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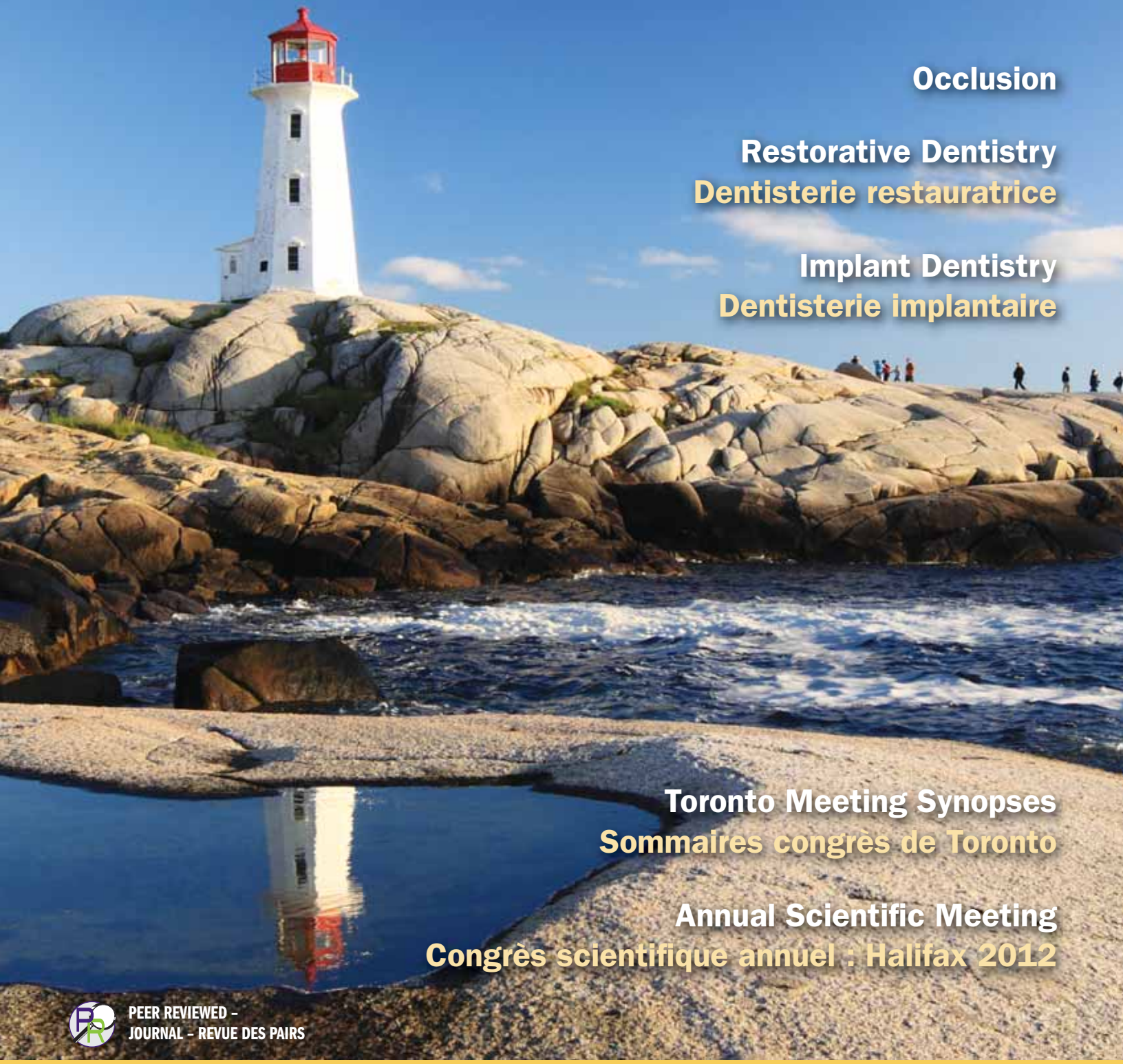

Occlusion

Restorative Dentistry
Dentisterie restauratrice

Implant Dentistry
Dentisterie implantaire

Toronto Meeting Synopses
Sommaires congrès de Toronto

Annual Scientific Meeting
Congrès scientifique annuel : Halifax 2012

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JOURNAL – REVUE DES PAIRS

Canadian Journal of Restorative Dentistry & Prosthodontics
The official publication of the Canadian Academy of Restorative Dentistry and Prosthodontics

Journal canadien de dentisterie restauratrice et de prosthodontie
Publication officielle de l'Académie canadienne de dentisterie restauratrice et de prosthodontie

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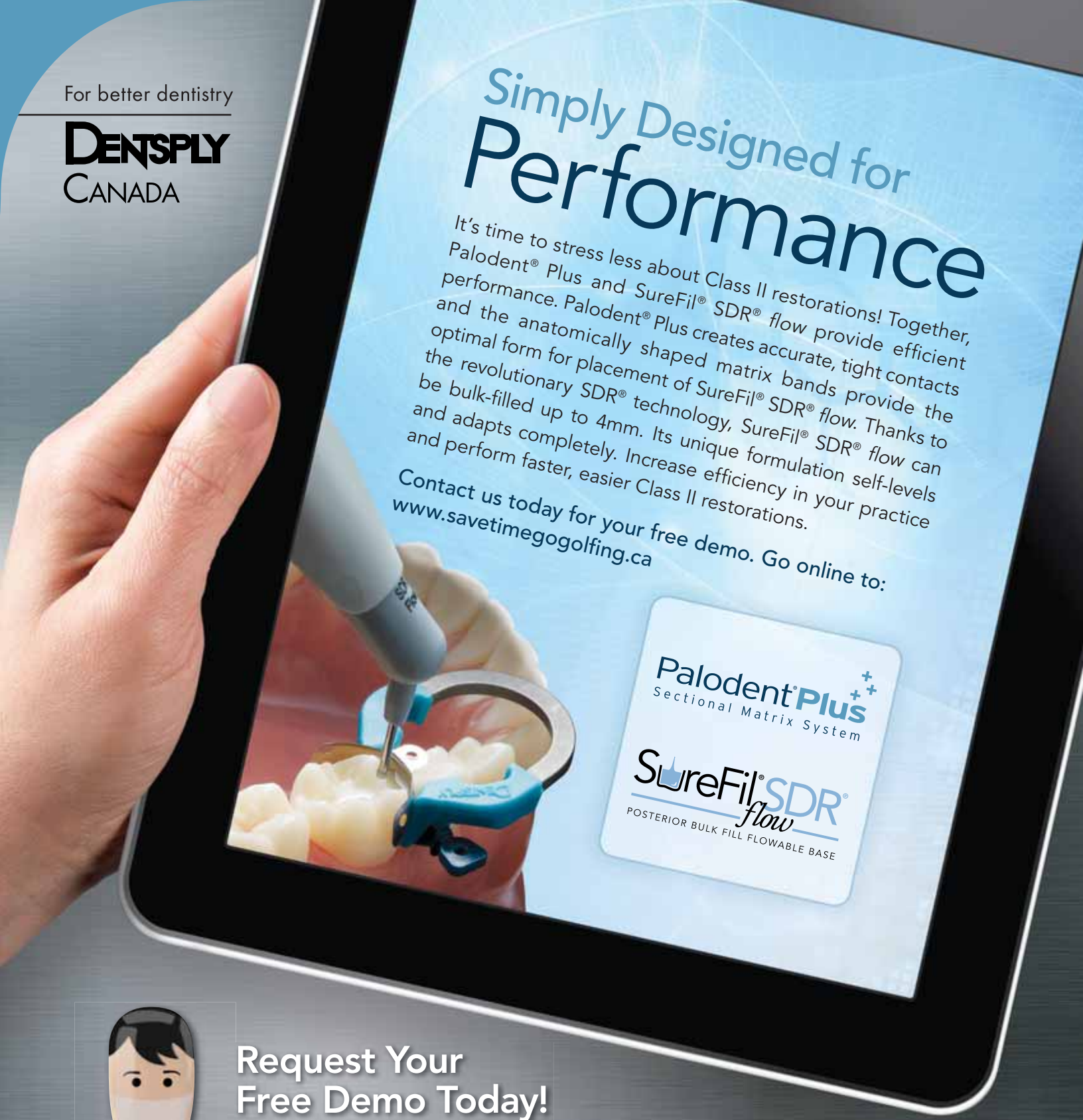

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Dr. Hubert Gaucher
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"Just-in-Time Learning" Model Impacts Dental Management Skills

"The exponential increase in new knowledge and the useful half-life of knowledge (7-10 years) are making it extremely difficult for clinicians to keep up-to-date. The number of articles published annually in peer-reviewed dental journals has grown from 6,212 in the year 1970 to 13,600 in 2009."[1] Add to this the marketing journals and advertisements in all their forms and one can certainly feel overwhelmed by the task of accessing the scientific information to substantiate clinical decisions.

For over a decade now dentists have been encouraged to join their medical colleagues in using **Evidence Based Practice (EBP)** skills aimed at formulating focused questions of the PICO acronym type, implementing internet systematic search strategies (PubMed, Medline, etc), seeking the highest level of evidence, critically evaluating said evidence and making clinical judgements on the applicability of this evidence for their patients. This clinical process has been well disseminated using interactive skills for achieving Evidence Based Decision Making in which Scientific Evidence is part of a triad encompassing Clinical Expertise and Patients' Needs and Preferences (Figure 1). "Only when all three are given due consideration in individual patient care is EBD actually being practiced. The first domain, evidence, is there to inform dentists and patients, but never to mandate a specific course of treatment. If we think about Evidence, Clinical Judgment, and Patient Needs and Preferences as three circles, then EBD is right in the center where all three circles overlap."[2]

From those pioneering times to actually embedding Evidence Based Practice (EBP) into the Dental curriculum, organized Dentistry has achieved a pivotal milestone whereby Dental Faculty accreditation reviews in North America require students to master these EBP skills. A most noteworthy dental curriculum innovation at the University of San Antonio, Texas, has involved the majority of the Faculty members mentoring students in their EBP courses. What ensued were **Critical Appraisal Topics (CATs)** that were tabulated to develop a CATs Library (https:// cats.uthscsa.edu/) (Figure 2).

Students are also reaching out to dentists in their dental practices in order to initiate them to the CATs library. These students have become facilitators for the dissemination of EBP skills. Such an initiative is a very tangible example of inter-generational collaboration and enhances cohesion within the profession.

Practioners are being offered numerous avenues to acquire these EBP skills through Dental Associations and dedicated resources. A great case in point, is the **ADA-Evidence Based Dentistry (EBD) Champions Conference** (http://ebd.ada.org/) which I was invited to attend this past March in Chicago. It was the third such conference convening practioners and academicians alike to share strategies for reaching out to an ever greater number of dentists wanting to upgrade their Practice Management armamentarium. Emphasis on free and readily accessible EBD systematic reviews and summaries, recommendations and resources, were presented by a panel of experts and reinforced with a hands-on computer search workshop. We were also shown the benefits of accessing the Cochrane Library (UK) with numerous free systematic reviews and clinical recommendations that are also compiled by calibrated scientific appraisers. More specifically, the objectives of the Cochrane Collaboration were presented: http://summaries.cochrane.org/search/site?f%5B0%5D=im_field_terms_cochrane_library%3A34799

CJRDP – EBP Survey

The CJRDP has taken the initiative to offer its readers a brief online survey aimed at better comprehending the present acceptance level and integration of EBP skills as a viable Dental Management resource. This survey can be accessed at the following URL:

https://www.surveymonkey.com/s/CJRDPEVIDENCEBASEDPRACTICESKILLSSURVEYPBR5LRF.

Please take a moment to voice your concerns and opinions on a topic that is probably the most significant paradigm shift in contemporary Dental Management Practice. Results of this CJRDP - EBP survey will be made accessible to all at www.cardp.ca and will serve as a discussion forum.

New CJRDP Publisher

This Issue spearheads the new participation of Palmeri Publishing Inc. (PPI). The Media Kit available online illustrates the far reaching expertise of PPI in the dental field. We are looking forward to broadening our Journal's spectrum of readers with the support and expertise of PPI. The CJRDP, based on its Summer 2011 membership Survey has, with the support of its Editorial Board members, brought added contents to both paper and digital versions. Please visit www.cardp.ca and download the updated Author's Guidelines, the CJRDP Production Schedule as well as its Media Kit. Article submission due dates are well indicated and a large array of topics relating to Restorative Dentistry and Prosthodontics are welcome.

For the benefit of our new readers, CARDP is an independent, non-profit national corporation, enlisting the expertise and efforts of its members on a volunteer basis, in view of producing excellent Annual Scientific Meetings and distributing its official publication, the CJRDP. The

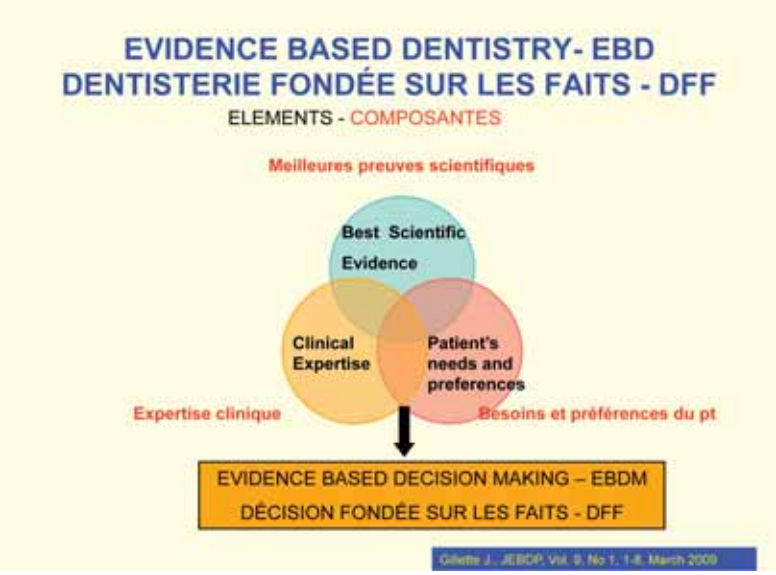

Figure 1

Dental Industry is continuously invited to support these activities as sponsors, as it has successfully done for over 50 years.

The Annual Meeting in Halifax this coming September will again exemplify the high caliber of scientific presentations, exhibits and social events that define the finest traditions of our Academy.

In this Issue, Dr. Peter Walford discusses a distinctive bridge retainer design with a well documented and illustrated clinical protocol aimed at initiating participation

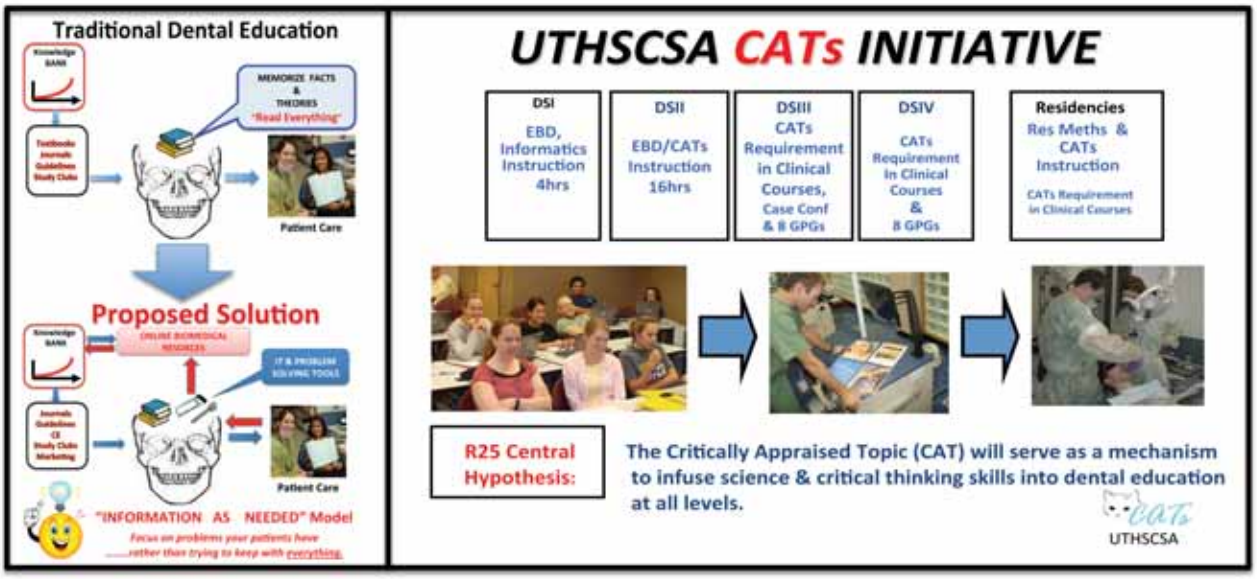

Figure 2

in clinical trials. Dr. Yvan Fortin reports on a thirty-year retrospective treatment leading to a very successful contemporary implant supported prosthesis case. Dr. Ron Zokol's case report of vertical ridge augmentation for implant supported posterior crowns addresses the biomechanical advantages of securing adequate crown/implant length ratios for the long term success of restoring lower edentulous ridges. Drs. Kim Parlett and Michael Racich's article contributions in our Journal's past Occlusion Issue were very well received and are presented in their entirety both in print as well as e-version following requests by our readers. As an added feature in this Issue, several Presentation Synopses from the Toronto meeting of last September are included. The Academy's Publication Committee has successfully enlisted the collaboration of several members whom we thank most sincerely.

Readers' comments and suggestions are always welcome and will be presented in Letters to the Editor.

Dr. Hubert Gaucher
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Le Modèle de "l'apprentissage instant" influence nos habiletés en gestion dentaire

"La multiplication exponentielle de nouvelles connaissances ainsi que la vie utile moyenne de ces connaissances (7-10 ans) rendent le rattrapage excessivement difficile pour les cliniciens. Le nombre annuel d'articles revus par des pairs dans les publications dentaires a passé de 6 212 en 1970 à 13 600 en 2009."[1] Ajoutons à ceci les publicités sous toutes leurs formes et nous voilà face à la tâche écrasante de dénicher une information scientifique valable qui épaulera nos décisions cliniques.

Depuis plus d'une décennie, les dentistes sont encouragés à se joindre à leurs collègues médicaux et aller vers des **décisions basées sur les faits**, en améliorant leurs aptitudes à formuler des questions du type PICO, (acronyme), à mettre en place des stratégies de recherches systématiques sur l'Internet (PupMed, Medline, etc.) obtenant ainsi le plus grand contenu d'évidence, puis à évaluer de manière critique cette évidence et enfin articuler un jugement clinique sur l'application de celle-ci pour leurs patients. Cette démarche englobe trois volets, soit: l'évidence scientifique, l'expertise clinique et les besoins et préférences des patients. (figure 1) "Ce n'est seulement lorsque ces trois éléments sont considérés dans le traitement individuel du patient que la dentisterie basées sur les faits est pratiquée. Le premier, l'évidence, existe pour renseigner dentistes et patients uniquement, jamais pour préconiser un traitement en particulier. Visualisez l'évidence, le jugement clinique et les besoins et préférences des patients comme trois cercles concentriques, avec la dentisterie basée sur les faits en plein centre."[2]

Depuis ces débuts jusqu'à l'implantation de la dentisterie basée sur les faits dans le curriculum scolaire, la Médecine dentaire a franchi un jalon pivotant en exigeant des étudiants nord américains qu'ils maîtrisent les habiletés s'y rattachant avant d'être accrédités. Un exemple prégnant se situe à l'Université de San Antonio au Texas, où la majorité des professeurs offrent à leurs élèves des cours en dentisterie basée sur les faits. Ce qui en découlent sont les **Critical Appraisal Topics** (**CATs**), un compendium de sujets dentaires catalogués. (https://cats.uthscsa.edu/) (figure 2)

De ce fait, étudiants rejoignent dentistes dans leur pratique, afin de les initier à la bibliothèque **CATs**. Ils sont devenus des collaborateurs à la dissémination des aptitudes d'une dentisterie basée sur les faits. Une telle initiative est un exemple tangible d'une coopération inter-génération, ce qui renforce la solidarité dans la profession.

De plus, les praticiens dentaires ont accès à plusieurs moyens pour acquérir ces aptitudes, via les associations

dentaires, par exemple, et diverses ressources qui y sont consacrées. Justement, le ADA m'a invité à Chicago en mars pour participer à une formation de dentisterie basée sur les faits (http://ebd.ada.org/). C'était leur troisième conférence du genre, réunissant cliniciens et académiciens dans le but de partager des stratégies pour atteindre le plus grand nombre de dentistes voulant améliorer la gestion de leur pratique. L'accent se posait sur les analyses systématiques et les sommaires gratuits déjà existants, en plus des recommandations et ressources proposées par plusieurs experts dans le domaine, le tout suivi d'un cours pratique en recherche sur ordinateur. On nous a démontré, entre autre, l'utilité de la bibliothèque Cochrane (Royaume Uni) avec ses diverses analyses systématiques et ses recommandations cliniques compilées par des évaluateurs scientifiques. Plus précisément, les objectifs de la Collaboration Cochrane nous furent présentés: http://summaries.cochrane.org/search/site?f%5B0%5D=im_field_terms_cochrane_library%3A34799

Sondage JCDRP – EBP (pratique basée sur les faits):

Le JCDRP prend l'initiative d'offrir à ses lecteurs un bref sondage en ligne afin de mieux saisir le niveau de prédisposition et d'intégration de l'évidence basée sur les faits dans le quotidien de leur gestion de pratique. Vous pouvez accéder à ce sondage au site suivant: https://www.surveymonkey.com/s/Z8TFPJPJCDRPSONDAGEDFF

Veuillez s'il-vous-plaît prendre quelques minutes pour exprimer vos opinions et appréhensions possibles concernant ce paradigme novateur. Les résultats de ce sondage seront accessibles à www.cardp.ca et constitueront la base d'un forum de discussion.

Nouvel éditeur du JCDRP

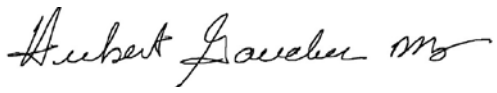
Ce numéro formalise l'implication de Palmeri Publishing Inc. (PPI). La trousse médiatique que l'on retrouve en ligne illustre fort bien l'expertise de PPI en matières dentaires. Nous anticipons une expansion considérable de notre base de lecteurs avec le support et la compétence de PPI. D'après les résultats de son sondage de l'été 2011 auprès des membres, le JCDRP a depuis rajouté du contenu à ses versions papier et numériques. Vous pouvez voir les nouvelles consignes aux auteurs, la cédule de publication du JCDRP, ainsi que la trousse médiatique au www.cardp.ca . Les délais pour soumettre vos articles y sont clairement indiqués et une panoplie de sujets portant sur la dentisterie de restauration ou de prosthodontie seront bienvenus.

À titre informatif à nos nouveaux lecteurs, l'ACDRP est une corporation nationale indépendante sans but lucratif, recrutant les énergies et connaissances de ses membres sur une base volontaire, en vue de produire des excellents congrès annuels et de distribuer sa publication officielle, le JCDRP. L'Industrie dentaire participe à ces efforts en tant que commanditaire depuis plus de 50 ans.

Le prochain congrès, qui se tiendra à Halifax en Septembre, démontrera une fois de plus le haut calibre de nos présentateurs, des exhibits et du programme social qui accentuent les traditions de notre Académie.

Dans ce numéro, Dr. Peter Walford discute du design d'attache de pont distinctif soutenu par un protocole clinique documenté et illustré, ciblant une éventuelle participation dans les essais cliniques. Dr Yvan Fortin fait une rétrospective sur 30 années du cas réussi d'une prothèse implanto-portée. L'étude de cas du Dr. Ron Zokol concernant l'augmentation verticale des crêtes en prévision de couronnes implant-portées, touche sur les avantages bio-mécaniques et l'obtention de ratio couronne/longueur d'implant adéquat, assurant ainsi le succès à long-terme de la restauration des crêtes édentées inférieures. Les contributions des docteurs Kim Parlett et Michael Racich dans un numéro antérieur du JCDRP portant sur l'occlusion furent si bien reçus qu'ils sont présentés dans leur intégrité en version papier et électronique. Comme valeur ajoutée, plusieurs sommaires de présentations qui ont eu lieu à Toronto l'an dernier sont inclus. Le comité de publication de notre Académie a recruté la collaboration de plusieurs de nos membres, que nous tenons à remercier très sincèrement.

Les commentaires et suggestions de nos lecteurs sont toujours appréciés et seront affichés dans les lettres au Rédacteur.



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1 Rugh, J. et al: Teaching Evidence-Based Practice at the University of Texas Health Science Center at San Antonio Dental School, Tex Dent J 2011; 128(2):187-190
2 About EBD: http://ebd.ada.org/About.aspx

Dr. Ron Zokol

Implant-supported Restoration of the Vertically Compromised Posterior Mandible – A Case Report

Restauration soutenue par implants dans le cas d'une mandibule postérieure compromise verticalement – un rapport de cas

Abstract

This case report deals with the surgical and prosthetic protocols used to regenerate vertical bone in the mandible for implant-supported restorations. The implants are used to secure and stabilize titanium mesh for the bone augmentation support. As a result of regenerating all the lost vertical bone in five dimensions, the final prosthesis has the appearance of a properly proportioned natural tooth with optimal biomechanical benefits and healthy, maintainable gingival tissues.

Résumé

Ce rapport de cas traite des protocoles chirurgicaux et prothétiques utilisés pour régénérer un os vertical dans la mandibule en vue de restaurations soutenues par implant. Les implants sont utilisés afin de solidifier et stabiliser des mailles en titane pour le soutien en vue de l'augmentation de l'os. Le résultat obtenu après avoir régénéré tout l'os vertical qui avait été perdu dans cinq dimensions fut une prothèse finale ayant l'apparence d'une dent naturelle bien proportionnée, avec des avantages biomécaniques optimaux et des tissus gingivaux en santé et faciles à entretenir.

Introduction

The patient is a 52 year old Caucasian female with no significant medical history. She is fully dentate with the exception of the mandibular left molars (Figure 1). Clinical and radiographic examination revealed evidence of periodontal therapy with limited horizontal bone loss and presently well maintained tissues. The mandibular left second premolar is in buccal cross-bite (Figure 2), exhibits approximately six millimeters of bone loss and gingival recession on its distal and lingual surfaces (Figure 3) and demonstrates a class two mobility. The maxillary molars are over erupted approximately two millimetres. Occlusal prematurities in centric relation are evident in the left posterior area and there is evidence of parafunctional habits with above average occlusal forces. There is no evidence of TMJ pathology. The patient is not interested in rehabilitating her malocclusion with orthodontics or prosthetics. The patient was referred to the author following failure of a previous attempt to restore the lower left posterior segment with implant-supported restorations (Figures 4, 5, 6).

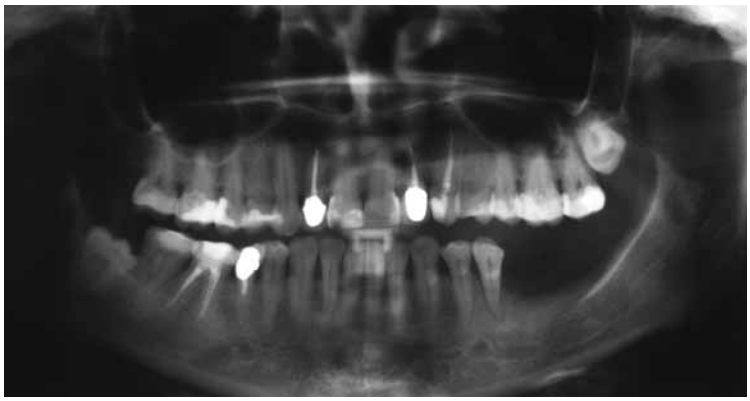


Figure 1 — Pre-operative panoramic radiograph of tooth 34.

Figure 2 — Facial view of tooth 34.

Figure 3 — Lingual view of tooth 34. Note recession.

History

The patient recalls losing her lower left molars due to periodontal disease and structural deterioration. The healed tissues exhibited significant vertical bone loss and migration of the mucogingival junction toward the crest of the edentulous ridge. A single implant was placed in the first molar position and was never brought to the restorative phase of treatment. The implant was removed and the area left to heal.

Treatment Plan

A comprehensive treatment plan was rejected by the patient, as well as a treatment plan to restore the left posterior plane of occlusion. The prognosis for the mandibular left second premolar was guarded and extraction was recommended and approved. The ailing second premolar was surgically removed and the area was allowed to heal for a minimum of three months. Following the resolution of the diseased phase, the tissues where re-evaluated and a treatment plan to rehabilitate the mandibular left second premolar and the two molars are developed.

The objective was to restore dental function on the left side back to the second molar creating bilateral vertical posterior support. Treatment options included:

1. Restore the edentulous site without bone grafting using three implants for support,
2. Restore the edentulous site with bone grafting using two implants for support.

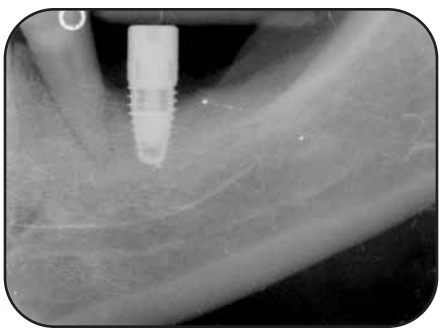
Based on the parafunctional habits with higher than normal occlusal forces the writer refused to treat the case without increasing the available bone. With increased bone volume longer and wider implants could be used which would increase the area of bony support and reduce the biomechanical loads on the supporting implants. This result would significantly improve the predictability of long-term health and stability. The prosthetic solution recommended was a three unit bridge supported by two implants. The pontic would be placed at the second premolar position supported by splinted restorations on the two molar implants.

The patient approved the bone graft treatment plan and expressed a desire for the implants to be placed at the same time as the bone graft. The request was based on a significant distance of travel and personal convenience. The patient was advised of the limitations of such a procedure and the higher probability of complications with poorer end results. Informed consent was provided and the patient elected to proceed.

Surgical Planning

Bone grafts are usually conducted as a separate procedure in advanced of implant placement, especially if the bone graft protocol uses particulate bone material.

Figures 4 — Lower left edentulous ridge



Figures 5 — Initial placement of failed implant 35

Figures 6 — Advanced bone loss, tooth 34 and implant 35 to be removed

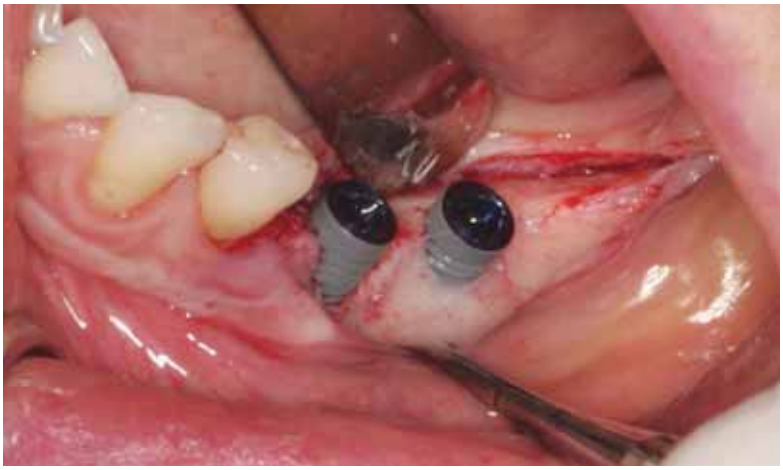


Figure 7 — Implants positioned with reference to optimal prosthetic position as if bone levels were actually ideal.

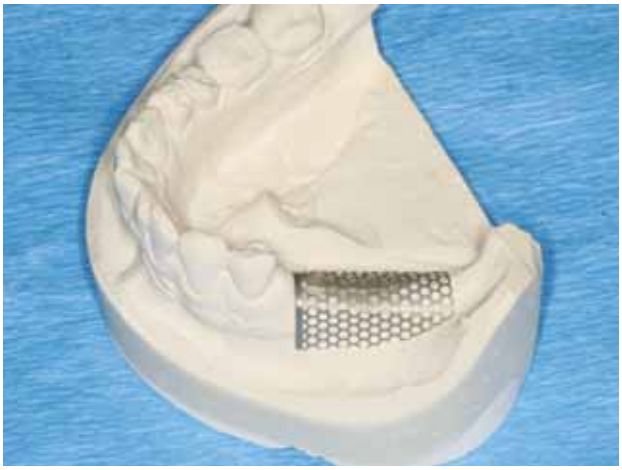


Figure 8 — Pre-surgical preparation of titanium membrane.

Conventionally placed implants have the benefit of using the bony ridge as a reference for the depth of the implant placement. Implants have been used to fixate block grafts in the case of severe resorbed anterior mandibles where prostheses height has never been a significant factor for consideration[1]. Placing a dental implant in a position which anticipates a concurrent bone augmentation requires that the position of the crest of the implant be calculated with reference to the prosthetic solution rather than the bony crest of the edentulous area.

The implant crest positions were calculated based on being three millimetres below the prosthetic CEJ of your final restoration. The calculated prosthetic CEJ positions allows for future restorations, not associated with this treatment plan, to have an appropriate clinical crown height and correct the posterior occlusal plane. This meant that the prosthesis coronal height for the current restorations would be reduced by the amount of over eruption of the opposing maxillary teeth.

Management of the vertical depth of implant placement can be done using two methods. Three dimensional computer assisted design and surgical template fabricate with computer software is one solution[2,3]. It requires absolutely exact placement of the surgical template with little or no margin for error[4]. Second, panoramic radiography may be used for treatment planning and measurements taken for height above bone at specific bone positions[5]. Caution must be exercised given that any horizontal measurement of a panoramic radiograph is not accurate, unlike the vertical measurements. A third method use the bony crest of the retained adjacent teeth could be used to facility the three dimensional perspective during the implant positioning.

Surgery Phase

Implants Placement

A full thickness incision was made from the distal of the first premolar to the retromolar pad. Full thickness facial and lingual flaps were elevated to expose facial and lingual aspects of the edentulous ridge. Osteotomies were performed at the 36 and 37 positions using a non-

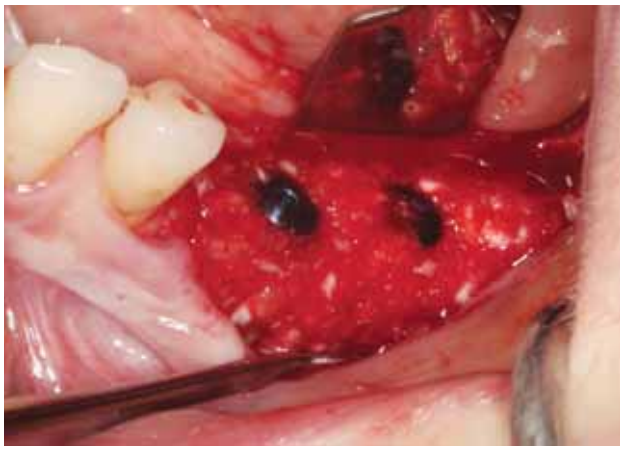


Figure 9 — Graft material placed to full contour and height.

Figure 10 — Ti Mesh barrier secured over graft fixated by implant cover screws.

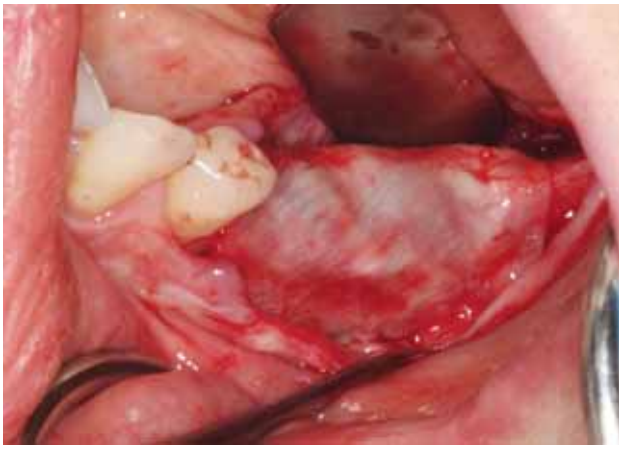


Figure 11 — Fibroblast inhibiting membrane placed over full aspect of the graft and Ti Mesh.

Figure 12 — Tissue closed with primary intention.

Figure 13 — Surgical post-operative radiograph.

Figure 14 — Immediately after suture removal. Note lack of incision line opening.

precision surgical guide to a depth of 2mm superior to the radiographic neurovascular bundle (Figure 13). Two NobelReplace 13mm WP implants (Nobel Biocare) were surgically placed in the 3-6 and 3-7 positions at depth as per treatment plan. The facial aspects of the implants were outside of the osteotomy 8 and 5 millimetres respectively with crests at a point 3 millimetres inferior to the anticipated prosthetic CEJ of the final crowns. Both implant had at least 3 millimetres of 360 exposed threads (Figure 7). Both implants were inserted with torque above 45 NCm.

Bone Augmentation

A 25mm x 34mm x 0.2mm sheet of titanium mesh (Salvin Dental) was pre-modified at the lab bench to fit the edentulous area at the anticipated height of the implants (Figure 8).

Refinement of the Ti Mesh membrane was completed following the placement of the implants. The facial and lingual extensions confirmed when the crestal aspect of the mesh. The crest of the Ti Mesh extended facially and lingually 2 millimetres out from the crest of the implant, and then was contour inferiorly to approximate the bone. Preparations were made in the Ti Mesh with a 701 fissure bur to accommodate the implant cover screws. The accuracy of the modifications was tested and confirmed by securing the Ti Mesh to the implants using 5 millimetre healing abutments strictly for convenience. The Ti Mesh was removed and set aside for completion after placement of the bone graft insertion.

Preparation of the augmentation recipient site included a thorough debridement of any soft tissue material. The augmentation site was decorticated with a 701 fissure bur in a surgical handpiece operating at 40,000 rpm under copious water flow.

The bone graft material was Regenaform (Exactech) hydrated with platelet rich plasma concentrated at 15 time base human values. Cover screws were placed on the implants followed by placement of the bone graft. The bone graft was contoured as per the Ti Mesh design (Figure 9).

The implant cover screws were removed and the Ti Mesh positioned over the graft and secured to the implants with the same cover screws (Figure 10). Any sharp edges of the Ti Mesh compressed toward the bone so as to reduce irritation of the overlying soft tissue.

Figure 15 — Opening into graft six months after placement.

Figure 16 — Cover screws removed and Ti Mesh pealed from underlying bone.

Figure 17 — Dermis allograft hydrated and placed around healing abutments prior to closure.

Figure 18 — Mature soft tissue four months after Ti Mesh removal and placement of Dermis graft.

Figure 19 — Lab selection and refinement of abutments for cement.

Figure 20 — Three-unit PFM bridge with an anterior cantilever pontic and two splinted abutments.

A fibroblast inhibiting membrane (BioGide, Osteohealth) is placed over the full extension of the Ti Mesh (Figure 11).

Semi-locking sutures with 3-0 vicryl are used to close the buccal and lingual flaps allowing healing by first intention (Figure 12). Post-operative instructions are repeated to patient in writing and verbally if sedation medications have not been provided (Figure 13). Post-operative radiograph is taken and the patient is scheduled to return in two weeks for suture removal.

At the time of suture removal, the surgical site is examined for any incision line opening or dehiscence of soft tissue exposing the Ti Mesh (Figure 14). In this case tissue closure was optimal. The graft was allowed to heal for a period of six months at which time the Ti Mesh was surgically removed.

Evaluation of the peri-implant area revealed full bone generation under 100% of the Ti Mesh membrane contour including 360 degree bone generation around both implants to the top of each implant crest module (Figures 15, 16). Five millimetre length straight healing abutments were placed on each implant.

Figure 21 — Implant abutments placed in on implants and torqued to 35 NCm. Note the small incision at the mesial of the 36 implant to release tissue for minimal trauma to gingival tissue.

Figure 22 — One month post prosthesis insertion. Note gingival height is optimal providing optimally proportioned clinical crowns for 35, 36 & 37.

The thickness and quality of the gingival tissue over the crestal aspect of the Ti Mesh membrane deteriorates over the five month course of healing. This is caused by a mild inflammatory response by the soft tissue moving over the surface of the titanium mesh. The frequent low grade inflammatory response released collagenase which attacks the collagen fibres within the gingival tissue. It is valuable to rehabilitate the character of the gingival tissue for optimum health and resistance to deterioration of the soft tissues around the dental implant. One option is to use a dermal matrix allograft for this purpose. A dermal matrix allograph is human dermal tissue processed to retain the natural collagen matrix and mechanical properties of native dermis. Puros Dermis dermal matrix membrane (Zimmer) was hydrated in platelet rich plasma concentrated at fifteen times human base value for five minutes. A 3.5mm diameter biopsy punch was used to prepare holes in the dermis accurately spaced to fit over the implant healing abutments (Figure 17). With the dermis placed around the healing abutments, the facial and lingual flaps were closed around the abutments with 4-0 vicryl sutures and allowed to heal for two weeks. Sutures were removed at after two weeks and the tissues allowed to mature for two months before the prosthetics phase was initiated (Figure 18).

Prosthetics Phase

A direct implant transfer impression (polyvinylsiloxane material in an open tray) was taken with transfer abutments splinted with orthodontic arch wire and GC Pattern Resin[6,7,8,9]. Implant abutments designed for cement retention were selected and modified at the laboratory. A three-unit porcelain fused-to-metal bridge was fabricated with a premolar pontic and splinted molar abutments (Figures 19, 20). The prosthesis was cemented with Tempbond cement and occlusion was refined and polished (Figures 19, 20, 21, 22, 23).

Post-operative periapical radiographs revealed very slight bone remodelling at the implant crest after one year. (Figure 24)

Discussion

There are three basic criteria for predictable bone augmentation – vascularization of the graft, fibroblast inhibition at the periphery and prevention of inflammation. Blood supply is the first criterion and provides the building blocks of tissue healing. Bone progenitor cells are delivered to the graft site via the neovascular system proliferating from the existing blood supply in viable bone.[10] The second is fibroblast inhibition[11]. Soft tissue grows significantly faster than bone. Without the fibroblast inhibiting membrane, generation of bone and proliferation of soft tissue would be in a race. Several millimetre of soft tissue would form under the Ti Mesh membrane leaving some bone growth, but not with the complete bone generation as seen in this case. The third criterion is management of inflammation.

There are a number of articles in the literature stating that Ti Mesh membrane does not work very well for guided bone regeneration. There is an inherent truth to that statement since there are a good number of failures associated with this procedure[12]. Understanding the biological response of the tissues to Ti Mesh during the healing phase is the key to success. The complexity of this subject is well beyond the scope of this report and will be the subject of another paper.

Inflammation does not require bacterial invasion[13]. Tissue damage, even at the cellular level, will invoke an inflammatory response. Collagenase is released and fibrous connective tissue is destroyed thinning the gingival tissue and predisposing it to dehiscence. Internally, the area of inflammation becomes acidic promoting osteoclastic activity and creating both cell mediated and solution mediated resorption of bone. If the Ti Mesh is

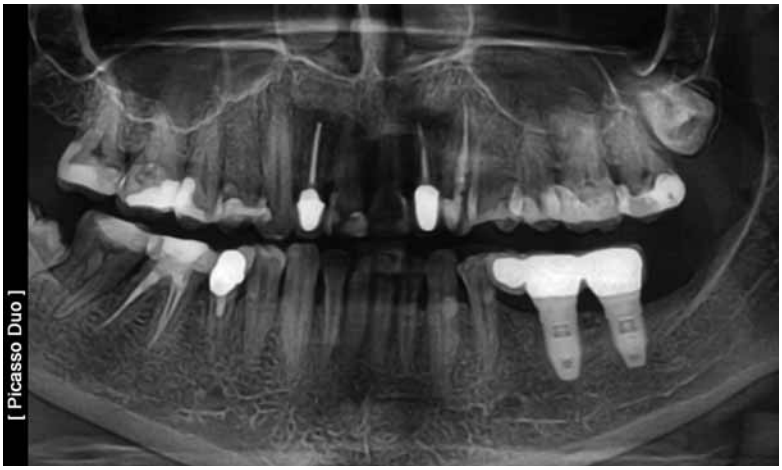


Figure 23 — Post prosthetic phase panoramic radiograph showing bone levels at the crest of the implants.

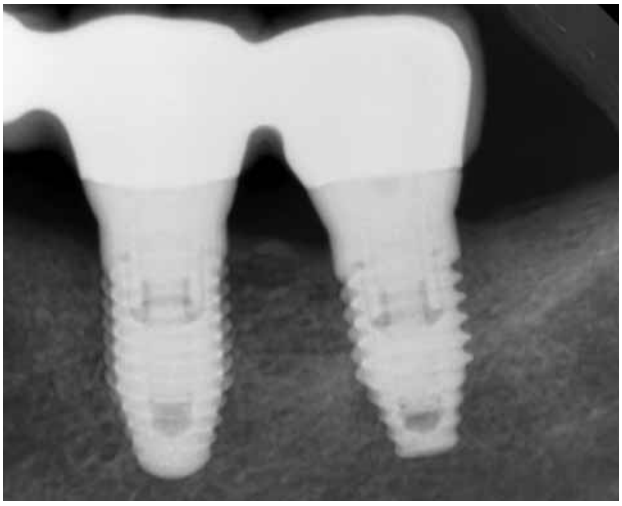


Figure 24 — One year post prosthesis insertion.

dehisced, bacterial contamination exacerbates the inflammatory response and the damage will be much worse if the patient cannot control the bacteria factor.

Hence, patient compliance is one of the key factors in the successful management of Ti Mesh cases. Surgical expertise certainly plays a large role, but no matter the level of surgical skill, success lies in the ability of the surgical team to convey to the patient the need to not place any pressure of any kind on the graft site until the Ti Mesh is removed.

While an inflammatory response will occur with tissue movement over the Ti Mesh, there will also be damage to graft tissue if the Ti Mesh membrane is allowed to move. Mobile Ti Mesh is then more easily moved with minimal oral forces creating a continuous and severe inflammatory response causing complete loss of the graft in almost all case. The Ti Mesh membrane must be rigidly anchored in place with bone screws and/or fixation to the rigid implant.

Rigidity of the Ti Mesh is also a factor. The author has found that 0.2 millimetre Ti Mesh resists flexing with larger spans and often requires fewer points of fixation with bone screws compared to the use of 0.15 millimetre Ti Mesh.

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Author declaration

I submit that I have no commercial interest in the subject of the above Case Report.

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Ron Zokol, DMD ('74, UBC) is the founder and director of the Pacific Implant Institute (PII) in Vancouver, and maintains a private referral practice in Vancouver, Canada exclusive to advanced surgical and prosthetic implant-supported reconstructive dentistry. Dr. Zokol holds Diplomate status with the American Board of Oral Implantology and the International Congress of Oral Implantologists and Fellowships with the American College of Dentists, the American Academy of Implant Dentistry and the Canadian Academy of Restorative Dentistry & Prosthodontics. He is a member of the Faculty of Dentistry at the University of British Colombia.

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Maintenance of Maxillary Alveolar Bone in the Esthetic Zone by Varying Strategies Over a 34 Year Period

– *a long term case report of one patient and six sites*

Entretien de l'os alvéolaire maxillaire dans la zone esthétique en variant les stratégies sur une période de 34 ans

– Un rapport de cas à long terme d'un patient et six sites

Abstract

In 1978 a 27 year old woman presented to the Oral Diagnosis Department at Laval University School of Dentistry with a severely compromised periodontal status of teeth 13 to 23. Planning and treatment was undertaken by a senior student finishing clinical requirements eligible for a student multidisciplinary research project presentation. The investigation undertaken was to evaluate in a direct comparison alveolar ridge preservation with strategically retained roots versus complete extraction in anterior sites closed by primary intention and protected with a tooth supported fixed provisional restoration.

In 1989 the 10 year results were presented to the Canadian Academy of Restorative Dentistry and Prosthodontics. Now the 34 year follow-up report is available. Preservation of the residual ridge hard tissue and soft tissue post-extraction and the status of the intentionally retained roots are documented against both beginning and interim records and photographs. The patient's desire for improved esthetics with comfort and stability continue, as do the attempts to preserve bone in a minimally invasive and predictable manner.

The transition from failing dentition in the esthetic zone after long term alveolar crest maintenance to an implant supported restoration is presented. The rationale for a one piece screw-retained porcelain to zirconia restoration is discussed. This includes the feature of pontic design, incorporation of the emergence profile design of implant placement and framework design that supports natural soft tissue contours of interproximal papillae maintained long term with toothbrush only maintenance. Noteworthy is that the patient has been able to avoid any type of removable restoration during the 34 year span. With planning, the transition from a fixed restoration on symptomatic teeth to a fixed restoration on implants with the same focus on alveolar ridge maintenance has been accomplished.

History

In 1978 a 27 year old woman presented to the Oral Diagnosis Department, University of Laval School of Dentistry with a severely compromised periodontal status of teeth 13 to 23. Three crowns had been placed in positions 11, 21, and 22 with mobility 2 for teeth 12, 11 and 22 (Figure 1). Hygiene was average and esthetics was very poor. The patient was accepted to be treated by a 4th year dental student as part of a multidisciplinary presentation research project.

The treatment plan included a fixed partial denture, gold and porcelain, from canine to canine keeping an intermediary pillar of

Figure 1 — Patient appearance before treatment, with +2 mobility in teeth 12, 11, 22 and previous crowns on teeth 11, 21 and 22.

Résumé

En 1978, une femme de 27 ans a été présentée au Département Oral de Diagnostic à l'Université Laval, École de Dentisterie, avec un statut parodontal gravement compromis des dents 13 à 23. La planification et le traitement furent entrepris par un étudiant du cycle supérieur terminant les exigences cliniques pour une présentation de projet de recherche multidisciplinaire. L'enquête menée fut de déterminer l'évaluation, en une comparaison directe, de la préservation de la crête alvéolaire avec des racines restantes bien placées, versus l'extraction complète des dents antérieures, fermé par première intention, et protégé par une dent supportant une restauration fixe provisoire.

En 1989, les résultats sur 10 ans furent présentés à l'Académie Canadienne de Dentisterie Restorative et de Prosthodontie. Maintenant le rapport des suivis sur les 34 dernières années est disponible. La préservation du tissu dur de la crête résiduelle, et des tissus mous de post-extraction, ainsi que l'état des racines intentionnellement conservées sont documentés depuis le début et l'intérim, par des documents et des photographies. Le désir du patient pour une esthétique améliorée avec confort et stabilité continue, ainsi que les tentatives visant à préserver l'os d'une manière mini-invasive et prévisible est tenu en compte.

Le passage d'une prothèse fautive dans une zone esthétique après un longs laps de temps d'entretient de la crête alvéolaire, à une restauration supportée par un implant est présenté. La justification pour une restauration d'une pièce vissée de porcelaine zircone est discutée. Cela inclus le projet d'une conception de pontique, l'incorporation de l'émergence du profil de placement de l'implant, et le projet d'armature qui supporte les contours naturels des tissus mous des papilles inter proximales entretenues à long terme seulement par une brosse à dents. Il convient de noter que le patient a été en mesure d'éviter tout type de restauration amovible pendant la durée de 34 ans. Avec la planification, la transition d'une restauration fixe sur des dents symptomatiques, à une restauration fixe sur implants, avec le même accent sur l'entretient de la crête alvéolaire, a été accomplie

support with the left central incisor. Part of the plan was to evaluate the possibility of having a more natural pontic appearance if the residual ridge could be stabilized from further resorption after extraction of teeth.[1-4] For this reason, evaluation of the possibility of selectively retained roots in the pontic spaces was chosen as a senior project for presentation.[5-8]

The right lateral incisor would be extracted. The right central incisor and left lateral incisor would be reduced to one millimeter subosseous height after undergoing endodontic therapy with an amalgam restoration placed in the remaining occlusal surface of the root of each tooth; after reduction the soft tissue would be allowed to fill in with the retained roots submerged in the pontic areas.

The canine teeth and left central incisor would be prepared to receive a temporary bridge. For the 3 sites where either the teeth would be submerged or the tooth extracted, the pontic was designed with the attempt to

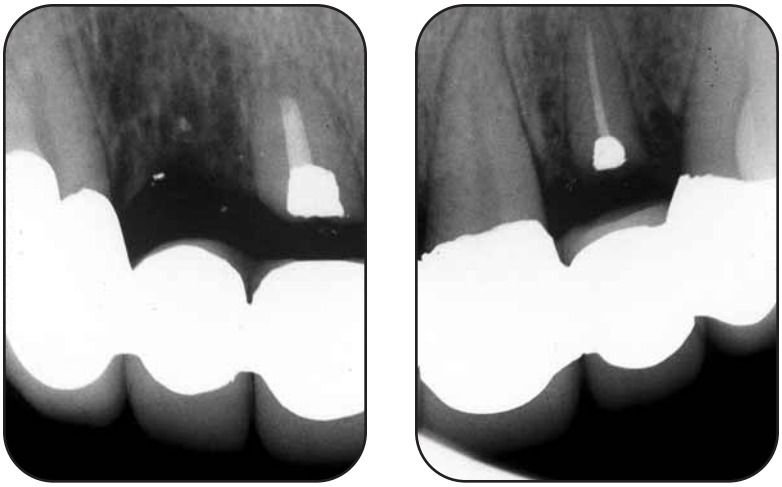

Figure 2 — Metal based provisional restoration after extraction of tooth 12 and endodontic therapy enabling retained roots in sites 11 and 22. The provisional fixed partial denture is supported by teeth 13, 21 and 23.

Figure 3 — Views of sites 13 through 23 after delivery of definitive fixed partial denture.
Note that alveolar soft tissue contours in sites 12, 11 and 22 all well maintained in both horizontal and vertical dimensions.

Figure 4 — Panoramic radiograph 33 years after delivery of definitive restoration to anterior maxilla. Patient now has symptoms of sensitivity from anterior teeth and also mobility of the anterior bridge restoration is detectable.

seal the sites to heal by primary intention when the temporary bridge with well adapted pontics was inserted. After a period of 6 months was observed the definitive bridge would be fabricated.

Treatment proceeded as planned from root canal therapy, tooth reduction, extraction and provisional restoration. At the time of removing the provisional bridge, a soft tissue seal was observed at all sites. The previously retained and submerged roots were not visible; where the roots were submerged there was no drainage or communication through the soft tissue, (Figure 2).

Except for a small labial concavity that had developed at the extraction site (12), there was no other significant resorption evident for either the submerged root sites or the extraction site. The function was satisfactory with the bridge with esthetics also improved but not perfect.

The patient continued to be followed in the private practice of the student dentist that had now graduated. The definitive restoration was delivered approximately one year after treatment began by the same clinician (YF) now a dentist in private practice in the community, (Figure 3). At the time of presenting the 10 year results, alveolar ridge height had been maintained and there was no significant difference in residual ridge crest height whether the there was a retained root compared to the lateral incisor that had been removed.

The patient had continued with the definitive tooth supported fixed partial denture throughout this time. Another twenty years later, this patient of the original one time student dentist now found her way back to his office to assess whether the new technology of today could improve the strength and esthetics of her current situation.

At this time, now 33 years later, the patient presented with the original porcelain to metal fixed partial denture still functioning. During examination a mild recession in the canines was evident accompanied by both a slight sensitivity and by a slight mobility. The submerged roots appeared to be in the same position without inflammation. All associated soft tissue was within normal limits and good bone volume was maintained in both vertical and horizontal dimensions, (Figure 4).

The treatment plan proposed at this time included:

- removal of retained roots in sites 11 and 22
- removal of maxillary canines 13 and 23
- removal of the left central incisor 21
- crowns on upper first premolar teeth
- immediately after extraction four implants — two in the canine positions and two in the in the central incisor positions with two pontics in the lateral incisor positions would be placed.
- immediate post-operative placement of a screw-retained provisional composite bridge with a tissue compression design. (Figure 5 a, b).
- after a period of period of 5 months begin the prosthetic steps for a porcelain-to-zirconia screw-retained restoration

Discussion

This case report shows follow-up of 34 years of the anterior maxillary ridge undergoing multiple dental procedures:

- extractions

Figure 5a — The decision was made to remove the remaining anterior bridge supports of teeth 13, 21 and 23, and follow directly with implant placement .

Figure 5b — implant placement after extraction was immediately followed with a fixed, screw-retained provisional restoration to attempt to preserve hard and soft tissue contours.

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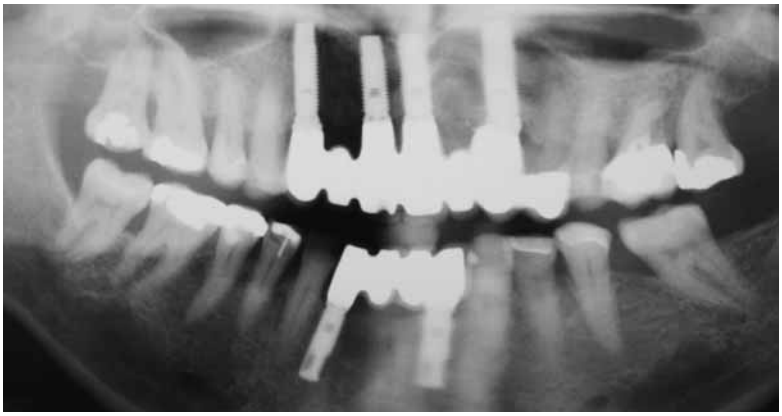

Figure 6 — Radiograph after delivery of one piece porcelain to zirconia scew-retained restoration.

- removal of clinical crowns with retention of subosseous roots
- fixed partial denture restoration with pontics
- osseointegrated implants placed simultaneously with tooth removal and also placement of a provisional restoration
- a pontic design ideally applied to anterior screw-retained zirconia implant restorations
- continuous anterior fixed bridge function over a 34 year span despite having all six teeth removed at different times throughout this period

This case report suggests observations that can be made after 34 years of follow up. We also see how it is possible to consider the treatment planning with the materials, techniques, experience and contribution of implantology.

It has long been recognized that whatever restorative material are used for clinical crowns, and however masterfully dental implant placement may be planned and executed, it is the volume and symmetry of the natural gingival contours that determine esthetics around teeth, pontics and implants alike.

To this end, maintenance of an abundance of natural soft tissue and underlying bone volumes and contours in the event of tooth loss are of a significant concern on long term esthetics, function and ease of hygiene maintenance. For these reasons, different strategies have been engaged to preserve the residual ridge crest and associated soft tissue. This approach allows the opportunity to achieve a more natural result with a more minimally invasive approach. Preservation of tissues is more desirable rather than allowing ridge atrophy to occur and then be faced with prospects of hard and soft tissue reconstruction.

The design for the definitive restoration is a one-piece 6 unit screw-retained porcelain to zirconia bridge placed to a Brånemark System external hexagon implants. The pontics are designed to have an emergence profile which would cause compression on the ridge tissue in order to recreate papillae to improve esthetics and facilitate hygiene for the patient, (Figures 6, 7a, b).

Figure 7a — 1979 after delivery of definitive restoration with retained roots in sites 11 and 22, with teeth 13, 21 and 23 serving as bridge abutments

Figure 7b — 2012 after delivery of porcelain to zirconia screw-retained bridge with supporting implants in sites 13, 11, 21, 23. A compressive pontic design is used to direct the soft tissue to the interproximal areas and simplify oral hygiene maintenance.

Follow-up appointments at 1, 3 and 6 months after delivery of the definitive restoration were performed to verify soft tissue response and hygiene maintenance.

Conclusion

We observed that there was no significant difference of bone maintenance between the anterior site with a compete extraction and the two areas where clinical crowns were removed with the roots kept in place and covered over by soft tissue. The explanation is that all of the wounds were closed by primary intention permitting almost total bone reconstruction and no significant loss of support.

We also observed that the roots remained in situ beyond 30 years. The explanation of this long-term stability is likely due to the reduction of the roots within the bone crest which in turn encouraged bone formation to develop around and slightly over the edges of the roots, thus allowing their prolonged retention.

We were able to improve the stability and certainly the strength of the bridge by placing 4 implants. We greatly improved the esthetics of the patient by providing a completely natural looking prothesis utilizing a screw retained bridge with a zirconia framework. This procedure also removed the sensitivity symptoms the patient had reported at the onset.

We further improved the esthetics and quality of life of the patient by developing an emergence profile pontic design which created the illusion of a natural tooth emerging from the soft tissue. This esthetic pontic design, having a convex imbedded surface, also significantlly simplified hygiene maintenance for the patient.

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Author declaration

I submit that I have no commercial interest in the subject of the above Case Report.

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A New Prosthetic Retainer for Tooth Replacement and Splinting

Un nouvel ancrage prothétique pour le remplacement de dent et la pose d'attelle

Dr. Peter Walford

Abstract

The twin drawbacks of poor retention and compromised aesthetics have led to widespread abandonment by the profession of conventional "Maryland" RBFPD (Resin-Bonded Fixed Partial Denture) retainers. In this article the author introduces a new retainer design that overcomes these drawbacks and illustrates the aesthetic potential in a high-cosmetics case. The case profiled has succeeded without incident for 5 years at the time of writing.

This retainer design has been utilized by the author on over 300 abutment teeth to replace or splint teeth, in both upper and lower arches, over 9 years in private practice, experiencing 98% retention during this time frame.

By comparison, a literature review by Wyatt[1] summarized outcomes of RBFPDs published in English-language, peer-reviewed journals since 2000. Annual de-bond rates are improving from those experienced from 1980 to 1990[2,3] where 15% annual de-bond was average. Subsequently, the incorporation of mechanical retention features and new luting protocols have improved survival rates. Currently, an annual 5% de-bond rate is normative, while 15% is noted in the anterior mandible.[4,5] For most practitioners, this is still an unsatisfactory level of reliability.

If one wishes to conservatively join retainers to sound teeth without incurring labial destruction, compromised aesthetics, or dubious retention, the new retainer design outlined in this article may deserve consideration.

Case Study

A 39 year-old female requests a fixed replacement for a long-standing "flipper" partial denture to restore with her missing right lateral incisor (Figure 2). The adjacent teeth are virgin, and dental arches are otherwise complete, the adjacent teeth are non-mobile, and the occlusion is group function.

Treatment options included implant placement, full coverage 3-unit bridge, or an inlay-adhesive cantilever RBFPD.

Examining for implant treatment, the following concerns were noted, (Figure 2). Inter-radicular bone between 13 and 11 is insufficient for implant housing, labial bone is deficient, papillae are blunted, the tissues are transparent, and the smile line is high. As well, the contra-lateral tooth is in labioversion, and, in order to create smile symmetry, unfavourable crown / implant angulations will be required. It is anticipated that crown rotation relative to the implant base will challenge aesthetics, and the path of insertion will be problematic. Finesse and augmentation procedures will be required, and fees will necessarily be high.

Neither patient nor clinician wish to invoke full coverage of these beautiful unrestored teeth, and, pragmatically, a limited family budget and four school-age children discount implant treatment, with the above concerns, as the best option.

A cantilever pontic, retained by the cuspid, utilizing an intracoronal lingual inlay to supplement a Maryland-type extracoronal flange, was selected.

Double-abutting was considered, but the literature reports that cantilever Maryland designs survive equally or better than double-abutment prostheses in lateral incisor replacement.[6, 7, 8]

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Résumé

Les deux inconvénients d'une mauvaise rétention et d'une esthétique compromise, ont conduit à l'abandon généralisé par la profession des classiques « Pont Papillon » (Maryland, prothèse partielle fixe liée à la résine).

Dans cet article, l'auteur introduit une nouvelle conception qui pallie ces inconvénients et illustre le potentiel esthétique dans un cas de haute-cosmétique. Le cas dénommé a réussi pendant 5 ans jusqu'au moment de l'écrire.

Cette conception de retenue a été utilisée par l'auteur sur plus de 300 dents piliers pour remplacer ou maintenir ensemble des dents, dans les arcades supérieures et inférieures, pendant plus de 9 ans, en pratique privée, connaissant 98% de succès durant ce laps de temps.

Par comparaison, une revue littéraire par Wyatt résumait les résultats des prothèses partielles fixes liées à la résine, publiée en langue anglaise, journaux régulièrement évalués par ses pairs depuis 2000. Les taux annuels de décollement s'améliorent par rapport à ceux expérimentés de 1980 à 1990, où un taux de 15% était la moyenne de décollement. Par la suite, le rajout de rétention mécaniques et des protocoles de collage nouveaux ont améliorés les taux de survie. Actuellement, un taux annuel de décollage de 5% est normal, alors qu'un taux de 15% est remarqué dans la partie antérieure de la mandibule. Pour la plupart des praticiens, c'est encore un niveau insatisfaisant de fiabilité.

Si on veut de manière conservatrice joindre avec un pont de bonnes dents sans encourir la destruction labiale, compromettre l'esthétique, ou utiliser une rétention douteuse, la nouvelle conception de pont démontré dans cet article peut mériter considération.

a bulletform subgingival porcelain ovate pontic was placed subgingivally at cementation by raising a surgical flap and removing necessary bone. Anti-rotation features were provided by preparing a minor indentation into the distal of the central incisor. The path of insertion was inciso-lingual.

Intracoronal Inlay Design

The retainer design, (see Figures 1 and 3), is based upon a sharply defined lingual inlay, with walls 7 degrees divergent, similar in size to an endodontic access opening, but guitar-shaped in outline. It is 1 to 1.5 mm. in depth, and clearly prepared into dentin. A "guitar-shaped" outline form is achieved, preferable to a slot or

Figure 1 — Post-operative view

Figure 2 — Pre-operative view

Figure 3 — Intracoronal and extracoronal appearance of cantilever inlay bridge

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Figure 4 a-e — Splint application

triangular form, generating more walls and increasing resistance against gingival or occlusal displacement.

Besides providing robust retention, the inlay ensures predictable seating, in both single and multiple abutments, particularly when splinting multiple mobile abutments, because margin closure can be definitively evaluated at the perimeter.

There is a learning curve required for this preparation: the clinician must master preparing the inlay with a lingual or linguo-incisal path of insertion, which is quite foreign to the conventional occluso-gingival path of insertion of most crown preparations. During preparation, the handpiece head vies for space with the mirror, which constricts vision. However, with patience, rehearsal,

Figure 5a — Blackout of lingual surface aids preparation visualization

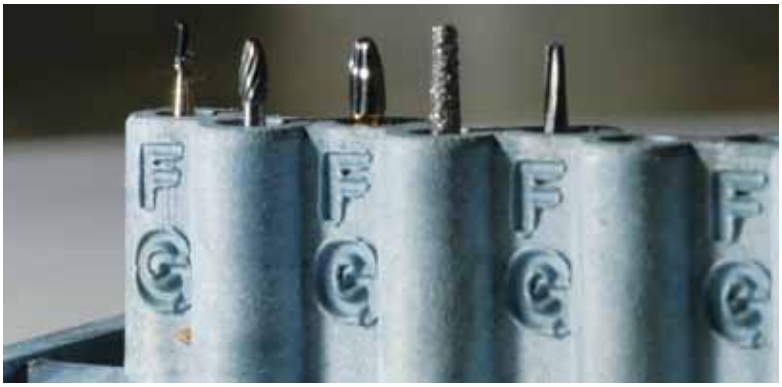


Figure 5b — Bur sequence used in preparation

and the preparation sequence to be described, these challenges can be overcome. It is recommended that the preparation be placed on Dentiform models and extracted teeth before bringing it to the mouth.

Figures 4 a-e, illustrate the intracoronal and extracoronal design in a periodontal splint application. These photos are of a case that has survived 8 years in the mouth despite a crown / root ratio of 4 to 1, illustrating that the inlay retainer delivers the robust resistance and anti-rotation features needed to offset the mobility of the abutments. This splinted sextant survives despite negligent hygiene.

Unlike conventional Maryland design, mobility of abutments is not a contraindication, because the inlays are "pinched" into place between the operator's thumb and forefinger, ensuring full seating at cementation. Thus, this retainer is compatible with periodontally mobile teeth. It has been hypothesized that the poor performance of periodontal splints in vertical-insertion RBFPDs is due to compromised seating and cementation with mobile abutments.[1] Hyper-elastic PDLs are also present in abutments immediately following orthodontics, showing reduced clinical success in these cases when treated conventionally.[1]

Retentive Design

Intra-coronal retention, in the form of an inlay, replaces conventional extra-coronal retention, in the form of proximal grooves, to mechanically supplement the adhesive flange of the resin-bonded retainer, see Figure 3. Benefits of the inlay beyond enhanced retention and verifiable seating include reduced facial show of metal, and reduced tendency to grey or opaquely "deaden" the abutments.[1]

Both maxillary and mandibular incisors often lack the form necessary to generate long grooves unless they are placed excessively to the facial. Conventional anterior Maryland-type bridges are often aesthetically degraded by greyness or unnatural opacity at the facial line-angles.[1]

Long parallel proximal grooves, needed to promote stability with conventional RBFPDs[1], reduce the amount of tooth structure available to mask metal. The resultant, "shine-through" or interproximal opacity from opaque cements is often unavoidable.

Although the maxillary cuspid is longer and often better in form than the incisors for achieving retention with grooves or hollow-ground retentive proximal preparation, these features still need to be extended facially to the proximal line angles in order to encompass

Figure 6 — Slot preparation with 330 at correct depth

Figure 7 — Expansion of outline with 7404 and 7406. Floor not deepened following slot stage.

Figure 8 — Refinement: 701 to sharpen internal form. Note that correct depth is retained from initial slot penetration

Figure 9 — Reduction with round bur for centric and excursive clearance (red)

Figure 10 — Perimeter outline generated with 1157 FG bur (or 7406).Pulpal depth retained. Remaining lingual surface is discretionally reduced or not.

Figure 11 — Occlusal Indicator wax to check reduction

Figure 12 — Typical inlay impression

180 degrees of the tooth. While opaque luting agents may hide greyness, thin interproximals sacrifice vitality, giving a "dead", grey, or lifeless opaque appearance to the abutment teeth post-operatively.

In this retainer design, because the interproximals are not reduced, these effects are mitigated.

Preparation: Steps and Instrumentation

The first step for the preparation is to black out the lingual surface with an insoluble marking pen, such as a "Sharpie™ "indelible laundry pen, see Figure 5a. This makes the development of the inlay considerably easier.

The inlay preparation is developed in four stages: This preparation sequence prevents overly deep axial penetration, the most common outcome early in the learning curve.

1. Slot
2. Gingival and incisal outline expansion
3. Extension of gingival floor with seven degree divergence
4. Refinement and finishing

Slot Penetration

A slot preparation of the desired height, from the desired path of insertion, is prepared at a depth of 1 to 1.5 mm with a 330 bur, (see Figure 6). As the 330 bur is 1.8 mm in depth, the correct depth of penetration is approximately one-half to three-quarters of its depth. The 330 FG carbide offers controlled cutting, delicate tactile control, and a ready gauge of penetration. Water coolant is used during this initial penetration.

Outline Form

Once a slot is prepared to correct depth and height, a 7404 bur is placed into its gingival base, to the depth of the pulpal floor, expanding the outline of the gingival portion of the slot, while not deepening it pulpally. Similarly, a 7406 is entered into the occlusal portion. These burs are not appreciably end-cutting, and are 12-fluted rather than 6-fluted, for a conservative cut.

The result is an outline that resembles an asymmetrical "barbell", see Figure 7. The isthmus between gingival and occlusal outlines portions is un-instrumented at this point in the preparation, because it is very easy to overcut and thereby lose the "waist" of the desired "guitar" shape.

Figure 13 — Typical impression material and Anterior Quad tray

Figure 14 — Gripper trays

Internal Form

A 0816.8M diamond (flat-end, round shouldered) is placed into the cavity to the depth of the pulpal floor, widening the gingival floor and reducing the excessive taper of the proximal walls remaining after the above step. As in the preceding step, the pulpal floor is not deepened and the isthmus is not instrumented. Only the pulpal floor is widened at this step. A light touch, with or without out spray irrigant, is used, as visibility requires. A directed air stream will reduce pulpal heat stress.

Refinement

A 701 carbide is placed into the cavity at slow rpms to sharpen the internal form, i.e., the walls and the pulpo-

Figure 15 — Microprime (Danville Dental)

Figure 16 — EZ Temp "Onlay"(Cosmedent)

Figure 17 — Temporary appearance after 3 weeks

axial line angles. This produces a very readable and impressionable inlay. Cutting dry, with directed coolant air, may facilitate preparation. (Figure 8)

Finally, the "waist" (isthmus) is instrumented with the 701 bur with a single pass if possible.

Flange preparation

Reduction in the areas of centric stop and excursive paths is accomplished with a suitable bur or round diamond, as in conventional Maryland Bridges. If necessary for occlusal clearance, a perimeter finish line is established with an 1157 bur. The blackened surface makes this step clean and visually definitive.

It should be noted that as the lingual surface is reduced, inlay depth is lost, and retention thereby decreased. Over-contouring of the final retainer may be preferable to deepening the preparation into dentin. This is particularly relevant in mandibular incisors.

Readers will therefore notice the retainer in Figure 2. is over-contoured towards the gingival where not in functional contact. This is deliberate.

Perimeter Outline

See Figure 10.

Final Finishing

The remainder of the flange bonding surface in the preparation may be superficially reduced with a 7406 bur to remove amorphous and heavily fluoridated mature enamel surface which otherwise resists etching at insertion and is not cohesive with the underlying enamel rods. Only a ten micron reduction is needed to meet this goal, so, alternatively, the lingual surface may be judiciously air-abraded at the insertion appointment to expose rod-ends for bonding.

Adequacy of occlusal and excursive clearance is evaluated with Occlusal Indicator wax (Kerr), Figure 11.

Once the preparation is completed, remaining black-out is removed with alcohol on a swab.

Impression

A conventional VPS impression material with high tear resistance[2] is used in an anterior tray.

The tray needs to meet the following criteria: a stiff frame, ample size, and clearance to prevent impingement and distortion in closure. Two suitable choices are the anterior Quad Tray (Clinical Research Dental), Figure 13 or the Gripper three-quarter or anterior tray (Discus Dental), Figure 14; depending on the extent of the arch

Figure 18 — Photo with shade tabs for laboratory e-mail.

Figure 19 — Dimple in laboratory stone to allow bullet-form pontic fabrication.

Figure 20 — Sandblasting with 27 micron aluminum oxide prior to etching

Figure 21 — Semi-lunar incision, bone and tissue removal for pontic:

Figure 22 — Pontic and retainer try-in.

that requires capturing. In Figure 13, the heavy body VPS material is Affinity (Clinical Research Dental), and light body material is Extrude (Kerr.) Other impression materials with similar properties can be selected.[9,10]

Note: a custom tray is not advantageous. If a custom tray is used, lingual relief must be generous to allow the impression to remove comfortably and deform without risk of tearing the inlay impressions. Consider that in splinting applications, the labial aspect of the tray and impression will be cut away by the laboratory to avoid breakage of long delicate clinical crowns after pouring the stone. In these cases, the labial aspect is unimportant. When the lingual surface alone needs to be captured, a custom tray is counter-productive. Finally, in mobile teeth, a custom tray will not be as comfortable for the patient upon removal, even if interproximals are blocked out. Regardless of technique, high tear-resistance and medium elasticity are essential in the chosen VPS material.[9,10]

Temporization

After impression, the dentin is painted with a desensitizer, such as Microprime B or G (Danville Products), or G-Force (Clinical Research Dental).

The preparation is temporized with a light-cured soft resin product such as EZ Temp (Cosmedent) Figure 16, or Fermit (Ivoclar). When a smoother surface finish is desired, a layer of low-viscosity flowable resin, for example Starflow (Danville Products) or Estelite LV (Kuraray) in a light shade (e.g. B1) may be flowed over the margins of the temporary and preparation. A light shade of flowable facilitates subsequent identification and removal, Figure 17.

No luting cement is used because the inlay temp material expands hydroscopically to provide retention. Three or four weeks of retention can be attained, but if lost, comfort will be ensured by the dentin desensitizer.

Laboratory Aspect

As it was not possible for the patient to attend the laboratory, an image was sent to the laboratory by e-mail, Figure 18.

A "bullet-form pontic extending 2mm subgingivally" was prescribed, with the instruction to cut back the stone model as required, Figure 19. Characterization details, tooth positioning and rotation, root demarcation and root shade were specified.

The metal chosen for the framework was a stiff noble ceramic metal. In larger splints, for economy, non-precious hypo-allergenic alloy, such as Talladium Tilite Premium, or similar RPD framework alloy is prescribed, which is typically cast upon a refractory model.

Figure 23 — Retraction cord (VanR Gingibraid)

Figure 24 — Tinplater and Microtin (Danville Dental)

Figure 25 — Alloy Primer (Kuraray)

Table 1 — ETCHANTS – DEPTH OF ETCH *(data from Summitt and Robbins, Quintessence) pg. 214*

Product	Concentration	Etch Time	ph	Depth in Dentin (microns)
Ultraetch (Ultradent)	10%	15	1.31	1.7
Ultraetch (Ultradent)	35%	15	0.02	1.9
Scotchbond etching gel	35%	15	-0.28	3.0
Aqueous phosphoric	37.5%	15	-0.43	5.0

Insertion

At insertion, local anaesthesia was placed, temporary removed, and disclosing solution applied to identify residual plaque or debris or other barriers to bonding. A single-hole rubber dam was used to isolate the tooth, and the lingual surface was sandblasted for 5 seconds with 27 micron aluminium oxide, using a Danville Microetcher (Danville Dental). This step increases etchability, debrides remaining contaminants, highlights residual temporary material, if present, and removes enamel that has been re-fluoridated due to toothpaste use between appointments, Figure 20. The dam was removed.

Tissue Surface Surgery and Haemostasis

An H-shaped scalpel incision was made to bone, and a mini-flap was raised where the pontic will insert into the tissue. Bone under the neck of the pontic was removed with a FG1558OS bur at low rpms, copiously irrigated, to create sufficient space (2mm.) for normal tissue architecture to develop postoperatively, Figure 21, until bridge seating was verified. Minor adjustments were made for aesthetics and occlusion. Figure 22.

Haemostasis was achieved by placing Gingibraid 0e retraction cord (Van R), or, alternatively, Pascal Siltrax, in the adjacent sulci. These cords contain aluminium-based salts and epinephrine, Figure 23. The epinephrine is important to restrict blood flow to the surgical field. To assist haemostasis, an astringent based on aluminium salts, such as Hemodent, (Premier), or Viscostat Clear (Ultradent) was used to saturate the cord, followed by a wet gauze under labial pressure for five minutes, with the bridge in place. Other modalities could be used as well.

Cementation

The clinical goal is to ensure that the bonding surfaces are completely free from contamination during cementation. Rubber dam is preferable whenever possible, showing improved prosthesis survival,[1] but was not possible in this case due to the subgingival pontic placement.

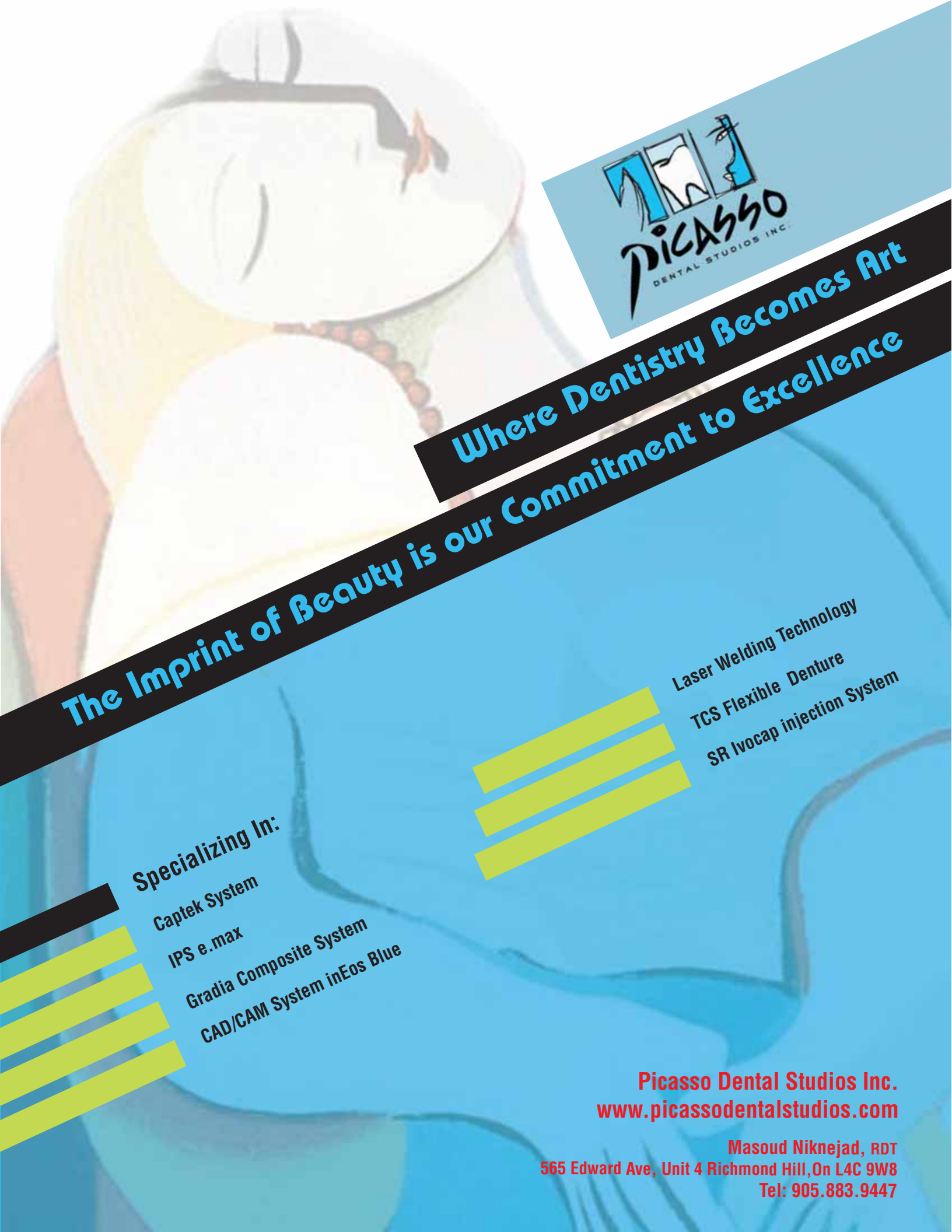
Table 2 — Immediate and 24-hour bond strengths of Panavia F2.0 and Photobond.
Data from Reality Research Labs and from Kuraray Dental (Personal Correspondence)

PANAVIA		Immediate bond	24-hour bond
ENAMEL	Self-etch	12	24
	Phosphoric etch	18	26
DENTIN	Self-etch	8	10
	Phosphoric etch	10	15
PHOTOBOND			
ENAMEL		22	22
DENTIN		17	17

Figure 26 — Photobond (Kuraray)

Retainer Surface Protocol

The retainer was sandblasted and electro- plated with tin (Danville Microtin electroplater) using Microtin solution (Danville Materials). This increases resin adhesion to acceptable levels.[1] After plating, it was thoroughly washed with water and scrupulously dried. Neither alcohol nor ultrasonic cleaning were utilized, however.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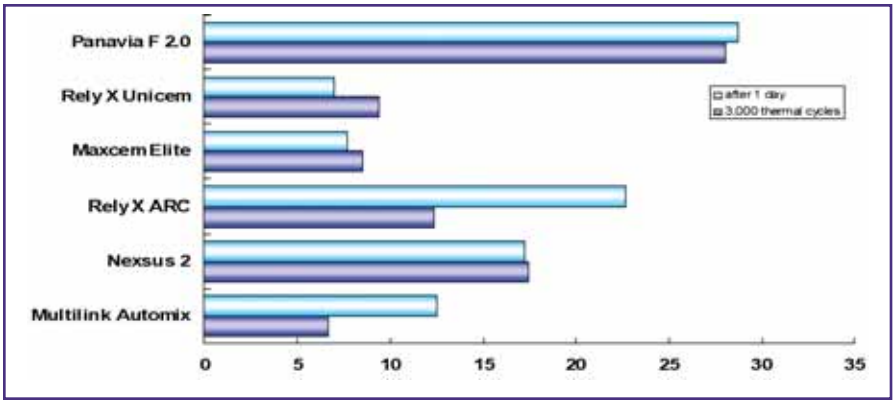
Graph #1 — Retention of selected resin cements to Enamel, MPa.
(From correspondence with manufacturer). Darker blue indicates data after 2000 thermocycles.



Alternatively, when bonding to noble metal, an alloy primer, such as Kuraray Alloy Primer (Kuraray Dental) Figure 25, or Metalprimer II(GC) can be utilized. Independent verification of adhesion as high as 35 MPa has been established for the first.[11] Adhesion of the primer should exceed the 26 MPa that delivered by Panavia F2.0, the luting agent selected.[11]

Abutment Surface Protocol

The abutment was etched with 37% liquid phosphoric acid under rubber dam for fifteen seconds, rinsed for ten seconds with water in a 3cc luer-lock syringe with 22 gauge tip, and blown dry. From Table 1, it can be seen that 37% liquid etch is more effective than some proprietary gel etchants.[12]

The 3cc syringe rinse protocol offers efficient etchant removal without excessive water pressure, which otherwise might disturb the surgical site and promote unwanted bleeding.

Choice of Luting Cement

Panavia F2.0 was chosen from among the field of resin cements, because it exhibits the least expansion, least solubility, and the highest enamel bond strength[13]. The "opaque" formulation was selected, which blocks light transmission by 97%.[15]

Other resin cements deliver higher dentin bonds, but this preparation is enamel-dominant and therefore Panavia is preferable, see Table 1.[12]

Choice of Etchant

Phosphoric acid etching shows increased immediate and final bond strengths relative to S/E, D/E protocol, Table 2.[15]

Luting Protocol

Panavia is available with its own D/E self-etch primer, which delivers low dentin bond strength.[8] The following protocol improves adhesion and has other clinical benefits.

After etch, rinse, and light drying, the dentin was primed with Microprime B or Microprime G (Danville Dental) or similar gluteraldehyde primer, and then thoroughly air dried. Photobond A and B (Kuraray) is mixed, placed in the inlay, air thinned, and solvent (alcohol) evaporated using a directed air stream.

Photobond is a Generation V bonding agent, develops a film thickness of 5 to 7 microns, is chemically nearly identical to Panavia, but without fillers, is dual-cure, and is made by the same manufacturer, ensuring inter-product compatibility, (personal correspondence with manufacturer)[14].

It is applied carefully only to dentin. This protocol increases adhesion to dentin, relative to the S/E primer accompanying the Panavia F2.0 kit.

However, set time of Panavia is retarded in the presence of Photobond, to 3 .5 minutes, relative to 45 seconds with the D/E primer, necessitating longer stabilization time after seating (personal correspondence)[14]. In longer spans

Figure 27 — Panavia F2.0, Paste and Opaque Paste B.

Figure 28 — Appearance after cementation, before final debridement.

Figure 29 — Appearance at three weeks: inflammation and granulation at base of pontic.

Figure 30 — Inflammation resolved at four months:

Figure 31 — Five year Post-op

a prolonged set time often is clinically advantageous, to allow more complete cement debridement before set.

After seating and gross cement removal, the margins are coated with Oxyguard II, Figure 27, a product-specific air-excluding gel to promoting full marginal polymerization and accelerating attainment of early strength values.[11] Immediate strength values reported in Table 2 are achieved after 15 minutes with Oxygard II, compared to 15 minutes without.[11]

Once the cement is set, the cord is removed; all excess cement debrided with an ultrasonic scaler, and the etched and sandblasted perimeter enamel are polished with a Shofu FG Brownie point.

Typically, some excess cement is retained around the enamel margin, and proves extremely tenacious, persisting for periods beyond a decade1 .Panavia shows very stable long-term insolubility.[1,15]

Occlusion was verified with shimstock between adjacent teeth. No sutures were placed, allowing the pontic to lift the overlying gingivae and have the wound heal by secondary intention to increase tissue bulk. The patient was dismissed with Ibuprofen 400mg.x6 q4h.

Note: the details of any bonding protocol are critical: while there are a great number of alternative cementation protocols available today, independent review to the extent possible is prudent to verify manufacturers' claims.

At three weeks, healing was incomplete Figure 29. After 4 months, it was observed that the tissue around the pontic had successfully regenerated, Figure 30.

Conclusion and five-year retrospective

See Figure 31.

Discussion: Comfort, Cost, Lifespan, Reliability, and Aesthetics

The patient is pleased with the result achieved, after two forty-minute appointments. She experienced no pain and did not require ibuprofen post-operatively.

The fee charged was one quarter of the cost of an implant, making it affordable for this patient. As well, unlike implant-related prostheses, RBFPDs are an insurable benefit under most dental plans, as it was in this case.

What will the eventual lifespan be of this restoration? The literature reports a lifespan in RBFPDs, where retention is not lost, exceeding 20 years. There is no reason to suspect that this treatment will provide less. As with all ceramics, porcelain aesthetics decline, chipping and wear may be experienced, all of which may spell the end to its clinical life.

Discussion

One of the desirable attributes of the original Maryland design was the possibility of subsequent removal, restoring the mouth back to virgin condition. Since those halcyon days, it has been found that RBFPD designs require tooth preparation to ensure adequate lifespan and to establish occlusal clearance, and hence removal does not leave a virgin tooth.[1] With a vertical path of insertion and vertical proximal grooves, removal is possible, albeit at the risk of fracture of fragile tooth structure. Heat-softening the luting resin through application of external heat facilitates removal in vertical-path RBFPDs.

With this lingual inlay design, removal of a prosthesis by heat-softening will not likely be possible; instead it will require grinding the flange back to enamel, and cutting the inlay out. These steps will deepen and widen the penetration into the tooth, underscoring the benefit of keeping the initial preparation as conservative as possible. However, in the author's experience, abutment de-bond is very rare, and proposes that strategies for managing it can be generated on a case-by-case basis.

Other Applications

This retainer design has proven itself reliable in single-tooth applications, including: lingual rests and guide

Figures 32 and 33— Facial and lingual views of ERA retainer

planes in partial denture treatment, and immediate extraction cantilever bridges. An example of an RPLD application is shown below at five-year recall.

This retainer, in Figure 32 and Figure 33, carrying the ERA semi-precision partial denture attachment (Stern), was spoiled by using a translucent shade of Panavia rather than opaque.

Multiple abutment splinting and tooth replacement in both lower and upper anterior teeth, mobile or not, has also proven viable.

Conclusion

If one wishes to conservatively join retainers to sound teeth without incurring labial destruction, compromised aesthetics, or dubious retention, this design may deserve consideration.

However, its apparent simplicity is deceptive. It is not easy to learn a different path of insertion, particularly in multiple abutments. Crisp and controlled preparations are critical, and over-cutting occurs quickly. A meticulous treatment protocol is needed, including rationalized substrate treatment, appropriate impression strategies, careful bonding and luting protocol and perfect isolation during preparation and bonding. For aesthetic success, an appreciation of periodontal artistry is needed to complete the envelope of treatment.

To objectively establish reliability, clinical trials with this prosthesis will begin in September 2012. Practitioners interested in participating are invited to correspond with the author.

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Author declaration

I submit that I have no commercial interest in the subject of the above Case Report.

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Dr. Peter Walford mentors study clubs in composite resin and adhesion-based prosthodontics in British Columbia. pwalford@telus.net. A study guide and video are available for this and other procedures at www.peterwalforddentistry.com.

The collaboration of Dr. Chris Wyatt in preparing this article for publication is greatly appreciated.

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Dental Occlusion Evaluation: 10 Essential Steps

Évaluation de l'occlusion : 10 étapes essentielles

Dr. Michael Racich

Abstract

A frequently asked question by dental practitioners is: "What are the essentials for assessing a patient's occlusion?" There are many schools of thought when addressing this question but when one distils down the various philosophies there are a few fundamental considerations that emerge. The following brief essay will lay out 10 basic steps for dental occlusal evaluation.

Résumé

Une question souvent posée dans la pratique dentaire est la suivante : « Qu'est-ce qui est important de vérifier lors de l'évaluation de l'occlusion d'un patient? ». Il existe plusieurs écoles de pensée à ce sujet mais lorsqu'on examine de près les diverses philosophies, on constate qu'il y a quelques aspects fondamentaux à considérer. Le bref compte rendu suivant vous révèlera les 10 étapes essentielles à l'évaluation de l'occlusion.

A practical approach to dental care involves conceptualizing the final result or, in other words, having a game plan. One way to approach the patient's stomatognathic system is to conceptualize the final occlusal relationship between the maxillary and mandibular arches. A recommended approach is the 10 essential steps for occlusal evaluation (Table 1).

Table 1 — 10 Essential Steps for Occlusal Evaluation

1. Chief Concern
2. Facially Generated Treatment Planning
3. "Thinking Wax"
4. "CR"/ Vertical Dimension
5. Sagittal 1st
6. Coronal 2nd
7. Occlusal Plane
8. Tooth Anatomy
9. Materials
10. Maintenance/Orthotics

1. Chief Concern

Patients attend dental practices for many reasons with various expectations including a chief concern. An important consideration for the dental team to appreciate is what could go wrong post treatment with the patient's chief concern and why? Distilled down, the answer falls into three main areas: diet, hygiene, and parafunction.[1] All three of these etiologies are patient preventable only. The dental team therefore act as the facilitators of dental education and patient oral care. That is why excellent communication and rapport are essential before embarking on treatment. A non-compliant patient will doom the dental team's efforts.

A patient that refuses to participate in effective personal and professional oral hygiene care will undoubtedly have future problems or compromises with their oral health such as root caries, periodontal issues, and esthetics (e.g., staining) to mention a few. Diet is another source for failure; specifically, sweets intake. Patients need to be educated on the relationship between sweets and caries and the significance of the frequency and volume of consumption. The patient also needs to appreciate that sweets are more than just chocolate and candies. There are many sources of sugars that the patient might not realize that are damaging such as

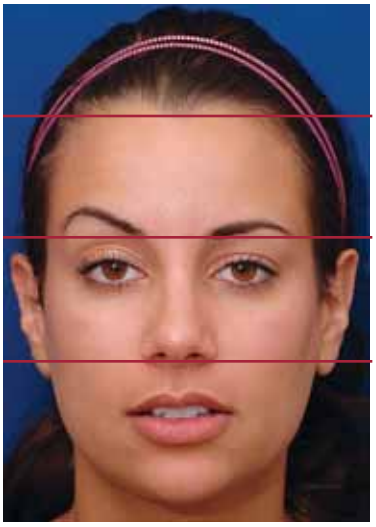

Figure 1 — The Rule of Thirds showing well proportioned facial features

Figure 2 — Narrow buccal corridor and longish front teeth offset an oval face.

Figure 3 — Direct mock-ups utilizing wax and black felt pen allow the patient to quickly visualize esthetic or cosmetic changes to their dentition.

fruits or sports beverages (sweet/food breakdown product "acid" attacks or acidic substances).[2] Age and the associated decline in salivary flow also require explanation. Strategies to offset lifestyle decisions can then be formulated.

The third and most significant reason for post-treatment failure is parafunction, better described as bruxism.[3] Patients' teeth are never together unless they are chewing or swallowing.[4] Patients teeth might touch for a split second when they chew or they might touch when they swallow. The dental team must educate patients to keep their teeth apart. For patients that brux at night or who just want to protect their dentition while they sleep, fabrication of a full coverage hard acrylic maxillary or mandibular orthotic is accomplished.

Diet, hygiene, and bruxism. Make all patients aware of these three vices. Failure to properly educate and monitor these three etiologies makes for post-treatment untoward sequelae.

2. Facially Generated Treatment Planning

Having a systematic, thorough approach to diagnostic planning that intimately involves patient input is critical. Facially generated treatment planning helps co-ordinate the dental team and patient objectives as "we meet the person, then the face, the mouth, and finally the teeth."[5–8]

Facially generated treatment planning begins after the dental team has met the patient (objectives, expectations, bias, etc., realized) and then they thoroughly assess the face. The face is assessed both from the lateral (sagittal) viewpoint as well as the frontal (coronal). Basic common sense applies as the dental team gauges the lateral view for Angle classification and for any soft tissue abnormalities (e.g., nose profile). Lateral cephalometric analysis can be useful at this point to locate hard tissue (e.g., the teeth) landmarks as well as soft tissue (e.g., the esthetic plane) landmarks.[9] From the frontal perspective we can assess facial proportion, the so called rule of thirds, for evenness between the upper, middle, and lower face (Figure 1).[10]

Meeting the mouth the dental team assesses tooth display at rest (repose) as well as in full smile.[11] The dental team can next assess whether or not the arch form is too narrow relative to the face and anterior tooth position. The rule of opposites can be applied. The rule of opposites suggests that if something is narrow (the face for example) then subtly widening an associated feature (in this case the arch form) will let the face appear wider and the anterior teeth smaller (Figure 2). Evaluation of occlusal plane form (generally it should "appear" parallel to the horizon) and overall intra and inter-tooth proportions is also spied. Direct mock-ups with either non-adhesively bonded composite or white periphery tray wax while utilizing a black felt marking pen for block outs yield real-time virtual evaluation which can then be transferred appropriately for in-office or laboratory assessment (Figure 3).

Lastly, the teeth and their structural integrity are scrutinized utilizing basic restorative and operative dental diagnostic criteria. The periodontal status must also not be neglected.

3. "Thinking Wax"

When single tooth dentistry is practiced, the process is visualized by the practitioner. Removal of pre-existing restorations and caries, cavity preparation and tooth foundation design, restorative material choice and placement, finalization of the project are all in the operators mind before the hand-piece is picked up. The

Figure 4 and 5 — Mutually protected occlusion. Posterior teeth protect anterior teeth in maximum intercuspation while anterior teeth protect posterior teeth in excursive functioning.

more thorough the conceptualization of the final result the finer the outcome and the smoother the sequence of treatment runs; relatively simple procedures such as these happen subconsciously and is effortless. This is not the case with more complex undertakings. A practitioner, especially in the formative years, is being extremely foolish if they believe they can take on complex rehabilitative efforts without having a clear, concise idea of the end result. In their minds eye the practitioner must have the final design concept mastered. One excellent method of facilitating this conceptualization process is "thinking wax."[12] Thinking wax is the process whereby the practitioner goes through the conceptualization exercise with complete wax dentures in mind. The "thinking wax" goal is to therefore answer the question: "What would be done for this patient if complete dentures were being fabricated given the present circumstances?" Depending on the skeletal jaw relationships and facial proportions, soft tissue contours, arch and tooth size considerations, or patient's desires and expectations would it not be nice to be able to be able to move the teeth and bone to a conceptualized relationship just like which can easily be done with wax denture set-ups? Along with other record taking efforts, such as charting, radiographs, and mounted study casts, diagnostic wax-ups can be produced which can be further utilized to consult with patients or other interdisciplinary team members.

When conceptualizing the final result or "thinking wax" an overall concept such as a mutually protected occlusal scheme should be ascertained (Figures 4 and 5).[3,13]

Ideally all the posterior teeth should contact evenly and down their long axes.[14] The more posterior teeth that are in even contact the more that any clenching forces can be distributed. Anterior teeth should touch minimally if at all when the arches are together.[4] Williamson and others have also shown that if the anterior teeth are in contact during excursions then less force is in the masticatory system (due primarily to elevator muscle relaxation).[15,16] The anterior teeth are also at a better mechanical advantage to withstand lateral forces due the class III lever principles involved.

Thus, ideally during clenching activities the posterior teeth are "protecting" the anterior teeth and during parafunctional activities such as bruxing the anterior teeth are "protecting" the posterior teeth from any excessive lateral forces. Nature has set-up quite an efficient machine by making the posterior teeth not only the chewing work horses but also the intermaxillary relationship stabilizers while allowing the anterior teeth to be the food knives and posterior stabilizer protectors.

4. Centric Relation/Vertical Dimension

Extensive restorative dental/ prosthetic work requires a starting point. Traditionally, this has been centric relation (CR).[3] A look at the *Glossary of Prosthodontic Terms*, however, shows seven different definitions. CR thus becomes the Confusing Relation. Furthermore, some clinicians advocate other starting positions such as MyoCentric.[17] This only leads us to more Confusion. What then, is the practitioner to do? Who is right? Who is wrong? The truth is that it is not so much what the starting point is but how reproducible and stable the starting position is.[18] CR, therefore, is a Consistently Reproducible position.

The health of the temporomandibular joint (TMJ) must be delineated early in treatment planning. Lack of inflammation and discomfort must be present and can be readily verified by examination and tests such as joint loading, functional resistance, and palpation.[19] Although TMJ noises (e.g., clicking in disc displacement with reduction) can be troublesome for patients, in the absence of pain and dysfunction the practitioner can

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accept this situation as stable since the TMJ tissues have the capacity for remodelling and repair.[20] Once again, this can be evaluated (joint loading, functional resistance testing, palpation). Treatment with the condylar head in the glenoid fossa with ("adapted centric relation"[21]) or without TMJ noises is not only practical but also physiologic.[4] When the opposing dentitions occlude in CR we have centric occlusion (CO) (which may or may not coincide with maximum intercuspation or habit bite).[3] Most importantly, Consistency and Reproducibility of this position is desirable when extensive treatment has been performed for long-term maintenance facilitation.

Occasionally it is necessary to rehabilitate with the condyles in a relatively forward position in the glenoid fossa. This can occur in such situations as when the retrodiscal tissues cannot withstand loading, the practitioner wants to treat "on the disc", or perhaps the patient is a skeletal class II and wants their final occlusal treatment position to be brought forward (a class II that wants to be a class I).[22] Some practitioners actually favour this relationship, especially those in the MyoCentric camp.[17] The main issue here is not whether this is bad or good or who's right or wrong but instead how consistently reproducible and stable is the relationship of the TMJs, especially when the teeth occlude.[18]

Another consideration when analyzing the starting position or "CR" is to take into account vertical dimension. Occlusal vertical dimension is defined as: "the distance measured between two points when the occluding members are in contact" while the rest vertical dimension is: "the distance between two selected points measured when the mandible is in the physiologic rest position." The vertical dimension of speech is: "that distance measured between two selected points when the occluding members are in their closest proximity during speech."[3] It is important to note that the maximum vertical dimension that is physiologically acceptable is the latter, i.e., speech determines the maximum permissible.[10] Therefore, with the aid of facially generated treatment planning and conceptualizing the final result (thinking wax) guesstimation of the occlusal vertical dimension can be made at a consistently reproducible position (CR) that the practitioner can work with (Figure 6).

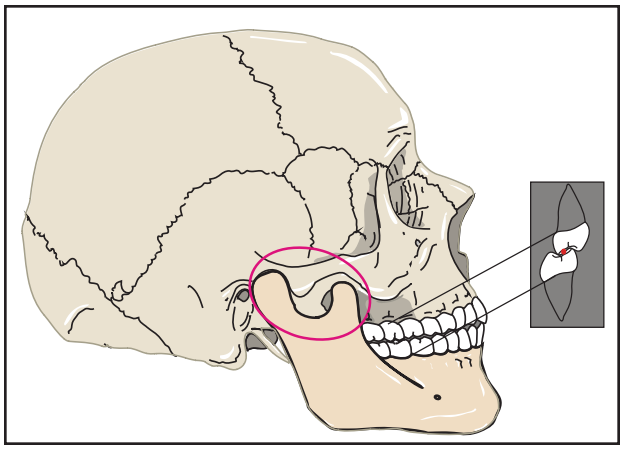

Figure 6 — CR and CO. The teeth occlude when the TMJs are in a Consistently Reproducible position where the condyles are in the anterior superior aspect of the glenoid fossa at an acceptable occlusal vertical dimension.

5. Sagittal 1st

The Glossary of Prosthodontic Terms defines sagittal as: "situated in the plane of the cranial sagittal suture or parallel to that plane" and the sagittal plane as: "any vertical plane … that divides a body into right and left portions."[3] Knowing where the maxillary and mandibular central incisors are in the sagittal plane allows the practitioner to optimize patient function.[23–25] The envelope of function ("the three-dimensional space contained within the envelope of motion that defines mandibular movement during masticatory function and/or phonation"[3]) is respected.[26] Undesirable tooth contacts such as anterior fremitus ("… a vibration palpable when the teeth come into contact"[3]) can be eliminated (Figure 7).

6. Coronal 2nd

Coronal 2nd is better known as *Smile Design 101 or Smile Design Du Jour*. Setting or conceptualizing where the anterior teeth need to be positioned facially really is no more difficult than doing a wax denture try in (thinking wax)![27–29] The interesting article by Waliszewski et al.[30] substantiates these contentions nicely. The authors created three different denture set-ups for six different patients and asked a group of people which they preferred. Did they prefer the natural look, the supernormal look, or the denture look (Figures 8–10)?

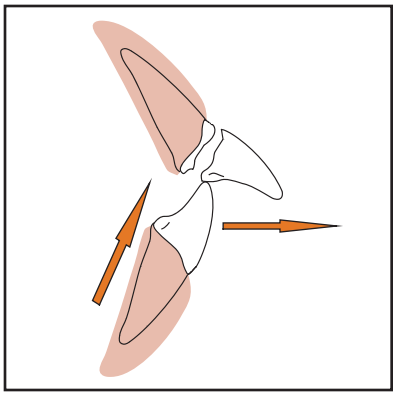

Figure 7 — Excessive anterior tooth contact can result in tooth, periodontal, and restorative/prosthodontic trauma.

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Figure 8 — Natural look.
Image courtesy Dr. Michael Waliszewski.

Figure 9 — Supernormal look.
Image courtesy Dr. Michael Waliszewski.

Figure 10 — Denture look.
Image courtesy Dr. Michael Waliszewski.

The results showed that 55% preferred the natural look while 26% preferred the denture look! Surprisingly, only 19% favoured the supernormal look which is so prevalent in today's Western World. Smile Design Du Jour is truly in the eyes of the beholder.

7. Occlusal Plane

The occlusal plane is defined by the *Glossary of Prosthodontic Terms* as "the average plane established by the incisal and occlusal surfaces of the teeth. Generally, it is not a plane but represents the planar mean of the curvature of these surfaces."[3] The mandibular occlusal plane usually can be visualized when the mandible is at rest as a relatively flat plane with the posterior buccal cusp tips and the incisal edges parallel to the horizon. The occlusal plane anatomically runs from approximately half way up the retromolar pad to slightly below the commisures of the lips. This can be verified with cephalometrics.[31] The maxillary occlusal plane similarly parallels the horizon with the posterior buccal cusp tips co-incident and not canted. If the practitioner so chooses, for a patient with a pleasing smile this can be readily confirmed by placing a maxillary cast on a bench top. The buccal cusps bilaterally should touch the surface evenly (with the incisal third of the maxillary central incisors perpendicular to the horizon).[32] Patients obviously do not want to walk about post-treatment with sloped dentitions when they smile or speak.

8. Tooth Anatomy

When dentistry is practiced that recreates natures design, then esthetic and functional results are achieved. Tooth anatomy restoration is thus an integral part of occlusal rehabilitation or stabilization for mastery of the stomatognathic system.

To refresh the practitioner's memories about tooth anatomy there are many excellent textbooks available.[33,34] Not only do these textbooks provide superb diagrams, the more recent publications have graphic programs that can be loaded onto computers. Tooth images can be rotated, teeth sectioned, and occlusal inter-relationships evaluated. Teeth have many planes, angles, grooves, tips, and fossa. Sharp cusp tips into well constructed fossa facilitate occlusal equilibration while differing facial planes on a maxillary central incisor diffuse and reflect light to entertain the observer's eyes (Figures 11 and 12).

There are some basic, distilled down rules to follow with tooth anatomy and inter-tooth relationships[35]:

1. Facial and lingual contour
   a. height of contour on the facial and lingual of all in the gingival third *except* on the lingual of mandibular bicuspids and molars where it is the middle third.
   b. height of contour extends from the cementoenamel junction (CEJ) on the facial and lingual of all teeth *except* on the lingual of mandibular bicuspids and molars where it may extend 1 to 1.5 mm above the CEJ.
2. Proximal contact areas
   a. are in the occlusal (incisal) third of all teeth *except* between the maxillary molar contacts where it is at the junction of the occlusal and middle third.
   b. viewed from the occlusal/ incisal the proximal contacts always are facial to the central fossa *except* between Mx molar to molar contacts where it is on the central fossa line.
3. Proximal surface from the contact area facial-lingually and occlusal/ incisal-cervically is flat or slightly convex.
4. Marginal ridges are at the same height regardless of the presence or absence of occlusal contact.
5. Curve of Wilson
   a. mandibular premolar buccal cusps are higher than lingual cusps by up to 1–1.5 mm.
   b. maxillary molar buccal cusps are shorter than lingual cusps by up to 1–1.5 mm.
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Figures 11 and 12 — Cusps, fossas, tooth planes are not only function but highly esthetic.

a. occlusal/ incisal, gingival, lingual, facial
b. with the lingual > facial and the gingival > occlusal/incisal

9. Materials

Dental materials are continuously being introduced into the marketplace and hence to the dental practitioner. The whole issue of change at first appears daunting. However, approached in an evidenced-based manner it's not as difficult as it appears at first glance especially if we treat patients similar to what the dental team would like to be treated like, i.e. not experimental specimens. Evidence-based dentistry involves that rich blend of patient values, practitioner expertise and bias, and what the reported literature has to say about a device, technique or product (Figure 13).[36]

When new techniques or materials are introduced, a go low, go slow approach is practical. Practitioners might wish to try different products but might also want to do so under as controlled an environment as possible such as taking hands-on continuing education programs (where products can be used in real time [i.e., intraorally]) or by selectively incorporating a technique or product in a routine, low risk situation where there is a high probability of success regardless what is employed (e.g., a new dental cement for a well designed cast crown). Also, conferring with peers with regards to their experiences is another useful tool. The practitioner can then distil and evaluate relative to personal experiences and biases and the specific clientele that seeks the dental team's services. Ultimately, as long as the dental materials are appropriately selected for the right dental environment, i.e., the patient's milieu (their occlusal scheme and long-term commitment/ownership), then prognosis can be reasonably stated.

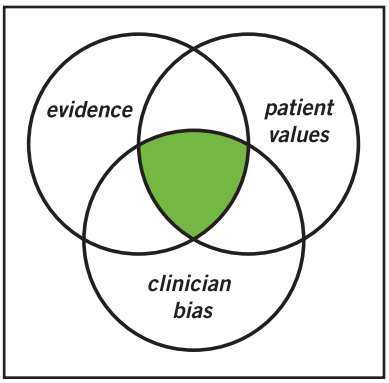

Figure 13 — Evidence-based dentistry. The green zone represents the ideal synergistic result when the evidence, clinician bias, and patient values are respected.

10. Maintenance/ Orthotics

Upfront business practices and cooperative well delineated patient relationships allow long-term work warranties and maintenance.[37,38] Occlusal observations at recare hygiene appointments, for example, can be routinely done.[39] Reinforcement of nocturnal occlusal protection in the form of dental orthotics can also be exercised.[40] There are many uses for dental orthotics with the most practical being simple, straightforward occlusal protection and hence, occlusion stabilization (Table 2).[41,42]

Table 2 — Considerations for Dental Orthotic usage:

1. Vertical dimension changes
2. Occlusion optimization
3. Occlusal protection
4. TMJ unloading
5. Mandibular repositioning
6. Influence growth
7. Altered sensory input
8. Cognitive awareness
9. Placebo
10. Expectations
11. Regression to the mean

Concluding Remarks and Recommendations

1. Patient expectations (knowledge of), education and long-term commitment requisite.
2. Conceptualization of end product is prudent before treatment initiation.
3. A sequential, consistent treatment approach is advised.
4. Optimization of oral anatomy and physiology routinely should be strived for.
5. An evidence-based approach to restorative and prosthodontic materials is today's standard of care.
6. Ongoing maintenance care is always facilitated.

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Author declaration

I submit that I have no commercial interest in the subject of the above Case Report.

About the Author

Dr. Racich is a 1982 graduate from University of British Columbia with a general practice in downtown Vancouver emphasizing comprehensive restorative dentistry, prosthodontics and TMD/ orofacial pain. Dr. Racich is a member of many professional organizations including the Canadian Academy of Restorative Dentistry and Prosthodontics, the Pacific Coast Society for Prosthodontics, and the International Association for the Study of Pain. He is a Fellow of the Academy of General Dentistry, the International Congress of Oral Implantologists, and the American College of Dentists as well as a Diplomate, American Board of Orofacial Pain. Dr. Racich has published in peer-reviewed scientific journals such as the Journal of Prosthetic Dentistry and the Canadian Dental Journal and lectured nationally and internationally on subjects relating to patient comfort, function and appearance. He currently mentors the didactic/clinical F.O.C.U.S. (Fundamentals Of Creating a Uniform Stomatognathic system) study clubs in British Columbia.

Anterior Guidance: What Does It Mean To You?

Guidance antérieure : Qu'est-ce que cela signifie pour vous?

Dr. Kim Parlett

Abstract

Anterior guidance is thought to be well understood by most dentists; however, a distilling process has reduced our current practice to a rather mechanistic approach to therapy which lacks understanding and rationale. The author reviews what we know about anterior guidance and what we may have forgotten and provides evidence for a more individualized treatment concept when altering anterior guidance through our therapies.

Three basis occlusion philosophies have dominated dental teaching and research for the past decade: bilateral balanced occlusion, group function occlusion, and canine or mutually protected occlusion. Each therapeutic approach has its own applications but none is appropriate for every patient. The individuality of each therapy must be understood. Through careful review of the literature we recognize several advantages to designing therapies that favour canine protected occlusions. This type of occlusion has several advantages over the other concepts. First, masticatory muscle activity is reduced with this guidance system as opposed to group or bilateral balance; second, lateral forces directed off the long axis of teeth from parafunction are reduced; and third a mechanical advantage of a class 3 lever is imparted to the stomatognathic system.

Anterior guidance is misleading because it suggests that all anterior teeth have a disclusive function. The anterior teeth are considered a functional unit but the central incisors are not part of any laterotrusive control. They are dominant in proprioception for determining the frontal area of the masticatory cycle and speech. Lateral incisors are highly variable in position and are more dominant during mixed dentition through maturation. The relationship of the cuspid and bicuspid is poorly understood by a static dental classification. It is a dynamic relationship where control of immediate protrusive disocclusion can be affected. The ultimate goal of all occlusal schemes and therapy should be to provide primary stability in maximum intercuspation and disocclusion of all posterior teeth in incursive and excursive function and parafunction. This disocclusion of posterior teeth is highly dependent on the relationship of anterior guidance and posterior condylar guidance. This relationship has been well documented in the literature but it has also been shown that it is highly individualized. Measuring functional condylar movements can help us to set the other parameters of anterior guidance, occlusal plane and cusp inclination to create an efficient chewing apparatus that minimizes destructive forces on our dental restorations.

"Anterior guidance" is a term that is instantly recognizable to most dentists. It is a term we heard repeatedly through dental school and one that is referenced, in one way or another, in every lecture since then. It is inherently understood by all dental specialties and is void of the ambiguity and confusion that comes from a term such as "centric relation" which has seven current definitions in the *Glossary of Prosthodontic Terms*. So, what does the term anterior guidance mean to you? It is my hope that this article will in some way help our readers to understand and utilize their own therapeutic, anterior guidance concept.

From my personal observations over the past decade there appears to have been a decline in our profession's interest in the details of occlusal study. With this has come a rather mechanistic approach to anterior guidance which includes duplication of existing lingual contacts and contours using custom incisal guide tables (Figure 1), trial and error methodology with "in the mouth" equilibration of temporary crowns and arbitrary settings for adjustable incisal guide tables that reference standardized norms , and my personal favourite, "let the laboratory technician work it out!"

What happened to the science? Major M. Ash, *Head*

Résumé

La plupart des dentistes pensent bien comprendre la guidance antérieure; toutefois, par un processus d'épuration, notre pratique courante s'est vue transformer en une méthode thérapeutique plutôt mécaniste qui manque de compréhension et de justification. L'auteur passe en revue ce que nous connaissons déjà au sujet de la guidance antérieure et ce que nous avons peut-être oublié et montre un concept thérapeutique plus individualisé lorsqu'il s'agit de modifier la guidance sur les dents antérieures.

Trois philosophies de base sur l'occlusion ont dominé l'enseignement et la recherche en médecinet dentaire depuis les dix dernières années : occlusion bilatéralement équilibrée, occlusion unilatéralement équilibrée (fonction de groupe) et occlusion mutuellement protégée (fonction canine). Chaque méthode thérapeutique possède ses propres applications, mais aucune ne convient à chaque patient. Il faut bien comprendre le caractère individuel de chaque traitement. Après un examen minutieux de la documentation, nous reconnaissons plusieurs avantages de concevoir des traitements qui favorisent la fonction canine. Ce type d'occlusion comporte plusieurs avantages par rapport aux autres concepts. Premièrement, l'activité des muscles masticatoires est réduite avec la guidance par rapport à l'équilibration occlusale bilatérale ou à la fonction de groupe; deuxièmement, les forces latérales dirigées du grand axe des dents de la parafonction sont réduites; troisièmement, un avantage mécanique d'un levier de classe 3 est concédé au système stomatognatique.

La guidance antérieure peut induire en erreur car elle suggère que toutes les dents antérieures ont une déviation. Les dents antérieures sont considérées une unité fonctionnelle mais les incisives centrales ne font pas partie du contrôle du mouvement latéral de la mandibule. Elles sont dominantes à la proprioception pour déterminer la partie frontale du cycle masticatoire et de l'élocution. La position des incisives latérales est très variable et ces dernières sont plus dominantes au stade de la dentition mixte jusqu'à la dentition permanente. On comprend mal la relation entre la canine et la prémolaire selon une classification dentaire statique. Il s'agit d'une relation dynamique dans le cas où le contrôle de la déviation avec problème protrusif peut être affecté. Le but ultime de tous les systèmes occlusaux et du traitement doit être de permettre la stabilité primaire d'intercuspidation maximale, le rétablissement de l'occlusion de toutes les dents postérieures et la correction des parafonctions.

Le rétablissement de l'occlusion des dents postérieures est fonction de la relation de la guidance antérieure et de la guidance postérieure condylienne. Cette relation a été bien documentée, mais il a été démontré aussi qu'elle est très individualisée. La mesure des mouvements fonctionnels du condyle peut nous aider à définir les autres paramètres de la guidance antérieure, le plan occlusal et l'inclinaison des cuspides pour créer un appareil de mastication efficace qui réduit les forces destructrices sur les restaurations dentaires.

and Face Medicine 2007;3:1 wrote that the paradigm shift to evidence based dentistry (EBD) that relates to occlusal therapy (OT), selective occlusal adjustment (OA), and stabilization splint (SS) therapy for TMDs has had an unfavourable impact on the teaching of many of the important aspects of occlusion needed in daily dental practice. The teaching of occlusion has practically been abandoned in our dental schools because of EBD induced contraindications for OA and SS. He argues that it is important to bring a clinical reality back into the dental curriculum by systematically teaching all aspects of occlusal management. This article will review what we do know about anterior guidance offering evidence based research to support it. There is some evidence to suggest a more scientific approach will allow us to treat our patients to a more individualized, functionally efficient outcome. The important questions we need to review when considering anterior guidance is: What therapeutic concept is right for our patient? Does anterior guidance provide any benefits to the stomatognathic system? What teeth are involved in lateral and protrusive guiding movements? Which surfaces of teeth are involved? How steep should the anterior guidance be? How much anterior guidance is too much? What is our therapeutic concept when we have no anterior guidance, (class 2, div.1, and class 3s)? (Note: Review of the literature suggests that the distribution of skeletal classification for the current North American and European populations is skeletal class 1: 37.2%; skeletal class 2: 57.2%, and skeletal class 3: 11.0%)

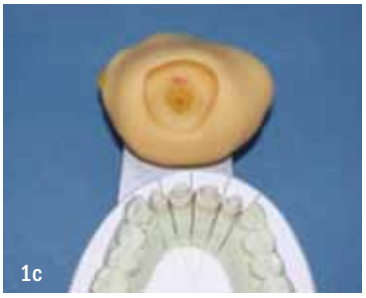

Figure 1a — Sam Articulator with adjustable incisal guide table.
Figure 1b — Gerbach programmed incisal guide table for sequential wax-up teeth #3-6.
Figure 1c — custom incisal guide table from patients existing anterior guidance contours.

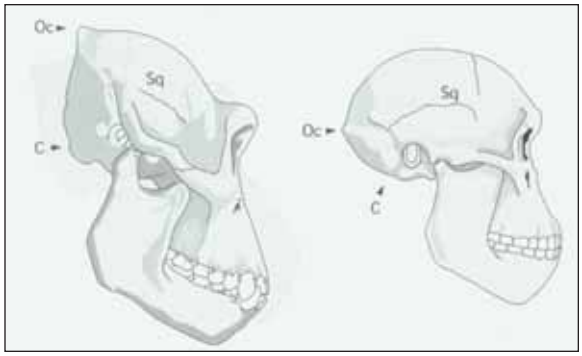

Figure 2 — Canine dominant occlusion does not equal canine protected occlusion. With postural uprighting, brain lateralization and speech development, the canine has regressed into the dental arches.

First let us clear up the semantics. *Canine dominant occlusion does not equal canine protected occlusion* (Figure 2). Canine protected occlusion is a therapeutic concept! Canine dominance is an evolutionary phenomena consistent from the great apes to modern man. With brain lateralization, development of speech and postural uprighting the canine has regressed into the dental arches. Nevertheless the function of cutting and tearing food has remained primarily the same for more than 3 million years![1–2]

There have been three therapeutic guidance concepts developed since the late 1800s. These theorems were developed by the leaders in dentistry of the time and became the object of great occlusion debate and division through the 1900s. The three concepts were (1) bilateral balanced occlusion, (2) group function occlusion, and (3) canine protected occlusion (also known as mutually protective occlusion) (Figure 3).

All three philosophies were developed as therapeutic concepts to aid the practitioner with his/her treatment goal. This philosophical debate continued to divide

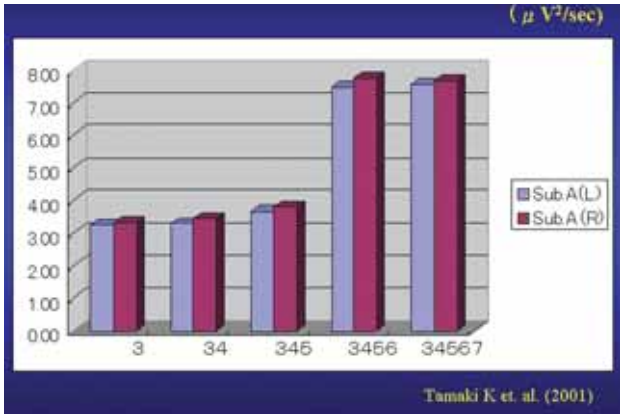

Figure 4 — EMG data from study shows lowest levels of muscle activity with canine guidance with similar results for sequential contacts including first and second bicuspids. There is a significant (2×) increase in the EMG activity when the group function includes the 6s and 7s. Adapted from Tamaki et al.[10]

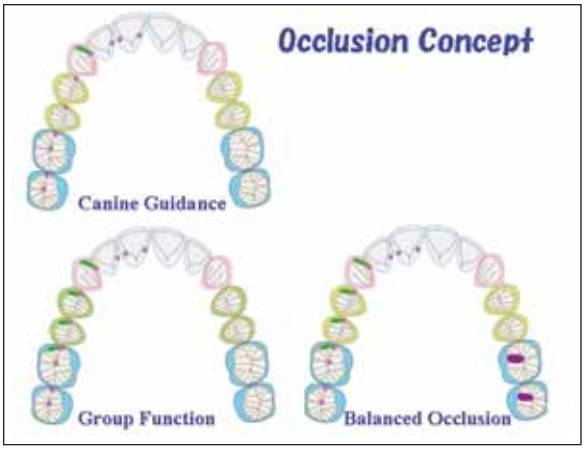

Figure 3 — The ultimate goal of any anterior guidance concept should be, to disocclude posterior teeth during lateral or protrusive movements. Canine guidance (CG) describes complete bilateral posterior disocclusion with lateral guidance the sole responsibility of the cuspid. Group function (GF) describes balancing side disocclusion with multiple guidance surfaces on the working side. Balanced occlusion (BO) describes bilateral occlusal contacts during lateral excursions.

organized dentistry into the late '70s. The proponents of each occlusion concept having an uncompromising belief that their particular concept could be applied to all patients whether dentate or fully edentulous!

Today, there is widespread general agreement that anterior guidance is a good thing to provide in our therapies. It means posterior teeth don't touch during incursive or excursive movements (especially during parafunction). The benefits to the masticatory organ include decreased masticatory muscle activity,[3–6] minimized lateral forces, and subsequent decreased incidence of dental disease on posterior teeth,[7] and a mechanical advantage to the system by lowering the forces on the anterior teeth through the physics of a class 3 lever system.[8,9]

It has been clearly stated in the literature that masticatory muscle activity increases as the number of guidance surfaces increases from anterior to posterior.[3–6] Most recently, Tamaki showed the effect of changing the guidance system from canine guidance to variable group function of 2–5 contacts on masticatory muscle activity as illustrated in Figure 4.[10]

Several authors have shown significant effects of occlusal discrepancy on periodontal disease.[7] Goldstein showed significant reduction in mean periodontal scores with canine protected occlusions.[7] Green conducted an extensive literature review and found significant reduction in periodontal disease with occlusal therapy (specifically equilibration). Burgett found a significant increase in attachment width after two years with equilibration before surgery compared to no equilibration. Bernhardt cross sectional study of 4,310 patients demonstrated a

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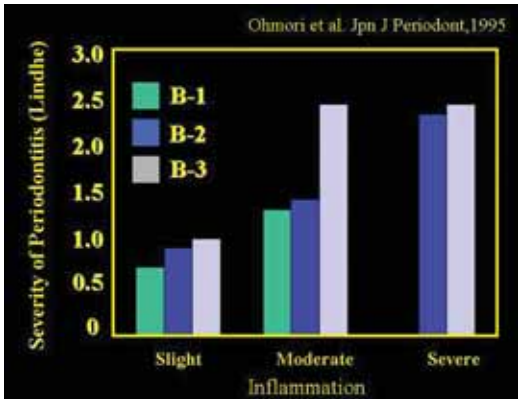

Figure 5 — B-1 canine guided, B-2 group Function, B-3 bilateral balance. In the population studied Ohmori classified the study group with slight, moderate, and severe inflammation according to Lindhe and found there was an even distribution of occlusal patterns in the mild inflammation group. There was no significant difference between cuspid guidance and the group function guidance in the moderate inflammation group but a significant increase in periodontal disease with bilateral contact occlusion. With the severe inflammation group there was a significant increase in periodontal disease with occlusal schemes that have multiple lateral contacts. Adapted from Ohmori et al.[17]

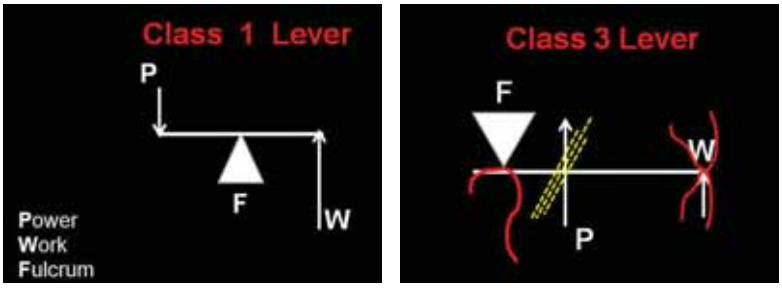

Figure 6 — A class 1 lever is the most efficient and does the most work with the least applied force. Ideally the jaw lever functions as a class 3 lever. The temporomandibular joint is the fulcrum (F), the masseter muscle, temporalis muscle, and medial pterygoid muscle provide most of the force (P) near the fulcrum, and the work (W) is done by the teeth along the dental arches.

statistically significant relationship between non-working contacts, attachment loss, and increased probing depths. Svanberg showed that occlusal trauma accelerates attachment loss in periodontitis. Moozeh found that reduction in mobility was significantly greatest in the group that had non-working interferences completely removed compared to the group that had them left in "harmony." Harrel and Nunn in a comprehensive study compared treated and untreated patients for occlusal discrepancies. Their study shows strong evidence of an association between untreated occlusal discrepancies and the progression of periodontal disease! Several studies by Japanese authors including Ohmori and Tamaki have shown evidence of increased severity of periodontal disease with group function occlusions and bilateral balance occlusions compared to canine guided occlusion (Figure 5).

The third and least discussed advantage of anterior guidance is the mechanical advantage imparted to the stomatognathic system by a class 3 lever.

The further the guidance system is from the temporomandibular joint (TMJ) the lower the level of work/force exerted for a given power/load. This concept is important because it acknowledges that despite the fact that no occlusal system can be without lateral forces, they can be reduced as we move away from the joint.[18] In clinical practice this phenomena is frequently seen as, the anterior teeth with their small conical roots and lack of periodontal support are often the last teeth in the mouth to be lost. The canine is ideally suited for this dominant role in lateral guidance because of its position in the dental arch relative to its distance from the TMJ, its anatomy and its proprioceptive capacity relative to other dental structures (Figure 7).[19]

The term, anterior guidance is misleading because it suggests that all the anterior teeth have a disclusive function. The anterior teeth are considered a functional unit, however, the central incisors are not part of any laterotrusive control. They are actually avoided during mastication. They do, however, play a dominant role in proprioceptive signalling and are a determinant in the frontal area end point of the masticatory cycle and speech.[20,21]

The lateral incisor has a highly variable position in the dental arches relative to its verticality and rotation. It has some laterotrusive control function primarily during

Figure 7 — Patient showing severe anterior wear. Anterior guidance that is not in harmony with posterior occlusion, occlusal plane, condylar pathways, creating a class 1 lever. If during a protrusive movement there is a heavy contact of posterior teeth, the molars overpower the TMJ as the fulcrum (F), the power is supplied by the muscles behind theses teeth (P) and a much greater work/load is transmitted to the anterior teeth as a class 1 lever system.

Figure 8 — Sequential class 1 wax-up showing protrusive guidance inclines of lower first bicuspid and the distal marginal ridge incline of the upper cuspid (blue wax incline on cuspid).

Figure 9 — McHorris, noted that disclusive lingual surface angle is most often the mesial and distal marginal ridges. There can be as much as a 35° differential between the concavity and the marginal ridge.

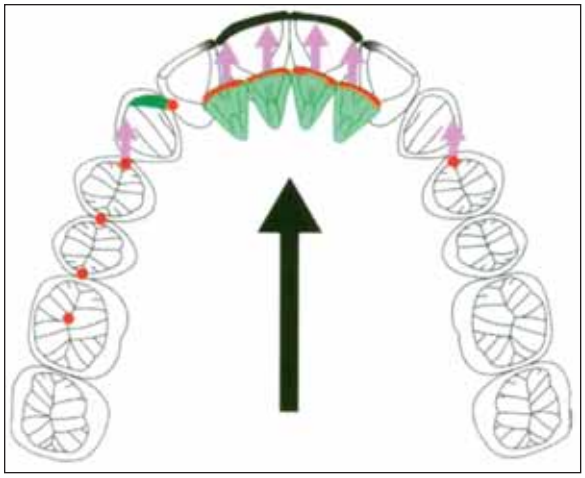

Figure 10 — The functional unit illustrated in green.

maturation of the developing dentition. It then becomes part of the anterior functional unit along with the canine after maturation. In a class1 dental situation immediate disocclusion of posterior teeth comes from contact of the lower first bicuspid with the distal marginal ridge of the upper cuspid during protrusive movements (Figure 8).

Posterior disocclusion resulting from condylar movement is the other dominant component. The interrelationship between anterior guidance and posterior guidance will be discussed later in the article. Further disocclusion comes from the contact of the lower incisors with the lingual contact of the upper incisors. This typically is not the deepest concavity of these teeth but the prominent marginal ridges (Figure 9).

The functional unit illustrated in green in Figure 10 is not the primary disocclusive unit in protrusion. This unit normally functions as a proprioceptive control for mandibular movement and speech when the posterior occlusion and joint dynamics are in harmony.

Now that we have discussed what anterior guidance is, our next topic is to develop a therapeutic rationale for how much of it we need? Is there a normal value that we can use for our therapies or is it highly variable? What if we have too steep a guidance system? What if it is too shallow? Slacicek, Sato, and McHorris, measured the lingual concavity angle of orthodontic normals, relative to the axis orbital plane.[8,9,20] Research by Slavicek, Sato, and McHorris, of non orthodontic normals showed a consistent disocclusion angle for the lingual concavity of each tooth, even among different populations.

Why can't we use these norms to apply to our therapy? Like most of the research that has been done on occlusion and its association with TMD, the answer is complicated!

This research further looked at condylar functional movement tracings and showed a high correlation between the disocclusion angle and condylar guidance angle for the canine (Figure 13).[20,8] However, when we try to apply this data into the general dental population, the individual variability makes it impossible to establish clinically useful norms that yield consistent results.

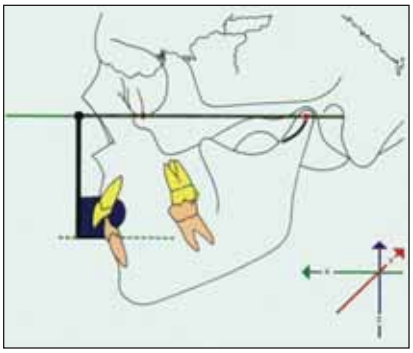

Figure 11 and 12 — Slavicek, Sato and McHorris measured the lingual concavity angle relative to the axis orbital plane on three different populations and found similar trends in steepness of angle, sequential decrease in angle from anterior to posterior and length of guidance contact surface. (Adapted from Slavicek R. Okklusionkonzepte, IOK 3-4/1982; Slavicek R. Die Functionellen Determinanten des Kauorganes, 1984)

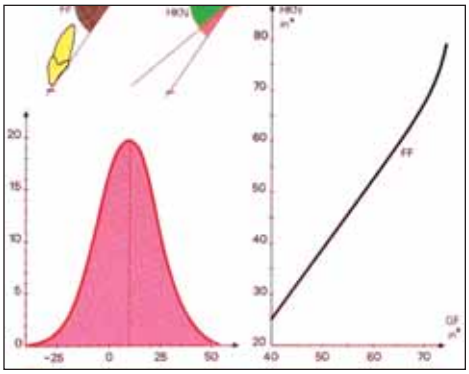

Figure 13 — Relationship of anterior disocclusion angle and functional condylar guidance led researchers to assert that the anterior guidance angle should be within a range of 0 to 10 degrees of the condylar guidance angle. (Adapted from Slavicek R. Okklusionkonzepte, IOK 3-4/1982; Slavicek R. Die Functionellen Determinanten des Kauorganes, 1984)

Therefore "clinical application must be assessed on an individual basis."[22]

Remember, the ultimate goal is disocclusion of posterior teeth. Anterior control is only one of the variables. As therapists we need to understand the role of each variable in order to provide optimal treatment for our patients. It is beyond the scope of this article to address all of these parameters; however, we must consider the effect of (1) anterior disclusive angle (CI); (2) posterior condylar guidance angle (HCI); (3) cusped teeth versus flatter teeth; and (4) occlusal plane inclination (OPI).

These four variables will determine the amount of disocclusion for every patient. As therapists we are able to change or modify the dental structures to accommodate the functional condylar anatomy to disocclude posterior teeth for optimal efficiency. Too little disocclusion during functional movements may cause interferences during parafunctional loading. Too much disocclusion creates excess separation of posterior teeth during functional movements and will be inefficient for chewing. Slavicek felt that considering parafunctional loading and mandibular deformation the ideal amount of disocclusion for maximum efficiency would be in the range of 6–8 degrees.[20]

Dr. Martin Mai, (Vienna Austria personal communication) developed this concept further and coined the phrase "Functional Geometry" where he illustrated the impact that changing these variables will have on the amount of disocclusion or interference created by our therapeutic design concept (Figures 14 and 15).

The last question is "What if anterior guidance is too steep?" Anyone who has ever placed anterior crowns recognizes the clinical significance of interfering with this delicate balance of adaption and harmonization. This is not a case of "if a little anterior guidance is good, more will be better!" Several researchers have shown that for harmony, Anterior guidance should be equal to or greater than posterior condylar guidance.[23] The literature reports a range of 0–10 degrees.

What if we err on the side of "more disocclusion is better?" What if we increase or steepen our therapeutic anterior guidance beyond 10 degrees? Several researchers have shown that artificially steepening canine guidance will alter muscle activity. One of the most novel research protocols on this topic is an experimental design by Tamaki where he artificially induced increasing canine guidance through cast gold lingual onlays provisionally cemented on dental students. He altered their guidance system, starting with a canine guidance that was equal to condylar guidance and then steepening the guidance in 5-degree increments. He then looked at the effect this had on condylar movement pathways and on muscle activity.[10]

At 10 degrees and greater the condylar movement pathway showed a definite retrusive, surtrusive movement on the working condyle. Clinically this would not be apparent but one can hypothesize that this type of movement has the potential to be very destructive to the retrodiscal component of the disc-condyle assembly. This phenomena was also mentioned by Coffee, Mahan and Gibbs in 1989.[24]

They felt that this effect of tooth guidance on condylar movement was an unexpected finding and warranted

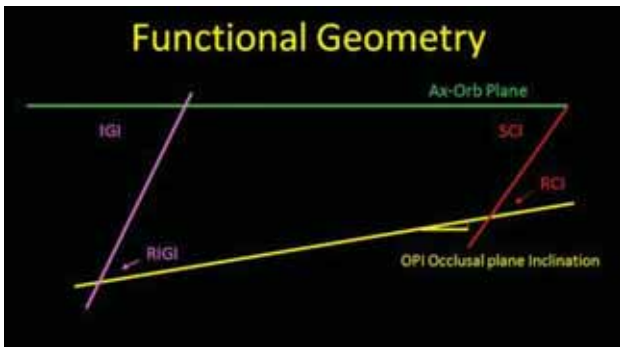

Figure 14 — Axis orbital plane (AOP) is used as the reference plane as it corresponds to most commonly used articulator systems. Horizontal condylar inclination (SCI) is patient specific and derived from condylar tracking device. Anterior guidance angle (IGI) is variable component and can be used/changed by therapy. Occlusal plane inclination (OPI) is defined as a plane from tip of lower central incisor to tip of distobuccal cusp of lower six year molar. The intersection of the IGI and SCI with the occlusal plane create relative incisal guidance angle (RIGI) and relative condylar inclinations (RCI), respectively.

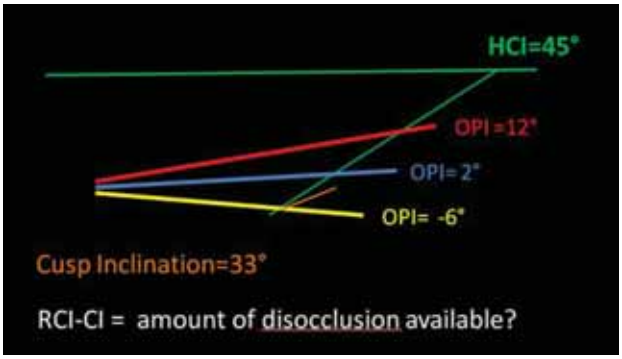

Figure 15 — This figure illustrates how functional geometry concepts can be used to predict and design therapies that will provide the appropriate amount of posterior disocclusion. Assuming a 33° cusp inclination (CI) and a known horizontal condylar inclination (HCI) of 45° it is clear how altering only one parameter can have a significant impact on the amount of posterior disocclusion! For example: HCI-OPI=RCI, RCI-CI= amount of disocclusion. 45°−12°=33°, RCI-CI=0 no disocclusion available(contacts inevitable)! 45°−2°=43°, RCI-CI=10° adequate disocclusion available (good function). 45°−(−6)°=51°, RCI-CI=18° too much disocclusion! (inefficient chewing).

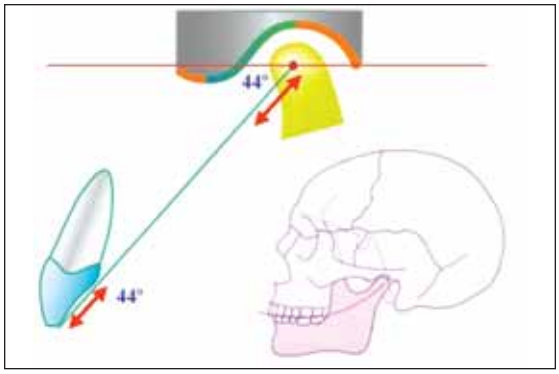

Figure 16 —The anterior teeth could be considered the guardians of the posterior teeth during any eccentric bruxing attempts. If they are properly coupled all bruxing forces become the responsibility of the anterior teeth, and all friction to include possible wear, becomes their burden. This amount of friction can be controlled however to insure their integrity by providing a disclusive angle that is identical to the condylar disclusive angle (1:1 ratio). Anterior disclusion significantly reduces the electrical activity of the powerful masseter and pterygoid musculature. Anterior teeth disclusion allows the mandible to work within a class 3 lever principle (Adapted from McHorris[23]).

further research to see if there was a correlation with TMD! Parlett found a high correlation between these retrusive and surtrusive condylar movements on the working side condyle and the incidence of internal dearangement.[25]

In 1981, Kirveskari wrote, "that negligible functional tooth wear has brought about changes to the form-function harmony of the stomatognathic system exemplified by the persistence of cusps and vertical overbite of anterior teeth. It appears that the presence of cusps can be easily tolerated provided that their form is accommodated to the joint function. However, anterior guidance is usually necessary for this requirement to be met."[26]

Treatment strategies should be based not on the original heavy masticatory function but on the present day condition where parafunction is the new enemy of our dental restorations. Anterior guidance in harmony with the cusps of teeth and the TMJ will help to decrease masticatory muscle activity, minimize lateral forces on posterior teeth, and create a mechanical advantage to the system of the lowering of forces on the anterior teeth by insuring a class 3 lever system. Harmonizing all of these components will allow you to create a therapeutic concept individualized for each patient that optimizes function, muscle efficiency and maximum protection from the pathologic levels of force consistent with parafunction.

Author declaration

I submit that I have no commercial interest in the subject of the above Case Report.

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About the Author

Dr. Kim Parlett, DDS, MSc, is in private practice in Bracebridge, Ontario. He is Past President and Fellow of the Canadian Academy of Restorative Dentistry and Prosthodontics.

The Therapeutic Promise of Mesenchymal Stem Cells

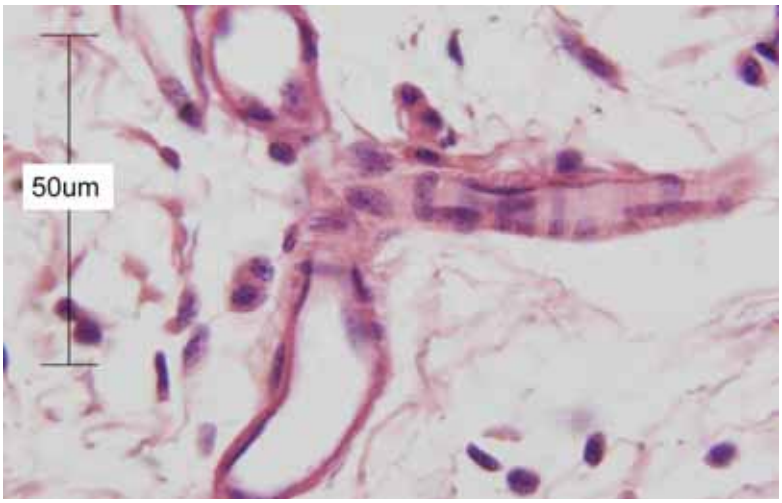
La promesse thérapeutique des cellules souches mésenchimiques

Presenter/Conférencier: Dr. J.E. Davies

Synopsis by Dr. Myrna Pearce

The objective of this presentation was to increase the understanding of the nature, power and potential of Mesenchymal Stem Cell (MSC) therapy, especially their capacity to influence treatment regimes of the oro-maxillofacial complex.

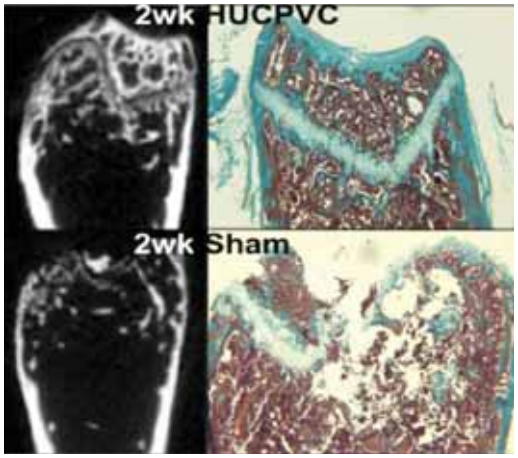
Stem cells are cells that self renew and produce progeny that can differentiate into many different cell types. The cells produced following conception result in a small cell mass called the morula. These cells are totipotent in that they produce both the embryo and all the extra-embryonic tissues. After several days of cell division the morula develops into the blastocyst, which has an inner cell mass that becomes the embryo. The cells of the inner cell mass are pluripotent since they possess the ability to become any type of tissue in the body – but not the extra-embryonic tissues. As adults, we also possess many different types of stem cells, although each is restricted to specific lineages. Among the latter, MSC produce all of the connective tissues of the body, muscle, bone, cartilage, fat, and fibrous tissues. But, unlike hematopoietic stem cells that replenish the blood, MSC are unique because they are both immunoprivileged (meaning that there is no donor matching required) and also immunomodulatory (they can be employed to abrogate immune and inflammatory reactions). MSC also accelerate wound healing through cytokine release and the stimulation of new blood vessel growth (angiogenesis). These abilities to reduce inflammation, speed up wound healing, and contribute to the genesis of new connective tissues are all properties of importance to regenerative and reconstructive surgery. Indeed, there are over 100 human clinical trials being conducted today, around the world, using MSC, for conditions as wide ranging as Crohn's Disease, rheumatoid arthritis, juvenile diabetes, cardiac ischemia, fractures and periodontal disease (see: http://www.clinicaltrials.gov/).



Perivascular cells, seen here around a branching capillary, are tissue resident mesenchymal stem cells MSC.

MSC are most commonly harvested from bone marrow, although the number available decreases rapidly with age – by teenage we have only 10% of the MSC found in the bone marrow at birth, and the number continues to decrease with advancing age. Fortunately, MSC have now been shown to be in almost every tissue of the body, and are found around blood vessels as perivascular cells. Thus, other tissue sources are also being explored, particularly the tissue removed in liposuction procedures, which is rich in small blood vessels and thus also contains perivascular MSC. More recently, the perivascular tissue of the human umbilical cord has been shown to be the richest source of MSC, and these cells are more biologically potent than those from adult tissues. The umbilical cord is usually discarded at birth and is considered medical waste, yet the extracted cells can be stored in liquid nitrogen indefinitely, and subsequently grown to very large numbers. This is important because the numbers of cells required for treatment of systemic disease is enormous (1-2 million cells per kg of body weight) – although local applications of cells would require small numbers of cells.

Having introduced this fascinating field, Dr. Davies described how MSC play a vital role in normal healing, with particular emphasis on the peri-implant bone healing



Bone & Cartilage regeneration using human umbilical cord perivascular cells (HUCPVC) following severe damage of bone and cartilage in the distal femur of a mouse. (MicroCT images on the left, histology on right).
From: Sarugaser et al PLoS ONE 2009,4(8): e6498

that is so important in providing secondary implant stability. Indeed osteoconduction, which results in bone-to-implant contact, is critically dependent on the recruitment and migration of MSC during the early healing phases (more information, with the animations shown during Dr. Davies talk, are available at http://www.ecf.utoronto.ca/~bonehead/). Dr. Davies explained that understanding such fundamental biological mechanisms has led to the development, in his laboratories, of a new biodegradable bone scaffold product called OsteoScaf™ that has recently gained FDA approval for use in dental and craniofacial applications. OsteoScaf™ works as a clot retention device that is also osteoconductive but, unlike ceramic-type materials, is completely replaced by natural tissue during the healing process. Examples were shown of OsteoScaf™ in both extraction sockets and sinus-lift procedures.

But the exciting promise of MSC lies in procedures where oro-maxillofacial connective tissues have to be repaired, replaced or regenerated. While umbilical cord derived MSC are only just starting to be employed in humans, Dr. Davies provided many examples where these cells had been used to regenerate bone, cartilage, tendons and dermis in many animals from mice to horses. The vision would be that a surgeon, when planning a surgery, would be able to order MSC for the operative procedure much like they presently order grafting materials.

In question time, the issue was raised about using stem cells from teeth to regenerate dental-related tissues. Dr. Davies felt that while an intriguing research pursuit, and worthy of continued scientific endeavor, the numbers of available stem cells in a single dental pulp is very small and considerable ex-vivo expansion in cell number would be required for therapeutic applications. However, it is generally agreed that minimizing the ex-vivo expansion of stem cells is preferable for reasons of safety and this makes dental pulp cells an unlikely future therapeutic.

More information about OsteoScaf™ and umbilical cord perivascular MSC is available at www.verypowerfulbiology.com.

Anatomical and Restorative Complications in Implant Dentistry / Complications anatomiques et restauratrices en Dentisterie implantaire

Presenter/Conférencier: Terry T. Tanaka, DDS

Synopsis by Dr. Patrick Pedlar

Implant surgery, (the placement of dental implants, surgical flap procedures, the placement of grafting materials and elevation of the sinus membrane) have become a routine part of a prosthodontist's practice as well as the principal part of a periodontal practice. This program addressed new insights into surgical and restorative complications that may arise if the prosthodontist/restorative dentist and surgeon do not have a thorough understanding of the facial morphology, underlying structural anatomy and their blood and nerve supply.

The above complications have been reported to result in sudden, profuse bleeding with swelling either under the tongue, or into the submandibular and neck spaces resulting in a compromised and obstructed airway and even death of the patient. A second complication may be the severing of a vein that bleeds slowly into the neck spaces post-operatively and compromises the airway in the unknowing and or sleeping patient.

The information reported upon in this program is part of six separate ongoing multi-center research grants supported by the Clinical Research Foundation and the

American Equilibration Society. The studies involve the imaging of over 212 fresh cadaver specimens with iCat and Kodak 9000 imaging units, followed by the complete dissection of all soft tissues from these specimens and the subsequent photography, location and measuring of the remaining osseous structures.

Anatomical observations

1. **Bone Types mandible:** Osteoporosis: there appears to be a general misunderstanding that individuals with osteoporosis are poor candidates for dental implants. However, our studies have shown that "site, or location" in the mandible must also be considered. e.g. the area anterior to the mental foramen in the mandible is still a good site with type 2 bone even when the area posterior to the mental foramen in the same mandible may be made up of type 4 bone.
   Bone Types Maxilla: Osteoporosis: the entire maxilla appears to be a poor choice for implants if osteoporosis is diagnosed because the general configuration (trabeculation)of bone in the maxilla does not allow for more dense bone in either the anterior or posterior of the arch.

2. Noting the degree of lingual inclination of the mandibular first and second molar teeth and even the second premolar and the alveolar ridges on the cone beam CTs is critical to prevent drilling the pilot drill and or placing the implant through the lingual plate of bone in this region. The hazard lies in the proximity of the lingual artery in this region.

3. Although the osteotome technique appears to be the most simple of the options for entering the floor of the maxillary sinus, it also invites an unpredictable upfracturing of the bone which may lead to tearing of the sinus membrane. Current studies with Piezosurgery units are providing more predictable results.
   * The lateral window approach(Caldwell-Luc) has been the standard approach to the maxillary sinus for many years. The lateral window appears to be used by more experienced surgeons.)

4. **Maxillary artery:** Our studies of these fresh cadaver specimens have noted that the maxillary artery travels under the sinus membrane along the lateral wall of the maxillary sinus at the level of the floor of the maxillary sinus and must be noted and avoided if possible. Otherwise, injury to this artery will result in a bleed into the maxillary sinus which may compromise the grafting procedure.

5. **Maxillary artery:** Our studies have also noted that the maxillary artery also travels along the floor of the maxillary sinus just below the sinus membrane and above the apices of the maxillary premolars and molars. Osteotome procedures can injure (cut) these vessels because they lie directly over the apices of the roots of the maxillary molars and premolars.

6. **Lingual artery at the lingual of the anterior mandible:** Lingual resorption of the mandibular ridge at the anterior of the mandible brings the genial tubercle into play at the lingual of the anterior mandible. Large branches of the lingual artery enter the lingual of the mandible at the middle of the genial tubercle and must be avoided.

7. **Presence of "fenestrations"** of the labial and buccal bone over the roots of the teeth of both arches present complications to the "routine removal and placement of dental implants." These fenestrations cannot be predicted with current iCat cone beam CT images with any predictability.

8. **Presence of "dehisences" of bone at the cervical of the teeth:** cannot be predicted with cone beam CT (iCat at 0.4mm3 and at 0.25mm3) with any certainty. Limited field of view (Kodak 9000) appears to be capable of detecting both dehisences and fenestrations at this time. The studies are still in progress with more specimens.

All of the 8 above mentioned complications and many more are currently being studied and being prepared for publication at this time. * A list of the principal researchers may be viewed in the CARDJ online article.

9. **Summarized Significant Pearls from Live Presentation:**
   By: M. Patrick Pedlar BSc, DDS, MSD, Prosth. Cert.
   - Ability to determine the presence of fenestrations and dehiscences of labial/buccal bone is poor with current cone beam CT imaging (iCat). Best to reflect tissue and visualize cervical bone during implant surgery.
   - Discussed root proximity to the floor of sinus. Sinus congestion may cause sensitivity in teeth from bacteria around root neurovascular bundle. Be careful not to separate root nerve and blood supply when elevating membrane.
   - Need to respect Greater Palatine Artery when reflecting tissue.

- Dolicofacials will have smaller anterior maxillary sinuses, be careful to not place implants in the nose.
- Reviewed routine removal of teeth often presents with an oral-antral communication, dehiscence and/or fenestration. Must decide if will graft and close or place implant and graft.
- Reviewed need to be conscious Mandibular teeth are inclined 18 degrees to avoid hitting the lingual artery in first & second molar region. This is an Emergency Room Case-apply pressure and go with patient to the ambulance/hospital-very difficult to stop, keep pressure on vessel
- Reviewed, bone levels do not always follow gingival levels.
- Reviewed, "those who can adapt to the stresses and rigours of life called "survivors", and those who cannot, are called "patients".

Terry T. Tanaka, DDS
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A non-profit Foundation for Research and Charitable endeavors.

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Gary Umeda, DDS, Private Practice, Honolulu, Hawaii
Matt Kroona, CDT. Radiologist, Orange Coast X-Ray Laboratory

Recognition, Management and Prevention of Dental Erosion

Détection, gestion et prévention de l'érosion dentaire

Presenter/Conférencier: Dr. Terry Donovan

Synopsis by Dr. John Pepper

This presentation was a condensation of a two day lecture on worn dentition with the purpose of increasing awareness of dental erosion and its early signs. In a subsequent lecture a protocol will be discussed to limit the erosive destruction by the use of fluoride, education, diet and oral hygiene. Progress has been made in dentistry to control periodontal disease and to reduce smoking through smoking cessation programs; however, dental erosion has not been addressed in a similar manner.

Dental erosion has become an epidemic with the main cause being: bulimia, GERD, the widespread consumption carbonated beverages, sports energy drinks, and acidic fruits, and xerostomia. The majority of these patients over the age of forty five require extensive and costly dental restorative treatment due to erosion and attrition. Therefore, there is an increasing need to intervene early and institute preventive regimes and to educate the patient.

It is common now to require the family physician to intervene in cases of Bulimia and GERD. Diet analysis may be required. As well, night guard appliances can be fabricated and remineralizing techniques can be utilized.

In cases of advance wear, there is often a combination of erosion and attrition. It is now recognized that there is a relationship between sleep bruxism, erosion and also, sleep apnea.

Erosive tooth wear can be multi-factorial with cultural differences, sex, attrition, abrasion (dental ceramics), abfraction (controversial) and diet all combining in various ways to exert their effects.

There are tree signs of erosion: cupped wear on non-occluding tooth surfaces, the presence of restorations that are "standing proud", and loss of well defined occlusal anatomy.

Erosion can be intrinsic or extrinsic. The extrinsic type can involve the labials of maxillary teeth, the buccal surfaces of posterior teeth and maxillary and mandibular occlusal surfaces. The intrinsic type of erosion can involve the palatal surfaces of maxillary anterior teeth and the occlusals of mandibular teeth.

The critical pH for root erosion is 6.7 and the critical pH for enamel erosion is 5.2.

A diet analysis is recommended in many cases. A vegetarian diet can be very abrasive to teeth. Habits such as sucking and mulling of fruit, the consumption of

high energy sports drinks, acidic carbonated beverages or wine can be very erosive.

Intrinsic conditions can result from GERD, bulimia, and extensive vomiting such as can occur in some pregnancies. GERD patients should be referred for medical assessment. Patients exhibiting Bulimic behaviour should also be referred for medical assessment (including a gastroenterological workup). Psychological counselling is required as well. Bulimics should be maintained on palliative care until the bulimia is consistently controlled, and then major restorative treatment may be performed. The incidence of GERD has increased 350% since 1980. GERD patients should be medications such as Nexium or Prilosec. They need to be careful with diet, timing of eating and to remember to elevate the head while sleeping at night. May GERD patients are asymptomatic, undiagnosed and if left untreated, are predisposed to cancer of the oesophagus.

Sleep Apnea patients treated with a CPAP device will have reduced acidity in the oesophagus and also exhibit reduced nocturnal bruxism. If the apnea is left untreated, both acidity in the oesophagus will increase and bruxism as well. This produces a vicious of erosion and attrition.

Saliva has many important functions. It dilutes attacking substances; it acts a clearing and a buffering agent and can act to remineralize teeth. Elderly patients on multiple medications often suffer from xerostomia.

Preventive care for dental erosion should involve diet analysis, the reduction of acid and carbohydrate intake. Mints and gum containing xylitol, can be prescribed. A strict oral hygiene regimen should be instituted. The patient should hydrate adequately. Remineraliztion therapy by means of the application of fluoride containing varnishes and toothpastes should be employed. Care should be taken in instructing the patient in minimizing abrasion with inappropriate dental hygiene techniques.

Prevention and Management of Root Caries

Prévention et gestion des caries radiculaires

Presenter/Conférencier: Dr. Terry Donovan

Synopsis by Dr. John Pepper

A preventive protocol is required in dentistry to deal with patients on multiple medications with xerostomia.

Adequate Saliva Volume is necessary to dilute, buffer, provide clearance and remineralisation.

Four Strategies are required:

- Increase salivary flow
- Decrease streptococcus mutans
- Decrease the ingestion of carbohydrates
- Increase mineralization

A caries Risk Assessment is Advisable

- Low risk-maintain on traditional regimen
- Moderate risk-use root caries protocol
- High risk- do primary phase assessment and then maintain on root caries protocol

Primary Phase Assessment Consists of:

- Salivary Streptococcus Mutans analysis (GC)
- Caries Screen (Oral Tech)
- Saliva Flow rate (GC)
- Diet analysis

Root Caries Protocol:

- Remove existing gross caries and restore with Fuji glass ionomer or Chem Fil
- Chlorhexidine rinse BID for 60 seconds or Caries Free Rinse (Biotech) BID for 60 seconds
- Use Prevident 5000 (Dry Mouth) toothpaste
- At the end of 4 weeks, do another step mutans level test
- If the count is reduced-go to maintenance therapy; If not reduced maintain on root caries protocol

Regular Maintenance

- Fluoride containing extended contact varnish (3M or ESPE) on root surfaces
- Prevident 5000 or Clinpro 5000 toothpaste
- Water Pik (changes the composition of dental plaque)
- Xylitol gum 2 gm- 6 times daily

The Canadian Academy of Restorative Dentistry and Prosthodontics
Académie canadienne de dentisterie restauratrice et de prosthodontie

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Dr. Dennis Nimchuk – Suite 1901, 805 West Broadway, Vancouver, BC V5Z 1K1 – Hon, 74

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Dr. Harry Rosen – Suite 107, 3545 Cote des Neiges Road, Montreal, QC H3H 1V1 – Hon., 64

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Dr. Terence Edward Donovan

Dr. Donovan is recognized for his exceptional and distinguished contributions to organized dentistry, and dental education at the undergraduate and graduate levels. He is universally respected for his research and his publications. His record of accomplishment is broad-based and clinically meaningful. Dr. Donovan is held in the highest regard throughout the profession, not only by his colleagues but also by his friends and associates. His record can be summarized as follows:

- D.D.S., University of Alberta, Faculty of Dentistry, 1967
- Certificate in Advanced Prosthodontics, University of Southern California, 1981

ACADEMIC APPOINTMENTS

University of North Carolina

- Professor/Chair: Section of Biomaterials, Department of Operative Dentistry, School of Dentistry-2006-present

University of Southern California

- Professor/Director: Advanced Education in Prosthodontics
- Co-Chair: Division IV: Primary Oral Health Care 2002-2006
- Professor/Chair: Department of Restorative Dentistry
- Chair: Section of Biomaterials Science
- Executive Associate Dean for Academic Affairs
- Associate Dean for General Practice
- Director: Restorative Clinical Research
- Manuals, Syllabi, Videotapes-Numerous
- Courses Developed and Presented to Dental Students-Numerous in Restorative Dentistry, Prosthodontics and Biomaterials

University of Saskatchewan

- Clinical Assistant Professor: Fixed Prosthodontics

PUBLICATIONS

Dr. Donovan's contributions to the literature are so numerous that space does not permit mention of individual titles.

- Case Reports and Technique Articles-34
- Review Articles-93
- Research Articles-26

ACTIVITIES IN PROFESSIONAL ORGANIZATIONS

- Chair: Committee on Scientific Investigation, American Academy of Restorative Dentistry
- Chair: ADA Council on Dental Materials, Instruments and Equipment
- Consultant ADA Council on Therapeutics and Research
- Council on Dental Research-CDA
- Article Reviewer-JCDA, JADA, Psychological Reports: Perceptual and Motor Skills
- Advisory Council: California Dental Association
- Chair: Research Committee on Delivery of Dental Care to Adolescents, College of Dental Surgeons of Saskatchewan
- Chair: Auxiliary Services, College of Dental Surgeons of Saskatchewan
- Plus many other Committee Duties as Chairman on behalf of College of Dental Surgeons of Saskatchewan

SERVICE TO DENTAL PUBLICATIONS

- Editorial Advisory Board: ASDA Journal
- Editorial Board: Compendium
- Editorial Board: Journal of Esthetic and Restorative Dentistry
- Editorial Board: Esthetic Dentistry Update

HONOURS AND AWARDS

- Honourary Life Member: Association of Prosthodontists of Canada
- Honourary Life Member: Western Canada Dental Society
- Honourary Life Member: College of Dental Surgeons of Saskatchewan
- Distinguished Alumni Award: University of Southern California
- Gordon Christensen Award: Chicago Dental Society
- Fellow: American College of Dentists
- Fellow: Pierre Fauchard Academy
- Achievement Award: University of Alberta Alumni Association
- Presidential Citation-American Dental Association
- Walter Hancock Fellowship Award-Western Canada Dental Society
- Dentistry Associates Faculty Award
- Onicron Kappa Upsilon Dental Honour Society
- Pre-clinical Teaching Award-Class of 1984, USC

MAJOR TEACHING ACTIVITIES

Dr. Donovan was instrumental in developing courses and curricula at every undergraduate level in biomaterials, literature evaluation, treatment planning, restorative dentistry and prosthodontics, fixed and removable, at U.S.C. over a span of some 25 years.

As voluminous as Dr. Donovan's contributions and accomplishments have been many of these are omitted due to space limitations.

Dr. Dennis Phillip Andrew Nimchuk

Dr. Nimchuk is recognized for his demonstrated leadership, achievements, and distinguished contributions to his profession and to his community. He has been a significant guiding influence in helping to direct the growth of CARDP in a positive direction. In addition, his mentorship of many study groups has raised the level of practitioner clinical skills throughout British Columbia.

His efforts have greatly contributed to the advancement of dental education and dental healthcare in his community and elsewhere. He is a consummate professional serving his profession with competence, diligence, and integrity. His record can be summarized as follows:

D.D.S., University of Toronto, Faculty of Dentistry, 1967
Certificate in Prosthodontics, British Columbia, 1979
Royal College of Dentists (Canada) – MRCD (C) –Prosthodontics-1980
Royal College of Dentists (Canada) –FRCD (C)-Prosthodontics-2004

TEACHING

Mentor to eleven dental study groups in Vancouver, Victoria, Kamloops, West Kootenay
Lecturer throughout Canada, United States, Central and South America, Europe and Asia
Honourary Sessional Lecturer, Faculty of Dentistry, University of British Columbia

PUBLICATIONS

Tape Cassette Programmes, Canadian Dental Association
-*Contouring Crowns for Periodontal Health*
-*Application of Non-Rigid Connections*
Journal of Prosthetic Dentistry-*Pin-Retained Porcelain Facings Bonded to Metal*
Quintessence International-Article as above translated and reprinted into Japanese and German
Teaching Videotape Series-Seven Modules on Complete Oral Rehabilitation, University of British Columbia, Faculty of Dentistry
Videotape-*Restoring Mis-Angulated and Mis-aligned Implants*, Dentsply International
Journal, Canadian Dental Association-*Connecting Implants to Natural Teeth*
Textbook: *Fundamentals of Occlusion*, 14 chapters. Work in progress (To be published by Quintessence)
Canadian Journal of Restorative Dentistry and Prosthodontics: *Achieving Initial Implant Stability-Observations on the Effect of Implant Body Macro-Design and Osteotomy Design*

SERVICE TO DENTAL ORGANIZATIONS

Developed Constitution and By-Laws for:
-Dental Specialists Society of British Columbia
-The Pacific Coast Association of Dentist Owned Laboratories
-The International Academy of Gnathology
-The Society of British Columbia Prosthodontists
Co-developed Constitution and By-laws for:
-The Canadian Academy of Restorative Dentistry and Prosthodontics
Developed Operation Manual for:
-The Canadian Academy of Restorative Dentistry and Prosthodontics
Developed and presented briefs to Government re: "*Denturists' expansion of services to the public"*
Developed and presented briefs to Government re: the *"Oral Health Certificate requirement for Dental Mechanics"*

HONOURS AND AWARDS

Award of Merit, B.C. Dental Association
Award of Merit, College of Dental Surgeons of British Columbia
Fellow, Academy of Dentistry International
Fellow, American College of Dentists
Fellow, International College of Dentists
Alumnus of Distinction, University of Toronto, Faculty of Dentistry

OFFICES HELD IN ORGANIZED DENTISTRY

Vice-President, B.C. College of Dental Surgeons
President, B.C. Society of Prosthodontists
Founding President, Dental Specialists Society of B.C.
Founding President, Association of Dentist Owned Laboratories
President, Canadian Academy of Prosthodontics
President, Canadian Academy of Restorative Dentistry and Prosthodontics
Associate Editor, Canadian Journal of Restorative Dentistry and Prosthodontics
Convention Chairman:
-Canadian Academy of Restorative Dentistry and Prosthodontics-1984, 1988
-Canadian Academy of Restorative Dentistry and Prosthodontics-1996, 2002
Chairman Scientific Program CARD 1984
Chairman of numerous committees of CAP and CARDP
Advisory Board Member, Calgary Dental Technology College

As voluminous as Dr. Nimchuk's contributions and accomplishments have been many of these are omitted due to space limitations.

Dr. Harry Rosen —
Dentist and Sculptor / Dentiste et sculpteur

The CJRDP'S AUTUMN 2010 (VOL 3-4, P.10) ISSUE:
http://www.allegrahamilton.com/publications/ajp/cjrdp/cjrdp_3_4/
featured the sculptures, biography and achievements of this founding member of CARDP.

VISIT : www.drharryrosen.com to view Dr. Rosen's most recent artistic contribution to the Segal Centre for Performing Arts in Montréal.

The Connection:

We need each other – L'un pour l'autre consists of two human sized figures in a performance of a typical "arm to shoulder hold" line dance. However, the figures are not standing parallel to each other. Rather they are leaning on one another at a precarious angle supported only by their "arm to shoulder grasp". They need each other.

Connection :

Deux personnages illustrant des danceurs s'appuyant l'un sur l'autre. Oeuvre en place au Centre des Arts Segal à Montréal.

CONSULTEZ WWW.CARDP.CA ET LES ARCHIVES DU JCDRP (automne 2010, vo; 3-4, p.10) pour les autres oeuvres du Dr Rosen aussi disponibles au www.drharryrosen.com

Contact:

dr.harryrosen@videotron.ca

View from inside the foyer, November 13, 2011

Oral Surgery Academy for General Dentists

Finally a Clinical Hands-on Oral Surgery Session for the GP

2-day live component with your patients!

Dr. Lawrence I. Gaum DDS, FADSA, FICD, FADI

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Enhance your surgical capacity and skills! Gain immediate confidence by registering for this outstanding live surgery event! It will sell out!

Dentists will work on their patients under the guidance of oral surgeon Dr. Lawrence Gaum!
ADIA, OAGD & TACD Members Qualify for a 10% Courtesy Discount

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Previous Oral Surgery Attendees Receive a 10% Courtesy Discount!

To register contact Palmeri Publishing at 905-489-1970 or email events@palmeripublishing.com

Academy of General Dentistry Approved PACE Program Provider | FAGD/MAGD Credit. Approval does not imply acceptance by a state or provincial board of dentistry or AGD endorsement. 1/1/2011 to 12/31/2014. Provider ID# 219289. This activity has been planned and implemented in accordance with the standards of the Academy of General Dentistry Program Approval for Continuing Education (PACE) through the joint program provider approval of Ontario AGD and the Aesthetic Design & Implant Academy (ADIA). The Ontario AGD is approved for awarding FAGD/MAGD credit. Co–sponsored by the Ontario AGD.

Join us in Halifax this September!

The Canadian Academy of Restorative Dentistry and Prosthodontics
l'Académie canadienne de dentisterie restauratrice et de prosthodontie

20th Annual Scientific Meeting, September 6-8, 2012

An Invitation Message from the CARDP President

Greetings from Halifax and Céad Míle Fáilte! (One Hundred Thousand Welcomes)

It is an honor as President of the Canadian Academy of Restorative Dentistry and Prosthodontics to welcome you to the 2012 Annual Scientific Meeting. The members of the Atlantic Provinces are thrilled to be hosting this meeting in the unique city of Halifax. The meeting will be held September 6 - 8, a wonderful time of year to visit this beautiful port city. Our venue is the Marriott Halifax Harbourfront situated in a premier location with wonderful views of the harbour, just a walk away from the downtown sites and scenes.

CARDP is steeped in great traditions. In 1993, two highly respected organizations, the Canadian Academy of Prosthodontics and the Canadian Academy of Restorative Dentistry, joined forces to create this Academy. The Academy has always offered its members and guests a highly educational Scientific Program and a sincere social program – and this year will be no different!

Dr. Peter Thomson, the Essay Committee Chair, has created a lecture program that will generate a dialogue of scientific information as it relates to Restorative Dentistry and Prosthodontics. Dr. Mark Sutherland, the Clinic Committee Chair, brings us a Saturday morning of short Lectures that will keep us intellectually stimulated! The Table Clinic portion of the meeting offers the ability to interact one on one with speakers, presenters and the dental Industry providing an intimate setting to discuss and learn.

Our Academy continues to have a strong relationship with its sponsors - the Industry leaders. Many thanks to these long-standing relationships and we look forward to seeing you again.

From each meeting to the next, members and their families, guests and sponsors of the Academy enjoy the social events that bring everyone together. The flavour of the Maritimes will continue to be the theme in Halifax and we look forward to lots of laughter and learning.

Mark these dates in your calendar and join us for a fun-filled, memorable meeting. See you there!

Respectfully,

Dr. Maureen Andrea
CARDP President

Hands-On Course - *INTRODUCTION TO CAD/CAM AND DIGITAL DENTISTRY 2012*

***A Hands-on Lecture* - Presented by Dr. Joseph Carpentieri**

Thursday, September 6th, 9:00 am – 4:00 pm, Halifax Marriott Harbourfront Hotel

Biography:

Dr. Carpentieri graduate University of Maryland College of Dental Surgery. Practiced general dentistry for eight years before receiving a Certificate in Prosthodontics from Einstein Montefiore Medical Center. Subsequent to that time he completed a four-year surgical implant fellowship at the Department of Periodontology and Implant Dentistry at NYU. Currently, he is an associate clinical professor, Dept of Prosthodontics/ Implant Fellowship, at Columbia University College of Dental Medicine Department, Head-Dr. Dennis Tarnow. Speaker, Publisher, Mentor and BIOMET *3i* Consultant; Dr Carpentieri speaks both nationally and internationally on all phases of surgical and implant dentistry.

COURSE OUTLINE AND LEARNING OBJECTIVES:
The purpose of this hands-on lecture is to present a thorough and concise overview of CAD/CAM and Digital Dentistry; it has absolutely revolutionized the practice of clinical dentistry and significantly changed what we do and how we do it.

- **Evidenced-based perspective of advantages/disadvantages or benefits and limitations of these technologies**
- **Review 'new workflow options' from both a conventional and digital perspective**
- **To understand how a CAD/CAM manufactured prosthesis provides us with the most cost-effective modality for most implant restorations**
- **Present literature supported rationale for utilization of CAD/CAM abutments and full arch CNC frameworks**
- **Discuss step-by-step clinical guidelines, abutment and material choice, and review controversies associated with zirconia abutments with new guidelines**
- **Review other controversies including third party abutments, the zirconia-titanium interface, veneering of various framework designs**
- **Introduce concept reverse engineering; one of the hottest topics in implant dentistry today**
- **Introduce the "players"; making this a diverse presentation of all implant companies**
- **Review BIOMET *3i*'s CAD/CAM Portfolio; ie, BellaTek™ Encode® Impression System. How does this company fit into this space and why is it different?**
- **Demonstrate integration of digital impression-taking-review of devices**
  How to select a scanner? Does it really work? Benefits to patient and practice?

Learning Objectives: To increase knowledge, confidence and predictability that will lead to improved aesthetic and functional patient outcomes

CE CREDITS

Thursday, September 6th, 2012 - Hands on course 6 CE Credits
Friday, September 7th, 2012 - Scientific Sessions 7 CE Credits
Saturday, September 8th, 2012 - Scientific Sessions 7 CE Credits
Plus 15 Afternoon Table Clinics 3 CE Credits

More information on our Speakers and Thursday, Hands on Course coming in the Next Issue.
Visit www.cardp.ca for program updates and registration coming soon!

Halifax Marriott Harbourfront Hotel
1959 Upper Water Street,
Halifax, NS B3J 3J5

Phone: (902) 421-1700
Toll Free 1-800-943-6760

Reservations Link:
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Charting the Course for the Future!

The Canadian Academy of Restorative Dentistry and Prosthodontics
l'Académie canadienne de dentisterie restauratrice et de prosthodontie

Friday, September 7th, Essayists, 1 Hour Presentations

Dr. George Cho

Provisional techniques for traditional and implant dentistry

Synopsis: Factors of occlusion, tooth preparation, function, phonetics, soft tissue manipulation and especially esthetics, can all be evaluated through the fabrication of a well-made provisional restoration. It is an important tool of communication to the patient, laboratory, and can help the dentist to anticipate problem esthetic areas. Factors of soft tissue management around implants will be discussed to optimize gingival architecture, papilla management, and implant crown contours utilizing provisional restorations. Manipulation of crown contours will be discussed to achieve ideal subgingival contours around the implant restorations. A technique will be presented to fabricate multiple-unit esthetic custom provisional restorations with all the characteristics of natural teeth.

Learning Objectives:

- Fabricate multiple-unit esthetic custom provisional restorations with all the characteristics of natural teeth.
- Fabricate implant provisional restorations.
- Discuss the ideal gingival architecture.
- Develop the implant coronal and subgingival contours.
- Manipulate implant soft tissue form with contours of implant restorations.

Dr. Charles Shuler

Oral lesions: An anatomic approach to differential diagnosis

Synopsis: This presentation will guide the participants to develop an approach for the differential diagnosis of lesions of the soft tissues of the oral cavity through evaluation of key features of the lesions and reference to the anatomy/histology of the intraoral site. It is not important to make the clinical diagnosis of any oral lesion the first time it is observed but rather to consider the range of possible diagnoses and establish a priority for them. Procedures that lead to a definitive diagnosis will be discussed and the rationale for selecting a particular procedure introduced. This presentation will use specific clinical cases to demonstrate the steps involved in generating a thorough assessment of the lesion.

Learning Objectives:

- Recognize pathologic changes in soft tissues.
- Evaluate lesions in a standardized format based on clinical examination strengths.
- Develop a process for generating a differential diagnosis based on the anatomy and histology of the site.
- Understand the application of additional procedures to reach a definitive diagnosis and determine an approach to treatment.
- Apply the process to clinical cases to reinforce this new approach.

Dr. Izchak Barzilay

"3DP" - Digital implant planning, placement, and prosthetics

Synopsis: This presentation will showcase digital implant dentistry in its many forms. It will look at placing implants in difficult situations and then restore those implants using a digital approach for design and manufacturing. Angled implants, planning software, digital impressions, and final restorations will be presented in a fast paced manner.

Learning Objectives:

- Use different planning software's to decide on the best implant choice and placement location.
- Use CT guided placement of angled implants through guides without flaps in situations of minimal bone.
- Use digital technology to collect information so restorations can be made with out conventional impressions.

Friday, September 7th, Essayists, Continued

Dr. Jim McKee

Occlusion in the restorative and specialty practice in 2012

Synopsis: Occlusion continues to be a critical factor in the success or failure of many dental cases and yet occlusion is perhaps the least understood discipline in our profession. Historically, the approach to occlusion has focused at the tooth level and addresses how teeth should contact in both vertical and horizontal mandibular movements. This approach has lead to inconsistent results. Today, current occlusal concepts focus at both the teeth and the TM joints to provide a new level of predictability for both the restorative and specialty practice.

Learning Objectives:

- Develop a protocol to use for every patient to determine the occlusal and TMD risk.
- Determine what diagnostic records are necessary and how to collect the information efficiently.
- Establish treatment planning options for both simple and complex occlusal/TMD cases.

Dr. Andre Ritter

Contemporary trends on the use of direct posterior composites

Synopsis: This presentation will summarize the current uses of posterior composites and discuss clinical solutions for common problems.

Learning Objectives:

- Identify the best cases for using posterior composites.
- Understand the advantages and disadvantages of current resin composite systems used for posterior restorations.
- Apply clinical solutions to address common problems associated with the use of posterior composites.

Dr. Jim Kessler

New Materials and Technologies - Is it Time to Jump In?

Synopsis: In this presentation we will examine what new technologies offer to us in the way of conservative preparations, esthetics, efficiency, accuracy, and even predictability. We will also take a candid look at the marketing claims associated with CAD/CAM, Digital Impression technologies, and digital articulation, while attempting to separate fact from hype. We will discuss how various systems produce restorations from a myriad of materials and how this might modify our concepts of treatment planning and ideal preparation design.

Learning Objectives:

- Understand the physical properties for the various all-ceramic materials with particular emphasis on what most frequently leads to failure and perhaps more importantly, what constitutes failure.
- Choose the all-ceramic systems most likely to succeed in given situations based on evidence from the current literature.
- Identify clinical situations for which gold or metal-ceramic restorations remain the restorations of choice.
- Learn the current status of digital image acquisition (digital impressions).

Halifax: Nova Scotia's capital city has the amenities of a big city but the charm of a small town. Part of Halifax's charm is due to the hospitality of the people, something for which the whole Maritime region is famous. More of the city's charm can be attributed to an Oceanside location, rugged shorelines, sandy beaches, nearby fishing villages and historic architecture.

Average September Temperature (Low / High) - 49 / 66ºF, (9 / 19ºC)

Marriott Halifax Harbourfront

Get Meeting information & Register online soon @
www.cardp.ca

ADA C·E·R·P Continuing Education Recognition Program

Charting the Course for the Future!

The Canadian Academy of Restorative Dentistry and Prosthodontics
l'Académie canadienne de dentisterie restauratrice et de prosthodontie

Saturday, September 8th, AM Clinics, 18 Minute Presentations

Dr. Jim Kessler
Reverse-Engineered, Defect-Driven Preparations for Bonded Restorations

Dr. Richard Price
How to choose the right curing light for your office and how you can be trained to effectively use it

Dr. Rob Roda
Prognosis of Fractured Teeth: Considerations for Treatment Planning

Dr. Emmanuel Rajczak
Why do teeth crack?

Dr. Tim Hess
"The Dirty Little Secret"--Perimplantitis Caused by Excess Cement

Dr. Peter Taylor
Esthetic and Biologic Tissue-Management for Fixed Restorations

Dr. Peter Walford
"Enhanced Success with Multi-surface Composites"

Dr. Ron Zokol
Essential Criteria for Large Vertical Dimension Bone Grafting "it may not be what you think"

Table Clinics, presented from 2:00 pm - 5:00 pm

Dr. Emmanuel Rajczak
Mucostatic impressions

Dr. Terry Koltek
The conservative cast gold inlay as a semi-precision abutment

Dr. Tim Hess
"The dirty little secret"--Perimplantitis caused by excess cement

Mr. Henry Hintze
Ankylos Syncone Bridge, the right removable implant restoration, for the right patient

Dr. Al Mardini
Porcelain fracture resistance; screw retained vs. Cement retained implant restorations

Dr. Richard Price
How to choose the right curing light for your office and effectively use it

Dr. John Bembenek
A new option of restorative and replacement therapy with the combination of CAD-CAM and BEST and STARRT

Dr. Chris Cameron
Peri-implant diseases: What you need to know

Dr. Joel Powell
Evidence on wisdom teeth extraction

Mr. Martin Mueller
The predicament of choices--Anterior PFM vs. full ceramic solution

Dr. Allan Coopersmith
The custom impression coping

Speaker to be advised
Intra-oral Scanning and You

Dr. Henri Thériault
Topic to be advised

Social Activities

Wednesday, September 5th & Thursday, September 6th
Kayaking with the Shaffner's in Lunenburg, NS

Thursday, September 6th
Golf at Chester Golf Club
6:45 am - 4:00 pm

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Kayaking at St. Margaret's Bay and Peggy's Cove, NS
9:00 am – 4:00 pm

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Eat, Meet & Greet at The Halifax Marriott Harbourfront Hotel
Welcome Dinner Buffet 6:00 pm – 10:00 pm

Friday, September 7th
Evangeline Trail and Wine Tasting @ Grand Pre
Partner/Guest Event - 9:00 am - 4:00 pm

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Evening Harbour Tour and Lobster Ceilidh
Harbour Queen and Murphy's on the Water
Cruise, Lobster Dinner & Entertainment - 6:00 pm – 10:30 pm

Saturday, September 8th
High Tea – Partner/Guest Program
2:00 pm - 4:00 pm

~~~~

Presidents Gala
Reception 6:30 pm - Dinner/Dance 7:30 pm

Marriott Halifax Harbourfront

Get Meeting information & Register online soon @
www.cardp.ca

ADA C·E·R·P Continuing Education Recognition Program

Rejoignez-nous à Halifax en septembre!

The Canadian Academy of Restorative Dentistry and Prosthodontics
l'Académie canadienne de dentisterie restauratrice et de prosthodontie

FRAYER LA VOIE DU FUTUR Le 6-8 septembre 2012

Salutations de Halifax et Céad Mile Fáilte! (Cent mille bienvenues)

En tant que Présidente de l'Académie canadienne de dentisterie restauratrice et de prosthodontie, c'est un honneur pour moi de vous souhaiter la bienvenue au Congrès annuel de 2012. Nos membres des provinces de l'Atlantique sont ravis de vous accueillir dans notre ville incomparable. Le Congrès aura lieu du 6 au 8 septembre, une période idéale pour visiter notre magnifique cité portuaire. L'événement se tiendra au Marriott Halifax Harbourfront, avec vues sur l'eau et à quelques pas du centre-ville.

L'ACDRP abonde en traditions depuis 1993, lorsque deux organismes, soit l'Académie canadienne de prosthodontie et l'Académie canadienne de dentisterie restauratrice se sont joints. L'ACDRP a toujours offert à ses membres et invités un programme scientifique des plus éducatifs ainsi qu'un calendrier social étoffé et cette année n'y fera pas exception.

Dr. Peter Thomson, Président du Comité de dissertation, a mis en place un programme de conférences qui engendrera un dialogue d'informations scientifiques relatives à la Dentisterie et la Prosthodontie. Dr. Mark Sutherland, qui préside le Comité clinique, nous propose un samedi avant-midi de conférences stimulantes et des présentations cliniques qui offriront l'occasion d'interagir directement avec les conférenciers, animateurs et représentants de l'Industrie dentaire dans une ambiance intime de discussion et d'apprentissage.

Notre Académie conserve des liens étroits avec ses commanditaires – les chefs de file de l'Industrie; à ceux-ci, nos sincères remerciements pour votre appui soutenu.

D'un congrès à l'autre, nos membres et leurs familles, les invités et commanditaires, se rassemblent lors de nos événements sociaux. Le parfum maritime demeure la thématique cette année à Halifax, pleine de découvertes et de gaieté.

Notez ces dates à votre agenda et soyez des-nôtres pour un congrès mémorable.

À bientôt!

Cordialement,
Dr. Maureen Andrea
Présidente, ACDRP

Halifax Marriott Harbourfront Hôtel
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COURS PRATIQUE - *INTRODUCTION À LA DENTISTERIE NUMÉRIQUE ET CAD/CAM 2012*

Cours Pratique offert par Dr. Joseph Carpentieri pour 6 crédits.
Jeudi le 6 septembre: 09h00 -16h00 Hôtel Halifax Marriott Harbourfront

Le Dr Carpentieri est diplomé de la University of Maryland College of Dental Surgery. Il a pratiqué la dentisterie générale pendant huit ans avant de recevoir son certificat en prosthodontie du Einstein Montefiore Medical Center. Il a par la suite poursuivi un post-doctorat de quatre ans sur les implants chirurgicaux au Department of Periodontology and Implant Dentistry à la NYU. Il est actuellement Professeur agrégé clinique, membre associé du département de prosthodontie/ implants au Columbia University College of Dental Medicine Department, sous la direction de Dr Dennis Tarnow. Conférencier, éditeur, mentor et consultant pour BIOMET *3i*, Dr Carpentieri donne des conférences au niveau national et international sur toutes les phases de la dentisterie chirurgicale et implantaire.

APERÇU ET OBJECTIFS D'APPRENTISSAGE :

L'objectif de cette conférence consiste à présenter un aperçu complet et concis de la dentisterie CAD/CAM et numérique laquelle a complètement révolutionné la pratique de la dentisterie clinique et changé significativement ce que nous faisons et comment nous le faisons.

- **Offrir une perspective fondée sur des preuves des avantages/désavantages ou des bénéfices et limitations de ces technologies.**
- **Évaluer les nouvelles options en matière de flux de travail à partir de perspectives conventionnelles et numériques.**
- **Comprendre comment une prothèse fabriquée à l'aide de la méthode CAD/CAM constitue la modalité la plus rentable qui soit pour la plupart des restaurations à base d'implant.**
- **Présenter des arguments appuyés sur des faits et preuves justifiant l'utilisation de piliers CAD/ CAM et d'armatures CNC à arcade complète.**
- **Discuter en détail des lignes directrices cliniques, du choix des piliers et matériaux et examiner les controverses associées à l'utilisation de piliers de zircone à l'aide des nouvelles lignes directrices.**
- **Examiner d'autres sujets controversés dont les piliers de fabricants tiers, l'interface zircone-titane et les facettes de différentes armatures.**
- **Introduire le concept de l'ingénierie inverse : l'un des sujets les plus chauds de l'heure en matière de dentisterie implantaire.**
- **Introduire les grands joueurs : offrant ainsi une présentation diversifiée de toutes les compagnies d'implant.**
- **Évaluer la gamme des produits CAD/CAM de Biomet *3i*, notamment les systèmes de prise d'empreinte BellaTek™ Encode®. Comment cette compagnie réussit à se tailler une place et comment se démarque-t-elle?**
- **Démontrer l'intégration de la prise d'empreintes; aperçu des différents systèmes**
  - **Comment choisir un numériseur?**
  - **Cela fonctionne-t-il réellement?**
  - **Quels sont les bénéfices pour mes patients et mon entreprise?**

Objectif : Accroître les connaissances, la confiance et la prévisibilité, tous des éléments qui favorisent la production de meilleurs résultats esthétiques et fonctionnels.

Crédits Éducation Continue

Jeudi le 6 septembre - Cours pratique, 6 crédits éducation continue
Vendredi 7 septembre - Programme Scientifique, 7 crédits éducation continue
Samedi 8 septembre - Programme Scientifique, 7 crédits éducation continue
Démonstrations de tables, 3 crédits éducation continue
Plus d'Informations s'Écoulent ensuite et www.cardp.ca

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ADA C·E·R·P

FRAYER LA VOIE DU FUTUR!

The Canadian Academy of Restorative Dentistry and Prosthodontics
l'Académie canadienne de dentisterie restauratrice et de prosthodontie

Vendredi, le 7 septembre, les Essayistes, Présentations de 1 Heure

Dr. George Cho

Techniques provisoires en dentisterie implantaire conventionnelle

Synopsis: Les facteurs tels l'occlusion, la préparation d'une dent, la fonction, la phonétique, la manipulation des tissus mous, et surtout l'esthétique, peuvent tous être évalués par la fabrication d'une restauration provisoire adéquate. Celle-ci s'avère un outil de communication avec le patient et le laboratoire et aide le dentiste à prévoir les problèmes esthétiques potentiels. Le maniement des tissus mous autour des implants sera discuté pour optimiser l'architecture gingivale, les papilles, et les profils d'émergence des couronnes implanto-portées au moyen de restaurations provisoires. Une méthode sera démontrée pour fabriquer des unités de restaurations multiples provisoires esthétiques qui possèdent toutes les caractéristiques d'une dent naturelle.

Objectifs:

- Fabriquer des unités multiples de restaurations provisoires esthétiques ayant toutes les caractéristiques d'une dent naturelle.
- Fabriquer des restaurations implantaires provisoires.
- Discuter de l'architecture gingivale optimale.
- Effectuer des contours coronaux et sous-gingivaux des implants.
- Manipuler les tissus mous péri-implants avec les profils d'émergence de restaurations implanto-portées.

Dr. Charles Shuler

Les lésions buccales: approche anatomique au diagnostic différentiel

Synopsis: Notre présentation mènera le participant à développer une approche de diagnostic différentiel des lésions des tissus mous de la cavité orale en évaluant les points clés de ces lésions et les référant à l'anatomie/histologie du site intra-oral. Il ne faut pas diagnostiquer une lésion dès sa première observation, mais plutôt tenir compte de la panoplie de diagnostics possibles et d'établir leurs priorités. Les méthodes pour arriver à un diagnostic final et les raisons pour favoriser certaines méthodes seront discutées. Des cas cliniques démontreront les étapes d'évaluation et de la démarche à suivre pour atteindre ce diagnostic final.

Objectifs:

- Identifier les changements pathologiques des les tissus mous.
- Évaluer les lésions selon un format standardisé.
- Générer un diagnostic différentiel basé sur l'anatomie et l'histologie du site.
- Comprendre les procédures additionnelles qui favorisent le diagnostic et le plan de traitement.
- Appliquer ce processus aux cas cliniques afin de renforcer cette nouvelle approche.

Dr. Izchak Barzilay

«3DP» - Planification, placement et prosthodontie numérique de l'implant

Synopsis: La dentisterie implantaire numérique sera vue sous ses multiples formes: le placement d'implants dans des situations difficiles et la restauration de ces implants à l'aide d'une approche numérique de conception et de fabrication. Les implants angulés, le logiciel de planification, les empreintes numériques et les restaurations finales seront présentés prestement.

Objectifs:

- Employer divers logiciels de planification pour décider du meilleur choix d'implant et de son placement.
- Dans des conditions osseuses minimales, placer les implants angulés avec un guide CT sans lambeaux.
- Utiliser la technologie numérique pour recueillir l'information nécessaire pour la fabrication des restaurations sans avoir recours aux empreintes conventionnelles.

Vendredi, le 7 septembre, les Essayistes, Continué

Dr. Jim McKee

L'occlusion dans une pratique restauratrice et de spécialité en 2012

Synopsis: Bien que l'occlusion continue d'être un facteur critique pour la réussite d'un cas, c'est peut-être la discipline la moins comprise de notre profession. La vision traditionnelle s'adresse uniquement aux contacts des dents et leurs mouvements mandibulaires verticaux et horizontaux. Cette approche cependant mène à des résultats variables. De nos jours, les concepts sur l'occlusion englobent à la fois les dents ainsi que les articulations temporo-mandibulaires, ce qui assure une prévisibilité accrue en pratique restauratrice et spécialisée.

Objectifs:

- Développer un protocole pour chaque patient afin de jauger les risques occlusaux et temporo-mandibulaires.
- Trouver les dossiers diagnostiques appropriés de manière efficace.
- Fixer les options de plans de traitements pour les cas occlusaux/DTM simples ou complexes.

Dr. André Ritter

Tendances dans l'usage de composites directs postérieurs

Synopsis: Cette présentation résumera les usages courants de composites postérieurs et discutera des solutions cliniques pour les problèmes liés aux restaurations avec composites postérieurs.

Objectifs:

- Identifier les meilleurs cas pour l'usage de composites postérieurs.
- Comprendre les avantages et inconvénients des systèmes de résine composite courants pour les restaurations postérieures.
- Employer des solutions cliniques pour les problèmes associés aux composites postérieurs.

Dr. Jim Kessler

Les nouveaux matériaux et technologies: devrions-nous nous lancer?

Synopsis: Cette présentation examinera les nouvelles technologies en vue de préparations conservatrices, de l'esthétique, l'efficacité, la précision et la prévisibilité. Nous étudierons les réclames publicitaires associées à la CAO/FAO, aux empreintes numériques et à l'articulé numérique, tout en tentant de distinguer entre la vérité et l'exagération. Nous discuterons comment différents systèmes produisent leurs restaurations à partir d'une multitude de matériaux et comment ceci influence notre approche envers le plan de traitement et notre concept du design idéal d'une préparation.

Objectifs:

- Comprendre les propriétés des divers matériaux tout-céramiques avec une vue particulière sur les causes fréquentes d'échecs, et ce qui constitue un échec.
- Choisir les systèmes tout-céramiques les plus aptes à déterminer le succès d'après la littérature contemporaine.
- Identifier les conditions cliniques où l'or ou les restaurations céramo-métalliques demeurent le choix par excellence.
- Mettre à jour le statut des prises d'empreintes numériques disponibles.

Halifax: la ville capitale de Nova Scotia a les agréments d'une grande ville, mais le charme d'une petite ville. La partie du charme de Halifax est en raison de l'hospitalité des gens, quelque chose pour laquelle la région Maritime entière est réputée. Plus de charme de la ville peut être attribué à un endroit Oceanside, des côtes robustes, des plages sablonneuses, des villages à proximité de pêche et une architecture historique.

La Température de septembre moyenne (Bas / Haut) - 49 / 66 ° F, (9 / 19 ° C)

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Samedi, le 8 septembre, les Essayistes, Présentations de 1 Heure

Dr. Jim Kessler
Préparations rétroconçues pour restaurations mordancées

Dr. Richard Price
Choisir la bonne lumière photopolymérisante et l'utiliser efficacement

Dr. Rob Roda
Le pronostic des dents fracturées: plans de traitements

Dr. Emmanuel Rajczak
Pourquoi les dents fêlent-elles?

Dr. Tim Hess
Le vilain petit secret: péri-implantite causée par l'excès de ciment

Dr. Peter Taylor
À la recherche d'une gestion esthétique et biologique des tissus en restauration fixe

Dr. Peter Walford
Meilleur rendement des composites à surfaces multiples

Dr. Ron Zokol
Critères essentiels pour les greffes osseuses volumineuses verticales

Démonstrations de tables - 14h00—17h00

Dr. Emmanuel Rajczak
Impressions de Mucostatic

Dr. Terry Koltek
L'or d'ensemble des acteurs conservateur incruste comme un contrefort de semi-précision

Dr. Tim Hess
Le vilain petit secret: péri-implantite causée par l'excès de ciment

Mr. Henry Hintze
Ankylos Syncone le pont, la restauration d'implant amovible juste, pour le patient juste

Dr. Al Mardini
Résistance de fracture de porcelaine; la vis retenue contre le Ciment retenu restaurations d'implant

Dr. Richard Price
Choisir la bonne lumière photopolymérisante et l'utiliser efficacement

Dr. John Bembenek
Une nouvelle option de fortifiants et la thérapie de remplacement avec la combinaison de CAD-CAM et la BEST et la STARRT

Dr. Chris Cameron
Maladies de Peri-implant : que vous devez savoir

Dr. Joel Powell
Évidence sur l'extraction de dents de sagesse

Mr. Martin Mueller
La situation difficile de choix - PFM Antérieur contre la solution céramique complète

Dr. Allan Coopersmith
L'impression personnalisée de faire face

Le speaker à être annoncé
Le fait de Scanner Intra-oral et Vous

Dr. Henri Thériault
Le Thème à Être Conseillé

Activités Sociales

Mercredi, le 5 septembre et jeudi, le 6 septembre
Kayaking avec Shaffner dans Lunenburg, NS

Jeudi, le 6 septembre
Golf à la Crosse de Chester
6h45 - 16h00

~ ~ ~ ~

Kayaking à la Baie de rue Margaret et la Crique de Peggy, NS
9h00 – 16h00

~ ~ ~ ~

Mangez, Rencontrez-vous et Accueillez à Halifax Marriott Harbourfront l'Hôtel
Accueillez le Buffet de Dîner 18h00 – 22h00

Vendredi, le 7 septembre
Evangeline Trail et Dégustation du vin Grand Pre
L'Événement de Partenaire/Invité - 9h00 - 16h00

~ ~ ~ ~

Le Tour de Port du Soir et le Homard Ceilidh
La croisière, le Dîner de Homard et l'Amusement - 18h00 – 22h30

Samedi, le 8 septembre
Goûter dînatoire – Programme de Partenaire/Invité
14h00 - 16h00

~ ~ ~ ~

Les Présidents de Gala
La réception 18h30 - le Dîner/Danse 19h30

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Tapered Internal case

Courtesy of Cary Shapoff, DDS (Surgical) & Jeffrey A. Babushkin, DDS (Restorative)

After atraumatic extraction, the socket was grafted with allograft calcified bone and allowed to heal for 6 months.

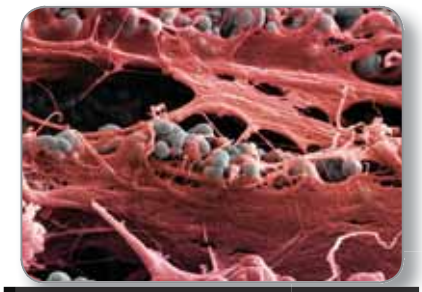
Six months after placement second stage surgery was performed and the tooth was restored.

2 year post-op study indicates excellent bone regeneration for BioHorizons implants.

FEATURES

Anatomically tapered body and proprietary buttress threads for compressive bone loading and excellent primary stability.

body-type	tapered
connection	internal hex
placement	bone level
surface treatment	Laser-Lok body | Laser-Lok collar with RBT body
delivery options	mount-free | 3inOne abutment
platform diameters	3.5mm | 4.5mm | 5.7mm
body diameters	3.8mm | 4.6mm | 5.8mm
lengths	7.5mm | 9mm | 10.5mm | 12mm | 15mm



colorized SEM (2,500X) of a dental implant harvested at 6 months post-op showing interdigitated connective tissue.

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