MiCD: Do no harm

Case report
Direct composite resin restoration

Technology
Wireless digital sensors
Dear Reader,

At the end of 2014, the Asian Academy of Aesthetic Dentistry (AAAD), which is the pioneer aesthetic dental organisation in Asia, held its 13th biennial meeting and scientific conference in Foshan in China jointly with the Foshan Academy of Esthetic Dentistry. During the meeting, the new executive council committee for 2014–2016 was elected, and I am honoured to have been elected as the 14th President of the AAAD.

Clinicians from Bangladesh, China, Hong Kong, Japan, Korea, Malaysia, Nepal, the Philippines, Singapore, Sri Lanka and Taiwan attended the 44 lectures of the scientific programme presented by invited speakers in various fields of aesthetic dentistry. At the conference, Chinese clinicians learnt about the growing global trends in cosmetic dentistry and participants from other countries learnt about the rapid development of China in the field of aesthetic dentistry.

An international programme of this magnitude helps to promote professional collaboration, friendship and opportunities to share knowledge and skills among clinicians and academics in the region.

With the rapid development of information and communication technology, AAAD is now planning to launch an e-learning platform to provide the most cost-effective aesthetic dentistry educational opportunities to young dental professionals in Asia. This will be developed with the active participation of member countries’ key clinicians and through joint collaboration with various like-minded professional academies, dental schools and dental experts, as well as dental companies around the world.

cosmetic dentistry being the official magazine of AAAD, I hope AAAD members will be able to put the information to full use to improve and share their clinical knowledge and skills.

In this year’s first issue, we have two exclusive articles about digital smile design and cosmetic dentistry practice philosophy and other clinical case reports. I hope readers will enjoy them, and the cosmetic dentistry editorial team looks forward to your feedback.

Yours faithfully,

Dr Sushil Koirala
Editor-in-Chief
President of the Vedic Institute of Smile Aesthetics, Kathmandu, Nepal
| content _ cosmetic dentistry |

<table>
<thead>
<tr>
<th>editorial</th>
</tr>
</thead>
</table>
| 03 Dear **Reader**  
| Dr Sushil Koirala, Editor-in-Chief |

<table>
<thead>
<tr>
<th>review</th>
</tr>
</thead>
</table>
| 06 **MiCD: Do no harm** cosmetic dentistry—Part I  
| Dr Sushil Koirala |

<table>
<thead>
<tr>
<th>special</th>
</tr>
</thead>
</table>
| 14 **Aesthetic Digital Smile Design:**  
Software-aided aesthetic dentistry—Part I  
| Dr Valerio Bini |

<table>
<thead>
<tr>
<th>technique</th>
</tr>
</thead>
</table>
| 24 **Technological innovation in professional home bleaching:** the ENA White 2.0 system in only 2 minutes per day without tray  
| Dr Luigi Leonardi |

<table>
<thead>
<tr>
<th>industry report</th>
</tr>
</thead>
</table>
| 30 **Direct resin restoration using the new** V4-Ring matrix and the new Micerium Enamel Plus HRi Function **composite**  
| Drs Francesco Simoni & Lorenzo Vanini |

<table>
<thead>
<tr>
<th>case report</th>
</tr>
</thead>
</table>
| 36 **Impression** of steeply angulated implants:  
**A new method**  
| Profs. Gregory-George Zafiropoulos & Oliver Hoffmann |

<table>
<thead>
<tr>
<th>technology</th>
</tr>
</thead>
</table>
| 40 **Wireless digital sensors**  
| Dr George Freedman |

<table>
<thead>
<tr>
<th>industry news</th>
</tr>
</thead>
</table>
| 44 **ENA White 2.0**—professional home bleaching  
| Micerium |
| 45 **Remedent NV launches major upgrade to dental marketing software**  
| Remedent |

<table>
<thead>
<tr>
<th>meetings</th>
</tr>
</thead>
</table>
| 46 **Regenerative endodontics and composite as an all-rounder**  
| Coltene |
| 48 **International Events** |

<table>
<thead>
<tr>
<th>about the publisher</th>
</tr>
</thead>
</table>
| 49 | submission guidelines  
| 50 | Imprint |

**Cover image courtesy of Lenaer**
Today, cosmetic dentistry is a $4 billion industry.

With SmileMe

you decide how much of that happens in your practice.
MiCD: Do no harm cosmetic dentistry—Part I

Author: Dr Sushil Koirala, Nepal

Introduction

The demand for cosmetic dentistry is a growing trend globally. Increased media coverage, the availability of free online information and the improved economic status of the general public has led to a dramatic increase in patients’ aesthetic expectations, desires and demands. Today, a glowing, healthy and vibrant smile is no longer the exclusive domain of the rich and famous; hence, many general practitioners are now being forced to incorporate various aesthetic and cosmetic dental treatment modalities into their daily practices to meet the growing demand of patients.

Cosmetic dentistry is a science-based art guided by the desire of the patient. Many young clinicians who plan to incorporate it into their practice are confused about what they and their patients actually wish to achieve. It is to be noted that the treatment modalities of any health care service should be aimed at the establishment of health and the conservation of the human body with its natural function and aesthetics. However, it is worrying to note that the treatment philosophy and technique adopted by many cosmetic dentists around the world trend towards macro-invasive protocols, and millions of healthy teeth are aggressively prepared each year for the sake of creating beautiful smiles.

The practice philosophy adopted by the clinic and the professional team members generally guides the overall output of the practice. Minimally invasive cosmetic dentistry (MiCD), a do no harm practice philosophy, has four fundamental components: level of care, quality of operator (dentist), protocol adopted and technology selected, which must all be respected in daily clinical practice. Adopting this holistic medical science practice philosophy is not an easy task, as it requires a change in the mindset of professionals.

In Parts I and II, I explain MiCD, do no harm cosmetic dentistry, based on my Vedic Smile concept, which I have been practising successfully in Nepal for the last 20 years, and advocating globally since 2009 as the MiCD global mission. It is to be noted that both parts are based on fundamental science (truth and available evidence), clinical experience and the common sense required in holistic dentistry. Part II of the article will follow in the next issue of *cosmetic dentistry*.

Cosmetic dentistry, a global trend

The prevalence and severity of dental decay have been declining over the last decades in many developed countries and this trend is shifting towards developing countries as well. With increased media coverage, the availability of free online information, public awareness has fuelled the demand for cosmetic dentistry globally. Now, a glowing, healthy and vibrant smile is no longer the exclusive domain of the rich and famous! The population of beauty- and oral health-conscious people is increasing every year and data from various sources shows that the coming generations of children, espe-
cially from the middle- to higher-income population, will have fewer decayed teeth and will need less complex restorative dental care as they age. These changing patterns of dental care needs will bring about a major shift in the nature of dental services from traditional restorative care to cosmetic and preventive services.

The increased market demand for smile aesthetics among patients is forcing general practitioners of today to incorporate the art and science of cosmetic dentistry into their practice. Cosmetic dentistry is not yet recognised as a separate clinical specialty like orthodontics, periodontics or paediatric dentistry. Cosmetic dentistry is synonymous with multidisciplinary dentistry, as its success and failure are related to the patient’s psychology, health, function and aesthetics. Ethical, high-standard cosmetic dentistry skill training of clinicians is essential for the increased global market of cosmetic dentistry and its promotion. It is widely seen that the treatment modalities of contemporary cosmetic dentistry are tending towards more-invasive procedures with an over-utilisation of full crowns, bridges, dentine veneers, and invasive periodontal aesthetic surgery, while neglecting long-term oral health, actual aesthetic needs and the characteristics of the patient. These aggressive treatment modalities are indirectly degrading social trust in dentistry, owing to the trend of fulfilling the cosmetic demands of patients without ethical consideration and sufficient scientific background and promoting the “the more you replace, the more you earn” or “more is more” mindset in dentistry.

Changing the professional mindset of the practising clinician is not an easy task; it is just like quitting smoking for a heavy smoker. In order to practise healthy dentistry, one must be groomed, starting from dental school education, with moral values, a high ethical standard, a positive attitude and a patient-centred practice philosophy. A student reflects the mindset of his or her teachers, and a teacher or mentor with comprehensive knowledge, clinical skills, honesty and humanity is difficult to find in today’s business-oriented dental education. I believe that knowledge should be free and skill training must be useful and easily affordable to our young practising clinicians around the world. Compromised university dental education and expensive private skill training with biased mentoring have been promoting health-compromising treatment protocols and costly diagnostic, preventive and treatment technologies. This highly business-oriented trend will promote a change in the mindset of practising clinicians to adopt more-aggressive and invasive dental treatment modalities, leading to the practice of unhealthy dentistry in the long term.

_Aesthetic versus cosmetic dentistry_

The words “aesthetics” and “cosmetic” are viewed as synonyms by many cosmetic dentists. However, it is necessary to understand the core difference in meaning. The Oxford dictionary defines “aesthetics” as “the branch of philosophy which deals with questions of beauty and artistic taste” and “cosmetic” as “improving only the appearances of something”. In dentistry, “aesthetics” explains the fundamental taste of a person concerning beauty, whereas “cosmetic” deals with the superficial or external enhancement of beauty. Therefore, aesthetic dentistry falls under need-based dental service, and is generally guided by the sex, race and age (SRA factors) of the patient. However, cosmetic dentistry, which is influenced by perception, personality and desires (PPD factors), can be categorised as want- or demand-based dental service. For example, a patient’s request to replace old amalgam restorations with tooth-coloured restorative materials can be considered an aesthetic requirement or demand. The request of an old woman for pearly white teeth and the ideal smile design is far more than an aesthetic requirement, and must be considered a cosmetic demand or requirement.

In my clinical practice, I divide aesthetic and cosmetic clinical cases into three different categories:

1. Preventive, or support based: treatment prevents or intercepts the diseases, defects, habits and other factors that may adversely affect the existing or the future smile aesthetics of the patient.
2. Naturo-mimetic, or need based: treatment is carried out to restore or mimic the natural aesthetics, bearing the SRA factors of the patient in mind, and the treatment generally enhances the health and function of the oral tissue.
3. Cosmetic, or desire based: treatment is performed to enhance or supplement the aesthetic components of the smile; hence, the treatment outcome of cosmetic treatment may not be in harmony with the patient’s SRA factors as in nature-mimetic dentistry, and cosmetic treatment
minimally invasive dentistry practice may not necessarily be beneficial to the health and function of the oral tissue.

**Practice philosophy in dentistry: The mindset**

The majority of dental schools around the world focus on teaching knowledge and skills in dental medicine that are based on contemporary dental science and art. Dental school education does not give due consideration to healthy dental practice philosophy owing to various factors, such as the right to choose one’s practice philosophy and the domination of business rather than service-oriented dental practice in the global market. However, quality and healthy clinical practice is always a dream of a good clinician, and establishing such practice requires an unbiased vision, learning and serving attitudes, and dedication from the dentist. We must understand that science and art in dentistry have no meaning if practiced by an unethical operator, who does not respect the overall health of the patient. Any scientific advancement in technology has positive and negative sides; hence, if not applied properly, it may adversely affect the profession and may become a threat.

I believe that a clinic or treatment centre must establish its practice philosophy according to its objectives. What a clinician wants and the kind of services he or she wants to deliver to his or her patients guides the clinic. Practically, the practice philosophy in dentistry can be classified into two different categories, depending on the mindset of the operator.

**Patient-centred**

Clinicians with this kind of mindset generally have a do no harm dental practice (Fig. 1). Professional honesty and humanity are the fundamental principles of such a practice. Operators with this mindset enjoy sharing their clinical knowledge and skills with their professional friends and junior colleagues to promote patient-centred clinical practice in society. This group of clinicians firmly believes in the word-of-mouth approach to practice marketing and always thinks of the patient’s long-term health, function and aesthetics. Clinicians practicing do no harm dentistry are generally cheerful, happy and healthy in their professional life.

**Financially focused**

Clinicians with this kind of mindset practice a financially focused dentistry and adopt various kinds of direct marketing approaches to sell their dentistry like a commodity in the market rather than a health care service. Practitioners in this group generally achieve a secure financial position quickly; however, it is frequently seen that they develop chronic stress, burnout syndrome, depression, frustration and professional guilt, leading to compromised health and happiness in their professional life.

**Dentistry and professional stress**

Dentistry has long been considered a stressful occupation. Dentists perceive dentistry as being more stressful than other occupations. Dentists have to deal with many significant stressors in their personal and professional lives. There is some evidence to suggest that dentists suffer a high level of occupation-related stress. A study has found that 83 per cent of dentists perceived dentistry as “very stressful” and nearly 60 per cent perceived dentistry as more stressful than other professions. Stress can elicit varying physiological and psychological responses in a person. Professional burnout is one of the possible consequences of ongoing
professional stress. The effect of burn-out, although work-related, often will have a negative impact on people’s personal relationships and well-being.12–13 Hence, dentists need to take care of their staff’s health and focus on professional happiness in daily practice.

A clinician has full right to adopt the practice philosophy that he or she prefers. However, it is always advisable to apply oneself to understanding, analysing and comparing this philosophy with others. I am very fortunate to have been brought up with the Vedic philosophy of the law of nature and the first, do no harm consciousness-based philosophy in my life at home, at school and in my society. The spiritual guidance and mentoring I received at an early age at home and school have helped me to become a professional with a firm philosophy of do no harm; hence, I started practising consciousness-based dentistry early in my career. During my 21 years of private practice, I have always experienced happiness and joy with high patient satisfaction, which has given me complete confidence and faith in my practice philosophy and the MiCD treatment protocol that I apply in my practice. Since late 2009, I have been promoting my practice philosophy and clinical protocol in South Asia, and started the MiCD Global Academy in 2012 with the help of like-minded friends, who also practise a similar kind of holistic dentistry around the world. The MiCD Global Academy has a mission to share clinical knowledge and fundamental clinical skills free of charge with all clinicians who desire to practise do no harm cosmetic dentistry for better patient care and to enhance their happiness in their professional life.

Three-way test: Questions for your conscience

Cosmetic dentists can make errors in practice in two ways, first owing to a lack of the required professional knowledge and skills, and second owing to a lack of professional honesty and humanity. The first one can be eliminated with good education and proper training, but the second one demands a total shift in mindset, with a high level of consciousness in professional ethics, attitudes and respect towards the patient’s long-term health, function and natural beauty.

I apply a simple yet very powerful test to keep myself stress-free and guilt-free and within the boundaries of professional ethics, honesty and humanity when proposing a dental treatment plan to my patient. Clinicians can apply the three-way test mentioned below just by taking a deep breath and closing their eyes for few seconds and analysing their answers (the true response that comes to mind) with professional honesty and humanity. If your conscience responds positively to all the questions, then it is advisable for you to propose the treatment plan and take up the case, but if you give negative responses to the questions, then you should rethink your proposed treatment plan to safeguard your and your patient’s long-term health, function and aesthetics using a more sensible and less destructive treatment approach.

The three-way test consists of three basic questions:

Would I use this treatment for a member of my own family in this situation?

Am I competent enough to take up the case?

Will the patient be happy with the biological, financial and time costs of the proposed treatment?

I have been using this simple test since my early days of practice and enjoying every moment of my clinical practice without any mental stress and post-treatment professional guilt. Moreover, I have found that the end-result of my case has always brought happiness to me and to my entire supporting team with high patient satisfaction. During all my MiCD international lectures, training, workshops and seminars, I always encourage my trainees and audience to enhance the quality of their operator factors (knowledge, skills, honesty and humanity) because it is the pillar of successful MiCD. It is my personal belief that, if a clinician adopts a habit of testing his or her treatment plan with the three-way test before proposing it to the patient, it can certainly help him or her to promote overall happiness in his or her practice with high patient satisfaction.
review _ minimally invasive dentistry practice

If we look carefully at the history of restorative dentistry, the word “extension” (or “invasive”) has always been a point of focus among clinicians. The concept of “extension for prevention and retention” was pronounced by Dr G.V. Black 100 years ago and it was appropriate in relation to the restorative materials available at that time. However, with the development of porcelain-fused-to-metal technology in the late 1950s, the concept of “extension for functional aesthetics” was advocated, which is still very popular in clinical practice. In the early 1980s, the concept of the “Hollywood smile” was introduced, which established the concept of “extension for cosmetics” in dentistry. In 2002, the FDI World Dental Federation endorsed the approach of minimal intervention dentistry, which has basically focused on the conservative management of carious lesions, applying the concept of “minimal extension for decay removal”. History clearly shows that, since Dr G.V. Black era to the present day, we have been applying the concept of “extension in dentistry” in the name of prevention, retention, function, aesthetic need and cosmetic desire, and caries removal. It is a clinical fact that this concept will remain the focus because each clinical situation is different, as its treatment modalities are guided by multifactorial issues such as patient factors (mind, body, behaviour and surroundings), operator factors (knowledge, skills, honesty and humanity), protocol factors (the truth, evidence, experience and common sense), technology factors (health, reliability, affordability and simplicity). The use of science and technology requires consciousness in operators and awareness in patients; hence, the operator must use his or her professional knowledge and skills with honesty and humanity to select the least invasive procedure, protocol and technology in treatment, so that extension in dentistry is always minimal, safe and healthy.

The invasiveness of procedures selected in cosmetic dentistry depends on the level of smile defect, type of smile design, proposed treatment types and treatment complexity. MiCD uses the most conservative smile enhancement procedure possible. The level of invasiveness in cosmetic dentistry can be classified into four types, namely non-invasive, micro-invasive, minimally invasive and invasive, and the treatment options, various treatment procedures and their biological cost for each are presented in Table 1. There is only one principle in selecting treatment modalities in MiCD: always select the least invasive procedure as the choice of the treatment. Treatment procedures mentioned under non-invasive, micro-invasive and mini-invasive are used selectively in MiCD.

<table>
<thead>
<tr>
<th>Treatment options</th>
<th>Treatment procedures</th>
<th>Biological cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-invasive treatment: when hard and soft tissue is not prepared during smile enhancement procedures</td>
<td>Smile exercise, Remineralisation of white spots, Oral appliances and bruxism guard, Dentures requiring no tissue preparation</td>
<td>None</td>
</tr>
<tr>
<td>Micro-invasive treatment: when hard and soft tissue is prepared at a micro-level during smile enhancement procedures</td>
<td>Cosmetic chemical treatment, such as bleaching and micro-abrasion, Cosmetic restorations with chemical tooth preparation, such as direct bonding, ultra-thin veneers, adhesive pontics and overlays</td>
<td>Very low</td>
</tr>
<tr>
<td>Minimally invasive treatment: when hard and soft tissue is prepared at a superficial or minimal level during smile enhancement procedures</td>
<td>Cosmetic contouring (teeth and/or gingivae), Cosmetic restorations with minimal tooth preparation, such as thin veneers, modified inlays and onlays, partial crowns, partial dentures, and mini-bridges, Non-extraction conventional and MiCD orthodontic treatment, Mini dental implants (small diameter), Gingival depigmentation</td>
<td>Low</td>
</tr>
<tr>
<td>Invasive treatment: when hard and soft tissue is prepared at a deeper level during enhancement procedures</td>
<td>Tooth preparation for crowns, bridge abutments and deep veneers, Orthodontic treatment with tooth extraction, Dental implants, Aesthetic surgical procedures, such as periodontal, orthognathic and facial surgeries</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 1. Treatment options, treatment procedures and biological cost in cosmetic dentistry.
MiCD treatment protocol and clinical technique

Minimally invasive dentistry was developed over a decade ago by restorative experts and founded on sound evidence-based principles. In dentistry, it has focused mainly on prevention, remineralisation and minimal dental intervention in caries management and not given sufficient attention to other oral health problems. For this reason, I developed the MiCD concept and its treatment protocol in 2009, which integrates the evidence-based minimally invasive philosophy into aesthetic dentistry in the hope that it will help practitioners achieve optimum results in terms of health, function and aesthetics with minimum treatment intervention and optimum patient satisfaction. The MiCD concept and treatment protocol are explained in an article titled “Minimally invasive cosmetic dentistry—Concept and treatment protocol”; hence, in the current article, I only discuss the MiCD core principles (Table 2). MiCD treatment protocol and clinical technique briefly (Fig. 2).

MiCD clinical technique: Rejuvenation, restoration, rehabilitation and repair

The MiCD clinical technique focuses on the aesthetic pyramid of the Smile Design Wheel (Fig. 3). Aesthetic components in dentistry are divided into three broad groups:

1. macro-aesthetics,
2. mini-aesthetics; and
3. micro-aesthetics.

Each aesthetic group deals with different smile aesthetic components (Table 3) and each component must be harmonised at the end of treatment. According to the smile defect and patient’s desire, there are four different techniques in MiCD to enhance smile aesthetics:

1. Rejuvenation: to rejuvenate in MiCD is to enhance smile aesthetics with minor modifications in tooth position, colour and form, also known as the MiCD ABC principles, namely align, brighten and contour (Figs. 4-9):
   - Align: minor discrepancies between the facial and dental midlines are acceptable in many instances. However, a canted midline would be more obvious and therefore less acceptable in cosmetic dentistry. Similarly, the disharmony in natural progression of axial inclination or the degree of tipping of anterior teeth affects the aesthetic outcome of a smile. The correction to the midline and axial inclination progression, and necessary changes to anterior tooth position are carried out using cosmetic orthodontic procedures with fixed or removable aligners. Once the anterior teeth are in an aesthetically acceptable position, the aesthetic concerns of the patient generally shift towards the colour enhancement of the dentition. It is to be noted that a well-aligned tooth generally requires no or less tooth preparation during tooth contour (shape and size) modification. This helps the clinician to achieve aesthetic smiles with micro- or minimally invasive procedures with a very low biological cost.
   - Brighten: tooth bleaching or colour modification in MiCD is carried out once teeth are in acceptable alignment but before the tooth form is modified. The level of tooth colour modification depends on the quality of the existing colour of the dentition and the patient’s desire. Home and office bleaching are popular methods for modifying tooth colour. However, in some cases, procedures such as remineralisation, micro-abrasion, walking bleach and thin enamel veneers are used.
   - Contour: a contour is an outline of the shape or form of something. In dentistry, cosmetic contouring entails reshaping teeth or gingivae to an aesthetic form. Cosmetic contouring can be performed in two ways, additive and subtractive. Additive cosmetic contouring entails changing the tooth form using tooth-coloured restorative materials, such as a resin

Table II MiCD core principles.

Table III Aesthetic components and smile design parameters.
review minimally invasive dentistry practice

1. **Smile self-evaluation**
   - Rating: Good, Satisfactory, Compromised

2. **Smile HFA grade**
   - Rating: Normal, Compromised A, Compromised HFA

3. **Aesthetic category**
   - Rating: Micro, Mini, Macro

4. **Treatment complexity**
   - Rating: Simple, Moderate, Complex

5. **Proposed treatment**
   - Rating: Accepted, Modified, Changed

6. **Established outcome**
   - Rating: Improved, No-change, Deteriorated

7. **Enhancement category**
   - Rating: Preventive, Nature-mimetic, Cosmetic

8. **Biological cost**
   - Rating: None, Very low, Low, High

9. **Exit remark**
   - Rating: Excellent, Good, Satisfactory, Below satisfactory

10. **Clinical success**
    - Rating: Excellent, Good, Satisfactory, Needs improvement

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**Ten areas Rating**

<table>
<thead>
<tr>
<th>Area</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Smile self-evaluation</td>
<td>Good, Satisfactory, Compromised</td>
</tr>
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<td>Accepted, Modified, Changed</td>
</tr>
<tr>
<td>6. Established outcome</td>
<td>Improved, No-change, Deteriorated</td>
</tr>
<tr>
<td>7. Enhancement category</td>
<td>Preventive, Nature-mimetic, Cosmetic</td>
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<tr>
<td>8. Biological cost</td>
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<tr>
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</tr>
<tr>
<td>10. Clinical success</td>
<td>Excellent, Good, Satisfactory, Needs improvement</td>
</tr>
</tbody>
</table>

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**Conclusion**

In order to practise do no harm cosmetic dentistry, a clinician requires the desire, passion, dedication and will-power to become an honest professional with humanity because honesty and humanity are the pillars of do no harm cosmetic dentistry, since the mind controls all other practice factors. The clinician must understand that honesty and humanity are not scientific like knowledge and skills, which can be learned, copied and applied immediately in the practice. Honesty and humanity are inner qualities of a person and are deeply related to the level of a person’s consciousness, which are generally expressed as habits and attitudes. Therefore, we need to learn these qualities at home and school, and from the profession and society.

Self-evaluation and the realisation of the level of inner happiness that you obtain through your daily professional work are vital to understanding and beginning to practise do no harm cosmetic dentistry in your practice.

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**Editorial note:** A complete list of references is available from the publisher.

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**Table IV**

- **Smile self-evaluation**
- **Smile HFA grade**
- **Aesthetic category**
- **Treatment complexity**
- **Proposed treatment**
- **Established outcome**
- **Enhancement category**
- **Biological cost**
- **Exit remark**
- **Clinical success**

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**Figures**

Fig. 15a

Fig. 15b

Fig. 15c

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**_about the author_**

Dr Sushil Koirala is the Chairman of and chief instructor at the Vedic Institute of Smile Aesthetics. He maintains a successful private practice in Kathmandu, Nepal. He can be contacted at drsushilkoirala@gmail.com.

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**_Summary_**

After completion of any MiCD clinical case, the patient’s overall satisfaction and the clinical success must be evaluated. In order to evaluate clinical cases comprehensively and practically, in the MiCD protocol, a clinician is advised to always summarise his or her cases under the ten areas listed in Table 4, called the MiCD summary ten.
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Introduction

The concept of aesthetics has been explored by various authors and discussed by eminent philosophers. While their definitions are subjective, they all agree on the natural origin of the term. For this reason, I believe that the real objective of aesthetic dentistry must be imitating nature, which is so simple to perceive yet so difficult to copy, particularly as regards the aesthetics of the lower third of the face. The skill and visual perception of the dental team are essential in pursuing this goal, and the dentist acts as architect and artisan of the oral and periodontal tissue by moulding the physiology of the smile.

Smile designer: A new means of communication

Dental surgery is increasingly being forced to adopt a multidisciplinary approach to treating the face and smile, in which the dentist plays an influential if not primary role. A balance between the teeth, inter-oral and perioral tissue, face, smile and person creates an aesthetic ideal, and synergises the artistic capacities and the expertise necessary to see the design in the context of the face. Today aesthetics is increasingly linked to measure, proportion and symmetry, which were all already present in ancient civilisations but today have been considerably perfected by the digital age. Modern scientific knowledge puts at the disposal of professionals various therapeutic options. This along with collaboration between different specialists (orthodontists, implantologists, periodontologists, dental technicians, maxillofacial surgeons, plastic and cosmetic surgeons) and the above-mentioned goal enable a treatment plan to be
developed with ever-greater precision (Fig. 1). Furthermore, images captured at locations far away and viewed via video conferencing using Skype, for example, give the dentist the role of the conductor of an orchestra and provide him or her with a new way of working together with other professionals.

Digital dentistry requires that one follow precise protocols in order to obtain a standard, predictable result that corresponds to an optimal clinical result (virtual planning) in an ergonomic manner and with a high level of quality. Today, the use of 2-D and 3-D software for photograph editing and digital image editing allows us to process data and customise parameters for each specific clinical and aesthetic requirement of the smile makeover. Modern digital technology along with the experience and aesthetic sensitiveness of the dentist, which are fundamental to the success of smile design, offers greater predictability for the patient, as regards both the final aesthetic results and the course of therapy agreed upon.

Figs. 4a–d. Front view and lateral views at 45 and 90 degrees.

Fig. 5a. Face Analogic Transfer Support.
Fig. 5b. Transfer of analogue measurements to digital calliper.
The combination of terms such as "aesthetic dentistry", "interdisciplinary vision", "digital dentistry" and "predictability" led me to consider that today a new professional figure might be created: the smile designer, whose fundamental role would be communicating with the patient and the aesthetics medical team, whose members are crucial in virtual planning.

My ideal would be to have at my disposal a single instrument that would serve the purpose of the smile designer.

Using various software platforms, I have pursued the development of a protocol for Aesthetic Digital Smile Design (ADSD) to be used alongside other important diagnostic elements useful for diagnosis and prognosis, ultimately to improve the health and well-being of the patient. Furthermore, it is advisable to obtain prior consent regarding the aesthetic treatment to be undertaken using real clinical models, such a mock-up, since this is also a predictable method of simulating the aesthetic treatment plan. It is useful to recall here the forensic dentistry provides that the dentist is obliged to comply with three fundamental principles in carrying out his or her profession: prudence, diligence and technical expertise.

ADSD method and protocol

Further to what has been said above, ADSD should first be an instrument to improve communication with the patient by showing the patient detailed images. On the monitor, the before and after photographs allow an index of predictability and point of comparison with the patient himself or herself. A milestone is the innovation of aesthetic clinical planning in aesthetic dentistry and prosthetic dentistry relating to dental technical analysis and planning, which, among other things, can be integrated into diagnosis and planning for plastic and maxillofacial surgery (Fig. 2).

The protocol first requires the acquisition of full-frame digital images and videos of the patient. Video especially is capable of capturing the dynamic phases of the smile linked to its physiology (mimicry, phonetics, relationship between the teeth and lips). Importing this vital data into the digital clinical file of the patient is complementary to the anamnesis because it is an integral part of the intra- and extra-oral objective examination, and will subsequently be the subject of aesthetic analysis according to the main guiding principles. Therefore, we could define this as the third part of the methodology, which we will call analytical processing, during which the aesthetic composition of the smile, the determining morphological features of the face and smile, including the fundamental points of reference to be
obtained from software such as face makers, will be mapped and processed.

The next phase in digital data processing is virtual planning by means of digital image editing: wax-up, digital and analogue diagnosis, mock-up, and provisional and definitive restorations. The digital methodology used for photograph and image editing is very reliable, especially in communicating through images the ongoing clinical case to dental laboratories concerning functional and morphological adjustments, which is made even easier if accompanied by explanations and verbal comments. Compatibility with other digital systems is very important, for example being able to implement ADSD in digital orthodontic simulations, digitalisation of casts, CAD/CAM, etc., thus adding to the methodology.

Acquisition and import of digital images

As stated earlier, the first phase of ADSD entails the acquisition and import of photographs of the patient. If possible, these photographs should be taken with a digital SLR camera with semi-professional features and with a good illumination system (nowadays there are a number of basic dental photography courses and books available dealing with this fascinating subject). We must remember that in the analytical phase the photograph is a clinical and aesthetic diagnostic element that will form part of the patient’s clinical history, which can be consulted by other specialists to establish an interdisciplinary vision. In view of this, the dentist/photographer must capture the photographs with the patient’s head in a position that can be replicated in the future to verify topography in relation to smile design. The
most reliable position in which to photograph the patient's face is that relative to the aesthetic plan (Fig. 3), that is the plane perpendicular (frontal) to the plane that runs at the centre of the angle formed between the Frankfort horizontal plane and Camper's plane. The same position must be projected orthogonally at 45 and 90 degrees (Figs. 4a–d) because photographs of the profile are of great importance in the aesthetic dental and facial analysis of the profile in relation to occlusal class, the relationship between the lips, and aesthetic angles, according to studies in orthodontics, maxillofacial surgery and cosmetic plastic surgery.

ADSD imports the measurements of the photographed subject standardised and configured to the scale of values expressed in pixels, the ordinary unit of measurement of a digital photograph. In order to do this, it is possible to use technical drawing tools, such as set squares and rulers (made of metal if possible and thus easily cleaned and capable of being sterilised, or other similar material). I have personally built a measuring tool called Face Analogic Transfer Support (Fig. 5a), which consists of a ruler with graduated millimetre and centimetre scales, which the patient can wear like a pair of glasses. Furthermore, for new photographs for the fabrication of mock-ups and PMMA models etc., it is useful to use a device such as a craniostat fixed to the headrest, which is integrated into our dental chair. If more accurate and detailed measurements of the teeth and gingival parameters are required, one can use digital callipers whose tips are placed at the cervical margin and incisal edge (the length of the tooth) or at the mesial and distal margins relative to the dental line (width of the tooth; Fig. 5b). These measurements when transmitted can be very effective in communication between the dentist and dental technician, whose manufacturing skills and expertise will be the most important to the end-result of this innovative method (Fig. 5c). It is necessary to bear in mind that the measurements expressed in millimetres in relation to the digital image produced by the digital processing, as well as the design of the dental contours, are not of much interest to patients, who desire a photograph of the first phase simulation, but
the measurements represented as 3-D wax models and mock-ups tried in and analysed in the patient's mouth will give you an idea of the delicate psycho-aesthetic approach to the clinical case very important for aesthetic dentistry.

**Aesthetic analysis of a face and a smile**

In relation to the manner in which to portray the patient in a photograph, we should reflect on the aesthetic component of the face and the smile. For the objective aesthetic analysis, the focal length is modified, starting from the first photograph (Fig. 6). For this parameter, the following classification criteria could be applied:

- _macro-aesthetics (extra-oral analysis of the face);
- _mini-aesthetics (extra-oral analysis of the mouth);
- _micro-aesthetics (intra-oral analysis of teeth and gingiva).

As regards the aesthetic analysis of the smile, the specific areas of the objective analysis that are pertinent to dentistry are as follows, based on that provided by a number of many authors:

- **Facial analysis**: Frontal/lateral, determining morphological features, horizontal/vertical reference lines, vertical/horizontal facial proportions, golden ratio, horizontal/vertical dimensions, analysis of the facial profile, and analysis of the lips, nose and eyes as regards position and size (Fig. 7).
- **Dental analysis**: Dental composition, dental arrangement and position, dimensions, proportions, shapes, contours, margins, textures, surfaces, axial inclinations, inter-incisal angles, interproximal contacts and colour (Fig. 8).
- **Dento-labial analysis**: Labial dynamics, smile line, width of smile, labial corridors, occlusal plane, mid-line, and inter-incisal and commissural lines (Fig. 9).
- **Phonetic analysis**: This is complementary to the dento-labial analysis and involves the recording

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**Figs. 13a–f** Virtual modelling of dental forms with DDID.
of the phonetics with particular attention to consonants and their combinations. In addition, the analysis of the phonemes "fm" and "lj" (sometimes also the phoneme "lf") is of great importance for detecting and determining the position of the lips and the maxillary incisors relative to the age and sex of the subject being analysed. Furthermore, it is important to bear in mind the extent to which the central incisors are the visual focal point of the smile architecture.

**Gingival analysis:** Architecture, shape parallelism, symmetry, zenith, papillae, biotype and colour (Fig. 10).

In general, it can be stated that considering all of these very important values and parameters in detail requires comprehensive planning and competence that cannot be contained in only a few lines. These have been scientifically established by a number of authors and further information can be found in books and scientific articles.

**Dental digital image editing**

Digital image editing can be performed in various ways (Fig. 2) according to the requirements of the smile designer and with various software packages (both freeware and for purchase) easily obtained from the Web. Their main use includes generic image and photography editing for both amateur and professional graphic designers. Some of the packages available have been developed by dentists. An important contribution to these packages is offered by some authors, who through the use of Keynote (a presentation application developed by Apple for Mac OS X and iOS) have made smile design easier with results that provide a schematised dental design with real outlines.

In addition to Digital Dental Design (Figs. 11a & b), ADSO offers important processing functions: the import, conversion and editing of dental shapes and types of dentition in the form of real images. In order to carry out these important functions, it is necessary to create a real dental library, which we shall call the Digital Dental Photos Database (DDPD). This might include:

- **Dental shape library**, which might be the best form of database, in which five types of dentition could be captured relative to anatomical form and possibly colour according to the quality and amount of light in the photograph as observed by the operator. The photographs of the teeth in this library should be taken at a frontal projection, and at 45 and 90 degrees laterally, that is a profile, so that they can be...
special digital smile design

I incorporated into the photographs and images of the patient in ADSD. The dental shapes contained in the library must correspond to nature itself, such as triangular, oval or rectangular with variables, like square or trapezoidal (Fig. 13f).

Libraries of dentition containing aligned and aesthetically ideal complete mouths: There are some libraries, such as that of Digidend, in which the teeth are already preformed according to the morphology of the incisal edges (flat, square and round).

Personal case reports database, that is the collection of our clinical cases concerning the fabrication of prostheses, aesthetic dentistry, virtual wax-ups, mock-ups and the healthy dentition of patients (with their permission). Dental technicians in laboratories could also exchange data thanks to the goodwill of colleagues who supply them with images. An ADSD images community would be of great scientific advantage. This library should consist of images of complete and partial dental arches (eight anterior teeth, six anterior teeth). These might be single maxillary arches, the primary object of smile design, or maxillary and mandibular arches with normal occlusion (useful for partially or totally edentulous patients). The images might also contain the gingiva according to photographic requirements; indeed, they may be integrated as a whole into the virtual oral cavity or else one might isolate single teeth (Fig. 12) in order to be able to adapt them according to shape, alignment, emergence, ideal contour and contact points respecting the aesthetics.

Dental libraries of removable prostheses: These are available on the Web from leading companies in the industry, such as Ivoclar Vivadent, Heraeus Kulzer and Candulor.

Smile library, consisting of photographs with faces of models smiling, which can be useful if in high resolution. The teeth can be selected and extrapolated from the face of the subject, generally photographed by professional photographers. These images can be downloaded from stock photography sites at a fee (such as 123RF.com, Fotolia.com, Shutterstock.com and Fotosearch.com).

Another very important feature of this method of smile design is Digital Dental Image Distortion (DDID; Figs. 13a–f), which allows the modification of the morphology of the teeth to be processed. This function is of great utility for the formation of the teeth in the DDPD. It must be applied to length and width (Figs. 14a–c), as well as in every direction both along the contours and on the dental surfaces, and especially along the lines of transition. This processing is often very useful for light reflected on the dental surfaces characterised by micro- and macro-textures, and is effective in the analysis and processing of the interproximal contact points and inter-incisal angles. Moreover, it is effective in the morphological classification of the incisal edges, transitional lines, etc., often reference points specific to the age, sex and personality of the patient (morphopsychology). From my point of view, this part of dental digital image editing is the most important because it is not possible to give a prefabricated smile to a patient; while such a smile might be made up of teeth that are in themselves perfect, it is necessary to know how to modify, model, shape, deform, increase, diminish or eliminate everything in contrast with the harmony of form (Figs. 15a–e).
In many aesthetic clinical cases, it is useful to perform Digital Dental Calibrated Transposition (DDCT), a transposition of the teeth necessary for the simulation of orthodontic movements, some of which apply to the situation prior to aesthetic treatment, prosthetic treatment, implants, etc. (Figs. 16a & b). The transposition must be calibrated, that is must move the teeth into the desired position and maintain the measurements and anatomical dimensions. This makes it easier to calculate more predictably the future dental composition, not only aesthetically but also functionally, as well as the relative spacing (mesialisation/distalisation) necessary for the insertion of the prosthetic implant. It gives important feedback for the implantologist, prosthetist and orthodontist, with all of whom it is necessary to communicate radiological findings (DICOM and Tac3D—the latter is compatible with ADSD). Only after having decided on the final positioning of the teeth can the smile designer pay greater attention to the improvement of the aesthetic aspects by further modifying the images with DDID. The same is true for the integration of the orthodontic simulation data from sophisticated applications such as ClinCheck (Align Technology), which can be implemented in the virtual planning towards an integrated aesthetic and prosthetic solution to an orthodontic problem (Figs. 17a–d).

Editorial note: This is the first of a two-part article based on a paper presented by Dr Valerio Bini to the 15th International Congress of Aesthetic Medicine in Milan in October 2013 during the session titled “Aesthetic dental surgery of the lower third of the face.” Part II of the article will appear in cosmetic dentistry 1/2015.

Valerio Bini, DDS, graduated from the University of Genoa in Italy. He is a specialist in prosthodontics and aesthetic dentistry. He has presented papers at international conferences on aesthetic dentistry and aesthetic medicine, and is the author of many articles published in national and international journals. Dr Bini is a member of the European Society of Cosmetic Dentistry, a fellow of Società Italiana di Estetica Dentale (Italian society of aesthetic dentistry) and a fellow of the Italian Academy of Esthetic Dentistry. He is Invisalign certified. Dr Bini may be contacted at info@studio-bini.com.

_Figs. 17a–d_ Implementation in ClinCheck, ADSD.
2 minutes instead of 6/8 hours per day

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Patent Pending
Technological innovation in professional home bleaching: the ENA White 2.0 system in only 2 minutes per day without tray

Author: Dr Luigi Leonardi, Italia

Introduction

The desire for whiter teeth has considerably increased in the last few years. The demand for tooth bleaching as a cosmetic treatment is increasing more and more, despite the recession, which only marginally affected aesthetics and cosmetics.

Nowadays, we live in a world where appearance is extremely important in any field; according to independent studies conducted for the American Association of Cosmetic Dentistry:

99.7 % of Americans are convinced that a bright smile is an important social factor;

96 % of adults are convinced that an unpleasant smile may have a negative influence on career opportunities.

74 % of adults think that an unpleasant smile may have a negative influence on career opportunities.

We are also aware that the desire of having a bright smile with white teeth has existed for centuries, but the research in this sector has only stepped notably forward during the past few decades.

This happened especially at the end of '80s, thanks to Dr Eyneman and Dr Aiwood,1–4 who conceived the idea of home bleaching treatment with the use of the well-known bleaching trays, customised or not, adequately filled with low-percentage hydrogen peroxide and worn for some hours a day or even all night long.

Afterwards, the companies of the dental field worked hard to improve these procedures, such as designing pre-filled trays or changing the flavour of the gel. The method is substantially the same, only the percentage of hydrogen peroxide (also available as carbamide peroxide) may vary from 10 % to 30 %.6–7 This influenced the contact period, which is at least from a couple of hours a day (for percentages that are only allowed for cosmetic bleaching) to all night long. All of them start from a single assumption: the bleaching action of peroxide needs a variable contact period to penetrate through the enamel prisms and the dentinal tubules, releasing active oxygen and allowing the free radicals to attack the chromophobe particles and reach the desired effect.9

Materials and methods

After years of attempts and experimentations used to improve the current methods and the result, I have managed to refine a new method,
making it easy and above all reducing the daily duration of the treatment to only two minutes instead of 6–8 hours of the traditional cosmetic home bleaching: I have optimised the method in an extreme way. After several tests, I deduced that peroxide, if activated by a special accelerator (XS 151) could penetrate in a faster way, exploiting the action of mechanical pressure generated by a special toothbrush with nozzle-doser and a dispenser filled with DHJ 1/10.

### Table I

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<th>GROUP 1</th>
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**Total in red: suspended treatment** 50%

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**Total 90 %**
This special bleaching toothbrush has been designed with a smaller head if compared to the most common toothbrushes in order to reduce the contact with oral mucosa.

Soft blunted bristles activate the accelerator (XS 151) contained in the gel while brushing and guarantee a faster absorption of the bleaching gel; it also improves the procedure by drastically reducing the application time: from 6–8 hours to two minutes per day! The advantages are amazing, because reducing the contact period means reducing enormously the undesirable effects: inflammation of soft tissues, hypersensitivity, risk of swallowing the gel and so on. There is also an improvement of some psychological aspects, due to the need of wearing the tray for hours or all night long with interferences with normal interpersonal relationships both in private life and at work.

The new method, as said before, considers reduced application times of about two minutes per day; it is easy to understand how this can encourage the user to apply tooth bleaching. The average total contact period of the whole treatment is less than one hour (two minutes for 20 days). This corresponds to less than one-fifth of the time that a single application with the tray technique takes, which is currently the most common mode. Furthermore, this special toothbrush with dispenser is extremely easy to carry thanks to its pocket-size and can be used for one minute in the morning and one minute in the evening anywhere, after one’s usual oral hygiene routine. The treatment lasts about 15–20 days on average, and this duration is sufficient to obtain an excellent result, achieving a reduction of 1–2 chromes of the VITA shade guide depending on the subject with a minimum commitment. Wherever you want, whenever you want: you can choose the place and time of application, which makes it different from other methods. The here-analysed method respects all the recent UE laws about the use of hydrogen peroxide as a cosmetic bleaching treatment, accepting a maximum percentage of 6%, specifying that the bleaching kits must be delivered to the user only by the dentist as a professional treatment, after an accurate visit and the evaluation of each single case.

It is also important to underline that advice and protocols are the fundamentals of what has been stated so far. First of all, the dentist must undertake thorough plaque removal, advise the patient about correct oral hygiene use, which means brushing the teeth with adequate toothpastes with special characteristics, for example, the Enamel Plus toothpaste, which has a low abrasion formula and desensitising action: this enhances and maintains the bleaching effect reached with this system. It is also important to limit the consumption of food with a high acid pH, such as citrus fruit, tomatoes, tea, tobacco etc, in order to preserve the achieved result. We also recommend to schedule regular visits with your dentist in order to monitor the condition of teeth and mucosa and point out any irritation or inflammation of mucosa; repeat the bleaching treatment regularly to maintain the results, considering that the repetition of this method decreases the undesirable effects thanks to the limited contact period of 1 hour maximum for the whole complete treatment of about 15–20 days, in comparison to the 120–150 hours or more of the traditional bleaching with tray method.
Comparative analysis with traditional bleaching systems

We carried out a comparative study performing 20 bleaching treatments in the same period: 10 cases were treated according to the traditional technique with tray and 6% hydrogen peroxide, and the other 10 patients with ENA White 2.0. The patients were aged between 25 and 55, and were divided into three age groups.

The first group were treated with bleaching trays and 6% hydrogen peroxide:

- Five were satisfied with the result;
- Three were not satisfied with the treatment and decided not to extend the treatment of a further 15–20 days;
- Two abandoned the treatment because they considered the application times to be too demanding; they didn’t have time to carry out the treatment as it clashed with their hours of working and/or because they felt discomfort and annoyance wearing the tray at night.

The inconveniences reported during the bleaching treatment with tray include the fact that in some cases, it was very difficult or even impossible to keep the tray in the mouth—which has a recommended time of action of several hours or all night—due to illness, for example flu, bronchitis with coughing fits, also with phlegm and colds. This was a further complaint that sometimes contributed to demotivate the user in such a decisive way as to suspend the treatment.

The second group of 10 people who used the new system ENA White 2.0 proposed by me:

We could verify the total satisfaction in nine subjects, only one of them was not completely...
industry report _ professional home bleaching

satisfied because he expected a more evident effect and did not want to extend the treatment.

With regard to motivation, all of them showed a huge satisfaction, especially for how the kit had been introduced, considering it as very innovative, handy and with no limits of use. For the result details of this comparative analysis, please see Tables 1 and 2.

_Clinical cases_

The case report in the pictures shows a 30-year-old male with an apparently optimal health condition, who was unhappy with the discolouration on the central and upper- and lower-lateral teeth near the cervical area. After an objective examination of the oral cavity, the subject showed a normal gingival biotype, good gingival health and good oral hygiene. For the verification of the initial and final colour (hue and croma) I used the VITA shade guide, starting from A3 (Fig. 2).

After a session of professional prophylaxis I proposed to the patient the bleaching treatment Ena White 2.0 and advised him to perform it after his oral hygiene routine in the morning and in the evening. When he realised how easy the system was to use, he immediately accepted the treatment that I explained, as shown in the pictures. First of all you show the patient how to open the toothbrush by unscrewing the cap (Fig. 3a). Then the head of the brush must be unscrewed too (Fig. 3b) to remove the seal from the base of the toothbrush (Fig. 3c). After screwing the final part of the toothbrush on the dispenser again (Fig. 13d), you must rotate the ring on the base of the toothbrush anti-clockwise towards the direction ‘UP’ until the bleaching gel comes out (Fig. 13e). For the first application, a couple of rotations are required, until the tube is filled up to the bristles. Explain to the patient that for the following applications it will be sufficient to rotate the ring of 2–3 marks to obtain the needed quantity of gel, like a small lentil, as shown in the picture (Fig. 13f).

You can notice the evolution of the bleaching action in pictures from Fig. 4 to Fig. 11, where you can appreciate the final result of the treatment.

Fig. 4 Check after 4 days.
Fig. 5 Check after 7 days.
Fig. 6 Check after 10 days.
Fig. 7 Check after 12 days.
Fig. 8 Check after 16 days.
Fig. 9 Check after 21 days.
Fig. 10 Check after 28 days.
Fig. 11 Check after 35 days.
the chromaticity at the end of the treatment corresponds to A1 of VITA shade guide.
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after 35 days with a shade corresponding to A1 of VITA shade guide. Halfway through treatment, a lighter chromaticity, almost equal to A2 of VITA shade guide, had been achieved, as shown in Fig. 9 (this is case No 13 in the statistic table).

The second case (No 15 of the statistic table) shows a 25-year-old female patient who was not satisfied with a bleaching treatment performed with a tray six months before, which irritated her gums. With the new treatment, she reported no discomfort and appreciated the result, as you can see in the pictures she changed from shade A3 of VITA shade guide (Fig. 12) to shade A1 (Fig. 14) in about 20 days (after 10 days, the result was already equal to A2 (Fig. 13).

_Conclusion_

Dental discolouration is an important factor of psychological discomfort for the patient, which leads to an increase in cosmetic bleaching requests. The new method explained here makes the bleaching procedure easier, considerably reducing the side effects that can appear with other techniques, thanks to the shorter contact period between gel and tooth.

This method allows to reach very satisfying results and produces a growth in the request of bleaching from the patient: this is attributable to both the time which is reduced (2 minutes a day) thanks to the special accelerator XS 151 contained in the hydrogen peroxide gel, which activates while brushing, and its portability, which means it can be performed anywhere and not exclusively at home, thanks to the new pre-filled brush.

_I also thank my son Marco for supporting me during my work with his knowledge in the chemical and pharmaceutical field, acquired with his degree in CFT and the doctorate at Madrid Complutense University._

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Direct resin restoration using the new V4-Ring matrix and the new Micerium Enamel Plus HRi Function composite

Authors: Drs Francesco Simoni & Lorenzo Vanini, Italy

Introduction

In restorative dentistry, as in all dentistry fields, in order to obtain a correct diagnosis it is essential to perform a proper clinical analysis, to take at least bite wings X-rays or preferably full mouth X-rays and to use a magnification system.1

Once a correct diagnosis has been obtained, the first treatment phase is to eliminate gingival inflammation by teaching the patient proper oral hygiene methods, followed by simple scaling, or complete non-surgical periodontal therapy.2 It is then possible to proceed with the removal of the carious lesion.

This paper describes the most important steps in performing a correct class II restoration using the new V4-Ring matrix and the new Enamel Plus HRi Function composite (Micerium).
Case study

After careful clinical and X-ray examination of the tooth decay on the second upper left premolar (Figs. 1 & 2), we carried out a local anaesthesia with articaine 1:100,000. Before proceeding with the removal of the carious lesion, the adjacent tooth must be protected with a matrix and a wedge (Fig. 3). The access to the cavity is then provided and a rubber dam is placed. Once the operative field has been isolated, the decay is removed first by using a medium-grained diamond bur mounted on a red ring hand piece (Fig. 4) and then a round (rosette) bur on a blue ring hand piece (Fig. 5). The preparation of the cavity is finished with a fine-grained diamond bur on a red ring hand piece (Fig. 6) and with a red rubber on a blue ring hand piece (Fig. 7). In order to optimise the preparation of the cavity at the marginal level metal strips are first used (Fig. 8) followed by paper strips (Fig. 9).

Once the preparation is finished the matrix V-Ring 4 is placed (Figs. 10 & 11) using the pin...
industry report  direct resin restorations

tweezers, which are placed in the hole on the matrix itself making insertion easier (Fig. 11). After checking proper assembly, the wedge and the transparent tines of the V4-Ring are inserted (Figs. 12–15). This allows light to pass through for 360° polymerisation.

After the matrix has been positioned, ENAetch is applied for 30 seconds evenly with a brush to distribute the etching agent (Figs. 16 & 17), and the area is washed with water for 30 seconds and with 0.2 % chlorhexidine digluconate (Fig.18). Ena Bond is then applied for 60 seconds (Fig.19). It must be polymerised for 40 seconds (Fig. 20) and at the end ENAseal is brushed on for 30 seconds (Figs. 21–22). Finally the cavity is polymerised again for 40 seconds (Fig. 23).

Every step has to be done properly, from carious lesion removal to cavity surface finishing. Any approximation may compromise long-term outcome and restoration aesthetics. With adhesive techniques it is mandatory to respect all protocols in order to prevent secondary tooth decay and ensure a long lasting restoration.
Once the adhesive step is finished, the interproximal wall is built up with Enamel Function 2 (Fig. 24) and finally, due to the new V4-Ring matrix special design, it is possible to polymerise the buccal, palatal and occlusal aspect of the composite reconstruction.

Once the restoration has been completed with Enamel Plus HR/ Dentine UD3 and Enamel Plus HR/ Function EF2, the fissures are characterised with Stain brown 2 and the marginal ridge with Intensive White.10, 11

After modelling, the restoration is finished on the interproximal level with paper strips. An occlusal check (Fig. 25), X-ray control (Fig. 26), and careful polishing are mandatory. A well-polished restoration is less likely to attract plaque adhesion, and is more respectful of periodontal tissues, while also maintaining better aesthetics over time (Fig. 27).3–12

References
1. Ricci G. Chapter 1 Diagnosis from the book “Periodontal Diagnosis and Therapy” Quintessence 2012.
2. Ricci G. Chapter 2 Non Surgical Periodontal Therapy from the book “Periodontal Diagnosis and Therapy” Quintessence 2012.
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Fig. 20  _Polymerisation for 40 seconds.
Fig. 21  _ENAseal for 30 seconds.
Fig. 22  _ENAbond and ENAseal, Micerium.
Fig. 23  _Polymerisation for 40 seconds.
Fig. 24  _Enamel Plus HR/ Function 2 Micermum.
Fig. 25  _An occlusional check.
Fig. 26  _An X-ray check, note the maximum integration of restoration.
Fig. 27  _Occlusal view of restoration.


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In the present case report, a new method that allows impression taking of implants inserted at a steep angle is presented. The use of implants for the rehabilitation of the partially or fully edentulous patient has become a routine treatment modality. Improvements in the field of implant surgery and in implant prosthetics allow for functionally and aesthetically satisfying treatment results in the vast majority of cases. However, implants may have been placed at an incorrect angle or in excessive...
proximity to another tooth or the natural teeth. Although rather rare, these situations render impression taking and the consequent restoration of the placed implants difficult. In the present case report, a method to allow for treatment in such a situation is described.

**Case report**

A 60-year-old male patient reported to our office for restoration of two implants placed in regions 29 and 30 three months earlier at a different office (Fig. 1).

According to the records obtained from the previous treating dentist, a surgical guide was not used when placing the implants.

Implant 29 had been placed at an inadequate angle. Owing to the angulation of the implant, the simultaneous placement of two impression posts was not possible, rendering it impossible to take an impression (Fig. 2).

Since the implant was placed in proximity to the inferior alveolar nerve, removal of the integrated implant was not advisable.

The following approach was used to solve this problem:

- **Implant 30** presented with a minor mesial tilt. Therefore, a prefabricated impression post, together with the corresponding impression coping, could be placed (Fig. 3).

**Fig. 4**, The 25-degree angulated abutment used.
**Fig. 5**, CAD/CAM-fabricated impression coping placed on the abutment.
**Fig. 6**, The coping covered with resin to increase retention.
**Fig. 7**, Impression posts with copings in place.
**Fig. 8**, Impression with implant analogues in place.
**Fig. 9**, Custom-made abutments in place on the cast.
**Fig. 10**, Metal–ceramic crowns in place on the cast.
**Fig. 11**, Panoramic radiographs with the abutments in place.
**Fig. 12**, The final restorations in place.
case report  impression of steeply angulated implants

Various prefabricated angulated abutments were tried on implant 29. An abutment with a 25-degree angle was chosen because it was comparatively parallel to the impression post on implant 30 (Figs. 3 & 4).

The selected abutment was scanned and an impression coping was fabricated from non-precious metal (cobalt–chromium alloy; Zenotec NP, Wieland Dental) using CAD/CAM technology (Fig. 5). The coping was covered with a thin layer of resin (PATTERN RESIN, GC) and small spheroids were modelled coronally, labially and lingually to increase retention (Fig. 6).

The impression post, together with the coping, was placed on implant 30. The 25-degree angulated abutment, functioning as an impression post, together with the coping, was placed on implant 29 (Fig. 7).

An impression was taken using a polyether material (Impregum, 3M ESPE; Fig. 8).

Two custom abutments were fabricated, as well as two individual porcelain-fused-to-metal ceramic crowns (Figs. 9 & 10).

The abutments were placed on the implants using a custom-made key and torqued to 35 Ncm (Fig. 11). The crowns were then cemented on to the abutments using provisional cement (Figs. 12 & 13).

Conclusion

The method described allows for the successful restoration of malpositioned implants.

However, proper treatment planning should precede any implant placement to guarantee the ideal position and thus eliminate any additional treatment steps.

Editorial note: A complete list of references is available from the publisher.

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Gregory-George K. Zafiropoulos, DDS, Dr. dent., is a specialist in periodontology certified by the German Society of Periodontology. He received his PhD in Periodontology from the Philipp University of Marburg in Germany. He has been in private practice in Düsseldorf in Germany since 1993 and is a professor at the Università Cattolica del Sacro Cuore in Rome in Italy. Prof. Zafiropoulos has completed postgraduate studies in preventive dentistry (University of Athens in Greece), periodontology (Saarland University and Philipp University of Marburg in Germany), oral implantology (University of Göttingen/German Association of Dental Implantology) and implant prosthodontics (RWTH Aachen University in Germany). He worked as an adjunct professor at the University at Buffalo in the US. He is a diplomate of the International Congress of Oral Implantologists and a specialist in implantology certified by the German Society of Oral Implantology, and has published 130 articles internationally in the fields of periodontology and implantology.

Oliver Hoffmann, DDS, MS, Dr. med. dent., received his dental and doctoral degrees from the University of Würzburg in Germany in 1997. He received his certificate in Periodontics and his master’s degree from Loma Linda University in the US. Furthermore, he is an associate professor at the Department of Periodontics at Loma Linda University and is an associate along with Prof. Zafiropoulos at a practice in Düsseldorf. Prof. Hoffmann is a diplomate of the American Board of Periodontology and an active member of the American Academy of Periodontology and the Academy of Osseointegration.

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When digital dental radiography was first introduced in the late 1980s, conventional X-rays had been in use for almost a century. The radiograph had, over the years, expanded the dentist's investigative capacity in many ways; it was possible to confirm health, or to detect disease, in many previously invisible areas of concern to the profession, including coronally, periapically, and periodontally. Visual access, complemented by radiographic interpretation, provided a comprehensive environment for earlier and more accurate diagnosis.

Advantages of digital radiography

For the practitioner, the lost production of the conventional X-ray's developing downtime (5 to 10 minutes) has always been a very costly break in the production day. The virtually immediate computer-generated radiographic image eliminates this irritating issue. For the dental team, the elimination of the darkroom, its chemicals, solution replenishment routines, foul odours, and increasingly complicated environmental liabilities are welcome changes.

Modern digital radiographic systems today provide highly accurate and clinically relevant diagnostic information. Their many advantages include: virtually immediate results, clinical accuracy, expanded diagnostic options, decreased patient radiation, convenient data storage and communication, ease of clinical use by auxiliaries, decreased consumable costs, and a more environmentally friendly profile.

Digital radiography options

Several categories of innovative dental radiographic imaging technologies have been intro-
duced into the dental marketplace. In general, they can be used with existing X-ray units. As a major benefit to dental patients, a significant decrease in radiation emission is required. Practitioners looking to update and upgrade their traditional [silver halide] radiographic systems have excellent clinical options. One of the most important selection criteria is the sensor-to-computer data transfer mode. Some digital chip sensors, such as the CCD (Charge Coupled Device) and CMOS (Complementary Metal Oxide Sensor), are hardwired to the computer through a USB or utilise a Bluetooth connection. The digital PSP (Phosphor Storage Plate) sensors (ScanX, Air Techniques, Melville, NY, USA) are wireless, and are most similar in appearance, function and convenience to traditional radiographic film. Wireless digital sensor technology (Fig. 1) is the most popular digital radiography process worldwide, with more than 50,000 dentists having incorporated PSP into their practices. The three types of sensors, CMOS, CCD, and PSP are equivalent in terms of the data that they accumulate per square millimetre during their very brief exposure to ionizing radiation, and then transfer to a digital image format.

Sensor diagnostic surface area

Sensor dimensions are crucial to diagnostic utility. The larger the active surface (or image) area, the greater the amount of information the sensor provides to the practitioner. A traditional size 2 film provides about 1,100 mm$^2$ of diagnostic area. Similarly, a size 2 ScanX wireless digital sensor offers 1,080 mm$^2$ of diagnostic area. Digital chip sensors typically have a smaller active area, providing correspondingly less diagnostic information. There is a further complication for the wired chip sensors with bitewing images (Fig. 2). The sensor wire must be placed between the posterior teeth, preventing their complete intercuspation. Unlike a thin cardboard or plastic bitewing tab, the wire is 4–6 mm in diameter, leaving the teeth that distance apart. The resulting empty interocclusal space is non-diagnostic for dental structures, and in fact, prevents the effective imaging of the gingival areas and the crestal bone. This often necessitates a vertical reorientation of the sensor and/or more radiographs, requiring a greater radiation exposure for the patient (Fig. 3).

Sensor thickness

The thickness of the sensor can be a major barrier to patient comfort and proper positioning of the sensor. A traditional size 2 film, at approximately 1.0 mm of thickness, can be rather uncomfortable for some patients, particularly individuals with small mouths or conditions such as lingual tori. Wired digital sensors range from 5.5–8.3 mm in thickness. Their thickness makes them more difficult to position in the mouth and more difficult for the patient to retain comfortably. The ScanX wireless digital sensor is less than half as thick as a conventional X-ray film at 0.4 mm. Furthermore, unlike the rigid, wired sensors, the PSP sensor

Fig. 4a & b. In some cases, effective imaging requires a greater radiation exposure for the patient.

Fig. 5. ScanX wireless digital sensors are available in different sizes.
is quite pliable and has a reasonable flex upon insertion into the mouth (Fig. 4), significantly increasing patient comfort.

Wireless sensor size range

ScanX wireless digital sensors are available in a range of sizes (Fig. 5): #0 and #1 for smaller and/or constrained mouths, #2 for standard bitewing, (Fig. 6) periapical, (Fig. 7) and endodontic (Fig. 8) images, #3 for long bite wings, #4 for occlusals, panoramic, (Fig. 9) cephalometric, (Fig. 10) and TMJ. Each sensor is a reusable plate that is inserted into a disposable protective barrier sleeve, positioned as required, briefly exposed, scanned and the data is immediately transmitted to the computer for image display. During the scanning, the data is automatically erased from the sensor, preparing it for immediate re-use in a new protective barrier sleeve.

The intraoral sizes are fabricated of a flexibly soft, reusable plastic that can be curved extensively to better fit the patient’s mouth. If the digital sensor is bent to the point where the surface cracks, the broken portion of the sensor surface can no longer provide diagnostic information. With reasonable care, each sensor should last for thousands of images.

Digital sensor replacement cost

Most breakdowns of chip sensors occur at the wire-sensor interface. While this should be easily (and inexpensively) repairable, there is a general reluctance to refurbish this connection, and the dentist is placed in a position where new sensors must be acquired. Whether the problem is a crushed chip or a frayed lead cable, wired digital sensors are very expensive to replace (often US$5,000–10,000 or more).

In fact, it is highly advisable to have a replacement (insurance) policy with the manufacturer or dealer to cover these eventualities. The replacement warrantee is typically more than US$1,000 per year per sensor. Wireless sensors, on the other hand, are far less costly; a size #2 replacement sensor costs about US$40. Moreover, there are no wires to break. Considering a lifespan of thousands of exposures, the per-use cost of a PSP digital sensor is negligible.

Developing/scanning time

Conventional X-rays were developed to image viewability through chemical baths, water rinses and air dryers. The process was long and frustrating, particularly if the results were needed quickly. After intraoral exposure, a single film might be ready in 5–6 minutes, but a full mouth series took 10 minutes or longer. Wired digital sensors transmit the ionization data to the software immediately, and the images are ready for viewing as soon as they are processed (typically a very minimal delay).

ScanX wireless digital sensors are placed in the small footprint scanning unit, ScanX Swift (Fig. 11) and the images are available for viewing momentarily. The first PSP image is ready within 11 seconds, and subsequent one take 4 seconds each. Thus, a
4-bitewing series is ready for viewing in less than 30 seconds, and a full mouth series within 2 minutes. The unit automatically erases all the data on each wireless sensor, readying it for the next radiograph.

**Image enhancement**

Digital radiographs have higher resolution than conventional film, and are thus clearer and more accurately diagnostic. The ScanX software has additional image enhancement tools that allow dentist to manipulate the acquired raw images (brightness, contrast, false colour, reversal) for additional analytic data without re-exposing the patient to additional radiation. These investigative tools are very valuable in pinpointing issues more specifically and far earlier than ever before. The software is intuitive and easy to use.

Viewing digital images on a screen has significantly improved both the way that practitioners diagnose their patients and the means whereby they develop simple and extensive treatment planning. The size of the monitor offers on-screen co-diagnosis and co-treatment planning that actively involve the patient in the dental treatment process.

**Data storage**

The practice's radiographic data is ideally stored in a single location on the office server computer from where it is readily accessible to all the operators. Since radiographic image files are rather large (and compression may cause the loss of important details), it is important to dedicate adequate storage space that can accumulate at least 3 years' worth of data. Cephalometric and panorex images are particularly space consuming. Off-site and multiple location backups are good safe-computing practices that eliminate the unlikely, but potentially disastrous results of fire, flood, or a total irreversible failure of the storage drive.

**Conclusion**

Digital dental radiography is faster, cleaner, more effective and better than silver-based film. More than 99 per cent of dentists who use digital radiography recognize that it was a good investment. The obvious advantages include: immediacy of the images, decreased radiation exposure, image enhancement, digital storage, and the elimination of chemicals. The mainstream acceptance of digital radiography has been slowed by high start-up costs, however. Some of the earlier objections such as rigidity and bulkiness of sensors, sensor cord damage, and ongoing maintenance and repair have been eliminated by the PSP wireless digital sensors. While the initial costs of conversion to digital radiography may be high at first, the long-and short-term clinical and financial benefits of digital radiography are well worth the investment.

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**Fig. 11** ScanX wireless digital sensors are placed in the small footprint scanning unit, ScanX Swift.

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**About the Author**

Dr George Freedman is a founder and past president of the American Academy of Cosmetic Dentistry, a co-founder of the Canadian Academy for Aesthetic Dentistry and a Diplomate of the American Board of Aesthetic Dentistry. His most recent textbook, “Contemporary Aesthetic Dentistry” is published by Elsevier.

Dr Freedman is the author or co-author of 12 textbooks, more than 700 dental articles, and numerous webinars and CDs and is a Team Member of REALITY.

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The SmileMe Mirror is a proven concept for practices to attract more cosmetic patients. By assisting the dental team with every step of the consultation, it is a software that has the power to grow dental practices by changing the way they communicate. In fact, SmileMe was designed so that every single patient receives the same information about the treatments the clinic has to offer. More specifically, it consists of three complimentary modules that spark a valuable 10-minute conversation between the practice and the patient. The end goal is to motivate the patient to move forward with the proposed treatment.

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The first step is for the patient and dental nurse to go through the Smile Analysis. This is a carefully crafted questionnaire that helps the practice understand what their patient wants. The goal of asking these 14 questions is to make the dental team aware of their patient’s desires. Depending on the outcome of the analysis, the practice can then respond with an appropriate cosmetic treatment.

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Last but not least, the protocol ends with a concise explanation of all relevant treatments. The Treatment Pages serve as a menu in the dental practice to make sure that the patient is familiar with all solutions available. To do so, SmileMe uses interactive content and digital animations so that all explanations are quick and easy to understand.

A must-have for cosmetic dentists

Thanks to this update, SmileMe can now confidently position itself as world leader in marketing technologies and services for cosmetic dentists. With a concept that is easy to integrate and has proven its success in hundreds of practices and dental chains across the planet, the SmileMe Mirror is an investment any practice looking for growth should make. Schedule a web demo at our website or come meet us at the IDS (Hall 3.2, Stand A041) or at ScanDeFa (C1–016B), to learn how SmileMe can grow your practice today.

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Regenerative endodontics and composite as an all-rounder

European COLTENE Key Opinion Leader Meeting sheds light on the future of dental medicine

The St Gallen football stadium is where various past matters of international importance have been settled. This November, the well known sports facility became the venue for a summit meeting of European dental medicine. The Swiss dental specialist COLTENE invited respected opinion leaders and distinguished researchers to the Key Opinion Leader Meeting on its home territory. Over 80 renowned experts from research and practice spent two days discussing the future of endodontics and restorative dentistry. Among the participants were representatives of leading European universities and research laboratories, as well as numerous dentists who have made a name for themselves, also internationally, with their innovative treatment concepts and unusual patient cases. Specialists from countries including Germany, Finland, Greece, Great Britain, Italy, Norway, Switzerland and the USA took part in numerous presentations and lively discussions.

The chameleon of restorative dentistry

Following a few words of introduction from COLTENE Managing Director Martin Schaufelberger, the first part of the congress focused on the creative use and advancement of composite as an all-rounder in restorative dentistry. To start the congress, the chairman, Prof. Ivo Krejci, Head of the Division of Cariology and Endontology, as well as President of the École de Médecine Dentaire at the University of Geneva, presented his own concept developed for lifelong dental coaching. Minimal invasive treatment with direct and indirect adhesive techniques still represent one of the best alternatives for long-term patient restoration. ‘Thanks to growing life expectancy in Western Europe, there is an increasing demand for sustainable dental care and therapy, starting with the small child well into old age’, according to Krejci. In the second presentation section, the emphasis was on the current state of material research. Prof. Jorge Perdigão from the Department of Restorative Sciences at the University of Minnesota spoke about the latest approaches for improving dentine adhesion with the aid of adhesives. Also, Simon Sutter allowed the international guests exclusive insights into the latest innovations from COLTENE’s Research and Development department under the title ‘How can the gloss retention of composites be improved?’. Tips and special ideas on the use of composite veneering systems, such as the worldwide established COMPONEER treatment concept, were presented by dentists in private practice and aesthetic specialists Dr George Gomes from Lisbon and Dr Mario Besek from Zurich. Industrially prefabricated nano-hybrid composite shells offer the modern practitioner a wealth of options for anterior restoration, rectifying misalignment, diastema and tooth fracture through to gap closure and classical caries therapy. Dr Monik Vasant from London illuminated the fine art of highly aesthetic anterior restoration using the freehand technique using the MIRIS system, for a direct comparison with ceramic restorations. The programme was rounded off with an exciting outlook on the perspectives of new solutions in restorative dental medicine. The discussion covered the skilful exploitation of 3-D printing in dental medicine, the use of CAD/CAM-generated composite blocks as real alternatives for ceramic, as well as crowning of implants with composite and the use of composite cement for bridges. Prof. Mutlu Özcan from the University of Zurich concluded the round of presentations with her own spectacular cases, in which prosthetic freehand constructions composite were used, and the enormous potential of composite as an all-rounder became abundantly clear.

New approaches in endodontics

The second day of the congress dedicated to endodontics was no less lively. Under the motto ‘Pulp Fiction—beyond today’s limitation of Endodontic treatment’, the participants researched new ways of achieving regenerative orientation in the supreme discipline of conservative dentistry, leading away from the conventional, purely surgical approach. The congress chairmanship was shared by Prof. Dag Ørstavik, Head of the Department of Endodontics and the Postgraduate Programme at the University of Oslo, and Dr Antonis Chaniotis who works at the University of Warwick and has his private practice in Athens. To start, Prof. Håvard Haugen from the University of...
Oslo explained the principles of morphogenesis and the special role of intrinsic disorder proteins (IDPs). The possibilities of developing a method for systematic regeneration of the dental pulp in the idea of tissue engineering was impressively illustrated by Dr Kerstin Galler from the University of Regensburg. The chairman Prof. Ørstavik himself demonstrated the basic principles and limitations in effective testing of dental materials. At the same time, he referred to the importance of clinical studies before using innovative materials in the clinical field. ‘Understanding biological processes must not mutate into an end in itself. Firstly it is important to define which objectives the investigations of new materials have and are then presented in the studies. At the end of the day, new treatment methods should also actually benefit the patient and be deployed intelligently’, Ørstavik strongly stressed. Konstantinos Simatos, who also travelled from Athens, offered creative enrichment. During the lunch break, all manner of percussion instruments were handed out in the lecture hall and the dedicated Greek managed to persuade the congress participants to work together as an orchestra for 40 minutes. A task that served for relaxation and evidently sounded like fun for all involved at the same time.

Dr Antonis Chaniotis had already complemented the insights from basic research with his experience from routine clinical work, and presented a series of long-term observations in the treatment of children in the regenerative part of the day’s programme. In his second contribution, he demonstrated why and how he came to use intelligent endodontic working aids, and how modular NiTi systems and endodontic aspirator tips significantly simplify obturation of a perfectly prepared canal for dentists today already. In the so-called ‘negative pressure technique’, fluid gutta-percha is transported in the temporarily sealed canal, even into the smallest lateral canals, through the skilled use of an aspirator tip. Mechanical preparation is still easiest with an almost unbreakable NiTi file. Taking the example of HyFlex CM and the new HyFlex EDM system, the endo expert demonstrated how high precision canal shaping can be achieved within a short time. As quoted by Dr Chaniotis on the current progress in the industry: ‘Thankfully we don’t have to wait for the future for high quality treatment and confident working! Nowhere is current technical development advancing so rapidly as in endontology.’

The eventful day was rounded off by Dr Barbara Müller, Head of the COLTENE Endo Business Unit. She introduced the upcoming new products, such as GuttaFlow bioseal and the Hyflex EDM files and illustrated that their special manufacturing process yielding a new generation of NiTi files, whereby the reduction in the number of files used is not at the expense of the quality of the endodontic treatment. The contribution was impressively complemented by Dr Ginaluca Fumei and Dr Thomas Rieger, who both presented cases from their practices, which were treated with Hyflex EDM.

**Important impetus for material research**

The host COLTENE was entirely satisfied with the results of the symposium and the ideas put forward by the various opinion leaders. The innovation-driven company will also consider the countless suggestions and ideas from the seminar within its own development work. The close cooperation with dentists from around the world and leading universities plays a crucial role in designing and shaping practical products. This is the only way of ensuring that clever working aids and dental materials optimally support dentists in their day-to-day therapeutic practice. Today’s visions from the dental specialists may then have already become common treatment in practice by the time of the next Key Opinion Leader Meeting.

The initial responses from the audience were also full of praise. For instance, Prof. Brian Millar from London and Dr Hagay Shemesh from the Netherlands emphasised the balanced mix between scientific and clinical contents. Participants such as Dr Michael Leski, Poland and Dr Sylvia Rahm, Germany, found the interdisciplinaries presentations extremely enriching and also appreciated the perfect organisation of the event.

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10–14 March 2015
Cologne, Germany
www.ids-cologne.de

Academy of Osseointegration 30th Annual Meeting
14–12 March 2015
San Francisco, USA
www.osseo.org

IMAGINA DENTAL
4th 3D & CAD/CAM Digital Dentistry Congress
1–3 April 2015
Monaco
www.imaginadental.org

APDC 37th Asia Pacific Dental Congress
3–5 April 2015
Singapore
www.apdc2015.sg

10th CAD/CAM & Digital Dentistry
International Conference
8–9 May 2015
Dubai, UAE
www.cappmea.com

White & Pink Esthetics
12th International Congress of Esthetic Dentistry
14–16 May 2015
Bucharest, Romania
www.sser.ro

EAED 29th Annual Meeting
28–30 May 2015
Florence, Italy
www.eaed.org

EuroPerio 8
3–6 June 2015
London, UK
www.efp.org

AAED 40th Annual Meeting
4–7 August 2015
Telluride, USA
www.estheticacademy.org

FDI Annual World Dental Congress
22–25 September 2015
Bangkok, Thailand
www.fdi2015bangkok.org

ESCD Annual Meeting
1–3 October 2015
Cannes, France
www.escdonline.eu

IFED 2015—The 9th World Congress of the
International Federation of Esthetic Dentistry
5–7 November 2015
Cape Town, South Africa
www.ifed-2015.com
**submission guidelines:**

Please note that all the textual components of your submission must be combined into one MS Word document. Please do not submit multiple files for each of these items:

- the complete article;
- all the image (tables, charts, photographs, etc.) captions;
- the complete list of sources consulted; and
- the author or contact information (biographical sketch, mailing address, e-mail address, etc.).

In addition, images must **not** be embedded into the MS Word document. All images must be submitted separately, and details about such submission follow below under image requirements.

**Text length**

Article lengths can vary greatly—from 1,500 to 5,500 words—depending on the subject matter. Our approach is that if you need more or less words to do the topic justice, then please make the article as long or as short as necessary.

We can run an unusually long article in multiple parts, but this usually entails a topic for which each part can stand alone because it contains so much information.

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**Text formatting**

We also ask that you forego any special formatting beyond the use of italics and boldface. If you would like to emphasize certain words within the text, please only use italics (do not use underlining or a larger font size). Boldface is reserved for article headers. Please do not use underlining.

Please use single spacing and make sure that the text is left-justified. Please do not centre text on the page. Do not indent paragraphs, rather place a blank line between paragraphs. Please do not add tab stops.

Should you require a special layout, please let the word processing programme you are using help you do this formatting automatically. Similarly, should you need to make a list, or add footnotes or endnotes, please let the word processing programme do it for you automatically. There are menus in every programme that will enable you to do so. The fact is that no matter how carefully done, errors can creep in when you try to number footnotes yourself.

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**Image requirements**

Please number images consecutively throughout the article by using a new number for each image. If it is imperative that certain images are grouped together, then use lowercase letters to designate these in a group (for example, 2a, 2b, 2c).

Please place image references in your article wherever they are appropriate, whether in the middle or at the end of a sentence. If you do not directly refer to the image, place the reference at the end of the sentence to which it relates enclosed within brackets and before the period.

In addition, please note:

- We require images in TIF or JPEG format.
- These images must be no smaller than 6 x 6 cm in size at 300 DPI.
- These image files must be no smaller than 80 KB in size (or they will print the size of a postage stamp!).

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Also, please remember that images must not be embedded into the body of the article submitted. Images must be submitted separately to the textual submission.

You may submit images via e-mail, via our FTP server or post a CD containing your images directly to us (please contact us for the mailing address, as this will depend upon the country from which you will be mailing).

Please also send us a head shot of yourself that is in accordance with the requirements stated above so that it can be printed with your article.

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An abstract of your article is not required.

**Author or contact information**

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**Questions?**

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