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

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

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Volume 7, No. 3 Fall/automne 2014

CJRDP JCDRP

Evidence Based Dentistry/Dentisterie fondée sur les faits

Digital Dentistry/Dentisterie numérique

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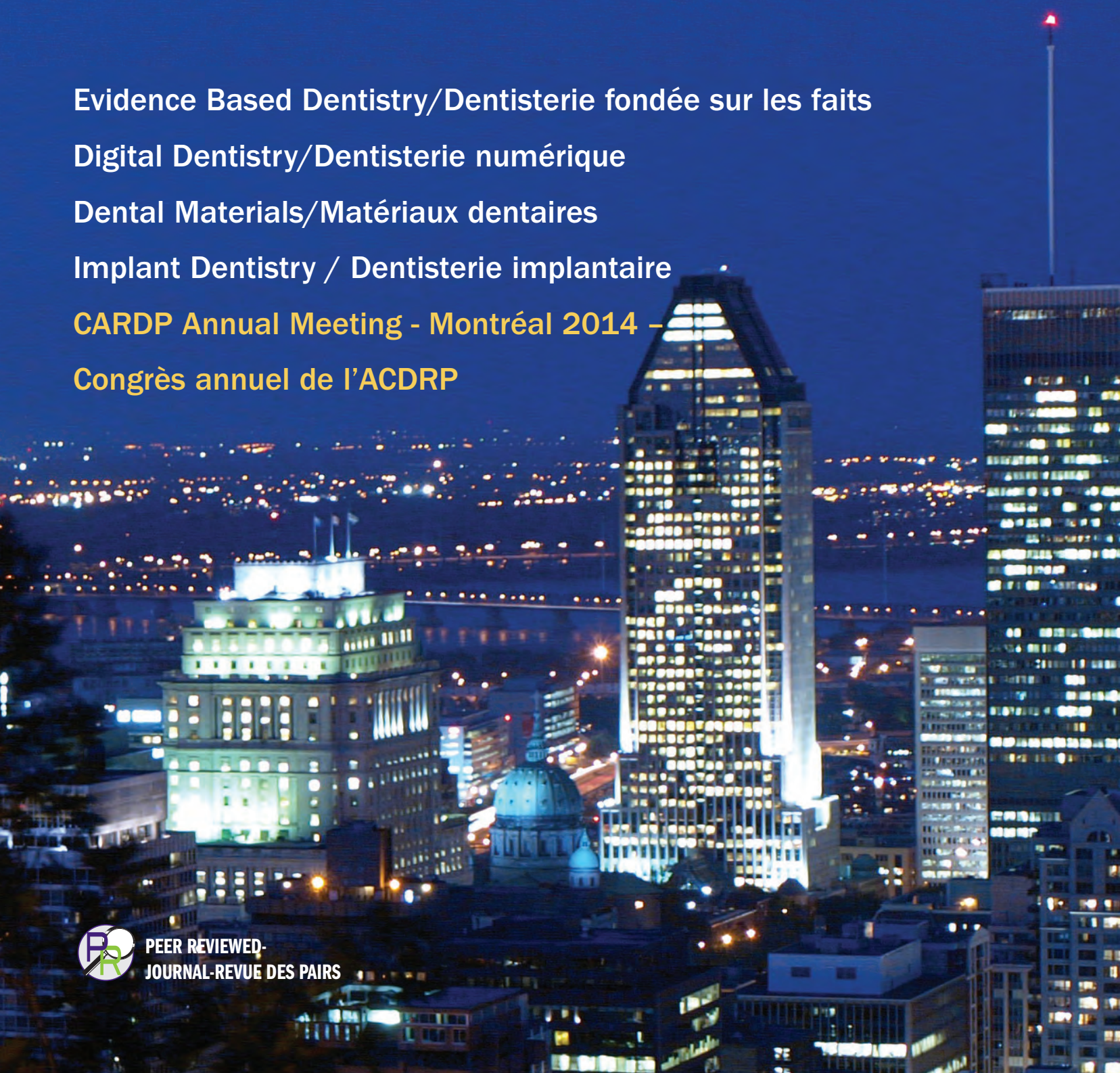

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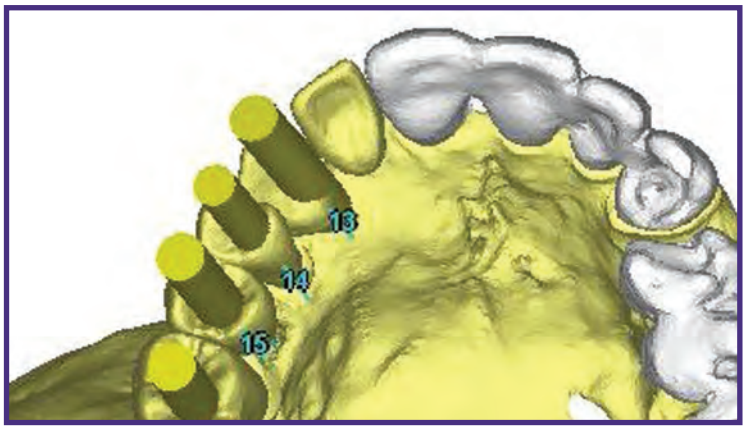
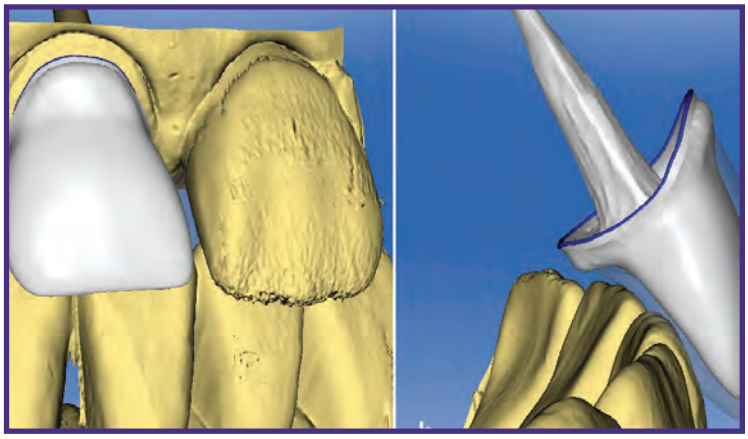
FEATURES/ARTICLES





INDICATES PEER REVIEWED/ INDIQUE REVUE DES PAIRS

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Dr. Hubert Gaucher

From Fascination to ROI - Where do you stand on Intra-Oral Scanners?

Way back, 25 years ago, CEREC I (Siemens, Bensheim, Germany) introduced the first dedicated dental office CAD/CAM system with an integrated intra-oral scanner. I attended Prof. W.H. Mörmann's hands-on course in Zurich in the early 90s, and could actually feel the excitement among the attendees in the great auditorium. Dr. Mörmann, who was seated at a large master console, monitored the numerous CEREC training units, coaxing, step by step, the international participants into capturing their very first 3D dental image, as they designed and manufactured an MOD ceramic inlay in situ. Wow! We felt practically light-headed when we seated those restorations onto typodonts all the while grasping that we were now among the pioneers of a new dental era.

For many years in its ads, Siemens referred to the Fascination of Dental CAD/CAM. And such a fascination is still going strong due to the continued technological advances in hardware, as well as software, supporting very sophisticated, user friendly, in-office (closed architecture) as well as office-laboratory (open architecture) dental digital scanners. Moreover, the dental 3D evolution promises to grow exponentially in its quest for innovative dental materials, increased production workflows, and objective quality control. This journey of CAD/CAM Dentistry has been well summarized in the following Reviews.[1, 2]

NEED TO KNOW

There now exist approximately 20 commercially available Dental Intra-Oral Scanners (IOS).[3-4] A well designed IOS Engeneering review[3] details the physics and the characteristics of many of these IOS technologies. For your convenience, I've put together a list of them that I gleaned from two sources, though, most likely, a broader search could reveal additional systems. Which ones are better suited to your needs? Do you know?

	IOS DEVICE	MANUFACTURER
1	Cerec	Sirona, Germany
2	Itero	Cadent, Israel
3	E4D	D4D, USA
4	LavaTMC.O.S.	3M ESPE, USA
5	IOS FastScan	IOS, USA
6	MIA3dTM	Densys3D, Israel
7	DIP-3D	Dimensional Photonics Int, USA
8	3D Progress	MHT, Italy, Switzerland
9	Direct Scan	Hint-Els, Germany
10	Trios	3Shape, Denmark
11	Bluescan	Atron3D, Austria
12	Condorscan	Remedent, Belgium
13	Planscan	Planmeca, Finland
14	CS 3500	Carestream, USA
15	DigImprint	Steinbichler Optotechnik, Germany
16	Clon 3D	IODIS, USA
17	Intrascan	Zfx, Germany
18	DWScan	Dental Wings, Canada
19	TDS	The Dental Solution, Korée du sud
20	Lythos	Ormco,USA

THE PUSH-PULL DENTAL MANAGEMENT DECISION MAKING PROCESS

We are 30 years into CAD/CAM Dentistry, as one remembers Dr François Duret's lectures in the French Alps in the early 80s, and the Dental Industry is still reporting a paltry 10% user base among our profession. Why is this?

Peruse dental blogs and you'll come across some of the reasons dentists give for not buying into CAD/CAM systems:

1. Improve the user interface and reduce the learning curve
2. Data transfers and validation can be problematic
3. Training is deficient
4. Lack of established standards to measure the accuracy and reliability of the systems
5. Over-treatment required to obtain ROI (Return On Investment)
6. Production requirements for ROI can cause ethical dilemmas
7. High initial system investment as well as annual and monthly user fees
8. Fear of losing control of the restoration's design when using milling centers
9. The restorations lack high level "finesse" standards

Well, there has been a decades-long learning curve on the part of the dental Industry in its strive to bring about accessibility and quality control that did not exist just a few years ago. Digital Restorative/Prosthodontic Dentistry is now emerging as a viable entity, due in great part to spin-offs from advancements in the aerospace sector, given that their technologies requiring minutiae meet our clinical standards.

Dr. W. J. van der Meer[5] not only compares the accuracy of these various new scanners, but sets forth a bench protocol that could very well become an accepted reference for future scanner evaluations. As technologies evolve, having a bench mark comparison protocol will ensure that improvements can be evaluated on a continuous basis, providing real-time pertinent information and updates to the users. We can always find electronic and software norms from the dental Industry per se, but shouldn't Dentistry set forth standardized IOS requirements based on the input of its own members?

ROI – RETURN ON INVESTMENT

Dental Management Consultants always recommend solid ROI projections before investing in large/costly equipment. Beware financial scenarios aimed at enticing buyers into 3D technologies. Your practice production levels, as well as your actual 3D technology priorities, present and projected, need to be factored into these ROI equations. For the 10% of 3D users out there, this exercise has most probably been done and they are well on their way to integrating 3D technologies into their practices. So where does this leave the majority of dentists who are prepared to initiate or update their 3D technology ROI? Shouldn't their practice situations (solo vs group, etc.) have a direct bearing on establishing their specific ROI?

SURVEY SAYS!

Here is an opportunity to convey your thoughts, opinions and observations on the matter by taking a few minutes to complete the attached anonymous CJRDP IOS SURVEY. CARDP members as well as readers at large are invited to express their views about integrating 3D technology into their practice. We need each other's feedback. Results will be forwarded to survey participants who have asked to receive updates over the next months. This CJRDP IOS Survey is NOT initiated and/or funded by the Dental Industry.

- **Journal Blog: You will also find this Editorial in the Journal Blog section of CARDP's website at www.cardp.ca Feel free to make comments and suggestions there as well, since this forum is about dentists' experiences and perspectives that can enlighten their colleagues.**

Please access the CJRDP IOS SURVEY using the following link: https://fr.surveymonkey.com/s/9RSBXB7

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4. *Jokstad, A.; CAD/CAM Technologies in Implant Dentistry, Spectrum Implants, Vol.5, No2, p. 60-61, Summer 2014*
5. *van Der Meer, W.J., et al; Application of Intra-Oral Dental Scanners in the Digital Workflow of Implantology, CJRDP, Vol. 7, No2, Summer, 2014 (www.cardp.ca)*

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Dr Hubert Gaucher

De la Fascination à RSI – Que pensez-vous des sondes intra-orales?

Il y a 25 ans déjà, CEREC 1 (Siemens, Bensheim, Allemagne) nous présentait le premier système CAO/FAO, avec balayage intra-oral, dédié à l'officine. J'étais présent au cours pratique du Professeur W.H. Mörmann à Zurich au début des années '90 et je pouvais sentir la fébrilité venant de l'auditoire. Le Dr Mörmann, assis à son poste de contrôle, suivait les opérations de chacun des particpants internationaux installés devant leur unité d'entraînement, les encourageant à apprivoiser l'appareil et capter leur première image dentaire 3D en concevant et fabriquant une incrustation MOD en céramique in situ. La tête nous tournait presque, le moment venu de placer ces restaurations sur nos typodonts, tout en réalisant qu'en posant ce geste, nous étions devenus des pionniers d'une nouvelle ère de la médecine dentaire.

Pendant plusieurs années, les annonces publicitaires de Siemens mentionnaient la fascination de la CAO/FAO dentaire. Et cette fascination se répète au fur et à mesure des améliorations technologiques dans les appareillages et les logiciels. Ceux-ci supportent des balayeurs dentaires numériques très sophistiqués et faciles d'utilisation, soit en officine (architecture fermée), soit en relation officine-laboratoire (architecture ouverte). D'ailleurs, l'évolution 3D devient exponentielle dans sa recherche de matériaux novateurs, d'une production accrue et d'un meilleur contrôle de la qualité. Ce parcours de la CAO/FAO dentaire est très bien résumé dans les deux articles suivants.[1,2]

IL FAUT SAVOIR

Il existe présentement environ une vingtaine de sondes intra-orales 3D sur le marché.[3,4] Une excellente analyse de plusieurs de ces systèmes[3] offre des détails sur les caractéristiques et le fonctionnement de chacun. À titre de référence, je vous ai compilé une liste, inspirée de deux sources, quoique, fort probablement, une recherche plus poussée en dénicherait d'autres. Lesquels, parmi tous ces systèmes, sont les mieux adaptés à vos besoins? Le savez-vous?

	APPAREILS SIO	MANUFACTURIERS
1	Cerec	Sirona, Germany
2	Itero	Cadent, Israel
3	E4D	D4D, USA
4	LavaTMC.O.S.	3M ESPE, USA
5	IOS FastScan	IOS, USA
6	MIA3dTM	Densys3D, Israel
7	DIP-3D	Dimensional Photonics Int, USA
8	3D Progress	MHT, Italy, Switzerland
9	Direct Scan	Hint-Els, Germany
10	Trios	3Shape, Denmark
11	Bluescan	Atron3D, Austria
12	Condorscan	Remedent, Belgium
13	Planscan	Planmeca, Finland
14	CS 3500	Carestream, USA
15	DigImprint	Steinbichler Optotechnik, Germany
16	Clon 3D	IODIS, USA
17	Intrascan	Zfx, Germany
18	DWScan	Dental Wings, Canada
19	TDS	The Dental Solution, Korée du sud
20	Lythos	Ormco,USA

PRENDRE UNE DÉCISION DE GESTION DENTAIRE PAR TÂTONS

La CAO/FAO existe depuis 30 ans au moins si l'on se souvient des cours du Dr François Duret dans les Alpes françaises au début des années 80; mais malgré tout le temps qui s'est écoulé, seulement un piètre 10% de dentistes utilisent ce genre de système, selon l'Industrie dentaire. Comment se fait-il?

Parcourez les blogs dentaires et vous y trouverez les diverses raisons que les dentistes invoquent pour expliquer leur hésitation d'investir dans un système CAO/FAO:

1. Il faut améliorer l'interface et abbréger la courbe d'apprentissage
2. Le transfert des données et la validation peuvent être aléatoires
3. La formation est incomplète
4. Manque de standardisation des mesures de précision et de fiabilité
5. Surtraitement nécessaire pour atteindre le RSI (retour sur investissement)
6. La production requise pour un RSI peut engendrer des dilemmes d'ordre éthique
7. Coût initial élevé en plus des divers frais d'utilisateurs annuels et mensuels
8. La hantise de perdre le contrôle de la conception de la restauration lorsque celle-ci est fabriquée ailleurs
9. Les restaurations perdent un certain niveau de raffinement

La courbe d'apprentissage de l'Industrie dentaire s'étend sur une période de décennies; elle ne cesse d'améliorer l'accessibilité et le contrôle de la qualité des sondes intra-orales. La restauration numérique/dentisterie prothétique est une entité viable de nos jours, grâce en grande partie aux avancements dans le secteur aérospatial, étant donné la minutie de leurs technologies qui correspondent aux besoins cliniques de la dentisterie.

Dr. W.J. van der Meer[5] compare scrupuleusement la précision de ces nouvelles sondes en plus d'avoir aussi établi un protocole pour évaluer les balayeurs intra-oraux à venir. Au fil de l'évolution technologique, un protocole comparatif assurera que les progrès seront évalués et mis à jour de façon opportune. Nous profitons toujours des normes électroniques et logistiques que l'Industrie nous fournit, mais la profession dentaire ne devrait-elle pas mettre à contribution une standardisation basée sur les besoins de ses propres usagers?

RSI – Retour sur investissement

Les consultants en gestion de cabinet recommandent toujours une projection de RSI substantielle avant d'investir dans des équipements coûteux. Gare aux scénarios qui visent uniquement la vente de technologies 3D. Vous devez tenir compte de votre niveau de production, ainsi que vos priorités, actuelles et futures. Les 10% d'utilisateurs ont dû faire cet exercice déjà et sont maintenant en train d'intégrer la technologie 3D dans leurs pratiques. Du reste, qu'arrive-t-il à la majorité des dentistes qui désireraient initier ou mettre à jour leur RSI de la technologie 3D? Leurs circonstances de pratique (vg solo vs groupe) ne devraient-elles pas refléter leur RSI spécifique?

AU SONDAGE!

Voici une occasion convoitée de transmettre vos idées, opinions et observations sur le sujet en répondant au bref questionnaire anonyme ci-joint. Les membres de l'ACDRP aussi bien que tous nos autres lecteurs sont invités à exprimer leurs points de vue sur l'intégration de la technologie intra-orale 3D dans leur pratique. Partageons nos impressions. Les résultats de ce sondage seront envoyés dans les mois à venir aux participants qui le souhaitent. Ce sondage du JCDRP n'est aucunement relié ni financé par l'Industrie dentaire.

- **Le Blog du Journal: Vous retrouverez cet Éditorial sur le site web de l'ACDRP, www.cardp.ca dans la rubrique Blog. Soyez tout à fait à l'aise de laisser vos commentaires là aussi puisque ce forum concerne les expériences et les perspectives de collègues susceptibles de nous éclairer.**

Pour accéder au Sondage du JCDRP sur les sondes de balayage intra-orales, suivez ce lien: https://fr.surveymonkey.com/s/XZT3TRC

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Références

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Evidence-Based Dentistry; critically appraising scientific evidence

Dr. Ben Balevi, B.Eng, DDS, Dip EBHC(Oxford), MSc.

Dentisterie fondée sur les faits ; évaluation critique de preuves scientifiques.

Abstract

In this age of patient-centered care, the professional relationship between the patient and dentist is one of shared decision making. Shared decision making between patient and dentist is made in a world of imperfect information, uncertainty and choice. Yet, dentists are expected to help the chairside-patient make definite decisions. Evidence-Based Dentistry offers a systematic approach on how to apply the best scientific evidence to clinical decision making. This paper focuses on the concept and required skills to critically appraising scientific research based on the following three criteria: validity (truthfulness), results (effect size)and generalizability of the results to patient care at chairside. Effective critical appraisal of the scientific evidence leads to optimal clinical outcomes, and thus better patient care.

INTRODUCTION

In this age of patient-centered care, the professional relationship between the patient and dentist is one of shared decision making [1]. Now, the dentist's role is to counsel and assist patients when deciding amongst a number of competing treatment options. Which option the patient chooses will depend on a number of factors: the apparent benefit of the treatment, its perceived risk of harm, and the patient's preferences, needs and values.

For example, consider a common clinical scenario - an adult patient with a full set of dentition, less the lower right 1st molar (tooth #46). The patient has a series of treatment options, depicted in the decision tree in Figure 1.

Each option has its advantages and disadvantages. Replacing the missing tooth with a bridge can be completed in as little as two weeks, but requires sacrificing tooth structure from the adjacent abutment teeth (#47 and #45). Furthermore, cutting into vital asymptomatic teeth risks causing pulpal necrosis.[2,3]

A dental implant supporting a single crown is a stand-alone prosthesis, but requires invasive surgery that risks causing paresthesia to the inferior alveolar nerve bundle.[4] Moreover, treatment requires no less than three months and costs significantly more. Finally, living with the edentulous space may compromise function, [5,6] but this option imposes no cost on the patient in terms of pain, time from work, or money.

The patient must evaluate many factors associated with each treatment option. Some of these factors are specific to the patient - notably, their financial situation, and how much they value replacing the lower 1st molar. Other factors, such as the probability of success for each option, are information that they rely on their dentist to provide.

What is Evidence-Based Dentistry?

Information comes in the form of evidence. Evidence is essentially something that indicates whether or not a belief or proposition is true. It is important to bear in mind that not all evidence is equally compelling; some evidence better reflects clinical reality than others. The quality of the evidence on which a decision is based will

Résumé

En cette époque de soins axés sur le patient, la relation professionnelle entre le patient et le dentiste est faite d'une décision partagée. Une décision partagée entre le patient et le dentiste est faite dans un monde mal informé, incertain et plein de choix. Cependant, les dentistes sont supposés aider leurs patients dans au fauteuil, à prendre les bonnes décisions. La dentisterie fondée sur les faits, offre une approche systématique afin d'appliquer les meilleures preuves scientifiques à des recherches de décisions cliniques. Cet article se concentre sur cette idée, et demande des compétences, pour une évaluation critique de recherche scientifique, fondée sur les trois criteria suivants : validité (véracité), résultats (effet) et généralisation des résultats pour les soins au patient dans au fauteuil. Une évaluation critique efficace des preuves scientifiques conduit à des résultats cliniques des plus favorables, et donc à de meilleurs soins pour le patient.

affect the likelihood that the desired outcome will be realised. Therefore, it is incumbent on the dentist to be able to critically appraise scientific evidence for the degree of truthfulness before blindly transferring any conclusions to chair-side decision making.

Evidence-Based Dentistry (EBD) is a patient centered systematic process for optimising clinical outcomes of shared decisions between dentist and patient.

The American Dental Association defines EBD in the following way:

Evidence-based dentistry (EBD) is an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to the patient's oral and medical condition and history, with the dentist's clinical expertise and the patient's treatment needs and preferences. (http://ebd.ada.org/en/, access July 19th 2014) EBD can be represented by the triad illustrated in Figure 2. All aspects depicted are equally important to clinical decision-making: the dentist's experience, the best current scientific evidence, and the patient's needs and preferences.

In the practice of EBD, the dentist, along with the patient, considers all three aspects when arriving at oral healthcare decisions. A decision that ignores one or more aspects is at a higher risk of an undesirable clinical outcome - one that does not meet the patients needs [7].

This paper will focus on one particular domain, that of scientific evidence. We will discuss the nature of evidence, its different forms, and importantly, how to critically assess the information provided.

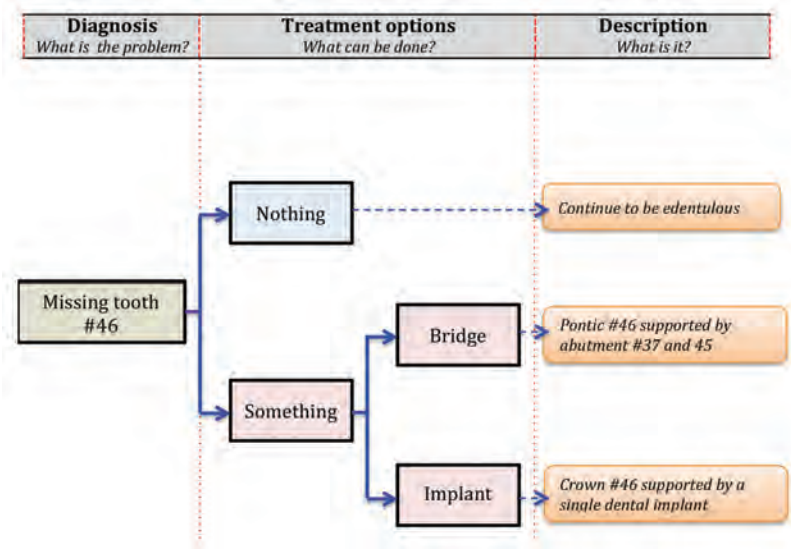

Figure 1- Treatment Decision Tree
The adult patient with a missing lower right 1st molar

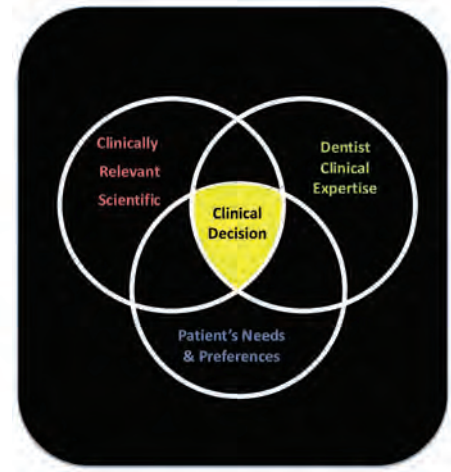

Figure 2. Triad of Evidence-Based Dentistry

SCIENTIFIC EVIDENCE

Science is a human pursuit to uncover the secrets of nature. To achieve this goal, the scientist employs a standardized method: generate a hypothesis, and test its validity through an experiment. The experiment should be objective; that is, not influenced by the beliefs and desires of the experimenter. Although, no scientific research is perfect, some comes closer to objectivity than others.

When making any clinical decision, EBD requires the dentist to consider current scientific evidence. While evaluating the importance of the evidence, the dentist uses three criteria: validity - how well the scientific methodology met the goal of objectivity, results - how important are the results themselves, and generalisability - how relevant the results are to the clinical problem at hand. As we will see later, these three factors are the cornerstones of critical appraisal (Table 2).

Biomedical Research

Biomedical research applies the experimental method to questions of a medical (including dental) nature. One of the first considerations for a dentist assessing a piece of evidence is the design of the experiment which provided the evidence. The different forms of biomedical research are summarised in Table 1.

Biomedical research may be clinically based, where the subjects being tested are human, or non-clinically based, where the test samples are not human. As an example, consider the recent publication of Häfer et al. (2014), measuring leakage on 180 extracted human teeth restored with composite resins in the laboratory [9]. This study is considered non-clinical since the objects being tested – in this case extracted teeth – are not attached to a human at any time when the experiment was being conducted. On the other hand, Peumans et al. (2007) conducted a clinical study, because the authors placed 100 composite resin restorations on twenty nine people, and then five years later assessed the microleakage around those restorations [10]. Although neither study can claim to present the absolute truth on the nature of microleakage around composite restorations, they both offer scientific evidence applicable to clinical decision making. Nonetheless, the results of a clinical study are generally more likely to be applicable in a clinical setting, because experiments done on humans better represents clinically reality than result from a bench top study testing extracted teeth.

Similarly, not all clinical studies are equally compelling. The results from prospective clinical research are usually a closer representation of the truth than a retrospective clinical trial, because prospective studies follow patients forward through time, rather than relying on the accuracy of memory and/or patient records of time gone by, as in a retrospective study. Furthermore, amongst prospective study designs, the results generated from a well conducted double blinded randomized control trial (double blinded RCT) are generally the most trusted because this design is the least threatened by bias and confounders.

In the practice of EBD, dentists use the "hierarchy of

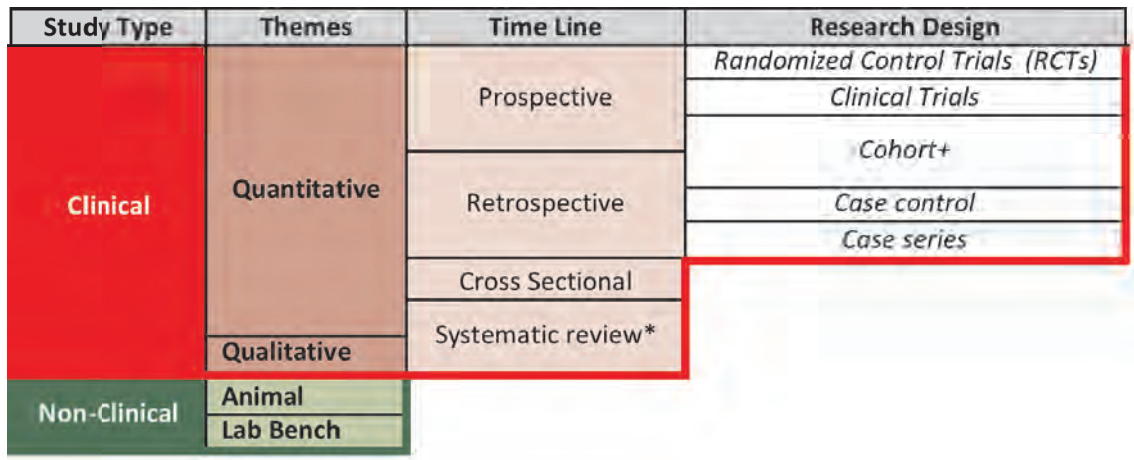

Table 1- Biomedical Research
Note: A detailed description of research design can be found in Professor Donald Brunett's (University of British Columbia) standard textbook, Critical Thinking [8].

+ Cohort study can be either prospective or retrospective by design.
* Systematic Review is a rigorous literature review that methodically identifies, critically appraises and synthesis all high quality research evidence relevant to a specific focused clinical question. It may review quantitative or qualitative studies by design.

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evidence" (Figure 3) as a guide when evaluating the importance of scientific research evidence. It is understood that no scientific experiment is flawless, the evidence generated from them are not necessarily absolute truths. In fact, an important component of a well written research article is a discussion of the limitations of the study.

CRITICAL APPRAISAL

It should now be clear that we live in a world of imperfect information, with some information more imperfect than others. Yet, dentist are expected to help patients make definite decisions based on imperfect information. In EBD, the dentist tries to base clinical decisions on the best available evidence. Therefore, dentists must hone their skills at evaluating the degree of truthfulness of all scientific evidence pertinent to a clinical problem and then its appropriate transfer to clinical practice.

Critical appraisal is the EBD discipline of systematically assessing the clinical relevance of research using three fundamental criteria: validity, results and generalisability (Table 2).

Validity questions how well the scientific evidence resembles clinical reality. Errors and flaws in the study methodology can threaten the validity of the results. Such shortcomings include bias or systematic error. A bias is a systematic error in the observation which may intentionally or unintentionally encourage one outcome over others. A list of common forms of bias to look out for in a scientific paper is given in Table 3. A full list of forms of bias that may threaten the validity of a research study is available elsewhere [11].

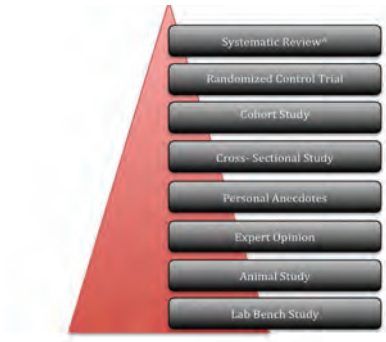

Figure 3- Hierarchy of Evidence
^ Systematic Review is a rigorous literature reviews that methodically identifies, critically appraises and synthesis all high quality research evidence relevant to a specific focused clinical question.

Identifying bias in a scientific article does not automatically render it irrelevant, but should affect the degree to which the results of the study are trusted. For example, imagine a hypothetical RCT comparing the clinical outcomes of periodontal surgery to nonsurgical periodontal therapy in a large sample of adult patients. It would be impossible to conduct a true double blinded RCT, since the patients in either arm of the study cannot be blinded to which therapy they received. Still, the rest of the study may be flawless. The reader must judge how much this bias threatens the validity of the results and then adjust accordingly for clinical decision making.

Results refers to how meaningful and precise the results of the study are. For example, imagine that the hypothetical RCT showed that surgery resulted in a pocket depth reduction of 3mm (95% confidence interval: 0 - 6mm) while the non-surgical group showed a reduction in pocket depth of only 2mm (95% confidence interval: 1.5- 2.5 mm). Looking only at the mean value, one may conclude that surgery is superior to non-surgery at reducing periodontal pockets. But a further assessment shows that the confidence interval from the surgery group lacks precision; it is very much wider compared to the non-surgery group. More importantly, the surgery groups confidence interval include zero, indicating that surgery may offer no benefit. On the other hand, the non-surgery group estimate is more precise, indicating that the true effect of non-surgery therapy is likely beneficial with an expected reduction between 1.5-2.5mm.

If the dentist is comfortable with the validity of the study and impact of the results, then they must address the generalisability of the evidence to their specific clinical context. For example, were the patients in the RCT similar to the patient currently sitting chair side? Is it reasonable to extrapolate the results from a sample of adult patients to your adolescent patient? These and many other questions must be addressed before the dentist can feel comfortable applying the scientific evidence to a specific situation.

Table 2 provides a list of thematic questions to ask when critically appraising a scientific article. Many standardised critical appraisal checklists are available to help dentists work through an article. All of them are categorised into the sections validity, results and generalisability. The one I use is available through the Critical Appraisal Skills Programme (CASP) from the University of Oxford (http://www.casp-uk.net).

CONCLUSION

Shared decision making between patient and dentist is made in a world of imperfect information, uncertainty and choice. Evidence-Based Dentistry offers a systematic approach on how to apply the best scientific evidence to clinical decision making. Effective critical appraisal of the scientific evidence leads to optimal clinical outcomes, and thus better patient care.

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Criterion	Questions (Themes)
Validity	1. Correct study design ? 2. Bias ? 3. Blinding ? 4. Randomization ? 5. Lost to follow up ? 6. Sample size ? 7. Conflict of interest ?
Results	1. Size effect ? 2. Confidence intervals ?
Generalisable	1. Similar Population ? 2. Outcome important ? 3. Harms considered ? 4. Patient values & preference ?

Table 2- Critical Appraisal. Each criterion has a list of theme questions to be applied to scientific evidence.

Type of Bias	Description
Measurement bias	Error in the way the outcome of interest was measured or processed
Selection bias	Error where the subjects may not be representative of the population of interest
Sampling bias	Error in how the subjects were divided into experimental groups (i.e. lack of randomization)
Recall bias	Error in memory , for example, outcomes of interest may colour subjects' recollections of events prior to or during the treatment process
Performance bias	Error where all subjects were not treated consistently in each group
Withdrawal bias	Error where subjects who leave the study (drop-outs) differ significantly from those that remain

Table 3- Common forms of bias to look for in a scientific article

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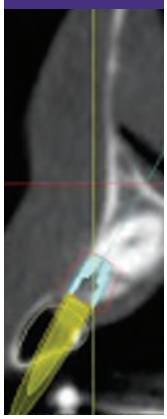

Assisted Computer Implant Surgery: a minimally invasive approach for the management of complex anatomy in the maxilla

Dr. Marc Shenouda, DMD. FRCD(c)

Chirurgie implantaire à l'aide d'ordinateur: une approche simplifiée, pour la gestion de l'anatomie complexe du maxillaire.

Abstract

In recent years, clinicians involved in the surgical planning and placement of dental implants have adopted computer assisted guided surgery as a novel tool to perform complex surgical interventions. In this case report, we will present a minimally invasive technique for the treatment of a patient with an impacted canine in the maxilla at the exact site where dental implants are desired. The surgery for the placement of the implants was virtually planned and a CAD-CAM surgical guide used to perform fully guided implant surgery successfuly. A review of the litterature will also show how the precision of this technology has been proven and that it does represent an accurate method for the precise placement of dental implants.

Introduction

Success in implant dentistry is based on multiple factors that allow clinicians to treat patients and meet their expectations. One of the most critical parameters that dictate the predictability of implant restoration is invariably the adequate and precise surgical implant placement based on the desired planned prosthetic plan. Clinicians have been striving over the years to develop techniques and tools to help guide implant insertion to the best-desired position. Guidance in implant surgery has greatly evolved over the years mainly due to advent of 3D imaging allowing the visualization and virtualization of patient's anatomy in its entirety. One of the major drawbacks of the conventional surgical guides, fabricated based on a laboratory wax up of the future restoration, and that we are accustomed to use in our practices, is that it does not take into consideration the underlying osseous anatomy nor does it allow taking into consideration vital anatomical structures at the surgical site. The technical evolution in the realm of computer guided surgery over the last few years is now changing the way clinicians approach complex treatment plan. Not only does is allow planning in the virtual world but with the use of computer generated surgical guide, it is now possible to predictably transpose this digital information into the patient's mouth in order to perform not only more precise implant placement, but equally carry safely more complex surgical interventions. In this case report, we will see how the use of this technology has allowed us to find an elegant minimally invasive, safe and precise way of treating a patient presenting with a more complex anatomy.

Case History

This case report relates and demonstrates the use of 3D imaging to allow for virtual planning and treatment of a complex fixed partial rehabilitation on implants.

We are faced with the scenario of a 58 year old female referred for an assessment of a failing fixed bridge in quadrant 1. Her chief complaint is that she had a recent infection that was treated with antibiotics and now requires definitive treatment (Figure 1).

Her previous medical history is positive for controlled hypertension, rheumatoid arthritis and osteoporosis. The patient's list of medication is composed of Actonel for duration of 1.5 years and oral antihypertensive. The patient has positive history of allergy to clindamycin and intolerance to opioids.

Her previous dental history of pertinence is as follows: previously extracted first maxillary molar in quadrant one 5 years ago. The patient also underwent endodontic therapy on teeth 15, 14 and 12. These teeth are abutments for a fixed bridge 12-X-14-15 that is now in place for 9 years. As can be seen on her pre-operative

Résumé

Ces dernières années, les cliniciens impliqués dans la préparation chirurgicale et le placement d'implants dentaires, ont adoptés une chirurgie guidée à l'aide d'un ordinateur, comme un nouvel outil pour exécuter des interventions chirurgicales complexes. Dans le rapport suivant, nous présenterons une technique simplifiée pour le traitement d'un patient avec une canine incluse dans le maxillaire, exactement à l'endroit de placement d'implants dentaires. La chirurgie pour le placement des implants a été virtuellement planifiée, et un guide chirurgicale CAO/FAO utilisé pour exécuter avec succès cette chirurgie guidée. Une revue de la littérature démontrera également, comment la précision de la technologie a fait ses preuves, et qu'elle représente une méthode exacte pour des placements précis d'implants dentaires.

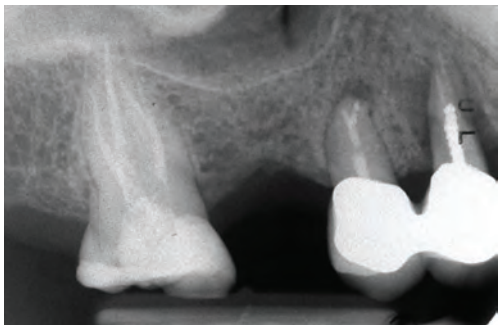

Figure 1: Pre-op periapical x-ray demonstrating presence of periapical pathology

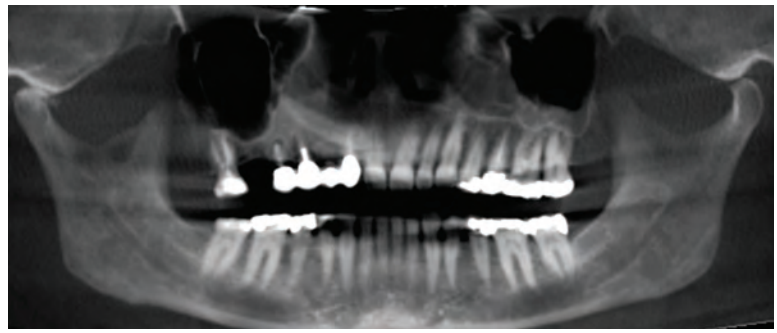

Figure 2: Pre-op panorex demonstrating the failing endodontic treatments on teeth 15 and 14 and the presence of an impacted tooth 13.

panorex, tooth 13 is impacted and has been replaced in the arch using the before mentioned fixed bridge in quadrant 1 (Figure 2).

Clinical & Radiographic evaluation

At time of presentation, the patient had recently completed a 1-week course of antibiotics for treatment of an odontogenic infection originating from teeth 15-14 (see periapical radiograph demonstrating periapical pathology).

Following the gathering of this information, a discussion took place regarding the different treatment options that we could consider for this patient. Our patient's main expectation was to be able to have a new fixed restoration on implants, as she did not wish to have a removable solution.

The specific challenges of this situation were outlined in a problem list as follows:

- Unsalvageable fixed bridge with planned loss of abutment teeth;
- Suspected root fractures of teeth 15 and 14;
- Poor margin adaptation and limited tooth substance at site 12 leading to eventual loss of tooth 12;
- Remote absence of tooth 16 with mild sinus pneumatization;
- Impacted canine 13 in the right hemi-maxilla limiting vertical bone height for implant placement;
- Esthetic nature of the restoration addressing the anterior maxilla;

The prosthetic elements of her case were confirmed following a consultation with a prosthodontist. The main question that was complicating this situation was the presence of the impacted canine and the space that it was occupying at the ideal implant sites.

During our initial discussion, the patient expressed to us that she was very reluctant to undergo the removal of this impacted tooth as it represented a fairly involved intervention. Potential complications of the removal of this fully bony impacted tooth were discussed, specifically the possible ankylosis of the tooth leading to a fairly aggressive bone removal at time of the extraction and the subsequent need for a bone graft to allow predictable healing of the osseous defect.

The patient preference was to try to determine if another option could be considered where tooth 13 wouldn't need to be removed but that the option of implant placement would remain possible.

In order to establish the exact location of tooth 13 versus the rest of the alveolus and to determine the amount of bone available for implant placement, the decision was taken to undergo a CBCT of the patient's maxilla. This examination lead to the following findings:

- Confirmation of the presence of periapical pathology at sites 15 and 14;
- Confirmation of the presence of tooth 13 with a palatal position to the alveolus and coursing posteriorly and superiorly within the maxilla;
- Confirmation of the absence of pathology surrounding tooth 13;
- At future implant site 13: a minimum distance of 6 mm from the crest of the alveolus to the most coronal aspect of the crown of the impacted tooth 13;
- A 7 mm height of alveolar bone at the site of previously removed tooth 16;

At future implant site 12: a minimum distance of 3 mm from the crest of the alveolus to the most coronal aspect of the crown of tooth 13 precluding implant placement at site 12 if the impacted tooth was not to be removed (Figure 3).

Treatment planning phase

Based on those findings the proposed treatment plan to the patient was as follows:

- Fabrication of an immediate removable partial prosthesis for the replacement of teeth 12-X-14-15;
- Under intravenous sedation, surgical removal of teeth 12, 14 and 15 with simultaneous alveolar bone ridge preservation bone grafting;
- Following a 6 months osseous healing phase, insertion of 4 implants at sites 16-15-14-13-X for the fabrication of a fixed implant supported bridge with a mesial cantilever tooth;

Due to the complex implant positioning caused by the very limited amount of height available and too minimize as much as possible the risks of encroachment with the impacted tooth during the placement of the implants, the decision was taken to undergo a 3D virtual implant planning to allow for the fabrication of a CAD-CAD surgical guide for the use of static implant guided surgery.

The patient was in agreement with the proposed plan and informed consent was obtained from the patient prior to the start of the treatment.

In terms of the planned implant dimensions, a study of the 3D imaging demonstrates a lack of height in the anterior maxilla due to the presence of the crown of the impacted canine. Based on this data, the planned dimensions were as follows (AstraTech Dental, OsseoSpeed Tx implants):

- Site 13: 4.0S X 6 mm
- Site 14: 3.5S X 8 mm
- Site 15: 4.0S X 9 mm
- Site 16: 4.0S X 8 mm

Surgical Treatment phase

The initial surgical intervention for the extraction of teeth 12, 14 and 15 with simultaneous bone grafting was uneventful and carried through as planned. The procedure was well tolerated by the patient. Xenografts were used to augment the sockets of the removed teeth and the previously prepared partial was delivered to the patient.

After 6 months of healing, a new CBCT of the patient's maxilla was taken. Using a virtual treatment planning software (Simplant, Materialise, Dentstply®), a virtual wax up of the planned restoration was designed in collaboration with the treating prosthodontist (Dr Laurent Franco, Montreal, Quebec). Masking of the relevant anatomical structure, specifically of the impacted canine was performed as well to better visualize spatially the location of the implants in regards to the impacted tooth. (Figure 4).

Ideal implant positioning was then planned on the software (Simplant, Materialise Dental, Dentsply) based on the placement of 4 implants at sites 16, 15, 14 and 13. Care was taken to

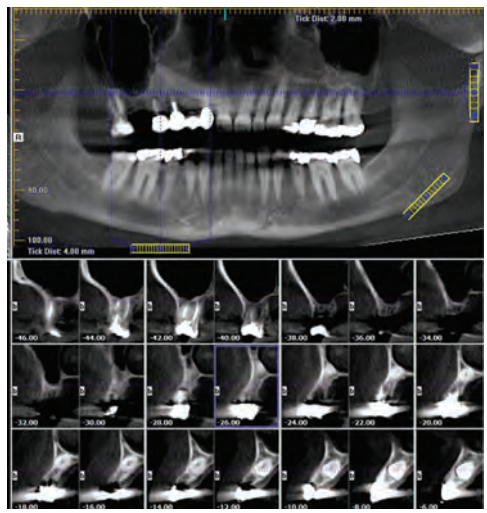

Figure 3: Cross-sectional images of the pre-operative CBCT.

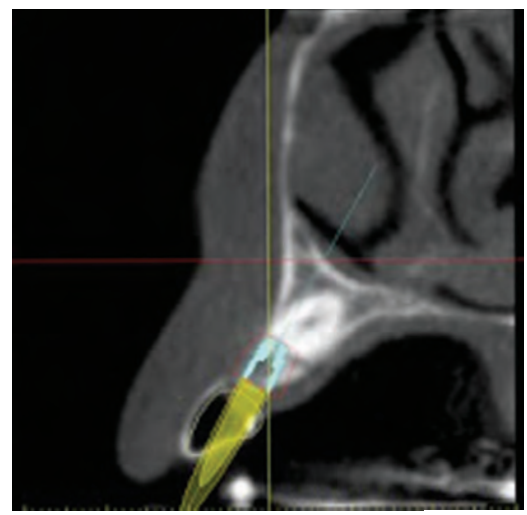

Figure 4: Cross sectional virtual planning image demonstrating the relationship between apical aspects of implant 13 and 14 to the crown of the impacted canine.


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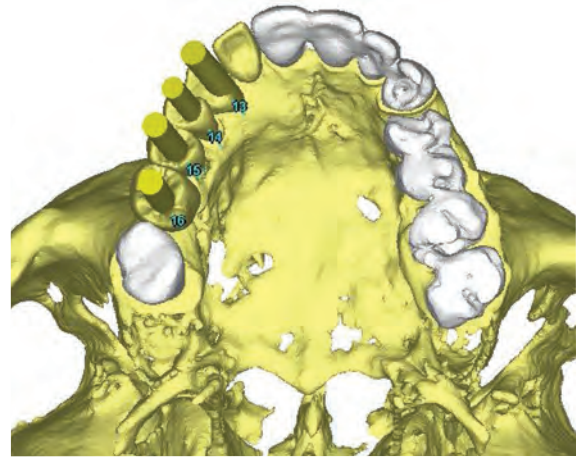
obtain the most ideal implant locations based on the predicted prosthetic design (Figure 5 & 6).

Once final implant positioning was obtained, a CAD-CAM surgical guide was ordered for the use of fully guided implant surgery using the Facilitate (AstraTech, Dentsply ®) system (Figures 7 & 8).

A tooth-supported guide was ordered with occlusal access holes allowing for full axial and depth control during implant preparation.

Once received, the surgical guide was tried in the patient's mouth to confirm adequate fit. Indeed a very stable guide was confirmed and the decision was taken to carry the surgical intervention as planed.

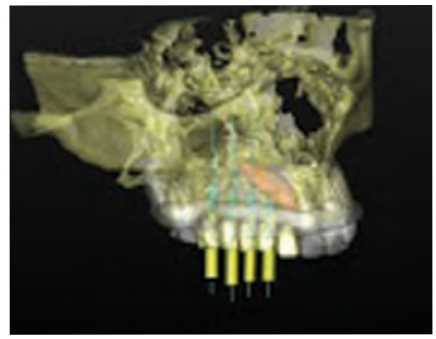


Figures 5 and 6: Virtual planning simulation with 3D masking of the impacted canine and the planned implants

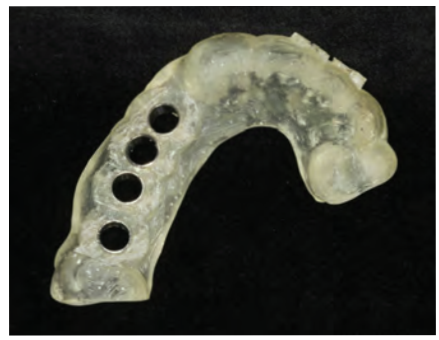
Under intravenous sedation and local anesthetic, surgical implant placement was carried through the routine fashion using the Facilitate osteotomy protocol for guide surgery. Simultaneous indirect sinus elevation bone graft (xenograft) was performed at site 16 to allow for the desired implant length preparation. The 4 implants were inserted as planned and all of them demonstrated excellent primary stability. No additional bone graft was required and no complications were encountered. The patient tolerated the procedure well and had an uneventful recovery phase.

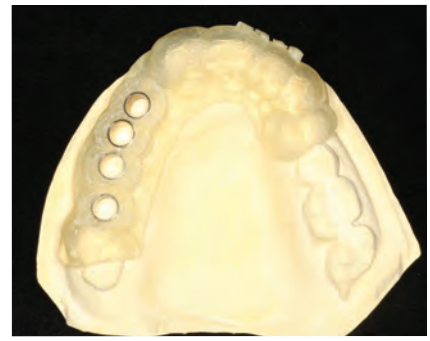
The final implant dimensions used at time of surgery were identical to the ones previously chosen during the planning phase:

- Site 13: 4.0S X 6 mm
- Site 14: 3.5S X 8 mm
- Site 15: 4.0S X 9 mm
- Site 16: 4.0S X 8 mm



Figures 7 and 8: Virtual preview of the CAD CAM surgical guide for online ordering





Figures 9A and B: CAD-CAM Surgical guide for the use of implant guided surgery

All implants received healing abutments (Uni 3.5/4.0 X 2 mm height) for one-stage closure around the implants. Furthermore, the previously fabricated partial prosthesis was adjusted and inserted immediately.

At 3 months, the implants demonstrated complete integration both from a clinical and radiogrpaphic perspective. The patient was then referred back to the prosthodontist for the restorative phase.

The restorative phase was carried expertly by Dr Laurent Franco, DMD, FRCD(c). An open tray impression was used in this case and the transfers did not need to be splinted. In establishing the occlusion pattern, a group function occlusion in excursive movements was established to evenly spread the forces across all of the implants. Finally, in terms of the static point of occlusion, it was established on the PFM crown on the natural tooth 17 and the contact on this tooth was adjusted so that the contralateral contacts on teeth 26 and 27 were even and well distributed.

A screw retained fixed bridge was delivered without complications and the patient was very satisfied with the final outcome. At 9 months follow up demonstrated excellent stability (Figure 9A & 9B).

Post-operative plain radiographs seem to demonstrate an intimate relationship of the most anterior implant to the impacted canine tooth but no clear evidence of actual contact of the

tooth. A CBCT could be taken to confirm this statement but considering the excellent stability of the implants and the lack of any symptoms from the patient's perspective, the decision was taken that the exposure to greater amounts of radiation wouldn't be justified at this point (Figure 10).

This case report demonstrates how the use of 3D imaging allows clinicians to be able to simulate in the virtual planning world treatment alternatives that would otherwise be overlooked with the use of conventional imaging and treatment planning modalities. Furthermore, the use of this technology transferred to the actual clinical care of our patients allows clinicians to achieve excellence with minimally invasive surgical procedures due to the very precision afforded by computer guided surgery (Figures 11 — 17B).

Discussion

As demonstrated in this case report, clinicians involved in the surgical placement of implants can safely and predictably perform complex interventions with the advent of computer assisted guided surgery. It affords a greater level of precision and safety compared to conventional guidance methods classically used in implant dentistry.

In this section, we will undertake a review of the evidence and knowledge that support the use of this technology.

Computer guided surgery is defined as the use of a static surgical template that reproduces virtual implant position directly from a computerized tomographic data and does not allow for intraoperative modification of implant position1.

Multitudes of indications have been reported in the literature. Based on our current clinical experience, we have established a list of clinical indications in where we feel that computer assisted implant surgery is indicated:

- Implant placement in close proximity to vital anatomical structures;
- Implant placement is critical to the success of the restoration;
- 3 or more implants side by side (to ensure parallelism)
- Multiple implants for a fixed complete prosthesis of the maxilla or mandible;
- Limited inter-radicular space for implant placement;

Clinicians that wish to adopt this technology will invariably ask themselves the same initial question, is this guidance method precise or as precise as claimed? We turn to the literature on this topic to find the evidence supporting the use of computer assisted implant placement.

In a landmark publication from the Proceedings of the Fourth ITI Consensus Conference, Jung et al.1 presented a systematic review of computer guided surgery. The goal of this review was to determine the level of accuracy afforded by this type of technology. The results demonstrate an accuracy of 0.74 mm at the entry point with 0.85 mm of accuracy at the apical portion. Other findings have also been reported. The overall implant failure rate for implants placed guided surgery was on average 3.36% at 12 months and intra-operative complications had a mean occurrence of 4.6%.

Another interesting study is the one published by Nickening et al.3 that compared the difference of accuracy of implants placed with computer guided surgery vs. free-hand implant insertion. The authors reported an average of 0.9 mm deviation coronally and 0.6-0.9 mm deviation apically in the guided surgery group compared to 2.4-3.5 mm coronal and 2.0- 2.5 mm apical deviations in the free hand group.

One of the most critical article in understanding the potential sources of errors in computer guided surgery is the article by Valente et al4. that discusses the different moments in both the planning and execution phase of computer assisted implant surgery. They list five main causes or factors of errors in accuracy:

1- Errors during image acquisition and data processing can have up to 0.5 mm of inaccuracy;

Figure 10: Immediate post implant placement panorex demonstrating desired implant positioning obtained with the use of CAD-CAM guided surgery

Figure 11: Multi-unit abutment in place before impression.

Figure 12: Prototype try-in for assessment of smile

Figure 13: Final restoration

Figure 14: CAD-CAM reproduction of prototype

Figure 15: Final restoration

Figure 16: Final restoration in place

2- Error during template production (CAD-CAM with stereolitography) varies between 0.1 to 0.2 mm;
3- Error during template positioning and movement of template during osteotomy preparation;
4- Mechanical error: bur-cylinder gap is 0.2 mm (to allow friction free rotation of the implant drill within the guidance cylinder).
   Depending on the length of the guiding cylinder this factor alone can cause up to 5 mm of deviation of implant position;
5- Human error;

General accepted consensus in current up to date literature in the field of computer assisted implant placement tend to demonstrate that when properly used, this technology affords a great deal of accuracy at time of implant surgery. It allows clinicians to confidently place implants closer to vital anatomical structures due to the depth control given by guided surgery instrumentations and improves on the overall precision of implants placement rendering the prosthetic phase simpler and more predictable.

Conclusion

In conclusion, we have discussed the use of both computer assisted implant planning and the clinical application of computer-guided surgery. This case report demonstrates how the correct use of this tool allows experienced clinicians to propose and carry minimally invasive complex implant surgery in a safe and predictable fashion with minimizing risks of complications and improved outcomes for our patients.

About the author

Dr. Shenouda *received his DMD from U de Montréal in 2004 followed by a multidisciplinary residency. He continued with his graduate training in Oral and Maxillofacial Surgery at McGill U, graduating in 2009. As well as his private practice, Dr. Shenouda is Associate Director of the Oral and Maxillofacial Surgery department at the McGill U Health Centre. He is also assistant Professor in hisspecialty at the Faculty and has an active role in clinical teaching, as well as administrative responsibilities in the graduate Oral Surgery training program.*
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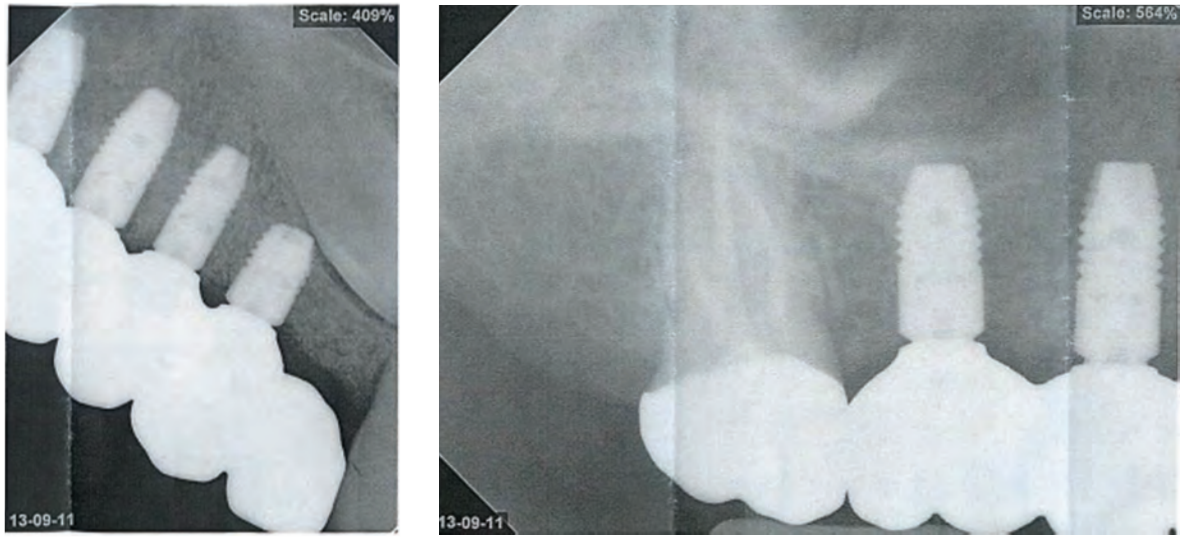

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A New Paradigm For Creating Durable Occlusal Precision With Indirect Bondable Ceramic

Un nouveau paradigme pour créer une occlusion durable et précise, avec une technique indirecte pour céramique mordancée.

Dr. Dennis P.A. Nimchuk, DDS, FRCD(C), FCDS(BC)

Abstract

The current development of high composition Lithium Disilicate ceramic for dental use has enabled clinical dentists to utilize complete or partial crowns that fulfill the restorative requirements of: accurate marginal fit, high fracture toughness, low abrasion, low thermal conductivity, high esthetics, adhesive luting, and when used in the press form utilizing lost-wax technique, also, occlusal precision. For the restorative Dentist who has relied on a gold occlusion for occlusal accuracy, e.max press is an alternative that provides significant additional benefits. At this time longer clinical performance evaluations are required to validate this material and to provide evidence for success in extended in vivo service.

Introduction

When diagnosed and executed properly, the clinical service of a well-prepared, well-constructed, and well-finished cast gold restoration can and has historically exceeded the precision and longevity of all other tooth-colored materials, direct or indirect, composite or ceramic.1-5

Notwithstanding, since the Weinstein patent of 1959 6, porcelain fused to metal has become the preferred choice for complete crown restorations principally because of the ability of porcelain to mimic the esthetic appearance of dental enamel. PFM's have reliably served the dental profession for over half a century providing restorations that for the most part are strong and esthetic. However, the PFM systems have never been able to achieve the occlusal precision or the service integrity that cast gold has provided.

Other high strength cores, made from ceramic instead of metal have also been available for considerable time. Core materials such as aluminum oxide and stabilized zirconia while very fracture resistant and more esthetic than metal, have not been esthetic enough on their own to be an acceptable substitute to metal or metal based ceramics. They have however allowed for a hybrid layering of more esthetic ceramic veneers. Unfortunately, like PFM systems, these layered hybrids have also not been able to achieve the occlusal precision or the service integrity that cast gold has provided and have been prone to ceramic fracture and chipping.

Presently, however, ceramic systems created of pressed or CAD lithium disilicate, (IPS e.max), have evolved to deliver all of the desired elements for an optimum restoration: precision, strength, retention, esthetics, comfort and abrasion compatibility. These newer, bondable monolithic restorations seem to be able to rival and even surpass the qualities of cast gold when used as a single unit of restoration.

About Lithium Disilicate

In dentistry glass ceramics are defined according to their major crystalline structure and/or application. Lithium disilicate is among the best known and most widely used among all the types of glass ceramics. The composition of IPS e. max lithium disilicate, includes quartz, lithium dioxide, phosphor oxide, alumina, potassium oxide, and

Résumé

Le développement actuel de céramique composée principalement de Disilicate de Lithium en art dentaire, a permis aux dentistes d'obtenir des couronnes complètes ou partielles qui respectent les exigences restauratrices suivantes: ajustement précis à l'épaulement, haute résistance à la fracture, peu d'usure, minimum de conductivité thermale, excellentes esthétiques, bonne adhésion du ciment, et lorsque fabriquées avec la technique de la cire perdue et de presse, également parfaite occlusion. Pour le dentiste en restauration, qui a toujours compté sur une occlusion en or, pour une occlusion précise, la presse e.max est une alternative qui apporte des bénéfices additionnels considérables. À cet effet, des évaluations de performance cliniques seront nécessaires pour valider ce matériau, et pour apporter une évidence de succès dans un service in vivo prolongé.

traces of additional other components 7. This composition, where lithium disilicate is incorporated at around the 70 percentile, is capable of producing a highly thermal shock resistant glass ceramic due to the low and even thermal expansion that results when it is processed. The material on completion becomes very resistant to developing micro-cracks or fracture during cooling and from post-production stresses placed on it and when making grinding adjustments or aggressive heat induced polishing. At in vivo function and in parafunction it is also extremely fracture resistant (Fig. 1).

Restorations made from this type of glass ceramic can be processed utilizing familiar, lost-wax, hot pressing techniques or by utilizing contemporary, state-of-the-art, CAD/CAD milling procedures 8. Because it is not a powder liquid build-up technique there is not the extensive condensing shrinkage of the material during the three or more furnace firing phases. which in aggregate can amount to 25 percent of the original stacked volume 9 – 10 - 11

About Porcelain Fused to Metal

The prevalence of ceramic fractures in the dental industry is a serious and costly problem. Moreover, ceramic fractures pose an aesthetic and functional dilemma both for the patient and the dentist because intraoral repairs for the most part are inadequate. Clinical reports indicate the prevalence of ceramic fractures is between 5 and 10% over a10 year period of use 12. The reasons for structural failure are myriad but always will settle on the inability of the layered ceramic to withstand stresses particularly due to the presence of microcracks and porosities, plus a hydrolytic effect from the wet intraoral environment 13 – 14 - 15

Mechanical failures of metal–ceramic systems are not surprising considering the large differences in modulus between the metal and ceramic materials. When conventional types of dental porcelain are cooled, the leucite crystals contract more than the surrounding glass matrix leading to the development of tangential compressive stresses around the leucite particles as well as to microcracks within and around the crystals 16 – 17 – 18

Wherever a ceramic veneer layer is proportionally offset from the supporting metal substructure or where the forces on the ceramic are disproportionate the processing flaws in the ceramic layer are especially more subject to multifactorial crack propagation 19 - 20 (Fig. 2).

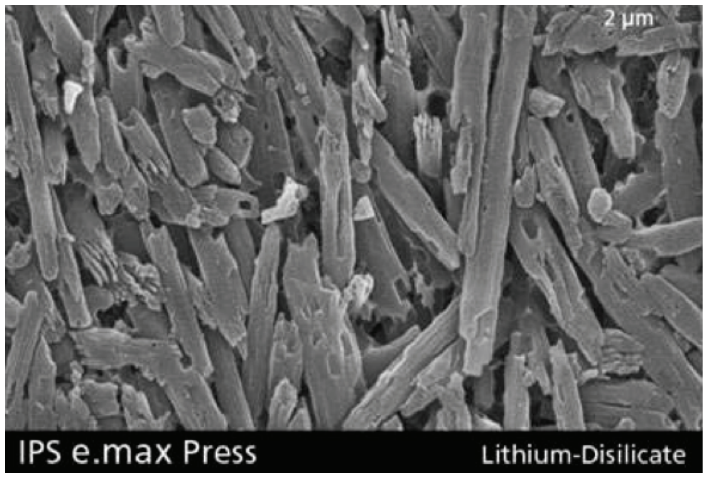

Fig. 1: Lithium Disilicate Structure

Fig. 2: Unsupported Ceramic Fracture

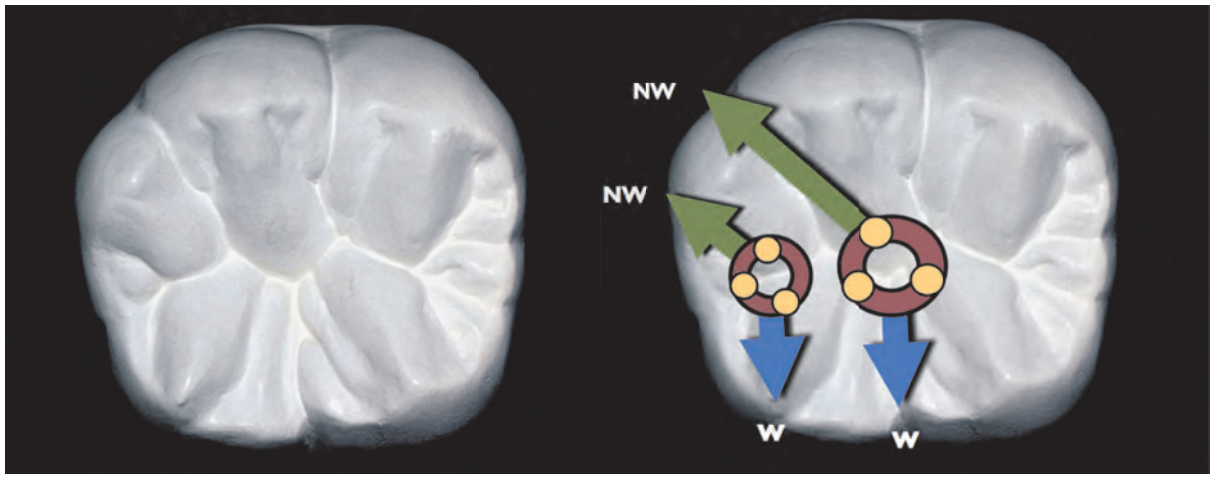

Fig. 3: Cuspal Tripodized Contacts and Egress Pathways

The Requirement for Occlusal Precision

The restoration of a single crown should replicate a biologic balance that is favorable and acceptable to all oral tissues and occlusally it should restore function without inducing any disruptive symptom of mandibular dysfunction 21. Even a single restoration requires a complex organization of cusps, cusp inclines, marginal ridges, occlusal grooves and cusp tip contours. The organization of the occlusion when many or most teeth require working together functionally and in synergy with jaw closure and excursive gliding jaw positions, represents a requirement to have a combination of advanced educational comprehension as well as the ability to perform high levels of clinical and technical skill execution 22 – 23 – 24 – 25 - 26. Most important in creating occlusal harmony is the ability to create dependable indirect occlusal patterns in the restorations in the laboratory that will not warp, shrink or become altered during processing. This is the disadvantage of condensation created porcelains that have high volumetric shrinkage. Even during the final glaze firing if the furnace temperatures are held too high or too long feldspathic composed porcelain surfaces may slump, creating significant inaccuracies of the occlusal contacts 9- 11- 25 .

The Biomechanical Basis of Occlusion

A refined and defined occlusal reconstructive concept will incorporate a number of key elements to develop a biomechanical occlusion. There will need to be a multiplicity of bilateral, uniform ccclusal cuspal and marginal ridge contacts; appropriately developed cusp heights; properly oriented ridges and grooves and a protrusive and latero-protrusive scheme that provides for a disclusion of the posterior teeth during jaw movements.

Practitioners who restore dentitions with a uniform, stable platform of multiplicity of contact points in the posterior dentition and who can then simultaneously organize egress pathways for opposing cusps in excursive jaw movements governed by defining a suitable degree of overbite and overjet will be able to achieve high degrees of biological acceptance that can be expected to significantly resist the deliterious effects of functional and parafunctional events 26 – 27 - 28 (Fig. 3).

In order to achieve these objectives, restorative material selection becomes quite important. Gold restorations have historically been able to perform these requirements best. Other hybrid material systems have not been as successful as gold, including PFM's and layered zirconia. Currently, pressed or CAD created Lithium disilcate restorations seem to be able to replicate what gold restorative materials have done so well, i.e. make a transference of laboratory end result precision to cemented intraoral occlusal precision 33.

Clinically Relevant Properties of IPS e.max

IPS e.max has had well over ten years of development and testing, showing outstanding bench studies as well as successful sample clinical results. Presently however, there are very few extended clinical trial reports as the e.max product has only in the past several years penetrated into widespread usage by the dental profession. Early clinical trial reports that have been published are very promising particularly when compared to precursor lithium dislicate systems 29 – 31 – 32 - 33

The following characteristics of IPS e.max which have been evaluated are:

Monolithic lithium disilicate restorations have been shown to outperform veneered Y-TZP principally due to the weak fatigue resistance of the veneering ceramic 34. When e.max is pressed to zirconia substrate it also performs better than traditional powder-liquid veneering. Monolithic e.max also performs better than powder-liquid veneering of an e.max substrate (Figs. 4 -7).

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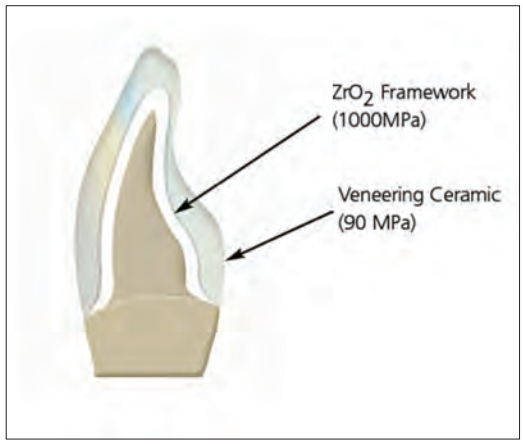


Fig. 4: Veneering Ceramic on Zirconia Substructure From Ivoclar

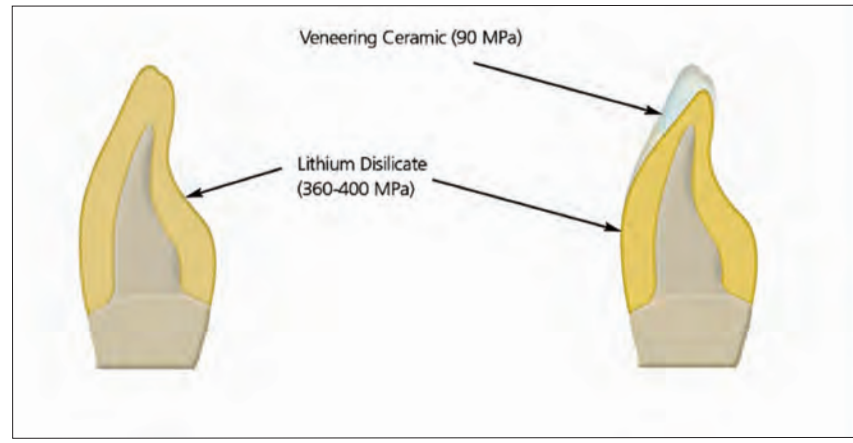


Fig 5: Monolithic and Veneered Lithium Disilicate Fracture Toughness Values From Ivoclar

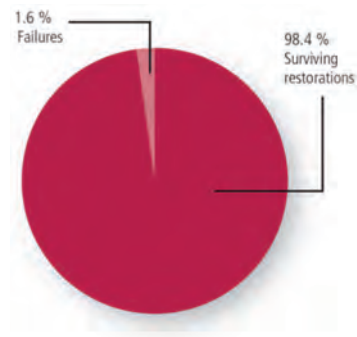


Fig. 6: Monolithic Pressed Lithium Disilicate Survival Values From Ivoclar

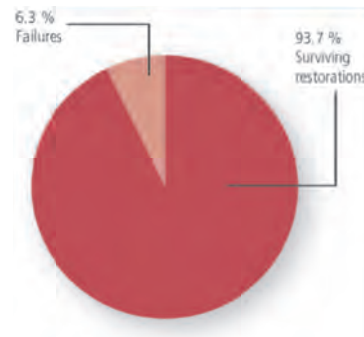


Fig. 7: Veneered Lithium Disilicate Survival Values From Ivoclar

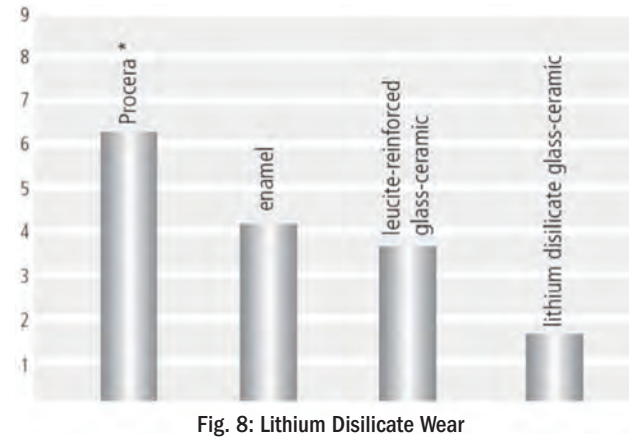


Fig. 8: Lithium Disilicate Wear

Monolithic lithium disilicate restorations have been shown to have excellent in-vivo wear against antagonist ceramic and natural enamel crowns 35 – 36 classifying it as a low abrasion material (Fig. 8)

Monolithic lithium disilicate restorations have been shown to have excellent luting longevity with conventional cementation but particularly by being able to use adhesive bonding. This is particularly important where there is a reduced macrogeometry of prepared tooth structure 37 – 38- 39.

Monolithic lithium disilicate restorations have been shown to have precision marginal fit and when pressed, exhibit precise wax pattern replication 40 – 41 – 42 – 43 – 44 - 45. This feature makes it desirable for developing occlusal accuracy, even for the tripoding of cuspal contacts (Fig. 9).

At 400 megapascals of fracture toughness, pressed lithium disilicate is resistant enough to be used on the occlusal loading surfaces of even second molars and should, for the most part, be able to withstand the effects of nocturnal bruxism without fracturing 46 (Fig. 10).

Conclusion

After half a century of evolution of dental ceramics there exists in the monolithic lithium disilicate version of e.max a restorative material that is esthetic, produces low antagonistic abrasion, exhibits low thermal conductivity, can be adhesively bonded to tooth substrate, has excellent fracture resistance and has high marginal and occlusal accuracy. This material fulfills many of

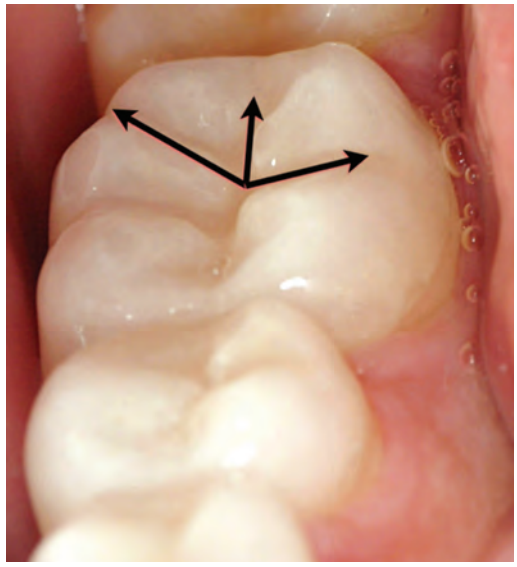


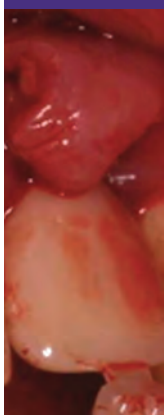
Fig. 9: Precision Excursive Grooves

Fig. 10: ¾ Gold Crown & e.max all Ceramic Complete Crown in a Bruxer

the most desired elements of a contemporary restorative material that can be applied to single units as well as to complete oral rehabilitation cases. Lithium disilicate restorations at this juncture seem to have advantages over time-tested gold as a restorative material 33. However, longer clinical trial terms and reporting are necessary to validate the current early trial results.

About the author

Dr. Nimchuk *is a Prosthodontist, an author and teaching clinician and has given over seven hundred presentations around the world. He has been an honorary sessional lecturer for the Faculty of Dentistry at UBC for over fifteen years. Dr. Nimchuk holds many titles and Fellows, including a position as Associate Editor of the Canadian Journal of Restorative Dentistry and Prosthodontics. Fellow and Honorary Member of CARDP - drn@dentalreconstructions.com*



Modified Roll Palatal Flap Technique in Aesthetic Zone. Stability of Results After 5 years

Dr. Marcello Guglielmi, DDS
Dr. K. M. Chochlidakis, DDS,
Dr. Carlo Ercoli, DDS,
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Technique d'un lambeau palatin roulé en zone esthétique. Résultats stables 5 ans plus tard.

Abstract

Purpose: This clinical report presents the 5-year follow-up of 2 implant-supported crowns where the soft tissue volume was optimized using the palatal roll technique.

Patient and Methods: A case of oligodontia with several congenitally missing teeth is presented. Implant therapy using a modification of Abrams's roll technique was used to correct the localized horizontal alveolar ridge deficiency on the maxillary lateral incisor areas. Polycarbonate crowns were relined with acrylic resin and anatomically shaped to provisionalize the implants and create natural emergence profile.

Results: By using this technique, it was possible to maintain an adequate band of keratinized mucosa and to augment the thickness of the soft tissue on the buccal aspect of the implant-supported restorations, without compromising the papilla height.

Conclusion: This clinical report indicates that after 5 years of follow up, the modification of Abrams's roll technique in localized ridge atrophy shows great stability and reliability.

INTRODUCTION

Numerous studies have been published regarding the surgical and prosthetic considerations of implant-supported restorations in the esthetic zone.[1-5] It has been shown that anterior maxillary implants have similar survival and success rates to implants placed in other areas of the mouth.6 However, the achievement of ideal esthetics for implant-supported crowns placed in the esthetic zone remains a challenge. The clinical and technical challenges to achieve a successful outcome can be further compounded by the patient's esthetic expectations and anatomical factors such as, smile line and inadequate soft and hard tissue contours. In 1983, Siebert[7] classified alveolar ridge defects into three general categories; Class I (buccolingual tissue loss with normal ridge height), Class II (apico-coronal tissue loss with normal ridge width) and Class III (combination of apico-coronal and buccolingual tissue loss). Although no universally accepted system is present in dentistry to classify the difficulty level involved in the treatment of a specific implant case, the SAC classification (Straightforward, Advanced and Complex treatment) has been proposed as one of the possible systems to identify the level of treatment complexity.[8]

Moreover, in order to achieve an esthetic result, not only the crown shade has to match the adjacent dentition, but also the colour and contour of the soft tissues are critical to achieve a successful result. In 2005, Fürhauser[9] proposed the pink esthetic score index (PES) focusing on the soft tissue around anterior implant restorations. The PES index was consequently modified in 2009 by Belser[10] and was combined with the White Esthetic Score index (WES) forming the new esthetic score index; PES/WES.

The PES index comprises the following 5 variables: mesial papilla, distal papilla, curvature of the facial mucosa, level of the facial mucosa, and root convexity/soft tissue colour and texture at the facial aspect of the implant site.[9] The WES specifically focuses on the visible part of the implant restoration itself and is based on the 5 following parameters: general tooth form, outline and volume of the clinical crown, colour (hue and

Résumé

But : Ce rapport clinique présente un suivi de 2 couronnes sur implants avec augmentation du tissu de la gencive en utilisant la technique d'un lambeau palatin roulé, 5 ans plus tard.

Patient et méthodes : Présentation d'un cas d'oligodontie avec plusieurs dents manquantes de fait congénital. Une thérapie d'implant en se servant d'une modification de la technique enroulée d'Abram pour corriger localement la crête alvéolaire horizontale, défectueuse dans la région des incisives latérales, au maxillaire. Des couronnes de polycarbonate ont été regarnies de résine et formées anatomiquement pour servir de provisoire aux implants, et créer un profil d'émergence naturel.

Résultats : En utilisant cette technique, il fut possible de maintenir une bande de muqueuse kératinisée et d'augmenter l'épaisseur du tissu mou de l'aspect buccal des restaurations sur implants, sans compromettre la hauteur de la papille incisive.

Conclusion : Ce rapport clinique indique, 5 ans plus tard, en se servant de la technique enroulée d'Abram dans une région de crête atrophiée, d'excellents résultats de stabilité et de solidité.

value), surface texture and translucency and characterization.10 A score 2, 1 or 0 is assigned to all five parameters of each index thus the highest possible combined score can be 20 which represents the most pleasant esthetic result.[10]

Not only the presence of anatomically adequate keratinized tissue[11] is important for an adequate esthetic result[12-13], but it might also be important for the long-term success of treatment especially in partially edentulous patients. Indeed, while it has been shown that the presence of keratinized tissue around dental implants does not influence the implant survival rate[14] , it has also shown that the presence of keratinized tissue around dental implants may provide better peri-implant stability[15-16] and plaque control.

As a result of the need for adequate keratinized tissue around dental implants, several techniques have been used to create and/or augment soft tissues. Bianchi & Sanfilippo reported on bone levels, keratinized tissue width and patient satisfaction of immediate implant placement with or without free connective tissue graft (FCTG) for single-tooth replacement.[17] While the survival rate was 100% for both groups, better outcomes were found for the implants that received a FCTC at implant placement when compared with controls.

In another study, Burkhardt evaluated the soft tissue coverage outcome at implant sites affected by recession using a coronally positioned flap (CPF) in combination with a FCTG.[18] The implant sites revealed a clinically significant improvement following CPF in combination with FCTG, but in none of the sites was complete coverage achieved.

Despite a large number of publications related to soft tissue management around dental implants, there is a lack of information and a strong need to critically assess the dental literature for optimized procedures and grafts in terms of soft tissue augmentation.[19] A systematic review evaluating soft-tissue augmentation techniques around implants, teeth and partially edentulous ridges, concluded that there is no evidence regarding the superiority of a particular soft tissue augmentation procedure and that no ideal grafting material is currently available.[19] Another systematic review reached the same conclusions related to the influence of flap design.[20] Although high level evidence is lacking in this area, there is a consistent theme prevailing in the literature that clinicians should attempt to achieve an adequate volume of keratinized tissue around dental implants. [19-20]

While several techniques are available, the palatal roll technique, originally suggested by Abrams [21] is relatively simple and can be easily incorporated in implant placement to correct limited-to-moderate class I defects.[7] According to this method, a de-epithelialized palatal flap is dissected and the pedicle displaced toward the buccal aspect of the implant site. The connective tissue pedicle is then rolled and eventually sutured inside the buccal flap to increase the horizontal dimension of the soft tissues. While several case studies using this technique have been reported in the literature, none of these reports in the literature has a follow-up period of more than 2 years. [22-24] Therefore, the purpose of this clinical report is to present the 5-year follow-up of 2 implant supported crowns where the soft tissue volume was optimized using the palatal roll technique.

CLINICAL REPORT

A 22 year old Caucasian male presented with a chief complain of "I want to replace my missing teeth with dental implants". His medical, surgical and social history was non-contributory. During clinical examination, a maxillary removable partial denture was replacing the congenitally missing lateral incisors and teeth # 24, #25 (Figs. 1,2,3). Radiographic examination revealed the congenitally missing lateral incisors #12, #22 as well as teeth #15, #24, #25, #35 and #45 (Figs. 4,5).

A diagnostic wax-up was performed in order to evaluate the space between the laterals and the central incisors and the

Figure 1. Full facial view showing the congenitally missing teeth #12 and #22

Figure 2. Maxillary occlusal view showing the congenitally missing lateral incisors and teeth #24, #25

Figure 3. Maxillary removable partial denture replacing congenitally missing lateral incisors and teeth #24,25

Figure 4. Mandibular occlusal view showing primary tooth #85 and the congenitally missing tooth #35

relationship of the planned restoration with the soft tissues. Based on the diagnostic wax-up, it was evident that the mesio-distal space of the edentulous lateral incisor areas was insufficient for adequate implant placement and that orthodontic treatment was needed to correct the diastema between the maxillary central incisors.

After 4 weeks of orthodontic treatment, the diastema between teeth #11 and #21 was closed (Fig. 6) and the edentulous space between the teeth #11 and #13 as well as #21 and #23 measured 7.2mm and 7.7mm , respectively, therefore appearing adequate for implant placement.

Radiographical and surgical guide was then fabricated to guide implant placement and 2 implants (3.7 x10mm; Zimmer Dental, Carlsbad, Calif) were surgically placed in the sites of #12 and #22 .Additional implants were also placed in sites #12 (4.1 x 12mm ;Zimmer Dental) ,#13(4.1 x 10mm;Zimmer Dental)and #20(4.8 x 8mm;Institut Straumann AG, Basel, Switzerland).

After a healing period of 6 weeks, augmentation of the buccal site of #12 and #22 was planned, using the modified roll palatal flap technique.

Two diverging vertical full-thickness (FT) releasing incisions of 5 mm in length were performed on the buccal and palatal aspects of the implant site. The incisions were submarginal in design and located 2 mm away from the gingival margin, in order to preserve the papillae and the periodontal attachment of the adjacent teeth. They were then joined by an initial split-thickness incision along the crest of the ridge. This latter incision was used as a starting point for the reflection of the palatal epithelial pedicle (Fig. 7) and then turned, 8mm apical into a FT design. The FT flap was then reflected towards the buccal area until the end of the vertical releasing was reached (Figs. 8,9). The de-epithelialized part of the palatal flap was then rolled inside the flap basically located between the buccal plate and the buccal flap (Figs. 10, 11) and sutured with 5. 0 Vicryl suture in interrupted fashion.

Following the augmentation, provisional abutments were inserted and torqued according to manufacturer recommendations. Pre-formed polycarbonate crowns (Henry Schein; Melville, NY) were relined with acrylic resin and cemented with provisional implant cement (Premier Implant Cement; Plymouth Meeting, Pa)(Fig.12). Care was taken to remove all excess cement very thoroughly.[25-26]

Clinical and radiographic evaluation confirmed the complete seating of the abutments and restorations on implants #12, 22, 24, 25 and 35.

The patient was then seen at three weeks and uneventful healing was confirmed. Six weeks after implant uncovering and

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   b) connective tissue graft
   c) frenectomy
2. Hard-tissue grafting
   a) guided tissue regeneration (osseous defects around teeth)
   b) guided bone regeneration (for implant or pontic site development)

Day 3: ***Hands-On Surgery and Suturing***

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2. open flap debridement surgery, continuous sling sutures
3. crown-lengthening surgery, vertical external mattress sutures
4. ridge augmentation surgery/implant bone graft, split-thickness flap
5. free gingival grafting and associated suturing
6. connective tissue grafting and associated suturing

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soft tissue augmentation, the final impression was taken with medium body polyether impression material (Impregum; 3M ESPE AG, Seefeld, Germany) and definitive cement-retained metal-ceramic restorations were delivered. After two months, the patient was enrolled in a six-month maintenance and recall program. After five years of follow up, the stability and health of soft tissue around the teeth #12 and #22 were re-evaluated (Figs. 13, 14).

The PES/WES analyses were performed at the 5-year follow up by two experienced Prosthodontists. Clinical photographs of the implant crowns as well as the contralateral teeth were taken with a digital camera. Each implant site was scored together, following the order of the 10 PES/WES parameters. The mean total PES for the peri -implant soft tissues was 8. The three PES parameters mesial papilla, curvature of facial mucosa and level of facial mucosa attained the maximum value of 2. The distal papilla and the combination variable root convexity/soft tissue color and texture scored 1. These parameters were the most difficult to satisfy .For the WES, the mean total for the implant restorations was 9 with all parameters rated as excellent (2) except for the color (hue/value) which was rated with 1.

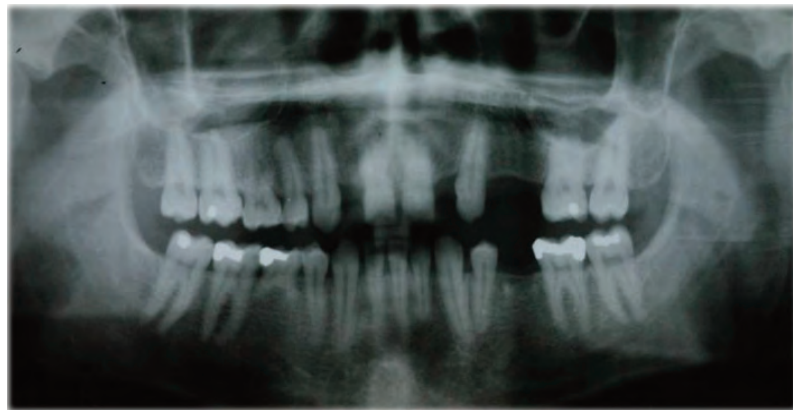


Figure 5. Preoperative panoramic radiograph showing the congenitally missing teeth

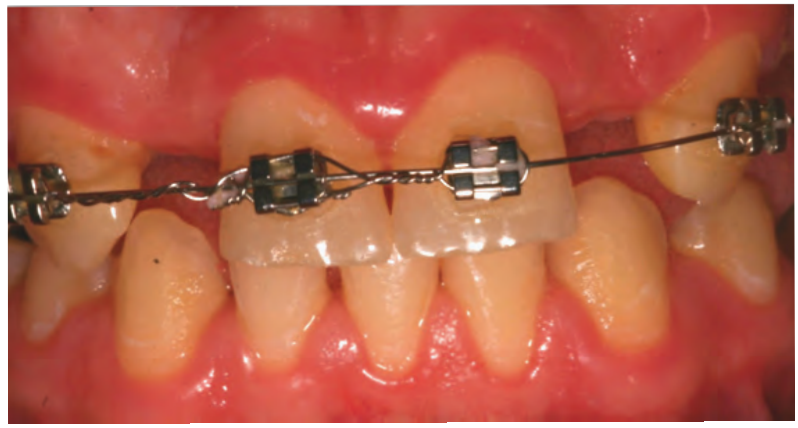


Figure 6. After four weeks of orthodontic treatment, the space between the central incisors has been closed.

DISCUSSION

Implant placement and rehabilitation in the esthetic area is challenging. In patients presenting congenitally missing teeth, deficiency of the hard tissue is a common finding and an adequate management of the soft tissue is crucial to achieve a pleasant aesthetic result. A novel index, named PES, has been recently introduced to evaluate the esthetic outcome of the soft tissue around implant-supported restorations.9 Among the variables being tested, are the level and the convexity of the facial marginal mucosa, which can be compromised in patients presenting a class I ridge deficiency (Figs.1, 2). In addition, due to anatomical factors, an adequate amount of keratinized mucosa might be missing. This can lead to a poor aesthetic outcome. Therefore, muco-gingival surgery around implant-supported restorations with lack of keratinized tissue or procedures aimed to preserve the existing keratinized peri-implant mucosa have been advocated.[14]

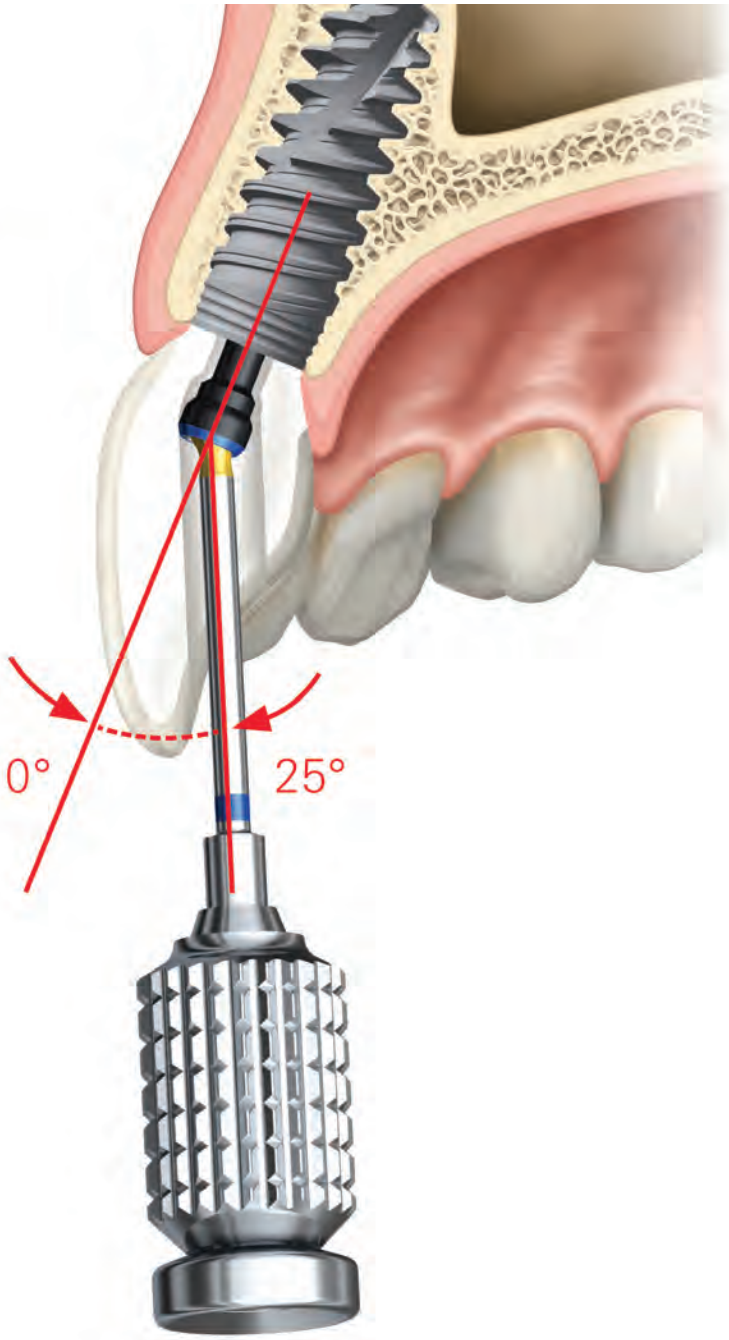
Several techniques can be applied to increase the thickness and the height of keratinized tissue around dental implants. Grafting procedures, such as FCTG with or without a CPF,[17-18] have been associated to positive outcomes, but they are relatively technique sensitive and require high-level surgical skills. In addition, grafting procedures are not without a biological cost, since they require a second surgical site for harvesting the graft, which is usually the palate at the level of the premolars and molars or the maxillary tuberosity.

The modified palatal roll technique[21] is a relatively simple minimally invasive technique that can be performed at the time of second-stage surgery without any additional grafting procedure in class I defects. Two sub-marginal divergent vertical releasing incisions are made. A palatal epithelial-connective tissue pedicle is reflected over the implant site and the connective tissue is exposed by means of two split-thickness incisions. Then the connective tissue is rolled under the buccal flap between the periosteum and the buccal bone and secured with suture. The interproximal papilla is preserved.

A case of oligodontia, including agenesis of both lateral incisors, was successfully treated with the placement of two implants at site #12 and #22, in conjunction with the modified palatal roll technique at the time of second-stage surgery. By using this technique, it was possible to maintain an adequate band of

Esthetics from a new angle.

Case courtesy of Dr. Juan Zufía and Sr. Santiago Dalmau



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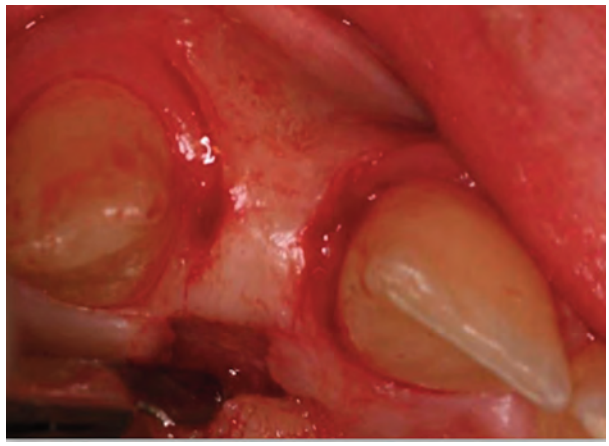

Figure 7. Two submarginal divergent vertical release incisions on the buccal side located 2mm away from the gingival margin

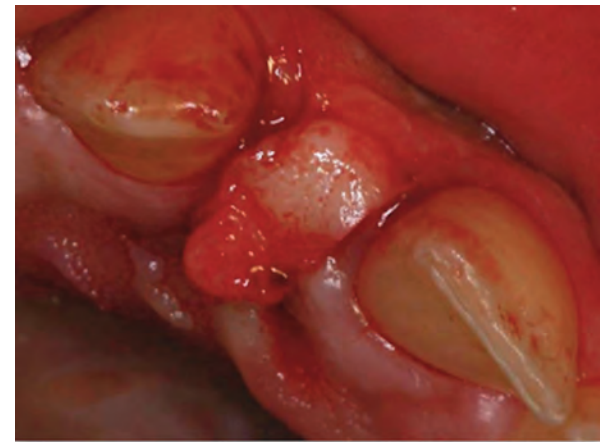

Figure 8. Two split-thickness incisions on the palatal side of the connective tissue

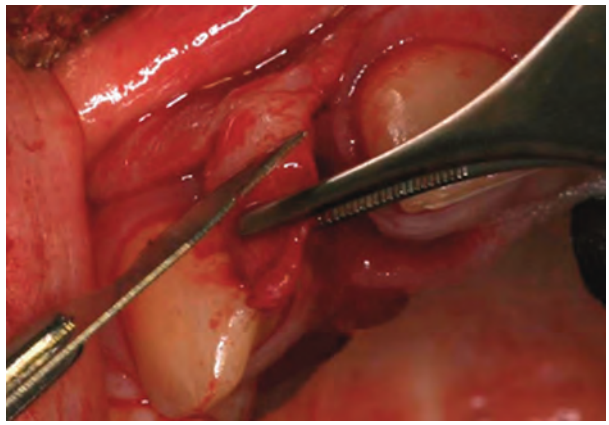

Figure 9. Further removal of epithelium tissue to expose more connective tissue

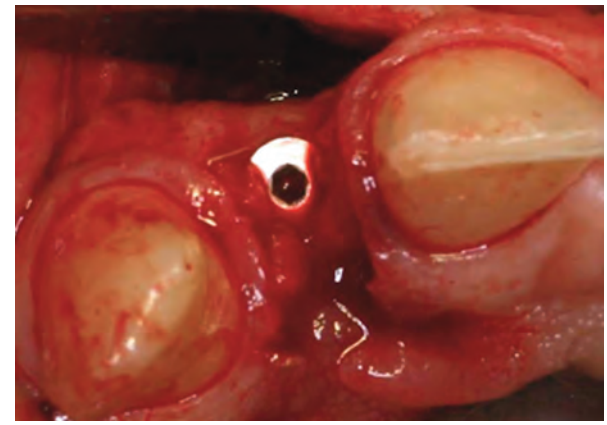

Figure 10. 1mm of bone was present on the buccal aspect of the implant

keratinized mucosa and to augment the thickness of the soft tissue on the buccal aspect of the implant-supported restoration, without compromising the papilla height. The aesthetic outcome was very good. In addition, mucosal contours demonstrated to be stable over a five year period and no scars were detectable. Also the aesthetic result in terms of buccal convexity and color match was satisfactory at the five year follow-up visit, as rated with a PES score of 8. With regard to the WES, the mean value for the final implant-supported restoration was 9, which means that the restoration esthetic outcome was satisfactory. This was possible due to an adequate implant placement and a correct provisionalization technique. Provisional restorations were fabricated immediately after second-stage surgery and kept in place for six weeks. Any correction on the contour, texture and colour of the restoration was performed and a natural emergence profile was achieved. As a result, the patient was extremely satisfied with the esthetic outcome of his restorations.

A recent case series was recently published on the same topic.[24] Twelve patients with missing central or lateral incisors were rehabilitated with single implant-supported restorations and a palatal roll technique was performed at the time of second-stage surgery. Six months after surgery the convex profile and the papilla height were improved, while the mucosal margin was harmonized with the gingival margin of the contralateral tooth. Our clinical report confirms these promising results and suggests that both highly esthetic soft tissue and implant restorations can be maintained over a 5-year period.

CONCLUSION

This clinical report indicates that after 5 years of follow up, the modification of Abrams's roll technique in localized ridge atrophy shows great stability and reliability. During the second stage in implant cases with minor buccal bone defects, the roll technique can be used successfully, minimizing the post-operative discomfort of the patient and providing acceptable esthetic results in the anterior area after five years of follow-up.

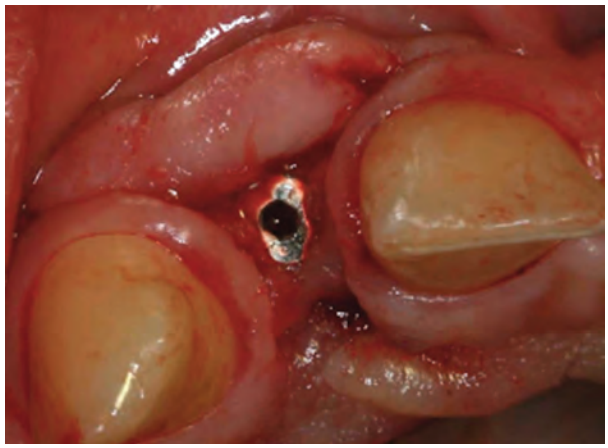

Figure11. Connective tissue rolled under the buccal flap between periosteum and bone

Figure 12. Immediate provisionalization of implants #12 and #22 with the use of provisional abutments and polycarbonate crowns

Figure 13. 5 years follow-up; Facial view

Figure 14. 5 years follow-up; Occlusal view

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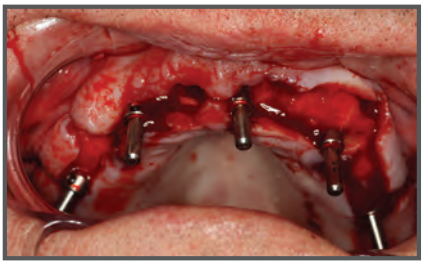

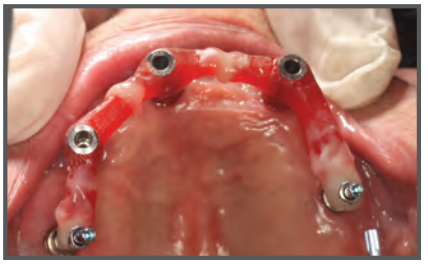

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Designing a custom-made post and core using CAD/CAM technology's CEREC system

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Dr. Pedro Gurgel de Souza
Dr. Candal Garcia,
Dr. Bianca Barino

Conception d'un pivot et d'un pilier sur mesure, en se servant du système CEREC de la technologie CAO/FAO

Abstract

The computer-aided design/computer-aided manufacturing (CAD/CAM) methods described in the literature for building a post and core involve taking the impression of the post space and adjacent teeth, casting in type IV high-strength die stone, and fabricating a wax pattern. Another method involves scanning the anatomy of the canal utilizing autopolymerized acrylic resin on a plastic post. The aim of this study was to design a custom-made post and core using CAD/CAM technology's CEREC system without a stone cast or wax pattern. A simultaneous two-stage impression technique for post space and adjacent teeth was performed using vinyl polysiloxane, and a 3D CEREC Bluecam camera was used for scanning. Data were processed with Inlab SW 4.2 software, facilitating the development of a three-dimensional digital model of the impression through specific parameters. The CEREC system proved to be a reliable method for generating the design of a custom-made post and core without a stone cast or wax pattern.

Keywords: cad/cam, cerec, anatomic posts, digital impression

INTRODUCTION

The use of a prefabricated post system manufactured from composite resin or ceramic materials requires preparation of the root canal to the size and shape of the post. This is usually followed by the addition of a composite resin core to the prefabricated post after cementation, or alternatively, the heat-pressing of a ceramic core onto the ceramic post during its fabrication. In both situations, the fit of the post with the canal walls depends on the configuration and size of the root canal.[1,2] For round-shaped canals with sufficient bulk of the dentinal walls, a prefabricated post can have intimate adaptation to the prepared canal along its entire length. However, in wide, noncircular, oval canals, the usual cylindrical prefabricated post systems may not achieve intimate adaptability of the root canal, possibly compromising the retention of the post.

As alternatives to conventional cast metal posts and cores and prefabricated fiber posts, there are additional methods for restoring severely damaged teeth. These include the use of zirconia posts and cores fabricated using the computer-aided design/computer-aided manufacturing (CAD/CAM) technology,[3] adhesively bonded polyethylene fiber-reinforced composite resin posts,4 and reinforcement of the root canal inner wall with resin-bonding techniques.[5] A one-piece post and core can provide good adaptation in the post space as well as a structure that lacks a post-and-core interface.[6]

Usually, the CAD/CAM methods described in the literature involve taking the impression of the post space and adjacent teeth, casting in type IV high-strength die stone, and preparing a wax pattern of the post and core from the cast without sharp edges to facilitate scanning. The wax pattern is then digitized with a three-dimensional 3D scanner and the data are processed with CAD/CAM

Résumé

Les méthodes CAO/FAO décrites dans cet article, pour la construction d'un pivot et d'un pilier, comprennent la prise d'empreinte de l'emplacement du pivot et des dents adjacentes, la coulée en plâtre de type IV extra dur, et la fabrication d'un cirage. Une autre façon, implique le scanning du canal, en se servant d'une résine acrylique autopolymérisante, et d'un pivot de plastic. L'idée de cette étude, est, la conception d'un pivot et d'un pilier sur mesure, en se servant du système CEREC de la technologie CAO/FAO, sans l'apport d'un modèle de plâtre ou de cirage. Une technique d'empreinte en deux étapes, simultanée, sur l'emplacement du pivot et des dents adjacentes, a été effectuée en utilisant un polysiloxane de vinyl, et un scanning, grâce à une caméra du système CEREC 3D Bluecam. Le data est enregistré avec un logiciel Inlab SW 4.2, pour faciliter la fabrication d'un modèle numérique en 3 dimensions, à partir de l'impression, par l'entremise de paramètres spécifiques. Le système CEREC a démontré sa fiabilité pour créer la reproduction d'un pivot et d'un pilier sur mesure, sans l'aide d'un modèle de plâtre ou de cirage.

Mots-clés : cao/fao, cerec, pivots anatomiques, empreinte numérique

software to develop a digital 3D model of the post and core. At the last stage, a block is milled.[6] A direct technique is also described to record the entire anatomy of the canal with autopolymerized acrylic resin on a plastic post instead of working with the cast in type IV high-strength die stone.[7]

The aim of the present study was to design a new custom-made post and core using CAD/CAM technology's CEREC system without a stone cast or wax pattern.

MATERIALS AND METHODS

Procedures- A TrueTooth™ replica code 8-001 maxillary central incisor (DELendo, California, USA) was selected and adapted in a typodont TOP PD 101 (Prodens, Rio de Janeiro, Brazil). This replica has an uncalcified pulp chamber with slight to moderate mesial and distal lateral pulp horns and a fairly large shape in the primary root canal space, ending with a good apical constricture. The apical diameter is 0.55 mm by 0.58 mm. An endodontic specialist performed the endodontic root canal treatment of the maxillary central incisor replica. The gutta percha was then removed with a low-speed Gates-Glidden instrument (Pulpdent Corporation, Massachussets, USA) to the desired post length without compromising the apical seal. The post space was prepared with a DC2E White Post bur (FGM, Santa Catarina, Brazil) to gain adequate diameter for the post and to eliminate undercuts. The coronal portion of the tooth was removed and prepared with a diamond rotary cutting instrument 5878K (Brasseler, USA) so that no acute angles were present between the post surface space and the apical surface space of the core, allowing the 3D camera to obtain clear images of the core–post junction space. It was ensured that the core–post junction space was wide enough and that the post space had rounded internal line angles where it met the tooth surfaces. The edge of the root orifice was also prepared parallel to the CEJ to create a platform for the post, with a diamond rotary cutting instrument 5878K (Brasseler, USA), and at least 2 mm of tooth structure was maintained apical to the core's finish line to be used at a later period for the crown finish line, providing an adequate 2-mm ferrule effect.[8,9,10] The vinyl polysiloxane adhesive Elite (Zhermack, Rovigo, Italy) was applied to the acrylic post Pinjet (Angelus, Paraná, Brazil) to assist the shaping of the root canal through the impression. A simultaneous two-stage impression technique involving the post space and adjacent teeth was performed with Elite (Zhermack). The impression was rinsed and dried to receive the contrast spray made of titanium dioxide (CEREC powder, Vita ZahnFabrik, Germany), allowing the digital acquisition to be properly made (figure 1).

At the software phase, a crown restoration type with a biogeneric individual design mode was selected for tooth 11. Six images were acquired from the impression in sequence, with the Bluecam tip pointing distally to tooth 21. The data were processed with CAD/CAM Inlab 4.2 software (Sirona Dental Company, Bensheim,

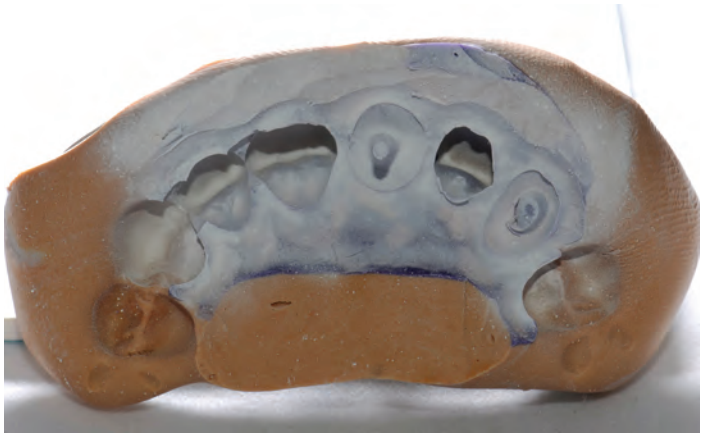

Fig. 1 Powdered elastomeric impression of the post

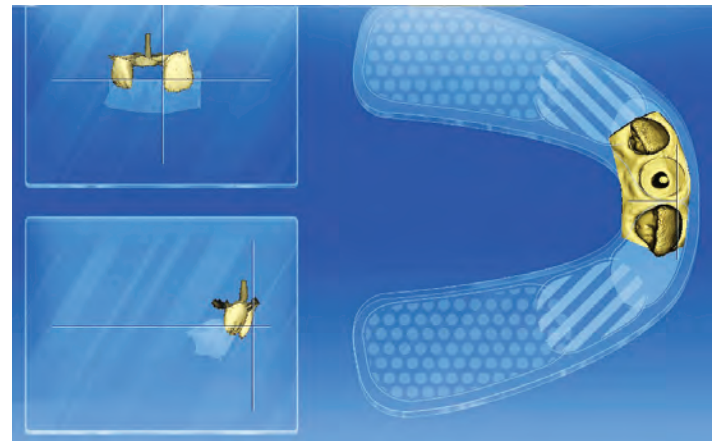

Fig. 2 3D model's axis determination

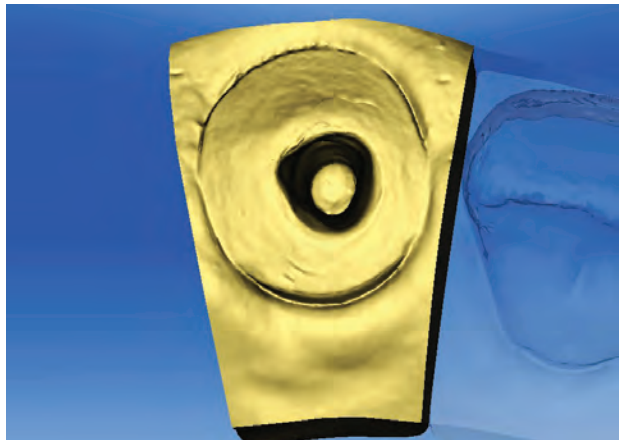

Fig. 3 3D model's trim phase

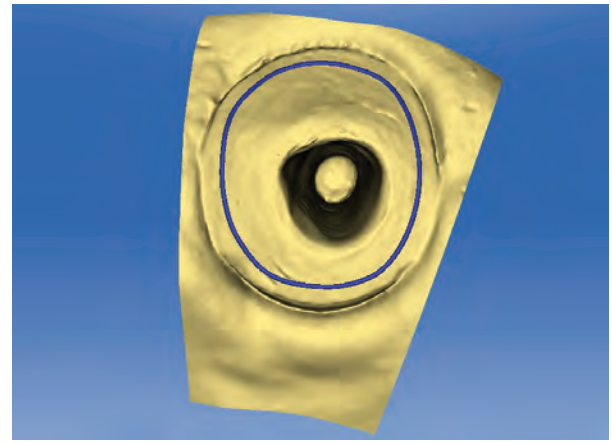

Fig. 4 Mandatory margin phase

Germany), creating a 3D digital model acquired from the negative impression by means of the Toggle Impression Scan tool.[11]

The mandibular and maxillary jaws of the typodont TOP PD 101 (Prodens, Rio de Janeiro, Brazil) also received the contrast spray made of titanium dioxide (CEREC powder, Vita Zahnfabrik), allowing the digital acquisition of the buccal and antagonist teeth.

For a virtual model of the 3D post and core, the following steps were performed:

- **Model Phase**
- **Model Axis**
  We determined the model axis by positioning the models according to the mid-line, the inclination, and the alignment of the anterior teeth; thus, the software could appropriately interpret the images in the initial proposal (figure 2).
- **Trim**
  In the eligible Trim Phase, the model was virtually trimmed for better visualization of the interproximal areas of the post and core restoration (figure 3).
- **Margin**
  In the mandatory Margin Phase, the supragingival preparation was homogeneously delimited before the limit of the tooth structure to be used at a later period for the crown finish line, providing an adequate 2-mm ferrule effect (figure 4).
- **Insertion Axis**
  In the Insertion Axis Phase, the insertion axis of the post and core restoration was determined, with possible retention areas avoided (figures 5a and 5b).
- **Design Phase**
- **Parameters** - The following restorative parameters were adopted:
  - Anterior Basic Shape: No
  - Spacer: 150
  - Occlusal Milling Offset: 0
  - Proximal Contact Strength: 0
  - Occlusal Contact Strength: 0
  - Dynamic Contact Strength: 0
  - Minimal Thickness (Radial): 700
  - Minimal Thickness (Occlusal): 700
  - Margin Thickness: 60
  - Consider Instrument Geometry: Yes
  - Remove Undercuts: Yes

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8:30am-11:30am — **3 CE Points**

Adverse Outcomes

Adverse outcomes take many forms, from serious morbidity following treatment to unmet patient expectations in cosmetic procedures. They know no boundaries, and are common to all aspects specialities and modalities of dental treatment. The lecture will begin by defining adverse outcomes with clinical examples, and move into the prevention and management strategies. The intent is to minimize the impact of these events to both the practitioner and patient. The seed for an adverse event or outcome may be present even prior to the patient presenting themselves in your office and can occur during or after treatment. The presentation will highlight informed consent, post treatment management communication, and documentation strategies. The requirements under the Regulated Health Professions Act "RHPA", prevailing court jurisprudence will be discussed, as will the appropriate use of the Apology Act. These adverse events can lead to patient loss, RCDSO complains and lawsuits. Further, the new paradigm, one of "shared decision-making", "informed consent" and "informed refusal" will form a part of this session. The necessity of appropriate follow up care, referral and disclosure will be highlighted. Dentists should become well versed in these principles in order to survive in today's increasingly difficult practice environment.

Upon completion of this session the participants will be better able to:

- Understand the need for appropriate communication strategies
- Become aware of the perils of using "Grey Market" dental materials and unlicensed or offshore dental laboratories
- Know the principles of informed consent and informed refusal
- Understanding why documentation and disclosure are required
- Realize why appropriate after hours care and available will resolve many patient issues with post treatment problems
- Effectively appropriate referral strategies to minimize their risk
- Develop pre-emptive and reactive solutions to most adverse events

Pavel Cherkas,
DMD, PhD, FRCD(C

and Dr. Ruslan Dorfman,
PhD, MBA, MSc, BSc

12:30pm-3:30pm — **3 CE Points**

New Approaches in Management of Endodontic Pain – Making Sense of the Evidence

This evidence-based lecture presents a broad overview of contemporary literature, clinical and scientific experience in acute and chronic endodontic pain management. Comprehensive understanding of different pain mechanisms provides an ultimate way for managing dental pain emergencies and post-operative conditions. The latest information on pharmacological and technological approaches will be provided to help clinicians with successful management of different types of endodontic emergencies. What is the best time for treatment of irreversible pulpitis? Can we predict which patients are more likely to experience pain after an endodontic therapy? What doesn't work for post-op pain? What are genetic determinants of pain? What is a personalized medicine concept and how to apply it in dentistry?

At the conclusion, participants should be able to:

- Discuss different pain mechanisms.
- Discuss the genetic determinants of pain.
- Apply a personalized medicine concept in dentistry.

Location: Hilton Suites Conference Centre & Spa (Toronto/Markham) 8500 Warden Ave, Markham, ON L6G 1A5

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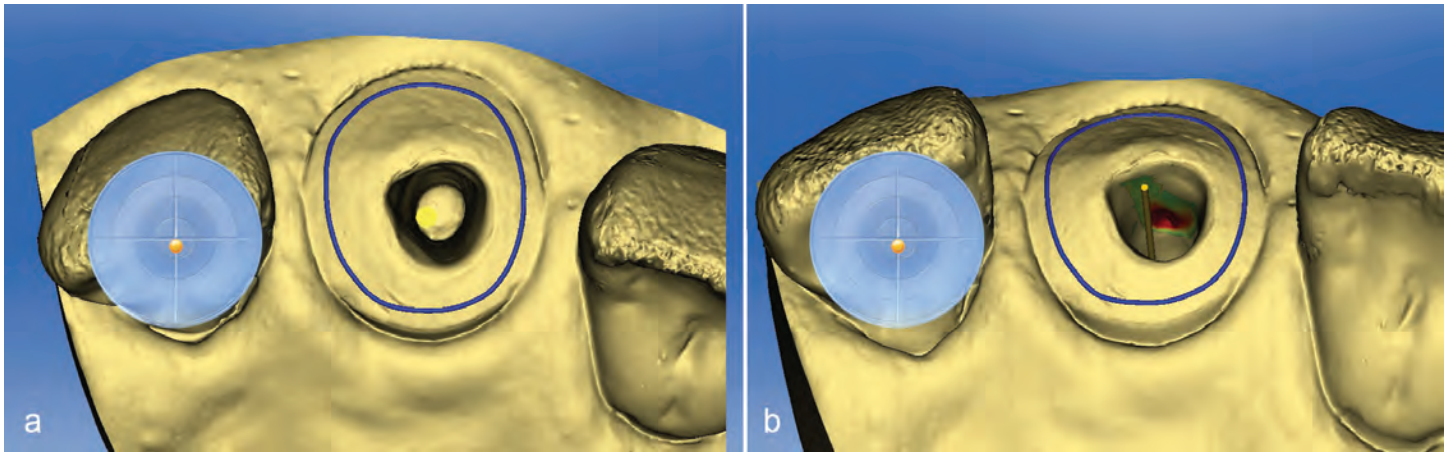

Fig. 5a and 5b (a) Insertion axis of the post & core restoration (b) Demonstration of possible retention areas that should be avoided

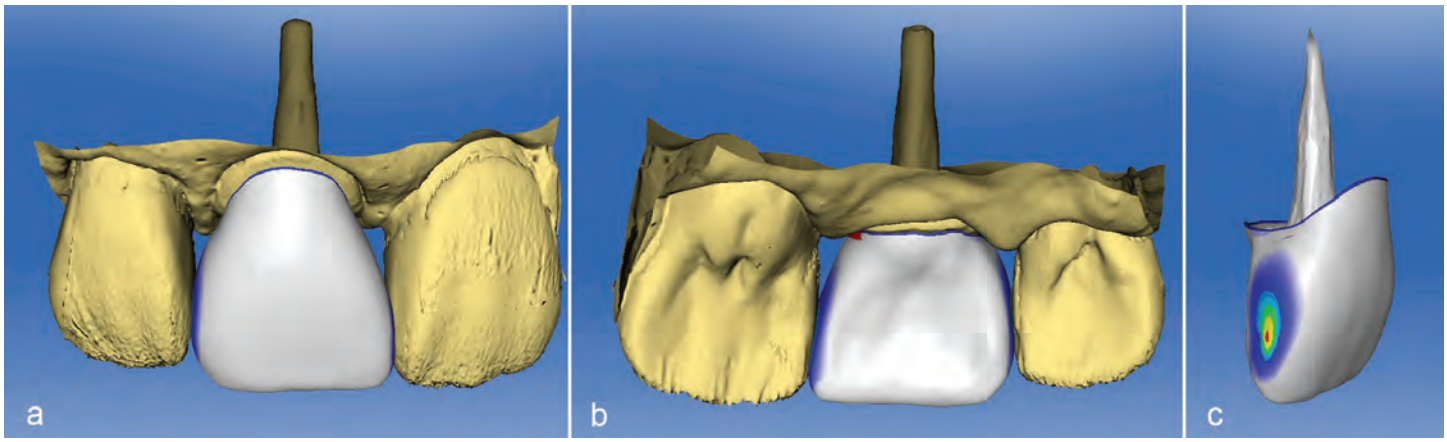

Fig. 6a, 6b and 6c (a) Vestibular view of post & crown restoration calculated (b) Palatine view of post & crown restoration calculated (c) Distal view of restoration's proximal contact

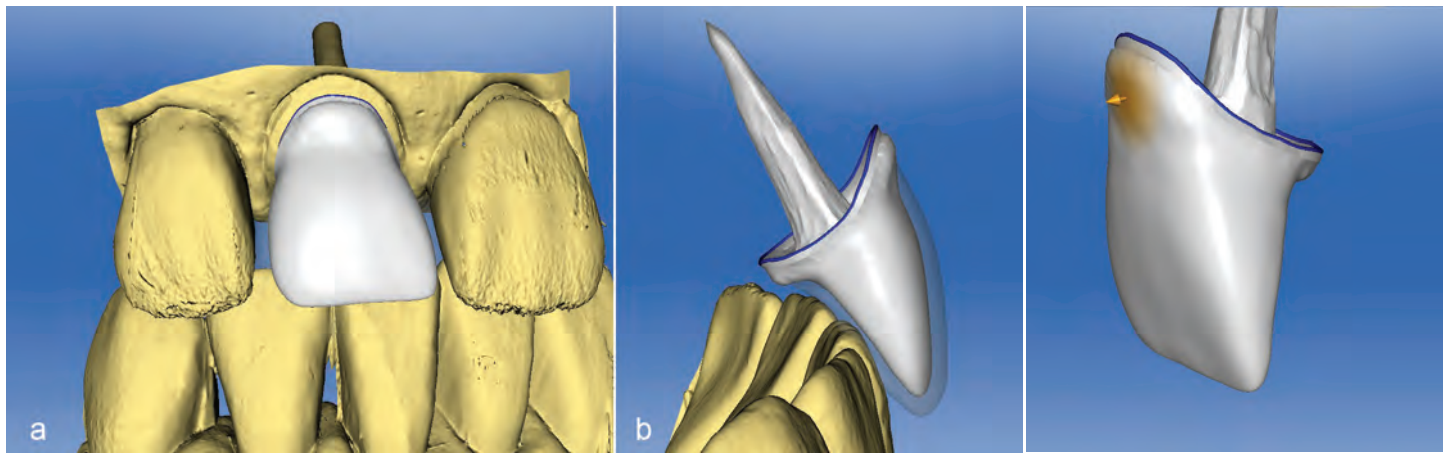

Fig. 7a and 7b (a) Vestibular view of post & crown restoration with reduce tool applied (b) Interocclusal space obtained by reduce tool

Fig.8: Design modification example, using the shape circular software tool to remove possible retention in cervical area

The post and crown restoration was calculated with the Biogeneric Crown design option (figures 6a, 6b, and 6c). From the tools menu, using the "reduce" tool, the crown was reduced entirely and homogeneously by 0.5 mm (figures 7a and 7b). Design modifications were performed with the shape circular software tool in cervical areas to avoid retention areas (figure 8).

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DISCUSSION

Frequently, the CAD/CAM methods described in the literature involve the following: taking the impressions of the post space and adjacent teeth with vinyl polysiloxane, casting in type IV high-strength die stone, preparing wax patterns of the post and core, digitizing the wax patterns with a 3-D scanner, processing the data with CAD/CAM software, developing digital 3-D models of the post and core, and milling a prefabricated block (glass fiber or zirconia) to develop the post and core with a milling machine6 (figure 9). A direct technique has also been described to record the entire anatomy of the canal with autopolymerized acrylic resin on a plastic post instead of working with the cast in type IV high-strength die stone.[7]

Use of the CAD/CAM technology of the CEREC system (Bensheim, Germany) for designing a direct custom-made post and core presents some advantages over the CAD-CAM technique described in the literature, because it scans the impression material pattern to generate a 3-D digital model. Therefore, the post and core can be designed virtually with Inlab SW 4.2 software (Sirona Dental Company) in a unique structure, avoiding the adhesive interface present between posts and cores in prefabricated systems (figure 10).

The remaining coronal portion of the tooth should be planned. Placing a deep chamfer may impair adjustment of the coronal portion of the post, leading to possible adjustments to the parameters related to the increase of the spacer, which would lead to an unintended increase in the cement thickness.

The parameter values should be observed, because round and oval canals will possibly demand different software adjustments; further research is needed in this area. Observation of the proximal and interocclusal distances to adjacent teeth is also important to minimize future adjustments in the core portion of the post and core restoration.

The possible benefit of the maximum adaptability to the canal wall with the CAD/CAM system also needs further research for evaluation of the bond strength between posts and circular/oval canals.[12,13] The stress distributions involving post and core restorations by the CEREC system should also be evaluated by 3-D elastic finite element analysis.[14]

Root fractures can be minimized by the use of fiber posts,[15,16] which have an elastic modulus similar to that of dentin and consequently allow for a more uniform distribution of loads along root dentin compared with that provided by metal posts.[17] Currently, the restoration of non-vital teeth by means of composite resin combined with fiber posts represents a highly reliable treatment option.[18] Further investigation is needed to manufacture CAD/CAM CEREC blocks similar in composition to the fiber posts available on the market today. Biomechanically, the elastic modulus would be similar to that of dentin[19,20,21] instead of zirconia, which has a high rigidity that produces higher stresses at canal walls because of its high elastic modulus.[22]

A post and core was milled using a prefabricated polymer block (VITA CAD-Temp 1M2/CTM-40 CEREC/inLab Vita

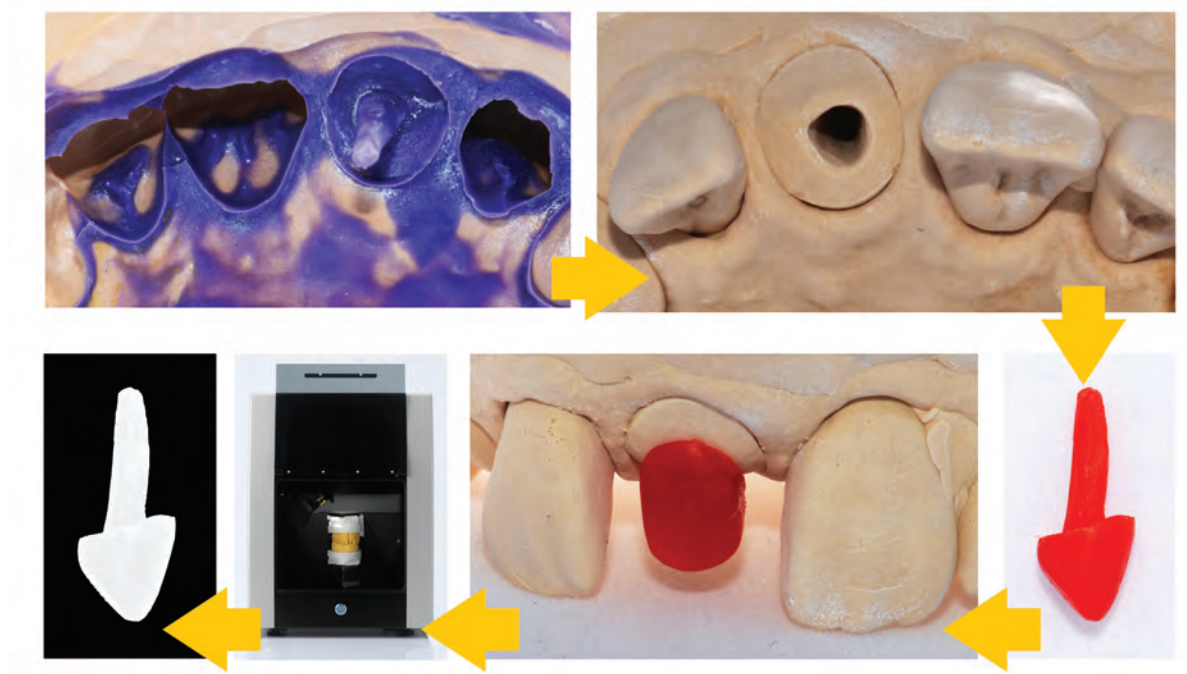

Fig.9 Traditional workflow of methods described in the literature

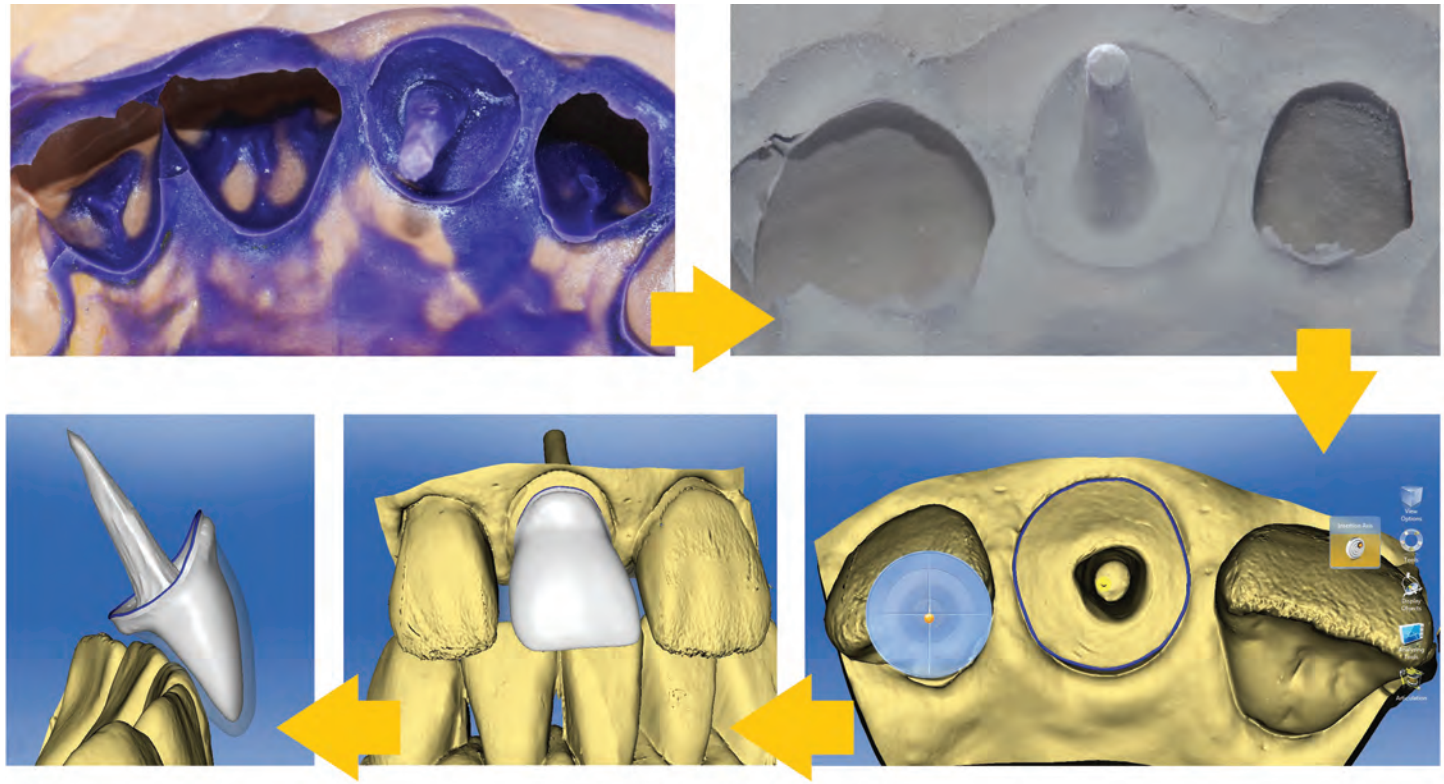

Fig.10 Workflow of the scanning procedure to generate a 3-D digital model

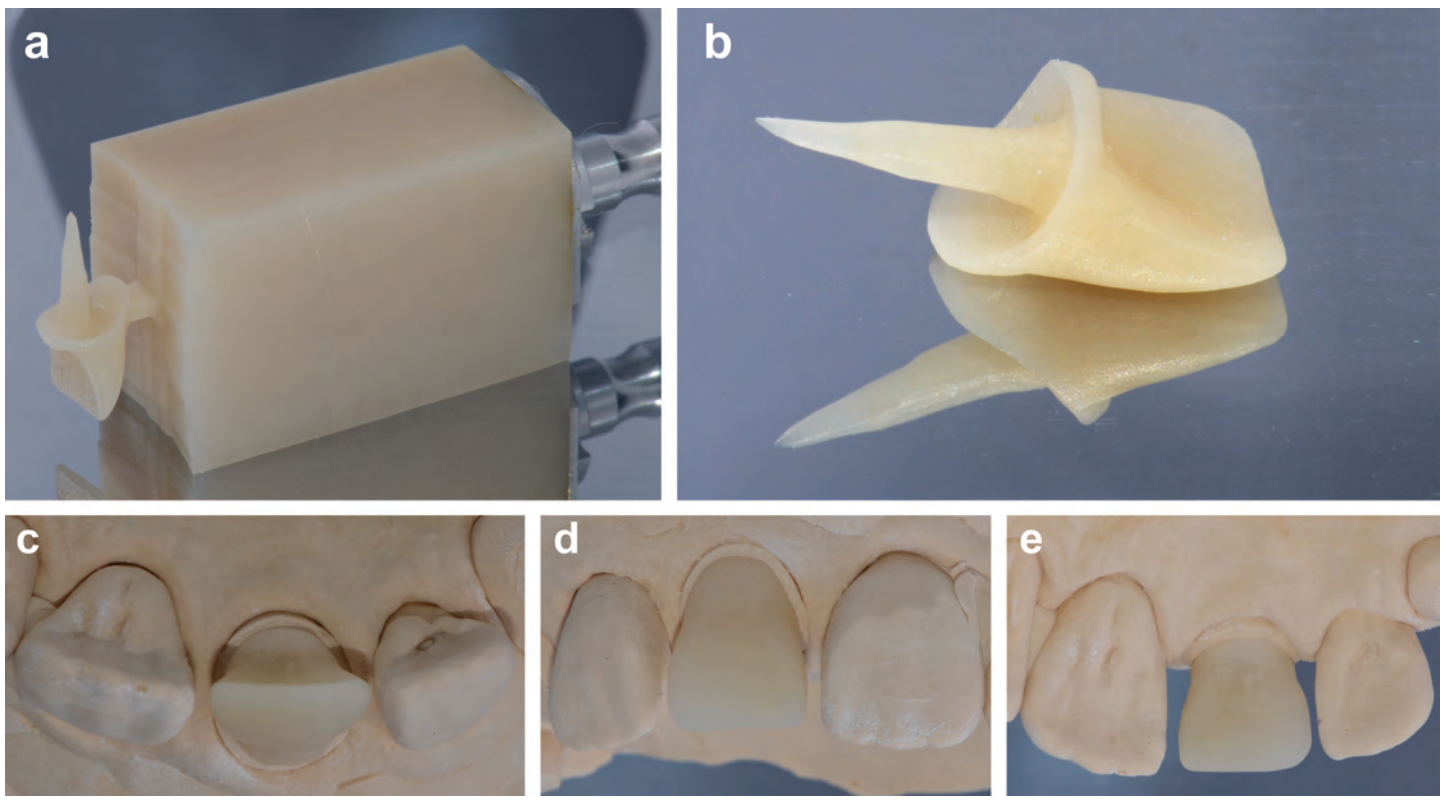

Fig. 11a, 11b, 11c, 11d and 11e (a) Polymer block milled (b) Post and core sectioned from the block (c) Palatine view of post & core (d) Vestibular view of post & core (e) Occlusal view of post & core

ZahnFabrik, Germany) only for the purpose of demonstration the final step of the process, as there is no polymer blocks for this indication in the market today (figure 11a, 11b, 11c, 11d and 11e).

Software updates, allowing new options for post and core restorations with new and specific parameters defined for this type of restoration, are also suggested.

CONCLUSION

The CAD-CAM technology of the CEREC system appears to be promising as a reliable method for generating the design of a custom-made post and core without a cast or wax pattern.

ACKNOWLEDGEMENTS

The authors would like to thank Sirona Brasil for the generous donation of Inlab SW 4.2 software.

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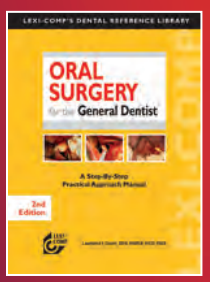

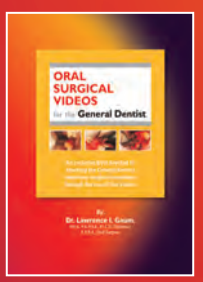

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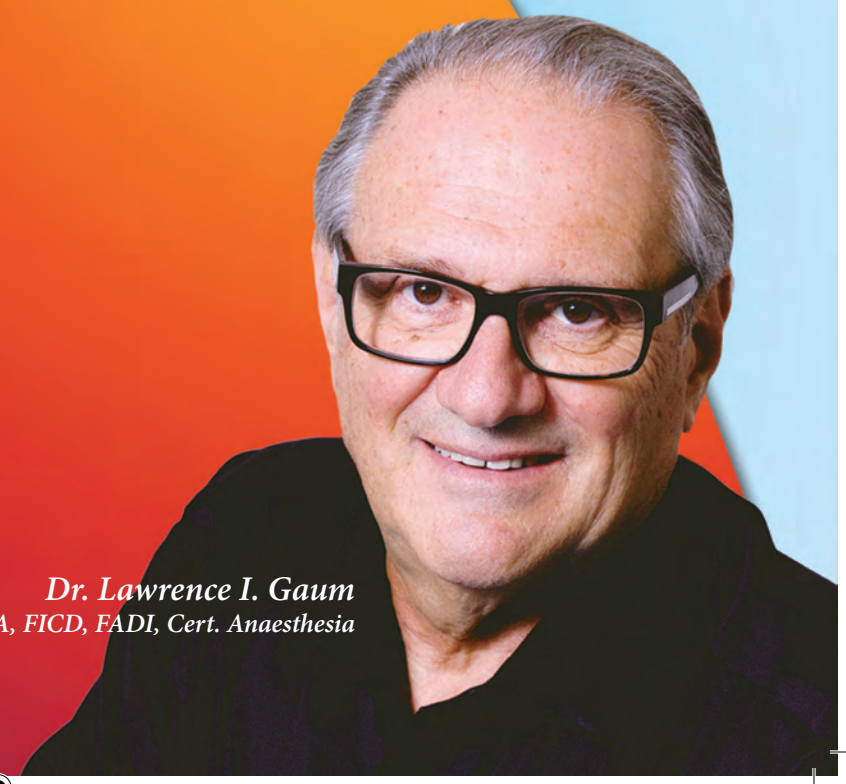

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Tomorrow's Dentistry Today - Atteindre la Dentisterie du futur

Dr. Jay McMullan

Welcome from our CARDP President/ Bienvenue de la part du Président de l'ACDRP

I am pleased to welcome you to our conference, Tomorrow's Dentistry Today, held this year in Montréal. The Canadian Academy of Restorative Dentistry and Prosthodontics prides itself on its unique conference format featuring 15 renowned clinicians and researchers. We look forward to providing you with a comprehensive program that, while focusing on Prosthodontics and Restorative Dentistry, also includes topics from digital based dentistry to sleep apnea and its relationship to bruxism and facial pain. Our roster, made up of leaders in their respective fields, will offer participants a cutting edge educational experience as well as quality networking which will certainly translate into better patient care.

September is a wonderful time of year to visit Montréal with its rich history and diverse culture. Our conference venue is ideally located on the doorstep of Vieux Montréal, allowing you to see the many sights of our city, meet new colleagues and enjoy the company of long time confrères.

I'm looking forward to seeing you in Montréal.

Dr. Jay McMullan
CARDP President

Il me fait grand plaisir de vous accueillir à Montréal pour notre congrès annuel dont le thème est Atteindre la dentisterie du futur. L'Académie canadienne de dentisterie restauratrice et de prosthodontie présente un format unique mettant en relief 15 cliniciens et chercheurs réputés. Notre programme offre une vue d'ensemble qui, en plus de souligner la Prosthodontie et la Dentisterie restauratrice, inclut des sujets tels la Dentisterie numérique et l'apnée du sommeil en relation avec le bruxisme et les douleurs faciales. La liste de nos conférenciers réunit les sommités dans leurs domaines respectifs, qui exposeront les participants à une instruction de fine pointe ainsi qu'à un réseau référentiel, ce qui leur permettra de prodiguer de meilleurs soins à leurs patients.

Le mois de septembre est une période splendide pour visiter Montréal, riche de son passé et de sa culture, et notre congrès se tient justement au seuil du Vieux Montréal. Venez rencontrer de nouveaux collègues et retrouver vos amis, confrères et consoeurs.

Au plaisir de vous voir à Montréal.

Dr Jay McMullan
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Tomorrow's Dentistry Today - Atteindre la Dentisterie du futur

Douglas Hamilton

Welcome from our Essay Chairman/

As Essay Chair, it is with great pleasure that I welcome you all to Montréal and the Annual Scientific Meeting of the Canadian Academy of Restorative Dentistry and Prosthodontics. We are especially proud of our program and hope you find it challenging and informative. Also, please enjoy our city as we feed and entertain you during your stay.

There are so many new and innovative ways we can treat our patients nowadays. Thirty years ago, when I graduated, we could ask the patient one simple question: "White gold or black and how long do you want it to last?" Well, things have changed since then. There are now a myriad of treatment options and modalities. Digital Dentistry has moved in with scanners, CAD/CAM and cone beam, and material science has exploded with many new options.

Dentistry has therefore become very complex and can be a bit daunting, even for the most experienced practitioner. Accordingly, our Academy offers sound scientific programs aimed at discovering the best evidence-based treatments for our patients. The result is that we have established a long history of congenial meetings where practitioners from across the country share their experiences.

This year's meeting will highlight Implant Restoration of the partially and completely edentulous maxilla, restorative planning with prototypes, materials properties and choices, TMJ, facial pain and sleep disorder, Digital Dentistry, cone beam case analysis and planning, implant complications, Lasers used in Restorative Dentistry and Periodontics, endodontic vs. implant decisions, endodontic treatment updates, matching colour with ceramics on discoloured teeth, ceramic precision and much more.

To our new readers, please consider joining our association as we invite you to follow us to various Canadian cities where our Meetings are held. This year, we offer you a heart-felt welcome to Montréal. It is our wish that you will enjoy your time here, then return home, not only with new insights and skills, but with warm memories of your visit.

I look forward to greeting you in Montréal. À bientôt.

Douglas Hamilton
Essay Chairman 2014

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Douglas Hamilton

Bienvenue de la part du Président du programme scientifique

En tant que Président du programme, je vous souhaite la bienvenue à Montréal pour le congrès annuel de l'Académie canadienne de dentisterie restauratrice et de prosthodontie. Nous sommes particulièrement fiers de ce programme qui se veut à la fois instructif et stimulant. Et n'oubliez surtout pas de profiter pleinement de cette belle ville ainsi que de notre hospitalité pendant votre séjour parmi nous.

Il existe tellement de façons novatrices pour traiter nos patients de nos jours. Les choses ont beaucoup évolué depuis que j'ai terminé mes études, il y a 30 ans, puisqu'il existe aujourd'hui une panoplie de modalités de traitements. Toutes ces options, comme la numérisation par exemple, en passant par le balayage intra-oral, la CAO/FAO, le faisceau conique et les nouveaux matériaux, ont fait irruption.

La dentisterie est devenue compliquée et intimidante, même pour les dentistes chevronnés. C'est pourquoi notre Académie offre des programmes scientifiques visant les meilleurs traitements basés sur les faits. Nous avons, par conséquent, établi une longue relation amicale de praticiens à travers tout le pays partageant leurs expériences.

Cette année, nous mettons en valeur la restauration implantaire du maxillaire partiellement ou complètement édenté, la planification de restaurations à l'aide de prototypes, les propriétés et choix des matériaux, les DTM, les douleurs faciales et problèmes du sommeil, la Dentisterie numérique, l'analyse et la planification de cas avec faisceau conique, les complications des implants, l'utilisation des lasers en Dentisterie restauratrice et en Parodontie, les Implants vs l'Endodontie, les derniers traitements endodontiques, la couleur des restaurations céramiques assortie aux dents décolorées, la précision des systèmes céramiques, et beaucoup plus encore.

À nos nouveaux lecteurs, nous vous invitons à devenir membres et suivre nos congrès dans plusieurs villes canadiennes. Cette année, nous sommes heureux de vous accueillir à Montréal. C'est notre souhait sincère que vous vous y plairez et que vous retiendrez d'excellents souvenirs de votre expérience, autant du point de vue scientifique que personnel.

À bientôt!

Douglas Hamilton
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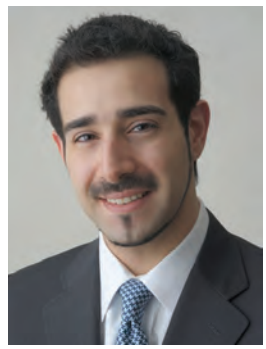

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TOMORROW'S DENTISTRY TODAY / ATTEINDRE LA DENTISTERIE DU FUTUR

SCIENTIFIC PROGRAM / PROGRAMME SCIENTIFIQUE

TIME/HEURE	Thursday/Jeudi 18 September
09H00 – 17H00	Dr. Howard Golan - FULL DAY HANDS-ON COURSE Versatility of Waterlase: applications in oral and periodontal surgery, endondontics and restorative dentistry La versatilité du Waterlase: applications en chirurgie buccale et parodontale, endodontie et dentisterie restauratrice
08H00 – 12H00 13H30 – 17H0	Dr. Stewart Shapiro - HALF DAY HANDS-ON COURSES Forward Endodontics / La fine pointe de l'Endodontie
TIME/HEURE	**Friday/Vendredi 19 September**
08H15	Dr. Jay McMullan - CARDP President/Président, Dr. Douglas Hamilton - Scientific Program Chair/Président du programme
08H30	Dr. Robert Vogel - Blending art, science and technology in Implant Dentistry for ideal patient care Fusion de l'art, de la science et de la technologie en Dentisterie implantaire
09H30	Dr Gilles Lavigne - Sleep apnea, bruxism and facial pain/L'apnée du sommeil, le bruxisme et les douleurs faciales
10H30 – 11H00	Refreshment Break with Sponsors - Exhibit Hall / Pause avec commanditaires – Salle des exposants
11H00	Dr. Izchak Barzilay - Digital reconstructive dentistry: how we maximize use of digital technology to restore complex cases Dentisterie de reconstruction numérique
12H00 – 13H30	Lunch with Sponsors - Exhibit Hall / Repas du midi avec commanditaires – Salle des exposants
13H30	Mr. Haim Keren CDT - Prosthetic Prototype – Planning for Success / Prototype prothétique - Tracer le succès
14H30	Dr. Mamaly Reshad - Resection vs augmentation: esthetic implant supported maxillary prostheses Résection vs augmentation: prothèses implanto-portées esthétiques au maxillaire
15H30 – 16H00	Refreshment Break with Sponsors - Exhibit Hall / Pause avec commanditaires – Salle des exposants
16H00 – 17H00	Dr. Yvan Fortin - Restoration of the edentulous maxilla: choosing prosthetic options Restauration du maxillaire édenté: choix des options prothétiques
TIME/HEURE	**Saturday/Samedi 20 September / Short Format Presentations / Présentations abrégées**
08H10 – 08H30	Dr. Mark Spatzner - Can implants go bad? Prevention: better than a cure! Les implants peuvent-ils se détériorer? Mieux vaut prévenir que guérir
08H30 – 08H50	Mr. Michael Schreck, CDT - Myths and reality of contemporary all ceramic materials Les mythes et la réalité des matériaux contemporains tout céramique
08H50 – 09H50	Dr Pierre Boudrias – Managing the esthetic region in Implantology La gestion de la zone esthétique en Implantologie
09H50 – 10H10	Dr. Michael Kaiser - The Canadian Military Dental Corps: how our military dentists serve you at home and abroad Le corps dentaire militaire canadien: comment les dentistes vous servent au pays et à l'étranger
10H10 – 10H30	Dr. Stewart Shapiro - Endo vs implants: revisiting the criteria for success with Endodontics L'Endodontie vs les implants: revue des critères de succès en Endodontie
10H30 – 11H00	Refreshment Break with Sponsors - Exhibit Hall / Pause avec les commanditaires – Salle des exposants
11H00 – 11H20	Dr. Marc Shenouda - 3D imaging in dentistry and computer assisted implant planning L'imagerie 3D en dentisterie et la planification numérique des implants
11H20 – 11H40	Dr Louis Drouin – Periodontitis / La Péri-Implantite
11H40 – 12H00	Dr Alexandre Taché - Saving periodontally risky teeth with Laser Assisted New Attachment Procedure (LANAP) Conserver les dents à risques parodontaux avec la procédure LANAP
12H00 – 12H20	Dr. Dennis Nimchuk - Precision with ceramics: the new paradigm / La précision avec les céramiques: le nouveau paradigme
12H20 – 12H30	Dr. Jay McMullan - Meeting conclusion/Clôture du congrès Dr. Ian Tester - Toronto 2015 Annual Meeting Announcement and Video/Présentation vidéo du congrès 2015 à Toronto
12H30 – 14H00	CARDP Members and Guest Luncheon Repas du midi des membres de l'ACDRP et des invités
14H00 – 17H00	Table Clinics / Démonstrations cliniques

Scientific Meeting Speakers /Programme Scientifique

Tomorrow's Dentistry Today/Atteindre La Dentisterie Du Futur

Pre-Meeting Courses - Cours pré-congrès

Thursday, September 18th Program/Programme du Jeudi 18 September

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

Dr. Howard Golan, New York

Versatility of Waterlase: applications in Oral and Periodontal Surgery, Endondontics and Restorative Dentistry

9:00 am – 17:00 pm

Location: St-Jacques Room, 3rd Floor

Fee: $395 pp: Includes full day course, breaks and lunch

CE Credits: 7

Synopsis:

The physics and biology behind laser dentistry will be introduced and the participant will gain significant knowledge in the applications of hard and soft tissue lasers in the restorative and prosthetic realm. Attendees will get the chance to "play" with lasers on extracted teeth and animal jaws in both the soft-tissue and hard-tissue areas. Finally, the economics and management of lasers in the dental practice will be discussed.

Learning objectives:

1. Identify the various wavelengths of dental lasers on the market
2. Explain how lasers interact with dental tissue
3. Experiment with laser wavelengths

Biography:

Dr. Golan graduated from the U of Michigan School of Dentistry and completed a two-year Implant Surgery and Advanced Prosthetic Fellowship at NSUH. He holds numerous other diplomas among which a Mastership certification in the World Clinical Laser Institute and he lectures internationally on the subject. Dr. Golan also maintains a private practice and is passionate about conserving teeth, soft tissue and bone.

Dr Howard Golan, New York

La versatilité du Waterlase: applications en chirurgie buccale et parodontale, endodontie et dentisterie restauratrice

09H00 – 17H00

Lieu: Salle Saint-Jacques, 3ième étage

Coût: 395$ pp: Inclut le cours d'une journée, les pauses et le repas du midi

Crédits: 7

Synopsis:

Le participant sera introduit à la physique et la biologie du laser en dentisterie et ses applications sur les tissus durs et mous dans les domaines restaurateurs et prothétiques. L'occasion sera offerte d'expérimenter avec le laser sur des dents extraites et des mâchoires d'animaux. Finalement, la rentabilité et la gestion des lasers en pratique dentaire seront discutés.

Objectifs:

1. Identifier les longueurs d'ondes des divers lasers dentaires sur le marché
2. Expliquer l'interaction entre le laser et le tissu dentaire
3. Expérimenter avec différentes longeurs d'ondes

Biographie:

Dr. Golan est promu en médecine dentaire de U of Michigan et a complété un Fellowship de deux ans en chirurgie implantaire et prothétique de NSUH. Il détient plusieurs autres diplômes dont un certificat de maîtrise du World Clinical Laser Institute et il présente des conférences sur ces sujets à travers le monde. Dr. Golan maintient aussi une pratique privée dédiée à la préservation des dents, du tissu mou et de l'os.

Dr. Stewart Shapiro, Montréal

Topic: Forward Endodontics

8:30 am – Noon or 13:30 pm – 17:00 pm

Location: TBA

Fee: $275 pp: Includes half-day course and break

CE Credits: 3

Synopsis:

This presentation is designed for general dentists who wish to provide excellent endodontic care for their patients through advanced rotary instrumentation, effective irrigation and masterful obturation. The program covers solutions on how to treat straightforward and complex endodontic cases as well as a hands-on workshop designed to enhance the clinician's practical skills.

* Participants are encouraged to bring radiographs of their prior endodontic cases for review with Dr. Shapiro

** Suggested materials to bring are extracted and accessed teeth and magnification loupes

*** Buchanan 3D blocks will be made available for use

Learning Objectives:

1. Diagnose and treat emergencies
2. Access cavities
3. Negotiate, shape and clean the canal
4. Perform a warm vertical obturation in 3D

Biography:

Dr. Shapiro received his dental degree from McGill U and a post-graduate degree in Endodontics at State University of New York. He currently teaches Endodontics at McGill and lectures nationally and internationally. Dr. Shapiro also maintains a private group practice in Montréal.

Dr Stewart Shapiro, Montréal

Titre: La fine pointe de l'Endodontie

8:30 am – Noon or 13:30 pm – 17:00 pm

Lieu: à venir

Coût: 275$ pp: Inclut cours d'une demi-journée plus la pause

Crédits: 3

Synopsis:

Cette présentation s'adresse aux dentistes généralistes qui désirent administrer d'excellents soins endodontiques à leurs patients par l'usage d'une instrumentation rotative, d'une irrigation efficace et d'une obturation expérimentée. Le programme suggère des solutions pour traiter les cas endodontiques simples et complexes et offre un atelier pratique afin de mettre en valeur les compétences du clinicien.

* Les participants sont incités à apporter leurs radiographies de cas d'endodontie pour examen par Dr. Shapiro

** Les matériaux suggérés sont des dents extraites et préparées ainsi que des loupes

*** Des blocs Buchanan 3D seront disponibles pour les exercices

Learning Objectives:

1. Diagnostiquer et traiter les urgences
2. Préparer les cavités
3. Négocier, façonner et nettoyer le canal
4. Effectuer une obturation 3D verticale à chaud

Biographie:

Dr. Shapiro a obtenu son diplôme en dentisterie de McGill U ainsi qu'un diplôme d'études supérieures en Endodontie de State University de New York. Présentement, il enseigne l'Endodontie à McGill et donne des conférences à l'échelle nationale et internationale. Dr. Shapiro maintient aussi une pratique privée de groupe à Montréal.

Table Clinics / Démonstrations Cliniques

Grande place - 8th Floor / 8ičme étage

Saturday, September 20th, 2014 – 2:00 PM – 5:00 PM / Samedi le 20 septembre 2014, 14h00 – 17h00

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

	Mr. Bruce Adams	*Real time occlusal analysis: here's the App for that!*	*L'analyse d'une occlusion en temps réel: en voici l'Application!*
	Dr. Geneviève Bonin	*Computer-guided posterior maxillary and mandibular implant-supported reconstruction*	*La reconstruction implanto-portée numérique postérieure au maxillaire et à la mandibule*
	Dr. Patrick Girouard	*May the Forces be with you, in your occlusion!*	*Corps dentaire royal canadien: les conditions environnementales d'opérations*
	Dr. Michael Kaiser	*Royal Canadian Dental Corps: operational environment conditions*	*Corps dentaire royal canadien: les conditions environnementales d'opérations*
	Mr. Haim Keren, CDT	*Restoration through the use of prototypes: ensuring restorative predictability*	*L'emploi de prototypes qui assurent la fiabilité des restaurations*
	Dr. Mark McCullough	*Advances in digital dentistry*	*Les progrès en dentisterie numérique*
	Mr. Michael Schreck, CDT	*Use of photography in obtaining optimal lab communication when matching discoloured anterior teeth*	*L'utilisation de la photographie afin d'optimiser la communication avec le laboratoire pour assortir la couleur des dents antérieures décolorées*
	Dr. Peter Walford	*A new matrix for posterior resin restorations*	*Une nouvelle matrice pour les restaurations postérieures en résine*

Pre-Meeting Social Activities / Activités pré-congrès et sociales

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

The Flavours of Montréal — For everyone
Thursday, September 18 (9:15 am - 3:30 pm)
Meet in Hotel lobby

Les saveurs de Montréal — Pour tous
Jeudi 18 septembre (09H15 – 15H30)
Rassemblement dans le foyer de l'hôtel

Welcome Dinner Buffet
Thursday, September 18 (6:00 pm - 10:00 pm)

Buffet de bienvenue
Jeudi 18 septembre (18H00 – 22H00)

Exclusive Shopping in Montréal — For registrants and guests
Friday, September 19 (9:15 am – 2:30 pm)
Meet in the Lobby

Lèche-vitrine à Montréal — Activité pour partenaires/ invités
Vendredi 19 septembre (09H15 – 14H30)
Rassemblement dans le foyer de l'hôtel

Evening Group Dinner at Beatrice/Bice Restaurant
Friday, September 19 (6:15 pm - 9:30 pm)
Meet in Hotel lobby

Dîner en groupe du vendredi soir Chez Beatrice/Bice
Vendredi 19 septembre (18H15)
Rassemblement dans le foyer de l'hôtel

High Tea at the Queen Elizabeth Hotel — Activity for partners/guests
900 René-Lévesque Blvd. W.
Saturday, September 20 (2:15 pm - 4:30 pm)
Meet in Hotel lobby

High Tea à l'hôtel Reine Élizabeth — Activité pour partenaires/invités
900, boul. René-Lévesque ouest
Samedi 20 septembre (14H15 – 16H30)
Rassemblement dans le foyer de l'hôtel

CARDP PRESIDENT'S GALA

Saturday, September 20 (6:30 pm – 12:30 am)
Le Westin Montréal - Fortifications Ballroom 9th Floor

Gala du Président

Samedi 20 septembre (18H30 – 00H30)
Le Westin Montréal – Salle de bal Fortifications 9ième étage

<u>Some dining recommendations:</u>

<u>Quelques recommandations de restaurants</u>

Traduction simultanée – Simultaneous Translation

POUR PLUS D'INFORMATION ET POUR S'INSCRIRE/FOR MORE INFORMATION AND REGISTRATION: WWW.CARDP.CA

Canadian Journal of Restorative Dentistry & Prosthodontics
The official publication of the Canadian Academy of Restorative Dentistry and Prosthodontics
CJRDP
JCDRP
Journal canadien de dentisterie restauratrice et de prosthodontie
Publication officielle de l'Académie canadienne de dentisterie restauratrice et de prosthodontie

Call for Papers

Demande de communications

CARDP's Executive Board has concluded a publishing agreement with Palmeri Publishing Inc. The Academy's Journal (**CJRDP**/**JCDRP**) is published four times a year since 2008 with a circulation of 7,000. The 2014 Journal Production Schedule is accessible at http://www.cardp.ca/sitedocs/2014%20CJRDP%20Production%20Schedule.pdf

Scientific articles are Peer Reviewed. The Journal welcomes article contributions from its members, guest dentists and dental technologists as well as the dental Industry.

Editor-in-chief: Dr. Hubert Gaucher

Associate Editors: Drs. Maureen Andrea, Emo Rajczak and Dennis Nimchuk

Section Editors: Drs. Kim Parlett, Ian Tester, Ron Zokol, Yvan Fortin, Paresh Shah, Izchak Barzilay, Peter Walford, Allan Coopersmith and Mr. Paul Rotsaert

Academic Liaison: Dr. Peter Taylor

I – Scientific Articles: (Original Research Studies, Reviews, Case Reports): Please refer to these "Instructions to Authors" for details. www.cardp.ca/sitedocs/CJRDP-Guidelines-PPI-PR1.pdf%2002-12.pdf

For Case Reports please review this information: http://www.cardp.ca/sitedocs/CJRDP-Case-Report-Authors.pdf

II – Member News: Please forward any news of interest to the Profession.

III – Young Authors Awards Fund: Financial contributions to this fund will recognize a dentist with 5 years' experience or less or a graduate student in Canada, with a $1,000 award for the best published article of the year.

IV – Dental Student Award Fund: Financial contributions to this fund will recognize a dental student in Canada, who will receive a $500 award for the best published article of the year.

V – Industry News and Product Profile Articles: New dental products, technologies and Industry services are presented to readers using articles that originate from the Industry and that are identified as such. This information is contained in the above "Instructions to Authors" and in the following Journal Media Kit: http://www.cardp.ca/sitedocs/MediaKit-2014-email.pdf

If you have comments or suggestions about submissions or would like to become more involved with the Journal, please contact the Editor-in-Chief:

Dr Hubert Gaucher
hgaucher@sympatico.ca
Tel: (418) 658-9210
Fax: (418) 658-5393

L'ACDRP a conclu une entente de publication avec Palmeri Publishing Inc. Le journal de l'Académie (**CJRDP**/**JCDRP**) est publié depuis 2008 et a une circulation de 7 000 exemplaires. Il y a quatre parutions par année. La cédule de production 2014 du Journal est accessible à http://www.cardp.ca/sitedocs/2014%20CJRDP%20Production%20Schedule.pdf

Les articles scientifiques font l'objet d'une revue par des pairs. Le Journal accueille des articles de ses membres, de dentistes et prothésistes dentaires invités ainsi que de l'Industrie dentaire.

Rédacteur en chef: Dr Hubert Gaucher

Rédacteurs associés: Drs Maureen Andrea, Emo Rajczak et Dennis Nimchuk

Rédacteurs de sections: Drs Kim Parlett, Ron Zokol, Yvan Fortin, Paresh Shah, Izchak Barzilay, Peter Walford, Allan Coopersmith et M. Paul Rotsaert

Liaison académique: Dr. Peter Taylor

I – Articles scientifiques: (Recherches originales, revues, rapports de cas): Veuillez vous référer aux «Instructions aux auteurs» pour les détails. http://www.cardp.ca/sitedocs/CJRDP-Guidelines-PPI-PR1.pdf%2002-12.pdf

Pour le Rapport de cas, veuillez consulter le document suivant: http://www.cardp.ca/sitedocs/CJRDP-Case-Report-Authors.pdf

II – Nouvelles des membres: S.V.P. nous envoyer toute information pertinente à la profession.

III – Bourse pour les jeunes auteurs: Les contributions financières permettront de remettre une bourse de 1 000$ à un dentiste ayant moins de cinq ans de pratique et/ou à un(e) étudiant(e) diplômé(e) au Canada pour le meilleur article publié au cours de l'année.

IV – Bourses pour étudiant(e) en Médecine dentaire: Les contributions financières permettront de remettre une bourse de 500$ à un étudiant ou étudiante en Médecine dentaire au Canada pour le meilleur article publié au cours de l'année.

V – Nouvelles de l'Industrie et Articles publicitaires: Les nouveaux produits, technologies et services de l'Industrie sont présentés aux lecteurs utilisant des articles venant de l'Industrie et qui sont identifés comme tels. Cette information est contenue dans les «Instructions aux auteurs» ci-haut ainsi que dans la Trousse Média: http://www.cardp.ca/sitedocs/MediaKit-2014-email.pdf

Si vous avez des commentaires ou des suggestions ou si vous désirez vous impliquer davantage dans notre Journal, veuillez communiquer avec le Rédacteur en chef:

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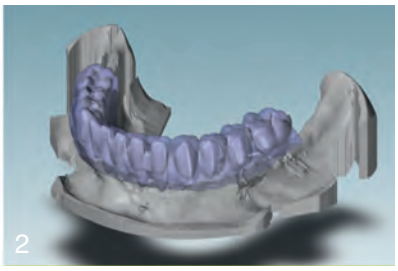

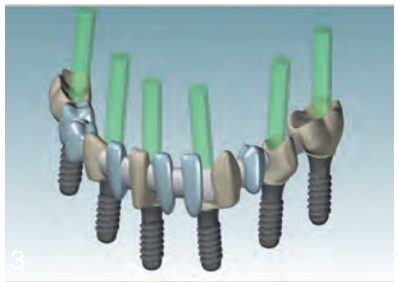

Fig. 1: Master model with fixed scan bodies ready for scanning.

Figs. 2, 3: Bridge framework designed with the visual software.

Fig. 4: Vestibular view of the framework and implant interface.

Fig. 5: Final restoration.

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