommateurs de services dentaires et ils réclameront la documentation pertinente aux interventions, matériaux et technologies que l'on propose avant de fixer leur choix sur un «pourvoyeur» dentaire. Ce n'est qu'en consolidant nos résultats de recherche et toutes autres ressources, par le biais de réseaux, que la Dentisterie organisée jouera son rôle premier. Elle devra initier et supporter la participation obligatoire de tous les dentistes dans cet effort. C'est aussi à ce niveau que le dossier électronique du patient deviendra indispensable.
- La Dentisterie organisée aura à fournir aux dentistes les outils essentiels d'une gestion de pratique novatrice et efficace, dans le but de réduire les coûts de l'équipement, des fournitures et de l'instrumentation dentaire. L'union fait la force, alors profitons de nos regroupements pour obtenir des rabais importants directement des manufacturiers en négociant les prix et, dans la mesure du possible, en éliminant les revendeurs. Ensuite, que les dentistes évaluent la performance et la valeur de ces mêmes produits et que les résultats de leurs évaluations soient distribués parmi tous les dentistes. Il n'en tient qu'à nous de maintenir le contrôle de nos pratiques.
- Et puis, on doit tenir compte du coût élevé de la formation. Selon le ADA, ce facteur précise le type de pratique que le finissant choisira. Le coût de mener une

faculté dentaire est exorbitant, alors pourquoi ne pas offrir des incitatifs aux facultés qui partagent leurs ressources? En minimisant les duplications via des cours en ligne, nous pouvons garantir le standard de l'enseignement et du contenu didactique tout en faisant profiter de ces épargnes aux étudiants. La Dentisterie organisée, encore une fois, pourrait entreprendre un tel projet.

- **Conclusions:** Puisque le dentiste est garant de tous ses actes professionnels, cette même responsabilité ne devrait-elle pas aussi être reflétée par la Dentisterie organisée? Ne craignons pas d'exiger de nos organismes des interventions ponctuelles à plusieurs niveaux de notre profession. Étant donné qu'ils sont propulsés par leurs membres, il va de soi que c'est la tâche des organismes représentants de défendre les intérêts du groupe.
- Quant aux applications des technologies de l'information qui se chargent de la crédibilité de notre profession, leurs nombres et leurs niveaux de qualité de recherche basée sur les faits sont en souffrance. C'est l'obligation de la Dentisterie organisée d'améliorer la quantité et la qualité de la recherche dentaire, avec des résultats percutants et incontestables.
- Et pour terminer, la Dentisterie organisée se voudra beaucoup plus impliquée dans la représentation de ses membres auprès des instances décisionnelles.¹¹

Je me joins à mes collègues du comité de rédaction pour vous souhaiter, ainsi qu'à votre famille, de Joyeuses Fêtes. DTJ

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Bacterium That Causes Gum Disease Packs a One-Two Punch to the Jaw

The newly discovered bacterium that causes gum disease delivers a one-two punch by also triggering normally protective proteins in the mouth to actually destroy more bone, a University of Michigan study found.

Scientists and oral health care providers have known for decades that bacteria are responsible for periodontitis, or gum disease. Until now, however, they hadn't identified the bacterium.

"Identifying the mechanism that is responsible for periodontitis is a major discovery," said Yizu Jiao, a postdoctoral fellow at the U-M Health System, and lead author of the study appearing in the recent issue of the journal *Cell Host and Microbe*.

Jiao and Noa Hiro Inohara, research associate professors at the U-M Health System, worked with William Giannobile, professor of dentistry, and Julie Marchesan, formerly of Giannobile's lab.

The study yielded yet another significant finding:

the bacterium that causes gum disease, called NI1060, also triggers a normally protective protein in the oral cavity, called Nod1, to turn traitorous and actually trigger bone-destroying cells. Under normal circumstances, Nod1 fights harmful bacterium in the body.

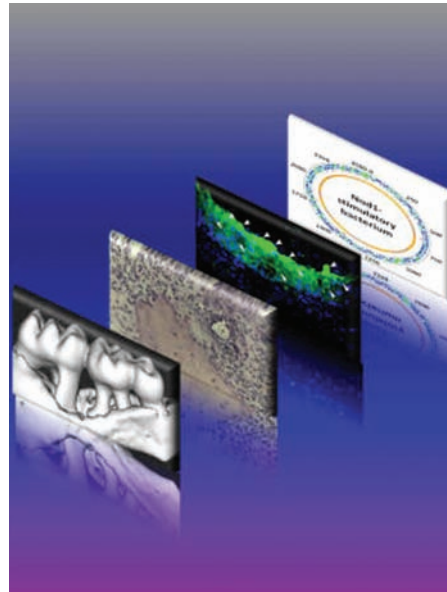
"Nod1 is a part of our protective mechanisms against bacterial infection. It helps us to fight infection by recruiting neutrophils, blood cells that act as bacterial killers," Inohara said. "It also removes harmful bacteria during infection. However, in the case of periodontitis, accumulation of NI1060 stimulates Nod1 to trigger neutrophils and osteoclasts, which are cells that destroy bone in the oral cavity."

Giannobile, who also chairs the Department of Periodontics and Oral Medicine at the U-M School of Dentistry, said understanding what causes gum disease at the molecular level could help develop personalized therapy for dental patients.

"The findings from this study underscore the connection between beneficial and harmful

bacteria that normally reside in the oral cavity, how a harmful bacterium causes the disease, and how an at-risk patient might respond to such bacteria," Giannobile said.

(Source: The above story is based on materials provided by University of Michigan.)



Being Overweight Linked to Higher Risk of Gum Disease

Impacting approximately one-third of the U.S. population, obesity is a significant health concern for Americans. It's a risk factor for developing type 2 diabetes, heart disease, and certain forms of cancer, and now, according to an article published in the January/February 2013 issue of *General Dentistry*, the peer-reviewed clinical journal of the Academy of General Dentistry (AGD), it also may be a risk factor for gum disease.

We know that being overweight can affect many aspects of a person's health," says Charlene Krejci, DDS, MSD, lead author of the article. "Now



researchers suspect a link exists between obesity and gum disease. Obese individuals' bodies relentlessly produce cytokines, proteins with inflammatory properties. These cytokines may directly injure the gum

tissues or reduce blood flow to the gum tissues, thus promoting the development of gum disease."

Half of the U.S. population age 30 and older is affected by gum disease – a chronic inflammatory infection that impacts the surrounding and supporting structures of the teeth. Gum disease itself produces its own set of cytokines, which further increases the level of these inflammatory proteins in the body's bloodstream, helping to set off a chain reaction of other inflammatory diseases throughout the body.

Research on the relationship between obesity and gum disease is still ongoing.

"Whether one condition is a risk factor for another or whether one disease directly causes another has yet to be discovered," says AGD Spokesperson Samer G.

Shamoon, DDS, MAGD. "What we do know is that it's important to visit a dentist at least twice a year so he or she can evaluate your risks for developing gum disease and offer preventive strategies."

The best way to minimize the risk of developing gum disease is to remove plaque through daily brushing, flossing, rinsing, and professional cleanings.

"A dentist can design a personalized program of home oral care to meet each patient's specific needs," says Dr. Shamoon.

To learn more about oral health, visit: KnowYourTeeth.com

Story Source:

- The above story is based on materials provided by Academy of General Dentistry.

Stem Cells Found in Gum Tissue Can Fight Inflammatory Disease

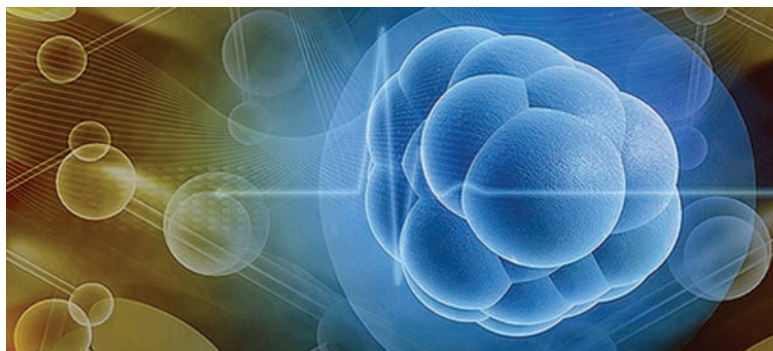
Stem cells found in mouth tissue can not only become other types of cells but can also relieve inflammatory disease, according to a new Ostrow School of Dentistry of USC study in the *Journal of Dental Research*.

The cells featured in the study are gingival mesenchymal stem cells (GMSC), which are found in the gingiva, or gum tissue, within the mouth. GMSC, like other stem cells, have the ability to develop into different types of cells as well as affect the immune system.

"Gingiva is very unique in our body," says Professor Songtao Shi, the study's senior author. "It has much less inflammatory reaction and heals much faster when compared to skin."

Previously, the developmental origins and abilities of GMSC hadn't been fully illustrated. This study shows that there are two types of GMSC: those that arise from the mesoderm layer of cells during embryonic development (M-GMSC) and those that come from cranial neural crest cells (N-GMSC). The cranial neural crest cells develop into many important structures of the head and face, and 90 percent of the gingival stem cells were found to be N-GMSC.

The two types of stem cells vary dramatically in their abilities. N-GMSC cells were not only easier to change into other types of cells, including neural and cartilage-producing cells; they also had much more of a



healing effect on inflammatory disease than their counterparts. When the N-GMSC cells were transplanted into mice with dextrate sulfate sodium-induced colitis – an inflamed condition of the colon – the inflammation was significantly reduced.

The study indicates that the stem cells in the gingiva – obtained via a simple biopsy of the gums – may have important medical applications in the future.

"We will further work on dissecting the details of the gingiva stem cells, especially their notable immunoregulatory property," says first author Xingtian Xu, specialized lab technician at the Ostrow School of Dentistry Center for Craniofacial Molecular Biology.

"Through the study of this unique oral tissue, we want to shed the light on the translational applications for improving skin wound healing and reducing scar formation."

The study was funded by the National Institute of Dental and Craniofacial Research.

Story Source:

- The above story is based on materials provided by University of Southern California.



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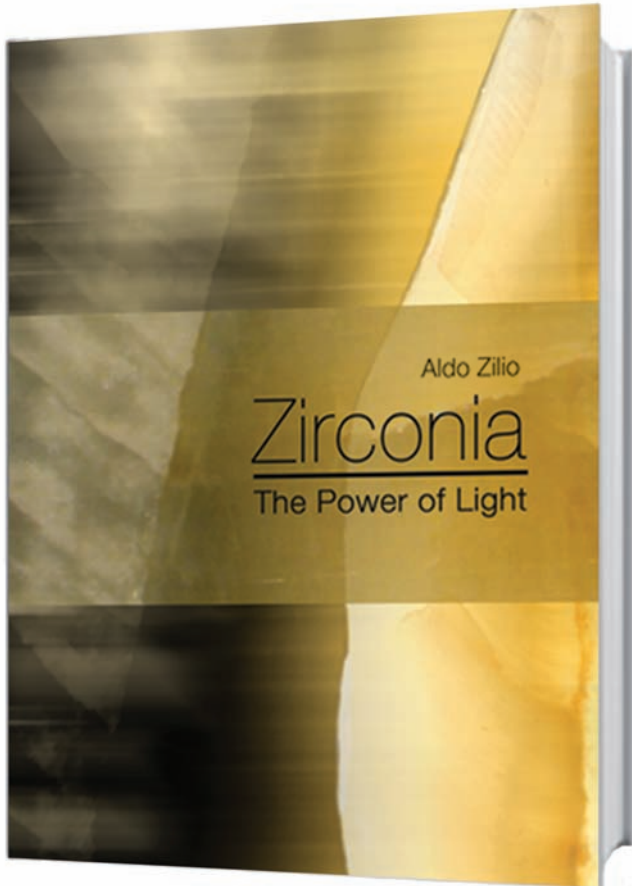


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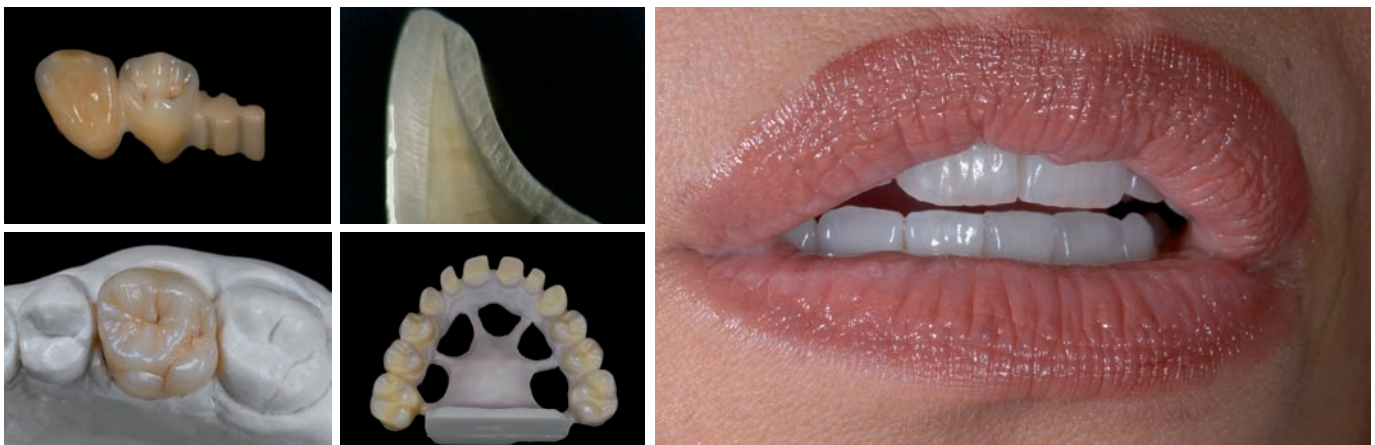
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The renowned scientific committee of the CAMLOG Foundation, chaired by Prof. Mariano Sanz, Spain, and Prof. Fernando Guerra, Portugal, is responsible for the first-class quality of the presentations at the Congress.

The surgical and prosthetic concepts and recommendations developed by a team of experts from 18 countries for the 1st and 2nd CAMLOG Consensus Reports are at the core of the program. These reports have been and will be worked out by a renowned team of experts from 18 countries during meetings in 2013 and 2014. It has to be particularly pointed out that the 1st CAMLOG Consensus Report has recently been accepted for publication by the renowned Clinical Oral Implant Research Journal. The CAMLOG Consensus Reports serve as a basis for questions relating to daily practice and these will be addressed at the Congress in Valencia both from academic and practical points of view.

The finishing touch at the end of the Congress will consist of case discussions on the controversial issue "Complications – what can we learn from them?" with a panel discussion also involving volunteers from the audience.

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Ivoclar Vivadent AG CEO Robert Ganley Honored at American College of Prosthodontists Conference in Las Vegas

Ivoclar Vivadent AG, of Schaan, Lichtenstein CEO Robert Ganley, was honored at the American College of Prosthodontists 2013 Annual Session at Caesars Palace in Las Vegas on October 10. He was recognized with Brasseler USA Chairman, President and CEO Don L. Waters as Honorary Directors of the ACP Education Foundation.

"I'd like to thank the American College of Prosthodontists (ACP) and its members for presenting me with this honor. Prosthodontists play a vital role in advancing quality dentistry today to improve patient outcomes," said Mr. Robert Ganley, CEO of Ivoclar Vivadent worldwide.

"Over the years, Ivoclar Vivadent has enjoyed its wonderful relationship with the ACP. As an Honorary Director of the Education Foundation, I promise to carry on the rich tradition of the foundation and its purpose."

As the Chief Executive Officer of Ivoclar Vivadent, AG, Mr. Ganley is responsible for the worldwide business of Ivoclar Vivadent and has been with the organization for more than 30 years. Under Mr. Ganley's direction, the organization has become the worldwide leader in innovative materials and processes for quality, esthetic dentistry. After graduating from St. Bonaventure University with an undergraduate degree in Mathematics, he received a Masters of Business Administration degree from the State University of New York at Buffalo.

Mr. Ganley began his career with KPMG. In 1980, he moved to Ivoclar Vivadent, Inc., as Vice President. He was named President of Ivoclar Vivadent North America in 1990, and, in 2003, he was appointed Chief Executive Officer of Ivoclar Vivadent AG in Schaan, Liechtenstein. Mr. Ganley was named an Honorary Director of the ACPEF Education Foundation earlier this year.

BioHorizons Canada is pleased to announce the appointment of Gilles Poitras as the Eastern Canada Regional Manager



BioHorizons Canada is pleased to announce the appointment of Gilles Poitras as the Eastern Canada Regional Manager. Gilles comes back to BioHorizons with a long list of achievements in the field of international business development, which were always people driven. After 2 years as the Director of the Canadian Implant Institute and 5 years as a Product Support Specialist at BioHorizons, Gilles went on to be the Vice-President International Business Development of a high-tech company as well as Director of International Business Development for a division of high-end stainless steel wine fermenters.

We are proud to have Gilles back at BioHorizons. With the entire team of BioHorizons' Product Support Specialists for Eastern Canada and everyone else at BioHorizons, Gilles will pursue his goal of providing our customers with the means to grow the care to their clientele.



Congratulations!

Congratulations to Mr. Dave Hunt, Sales and Marketing Manager at Shaw Lab Group. On Tuesday, September 10th, 2013 Dave was formally recognized and celebrated for his exceptional volunteer service at the University of Toronto.



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ASK THE EXPERTS

Hiring New Team Members

Q: For so many years I had no need to hire, now I find myself needing to hire a hygienist and a business team member. Can you give me some techniques that will be helpful?

Dale Tucci explains:

A: Thanks for this question. Recruiting is a topic I could write volumes about, however for this brief column I will pare the subject down into tips you can use immediately.

Before you begin the recruiting process start by clarifying the personality attributes, skill sets, experience and qualities you are looking for with each new team member. The next step is to develop detailed job descriptions for the business person and hygienist which include the performance measurements.

Once you have these basics completed, place ads on the web, newspapers, educational institutions, professional web sites and of course, network. I suggest creating a separate email address for potential candidates to forward resumes and cover letters. Typically the responses are brisk so you and/or a team member will sort through the resumes until you have a stack of potential candidates.

I recommend you determine how the pre-screening of candidates will be completed and by whom. It is far too labour intense to interview all candidates in person so a pre-screening process will make this process more efficient. I personally believe a brief ten minute telephone interview should be focused less on the details of the conversation and more on the enthusiasm, friendliness and flow of conversation. Why is the pre-screening interview such a valuable

tool? Simply put, patients need to connect to team members on a human level first and foremost. The existing team members and patients move toward people with the likability factor. This short telephone interview should result in sorting candidates into those to schedule for an in person interview.

Arrange the interviews for one hour per candidate whether you use all the time or not. Keep in mind candidates are also deciding if they want to join your team, so making a good impression applies to the candidates and the employer. Schedule the interviews with the employer and a team member with each having portions of the interview to conduct.

The interview format should include a mix of specific questions about skills sets and experience as well as questions that may put the candidate under stress. The person will demonstrate their natural reaction to feeling under pressure. For example, does the person shift in their seat, stop talking, speak quickly or do they calmly answer the question. Asking questions about resolution of conflict and the manner in which the candidate deals with it gives you invaluable insight. Another question to include in interviews is asking candidates how they learn new information. Do they prefer hands-on training or prefer reading manuals? Record their preferences because even a very experienced person must adapt and learn how to integrate into a new practice.

During the interview it is equally important for the candidate to have opportunities to ask questions. Be sure to pause throughout the interview and invite the person to ask questions. The interview



Dale Tucci is owner and president of Tucci Management Consultants Inc. Dale and her team offers a wide

variety of custom practice management solutions, transition planning, business coaching, associate recruiting, marketing and human resource services. You can reach Dale Tucci directly at 416.450.8769 or via email at: dale.tuccimgmt@gmail.com www.daletucci.com




Amy Rose-Jones is the marketing manager at Dental Design Ltd, the leading design and marketing agency for the dental

profession. With more than 10 years of dental marketing experience, Amy has a passion for driving businesses forward through a unique blend of design and marketing skills.



Nadean Burkett is a career and business transition coach with more than 30 years experience in the dental profession — now assisting

accountants and other professionals in private practice by referral. Trusted practice evaluator, business planner and respected coach and advisor for the past 10 years - Nadean facilitates The EMPOWERMENT Program series, Career & Practice Management for Dentists both online and from NBAI's head office situated in beautiful Vancouver, British Columbia. Visit www.mypacticematters.com email nadean@mypacticematters.com for listings, job postings, & more resources with your practice transition coach.



“Dale Tucci found a great candidate who purchased my half of the partnership and the team aided me in selling shares with the lifetime capital gain exemption. I highly recommend this presentation to dentists at all stages of their careers.”

- Dr. Gerry Ross, General Practice, Tottenham, Ontario

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is meant to be an exchange between the employer, team member and candidate. This conversational interview style will create a rhythm to keep the dialogue flowing and create a comfortable environment.

The interviews should be documented as the details cannot be remembered for each interview. At the second interview refer to the first interview notes and ask probing questions to expand on previous responses. At a second interview, I strongly suggest you ask the candidates to observe in the office for a few hours. Observation sessions will allow other team members to meet potential candidates, see how the candidates interact with patients and team and assess the candidates comfort level in the office.

If you are now ready to hire then proceed by reviewing the job description and complete a job offer for the candidate. The job offer document would be signed by the new hire and employer. Develop a four week training plan as a guide to integrate the new employee and assess weekly progress.

In conclusion, by breaking down recruiting into steps and using effective tools the hiring process can be simplified.

Accessing Website with Mobiles and Tablets

Q: Many clients seem to be accessing the practice website with tablets and

mobiles. How do I go about adapting my website accordingly?

Amy Rose-Jones says:

A: As smartphone and tablet adoption rapidly increases, so does the importance of a mobile-friendly website to any business - a dental practice is no exception.

But, it's no longer enough to have a desktop website only, or a separate mobile website - your Google Analytics will confirm this. Upwards of 30% of all traffic will now originate from a mobile / tablet, making a positive browsing experience for your patients, across all platforms, absolutely crucial.

The solution is simple; responsive website design - as recommended by Google. Google describes responsive website design as "industry best standard" for all website owners and, with 67 percent search market share, when Google speaks, it pays (in digital currency) to listen.

So, what is responsive website design? Simply put, a responsive website will interrogate your browser and automatically adapt the website design accordingly. It's a one size fits all website marketing strategy. For instance, if you're viewing on a mobile, the navigation will become "thumb - friendly" and telephone numbers will be designed to "click-to-call". As a device gets smaller, less information will be available - and you get to dictate what stays, and what goes. It's clever

stuff. Common sense dictates that navigation and contact details remain as the most important features across all devices, but you can tailor this fully to your requirements.

Use an online tool such as www.responsinator.com to see how your website will look on the most popular devices in various orientations. It can replicate the iPhone, iPad, Kindle and Android smartphones - amongst others.

You have two real options. The first is to simply convert you current website - this is the most cost effective solution, and will set you back no more than £1,500 (CA \$2517.32).

If, however, you are unhappy with your current website, or it's underperforming (for reasons other than accessibility) a full website re-design may be required and that will likely cost somewhere in the region of £2,500 (CA \$4195.80) upwards.

It's worth nothing that mobile sales have already overtaken desktop sales, and mobile internet usage is predicted to overtake desktop internet usage by 2014. It is only logical that mobile search will overtake desktop search at some point in the near future as well. I look forward to the day that all website are responsive as standard. Until then, it's my opinion that making cost an obstacle is a marketing mistake.

Buying or Selling a Practice

Q: "Is now a good time to buy or sell a practice?"

Nadean Burkett answers:

A: This is a frequently asked question by young, associate dentists and mature practice owners, general practitioners and specialists. The answers are "yes" and "yes", "no" and "no"; depending on location, and personal needs and expectations.

The choice to acquire (buy) a practice should be as part of a comprehensive business plan with a clear, well-defined vision. The first question to ask oneself is, "why?". To some the answer is simple – money. Cash flow is what keeps a practice viable; profit is what provides business contingency fund, retirement nest-egg, and freedom to make lifestyle choices. Practice acquisition should always be considered an investment, not a purchase; therefore, there should be reasonable expectation of profitability based on both the transferable practice performance and your skills.

The most desirable practices are those generating \$1M+ in revenue, and with low overhead. Practices in this category are attractive to virtually every

Purchaser. Supply and demand strongly influences price that the market will bear. In turn, value and return on the investment are diminished. Values of solo practices are currently 1-3 times earnings (net income after operating expenses). Multi-practice DSOs may be valued at up to 10x earnings!

The decision to sell one's practice is often motivated by frustration, stress or "burn-out". The negative effect of those circumstances can often be seen in the clinic and practice performance. Selling in distress or under duress usually devalues the opportunity – who wants to take on someone else's headaches? One should also consider life after the sale – will you be happier not making decisions, dealing with staff issues and being responsible for the mundane daily management? Will you be able to bear living with the policies, rules and regulations of others when you are not the owner? Be careful what you wish for...

In today's changing landscape for dental professionals, there are many more career and business options. It is said that timing is 70% of success. That is especially true in the dental profession. Make an informed decision – ask questions (lots of them!), understand the challenges inherent in any opportunity, and resist being motivated by fear. ☐☐☐

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What Matters

Nadean Burkett

Social media sites are buzzing with blogs and discussions about how to survive the tough market conditions that continue to plague dental practices throughout North America. Clearly some practices are failing, others are struggling, but there are still those that continue to not only survive but even thrive. How we define success influences what results we expect and what we are prepared to do to turn challenges into opportunity?

First and foremost, it is important to compete only with yourself – be inspired by those you admire to aspire to achieve your own success. **Albert Einstein said, “Not everything that counts can be counted and not everything that can be counted counts.”** Successful people know that real success is the freedom to make your own decisions, to do what you love and enjoy what you do every day. We all have financial obligations which need to be met personally and in business. Revenues are and will always be a result of our success in meeting expectations and demands of our clients. Failing to recognize this

jeopardizes the foundation of every professional practice – our relationships.

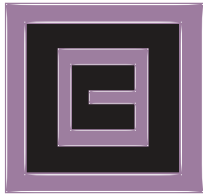
Prepare your practice plan and use it to establish strategies, budgets, policies and systems. When the plan is comprehensive – considers all five components of a complete business plan – the result is a guide that will keep you focused on your goals, vision and guiding principles. Making choices may not be easier, but they will be simpler. With practice, guided by the plan, you will learn how to make confident choices when facing challenges and obstacles.

Avoid assumptions, especially about how people choose services. Know yourself, your patient and community profile. How will or do you fit in to the community you serve? How will or do you differentiate yourself from others? Anticipate change and use your plan as a guide to adapt to those changes. Otherwise, you may be spending time and money chasing after unattainable goals. Our best source of referrals and new business is still WOM (word of mouth). Learn how to use social media to accelerate good news and opinions from your raving fans. The best way to get what we need is to help others get what they want. How do you give back to your community?

Be genuine and transparent. As service providers we must remember that people “vote” with their feet. **Tom Peters tells us “to under-promise and over-deliver”.** Attempts to manipulate decisions for our short term benefit are more likely to adversely affect our long term relationships than to enhance them. The result of this damage can be deep and prolonged. Educate and inform first, then provide options that will allow the client to make their own decision. Be patient and supportive. Listen. Service-based businesses rely on referrals and return visits for sustainability and growth. The expectation that our practice is in a growth cycle and is both sustainable and manageable may not be realistic depending on your location and other business cycle factors. The evolution of every practice results in structural and operational dynamics that may go unnoticed until a



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crisis arises that forces us to react rather than respond. What are you and your team doing right? How can you improve?

Be accountable. Stand up for your employees. Be seen to be doing the right thing rather than being right. Everyone makes mistakes. When we accept responsibility for our behaviour or results of it, we instantly gain respect of those we work with and for. If and when you are aware that a particular service or procedure did not go as planned or promised, follow up personally with the patient/client offering a reasonable means of making amends or restitution. Most often, though, an apology and assurance that the mistake will not be repeated is all that is required. We treat others the same way we want others to treat us – when we are respectful, we will be respected.

Get feedback. People are usually willing to give their opinion. If they don't tell us, they will tell their friends, co-workers and family. They may even post

their opinion on the internet for all to see! If we are willing to hear honest feedback and use it to improve how we deliver services, this is an invaluable exercise. There are a number of ways to get feedback. Businesses have used comment cards that allow their

“There are no secrets to success. It is the result of preparation, hard work, and learning from failure.”
— Colin Powel

patrons to make suggestions, give kudos or make a complaint. Technology allows us to expand this program to responses on our web site or via e mail questionnaire. We have recently been introduced to a new system for those in private practice – find the link to this new patient management tool on our web site. 

About the author



Nadean Burkett is a career and business transition coach with more than 30 years experience in the dental profession – now assisting accountants and other professionals in private practice by referral. Trusted practice evaluator, business planner and respected coach and advisor for the past 10 years - Nadean facilitates The EMPOWERMENT Program series, Career & Practice Management for Dentists both online and from NBAI's head office situated in beautiful Vancouver, British Columbia. Visit www.mypacticematters.com email nadean@mypacticematters.com for listings, job postings, & more resources with your practice transition coach.

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- Patient Identification
- Medical History
- Diagnosis and Treatment Planning
- Surgical Protocol and Technique
- Surgical Components
- Post Operative protocols

DAY 2

AM

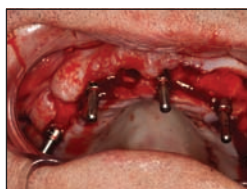
- Live Surgery and retrofit

PM

- Surgical Review and Retrofit Review
- LAB: Surgical Phase and Retrofit Phase
- Review of both Days

PM

- Retrofit and Impression Technique
- Lab retrofitting Technique and Components
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Are you making the most of Twitter?

Amy Rose explains how best to make use of the social networking frenzy and how to use it for your benefit

For most of us, tweeting forms part of our daily routine. You may even find yourself wanting to use hash tags to conclude other electronic conversation. But, is its social prowess a marketing hurdle? It's all too easy to get caught up in the social side of Twitter, thus failing to capitalize on what is a free, powerful marketing tool. Very simply, talking with your peers is unlikely to generate patients.

With that in mind, let's get better at making Twitter work for us, in a marketing sense. Here are a few tips that will help to bridge the gap between Twitter the social tool, and Twitter the business tool:

Seek out patients

This smart feature allows you to proactively track down people tweeting about specific things, specific to any given location. It's simple but clever, targeted marketing:

1. Enter "dentist" into the search box
2. Click on the cog icon, to the right of the search box - select "advanced search"
3. Enter keywords into the "Any of these words" field - for example, "dentist"
4. Enter your location (i.e. London) into the "Places" field.

This will reveal a list of tweets from

people in, or nearby, London, talking about a dentist. Engage with them. If they are in dental pain, it might just be a case of being in the right place, at the right time. Patient won.

Exercise trial and error. Repeat the search for a number of relevant keywords: Invisalign, emergency dentist, tooth whitening, etc. Save the search each time, by clicking on the cog icon once more.

Be sweet and retweet

Retweeting is an integral part of the Twitter experience. Retweeting (RT) someone that doesn't follow you might just bag you a new follower! Speaking



from personal experience, I am always grateful of a RT and often meet this with a thank you, sparking further conversation. Do include "Please RT" in some of your tweets, research shows that it will improve retweets by more than four times.

Choose your recommendations wisely

Not forgetting that Twitter is a social network, of course you may wish to encourage your followers to follow your entertaining Twitter friends and peers. But our new game is about winning patients. If you #FF (Follow Friday) a local business, or a forthcoming charity event, there is a good chance that it will

be retweeted, or replied to. Your tweet has just gone viral.

Most importantly, be seen to be engaging with your local community and charities. If you are visible in this way, you further increase the chance of getting new followers.

In summary...

Yes, Twitter is a social network and there is plenty of room for social conversation between friends, however, there are significant business gains to be had — try to split your time more evenly and you'll begin to see a shift in your followers from friends et al, to patients, or potential patients at least.



After all, everyone needs a dentist - except for another dentist. *[DT]*

About the author



Amy Rose heads up the design and marketing team for Dental Design Ltd, the leading website design agency for the dental profession.

With more than eight years' experience in a marketing capacity, Amy has helped hundreds of practices throughout the UK to maximize the unrivalled potential of e-marketing.

The parallel advance

Simon J. Garthwaite explains why employing the latest cone beam imaging technology is essential when it comes to diagnostics

Whether the latest, highly sophisticated orthodontic and implant procedures represent an inevitable progression due to the application of new diagnostic technology, or whether the technology is itself the natural response to clinicians' desire to expand the science of what is possible in the 21st century, driven by rising patient expectations, is a debate without any possible, definitive conclusion. The ancient question of the chicken and the egg comes to mind.

However, for practicing orthodontists and implantologists, it is enough that this twin track advance continues within their respective disciplines, as well as within dentistry as a whole, and is accompanied by a growing understanding of the critical importance of accurate diagnosis and comprehensive, pre-application treatment planning to achieve successful results in complex procedures. It's in this context that the wisdom of the late 16th century proverb, "Knowledge is power" rings as true as ever.

The "compensation" culture

Healthcare professionals in every field are only too aware of the rising incidence of negligence litigation following a clinical procedure whose outcome has been disappointing for the patient, even though the treatment may not have failed completely and the patient was fully briefed of the potential risks beforehand. Dental practitioners are naturally not immune to the growing "compensation culture" in our society, and so owe it to themselves as well as their patients to take every possible precaution to ensure a satisfactory treatment outcome.

Although the ever-present risk of cross infection seems likely to remain the primary concern of the regulatory authorities, a breach of protocol within this

aspect of patient care is only rarely directly responsible for the failure of complex implant or orthodontic procedures. While there may be multiple contributory factors to an unsatisfactory outcome to a sophisticated treatment, not all of them foreseeable or within the clinician's control, an inadequate, inaccurate diagnosis or sketchy treatment plan should ever be among them.

Advances in technology

The parallel advances in dental materials, oral prosthetics and clinical potential and digital imaging technology, are together ideally poised to complement each other and vastly improve both diagnostic accuracy and detailed treatment planning. For the clinician approaching a difficult challenge, today seeing is believing, and this knowledge of the underlying structures offers the power to deliver patient satisfaction to a degree unimaginable only a decade ago.

Nevertheless, as the more complex procedures increase in popularity and become more widely available, with implants perhaps leading the charge as the impact of personal appearance and first impressions assumes a more prominent importance in the public consciousness, a potential new danger has emerged.

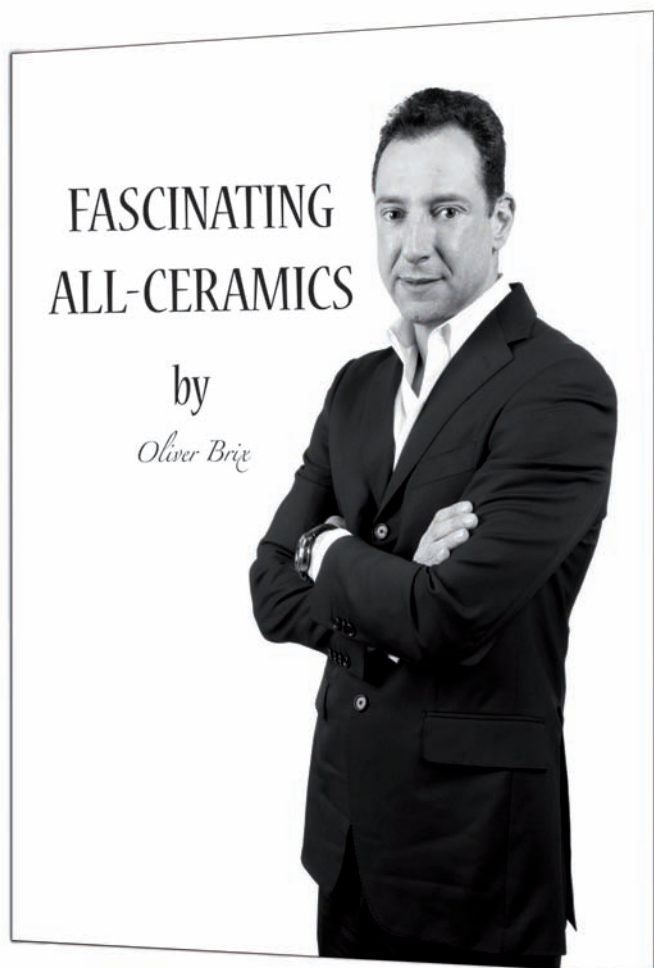
More suffering injury

The results of a recent survey of implant patients indicate that a growing number are suffering injury to the inferior alveolar nerve (IAN) during or following implant placement, with chronic, often debilitating consequences. Damage to this nerve causes severe facial pain or numbness, to a degree which may compromise the affected patient's ability to speak or eat comfortably and inevitably has an impact on their quality of life.



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Reducing the risk

Eliminating this risk is best addressed at the diagnostic and planning stage of the implant protocol and employing the latest cone beam imaging technology, exemplified by a unit such as Carestream Dental's CS 9300C, offers the optimum opportunity to determine a safe procedure and the best possible outcome.

The CS 9300C offers multiple tiers of visual information using both two and three-dimensional imaging to enable unprecedented detail in facilitating both diagnosis and treatment planning. The field of the image, with resolution up to 90um, is variable from a generously wide overview to focusing on a specific area, with "slice by slice" axial, coronal, sagittal, cross-sectional and oblique views possible to ensure a highly accurate clinical analysis of the operating area and the conformation of the underlying bone and soft tissue. The system incorporates user-friendly software and is designed to minimize the patient's radiation exposure.

With the benefits of such high quality imaging, disconcerting surprises, and the need for unexpected compromise once a procedure is under way, are virtually eliminated; outcomes can also be forecast with greater confidence, authority and certainty, which is more reassuring for the patient and can also lead to higher take up rates for discretionary treatments.

All in one systems such as the CS 9300C have multiple applications across the entire spectrum of dental care, and while they come into their own when specific detail is required for a particularly challenging patient, they also offer diagnostic benefits for more mundane, everyday treatments. A non-clinical benefit is the impression they give to patients of cutting-edge technology being routinely employed to ensure that they receive the best care.

The application of technology, both pre-treatment and within the surgery has already created a brave new world in many aspects of dental restorations, and this progress is certain to continue as the demand for the "perfect smile" intensifies across a widening demographic. It could be argued that the dental profession and cosmetic specialists in particular, owe a

great deal to reality television, and the popular belief that "in the future everybody will be world famous for fifteen minutes."

As patients' expectations rise, and the parameters of the possible expand apparently without limit, practitioners have a responsibility to offer their patients the optimum treatment options; only by exploiting the latest technology can the quality of diagnosis and treatment planning be realized to adequately support and justify restorative and corrective procedures which, while widely accepted today, were far beyond the scope of even the most gifted clinician less than a generation ago. *DTW*

About the author

Simon J Garthwaite has worked in a variety of roles in the dental industry since 1984. He joined Coltene UK in 1991 as technical sales representative and, in 1994, moved into the newly emerging dental imaging field, progressing to demonstrating practice management systems and integrating imaging solutions. Currently, Simon is sales account manager for Carestream Dental, looking after cutting-edge imaging products for dental practices, specializing in digital X-ray and CBCT technology.



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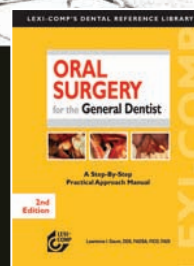
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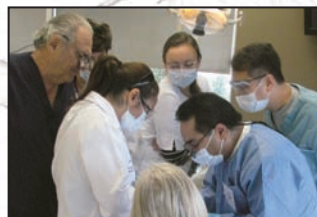
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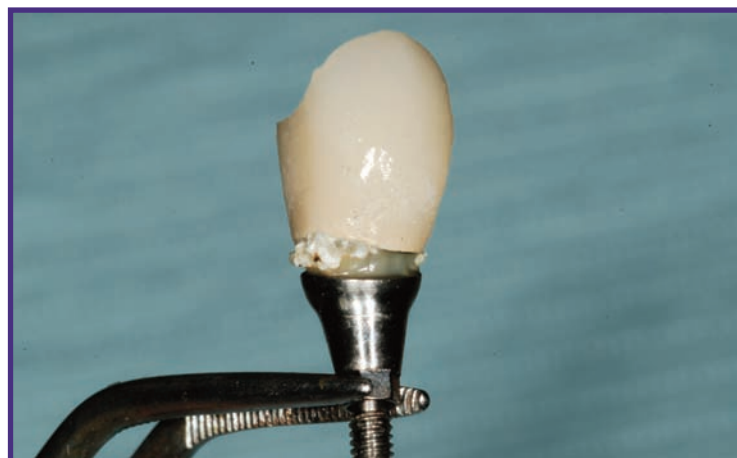
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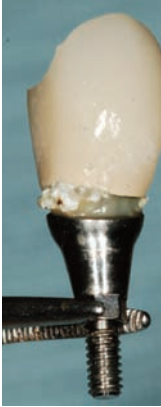
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Early intervention of peri-implant mucositis secondary to inadequate restorative protocols: a clinical report



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Apparition précoce de mucosite péri-implantaire à la suite de protocoles de restauration inadéquats: rapport clinique



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Abstract

This case report describes the early intervention of a peri-implant mucositis case. Peri-implant mucositis can be a precursor of peri-implant disease and eventual loss of implant osseointegration. Proper restorative protocols need to be employed to avoid inflammation. Once peri-implant mucositis is identified it must be treated without significant delay.

KEYWORDS

Peri-implant mucositis, Peri-implant disease, Implant, Cement, Radiopacity

Résumé

Ce rapport de cas décrit une apparition précoce de mucosite péri-implantaire. La mucosite péri-implantaire peut être un signe précurseur de maladie péri-implantaire et d'un éventuel manque d'oséo-intégration de l'implant. Des mesures de restauration adaptées doivent être employées afin d'éviter tout risque d'inflammation. Dès que le diagnostic de mucosite péri-implantaire est posé, celle-ci doit être traitée sans délai.

INTRODUCTION

Peri-implant mucositis is considered by many to be the precursor to peri-implant disease. The condition may be related to residual excess cement (REC) upon seating of the restoration.⁽¹⁻³⁾ The majority of crowns placed on single implants are cement retained and the most frequent biological complication is peri-implant mucosal lesions.⁽⁴⁾ Often the clinician is unaware of REC because no post-operative radiograph was taken or a lack of adequate radiopacity of these cements.⁽⁵⁻⁷⁾ In the early stages implants with REC may be asymptomatic but may develop pain, soft tissue color changes, exudate, radiographic bone

loss or other inflammatory parameters that have been postulated to lead to loss of osseointegration.⁽⁸⁾

Common practice is to fabricate an abutment that establishes the margin 1-2mm subgingival.⁽⁹⁾ However, placing the margin subgingival makes detection and removal of REC next to impossible with the problem increasing with depth of the margin.^(10, 11) Generally the peri-implant soft tissue health is better with screw retention.⁽¹²⁻¹⁴⁾ If a cemented restoration is fabricated, its margins should be placed at or above the free gingival margin.⁽¹⁵⁾

Greater caution and different cementation protocols need to be taken when seating a crown on an abutment in comparison to a prepared tooth.⁽¹⁶⁻²⁰⁾ Any cement introduced



into the crown-abutment complex has potential to be forced into the peri-implant sulcus to the head of the implant and onto its surface.

CASE REPORT: PERI-IMPLANT MUCOSITIS

In early 2011, a 65 year old woman with an unremarkable medical history was seen for placement of a 5.0S x 9mm implant (Astratech; DENTSPLY Implants, Waltham, MA) to replace tooth #24 (International teeth designation) due to a vertical root fracture tooth. Twelve weeks later a stock titanium abutment (Astratech) was placed and a porcelain-fused-to-metal crown was fabricated then seated with resin modified glass ionomer cement (Rely-X luting; 3M ESPE, St. Paul, MN).

Four weeks following restoration, the patient complained of gingival irritation. The periodontist noted inflammation of the soft tissues. Based on the bur marks and opacous layer being visible, significant occlusal adjustments were made when seating the crown (Fig. 1). A bitewing intraoral radiograph showed the gap between the crown and abutment with cement visible both mesial and distal (Fig. 2).

The chimney of the abutment was accessed using a diamond bur (856 018; Brasseler USA, Savannah, GA) and the cotton pellet removed. The screw was loosened, crown-abutment complex removed and REC was observed on the abutment (Fig. 3). The inflamed peri-implant sulcus was irrigated with chlorohexidine gluconate 0.12% (Peridex; 3M ESPE) and 3% hydrogen peroxide solutions (Hydrogen Peroxide; Vi-Jon, Smyrna, TN)(Fig. 4). A 5.0mm impression coping (Astratech; DENTSPLY Implants) was seated onto the implant and an intraoral bitewing radiograph was taken to verify intimate contact. An impression was taken using polyether (Impregum; 3M ESPE) and delivered to the laboratory for fabrication of an "implant crown with an adhesive plug" (ICAP).(14)

As a provisional measure, the REC was removed from the abutment using an intraoral sandblaster with 50 micron aluminum oxide powder (MicroEtcher II; Danville Materials, San Ramon, CA)(Fig. 5). Flowable composite (Filtek; 3m ESPE) was added to the abutment and the original crown-abutment complex was placed back onto the implant (Fig. 6).

Four weeks later, the provisional was removed. The soft tissue showed improved health with complete absence of inflammation (Fig. 7). Isolation was achieved using the



Figure 1–Restoration with significant occlusal modification.



Figure 2–Bitewing radiograph illustrating incomplete seating.



Figure 3- Inflamed peri-implant sulcus



Figure 3– Crown-abutment complex with REC.



Figure – 5: Crown-abutment complex air abraded.



Figure – 6: Crown-abutment with composite added for provisionalization.

isolite (isolite; isolitesystems, Santa Barbara, CA). The abutment screw of the ICAP was torqued to 25Ncm and a small piece of polytetrafluorethylene (PTFE) tape commonly known as Teflon tape, plumber's tape or TFE (tetrafluoroethylene) threaded seal tape (Oatey Co, Cleveland, Ohio) was condensed over the screw head to protect the screw should it need to be accessed and removed (Fig. 8). An intraoral bitewing radiograph was taken to verify complete seating of the ICAP restoration with the implant. The isolite was removed, the occlusion refined and the proximal contacts were confirmed to be acceptable. The isolite was again placed (Fig. 9).

Previously, the keyway porcelain and plug portion of the ICAP had been etched using 5% hydrofluoric acid (Ceramic etching gel; Ivoclar Vivadent, Liechtenstein) for 20 seconds. Once the ICAP was seated the keyway and plug were treated with a resin adhesive (Optibond XTR; Kerr Corporation, Orange, CA). A composite resin containing a rheologic modifier (SonicFill; Kerr Corporation) was extruded into the chimney of the ICAP using the SonicFill delivery handpiece (Fig. 10). The ceramic inlay plug was delivered using an adhesive stick applicator (micro-Stix; Microbrush International, Orlando, FL) (Fig. 11). Complete seating was achieved using a modified empty unidose tip on the delivery handpiece placed on the inlay plug to impart sonic energy into the composite and improve the flow dynamics (Fig. 12). Excess extruded composite was wiped away and glycerin (Glycerin; McKesson, San Francisco, CA) was applied prior to curing of the composite margins for 80 seconds using a LED curing light (bluephase; Ivoclar Vivadent). The occlusal margin surrounding the ceramic inlay plug was polished using a composite polishing point (Enhance; DENTSPLY International) (Fig. 13). Finally, the

occlusion was again checked and the patient dismissed. At eighteen months, no signs of gingival irritation or inflammation could be detected (Fig. 14 & Fig. 15).

DISCUSSION

It needs to be emphasized that restoring a dental implant is not analogous with restoring a prepared tooth and REC can be a greater concern.^(1, 7) The epithelial attachment is far less robust to the implant or non-existent at the time of seating a crown and abutment.⁽¹⁶⁾

The clinician needs to employ crown cementation protocols that are different from those used with a tooth prepared to receive a crown.⁽²⁰⁾ For cemented implant crowns, it is recommended that the restorative margins are placed at least equi-gingival and preferably supra-gingival. Any subgingival margin can lead to transportation of dental cement to, or below the bone surrounding the head of an implant.^(7, 10, 11) If esthetics are a concern then advanced prosthetic design protocols such as the "implant crown with an esthetic adhesive margin" (ICEAM) should be considered.⁽¹⁵⁾ Clearly, screw retention offers the best defense against REC leading to peri-implant disease.^(12, 14)

For cemented implant restorations, adequate radiographic protocols must be used. A pre-cementation intraoral bitewing radiograph must be taken to verify complete seating of the crown-abutment complex with the implant. Caution should be taken to be as perpendicular as possible to the long axis of the implant. Generally a bitewing radiograph will give the correct angulation and the clinician should be able to clearly see the implant threads. A post-cementation radiograph must be taken and



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compared to the pre-cementation radiograph looking for small discrepancies that indicate REC. Radiographs are only useful if the cement used has sufficient radiopacity to contrast against the crown, abutment or implant and if the REC is on the mesial or distal rather than buccal or lingual.⁽⁵⁻⁷⁾ The amount of cement extruded when luting the crown to the abutment should be reduced using techniques such as a copy abutment, internal venting of the abutment or application of less cement rather than gross application of material.⁽¹⁷⁻¹⁹⁾

Once peri-implant mucositis is identified visually or with near infrared spectrometry, intervention must occur without delay to avoid progression to peri-implant disease and possible loss of osseointegration.⁽⁸⁾ It is well known that by the time bone loss is identifiable on a radiograph, the disease process has progressed significantly. Although surgical intervention is often indicated, often addressing the compromised crown-abutment complex by removing

the crown and abutment, then cleaning off the REC is less invasive and preferable. Occasionally, the strong adhesion or bond created by the dental cement makes it difficult to remove the crown or retrieve it intact. In these circumstances the crown-abutment complex can often be removed by accessing the abutment screw through the crown. If the esthetics of the restorations are not compromised as a consequence of the retrieval process, then the crown-abutment complex may be re-seated once the REC is removed. If the esthetics are unacceptable then a new crown-abutment complex will be required with the preference for screw-retained.

CONCLUSION

The success or failure of dental implants is greatly affected by restorative design. There are many indications when cement retention is necessary and unavoidable. In order



Figure 7 – Improved health of peri-implant sulcus.



Figure 8 – Screw retained restoration try-in. Note PTFE tape.

Figure 9 – Bitewing radiograph verifying complete seating of abutment into implant.



Figure 10 – Composite injected into chimney to cement the implant crown adhesive plug (ICAP).

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Figure 11 – Delivery of ICAP plug with adhesive stick.



Figure 12 – Delivery handpiece with modified tip to seat ICAP plug completely.



Figure 13 – Polishing of composite around ICAP plug.



Figure 14 – Occlusal view of final ICAP.

to avoid iatrogenic peri-implant disease, it is important to adhere to meticulous protocols to minimize the risk for REC. Scalloped custom abutments that follow the soft tissue profile and allow the placement of equi- or supra-gingival restorative margins greatly enhance the clinicians ability to remove any excess cement. Moreover, the use of custom healing abutments and full contour provisional restorations prior to impression procedures allow for greater control over the final position of restorative margins. However, in order to relay this information to the dental technician a modified impression coping technique is highly recommended.

Screw-retained restorations have the advantage of eliminating the potential problems associated with residual excess cement (REC) and should be utilized whenever possible. One of the objections often cited against the routine use of screw-retained restorations is reduced esthetics related to an inability to match the resin plug to the porcelain of the crown-abutment complex. Techniques such as the implant crown with an adhesive plug (ICAP) should reduce the aesthetic concerns when dealing with the screw access chimney.



Figure 15 – Buccal view of final ICAP.

Finally, if peri-implant mucositis is encountered, the restorative dentist rather than the periodontists may be the better clinician to initially address the issue.

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Dr. Mike Racich

A Logical Approach to Occlusal Equilibration

Approche logique à l'équilibration occlusale

The content of this article was presented by the author at the Academy's recent Vancouver Annual Scientific Meeting – Le contenu de cet article a été présenté par l'auteur lors du récent congrès annuel de l'Académie à Vancouver

Abstract

Occlusal equilibration is a procedure that is frequently performed by restorative dentists, prosthodontists and by some orthodontic practitioners. Occlusal equilibration is taught in many different formats by many different academic and private institutions. Advanced diagnostic considerations and training for occlusal equilibration by dental practitioners must be acquired in order to standardize their technique for this irreversible clinical procedure. This paper describes an efficient, practical and logical approach to occlusal equilibration that all levels of dental practitioners can readily master.

Occlusal equilibration is defined by The Glossary of Prosthodontic Terms as: “the modification of the occlusal form of the teeth with the intent of equalizing occlusal stress, producing simultaneous occlusal contacts or harmonizing cuspal relations”.¹ Occlusal equilibration therefore can be additive or subtractive (e.g. selective occlusal build-ups with composite) but mostly it is a subtractive procedure.² Furthermore, the production of simultaneous occlusal contacts and/or harmonized cuspal relations needs to be in a consistently reproducible position that is at an appropriate vertical occlusal dimension with allowance for the envelope of function considerations that is free from fremitus.³⁻⁶ Occlusal equilibration is gnathologically carried out by mandibular guidance that is gentle, unstrained, with the patient in a relaxed, comfortable position. Occlusal equilibration is never mandibular manipulation. It is important therefore to have frank, open discussions with patients pre-treatment so that they understand what the treatment entails, how it will be carried out, and why the task is being undertaken. Knowledge is power and patients need to be empowered to be participants in their care, even if it is an indirect

manner; when patients are knowledgeable they are more likely to have increased trust and be more relaxed with their care providers.⁷ The actual mandibular guidance technique employed is strictly operator preference and in reality the astute clinician has more than just one style to offer.⁸ With a clear conceptualization of the endpoints of care in mind, occlusal equilibration then becomes a routine procedure for the dental team and a comfortable procedure for the patient optimizing stomatognathic stability in function such as speech and chewing, and in parafunction by helping to offset the ravages of clenching and grinding.^{3,9} Regardless, teeth apart is literally the order of the day and while sleeping protection (via dental orthotic usage) is mandatory.^{10,11} Ongoing maintenance, depending on the patient's specific needs, helps to maintain the stability of the desired occlusal relationship since a degree of wear and tear will usually occur.

The work-up for occlusal equilibration follows standard protocols as taught to every undergraduate dental student.^{12,13} Complete, thorough examinations are done evaluating intra and extraoral structures. Intraorally, the

L'équilibration occlusale est une procédure qui est souvent effectuée par les dentistes, les prosthodontistes et certains orthodontistes. L'équilibration occlusale est enseignée sous différentes formes, par différentes écoles publiques ou privées. Des considérations diagnostiques et des formations concernant l'équilibration occlusale par les dentistes doivent être acquises afin de standardiser leur technique pour mener à bien cette procédure clinique irréversible. Cet article décrit une approche logique, pratique et efficace de l'équilibration occlusale, que tous les dentistes, quel que soit leur niveau, peuvent maîtriser rapidement.

dentition is charted noting restorations, tooth mobility and percussion sensitivity, gingival recession, furcations, attached gingiva, periodontal probing depths, and spacing. Palpation of soft tissues and cancer screening is also routinely done. Maxillary-mandibular tooth relationships are recorded: skeletal/dental classification, overbite/overjet/crossbite, lateral and protrusive excursive contacts, guided mandibular position to first contact (CR) – habit bite/maximum intercuspation (MI) discrepancy and character description such as equal vs. slide, slide of how many millimeters and direction, first teeth contacting.^{1,6,8} Extraorally, the temporomandibular joints (TMJs) are tested for pain and dysfunction as is the head and neck musculature.¹⁴ Detailed notes are entered into the chart. Imaging, for example radiographic or MRI, is as indicated. Records for mounted dental study cast evaluation and photograph taking complete the process.

Before occlusal equilibration commences it is generally taught that the patient should wear a hard acrylic orthotic for a period of time; this time depends on the teaching center or mentor and the recommendations can range from 24/7 wear for a period of weeks, wear only for 2 weeks preceding the occlusal equilibration appointment, or wear only just the 24 hours proceeding the appointment in order to relax the musculature and tighten-up the TMJ complex (e.g. reduce inflammation).¹⁵ Similarly, mounted cast equilibration pre-occlusal adjustment is also frequently taught by many teaching centers as doing a procedure extraorally before actually doing it intraorally has obvious advantages and is wise to continue until the practitioner is expert at the technique. The following description of occlusal equilibration will forgo describing orthotic fabrication and cast equilibration (Figure 1); cast equilibration will be described later in this section as the description of occlusal equilibration of the natural dentition will cover all the essential elements and prevent unnecessary descriptive redundancy.

Occlusal equilibration should be done in a stress free environment with all stakeholders comfortable and relaxed.

The patient once seated should be provided with any ancillary supports required. The same follows suit for the dental team. As for working position, having the patient placed too far supine, although it might make it easier for the dental team to work, in the long run it lengthens treatment time as the occlusal equilibration checks at general seating and eating positions will usually require more adjustment since as patients posture forward most mandibles also come forward thereby changing occlusal contacts. Hence, it is preferable to position the patient at a 20–30 degree angle to the horizon depending on the patient's physical stature. Next, the nature of the coupling of the anterior teeth is checked (Figure 2).

Anterior coupling (Step 3) defines the existing vertical dimension of occlusion. The existing vertical dimension of occlusion must never be encroached upon as it has the tendency to give patients discomfort and/or increased occlusal awareness as the dentition can have a lock-in or trapped feeling to it with the concomitant tendency towards parafunction such as clenching or bruxism.^{4,16} Conversely, slight increases in the vertical occlusal dimension can be allotted for, especially if the anterior coupling is excessively deep or restrictive.^{4,17} Generally though, occlusal equilibrations are ended where started; it is good practice therefore to make a mental note of a tooth relationship such as the right cuspids and equilibrate the dental occlusion until back to or just shy of the initially noted anterior relationship.

Step 4 is to guide the mandible to a consistently reproducible position and ask the patient which side touches first (CR).⁸ Once the side is identified, ask the patient which teeth make first contact by having the patient physically point to the teeth (Figure 3).

Of particular note, the mandibular guiding is being properly executed when the patient consistently verifies that the same teeth are contacting and the patient's head is not moving. Imagine a point on the patient's forehead: the imaginary point should not be moving and the patient's

Figure 1: 10 Steps for Occlusal Equilibration

1. Comfort (Dr. and patient)
2. Working position
3. Anterior contact in maximum intercuspation (MI)
4. First contact in guided mandibular position (CR)
5. Working vs. non-working "style" contacts
6. CR=MI
7. Fremitus relief
8. Lateral/ protrusive excursions
9. CR=MI (20 degrees, 90 degrees, anterior feeding position)
10. Post-op instructions



Figure 3: getting the patient involved in the procedure greatly enhances treatment efficiency.



Figure 2: anterior coupling analyzing pre-occlusal equilibration.



Figure 4: maxillary cast showing mesial inclines

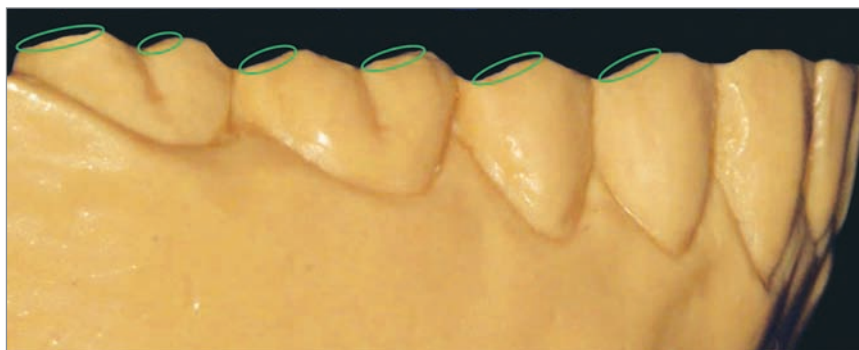


Figure 5: mandibular cast showing distal inclines

neck is unstrained, i.e. the neck is as relaxed and non-braced as when the patient positioned themselves during Steps 1 and 2. Once the initial contacting teeth are identified guide the mandible to the first tooth contact and have the patient squeeze their teeth into MI. Note the character of the slide: whether the direction is straight/left/right/ forward/back and amount in approximate millimeters. Usually the mandible will go forward, occasionally just straight forward but more often with a left or right component or shift. In order for the mandible to go forward when the patient squeezes from CR to MI, the only tooth contacts that can cause this movement are distal inclines of mandibular teeth and mesial inclines of maxillary teeth.



Figure 6: schematic showing traditional working and non-working interferences (inclines colored red)¹ when the mandible moves to the patient's right



Figure 7: schematic showing traditional working and non-working interferences (inclines colored red)¹ when the mandible moves to the patient's left



Figure 8: schematic showing working and non-working "style" contacts (inclines colored green) when the mandible moves to the patient's left



Figure 9: schematic showing working and non-working "style" contacts (inclines colored green) when the mandible moves to the patient's right

Therefore, forward straight equilibrations only involve the selective adjustment of these tooth surfaces exhibiting the "slide" or "skid mark" (Figures 4 and 5).

For left or right mandibular movements the concept of

working vs. non-working "style" contacts (Step 5) must be conceptualized. All dental practitioners know what working and non-working posterior contacts or interferences are when patients with mutually protected occlusions go into lateral excursions (Figure 6 and 7).¹





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Figures 10 and 11: before and after of an occlusal equilibration depicting cusp tip non-adjustment



Figure 12: precise cusp tips occlude on flat surfaces



Figure 13: cotton roll drying of the dentition

Working contacts/interferences are posterior tooth contacts on the rotating condylar side and for the maxillary posterior teeth are the lingual surfaces of the buccal and palatal cusps while for the mandibular posterior teeth are the buccal surfaces of the buccal and lingual cusps. Non-working contacts/interferences are posterior tooth contacts on the orbiting condylar side and for the maxillary posterior teeth are the buccal surfaces of the palatal cusps and for the mandibular posterior teeth the lingual surfaces of the buccal cusps. Working and non-working contacts or interferences occur when the patient goes from MI into a lateral excursions and are essentially an “in->out” movement. On the other hand, if patients begin with their teeth together in the “out” position, when they squeeze their teeth together and go “in” to MI, they reproduce traditional working and non-working contacts/interferences as just described. We call these “out->in” movements “style” movements since they mimic the more familiar “in->out” contacts or interferences that most dentists can readily identify. Hence, working and non-working “style”

contacts describe the left or right mandibular movement for tooth contact from CR to MI. For a mandible that moves forward and to the patient’s left we look for the mandibular distal inclines/maxillary mesial inclines and right working “style” contacts/left non-working “style” contacts (Figure 8).

For a mandible that moves forward and to the patient’s right we look for the mandibular distal inclines/maxillary mesial inclines and left working “style” contacts/right non-working “style” contacts (Figure 9).

A useful exercise at this juncture is to take two sets of maxillary and mandibular casts and mark the working and non-working contacts/interferences similar to Figures 6 and 7. Practice “in->out” traditional lateral excursive movements and verify traditional working and non-working contacts/interferences then begin from the “out” position and squeeze the casts into the “in” or MI position; the later movements are working and non-working “style”

interferences (Figures 8 and 9). Throughout an occlusal equilibration all the operator has to do is 1) initially identify which way the mandible moves and 2) adjust only the contacts/interferences and their resultant "slide/skid mark" that can facilitate that movement, i.e. mesial/distal inclines and working/non-working "style" contacts.

Once the first tooth contact and the direction and character of the mandibular CR-MI movement have been identified the occlusal equilibration begins. A suggested bur to do the majority of the occlusal equilibration with is a #7408 (Midwest, Dentsply, York, PA, USA). In the occlusal equilibration process, only the mesial/distal and or working/non-working "style" surfaces are adjusted. Cusp tips are never adjusted unless the particular tooth is in supereruption. Cusp tip contacts are just made smaller; they are never eliminated (Figures 10 and 11).

Conceptually, when the cuspal tooth surfaces are adjusted the operator is attempting to make the cusp tips as precise as possible with their opposing contacts a flat plane free of cuspal interferences (Figure 12).

The teeth are dried on the side of the mouth where the first guided tooth contacts were with 6 inch long cotton rolls (Richmond Dental, Charlotte, NC, USA), thick 225 micron blue paper (Mynol, ADA Products, Milwaukee, WI, USA) is inserted between the teeth, the mandible guided into position, and the patient squeezes their teeth together (Figure 13).

Examination of the teeth will then identify the surfaces to be adjusted (as per the previous discussion). Next, the operator guides the teeth together and asks the patient which side touches first. The 6 inch cotton roll and thick blue paper only go on the identified side and it is marked and the adjustment occurs; by having the patient identify the first side contacting greatly enhances the occlusal equilibration by increasing efficiency and speed. The process continues as the dental team asks, dries, and marks slowly utilizing thinner ribbons or films such as 19 micron Ardent Exact-a-film (WhipMix Corporation, Louisville, KY, USA) and continues to adjust the occlusion until CR=MI is at the original vertical occlusal dimension or at a slightly increased vertical occlusal dimension. Step 6 has been achieved. It is important to emphasize that once the side of a patient's dentition is identified as the working or non-working "style" it most always remains that way throughout the occlusal equilibration; this bit of information is particularly useful to know in those situations when the equilibration appears to be stalled (e.g. look for the "style" contacts on previously placed shiny restorations).

Fremitus is next evaluated by utilizing 90 micron silk ribbon (Madame Butterfly, Almore International, Portland, OR, USA) (Figure 14).^{1,10}

Madame Butterfly ribbon has just the right amount of thickness to allow for adequate fremitus relief. Adequate fremitus relief is when the operator can readily and



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Figure 14: anterior coupling clearance assured



Figure 15: specific patient directions are required in the final stages of an occlusal equilibration



Figure 16: occlusal equilibration accuracy is evaluated at different head and neck postures

smoothly pass the Madame Butterfly ribbon through the anterior dentition while the teeth are in MI. Some clinicians prefer tighter tolerances relative to anterior coupling and will use the thinner 8 micron shim stock materials (Almore International, Portland, OR, USA). After fremitus relief, traditional working and non-working contacts or interferences (“in->out”) are eliminated (Step 8). After drying with 6 inch cotton rolls the operator can use thick Mynol paper unilaterally having the patient go through all the excursions including protrusive, then remark CR/MI with a different color ribbon or film and then adjust all the blue interferences that need eliminating. The operator then can repeat the excursion maneuvers until satisfied with the anterior disclusion that results such as cuspid disclusion in lateral excursions, even central incisor contact in protrusive, or any combination of anterior group function that might also include the first premolars for skeletal Class II's relationships. It is also important to check that crossover, i.e. when the occluding mandible is past the facial surface of the maxillary anterior teeth, is effortless and unimpeded in any direction.

The mandible is now guided and once again a check is made for any CR-MI discrepancies that may have arisen

(Step 9). It is imperative that all discrepancies are removed; cusp tips are not adjusted ... only the offending surfaces/inclines are adjusted. Next the patient is asked to repeatedly and quickly tap their teeth together and they are asked “Are the left and right sides of your mouth touching evenly with the front teeth barely touching if at all?” Adjustments are made only to the teeth that the patient directly points to (Figure 15).

The dental team does not guess for the patient, the patient gives the direction as to which tooth surfaces need further refinement. Once all are satisfied that the occlusal equilibration has CR=MI in the chair position that the treatment has been done at, the chair is adjusted such that the patient is seated 90 degrees to the horizon. Again the rapid tapping exercise to verify CR=MI with adjustments if indicated followed by the patient's head positioned downward (flexion) and repeat of the tapping exercise (Figure 16).

Once all is acceptable, a last verification in the original working chair position is done with and without operator assistance.



Figures 17 and 18: mandibular contacts present in Figure 18 opposing an orthotic would be similar to what the occlusal equilibration of the same dentition in Figure 17 would look like post operatively

The occlusal equilibration is not complete until post-op instructions are given (Step 10). The patient is reminded to keep their teeth apart during the day and wear their dental orthotic at night if indicated.^{10,11} The patient also is advised that there will be a follow-up appointment in approximately 6 weeks to do any fine tuning of the occlusion if required. Although the patient is well aware that they are not supposed to have their teeth together during the day, if by chance they do notice that a few teeth are all of a sudden in traumatic contact then by all means they should return to the dental team's office for the minor adjustment(s) required. The patient is also instructed that an occlusal equilibration should be a comfortable treatment and they should leave the dental office as comfortable or they should feel better than when treatment commenced. If the patient has any concerns then it is incumbent upon them to call the dental office immediately. Then, one last tapping exercise is done while the patient is standing directly in front of the practitioner before exiting the operatory.

A few additional thoughts on occlusal equilibration before cast equilibration is described. Patients' should never leave the dental office with their teeth not touching evenly when they do the rapid tapping exercise whether they are standing or sitting in any postural position. Two other interesting occurrences that occur as the occlusal equilibration proceeds is that of the sound that the teeth make as CR gets closer and closer to MI (i.e. CR=MI) and the laxity of the mandible; the sound is like that of a horse's hooves on cobblestones and the mandible loosens up and feels just like a "dead fish handshake" such that mandibular guidance becomes easier and easier to facilitate. And lastly, if a hard acrylic orthotic has been fabricated pre-occlusal equilibration, it should fit practically

the same as it did prior to the procedure since none of the cusp tips have been adjusted. The orthotic should seat the same, albeit maybe a little looser as some of the cusp inclines have been shaped, and the opposing dentition should contact in virtually the same locations assuming, of course, that the orthotic was adjusted in CR (i.e. CR=MI). Hence, occlusal relationships are refined, not changed (Figures 17 and 18).

With cast equilibration the rules are essentially the same as equilibration of the natural dentition except, obviously, for all the patient dialogue/cooperation previously discussed. When identifying the anterior coupling contact or Step 3, some practitioners like to unlock the latch on the articulator, loosen the anterior pin, and place the casts in MI which identifies the vertical occlusal dimension. The anterior pin is then locked followed by locking the articulator latch. The anterior pin will then have a space between its tip and the articulator's anterior table. The cast equilibration is carried on until the pin retouches the table thus returning to the original vertical occlusal dimension. For a cast equilibration, many dentists use scalpels but some prefer to use a bur as it speeds up the procedure.

Gnathologically based, occlusal equilibration is a guided mandibular position that permits "the modification of the occlusal form of the teeth with the intent of equalizing occlusal stress, producing simultaneous occlusal contacts or harmonizing cuspal relations".¹ The results give the dental team and their patients' dentitions a fighting chance against any destructive parafunctional habits with increased stomatognathic system stability and physiologic function. Ultimately, further trusting professional relationships are enhanced.

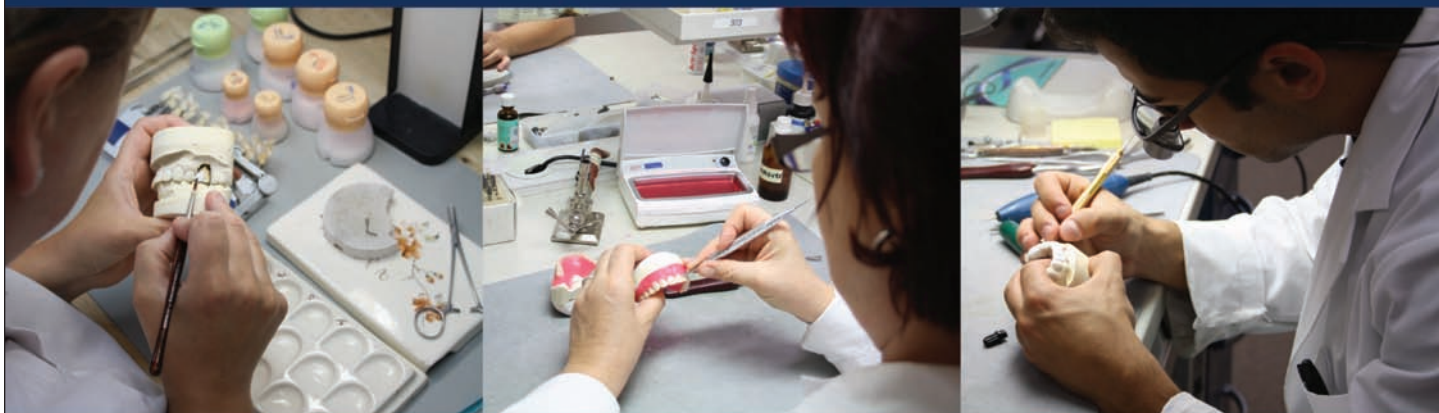
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About the Author

Dr. Michael Racich has a general dental practice emphasizing comprehensive Restorative Dentistry, Prosthodontics and TMD/orofacial pain. He has both extensively lectured, nationally and internationally, and published in peer-reviewed scientific journals. He is Past President and a Fellow of CARDP. E-Mail: mike@drracich.ca

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Abstract

Direct composites currently are indicated in posterior teeth in small and medium sized restorations with conservative preparations where esthetics is important. They are not indicated in situations with heavy occlusal stresses or in areas that are difficult to isolate. Margins should be on enamel for increased durability of the marginal seal.

Résumé

Les composites directs sont souvent indiqués pour les dents postérieures des restaurations de petite ou moyenne taille à l'aide de préparations conservatoires où l'aspect esthétique est important. Ils ne sont pas indiqués dans les cas de lourds stress occlusaux ou pour les zones difficiles à isoler. Les marges doivent être sur l'émail pour une durée de vie plus longue du scellement marginal.



Despite being extensively researched with favorable outcomes, posterior direct composites are still not widely accepted by our profession due to operator experiences including post-operative sensitivity, difficulty finishing, poor anatomy and suboptimal interproximal contacts. These perceived shortcomings can be overcome with proper material selection and techniques. Carefully following the correct bonding protocol, rubber dam isolation and working in a dry field and the use of an aqueous solution of 5% glutaraldehyde and 35% HEMA after etching to stabilize the bond can all improve success rates. The use of a flowable composite for the first layer is controversial but if done, a thin layer should be used to minimize the shrinkage. Flowables facilitate handling but are likely unnecessary. Incremental placement of layers will minimize the stress on surrounding tooth structure and decrease sensitivity. To assist with anatomy, once the dentin stratum has been completely cured, build up the enamel layer slowly in cusp-sized increments curing a few seconds as you go to minimize excess and finishing. Once the entire occlusal

layer is finished, it is cured for 30-40 seconds to complete the curing process. To improve proximal contacts, pre-wedging and use of sectional matrix systems are recommended.

Introduction

Resin-based composites were first used for posterior restorations in the 1970's,^{1,4} and have been increasingly used since then. Composites offer many advantages over traditional restorative materials and techniques used in posterior teeth, chiefly the fact that they can be placed in ultra-conservative preparations compatible with the concept of minimal intervention dentistry.^{5, 6} Unlike amalgam, composites present minimal mechanical requirements relative to depth and width of the tooth preparation, allowing the clinician to limit the preparation to access and elimination of diseased tooth structure and/or a failed restoration, removal of grossly unsupported enamel, and establishment of a convenience form for the restoration. Consequently, the strength of the tooth is better preserved

by reduced loss of sound tooth structure. Moreover, direct posterior composites can be very esthetic when properly placed.

Although posterior composites present many positive attributes, their current stage of development is still imperfect. Composites require a different clinical technique compared to non-adhesive restorative materials, including tooth preparation design, pulp protection, matrix placement, insertion technique, and restoration maintenance. Composite resin restorations are technique-sensitive, particularly in posterior areas where access, visibility, and moisture control are sometimes compromised. Despite these challenges, composites are gaining increased popularity as the restorative material of choice for conservative direct restorations in posterior teeth.

Posterior composites can last many years when properly placed.⁷⁻¹⁰ Several studies report the clinical performance of posterior composites over time. Opdam et al. published a retrospective study on the longevity of 1,955 posterior composites placed in a private-practice setting.¹¹ Life tables calculated from the data reveal a survival for composite resin of 92% at 5 years and 82% at 10 years. There was a significant relationship between the extent of restored surfaces and the survival of the restorations, i.e., the more conservative the restoration the longer it survived. A number of other studies published in the past 10 years report success rates ranging from 70% to 100% for posterior composites.¹²⁻¹⁶ These results were similar to those of a meta-analysis of studies conducted during the

1990's.¹⁷ Kiremitci et al. reported on the clinical performance of a packable composite material, noting no clinical failures at the six year evaluation visit.¹⁸ Very few clinical studies with evaluation periods longer than 10 years are available. A study by Wilder et al. reported a 76% success rate for 85 UV-cured posterior composites after 17 years,¹⁹ while Da Rosa Rodolpho et al. reported a 65% success rate for 282 hybrid VL-cured composites after 17 years.²⁰ The relatively low success rate reported in the later study was attributed by the authors to the high number of large restorations placed. More recently, Da Rosa Rodolpho et al. recently published a 22-year clinical evaluation of two posterior composites, and reported good clinical performance for the two systems used, with an annually failure rate of 1.5% and 2.2% of annual failure rate, respectively, for midfilled and minifilled materials.²¹ Most clinical performance studies show that, in general, there is a linear correlation between size of restoration and observation period, and number of failures,^{9, 22, 23} which supports the recommendation that posterior composites should be used in conservative cases.

The most commonly cited reasons for failure in clinical studies of posterior composites are secondary caries, fracture, marginal deficiencies, and wear.⁸ Although clinical studies do cite reasons for restoration failure, only a few studies discuss predictive factors for future failure. Hayashi and Wilson demonstrated that marginal deterioration is a good predictor of failure.²⁴ By studying the data from a 5-year clinical trial, they noted that



Figure 1: Occlusal view of tooth #31 (FDI #47) with moderately-large occlusal sedative restoration extending onto the buccal and lingual surfaces. The tooth is asymptomatic.

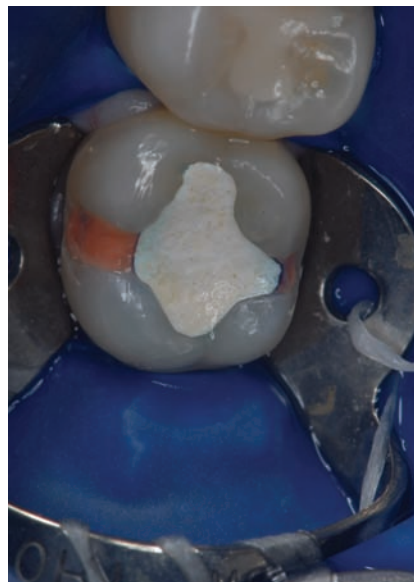


Figure 2: After administering local anesthetic and verifying the occlusal scheme, the area is isolated with rubber dam. No functional contacts are detected in the area of the sedative restoration.

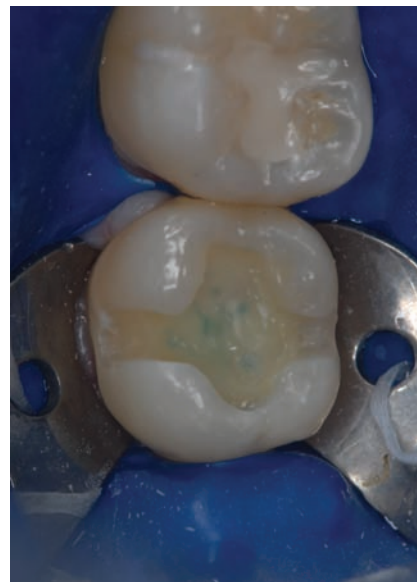


Figure 3: After removal of the sedative restoration caries is excavated using a caries detection dye.

restorations with marginal deterioration were over 5 times more likely to have failed by 5 years than restorations with no marginal deterioration. Restorations with marginal discoloration at 3 years were 3.8 times more likely to have failed by 5 years than restorations with no marginal discoloration at 3 years. Moreover, restorations with both marginal deterioration and marginal discoloration at 3 years failed 8.7 times more frequently than restorations with sound margins at 3 years. In another report based on results from the same study, the authors conclude that restorations with post-operative sensitivity in large cavities were more likely to fail by five years than restorations in small cavities.²⁵

In a study of 51 posterior composite restorations where a 30% failure rate was reported at 5 years, Köhler et al. demonstrated that almost 2/3 of the failures (69%) occurred due to secondary caries and marginal defects in patients with high counts of *S. mutans* at baseline, suggesting that patient factors such as caries activity and/or caries risk can influence the longevity of posterior composite restorations.¹³

In a recently published review, Demarco et al. also demonstrated that the longevity of posterior composite restorations is more influenced by factors such as caries risk than the choice of material.²⁶ These authors reported an annual failure rate between 1-3% found in 34 longitudinal clinical trials with over 5 years of follow-up.

Resistance to wear has improved markedly in modern composites. While early studies showed clinically significant wear rates,^{27, 28} studies published more recently in general

show clinically acceptable wear rates when posterior composites are used in conservative and moderately-sized restorations.^{29, 30} It is believed that the improvement in wear resistance is due in great part to improvements in the material itself, but certainly a better understanding of the posterior composite technique, along with improved light-curing technology, has also helped. Willems et al. reported occlusal contact wear values of 110 to 149 microns after 3 years,³⁰ while Wilder et al. reported wear values of 197, 235, 264 microns after 5, 10, and 17 years, respectively.¹⁹ Given that the occlusal contact wear for enamel has been reported to be 15 microns/year for pre-molars and 29 microns/year for molars,³¹ the yearly wear reported for posterior composites is similar to the reported enamel wear. However, wear may still be an important mode of failure for bruxers and clenchers, especially in large restorations.³²

Clinical Technique

Initial Clinical Procedures: Assuming a thorough clinical and radiographical examination including pulp status diagnosis have been carried out beforehand, plaque removal, shade selection, occlusal analysis, local anesthesia, and proper isolation are important initial clinical procedures that have to be accomplished before starting the tooth preparation.

Tooth Preparation: In general, the more conservative the preparation the better the chances for long-term success in the procedure. The tooth preparation for a composite restoration is usually limited to access, removal of the failed



Figure 4: A RMGI base is used given proximity with the pulp.



Figure 5: The preparation is etched with 35% phosphoric acid, and rinsed.



Figure 6: A 2-step etch-and-rinse adhesive is applied and light-cured.

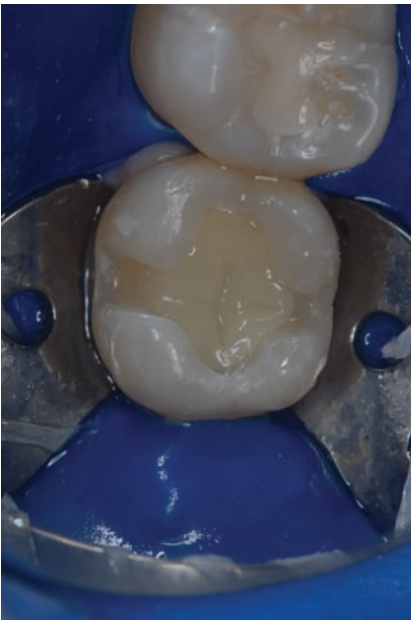


Figure 7: The dentin stratum of the preparation is restored.



Figure 8: Composite is incrementally placed, shaped, and light-cured. This image shows the composite increment on the mesiolingual cusp aspect of the preparation. When using the anatomical layering technique for posterior composites, it is strategic to apply the composite one cusp at a time.



Figure 9: Shaping the mesiobuccal increment.

restoration and/or caries excavation, and development of a convenience form to facilitate placement of the matrix, when needed, and the restorative material. The extension of the preparation is usually dictated by the extension of the defect or failed restoration, because it is not necessary to reduce sound tooth structure to provide “bulk for strength,” or to provide conventional retention and resistance forms. Small initial caries lesions in pit-and-fissures of posterior teeth are conservatively restored with composites without the need for extension into the dentinenamel junction or extension for prevention to non-affected fissures. In these restorations, called conservative or preventive resin restorations, the carious pit is excavated, the preparation is restored with composite, and the adjacent non-carious pits are sealed with a pit-and-fissure sealant for prevention.

When the preparation involves the proximal aspect of the tooth, pre-preparation wedging may be useful. Pre-wedging protects the interproximal rubber dam and the papillae, prevents bleeding that could jeopardize bonding procedures, and promotes slight teeth separation favoring matrix application and achievement of adequate proximal contacts. Anatomical wooden wedges are most appropriate.

As a general rule, cavosurface margins should not be beveled when placing posterior composite restorations. While a conservative cavosurface enamel bevel can

increase surface area for bonding, both in vitro and in vivo studies show there is no evidence that a cavosurface bevel is required to improve the restoration performance.³³⁻³⁵

Matrix Application (for proximal surface preparations): Matrices are often needed to restore proximal surfaces of posterior teeth. Matrix selection and placement is critical when restoring with composite, which is a non-rigid, non-condensable material. Individual, thin, precontoured metallic matrices are very suitable to obtain good contour and effective interproximal contacts without composite overhangs in most of the situations. Care should be exercised to avoid collapse of the matrix in the preparation, which would generate inappropriate contour. Various excellent sectional matrix systems are available (e.g. V3 System, Triodent, New Zealand and Ultradent Products, South Jordan, UT; Composi-Tight 3D, Garrison Dental Solutions, Spring Lake, MI; Palodent Plus, Dentsply International, York, PA) and include a metallic ring to stabilize the matrix system and promote additional tooth separation. Such rings should be used only when (1) there is no remaining proximal contact between the tooth being restored and the adjacent tooth, (2) they do not interfere with the matrix contour, (3) the remaining tooth structure is strong enough to support the ring, and (4) they can be placed securely without interfering with the wedge.

Matrix application techniques vary depending on the

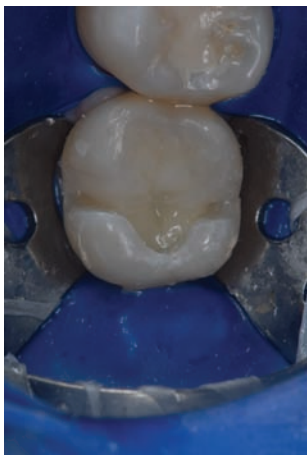


Figure 10: Mesio Buccal increment in place. Note this increment extended onto the buccal groove area.



Figure 11: The distolingual increment is completed.



Figure 12: Occlusal view of the final restoration.



Figure 13: Buccal corridor view of the final restoration.

proximal box faciolingual extension. In conservative preparations, where the faciolingual extension does not break contact with the adjacent tooth, a conventional metallic matrix can be used. For these cases these bands are easier to apply than sectional matrices. In larger preparations where the faciolingual extension does break contact with the adjacent tooth, sectional, precontoured matrices are recommended. However, very wide faciolingual preparations should be restored with composite infrequently as discussed previously.

Regardless of the type of matrix used, the clinician should always stabilize the matrix with an anatomic wooden or plastic wedge. The wedge should be positioned gingival to the preparation's gingival margin, so as not to interfere with the restoration's contour. After the matrix is secured with a wedge, it should be burnished internally against the adjacent surface to provide for appropriate contour and proximal contact. Because light-cured composites are plastic, non-rigid materials, matrix installation and modeling prior to insertion of composite is essential in order to obtain a proper restoration.

Application of Dental Adhesive: Regardless of the type of adhesive used, it should be applied and polymerized after matrix application and wedging, which prevents etching and bonding of adjacent structures. Care should be exercised to avoid adhesive pooling in areas adjacent to the matrix and internal angles on the preparation.

The use of liners and bases under posterior composites is controversial. It is generally accepted that hybridization of the prepared tooth substrates with an adhesive system

is the optimal treatment to seal the preparation and protect the pulp-dentin complex under composite restorations.³⁶ Liners and/or bases are recommended only when the preparation is deemed deep. In small, non-contaminated, non-hemorrhagic mechanical pulp exposures, the pulp exposure area should be covered with a thin layer of hard-set calcium hydroxide cement. Then, a 1-2 mm thick layer of a resin modified glass-ionomer cement (RMGI) should be placed to protect the pulp dressing. In deep, non-exposed preparations the RMGI can also be used as an initial increment of the restoration. Liners and/or bases, if used, should in general not be extended to the restoration's margins.

The use of flowable composites as a first increment is also controversial. When used in a thin layer and not as the sole restorative material, flowable composites can be used to facilitate the adaptation of the restoration to the preparation walls. However, there is no research evidence that the use of flowable composites result in a better posterior composite restoration.^{35, 37}

Composite Placement and Polymerization Technique: Techniques for insertion and polymerization of posterior composites have been extensively researched. Horizontal, oblique, vertical, bulk, and incremental techniques have all been recommended. Microleakage assessments comparing different insertion and polymerization techniques are not conclusive, and no single technique has been universally accepted.

Several manufacturers claim that a more profound depth of cure can be achieved with some composites, but this

assertion has been disputed. Incompletely cured composites can cause adverse pulp reactions when in direct contact with vital dentin, through leakage of unreacted monomers via dentinal tubules. In addition, the material's properties and bond strengths are substantially compromised when the composite is not fully cured.³⁸ High-intensity curing lights and new curing technologies are promising in providing faster and more thorough composite polymerization, as was discussed earlier. However, the high energy output per unit of time might lead to more shrinkage stress than when conventional curing techniques are used. Polymerization-derived stresses can disrupt the composite-preparation bond, and/or diffuse stresses to the tooth structure, compromising the integrity of the tooth-restoration unit.³⁹

The incremental insertion and polymerization technique provides enhanced control over application and polymerization of individual increments of composite. The incremental technique also allows for (1) orientation of the light beam according to the position of each increment of composite, enhancing the curing potential, (2) intrinsic restoration characterization with darker or pigmented composites, and, most importantly (3) sculpture of the restoration occlusal stratum with a more translucent material simulating the natural enamel.

The number and distribution of composite increments varies according to the preparation's geometric shape and size. Shaping the entire anatomy, or most of it, during insertion of the composite minimizes the need for burs during the finishing phase, eliminating complications associated with this procedure. The occlusal sculpture is guided by the remaining cusp inclines, similarly to the technique used for sculpting amalgam restorations or dropping/carving wax in a wax pattern. Uncured composite can be effectively carved, shaped, and smoothed with a variety of instruments and brushes to establish contour and surface smoothness prior to light-curing.

No more than two or three hand instruments are needed in the posterior composite armamentarium. One thin, round-ended composite spatula, and one double-sided composite condenser, both metallic, are enough for inserting and shaping posterior composites. The sharp end of an explorer tine can be used to sculpt primary and secondary grooves on the composite before it is cured. Contemporary posterior composites have much better handling properties compared to earlier composites. Still, some composites might feel "sticky" and difficult to handle. The best technique to avoid having the composite stick to the instrument and not to the tooth is to use a clean, dry instrument. The instrument can be wiped with a piece of dry gauze often during the procedure. Lubricating the

composite spatula or condenser with bonding agent will compromise the restoration by imbedding fluid resin in it, and alcohol should also be avoided.

Finishing, Polishing, and Occlusal Adjustment: Ideally, composite restorations should not have to be finished. The use of cutting instruments on the polymerized resin can induce flaws on the tooth-restoration interface and on the restoration surface, compromising its performance. When an anatomical matrix is used and the described stratified incremental technique is utilized, the need for finishing with hand or rotary instruments is minimized.

However, it is virtually impossible to insert the composite to the exact desired final contour with available materials and instruments, particularly when a proximal surface is restored. As necessary, flashes of composite can be trimmed with a surgical blade or reciprocating diamond blades. Sequential aluminum oxide-impregnated finishing discs are good instruments to contour and polish the accessible facial and lingual embrasures and marginal ridges of posterior composites. If necessary, the anatomy of the restoration can be refined with medium, fine, and super-fine diamonds applied intermittently with a high-speed handpiece running at reduced RPM. These instruments should be used in a dry field to facilitate visualization and avoid inadvertent cutting of marginal enamel.

Posterior composites are difficult to polish to a high gloss, as with microfill composites. However, good results can be achieved with extra-fine polishing pastes applied with nylon brushes and/or silicone points and cups at slow-speed. An aluminum-oxide impregnated polishing brush produces a very good surface finish on occlusal surfaces. The finishing and polishing potential of resin-based composites has been shown to be product-specific. It is important, therefore, to follow the manufacturers' recommendations for finishing and polishing.

Occlusal adjustments are made after removal of the rubber dam, if used. The same diamonds used for occlusal finishing described above should be utilized to adjust newly placed composite restorations in centric and eccentric positions. In the described technique, occlusal adjustments are minimal, and usually restricted to a small area. When excessive corrections have to be made, the occlusal analysis was incorrectly done. If occlusal adjustment is done, it is necessary to polish the restoration's selectively adjusted area(s), and apply a surface sealant to "seal" the restoration surface and margins. No surface sealant is necessary if the restoration surface is not instrumented or adjusted.

The accompanying Figures illustrate the clinical sequence for placing a posterior composite restoration in

a mandibular second molar. Figure 1 shows a moderately large existing provisional/sedative restoration. The tooth is asymptomatic, and the patient wants a conservative “tooth-colored” restoration to be used. There is no evidence of occlusal parafunction or any other contraindication for a posterior composite. Figures 2 and 3 show the tooth after rubber dam isolation (Fig. 2) and removal of the sedative restoration (Fig. 3). A caries detection dye was used to guide caries excavation, but the remaining dentin at this stage is deemed to be sound. Given the depth of the pulpal floor and estimated remaining dentin thickness of approximately 1.5mm, a RMGI base was applied and light-cured (Fig. 4). A 35% phosphoric acid gel is applied for 10 seconds on dentin, and 20 seconds on the enamel margins (Fig. 5). An aqueous solution of 5% glutaraldehyde and 35% HEMA is applied to the etched dentin not covered with the RMGI, and then a 1-step etch-and-rinse adhesive is applied and cured (Fig. 6). Figures 7-12 illustrate the incremental placement described in this article, where the composite increments are placed sequentially following the tooth anatomy. In Figure 7, the dentin layer is completed and light cured. Note the mesiodistal and buccolingual grooves are drafted in the dentin increment, so as to leave enough space for the enamel stratum. Figure 8 shows the layering of the mesiolingual cusp increment, shaped following that cusp's incline and anatomical features. Figures 9 and 10 show the layering of the mesiobuccal increment, while Figure 11 shows the layering of the distolingual increment. Figures 11 and 12 show the final restoration before removal of the rubber dam. Note that at this point the entire anatomy of the restoration was developed using the anatomical layering technique described, without the use of any rotary instrumentation. Figures 14 and 15 show the completed restoration after removal of the rubber dam and occlusion check.



Figure 14: Occlusal view of the final restoration after removal of the rubber dam.



Figure 15: Final occlusal check.

Conclusion

Composite resins are extensively used for the restoration of defects in posterior teeth. As the understanding of their properties, characteristics, and intra-oral behavior increases, it can be expected that the posterior composite technique will soon be applied with even more predictability. Careful attention to case selection and placement technique is critical for optimal success with posterior composites.

Disclosure

Dr. Ritter discloses no conflict of interest with manufacturers of materials mentioned in this paper. Parts of this article appeared previously in the following publication by the author, and are used with permission: Ritter AV. Clinical techniques: A review of posterior composites. *ADA Professional Product Review* 2011;6(4):3-8.

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Welcome Our Incoming President

Bienvenue à notre nouveau président

Dr. Jay McMullan

Dr. McMullan received his BSc from St. Francis Xavier University in 1980, followed by his dental degree from McGill University in 1984. Since then, he has a private general practice focused on restorative dentistry, in Kirkland, Qc.

Involved with organized dentistry regionally, provincially and nationally, Dr. McMullan received a fellowship from the International College of Dentists and has served as its Regent for Québec. He is a member of the Montréal Dental Study Club as well as The Frank Spear Study Club and is a member of the AGD. He taught at the McGill Faculty of Dentistry as a clinical demonstrator from 1988 to 1999. He became a member of CARDP in 2001 where he has served as the Québec-Nunavut representative on the executive council as well as the Conference Chair for the 2009 CARDP Scientific Meeting held in Montréal.

He and his wife Heather have three adult children. They enjoy cycling, golf, skiing and travelling.

Promu avec un BSc de St. Francis Xavier University en 1980, Dr. McMullan poursuit ses études en Médecine dentaire à McGill University pour obtenir son diplôme en 1984. Depuis, il entretient une pratique générale concentrée sur la dentisterie restauratrice à Kirkland, Qc.

Dr. McMullan est impliqué de façon régionale, provinciale et nationale dans les organismes dentaires et est récipiendaire d'un Fellowship du International College of Dentists, représentant le Québec sur le conseil d'administration de ce dernier. Il est membre du Montréal Dental Study Club ainsi que du Frank Spear Study Club en plus d'être membre de AGD. Il a enseigné, en tant que clinicien, à la Faculté de Médecine dentaire de McGill entre 1988 et 1999. Membre de l'ACDRP depuis 2001, il a siégé sur son comité exécutif pour représenter Québec-Nunavut et fut Président du congrès annuel de l'ACDRP en 2009 tenu à Montréal.

Son épouse Heather et lui ont trois enfants adultes. Leurs passe-temps préférés sont le vélo, le golf, le ski et le voyage.

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